ARMY LOGISTICIAN

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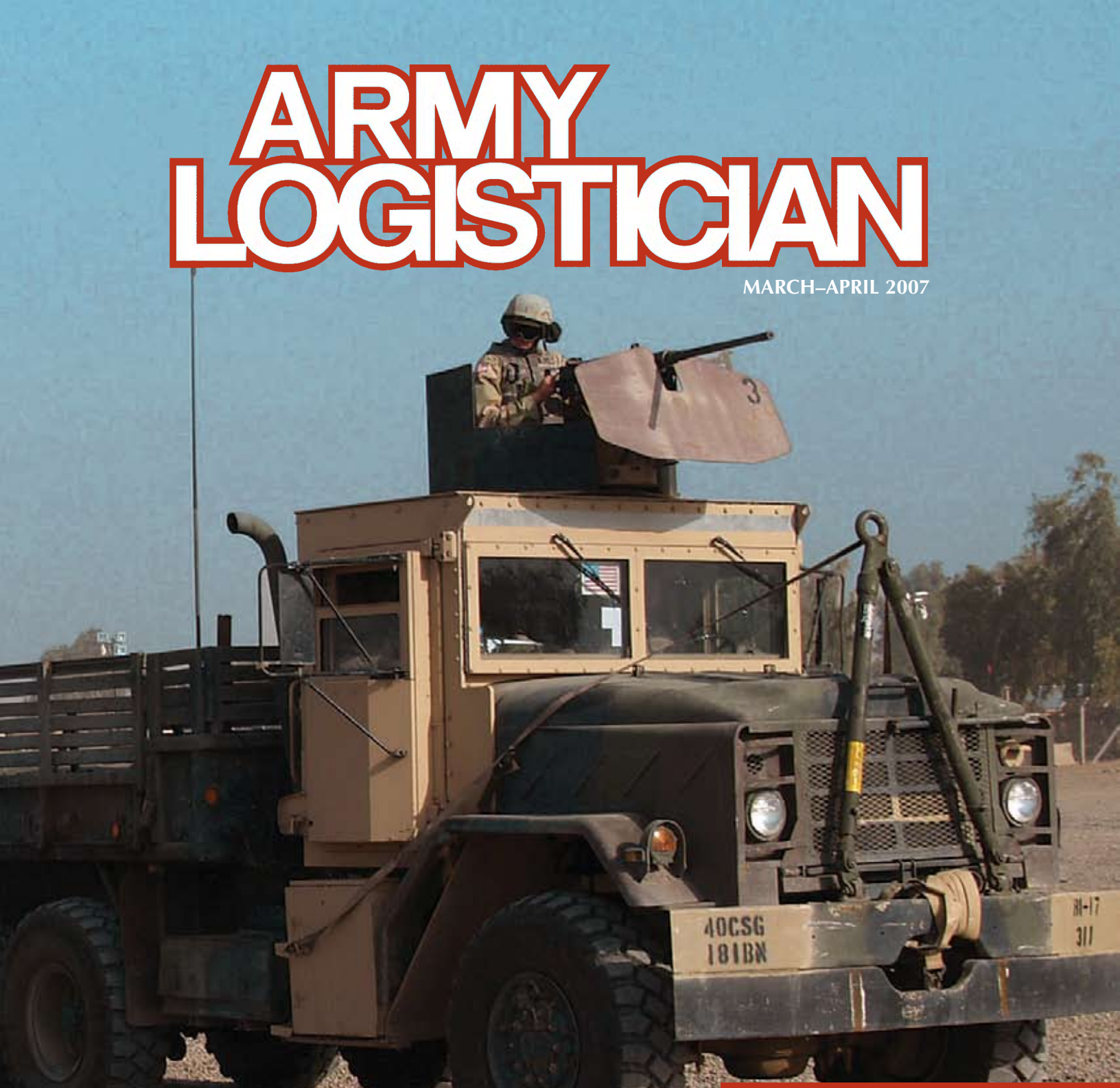

Distribution-Based Logistics in Iraq

Also in this issue:

Logistics: Supply Based or Distribution Based?

The Changing Face of Fuel Management

Combat Logistics Patrol Methodology

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Cover: During Operation Iraqi Freedom 05–07, the 3d Corps Support Command (COSCOM) provided support to over 220,000 coalition Soldiers and civilians and backup support to the emerging 300,000-man Iraqi Security Force. In order to perform their corps sustainment mission, 3d COSCOM units traversed almost every main supply route and most alternate supply routes throughout Iraq. Their story begins on page 2. In the cover photo, Soldiers of the 181st Transportation Battalion prepare to provide security for a departing combat logistics patrol. *(Photo by SGT Mary E. Ferguson, 3d COSCOM PAO.)*

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ALOG NEWS

LIFE CYCLE MANAGEMENT COMMAND CREATED FOR MUNITIONS

The life cycle management command (LCMC) concept was extended to munitions with the activation of the Joint Munitions and Lethality (JM&L) LCMC in November. The JM&L LCMC is the fourth of the Army Materiel Command's (AMC's) LCMCs, joining the Aviation and Missile LCMC, the Communications-Electronics LCMC, and the TACOM [Tank-automotive and Armaments Command] LCMC. The creation of the LCMCs is designed to reduce life-cycle costs and deliver better products to Soldiers more quickly by improving the relationship among AMC, its major subordinate commands, and the program executive offices (PEOs).

Headquartered at Picatinny Arsenal, New Jersey, the JM&L LCMC integrates the Armament Research, Development, and Engineering Center at Picatinny; the PEO for Ammunition, also at Picatinny; and the Joint Munitions Command at Rock Island Arsenal, Illinois.

JM&L LCMC logo.

ARMY SPEEDS UP BCT SCHEDULE

The Army announced in December that it will establish two more Active-component brigade combat teams (BCTs) ahead of schedule in order to increase the number of combat and combat support units available for combat and homeland-defense missions.

The 3d Brigade, 1st Armored Division, at Fort Riley, Kansas, will convert to a heavy BCT in April, 11 months earlier than planned. Its transition team mission and resources will be assumed by the 1st Brigade, 1st Infantry Division. The BCT will reflag next September as the 2d Brigade, 1st Infantry Division, bringing all Fort Riley units under the 1st Infantry Division.

The 3d Brigade, 1st Infantry Division, at Fort Hood, Texas, will convert to an infantry BCT in April, 17 months ahead of schedule. When facilities become available, the unit will relocate to Fort Knox, Kentucky. However, if the unit deploys, it will return from combat to Fort Hood before moving to Fort Knox.

The conversion to BCTs is in keeping with the Army's decision to transform the total force from a Cold War-structured organization to one that is prepared to operate in conflicts ranging from full-scale combat to stability and reconstruction operations.

Increasing the number of BCTs also will help reduce stress on the current force by giving Soldiers a few more months at home than they now have. Currently, the ratio is 1 year deployed to sometimes less than 1 year at home station. The Army's goal for the Active component is 1 year deployed to 2 years at home station.

Most of the Soldiers affected by the accelerated creation of the two BCTs will receive permanent change of station orders this summer.

HANDBOOK OFFERS LOGISTICS CAPTAINS INTRODUCTION TO ARTILLERY SUPPORT

The Army Logistics Management College (ALMC) at Fort Lee, Virginia, has prepared a handbook designed to prepare logistics captains for support positions in field artillery battalions, particularly in forward support companies. The handbook, *Field Artillery Logistics: Munitions Support,*

VETERAN ARMY LOGISTICIAN EDITOR RETIRES

Janice L. Simmons, a staff writer-editor at *Army Logistician* since 1995, retired on 3 January after 34 years of Federal service. During her 12 years at *Army Logistician*, Ms. Simmons consistently performed according to the highest standards of Army journalism. The hallmarks of her work were meticulous attention to detail and devotion to accuracy. She combined the skills of a painstaking researcher with the discernment of a master grammarian. Her excellence was recognized at the Army level when she received the Army Editor of the Year Award in 2003. Her judgment, advice, and humor will be missed greatly.

(continued on page 46)

Distribution-Based Logistics in Operation Iraqi Freedom

BY COLONEL C. BRANDON CHOLEK AND CHIEF WARRANT OFFICER (W–5) MATTHEW A. ANDERSON, SR.

The lifeline to the Army's combat power is its distribution network and demand-supported, on-hand stocks for all classes of supply.

In the summer of 2005, Brigadier General Rebecca Halstead, the Commander of the 3d Corps Support Command (COSCOM), directed our unit, the 3d Corps Distribution Center (CDC), to analyze, optimize, and refine the distribution architecture of the Iraqi theater. Her charter to the CDC was: Increase the velocity and quality of support to the warfighter, optimize effectiveness of scarce distribution assets, keep Soldier and contractor force-protection paramount, and improve unity of effort across the many disparate organizations to enhance tactical, operational, and strategic distribution enablers for supporting a transforming Army.

In order to reduce the millions of dollars worth of "insurance stocks" and increase the confidence of supported units in the distribution network, the variability of supplies and equipment must be limited. At the same time, the operational readiness and visibility of unit equipment must be increased. While the processes of requisitioning, distributing, and receipting materiel, supplies, and commodities are interrelated and integrally linked to readiness, each process is straightforward when individually scrutinized. In Iraq, the CDC team analyzed all distribution modes and nodes while using the Army distribution management philosophy: define, measure, and improve. From the tactical level through the strategic level, the distribution process involved numerous agencies and many disparate teams of professionals.

Command and Control for Echelons Above Brigade

Unity of command greatly facilitated the logistics success of 3d Corps units on the battlefield during Operation Iraqi Freedom (OIF) 05–07. Previous rotations operated under the Army of Excellence organizational structure, in which the divisions were supported by their assigned division support commands. For OIF 05–07, transformed and transforming modular units were employed at various levels of manning, with all of the division's logistics capabilities residing in the brigade combat teams (BCTs).

A 317th Maintenance Company Soldier directs a forklift operator to move a pallet of tires that is being staged for retrograde. *(Photo by SGT Rachel A. Brune, 101st Sustainment Brigade PAO.)*

During our deployment, the 3d COSCOM's support brigades assumed the missions of the former division support commands as well as those of the supporting corps support groups. Brigadier General Halstead was in direct command and control (C2) of all logistics assets above the BCT level and could effectively flex to meet the Multinational Corps-Iraq (MNC–I) commander's intent. The tremendous logistics capabilities of 20,000 COSCOM Soldiers and 5,000 Logistics Civilian Augmentation Program (LOGCAP) contractors encompassed materiel management, field maintenance, automated logistics systems operation, and distribution.

The 3d COSCOM's C2 reach extended to every corner in Iraq, and, unlike any single division or coalition force headquarters, 3d COSCOM units traversed almost every main supply route and most alternate supply routes nightly in support of their corps sustainment mission. The depth and breadth of the 3d COSCOM span of control over the combat service support echelons-above-brigade units, coupled with its ownership of direct support and general support stocks, enabled the 3d COSCOM to manage all of its resources seamlessly and effectively in a coordinated and synchronized manner. Providing support to over 220,000 coalition Soldiers and civilians and backup support to the emerging 300,000-man Iraqi Security Force was a mission the 3d COSCOM embraced with conviction.

The 3d COSCOM comprised two sustainment brigades, three corps support groups, a theater security BCT, an area support group, and two rear-area operations centers arrayed across Iraq on diverse, inhospitable terrain in an area the size of Texas. Almost 40 percent of the 3d COSCOM's force was committed to providing force-protection duties for 5 bases and serving as theater security escorts for 2,000 trucks organized into approximately 70 nightly combat logistics patrols (CLPs). These 70 CLPs were in addition to the 30 CLPs (over 1,000 trucks) from the theater transportation group that accompanied deployments, redeployments, and theater sustainment from Kuwait. During surge periods, the 3d COSCOM had to track up to 4,000 trucks moving in more than 130 CLPs. During our yearlong rotation, corps, theater, and contractor trucks moved in more than 37,000 CLPs (over 1.1 million truckloads) throughout Iraq and endured over 1,400 enemy confrontations on the dangerous supply routes.

The 3d CDC, composed of commodity analysts, distribution and movement control experts, and future operations planners, served as the logistics nerve center for the 3d COSCOM. The CDC fused the supply expertise of the 19th Materiel Management Center with the transportation, distribution, and movement control functions of the 27th Movement Control Battalion under the supervision of the 3d COSCOM support operations staff to achieve a logistics common operating picture. Enabled by logistics automation systems and supported by movement control and distribution management teams throughout Iraq and at three borders, the CDC was ideally postured to synchronize seamless, continuous support.

The CDC maintained continuous visibility and oversight of all commodities and common-user land transportation assets in Iraq. The CDC had real-time situational understanding and was fully integrated in the operational and mission planning of the MNC–I, so it was able to apply resources to operations rapidly and effectively while continuing to balance the complex theater sustainment mission. Having single operational logistics C2 reside with the 3d COSCOM also provided the MNC–I commander and his staff complete logistics situational awareness, flexibility, responsiveness, and sustainability in the allocation of resources in the dynamic joint and coalition theater.

While achieving unity of command for the corps' logistics assets, the 3d COSCOM served as the primary logistics integrator and conduit for leveraging the capabilities of our in-country strategic partners to achieve unity of effort. Working with the MNC–I C–4, the Multinational Force–Iraq (MNF–I) Deputy Chief of Staff for Resources and Sustainment, the 377th Theater Sustainment Command, and the Coalition Forces Land Component Command C–4, the 3d COSCOM coordinated logistics unity of effort by leveraging the capabilities and resources of the Army Materiel Command (AMC); the Defense Logistics Agency (DLA) and subordinate DLA organizations such as the Defense Energy Support Center and the Defense Reutilization and Marketing Service, the U.S. Transportation Command and its forward-deployed U.S. Central Command Deployment and Distribution Operations Center (CDDOC), the Joint Contracting Command, and our LOGCAP and contractor partners. The 3d COSCOM's unique single logistics C2 structure facilitated the synchronization of vertical and horizontal coordination of all logistics required for simultaneous protracted theater sustainment, deployment, and redeployment and enabled operational support.

Operations

The Iraqi Theater was a hotbed of activity. Routine sustainment and operational support missions occurred simultaneously and continuously throughout Iraq. During our rotation, but most notably for the

Ramadi and Baghdad operations, the 3d COSCOM rapidly conducted parallel and multiechelon mission analyses to implement flexible, effective complex mission sets. The 3d COSCOM was able to balance the fight carefully with the right enablers to implement proactive measures for countering or mitigating enemy actions, the friction of competing events, and natural challenges. Employing and managing the critical assets of each of the support brigades in Iraq as a single, seamless logistics capability resulted in a logistics effort greater than the sum of its many parts.

For both the Ramadi and Baghdad missions, only the 3d COSCOM could plan, coordinate, assemble, and allocate the Soldiers and the resources necessary to ensure that these operations succeeded in the required timeframe. Both missions required common-user land transportation, field services, and materiel exceeding the capabilities of the respective support brigades in the battlespace. The CDC's future operations planners, who were attuned to corps and division planners, developed effective concepts of support for using Soldiers, equipment, and materiel from all five support brigades. The timely movement and repositioning of over 2,000 truckloads of equipment enabled the maneuver commanders to execute their missions and postured the corps for logistics success. For each of these missions, planning and execution were accomplished seamlessly within a 2-week timeframe and without adversely affecting the nightly sustainment missions. Fortunately for the Baghdad mission, the theater transportation trucks were already in Iraq in preparation for the redeployment of the Stryker brigade, so the corps movement control battalion, along with the corps and theater planners, diverted the convoys to Baghdad.

The 3d COSCOM, in concert with all of its partners and subordinate units, planned and coordinated to provide the right amount and type of transport needed to balance the operational requirements effectively with its capabilities. Single C2 for synchronizing transport resources, timing, and the ability to leverage existing infrastructure and processes, coupled with the robust stocks on hand, provided unprecedented flexibility, agility, and responsiveness.

Defining and Refining the Distribution Process

As the CDC team studying the theater distribution system identified the key nodes through which materiel would travel from end to end, the term "partnering" took on new meaning. Identifying tasks, applying measurable, standardized metrics for success, and assigning responsibilities at each node were prerequisites for refining a common distribution operating concept. Essential for process improvement was identification of an individual who was directly responsible for each task and who could make a change in the process.

The CDC team also had to identify what the change to the distribution process should be and, more importantly, how the system components should be modified and measured. The entire system had to be analyzed holistically, because an improvement in one segment could affect the functionality in another segment and impede its established performance metrics. Although distribution systems in the theater had matured significantly over the course of OIF, individual distribution nodes and segments were under constant and often dramatic transformations that affected other segments. Changes to automated logistics systems, advances in radio frequency identification technology, improvements in in-transit visibility (ITV) devices and systems, new air and ground systems, and modular organizational structures for tables of organization and equipment were some of the many variables affecting distribution. Although we encountered constant challenges and constraints with the distribution system, we were able to refine the system in order to provide a complete range of supplies and services to a hard-fighting, demanding force.

Different rotation polices and support solutions among the services could adversely affect support if not carefully orchestrated among strategic, operational, and tactical units and critical strategic logistics providers. The inevitable disruptions along main and alternate supply routes by improvised explosive devices or complex attacks could result in delays and an increase in the supported units' requisition wait time (RWT) if not properly considered. To ensure seamless support to the warfighters, we developed mitigating strategies and compensating mechanisms. For example, by adjusting days of supply for fuel and food and relocating tankers and refrigerated storage vans at key nodes in order to implement more flexible redistribution measures, the 3d COSCOM was able to absorb the variables inherent in the friction of war without any impact to the warfighter. ["Friction of war" is a term coined by Major-General Carl von Clausewitz, a renowned Prussian military theorist, to refer to unforeseen circumstances that frequently arise and routine tasks or expectations that often become extremely difficult.]

Reducing Requisition Wait Time

To measure RWT, we used weekly supply pipeline reports produced by AMC's Logistics Support Activity (LOGSA). These reports provided RWT and pipeline segment processing times for requisitions receipted in Iraq by class of supply, priority, mode of transportation, and source of fill.

Personnel from the 155th Cargo Transfer Company winch an M1A2 Abrams tank onto a heavy equipment transporter at Camp Taji, Iraq. *(Photo by SGT Joshua Salmons, 4th Sustainment Brigade PAO.)*

Near the beginning of OIF 05–07, the 85th percentile RWT measurement was below the Army Central Command's standard of 20 days. However, there were several weeks during which RWT fluctuated between 22 and 23 days, which exceeded the standard. Factors contributing to higher RWT were unit transitions, strategic transportation demands outside the theater, competing demands for in-theater transportation, supply support activity (SSA) personnel turnover, and limited periods of movement during critical Iraqi constitution referendum and national elections.

We formed a process action team (PAT) to explore ways to reduce the time required to process a unit's requisition from the time the requisition reached the SSA until the requested item was received in the SSA. The PAT was a cross-section of subject matter experts from the tactical, operational, and strategic distribution levels. We examined ways to improve processes throughout the supply chain, assigned responsibility for each process, and identified the individual who could impact specific areas for improvement. The PAT studied intratheater airlift and the ground lines of communication at the operational and tactical levels. We analyzed trends, routes, the current number of CLPs, the volume of transportation movement requests, and the priorities of the MNC–I in relation to the ability of 3d COSCOM, division, and theater transportation assets to meet those priorities.

Part of the PAT's charter was to increase the visibility of requisitions throughout the supply chain and to instill confidence in the distribution system in our customers. Increasing visibility and reliability would greatly reduce the counterproductive cycle of redundant ordering, which further burdened an already constrained distribution system and taxed the supply nodes.

The PAT conducted a detailed support-to-supporting-unit analysis, and each Department of Defense Activity Address Code (DODAAC) was aligned with the unit position on the battlefield and further aligned with the closest SSA. We reorganized operationally and reallocated and repositioned transportation assets. We also reduced the number of ground lines of communication and implemented measures to vary routes in order to reduce the predictability of convoys to the insurgents. Using a variety of statistical tools and reviews, we constantly scrutinized the logistics hierarchy at all levels, which improved the utilization rates of the subordinate logistics brigades.

As a result of these detailed efforts, the CDC and its key enabling partners were able to reduce the RWT from 22 to 23 days to 12 to 14 days over the course of 6 months. Quarterly, we studied the changes that were implemented and made incremental adjustments to ensure maximal support to the units with negligible impact on the distribution resources at all levels.

As a part of our supply chain analysis, we implemented mitigation strategies that would reduce the threat to Soldiers and contractors traversing the dangerous roads of Iraq and, at the same time, enhance distribution. For example, we maximized the use of airlift, built water-bottling plants, and increased ITV. For every four pallets flown, one truckload was displaced. For every CLP not sent out, up to 35 personnel were kept off the road.

Maximum Use of Airlift

The 3d COSCOM partnered with the Air Force and Army aviation units to ensure maximum use of their pallet- and cargo-carrying capabilities. The Air Force and the CDDOC team embedded forward at the theater level were highly supportive of our efforts. Their mantra

became "Load the pallets into GATES and the aircraft will come." [GATES (Global Air Transportation Execution System) is the Air Force Air Mobility Command's aerial port operations and management information system designed to support automated cargo and passenger processing.] GATES provided the much-needed visibility of cargo and the accompanying workload data needed to schedule channel missions and opportune lift. Cargo usually was moved within 72 hours.

In addition to the usual gray Air Force cargo planes, the CDDOC contracted commercial aircraft—most notably Russian IL–76 cargo planes. Starting out as a proof-of-concept principle, use of the cargo planes proved reliable, flexible, and predictable throughout the entire rotation. These planes moved more than 15,000 pallets (the equivalent of over 3,700 truckloads). Monthly, the CDC Air Cell, in conjunction with the CDDOC and the Air Force, reviewed aircraft utilization statistics to assess requirements and adjust flight route channel frequencies and locations.

Army CH–47 Chinook helicopters proved critical in moving repair parts and major assemblies. Initially, the 3d COSCOM received only one mission (requiring two helicopters) on alternating nights; but our workload soon quadrupled, which meant that we had sufficient workload to justify two missions (requiring four helicopters) nightly. Integrating global contractor repair parts into the 3d COSCOM theater distribution network was essential to effectively distributing unique repair parts for equipment that had been fielded rapidly throughout the theater. During OIF 05–07, the Army helicopters proved to be adaptable for this mission, and they could be dispatched readily to the remote locations from which many requirements originated. The helicopters transported over 3,000 pallets, which made it unnecessary to dispatch more than 770 trucks.

The C–23B Sherpa aircraft was an indispensable workhorse for moving medical cargo and personnel. More than 98 percent of medical supplies were distributed by aircraft. These small, agile, and reliable aircraft transported over 10,000 pallets, or the equivalent of 1,200 truckloads.

Water-Bottling Plants

Soldiers and contractors operating in desert environments need large amounts of potable water for drinking, dining facility operation, and sanitation and hygiene. Despite advances in reverse-osmosis water-purification unit (ROWPU) technology and the Army's significant investment in personnel and equipment to prepare water for consumption, bottled water is preferred by the troops.

Bottled water was trucked in from Kuwait, Turkey, and Jordan; this required thousands of line-haul truckloads and exposed drivers and escorts to lethal enemy actions. In order to take advantage of an opportunity to mitigate the Soldiers' exposure to danger while hauling water and the obvious cost effectiveness of building potable water-bottling plants directly on U.S. bases in Iraq, logisticians and representatives of the Defense Contracting Command solicited contractors to build six water-bottling plants.

The first plant was constructed at Logistics Support Area Anaconda. It quickly proved its worth and served as a source of lessons learned for constructing the five other plants. In a 7-month period, the Anaconda facility produced the equivalent of 3,500 truckloads of water and saved millions of dollars because the average case price was reduced by almost 70 percent. Every month, the five completed plants displaced over 3,100

A water-bottling specialist prepares water for packaging at water-bottling facility number 6 in Iraq. The plant produces 450,000 one-liter bottles a day. *(Photo by SFC Guadalupe Stratman, 4th Sustainment Brigade PAO.)*

trucks that had been required to haul water. When fully operational, the six plants will displace more than 16,000 truckloads and yield a potential saving of over $100 million a year. In addition to mitigating risk to Soldiers and saving the Army money, the plants afforded increased operational flexibility because we could adjust production levels and rapidly change the distribution schedule to coincide with requirements.

In-Transit Visibility

To increase effectiveness of the distribution system, the 3d COSCOM, MNC–I, and MNF–I embarked on a campaign to "tag everything that moved" to make better use of the maturing ITV infrastructure. With over 90 fixed interrogators at key nodes throughout Iraq and the availability of the upgraded Standard Army Retail Supply System (SARSS) at SSAs to write radio frequency tag content, ITV provided us an opportunity to assist all stakeholders. Teams of logisticians throughout our area of responsibility relied on the data feeds, data integrity, and data latency to conduct their day-to-day operations. The 3d COSCOM's readiness analysts were trained to use logistics automation enablers, such as the Movement Tracking System (MTS) and the Battle Command Sustainment Support System (BCS3), to track and report on the status of shipments. Control of situational information allowed us flexibility in providing support and enabled us to use a variety of modes to move key items of materiel to their ultimate destination.

Redistribution and Retrograde

Redistribution and retrograde of equipment became additional missions for all units in Iraq, most notably for AMC's Field Support Brigade-Iraq (AFSB–I), the Military Surface Deployment and Distribution Command's 840th Transportation Battalion, and the 3d COSCOM. These processes reversed the paradigm of bringing everything into Iraq, as had been done for the last 3 years. Instead, we began a momentous paradigm shift toward moving equipment and materiel out of Iraq while redistributing other equipment to other combat, sustainment, deployment, and redeployment operations.

Redistribution and retrograde were key components of the Army's transition from limited wartime property accountability to stricter peacetime accountability standards. Redistributed equipment was allocated to coalition forces and provided to the Iraqi Security Forces (ISF) as significant military equipment. ["Significant military equipment" is defined as articles for which special export controls are warranted because of their capacity for substantial military utility or capability.] The remaining equipment would be retrograded to reconstitute the Army pre-positioned stocks in theater or redeployed out of theater for refurbishment to reset the Army.

The equipment to be retrograded ran the gamut of all classes of supply and equipment. Major end items were under the purview of AFSB–I's redistribution property accounting teams and accounted for using Property Book Unit Supply Enhanced (PBUSE). SARSS was the primary system used to account for other classes of materiel, and responsibility for its retrograde lay with the retrograde materiel redistribution teams and the SSAs. Together with the owning units, the teams opened containers; inventoried their contents; segregated materiel into serviceable, unserviceable, and recoverable items; properly restuffed and consolidated containers; created radio frequency identification tags; and submitted movement requests to the appropriate destinations in or out of Iraq. Hazardous items were containerized for disposition. Various onsite disposition instructions included "scrap," "hazmat," "sensitive item," "demilitarization required," and "condemned."

By using the 3d COSCOM's central receiving and shipping points (CRSPs), the forward redistribution point at Logistics Support Area Anaconda, and the ground lines of communication at the major bases, the mammoth redistribution and retrograde effort was undertaken without disrupting combat or sustainment operations.

Theater transportation units, which provided backhaul of equipment concurrent with redeployments and operational moves, were integral to the success of the operation. In a 6-month period, over 8,000 vehicles (valued in excess of $1 billion) were retrograded from Iraq. Hundreds of pieces of other equipment were redistributed among coalition and ISF forces, and thousands of additional items of materiel were redistributed within the battlespace.

Future Distribution in Iraq

The lifeline to the Army's combat power is its distribution network and demand-supported, on-hand stocks for all classes of supply. Just-in-time logistics does not work in a combat zone, and "iron mountains" of supplies are too costly and cumbersome for an agile force. The key to logistics success has been optimizing the distribution network with supplies on hand and maintaining multiple lines of communication into Iraq. The overwhelming logistics capabilities of battle-hardened logistics warriors, augmented with a division's worth of contractors on the battlefield, provide unprecedented, near-total freedom of logistics maneuver on the battlefield.

In the future, the Army must continue to increase its use of ITV by extending it to all units and the BCT SSAs. Better yet, the use of ITV should be instilled in units at their home stations and reinforced at the major training centers to such an extent that ITV becomes

Soldiers of 3d COSCOM's Task Force Bandit demonstrate how to change a flat tire during a convoy. *(Photo by SPC David Chapman, 3d COSCOM PAO.)*

an integral part of combat support operations. Without full support for ITV from shippers and shipping activities, transporters cannot enforce the policy that requires that every piece of equipment or container be tagged, because doing so will increase frustrated cargo, backlog subsequent missions, and ultimately impede combat operations.

Iraq continues to serve as the battle laboratory for transformation at many levels. The Iraqi theater continues to mature in many respects, and it is time to truly employ joint logistics, which is a much bolder initiative than merely achieving interdependence and coordination. Although the Army has executive-agent responsibilities for many logistics functions that support all forces in Iraq, each service continues to maintain its own stovepiped systems, which are often redundant and compete for the same limited resources. In the western portion of Iraq, the Marine Corps maintains a field service support group (-), while the Army has a corps support group. Establishing single logistics C2 under the 3d COSCOM (the current sustainment command [expeditionary]), would involve one colonel-level command (either Army or Marine) that would include battalions and companies from each service. At Balad, a similar organizational structure could include the Air Force support group there.

We must continue to expand cooperation and communication with neighboring countries to improve consistency and visibility of cargo transiting their borders. The distribution flexibility afforded to the logistics community by the three reliable Iraq ingress routes for materiel (from Kuwait, Turkey, and Jordan) reduces operational risks and contributes to long-term economic growth and stability in the region by promoting trade and employment.

Distribution in Iraq will continue to evolve as the current operations, the insurgent threat, the pace of transition to an Iraqi battlespace, and politics at home and abroad change. As the ISF assumes the lead for counterinsurgency operations, it may be possible to reduce the current number of BCTs in the theater. However, the number of combat support and combat service support enablers cannot be reduced as part of a linear, total-force reduction. The U.S. logistics, aviation, medical, police, engineer, and signal capabilities provide the coalition forces unparalleled capabilities that cannot be readily replicated or established in the ISF. Ultimately, success in Iraq will hinge on the ability of the ISF to conduct and sustain independent counterinsurgency operations.

ALOG

Colonel C. Brandon Cholek is the C–3 of the 3d Corps Support Command. He served as the Chief of the Corps Distribution Center for the 3d Corps Support Command during Operation Iraqi Freedom 05–07. He has a bachelor's degree in business administration from the College of William and Mary and a master's degree in strategic studies from the Army War College. He is a graduate of the Army Command and General Staff College.

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COMMENTARY—

Logistics: Supply Based or Distribution Based?

BY ERIC PELTZ

A mantra that we frequently hear is that the Army has moved to a distribution-based logistics system. But what does this mean? If it connotes a target vision that is off base, this could create problems in logistics system design and career development.

For this reason, I have never really liked the distinction made between supply-based systems and distribution-based systems. Such a distinction suggests extreme assumptions and design directions that can cloud our thinking as we strive to design the best possible system for a given situation. Instead, I view the range of possible systems on a continuum. In every case, we should implement the logistics system design that meets customer requirements, including risk considerations, while minimizing total supply-chain cost.

The ideal logistics system for a given situation depends on process capabilities, resource costs, and item, demand, and customer profiles. What is ideal is subject to change—change that is sometimes slow and sometimes quite rapid. As processes improve, the system design should change in an evolutionary manner. For example, faster requisition wait times attained through velocity management (VM) enabled lower reorder points for authorized stockage lists (ASLs), or, in some cases, a higher, more appropriate satisfaction rate within the same storage constraints.

By contrast, the logistics system should change in a more revolutionary manner as process improvements breach thresholds and as new capabilities are developed. This happened, for example, when scheduled truck service in the continental United States (CONUS) began providing deliveries with the same high speed and reliability provided by premium air service while retaining lower truckload costs. It also happened in Operation Iraqi Freedom (OIF), when use of pure pallets enabled direct delivery to widely distributed aerial ports of debarkation in Iraq. Both of these changes significantly reduced distribution times. Similarly, the ideal system design also may change gradually or in large steps as resource costs or potential risks change.

Enthusiasm about the role of distribution in an ideal logistics system is understandable. Long-term trends toward better processes—resulting from the adoption of Lean and VM-like approaches; lower transportation costs in all modes (30 to 60 percent lower from 1965 to 1990, depending on the mode); and information capabilities that have dramatically increased and become less expensive—have led to greater reliance on rapid distribution and dramatically reduced inventory requirements. In fact, business inventories have been reduced 55 percent as a percentage of gross domestic product from 1984 to 2003. However, in most situations, even with these trends, it still continues to make sense to hold inventory at multiple points in the supply chain as part of the ideal logistics system design.

Where demand predictability, volumes, distribution patterns, production horizons, and risk factors support it, maintaining very little inventory—with distribution centers serving primarily as cross-docking operations—is a great approach, but it is not a "one size fits all" situation. ["Cross docking" refers to the process of receiving an item at a distribution center and shipping it out almost immediately without holding it in storage. Maintaining an inventory in a warehouse is virtually eliminated.] More generally, cross-docking activities are integrated with inventory-holding distribution centers (DCs) to break down bulk shipments and consolidate them for movement to their final destinations. A simple example in this context is the cross-docking found in supply support activities (SSAs): An SSA cross-docks deliveries of nonstocked and out-of-stock items, sorting these deliveries and issues from the SSA to provide one set of parts for each maintenance customer. The SSA's response-time advantage remains such that it continues to add value for the SSA to hold in inventory items that drive readiness.

Better response time, if it meets a customer's need, is one major reason to hold inventory at a location. Another potential reason to hold inventory is to enable the utilization of lower cost but slower transportation options while preserving fast response to final customers from the inventory location. But this is advantageous only when the transportation savings outweigh the inventory costs; that advantage depends on such factors as item weight and price, transportation rates, and inventory holding costs. If an inventory location does not produce an advantage in response time, does not lower total supply chain costs, or does not play an analytically supported role in risk mitigation, then it should be considered for elimination.

In the private sector, it seems that recent transportation issues that have created occasional bottlenecks, variability in service, and increased risk are causing a small shift back toward holding inventory. My impression

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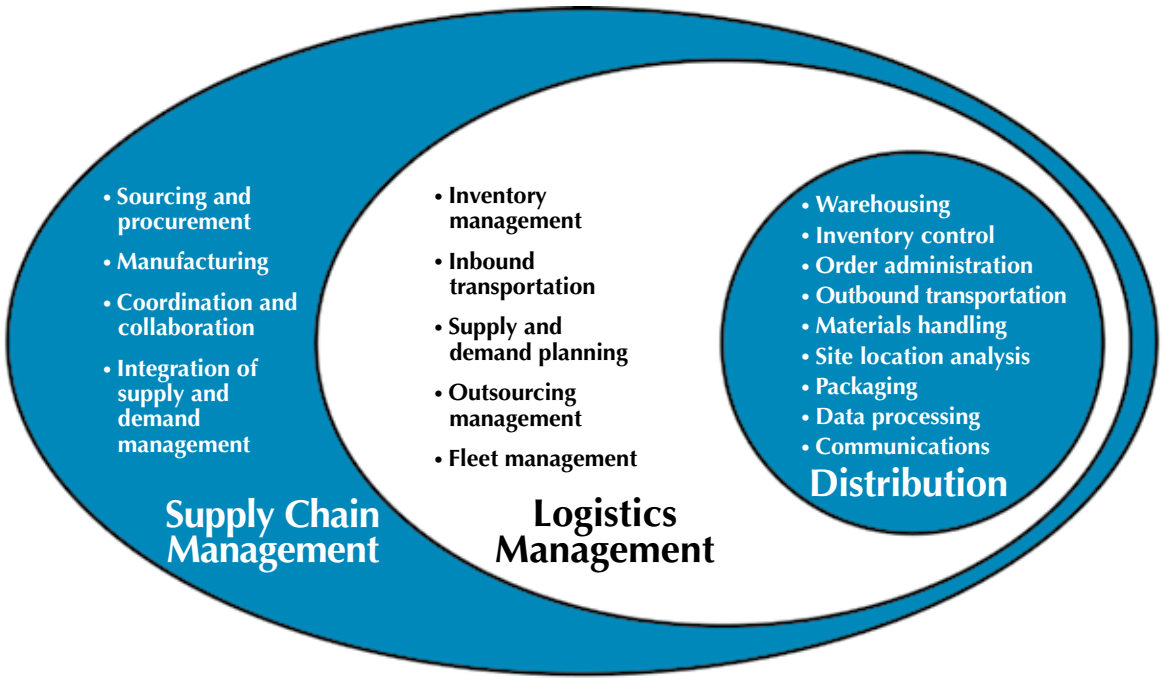

This chart illustrates the relationship among distribution, logistics management, and supply chain management. Distribution is a component of logistics management, and logistics management is a component of supply chain management.

Definitions

Distribution is outbound logistics, from the end of the production line to the end user. It includes activities associated with the movement of material, usually finished goods or service parts, from the manufacturer to the customer. These activities encompass the functions of transportation, warehousing, inventory control, material handling, order administration, site and location analysis, industrial packaging, data processing, and the communications network necessary for effective management. Distribution includes all activities related to physical distribution as well as the return of goods to the manufacturer. In many cases, this movement is made through one or more levels of field warehouses. (This definition is from "Supply Chain and Logistics Terms and Glossary," compiled by Kate Vitasek for the Council of Supply Chain Management Professionals. See www.cscmp.org/Downloads/Re-sources/glossary03.pdf.)

Logistics management activities typically include inbound and outbound transportation management, fleet management, warehousing, materials handling, order fulfillment, logistics network design, inventory management, supply and demand planning, and management of third-party logistics services providers.

Supply chain management encompasses the planning and management of all activities involved in sourcing and procurement, conversion, and all logistics management activities. Importantly, it also includes coordination and collaboration with channel partners, which can be suppliers, intermediaries, third-party service providers, and customers. In essence, supply chain management integrates supply and demand management within and across companies. (The definitions of logistics management and supply chain management are adapted from those of the Council of Supply Chain Management Professionals. See www.cscmp.org/Website/AboutCSCMP/Defini-tions/Definitions.asp.)

is that increasing customer service expectations also are contributing to this shift. So, too, is offshoring, which creates longer and more variable transportation pipelines. ["Offshoring" is the relocation of business processes to another country.] In other cases, recent rises in transportation costs, combined with associated inventory costs, have interrupted the longer term trend toward reducing inventory and are causing some rethinking of the use of overseas production. This is an example of a threshold being crossed that triggers a change in the supply chain design; higher off-shore labor costs plus higher overseas transportation-induced inventory costs have changed some sourcing location decisions.

I recently attended the annual Council of Supply Chain Management Professionals conference, and what I heard in presentations there reinforced my sense of a slight trend toward increasing inventory. This seemed to have the most to do, though, with a better general understanding that the overall objective should be achieving a high level of customer service while working to minimize total supply chain cost. My impression is that, in some cases, people have been too fixated on cutting inventory instead of focusing on total supply chain costs and customer service. Now, as their focus shifts to these overall objectives—the real targets—they are not increasing inventory "just in

case" but as part of a more carefully calibrated total supply chain approach to meeting customer needs.

Decreasing inventory is the right thing to do when replenishment times become faster and more reliable and when it is done as part of an overall supply chain strategy. But it should not be done as an end in itself. What this discussion of long- and short-term trends illustrates is that we are likely to continue seeing a changing balance over time among logistics system resources, depending on capabilities and conditions. We also should ensure that we consider all approaches and types of resources when developing solutions rather than starting from a limited subset of options.

Implications for Army Logisticians

The continual need for a nuanced and dynamic balancing of distribution and supply in logistics system design has implications for the training and career development of Army logisticians. A logistician's ability to make the right integrated decisions depends on his having broad system knowledge—on being a logistics expert rather than a supply or transportation specialist.

Those engaged in planning the logistics system should understand the tradeoffs among the available resources and system design options. This understanding comes into play at the national level and in setting and evolving a theater structure over time. Logistics system planning will mostly involve field-grade and above officers and civilians in theater staffs and national-level provider organizations as well as in policy and concept, doctrine, and organizational development activities. At these levels, it is important to understand the capabilities and costs of different transportation options and different distribution-channel options, the tradeoffs involved in maintaining inventory depending on item and demand characteristics, and the effects of shipment consolidation options. It also is important to understand synchronization, process management, and how to effectively employ information. Without a good understanding of the full breadth of logistics management and, for some positions, supply chain management, the need to adapt systems as conditions and capabilities change may not be clear or the root causes of problems may not be understood.

The knowledge and skill demands on those whom we might term "battlefield distribution managers" are quite different from those of logistics system planners. These demands are more oriented toward execution management and more focused on transportation. On the battlefield, the Army needs good distribution network managers who can effectively manage and plan the daily use of transportation, transshipment nodes, and battlefield DCs—managers who are focused on inbound, outbound, and cross-docking execution and on running warehouses more than managing inventory requirements. Doing this well demands that managers understand how to synchronize processes and use information. They also should understand the design of the broader global logistics system in order to integrate their operations effectively with strategic providers. However, at this level, the trend is to have inventory management designed centrally as part of the overall system (for example, the authorized stockage list policy pilot being worked in OIF today), with the personnel in the field more focused on operational management of the warehouse and broader DC activities. We might term the core set of battlefield distribution tasks "physical distribution management." It is about running the DC rather than planning what is in it and where it is, more tactical and operational than strategic.

Thus, as military logistics professionals progress in their careers and begin to play a role in theater- and national-level planning, their knowledge base must expand as they move from more tactical, transportation- and physical distribution-oriented execution management to more strategically oriented logistics-system and supply-chain design and management positions. To be most effective, they need to become adept at integrating the full range of options available to best support units in the field, no matter the situation. Efforts should not be made to minimize inventory to achieve conceptual visions, nor should inventory stockpiles be increased above that which can be analytically justified to meet needs and appropriately protect against risk. Every resource, whether inventory, transportation assets, distribution facilities, or people, should have a clearly defined role designed to meet an objective derived from overall system goals. If these objectives are well understood and used to drive logistics system design, the "right" levels of resources in the "right" places will be employed effectively. Rather than choose between distribution-based and supply-based designs, the Army, in conjunction with its joint supply-chain partners, should seek optimal, balanced logistics system designs that it can adapt quickly to changing conditions.

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Combat Logistics Patrol Methodology

BY MAJOR JULIAN H. BOND, CAARNG

Logisticians on the battlefields of Iraq and Afghanistan must operate using unprecedented and uncharted tactics, techniques, and procedures. They can no longer rely on nonorganic force protection or other emergency response assets when they operate "outside the wire" on austere main supply routes (MSRs). Logistics units, specifically transportation units, must be able to master actions on the objective, force projection, and critical emergency response skills. Effective combat logistics patrols (CLPs) are not just a concept; they have become a way of life for combat service support units. CLP methodology provides the standard for fixing, fueling, arming, moving, and sustaining the force. The multifunctional warrior has evolved into one of the premier warriors on the nonlinear and nonconventional battlefield.

The 756th Transportation Company (Petroleum, Oils, and Lubricants), while stationed at Camp Taji, Iraq, in support of Operation Iraqi Freedom 05–07, successfully delivered millions of gallons of class IIIB (bulk petroleum) and transported fuel over 200,000 miles throughout the Multinational Division-Baghdad sector. This was possible because of the skills the 756th developed in theater that allowed the unit to transform organically to react to opposing forces.

Specific additional equipment was needed to augment the unit's fleet of M1088 tractor trucks and M967 and M969 5,000-gallon fuel tankers. This additional equipment included gun trucks, fire-suppression systems, maintenance recovery vehicles and wreckers, and Counter Remote Control Improvised Explosive Device (IED) Electronic Warfare (CREW) systems. To augment the newly acquired equipment, motor transport operators (military occupational specialty 88M) became proficient in operating Single-Channel Ground and Airborne Radio System (SINCGARS) radios, Warlocks (IED-jamming devices), Movement Tracking Systems (MTSs), Blue Force Trackers (BFTs), and a number of weapon systems (M2 machinegun, M240B machinegun, M16 rifle, and M4 carbine). The vehicle operators also became proficient in vehicle-recovery operations, combat lifesaver functions, and commodity operations.

Gun Trucks

The 756th reconfigured M1088 tractor trucks into gun truck platforms, complete with a gunner's protection kit. A dual-mounted gun shield offered protection to the vehicle's front by allowing the mounting of two automatic weapon systems. All gun trucks were equipped with CREW systems and AN/VRC–92 dual long-range SINCGARS. Gun truck personnel were trained and drilled on escalation-of-force tactics, rules of engagement, and mitigating unnecessary collateral damage. Sirens, loud speakers, Iraqi warning signs, and 1-million-watt spotlights were used to warn incoming traffic of the danger of approaching a CLP.

Communication

The 756th gradually increased the proportion of CLP vehicles able to communicate with each other from 15 percent to 100 percent. Because of the nonlinear opposing-force tactics, every asset within the CLP had to be able to communicate to maintain situational awareness. To achieve this, the company obtained an AN/VRC–90 single long-range SINCGARS for each of its transport vehicles.

Soldiers prepare to leave the forward operating base on a combat logistics patrol.

Navigation

The company had two types of navigational systems: MTS and Force XXI Battle Command Brigade and Below-BFT (FBCB2–BFT). The company tactical operations center (TOC) had a matching base system. Vehicle operators became proficient on both systems through extensive training and daily operations.

As the primary navigational system used, MTS was useful as both a communications and a navigational tool. Using MTS to provide critical messaging, including group notifications, route updates, and communication with battlespace owners, provided the CLP an invaluable tool.

Weapon Systems

The motor transport operators chosen to become gunners had to be qualified on multiple weapon systems, including their individual weapon (M4 carbine or M16 rifle), the M249 squad automatic weapon, the M240B 7.62-millimeter machinegun, and the M2 .50-caliber machinegun. Weapon system skills were sustained by monthly training at firing ranges and realistic "live fire" lanes. The ability of turret gunners to perform escalation-of-force drills successfully—gradually moving from the lowest caliber weapon to the most lethal systems—became the difference between life and death on the MSRs.

Fire-Suppression System

CLPs encounter various fire risks, such as IEDs and possible vehicular accidents, on an MSR. The fire-suppression system can provide 500 gallons of mobile fire-suppression foam, which pushes back flames from the cab so personnel can extract casualties and equipment. A platform was developed for mounting the fire-suppression system directly on an M1088 tractor truck. The crew of that M1088 received extensive fire-suppression operation and first-responder medical training.

Recovery and Wrecker Operations

Preparing for an unexpected breakdown is critical to the success of a CLP because being stationary on an MSR increases the risk of opposing-force engagement and ties up critical supply routes. Maintenance and recovery personnel had 15 minutes to fix a mechanical failure or tow the system. All of the 756th's CLPs were equipped with a wrecker vehicle, preferably the M984 heavy, expanded-mobility tactical truck (HEMTT) wrecker, and an additional M1088 tractor truck for trailer recovery.

CREW Systems

The danger of remote-controlled IEDs was mitigated by using CREW systems that jammed IED receivers to prevent trigger signals from reaching their targets. CREW systems were constantly being developed and upgraded to meet the latest threats.

Combat Lifesavers

Qualified first responders are essential to Soldier survival. Advances in medical transportation and trauma care can save lives only if wounded Soldiers are stabilized within the first 5 to 10 minutes of injury. Every Soldier in the company received combat lifesaver training. Every CLP vehicle was required to have one combat lifesaver-qualified Soldier with a combat lifesaver bag. Gun truck personnel received enhanced first-responder training developed by the 101st Airborne Division (Air Assault). This training focused on critical trauma skills and the most common injuries in theater.

The 3 Cs

The commander of the 4th Sustainment Brigade, 3d Corps Support Command, Colonel Gustave Perna, developed the 3 Cs concept: confidence in yourself, confidence in your equipment, and confidence in your leaders. While attached to the 4th Sustainment Brigade for Operation Iraqi Freedom, the 756th always used this concept as the foundation of its operations. The 3 Cs were the focal point of the company's constant evolution of equipment, leaders, and, most important, Soldiers.

This article offers only a brief picture of the true abilities that the 756th Transportation Company developed with the assistance of the 189th Corps Support Battalion (Airborne) and the 4th Sustainment Brigade. The 756th committed itself to meticulous attention to detail and constant improvement, thereby creating a CLP methodology. The 189th Corps Support Battalion commander used any means necessary to resource the 756th's dynamic formation and developed very efficient CLP standing operating procedures. Today's logistics Soldier has evolved into a first-rate warfighter. **ALOG**

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Army Reduces Tactical Supply System Footprint

BY THOMAS H. AMENT, JR.

Centralizing all of the Army's Corps/Theater Automated Data Processing Service Center operations at one site represents the first step toward consolidating tactical supply systems for the modular Army.

The Army's transition to a brigade-centric structure requires a number of changes to its logistics support concepts, organizations, and processes. One of the most significant changes removed the administration, operations, and support of the Corps/Theater Automated Data Processing Service Center (CTASC) from corps and theater materiel management centers and placed them at the theater support commands or Army support commands (ASCs). Each CTASC provides end-user support of the Standard Army Retail Supply System (SARSS), which is the Army's tactical supply system.

In order to meet its schedule for transforming into a modular force, the Army needed a centralized CTASC administration and operations center. Such a centralized center was needed to meet the requirements of a brigade-based force, support the Army's 500-Day Plan for information technology, and simplify the migration toward a centralized environment for the Single Army Logistics Enterprise (SALE). [The Army Chief Information Office/G–6 issued the Army 500-Day Plan in October 2005 to provide a roadmap for achieving a joint, network-centric information enterprise in support of the warfighter.]

Those of us working on the project realized that centralizing CTASC operations at a single site would provide significant enhancements by reducing the logistics footprint, standardizing network and processing operations, reducing total network traffic, simplifying unit transfers for deployments, and greatly simplifying post-deployment software support. Most important, however, centralizing CTASC operations would substantially reduce the number of personnel needed for CTASC administration and operations.

Developing a Plan

To accomplish this monumental task, Lieutenant General Ann E. Dunwoody, the Deputy Chief of Staff, G–4, Department of the Army, directed her staff to work with the Army Combined Arms Support Command (CASCOM), the Army Materiel Command (AMC), the Program Executive Office for Enterprise Information Systems (PEO EIS), and the G–4s of major subordinate commands to plan for and execute the centralization of all Army CTASCs at a single site.

In January 2006, CASCOM hosted an integrated concept team (ICT), which mapped the way ahead for CTASC operations under modularity. The ICT was composed of CTASC and SARSS subject-matter experts from the major commands, CASCOM, and the Department of the Army G–4. Over a 6-week period, the team developed a plan. On 28 March 2006, based on the plan's recommendations, Lieutenant General Dunwoody signed a memorandum directing the transfer of all Army CTASCs to a single, collocated site, with a separate geographic location for a contingency of operations (COOP) site.

The AMC Logistics Support Activity (LOGSA) at Redstone Arsenal, Alabama, was selected as the central CTASC production site and the Functional Processing Center at the Software Development

CTASC
The Corps Theater Automated Data Processing Service Center (CTASC) is an Army automated information system previously employed at the corps and echelons-above-corps levels to provide automated data processing support for combat service support logistics support agencies. CTASC provides end-user support of the Standard Army Retail Supply System (SARSS), which is the Army's tactical supply system.

The central CTASC production site is located at the AMC Logistics Support Activity at Redstone Arsenal, Alabama. CTASC operations and administration (above) are conducted just outside the CTASC/Middleware computer room (inset.) Middleware, which comprises both hardware and software, revises data in the Standard Army Retail Supply System (SARSS), thereby extending the use of the Army's current logistics and financial systems until they are replaced by the Single Army Logistics Enterprise (SALE).

Center at Fort Lee, Virginia, ultimately was selected as the site that would perform COOP operations. The AMC and LOGSA commanders announced that they were prepared to accept the CTASC mission from losing commands in accordance with a timeline that had been synchronized to the Army's transformation schedule by the ICT members.

CASCOM immediately went to work and developed the table of distribution and allowances out-of-cycle adjustments needed to conduct CTASC operations at LOGSA and the COOP site and forwarded them to the Office of the Deputy Chief of Staff, G–3, Department of the Army, Force Management Directorate, where they were approved and implemented. Chief Warrant Officer (W–5) Wade Lovorn, who was running CTASC operations for III Corps, was selected as the first Officer in Charge and Chief of Operations of the new production CTASC at LOGSA.

Centralizing CTASC Operations

The Army is well on its way toward achieving a centralized CTASC. On 7 April 2006, the U.S. Army Reserve Command (USARC) moved its CTASC operation from Fort Gillem, Georgia, to the LOGSA facility, marking the beginning of centralized CTASC operations. In April, the 2d Corps Materiel Management Center at Fort Bragg, North Carolina, moved its CTASC operations to LOGSA. It was followed by the 321st Theater Materiel Management Center in Baton Rouge, Louisiana; the Installation Management Agency at Fort Monroe, Virginia; the 4th Corps Materiel Management Center at Fort Hood, Texas; U.S. Army Europe in Germany; Eighth U.S. Army in Korea; and U.S. Army Pacific in Hawaii. The move of the National Guard CTASC from Little Rock, Arkansas, to LOGSA in January 2007 signaled the end of the collocation effort.

The focus for the remainder of fiscal year 2007 is on CTASC server consolidation. Much like the ICT that met to develop the plan for CTASC collocation, a new team will stand up to develop the plan for CTASC server consolidation. Preliminary studies indicate that a reduction from the current 10 servers to 3 or 4 is possible and will result in more streamlined operations and a further reduction in the support requirement with no degradation in service and support to the tactical logistics community.

Work standing up the COOP site at the Software Development Center at Fort Lee continues. It was expected to be fully operational not later than February 2007, with the first COOP exercise planned for March. **ALOG**

Thomas H. Ament, Jr., is a career logistics management specialist serving since March 2003 on the staff of the Deputy Chief of Staff, G–4, Department of the Army. He previously was assigned to the U.S. Army Europe (USAREUR) G–4 staff, where he was responsible for developing the USAREUR Information Warehouse. He currently is enrolled in acquisition management courses with the Defense Acquisition University.

Medical Logistics Interface Tab for FBCB2

BY CAPTAIN CODY R. ROBERSON

Medical logisticians in Iraq and Afghanistan are currently operating with the luxury of a mature logistics infrastructure in a forward operating base-centric theater of operations. This maturation has resulted in a significant decrease in negative observations and after-action review comments about medical logistics challenges. However, what would happen if U.S. forces began another offensive operation in a different global "hot spot"? Have they learned from the shortfalls and mistakes in brigade-and-below connectivity and in medical logistics real-time offensive operations that occurred in Operation Desert Storm and the initial stages of Operation Iraqi Freedom?

I served previously as a medical company commander in Operation Iraqi Freedom and an observer-controller at the National Training Center at Fort Irwin, California, and I have visited combat training centers and conducted one-on-one interviews with many Soldiers in theater. I learned from those experiences that, should U.S. forces start an offensive fight elsewhere, they would learn quickly that they have failed to develop a permanent solution for class VIII (medical supplies) connectivity or real-time logistics management for brigade-and-below medical units. "Three-peats" are only good when talking about sports championships, not medical logistics blunders.

Two Army Battle Command System (ABCS) components—Force XXI Battle Command-Brigade and Below (FBCB2) and Battle Command Sustainment Support System (BCS3)—could provide valuable logistics information to medical personnel. However, this currently is not possible because ABCS and Army Medical Department (AMEDD) digital medical logistics systems do not have interface capabilities.

ABCS Systems

FBCB2 is a digitized battle command information system that includes both software and hardware for providing on-the-move, real-time, and near-real-time battlefield information to maneuver, fires, and effects commanders, operations support commanders, and force sustainment commanders, leaders, and Soldiers. This system is designed to give leaders and Soldiers enhanced battlefield situational awareness to the lowest level.

BCS3 is designed to interface with FBCB2 to provide operations support and force sustainment commanders, leaders, and Soldiers with the logistics management tools and information needed to support maneuver commanders. BCS3 includes tools for readiness, combat power, convoy movement control, in-transit visibility, transportation and logistics alerts, main supply route status, course-of-action analysis or the military decisionmaking process, and G–3 operations.

Although BCS3 can interface with FBCB2 and has secure and unsecure interface capabilities for logistics management and brigade-and-below logistics, the two systems are useless to brigade support medical company or task force medical platoon leaders and planners. These systems need a medical logistics interface tab. The medical logistics interface tab is a set of tactics, techniques, and procedures that I developed that uses the FBCB2 text-messaging capabilities and closed-circuit network to send class VIII requests to the brigade support medical company. This has been field-tested as a tool for making medical logistics work when the TAMMIS (Theater Army Medical Management Information System)/DMLSS (Defense Medical Logistics Standard Support) Customer Assistance Module (TCAM) fails and the "sneaker net" (hand-carrying logistics information on diskette from one computer system to another) is too slow. [TCAM is used for digital ordering and tracking of medical supplies.] Now the system needs to be formalized as a "tab" under the existing FBCB2.

AMEDD Systems

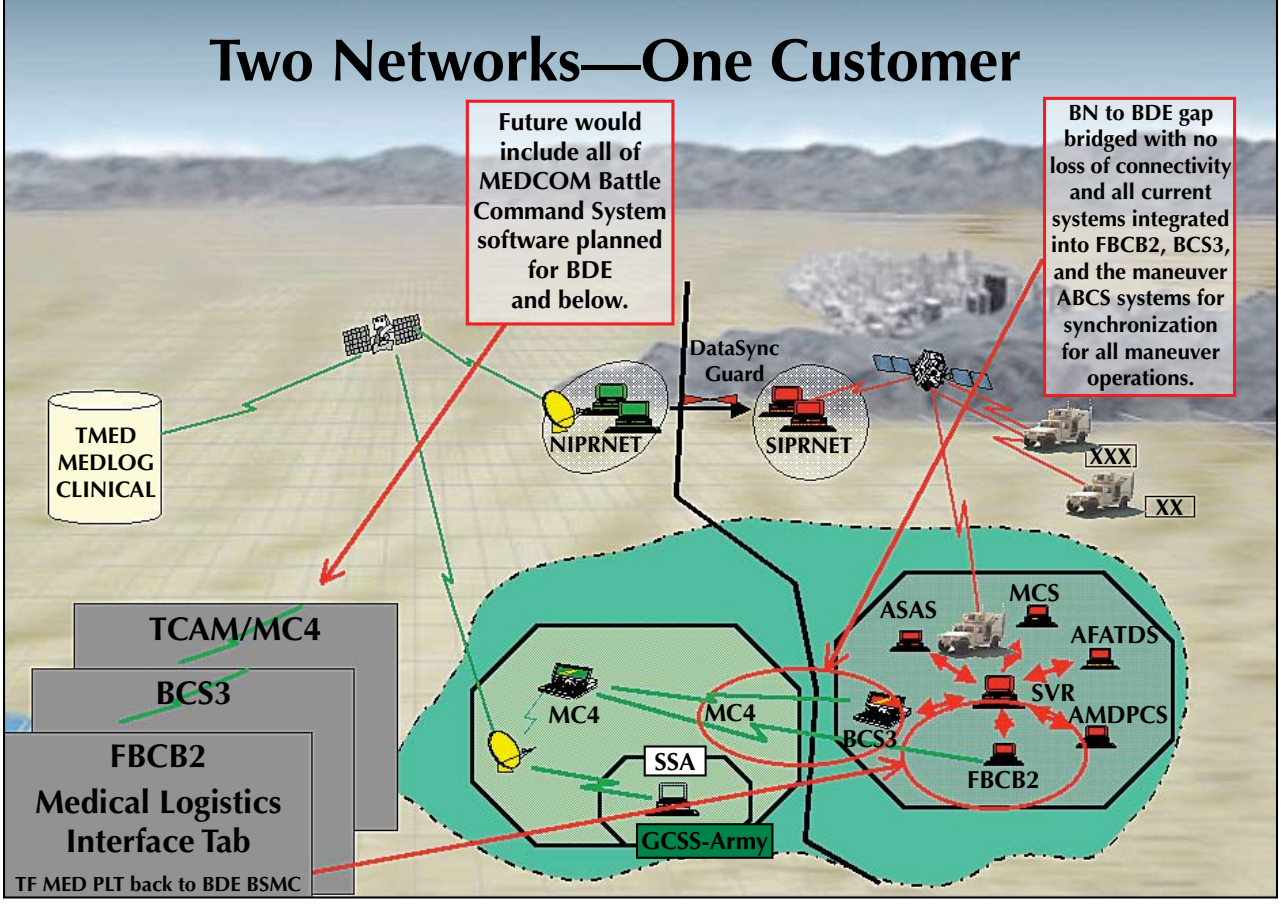
AMEDD recently developed enhanced digital tracking systems to use with the Medical Communications for Combat Casualty Care (MC4) system and TCAM.

In a separate endeavor, AMEDD is transitioning all of its current operating systems over to the Army Medical Command (MEDCOM) Battle Command System, which will operate in the future under one network called the LandWarNet (the Army's share of the Department of Defense Global Information Grid). MEDCOM does not plan to link its battle command systems at brigade and below to any of the maneuver brigade combat team (BCT) systems using ABCS.

Medical Logistics System Shortcomings

The MEDCOM Battle Command System's inability to interface with any of the ABCS systems at brigade and below is a critical flaw. As stated by the AMEDD lessons learned chief, Lieutenant Colonel Jeffery L. McCollum, USA (Ret.), "BCTs are the base for future fights . . . synchronization and tracking of class VIII is so important—the Soldier's life may depend on it."

The MEDCOM plan for transitioning to the MEDCOM Battle Command System adds three operating systems to existing TCAM and MC4 requirements. These systems—the Composite Health Care System



This chart shows how the proposed medical logistics interface tab would link medical and logistics information systems.

Legend

ABCS	=	Army Battle Command System
AFATDS	=	Advanced Field Artillery Tactical Data System
AMDPCS	=	Air and Missile Defense Planning and Control System
ASAS	=	All Source Analysis System
BCS3	=	Battle Command Sustainment Support System
BDE	=	Brigade
BN	=	Battalion
BSMC	=	Brigade support medical company
FBCB2	=	Force XXI Battle Command-Brigade and Below
GCSS-Army	=	Global Combat Support System-Army
MC4	=	Medical Communications for Combat Casualty Care
MCS	=	Maneuver Control System
MED	=	Medical
MEDCOM	=	Army Medical Command
MEDLOG	=	Medical logistics
NIPRNET	=	Unclassified but Sensitive Internet Protocol Router Network
PLT	=	Platoon
SIPRNET	=	Secret Internet Protocol Router Network
SSA	=	Supply support activity
SVR	=	Server
TCAM	=	TAMMIS (Theater Army Medical Management Information System)/ DMLSS (Defense Medical Logistics Standard Support) Customer Assistance Module
TF	=	Task force
TMED	=	Telemedicine

II-Tactical (CHCSII–T), Theater Enterprise-Wide Logistics System (TEWLS), DMLSS, and the U.S. Transportation Command (TRANSCOM) Regulating and Command and Control Evacuation System (TRAC2ES)—will be used at the battalion aid station, which is located at the maneuver task force level. Adding these systems to the MEDCOM Battle Command System will further complicate the problem that task force medical platoon leaders face in logistically and tactically synchronizing their efforts with the battalion task force and brigade.

In the future, medical platoon leaders will need an operational understanding of eight digital operating systems—BCS3, FBCB2, TCAM, MC4, CHCSII–T, TRAC2ES, TEWLS, and DMLSS. Five of these—TCAM, MC4, CHCSII–T, TRAC2ES, and TEWLS—will not interface with any of the maneuver ABCS being used by the battalion task force.

Currently, a medical platoon stands alone in a sea of digital capability because it cannot use AMEDD digital systems to synchronize its medical logistics with any of its maneuver battalion or brigade counterparts that are using FBCB2 and BCS3. For example, battalion task forces at the National Training Center often have difficulty ordering and tracking class VIII supplies. Why do they have these problems? First, a battalion staff using BCS3 has minimal visibility of the status of a medical platoon's class VIII inventory. Therefore, medical supplies used for logistics package (LOGPAC) and resupply operations are rarely tracked as closely as the other classes of supply that are managed digitally by BCS3. Second, a medical platoon requisitions class VIII using TCAM, which is a completely separate system from the battalion ABCS common operating systems that all other elements in the task force use. The battalion task force medical platoon is forced to operate outside of the ABCS umbrella under which they fight.

This disconnect creates additional connectivity competition problems as well as a lack of understanding by leaders and a resulting lack of command emphasis.

This problem was raised by Captain Michael S. "Sean" Smith in his article, "TCAM: Making the Class VIII System Work for Your Brigade Combat Team," in the September–October 2005 issue of *Army Logistician.* According to Smith, "BCT leaders are hesitant to mandate use of TCAM because it is new and unfamiliar to the leaders and Soldiers. There is little command emphasis to compel units to make TCAM the standard for Class VIII operations."

Medical Logistics Interface Tab

Developing a medical logistics interface tab for FBCB2 or BCS3 under ABCS would allow medical platoons and brigade support medical companies to synchronize their operations with tactical commanders at brigade and below. Civilian production cost estimates for developing medical logistics interface tab software range from $2.5 million to $5 million.

Training on the FBCB2 system is currently provided by a contractor at Fort Sam Houston, Texas. Only minor changes would be required to expand this training to cover use of the new medical logistics interface tab. Computers and facilities used for training would not have to be changed. Fort Sam Houston has a training facility that can support 6 classes of 180 students each per year. This facility also provides over 6 hours of hands-on instruction in the AMEDD Basic Officer Leadership Course. The installation has 3 additional equivalent classrooms with over 100 terminals each to support larger classes if needed.

Advantages

Having a medical logistics interface tab for FBCB2 or BCS3 would reduce the need for additional and competing connectivity—specifically, Very Small Aperture Terminal (VSAT) connectivity—for the brigade-and-below maneuver elements. It also would give battalion S–4s a complete logistics common operating picture at the battalion through brigade levels for on-the-move, real-time, or near-real time situational awareness and synchronized tracking. Medical platoon leaders would no longer have to revert to analog systems, sneaker net, or work-arounds to report to battalion or brigade commanders, as illustrated in the February 2006 1–25th Stryker Brigade Combat Team lessons learned brief—

> The medical company could not routinely check on the Due-out statuses with TCAM—the report was requested through the supporting MED LOG [medical logistics] unit. The medical company had an embedded MC4 contractor, but he could not resolve the TCAM ordering and administrative problems. The system never worked to standard and the unit ended up using workarounds exclusively. . . . We need dedicated VSAT or some other system to ensure connectivity at the BSB [brigade support battalion] and ideally [at] all BASs [battalion aid stations].

Challenges

ABCS is an extremely complex system operating on more than 1,000 computer systems within each maneuver brigade. To develop a medical logistics interface tab that would provide total battlefield analysis, software must be upgraded for FBCB2, BCS3, TCAM, MC4, and any other systems that compile data within ABCS and the MEDCOM Battle Command System.

AMEDD should reconsider its plans for future digital operating systems at brigade and below within the MEDCOM Battle Command System under the LandWarNet. Funding limitations may require AMEDD to choose between the medical logistics interface tab and TCAM. The decision would be based on which system is determined to be the more compatible, synchronized, and suitable digital system for supporting tactical commanders at brigade and below.

Extensive training covering a broad spectrum of logistics operations would be required to ensure that the chosen system (the tab or TCAM), Soldiers, and units could perform all current and future missions effectively. A new mission-essential task list and all the individual and collective tasks to support it could be difficult to develop.

Using a medical logistics interface tab would be the key to synchronizing brigade-and-below medical logistics management of all medical logistics operations at the maneuver, fires, and effects levels. This tab could provide real-time to near-real-time decision-making capabilities to brigade-and-below maneuver task force commanders and the battalion task force staff. It also could assist BCT medical planners in developing immediate courses of action, and it could bring the AMEDD medical logistics systems into *one* common operating system with FBCB2 and BCS3 under the existing ABCS for maneuver elements. The medical logistics interface tab would not eliminate the need for a medical logistics system, but it would force the MEDCOM Battle Command System to interface with ABCS systems such as FBCB2 and BCS3 under the LandWarNet at the appropriate maneuver level.

ALOG

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Midnight Run

BY CAPTAIN MICHAEL J. RAINIS

A last-minute "call forward" message required the 1st Armored Division Support Command staff to develop a creative solution in order to meet the mission deadline.

It was a normal Monday morning at the 1st Armored Division Support Command (DISCOM) headquarters near Wiesbaden, Germany, and I had just settled down at my desk when my boss called me into his office. He informed me that the 2d Brigade, 1st Infantry Division, had just been given the long-awaited "call forward" message and that we had our work cut out for us. As the brigade movement control officer, I knew that I would be very busy because, at that very moment, the 2d Brigade was in the middle of a gunnery rotation at the Grafenwoehr Training Area (GTA). Before I knew it, the G–4, the division transportation officer (DTO), and I were neck deep in plans to pull a combat brigade out of a gunnery rotation in time to prepare them for immediate-staging-area operations and deployment. Our commanding general had made our mission clear: we were to use every resource available to us to bring the unit and all of its equipment back to the brigade's base at Schweinfurt at the earliest possible date. So, with our marching orders in hand, we set about the task with feverish intensity.

The Challenge

Initially, trains had been scheduled through the Deutsche Bahn to transport most of the equipment by rail on 26, 27, and 28 August—a week after the date we had to have the equipment back to Schweinfurt. Unfortunately, we were unable to reschedule the movement by train, so we were forced to use both military and contracted civilian trucks to move an entire brigade's worth of combat systems. While keeping the lines of communication open with the Deutsche Bahn, we began to make equipment lists and assign truck assets to various heavy equipment systems. The movement would be conducted by the 123d Main Support Battalion (MSB), which was stationed in Dexheim.

After a week of coordination, the principal parties (DTO, G–4, and the brigade S–4 unit movement officer) produced a basic transportation outline. The plan called for contracted civilian trucks to move most of the lighter track vehicles and other cumbersome pieces of equipment. Meanwhile, the heaviest combat systems (M1A1 Abrams tanks and M2 Bradley fighting vehicles) would be moved using military heavy equipment transporters (HETs).

Then a rather large problem presented itself. The Army had to obtain written consent from the German authorities to operate its mammoth-sized trucks on German roads. Normally, it can take up to 3 weeks to gain the necessary approval. Although we can usually "massage" the system to generate these "march credits" in a crisis situation, this was still a tall task for Movement Control Team Wiesbaden. The initial

Heavy equipment transporters (HETs) are staged for the movement mission. Note the white domes on top of the trucks. This is part of the Defense Transportation Reporting and Control System (DTRACS), which is used for communication and for tracking the vehicles.

response was encouraging, and our fax machines were flowing with march credits for 19 and 20 August. Then we hit a roadblock: It is difficult to obtain permission to run such large vehicles on these roads at night during the week, but it is nearly impossible to receive permission to move them on the weekend. The fact that we were currently operating under the German annual summer road restrictions made this particular request especially difficult to get approved. However, our orders stood firm; failure was not an option. We needed those weekend march credits.

A Plan Materializes

It seemed as though all was lost. There we were—holed up in the DTO's subterranean office late on Friday, 21 August, racking our brains to find a solution to the seemingly hopeless situation. In order to secure the necessary road clearances, the DTO finally devised an intricate plan that involved using German polizei escorts, civilian escorts, and military police to accompany the convoys carrying the equipment. After quickly preparing this plan, we briefed the G–4 on our proposal. The G–4 provided our team with guidance and then pitched the plan to the 1st Armored Division Chief of Staff. By 1900 that evening, we had the go-ahead from the commanding general.

The approved plan called for us to move from GTA to Schweinfurt after 1900 hours on Saturday night and back to GTA after 2400 hours on Sunday. This would allow the HETs to get back to GTA in time to carry one more load of tracked vehicles to Schweinfurt later on Monday night, thus completing the mission on schedule.

Avoiding Showstoppers

This mission had many potential pitfalls that could cause the mission to be delayed or even to fail. We identified several possible "showstoppers" as we reviewed our plans for Saturday night and early Monday morning. For example, our timetable could be disrupted if the civilian escorts were late arriving; our entire movement could be canceled if the polizei did not meet us at the gate to lead our trucks onto the autobahn; or one or more of our HETs could break down during the mission.

We had secured the road clearances in a rather unorthodox way, and we were in danger of upsetting our host-nation authorities if our plans did not go smoothly. Leaders at every level would want to know where the HETs were at all times—from mission start point to mission release point, and they would want frequent updates on their status as they were moving. We needed a reliable way of tracking these two critical missions in real time so that information could be provided to everyone involved quickly and efficiently. The solution was to use the Defense Transportation Reporting and Control System (DTRACS), the Battle Command Sustainment Support System (BCS3), and cell phone text messages.

DTRACS is a Department of Defense-funded system that allows the U.S. military to have command and control of its logistics assets anywhere in the world. It is used primarily as a messaging system to enable convoy commanders to stay in contact with their headquarters when convoys are too far away for radio transmission. Both the 1st Armored Division's DISCOM and the 123d MSB used this system extensively to monitor combat logistics patrols (resupply convoys) while deployed to Iraq in support of Operation Iraqi Freedom. DTRACS consists of a large white globe (affixed to the roof of each vehicle), a messaging keyboard, and various connecting cables. Because DTRACS is satellite-based, the DISCOM was able to use BCS3 to track each DTRACS-equipped vehicle. In fact, this system actually allowed the DISCOM to see vehicles move across the computer screen as they traveled along the route. BCS3 is a software program—complete with high-resolution maps and

Soldiers from the 123d Main Support Battalion in Dexheim, Germany, move a "disabled" Stryker onto a HET during recovery training at the Grafenwoehr Training Area.

A Soldier uses the Battle Command Sustainment Support System (BCS3) to track the progress of a convoy.

satellite imagery—that can be loaded onto any Department of Defense laptop computer. The 1st Armored Division has been using this system to track vehicle movements for quite a while.

I went home Friday night knowing that I would be in the office all weekend ensuring that every possible measure was taken to guarantee mission success. On Saturday afternoon, I created a mission sheet for the DISCOM Emergency Action Center (our 24-hour operations center) so that they would be aware of every detail of the mission. The mission sheet contained the timetable for that night's convoy, the route it would take, and all pertinent cell phone numbers and contact information. I briefed the Soldier on duty that he was to call me when the mission began, if any accidents occurred, and when the mission ended in Schweinfurt later that night. The stage was set, and, as the hours ticked away, we grew closer and closer to the start point.

Implementing the Plan

At 1700, the civilian escorts arrived on time, which allowed everyone to breathe a little easier. At 1830, the convoy commander positioned his vehicles just outside of the gate in preparation for departure, and they departed at 1900. The DISCOM Emergency Action Center noncommissioned officer (NCO) called me as soon as he received confirmation over the phone of what was being displayed on the BCS3 screen. After receiving further confirmation from the 123d MSB Support Operations Transportation Officer, I informed my commander of the convoy's departure.

We on the DISCOM staff consider ourselves to be well versed in all modern forms of communication. The cell phone age is in full swing here at the upper echelons of the brigade staff. Consequently, I was compelled to use this "marvel of modern ingenuity" to keep my senior commander abreast of all the convoy developments. From my apartment 300 kilometers away, in Wiesbaden, I was able to send him cell phone text messages with updates on the whereabouts of our HETs as events unfolded.

The use of phone calls, text messages, BCS3, and DTRACS made the entire process resemble an elaborate communications network. It was truly a process to behold. Not only did we circulate information quickly and efficiently, but we also recorded it at the brigade and division levels. The DISCOM Emergency Action Center made regular status reports to both the Division Operations Center and entries to the DISCOM's automated journal throughout the night. We were able to capture and disseminate information in "real time" so that leaders could make informed decisions and senior leaders could be informed of significant actions as they happened.

The HET mission that Saturday night was a complete success. The German polizei escorts arrived on time and escorted the convoy on and off the autobahns according to the mission timetable. The DISCOM Emergency Action Center staff duty NCO tracked the movement on BCS3 and phoned the convoy commander to confirm that each critical phase had been completed. Senior leaders from brigade to company level were kept in the information loop throughout the night until the mission was complete. We had similar success in the early hours of Monday morning when the HETs returned to GTA.

The weekend provided us with an excellent opportunity to showcase the capabilities of our BCS3 systems. We were able to track convoy movements effectively from the comfort of our own living areas and workspaces, 300 kilometers away from where the action was taking place. Although we encountered hurdles along the way, we learned a valuable lesson: The services provided by systems like BCS3 and DTRACS are truly invaluable. **ALOG**

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The Active Guard/Reserve Instructor Share Program

BY MAJOR PAUL WAKEFIELD

The Army Command and General Staff College (CGSC) was established in 1881 at Fort Leavenworth, Kansas, to provide Army majors with a world-class military education. Since then, the CGSC curriculum has evolved steadily and expanded to ensure that unit commanders receive competent, prepared majors who are trained in current, relevant warfighting doctrine and concepts, including logistics support.

The most recent of those changes occurred when CGSC implemented the Intermediate-Level Education (ILE) curriculum at the resident school at Fort Leavenworth. At the same time, the Nonresident Studies School, which is now known as the School of Advanced distributive Learning (SAdL), began work to implement the ILE curriculum in The Army School System (TASS) battalion and correspondence course venues by the end of 2005. The Army's Active and Reserve components both benefited when, as part of this change, the U.S. Army Reserve Command (USARC) and the 84th Army Reserve Readiness Training Command (ARRTC) at Fort McCoy, Wisconsin, agreed to provide Active/Guard Reserve (AGR) instructors to teach full time on the logistics staff at CGSC.

Program Origin

The AGR instructor share concept began in 2003 when Lieutenant General James R. Helmly, then the Chief of the Army Reserve, visited CGSC to address the class of 2004. During that visit, Lieutenant General William S. Wallace, then Commandant of CGSC, and General Helmly initiated a collaborative effort to develop a program that would help both the Active and Reserve components reach a "common goal of making [the] officer education system first class, and [enable the Army] to better execute ILE for [the] entire officer corps, both Active and Reserve." At that time, Generals Helmly and Wallace determined that the students and faculty at CGSC "would benefit from gaining additional well-qualified instructors [who could] better enable the school to handle the increased student load. In exchange, the TASS battalions would receive experienced CGSC instructors who could pass on their experiences captured at Fort Leavenworth [to the Army Reserve]."

The actual program began in August 2005 when the 84th ARRTC provided one instructor from its Leader Development Directorate to serve on staff in the CGSC Department of Logistics and Resource Operations (DLRO). The initial plan called for three AGR instructors, but that requirement was scaled back because of force structure issues resulting from Base Realignment and Closure 2005 decisions.

For the pilot program, the officer who would fill the DLRO instructor position needed to have a proven logistics background and meet as many of the following requirements as possible—

- Be a CGSC graduate (preferably the resident course).
- Possess Active-duty combat zone logistics experience, preferably with a 90A (Logistics) area of concentration (AOC).
- Have a master's degree.
- Successfully complete a rotation at one of the Army's combat training centers (CTCs).
- Successfully complete a "branch qualification job" (such as an S–3 or executive officer).

The candidate chosen was a school-trained Army Medical Department logistics officer with a 70K (Health Services Materiel) AOC who met all of the criteria except for the 90A AOC.

How the Instructor Share Program Works

When he reports for duty, an AGR logistics instructor begins an intensive tiered training program that qualifies him to receive the instructor additional skill identifier (ASI) 5K. The program ensures that the individual possesses the knowledge base and skills he needs to conduct adult education as a member of a CGSC teaching team.

First, the instructor completes Phases I and II of the CGSC Faculty Development Program to learn the basic construct and applications of the adult learning model. After that training is completed, the new instructor attends course-specific DLRO logistics and force management training sessions and shadows experienced DLRO instructors as they use the adult learning model and apply various teaching techniques in the classroom.

Next, the instructor team-teaches classes with those same DLRO instructors. Finally, he completes instructor certification by solo-teaching a lesson to one of the CGSC student staff groups. Once the AGR officer is certified, the Director of DLRO assigns him to a teaching team.

In addition to the certification process, AGR logistics officers participating in the instructor share program

have a variety of opportunities to enhance their teaching skills and knowledge base. Like all DLRO instructors, they can attend the 4-week Army Advanced Force Management Course at Fort Belvoir, Virginia, and Phase III of the CGSC Faculty Development Program (Lesson/Course Author Training).

DLRO also requires all of its instructors to "re-green" annually. This program gives AGR instructors an opportunity to see Army transformation in action by participating in Active component unit training. For example, an instructor can "right-seat ride" with an Active component unit at one of the Army's CTCs. Or, if he prefers, he can participate as a member of a Battle Command Training Program (BCTP) team as it evaluates a division's warfighter exercise (WFX) or mission rehearsal exercise in preparation for pending Operation Iraqi Freedom and Operation Enduring Freedom rotations. For example, one AGR logistics instructor gained valuable institutional logistics knowledge by traveling to Fort Hood, Texas, with BCTP Team B to evaluate the 1st Cavalry Division during its weeklong WFX.

Program Benefits

The AGR instructor share program is a "win-win" situation for both the Active and Reserve components for three reasons. First, it improves the academic experiences of students in the resident and SAdL courses by drawing from the knowledge base of both components. Second, it allows the Army Reserve to develop highly qualified subject-matter experts with a functional knowledge of logistics and force management concepts at the strategic, operational, and tactical levels. Third, it provides the Reserve components with highly competent logistics officers who are ready to assume command and staff positions in logistics units as the Army institutes its new Logistics Branch.

Before the inception of the instructor share program, the resident CGSC and SAdL courses had no real linkage. TASS battalion instructors had to meet minimum certification requirements in order to teach at CGSC, but SAdL instructors had no real reachback capability to get answers to logistics curriculum questions. As a result, some of the blocks of instruction lacked the quality needed and expected of a world-class educational institution.

The AGR instructor share program allows the selected AGR officers to become fully trained and certified instructors who possess up-to-date information on logistics and force management issues, which underpins a reachback capability. They can use these skills to work with TASS brigade commanders on curriculum issues or mentor TASS battalion instructors as they prepare to teach specific ILE courses.

The AGR instructor share program received an additional boost when the 84th ARRTC provided two additional AGR officers to Fort Leavenworth—one for the SAdL and the other for the Battle Command Knowledge System (BCKS). The SAdL officer serves as a critical liaison between CGSC and the SAdL as the SAdL's old legacy course transitions to the new ILE course now taught at the TASS battalions and on line. The BCKS officer is instrumental in collecting Army Reserve-related issues for inclusion on the BCKS Web page at https://bcks.army.mil. This site is designed to be a one-stop source of answers to almost every type of question Soldiers may ask in today's Army. The site, which is available to registered AKO users, features various professional forums; a collection of regulations, maps, and training files; and lessons learned from the Global War on Terrorism. The BCKS Web site is especially helpful to SAdL students in CGSC courses.

AGR instructors, the SAdL liaison officer, and the BCKS liaison officer are available to help address the unique curriculum requirements and academic needs of resident CGSC and SAdL students and faculty. They also are uniquely qualified to provide institutional knowledge to unit leaders seeking current logistics doctrine and information.

At the end of their teaching tours, AGR instructors are true logistics and resource management subject-matter experts who are ready for follow-on assignments as battalion commanders or staff officers in Reserve logistics units. They can train and mentor unit personnel on doctrine and tactics, techniques, and procedures; or they can serve in TASS battalions, where they can train Reserve component instructors to ensure that SAdL curriculum standards are maintained. As General Helmly said, "The experience gained by [AGR] instructors [will] be invaluable to the TASS battalions, strengthen them professionally, and forge a strong tie between TASS battalions and the parent school."

CGSC has come a long way since it was established. The 84th ARRTC's willingness to support the vision of Generals Helmly and Wallace reflects confidence in the AGR instructor share program. It has already paid great dividends to both the Active and Reserve components, and it enables CGSC to continue its tradition of providing a world-class education to the military's future leaders. **ALOG**

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The Changing Face of Fuel Management

BY MAJOR VINCENT C. NWAFOR

Many of the products which create a modern standard of living are only the physical incorporations of ideas—not only the ideas of an Edison or a Ford but the ideas of innumerable anonymous people who figure out the design of supermarkets, the location of gasoline stations, and the million mundane things on which our material well-being depends. Societies which have more people carrying out physical acts and fewer people supplying ideas do not have higher standards of living. Quite the contrary.

—Thomas Sowell
American economist,
political writer, and commentator

In October 2005, my unit, the 16th Corps Support Group (CSG), deployed from Hanau, Germany, to Tallil, Iraq, to serve in Operation Iraqi Freedom (OIF) 05–07. Our mission included providing fuel from the Cedar fuel farm, a general support (GS) site in our area of responsibility, to other fuel sites in southern Iraq. Effective management of fuel in the Iraqi theater of operations is critical because fuel convoys constitute approximately 70 percent of the vehicular traffic that braves the attack-prone main supply routes. Our mission and location on the battlefield gave us the opportunity to improve the fuel support process. The field commanders would have been even better served if we could have emplaced a vertical fuel support network that built on the existing support. Although we knew of no missions that had failed because of a lack of fuel support, we knew that complacency is calcifying. We needed to do more to improve the direct support (DS) fuel management process.

Fuel Flow

Fuel support through southern Iraq began when the operational Army in Kuwait requested a 14-day supply of fuel from the Defense Logistics Agency's Defense Energy Support Center. The operation ended when fuel was pushed from the Cedar fuel farm in response to a projected 96-hour fuel requirement generated by the tactical Army. Army fuel supply channels responded very well to this routine. However, emergency surges in fuel requirements sent frantic waves through the support channels.

Each day, the 475th Petroleum Group in Kuwait sent a 4-day nearly static fuel delivery forecast to the Cedar fuel farm. Similarly, the 3d Corps Distribution Center (CDC) provided a 96-hour fuel push directive. The 16th CSG followed up by generating a push matrix that showed local-draw and CDC-directed fuel pushes to other GS and DS fuel sites in the Iraqi theater of operations. The 16th CSG's daily fuel-support matrix was the basis for fuel-delivery missions by the Logistics Civil Augmentation Program (LOGCAP) contractor, Kellogg Brown & Root (KBR), and the tasking of the Georgia Army National Guard's 48th Infantry Brigade Combat Team (BCT) to provide combat patrol platform (CPP) escorts for the fuel convoys. The 16th CSG coordinated all activities in order to ensure responsive fuel support. The Unclassified but Sensitive Internet Protocol Router Network (NIPRNet) was the common, accessible mode of communication among the key players, so coordination relied heavily on email instructions.

Various commands participated in the actual movement of a tanker of fuel in the Iraqi theater of operations. The 48th Infantry BCT provided gun trucks or other CPPs to serve as escort vehicles, the 16th CSG managed the fuel, and the 3d CDC oversaw fuel operations. KBR conducted fuel-site operations and fuel deliveries. The 3d Quartermaster Detachment, a forward-deployed theater petroleum unit from Fort Lee, Virginia, assisted with control at the Cedar fuel farm.

Although unity of effort was not exactly the watchword during much of the operation, the fuel support operations staff came together to accomplish the common goal—supporting the forces. Occasionally, when a mission was cancelled or a backhaul of fuel tankers was delayed because of the unavailability of CPPs, it was difficult to synchronize command and control. Inaccurate fuel-site data sometimes triggered premature fuel resupply to sites that did not need fuel, which held up fuel tankers and increased fuel download time.

Command and control that vertically penetrates the key players' communication nodes is necessary

to achieve unity of effort and effectiveness in DS fuel support. I believe that fuel support would have been better synchronized if the CSG had had operational control of the key players in its area of responsibility.

LOGCAP

KBR plays a dominant role in fuel and base support operations, an indication of a shift that needs to be captured doctrinally to assist in phased support planning. KBR is supposed to be augmenting combat service support (CSS) units; however, during OIF 05–07, the reverse was the case. CSS Soldiers increasingly became the augmentation force to KBR. Many units faced the reality that actual mission performance differed from their doctrinally assigned wartime mission.

KBR has helped to reduce the footprint of CSS units by using third-country nationals or sub-contractor employees to do many jobs, which has freed up Soldiers who are sorely needed elsewhere. This practice has been a boon for all involved. The third-country nationals have an opportunity to make better wages than they could make in their home countries. Salaries for U.S. civilians employed by KBR are lucrative; many receive double or triple the income they received before being employed by KBR.

KBR is a force multiplier that also has become the core of fuel operations in the Iraqi theater of operations. During OIF 05–07, a Kuwaiti contractor, Jassim Transport and Stevedoring Company, pushed fuel from the Kuwaiti Oil Refinery to the Cedar fuel farm, and KBR received, operated, dispensed, and distributed the fuel to 13 forward operating bases (FOBs) in the Iraqi theater of operations. KBR used commercial fuel tankers and Government-furnished equipment to deliver the fuel.

Fuel Discrepancies

The KBR-Jassim arrangement worked well while I was there—most of the time. However, Jassim's 8,000-gallon fuel tankers sometimes arrived at the Cedar fuel farm with a fuel meter reading 1,500 gallons less than the tanker's capacity. How could that be? Fuel expansion and contraction do not logically account for such a large discrepancy. Perhaps a faulty meter was the culprit. Or perhaps some of the fuel that was seeping out of the tankers was lining the pockets of pilferers.

There are several ways to get a handle on the fuel accountability problem. If a faulty fuel meter is to blame for the discrepancies, it should be replaced with a fuel meter designed to withstand rough terrain, harsh weather conditions, and the rigors of a combat zone. If pilferage is a problem, contracts for fuel delivery should stipulate that payment will be based on the number of gallons of fuel delivered to a destination.

KBR's fuel tankers, like Jassim's, have a capacity of 8,000 gallons. The capacity of most Army fuel tankers is 5,000 gallons. This means that it takes two Army fuel tankers to haul the same quantity of fuel moved by one KBR fuel tanker. The Army should consider equipping its petroleum truck companies with 8,000-gallon fuel tankers (or 7,500-gallon M1062 tankers) to reduce the number of trucks needed to transport fuel on the hazardous main supply routes in Iraq. The 5,000-gallon fuel tankers should be used only at the organizational support level.

Convoys

The enemy exploited the vulnerability of CSS convoys until the emergence of the CPPs and other convoy-protection devices. Fuel convoys hauling fuel from the Cedar fuel farm were composed of tankers,

A typical KBR tanker holds 8,000 gallons.

recovery tractors, and accompanying CPPs. The ratio of CPPs to cargo trucks was 1 to 10. That ratio sometimes changed, depending on the prevailing threat level. During line hauls, the CPPs dropped off tankers at their destination and then escorted waiting backhauls on the return trip. The dropped-off tankers downloaded and waited for the arrival of the next CPP for their backhaul trip.

Occasionally, the lengthy waiting time for a returning convoy drew command attention, and CPPs were detailed to the backhaul. The logical question is, "Why didn't each convoy have dedicated CPPs?" The answer is that there were not enough CPPs to go around. Maybe the Army needs to resource and develop CPP platoons and task-organize fuel tanker companies with CPP platoons. An alternative solution might be to have each CSG exercise operational control of a battalion-sized CPP organization. The 48th BCT, which provided CPPs for convoy missions, was under the operational control of the 3d Corps Support Command and lacked the flexibility to satisfy the 16th CSG's CPP daily fuel movement requirements. The 16th CSG, like other CSGs, improvised to bridge the CPP support gap by cross-leveling Soldiers from other military occupational specialties to perform the CPP mission.

In Iraq, hauling fuel by road will remain the norm for the foreseeable future, which means that convoys will continue to be targets. Therefore, the time to make changes and incorporate CPP elements into the CSG formation is now.

This fuel bridge, built by Soldiers of the 16th CSG, permits safe fuel transfer to skid-mounted tanks.

Fuel Forecast Tool

A locally developed, Excel-based fuel chart served as the 16th CSG's 96-hour fuel forecasting tool. The forecast was based simply on the sum of the quantity of fuel on hand plus the projected quantity of fuel to be received minus consumption (using the previous quarter's 96-hour average). The Excel chart was helpful, but its utility diminished over time because of the following factors—

- The reality of inherent discrepancies in programmed versus actual fuel issues or receipts.
- A stale quarterly consumption factor that did not reflect recent surges in demand or near-term events.
- Erratic arrival of fuel on the programmed date because of the unavailability of CPPs, border-crossing issues, or vehicle mechanical problems.
- Murky procedures for accounting for fuel tankers uploaded at the Cedar fuel farm. KBR tankers uploaded fuel 24 hours before mission date, while the Army tankers uploaded fuel after receiving the mission to keep tankers in ready status.
- "Missing" tankers. When the Jassim trucks scheduled to transport the Kuwait-to-Cedar fuel push failed to make the mission, they were annotated as "missing" on the Excel chart. Missing tankers had 4 days to complete the mission. After 4 days, another fuel tanker was tasked with transporting the undelivered fuel. The focus of the fuel accounting was on the programmed delivery date, so failed deliveries or follow-up deliveries skewed the accounting for daily fuel receipts.
- Fuel meter deviation. The standard fuel meter deviation allowed was .005 percent of fuel received, which meant that an overage or shortage of one half of 1 percent of the programmed fuel receipt was within tolerance. However, the actual meter deviation was in the range of plus or minus 19 percent. The impact of the excessive meter deviation was not factored in when tabulating projected fuel receipts.

In effect, the Excel chart was not a very reliable fuel forecasting tool. Good judgment and common sense usually carried the day. The Army sorely needs a system that meshes algorithms to produce desired perspectives, including fuel forecasts and other much-needed data.

Instead of the current 96-hour forecast at the tactical level, perhaps we should mirror the near-term training plan model, which is: A 6-week training forecast, a 4-week lock-in, and weekly validation of requirements. The 96-hour forecast window did not prompt the field commanders to ask the right questions about fuel support nor did it influence the theater fuel stockage in the near term. In a combat zone, the requirements of the tactical Army should be the dominant feeder to the operational Army fuel forecast. Inasmuch as historical records are indispensable in

forecasting fuel at operational and strategic levels, the frontline commanders' desired fuel stockage should drive fuel flow. According to Colonel Victor Maccagnan, the 16th CSG commander, "We are at war, so effectiveness—not economy or efficiency—is the goal." Nothing took away from that paradigm more than the near-rigid, 96-hour timeline for pushing fuel from the operational Army to the tactical-level DS fuel lines of operations.

Consumption Factor

The use of a quarterly consumption factor was the norm. The problem was that a quarterly figure swallowed the valleys and peaks in fuel consumption. It often predicted fuel demand surges inadequately, and supply fell significantly behind as a result. The monthly consumption factor was preferred to the quarterly consumption factor because the closer the average used was to the current date, the more realistic the forecast would be. The daily floating consumption factor rarely in use was even more accurate, particularly where road conditions and tactical requirements remained fluid as the insurgents' tactics evolved and influenced the tactics, techniques, and procedures of the coalition forces. A daily floating consumption factor would have been the most realistic and progressive, but it was time-consuming to compute fuel consumption every day.

Different Kind of Support

The coalition forces' nation-building efforts in Iraq called for unique support, such as providing emergency fuel supplies to the budding Iraqi Security Force's (ISF's) base camps. The Soldiers of the 406th Corps Support Battalion, a subordinate unit of the 16th CSG, showed amazing ingenuity when they built a fuel bridge to permit safe fuel transfer to skid-mounted open fuel tankers at the ISF bases. Skid-mounted tankers were used at a few retail fuel points at the forward operating bases (FOBs), which begs the question, "Why not have flatrack-mounted tankers at small fuel DS sites?" I believe that the benefits of using flatracks are undeniable.

Another significant adaptation was the reassignment of Soldiers who would otherwise redeploy when their functions were assumed by KBR employees. A troop-to-task analysis revealed that force-protection and transportation functions were the primary benefactors when fuel Soldiers were displaced by contract personnel. It was not surprising that a lot of the fuel Soldiers were performing jobs that were outside the parameters of their military occupational specialties.

Fuel Stockage

Standards. The 3d CDC used two fuel stockage standards: days of supply (DOS) and percentage of storage capacity. The CDC favored the DOS standard. At the DS level, the fuel stockage objective was 5 DOS—derived by multiplying the consumption factor by five, plus 5 percent of total storage capacity.

The DOS stockage standard did not command much support outside the CDC. Many supported units wanted the CDC to maintain the maximum safe storage capacity of fuel. Maintaining 5 DOS on-hand did not provide enough time to order replenishment shipments. As a matter of fact, there was no reorder point, and the use of just-in-time logistics was riddled with obstacles. The vagaries of weather, sectarian clashes, and minor labor disputes determined the fuel flow to a larger extent than did the dubious tactics of third-country fuel suppliers. Any of these obstacles could send shock waves through the supply system, and the status of the fuel DOS reading would glide from green to amber to red in a matter of a few days. Fuel was crucial to our battlefield mobility, and we undoubtedly would have used up all fuel that was available to us in a short time. The 5 DOS stockage standard was management intensive, and it undermined the field commander's confidence in fuel sufficiency in the uncertain environment of Iraq.

In a conventional offensive setting, organic fuel lift capability influences the sustainable fuel stockage. But in the Iraqi war of attrition, fuel support is FOB centric, and the FOBs are as secure as a fortress. Other than the risk of receiving bad fuel because of recirculation problems or the possible loss of a fuel farm due to enemy attack, fuel stockage to the maximum safe storage capacity has advantages over the DOS standard. (Recirculating fuel removes water, dirt, and algae before it builds up and poses a threat to equipment.) Maintaining 5 DOS increases the already-high number of convoys on the attack-prone main supply routes.

The goal should be fuel stockage to the maximum safe storage capacity, which should be no less than 15 DOS. Resupply could be done biweekly to reduce the number of fuel convoys on the road. This would mean that more force-protection resources would be available to provide greater security to the reduced number of supply convoys on the road.

DS fuel sites. Questions asked repeatedly by new units when they rotated into an FOB were, "Why can't there be preconfigured bulk fuel packages for FOBs?" "Why shouldn't fuel stockage capacity be preconfigured into 'plug-and-play modules' to support FOBs?" "How do you determine initial fuel stockage capacity for a unit that will fall in on unidentified equipment when it arrives at the FOB?"

You may be surprised to learn that the initial planning for fuel stockage capacity still hinges on garrison equipment density and its canned consumption factor.

This photo shows a skid-mounted fuel site at a forward operating base.

Proposed "plug-and-play" DS and GS fuel modules are as follows—

- DS–Fuel (F) Module (Mod) 1: Less than 100,000 gallons.
- DS–F Mod 2: More than 100,000 gallons but less than 200,000 gallons.
- DS–F Mod 3: More than 200,000 gallons but less than 300,000 gallons.
- DS–F Mod 4: More than 300,000 gallons but less than 400,000 gallons.
- DS–F Mod 5: More than 400,000 gallons but less than 500,000 gallons.
- GS–F Mod 1: More than 500,000 gallons but less than 1 million gallons.
- GS–F Mod 2: More than 1 million gallons but less than 2 million gallons.
- GS–F Mod 3: More than 2 million gallons but less than 3 million gallons.
- GS–F Mod 4: More than 3 million gallons but less than 4 million gallons.
- GS–F Mod 5: More than 4 million gallons.

The observed ratio of fuel storage capacity in Iraq by fuel type was 16 gallons of JP8 to 3 gallons of DF2 to 1 gallon of MOGAS. In predominantly coalition-force FOBs, DF2 took the lion's share of the storage capacity. The use of reconfigured fuel modules would greatly simplify fuel support planning, a fact that will be obvious when we build up forces, realign forces, or redeploy forces when hostilities subside.

Connectivity

DS supply information systems. Other than the Battle Command Sustainment Support System (BCS3), there were no Standard Army Management Information Systems (STAMIS) dedicated to fuel supply at the organizational and DS levels in Iraq during OIF 05–07. Other classes of supply had recognized the effectiveness of technology in supply management. For example, the Unit Level Logistics System–Ground (ULLS–G) and the Standard Army Retail Supply System (SARSS) are used to manage repair parts. Those dedicated STAMIS are not perfect, but they enhance management capabilities.

In Iraq, the fuel management processes at the organizational and DS levels were literally manual. The Fuels Automated System (FAS) was used only at the GS fuel sites. The need for STAMIS at DS fuel sites is acute. Perhaps a Rapid Fielding Initiative team could visit fuel sites in Iraq to capture and integrate the current fuel accounting essentials into a system that incorporates what we know about other commodity systems. Such efforts would be extremely beneficial in the long run.

Common user communications. The prevailing indifference to the disparities in communications systems between the Army and KBR cannot be ignored. Most of the DS fuel sites in Iraq were under the operational control of KBR. The 16th CSG directed fuel draws, influenced the stockage objective, facilitated fuel distribution, ensured KBR compliance with theater directives, and served as an information conduit for military forces at higher and lower echelons. Communication with KBR representatives was mostly by NIPRNet because Defense Switched Network (DSN) phones, in common use in the Army, were rarely available to KBR fuel site managers. KBR had a commercial phone system. The incompatibility of phone systems meant that it took hours, if not days, to get a response that should have taken minutes with a phone call. Sometimes, the old message runner approach was used to pass needed information.

The time has come for a tactical common access phone system that enhances the partnership between the Army and the LOGCAP contractors. Cell phones would work, but their use at the tactical level is not common. Voice over Internet protocol (VoIP) phone links to KBR elements would be great. (A VoIP phone is a telephone device that looks like a traditional telephone, but, instead of connecting to the traditional telephone system network, it has an Ethernet port that is used to connect to a transmission control protocol/Internet protocol [TCP/IP] computer network.)

Some Department of Defense (DOD) civilians have stateside DSN phones with extensions that are linked to forward-deployed individuals; this may be a consideration for KBR-operated fuel sites. The concept of free download of antivirus software to all DOD employees for their personal computers may facilitate the transmission of common access Army communications with KBR.

Institutional Fuel Lapses

Bulk fuel draw. Allowing any Army unit to stop by a KBR fuel site and obtain bulk fuel with little or no questions asked impairs the ability of the site to forecast requirements, which further destabilizes the fuel management process. Imagine a unit showing up at an ammunition supply point unannounced to pull tens of thousands of rounds of ammunition or an Army unit showing up at a supply support activity to draw repair parts. Such unplanned support, if frequent, can unhinge the ability of the supply site to support programmed requirements. During OIF 05–07, there was no requirement to tie the aggregate monthly fuel draw to a particular unit. The situation was even dicier when coalition forces were configured into the equation. However, I did not witness any negative consequences resulting from violating acquisition cross-servicing agreements.

Bulk fuel issued is assumed to be bulk fuel consumed. A formal list should be drawn up of who can draw bulk fuel at designated fuel support sites. The 16th CSG instituted a number of local remedial actions; among them was a monthly validated draw list for FOBs in its area of responsibility.

Fuel school curriculum. The Petroleum Officers Course, which is taught by the Advanced Petroleum and Water Division of the Army Quartermaster School at Fort Lee, prepares company-grade officers for staff and supervisory petroleum and water operations assignments. Instruction includes joint operations, equipment operation, quality surveillance, and logistics planning. Lessons learned from recent operations are included as scenario-driven examples. The course teaches students "what right looks like." However, reality places unique constraints or requirements on fuel operations. Because most students will be working in combat zones after completing the course, the course should offer students more thorough training in combat zone fuel operations. When warranted, doctrine should be updated to institutionalize lessons learned, because localized remedial actions are seldom passed along when units rotate out of the combat zone.

The DS management of the fuel flow in southern Iraq is crucial to the mobility of forces there. During OIF 05–07, the combined efforts of the 16th CSG, 3d CDC, 475th Petroleum Group, 48th Infantry BCT, and KBR ensured fuel support despite frequent insurgent attacks on fuel convoys.

Several remedial actions would enhance the effectiveness of DS fuel management in Iraq. Using a monthly rather than quarterly consumption factor would increase the accuracy of fuel forecasts. Field commanders would welcome the replacement of the current 96-hour fuel forecast with their near-term fuel forecasts. Currently, too many fuel convoys have to brave the attack-prone Iraqi main supply routes in order to maintain the 5 DOS stockage objective standard. Implementation of the maximum safe storage capacity of no less than 15 DOS could help to reduce the number of fuel convoys that are sent out.

The Army must use technology to achieve the maximum safe fuel stockage at DS fuel sites in Iraq. Developing and fielding DS fuel STAMIS will alleviate dependence on the current manual processes. Other classes of supply have dedicated STAMIS that enhance management effectiveness—fuel managers must follow their lead.

The use of tactical common access phones to facilitate the support network on the battlefield is overdue. This communications shortfall hinders progress in fuel support operations, particularly as KBR's role becomes the centerpiece of DS fuel operations. LOGCAP systems must be cross-pollinated with Army systems to improve interoperability.

Finally, all elements responsible for fuel support in a CSG's area of responsibility should be under the operational control of the CSG. CSG control of the CPP task force would promote unity of effort and increase the effectiveness of support.

These changes in the DS fuel management processes are necessary to optimize fuel support to the fighting forces in Iraq. Business as usual is not acceptable.

ALOG

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Polymer Advances in the Interwar Period: The Impact of Science on World War II

BY MAJOR PAUL WAKEFIELD

When I asked fellow staff members and students at the Army Command and General Staff College to tell me what came to mind when they heard the words "World War I," by far the two most common answers were "trench warfare" and "attrition." One statistic from that war is particularly sobering: Over the course of the war, both the Allied and Central Powers reconstituted their infantry ranks three times. No wonder people called it "the war to end all wars." Those who studied the lessons learned from that tragedy quickly realized that the trench warfare that characterized World War I had become an untenable military tactic. For nations to wage future wars successfully, they would have to fight very differently. Militaries would need to incorporate technological advances more fully into their doctrine to help minimize losses.

By the start of World War II, scientists, in their study of polymer materials, had made many discoveries that facilitated the creation of new or improved products. Those products improved efficiency, which enabled militaries to better execute new doctrine that changed the way nations prosecuted war. Although not all of the inventors intended their products for military use, people nevertheless found ways to use them militarily, and some uses proved to be extremely valuable. Specifically, the Allies' ability to capitalize on interwar discoveries in synthetic rubber, polyamide, polyethylene, and polytetraflouroethylene influenced the outcome of World War II by enabling the Allies to shoot, move, and communicate with greater ease, reliability, and lethality than could German and Japanese forces. Polymer advances since World War II continue to influence the way nations train for and fight wars.

A chronology of some of those technological advances can be found in publications such as *Packaging Today* magazine; various encyclopedias; and books such as *Milestones in Science and Technology: The Ready Reference Guide to Discoveries, Inventions, and Facts*, by Ellis Mount and Barbara List. These and other sources provide a fascinating look at the development of many important products in use today. Some of the facts and figures below are taken from these sources.

The Search for a Technological Edge

At the end of World War I, industry was still using natural resources to make products such as hoses, tires, valves, and gaskets. Manufacturers used textiles like cotton, wool, and silk to make clothing. Scientists already had played an important role in improving many of these resources. For example, Charles Goodyear's discovery of the vulcanization process in 1839 (patented in 1844) made it possible to develop flexible, waterproof, winter-proof rubber tires. Still, in order to succeed at war, the United States needed to be able to support its military by expanding its technological edge without depending solely on natural resources that were vulnerable to control by enemy forces. Polymer products were the perfect way to do both.

Germany was devastated after World War I. The economic blockade of Germany by the Allies, which began in 1916, was not lifted until June 1919, 7 months after the armistice ended the war. This blockade is estimated to have caused the death of some 800,000 German civilians. During the interwar period, the German Army quickly began a comprehensive study of lessons learned, publishing their findings in a doctrinal manual that was based on a thorough assessment of World War I. However, while the Germans were busy learning, most Americans were unmindful of the connection between American prosperity and safety and the need for a free world. Politically, the United States sought isolation, and its military innovation consequently lagged during the interwar period. Nevertheless, scientists in Germany, the United Kingdom, and the United States made many spectacular (and sometimes collaborative) advances in the area of polymers. In fact, American industry developed some very innovative products during this period by capitalizing on the discoveries of independent inventors.

Synthetic Rubber

In the 1920's, American scientist Wallace H. Carothers began his studies of the chemistry of giant molecules. His studies led him to confirm that high-molecular-weight molecules consist of repeating units of simple molecules (monomers) that are linked together by chemical bonds

to form long chains (polymers), as first proposed in 1920 by German chemist Hermann Staudinger. Carothers' work for E.I. DuPont de Nemours and Company led to the company's highly successful commercial production of neoprene, the first synthetic rubber made in the United States. Neoprene proved invaluable as a replacement for natural rubber because it was highly resistant to heat and chemicals, such as oil and gasoline, and it could be used to make fuel hoses and insulating material for machinery and plumbing.

In 1935, German chemists produced the first of a series of synthetic rubbers known as "buna rubbers." One buna rubber, known as "Government rubber-styrene," or GR–S, would become the basis for synthetic rubber production by the United States during World War II. Both the military and the industrial base needed rubber for vehicle tires, engine components, and other machine parts, so this invention would prove critical to the Allied Forces during World War II. Even though the Japanese controlled virtually all of the world's rubber-producing regions in 1942, 50 U.S. factories were manufacturing synthetic rubber by 1944, producing a volume twice that of the entire world's natural rubber production before the beginning of the war.

Wallace H. Carothers demonstrates the pliability of neoprene in his laboratory at DuPont. *(Photo courtesy of Hagley Museum and Library.)*

Nylon stockings returned to stores after the end of the war in 1945. This customer could not wait to get home before trying hers on. *(Photo courtesy of Hagley Museum and Library.)*

Polyamide

Although Carothers helped to invent synthetic rubber, some people know him best for his work with polyamide. The Harvard-trained scientist headed a secret DuPont program that culminated with the invention, marketing, and mass production of "Fiber 66," commonly known as nylon. DuPont first introduced nylon at the 1939 World's Fair in New York City as a silk substitute. Its use for items such as stockings continued in the United States from 1939 until the outbreak of World War II. At that time, Japan, which provided most of the world's raw silk, ceased exports to the United States. Of necessity, U.S. manufacturers stopped producing nylon stockings so that nylon could be used exclusively for military purposes, such as rope and parachutes for airborne troops.

Polyethylene

Another critical polymer developed during the interwar period was polyethylene, which was discovered in 1933 by British chemist R.O. Gibson. Polyethylene is waterproof and has good insulation qualities for use in electrical devices. Because of these characteristics, industry quickly saw polyethylene's value to the communications field and started using it to insulate telephone wiring. The first commercial radiotelephone communication between continents occurred between New York and London in January 1927. By the end of 1933, the British were producing enough polyethylene to insulate submarine telephone cables. In fact, the development of coaxial cables with polyethylene insulation and other communications improvements, such as carrier frequency equipment and broadband repeaters, enabled the world to realize transatlantic telephony before World War II. From then on, both Government and civilian organizations used coaxial cables to conduct business over the transatlantic radiotelephone cable system. However, this was just the beginning of the possibilities for using polyethylene.

Before World War II, parachutes were made of Japanese silk. When Japan cut off silk supplies during the war, DuPont persuaded the Army to try nylon as a substitute. Here, an employee at a parachute factory is shown just after landing with a nylon parachute. *(Photo courtesy of Hagley Museum and Library.)*

Polyethylene also contributed to the development of radar. In 1935, Scottish engineer Sir Robert Watson-Watt developed a warning system that could detect a plane 40 miles away. Later, in 1939, British scientists Harry Boot and John Randall invented the magnetron tube. This tube, coupled with the ability to insulate the warning system's cables with polyethylene, enabled scientists to develop a radio detection and ranging (RADAR) system that would serve many purposes during World War II. The British Royal Air Force used it to locate and defeat incoming German Luftwaffe and rocket attacks. In the Pacific theater, the U.S. Navy enhanced its power-projection capabilities by using radar to detect enemy vessels and aircraft and launching attacks even before making visual contact.

Polytetraflouroethylene

Regardless of how wonderful and useful they were, synthetic rubber, nylon, and polyethylene arguably pale in comparison to polytetraflouroethylene. This product, which American chemist Roy J. Plunkett accidentally discovered in 1938, would play a significant role in ending World War II and in saving countless lives since.

Plunkett had been attempting to develop a nontoxic refrigerant from gaseous tetraflouroethylene. Instead, he came up with polytetraflouroethylene, commonly known as Teflon, which was first used in the manufacture of gaskets and valves for the atomic bomb. As a result, military doctrine at the strategic level could switch from attrition to deterrence through mutual assured destruction (a military strategy in which a full-scale use of nuclear weapons by one of two opposing sides would effectively result in the destruction of both the attacker and the defender, thereby deterring both sides from attacking). Because it contributed to making doctrinal change possible, Teflon undoubtedly has helped to save infinitely more lives than were lost at Nagasaki and Hiroshima.

Polymers Today

Today, the world uses polymers in countless ways. Their medical uses alone are too many to mention, but a few of the more common medical products made of polymers include synthetic rubber catheters, airway openers, latex gloves, plastic tubing, intravenous bags, cardiac stents, and autoclave instrument trays, as well as the ubiquitous Band-Aid. However, the most advanced products of all are artificial hips, knees, chins, noses, bones, and even corneas that are made of Teflon.

Advances in other polymers have equally significant applications today. For example, scientists originally planned to use neoprene for plumbing insulation; however, improvements in the product allow manufacturers to make clothing such as wetsuits, dry suits, aircraft pressure suits, and space suit undergarments, which all have great military significance. Military and commercial businesses use nylon to make much more than just clothing, rope, and parachutes. Because of its wear resistance when in bulk form, it is also perfect for making gears, bearings, bushings, and other mechanical parts. Polyethylene, the product originally used as a coating for cables, is the basic polymer used to make Kevlar for helmets and body armor and Nomex for fireproof clothing.

Polymer products developed during the interwar period truly had a huge impact on the outcome of World War II. Scientific advances during that period continue to help militaries shoot, move, and communicate with greater ease, reliability, and lethality while enabling technological advances to occur in virtually every other field. Indeed, research will continue to enable scientists to develop new polymers and further improve the ones the world currently uses, thus allowing researchers to bring to fruition technology that was once unimaginable. **ALOG**

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Resources for Convoy Battle Drills

BY CAPTAIN CHRISTINA A. POLOSKY

Every unit deployed to Iraq has developed a list of convoy battle drills that worked in its particular situation. Units in Iraq have learned through experience that what worked in the open terrain between Samarra and Tikrit proved to be completely dysfunctional in the urban conditions of Baghdad. The need to be aggressive and the ability to take the fight to the enemy are constants in all effective battle drills. Merely closing up and running away may minimize casualties today, but, in the long run, leaving attackers alone will encourage them and ultimately result in increased friendly casualties. A commander also has to accomplish his convoy's mission. The problem facing commanders is deciding which battle drills will be most effective for the local terrain and road conditions they face.

To provide a framework for evaluating which battle drills are more suitable to a particular convoy mission, commanders should consider four principles. These principles are not listed by priority; different tactical situations will determine their relative importance for each mission. An effective convoy battle drill is one that, for a specific situation, will—

- Minimize friendly casualties.
- Maximize enemy casualties.
- Leave no abandoned equipment.
- Allow the convoy to accomplish the mission.

So what factors should a convoy commander consider in deciding which battle drills apply to his mission that day? Some factors that influence the effectiveness of a particular battle drill can be determined by asking the following questions—

- How many vehicles and Soldiers are in the convoy?
- How many crew-served weapons—mounted and hand carried—does the convoy possess?
- Does the terrain allow the convoy (both cargo trucks and gun trucks) to drive off the paved surface?

Units in Iraq have learned through experience that what worked in the open terrain between Samarra and Tikrit proved to be completely dysfunctional in the urban conditions of Baghdad.

- Does the convoy have the means to communicate while dismounted?
- Is the terrain the convoy will traverse flat and open, rolling hills, or urban?
- How critical is it to the receiving unit that the supplies the convoy is delivering reach it on schedule?
- Where along the route can the convoy commander call for help, and where are the communications dead spots?
- How proficient in their various battle skills are the Soldiers in the convoy?
- How skilled are the leaders and Soldiers at recognizing which battle drills they should execute for any given situation?

What should be apparent is that a single convoy may need three or four different battle drills to be prepared to react to improvised explosive devices (IEDs) and small arms fire, depending on the conditions along its route.

Soldiers in a convoy must have a clear vision of the expected hazards along different portions of the route. The convoy commander must communicate to the Soldiers in the convoy which battle drills will apply and when each will be in effect. It is the job of commanders and staffs to make sure that the Soldiers in a convoy have the knowledge and equipment they need to be successful. Soldiers in a convoy have the best chance of success if the staff of each unit involved in the convoy does its part in a coordinated brigade operation.

To help commanders and staffs obtain information they can use to improve their convoy battle drills and operations, I offer on the following pages my assessment of some Web sites that provide convoy tactics, techniques, and procedures. **ALOG**

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Center for Army Lessons Learned

Main idea of the Web site. This site is maintained by the Center for Army Lessons Learned (CALL) at Fort Leavenworth, Kansas. CALL is the Army's foremost authority on lessons learned, so this site offers the best convoy operations lessons learned on the continually changing battlefield.

Login. Go to http://call.army.mil and click on "DoD Users Login Here" on the upper left-hand column of the window. Then log in by one of four ways: "AKO [Army Knowledge Online] LOGIN," "Login using my CAC [Common Access Card]," "DEERS [Defense Enrollment Eligibility Reporting System] LOGIN," or "CALL SUPPLIED LOGIN."

Basic information available.

- "Warfighting" contains information from the front, including after-action reports and information on such subjects as improvised explosive devices (IEDs), urban operations, and cultural awareness.
- "Training for War" provides information on training and mission readiness, including combat training packages; mobile training teams; the Officer and Noncommissioned Officer (NCO) Education Systems; tactics, techniques, and procedures (TTP); and training videos.
- "Transformation" includes links to Army Transformation, Modular Force, and Stryker Brigade Combat Team sites.
- "New Stuff at CALL" has a chronological list of new items on the CALL Web site.
- "CALL Products" offers handbooks, newsletters, initial impressions reports (IIRs), and other products produced by CALL.
- "Focus Areas" contains information sorted by battlefield operating system, region, conflict, or deployment. It also offers documents and training packages from sources other than CALL.

Currency of information. The CALL Web site has no designated timeframe for updating or posting items. Basically, when an item is approved and formatted, it is posted. This ensures that the CALL Web site has the most recent data at any given time.

Completeness of information. Besides unit-specific SIPRNet (Secure Internet Protocol Router Network) sites, this is the most comprehensive Web site available to those of all ranks, as long as they have a Department of Defense login. CALL has a SIPRNet access at http://call.army.smil.mil. It mirrors the NIPRNet (Unclassified but Sensitive Internet Protocol Router Network) restricted site by offering all documents, plus a SIPRNet search capability and links to various other sites.

User-friendliness. First-time users will have to spend some time to get acquainted with the Web site. The site offers a lot of information, and you may be confused if you do not know exactly what you are looking for.

Useful links. Under "CALL Resources," which is found on the far left-hand corner of every CALL window, you can click "Links" to go to several hundred links, including links to schools and training centers, news services, and rear detachment operations sites.

Relevance. You can search this site for days and then find newer information the very next day. Since this is an Army Web site, much more is available than convoy operations, and sifting through the extraneous information can be time-consuming.

Best feature. By far, this site's best feature is having all lessons learned for every facet of Army operations in one place.

Most challenging feature. Navigating through all of the available information to find information on convoy operations is difficult. The simplest way to start researching is to click on the "Warfighting" link, then the "Operation Iraqi Freedom (OIF)" link, then conduct a keyword search in the search window for "convoy operations."

Army Training and Doctrine Digital Library

Main idea of the Web site. This site is operated by the Army Training Support Center at Fort Eustis, Virginia. It provides access to a wide array of Army documents.

Login. Go to www.train.army.mil and use your AKO login to access this site.

Basic information available.

- "What's Hot!" on the upper right-hand side of the window gives you access to articles and documents, such as "A Military Guide to Terrorism in the Twenty-First Century" and "Convoy Survivability Training Support Packages."
- "Library Search" on the lower right-hand side of the window leads to a search page, where you can conduct a keyword search for "convoy operations" and find sources of information like Field Manual (FM) 4–01.45, Multi-Service Tactics, Techniques, and Procedures for Tactical Convoy Operations.
- "My Tasks." By clicking on this tab at the top left side of the window, pulling down the "Type" menu, and then clicking on "MOS/Keyword," you can enter the word "convoy" and get many hits that lead to specific task and condition standards for various branches.

Currency of information. The Web site is updated several times a year. However, most convoy operations hits currently on the site are from the spring and summer of 2005.

Completeness of information. If you take the time to do a variety of keyword searches, you will find much information on convoy operations, including

specific task and condition standards. Complete information is available for a training NCO or a lieutenant in a support operations shop who is putting together a battalion consolidated tactical convoy operations handbook or standing operating procedures (SOPs). This site is an alternative to CALL, but it is not as current or as complete.

User-friendliness. This is not an easy Web site to navigate. Some creative surfing is required to find specific convoy-related articles. A good way to start is to follow the steps listed above under "Basic information available." Once you get started, surfing and experimenting will take you further.

Useful links. The site has links to other resources, but it is difficult to find them. This is not a useful site for finding convoy-related links.

Relevance. This site is great for finding specific training guidance for any area. However, the articles tend to be older than those found on the CALL Web site, and fewer are on convoy operations.

Best feature. Once you perform a keyword search, you can check the box beside any interesting finding and that finding will be kept in a place called "My Rucksack" found on the Web site's home page. This is a great feature because you will not have to do a new search every time you open the page.

Most challenging feature. This Web site can be confusing the first few times it is used. You may become frustrated when trying to find convoy-specific guidance. Many of the findings are not particularly useful for a combat logistician. However, the more information you can obtain before deploying, the better prepared you will be.

Convoy Survivability Training Support Package

Main idea of the Web site. This site is maintained by the Army Combined Arms Support Command (CASCOM) at Fort Lee, Virginia. It was designed for training convoy commanders at the institutional level, although deploying units have used it extensively since its creation. It provides the Training Support Package (TSP) for Convoy Survivability, Course Number 55–Z–0001, Version 1.51, dated 14 November 2005. Prerequisite instructions for using this site include "Plan Convoy Operations" (55188A9013) and "Conduct Convoy Operations" (55188A9015).

Login. This TSP is available through the CASCOM Web site. Go to https://www.cascom.army.mil/private/TD/Transportation/training_products/Convoy%20Survivability/convoy_surv.htm and log in with AKO login to access this site.

Basic information available.

- Click on "CONVOY SURV TSP.doc" to open the Word document, "TRAINING SUPPORT PACKAGE FOR: CONVOY SURVIVABILITY, Version 1.51, 14 November 2005."
- Convoy survivability PowerPoint presentations. These presentations consist of a set of introductory slides and seven sets of slides for each of the course's enabling learning objectives (ELOs).
- "CONVOY SMART CARD." This opens a handy "LOGISTICS CONVOY OPERATIONS Smart Card" (GTA 90–01–004, dated September 2004).
- "Convoy Leader Handbook Vol. II." This link opens CALL Handbook 04–27, Convoy Leader Training, Volume II, dated November 2004. (The CALL Web site has a more recent version of the CALL handbook, dated February 2005.)

Currency of information. This TSP is updated every several months. TSP for Convoy Survivability, Course Number 55–Z–0001, Version 1.51, dated 14 November 2005, supersedes Version 1.1, dated 27 August 2004.

Completeness of information. This TSP includes updated information for the commander of a deploying convoy. New topics have been added, and new TTP are discussed in detail.

User-friendliness. This is the easiest Web site to use that I have reviewed. You just need to point and click on the document you want to open, and it is there for you to use.

Useful links. The TSP includes hyperlinks for ease of navigation through the lesson plans and the many resources listed throughout.

Relevance. This site is extremely relevant to all commanders getting ready to deploy. It is updated regularly, it is easy to use, and it is easy to download already created presentations and documents.

Best features. The best features of this Web site are the already created presentations and the most recent information available to CASCOM.

Most challenging feature. The section covering electronic countermeasures (ECMs)—ELO H, Section 6—was removed from this version of the TSP so the TSP could be released to foreign students. Instructors who desire access to this section may contact shawa@lee.army.mil or buck.shaw@us.army.mil for a copy. However, be advised that this section contains only a general description of various ECM systems.

CompanyCommand.com

Main idea of the Web site. This Web site was originally set up by company commanders for other company commanders—past, present, and future. As their informational page states, the site creates an online forum for commanders to engage in an "ongoing professional conversation about leading soldiers and building combat-ready units." This site captures

conversations taking place on front porches, around vehicle hoods, and in command posts, mess halls, and forward operating bases around the world. The creators of this site believe that, by engaging in this ongoing conversation centered on leading Soldiers, participants become more effective leaders and develop units that are more effective. Their mantra is, "Amazing things happen when committed leaders in a profession connect, share what they are learning, and spur each other on to become better and better."

Login. Go to http://companycommand.army.mil/ and register with CompanyCommand.com to access the site. You will have to list where you are currently in command or where you previously had a command as well as your current unit and assignment, past duty assignments, and contact information. If this is your first time on this site, click on the red "How to Start?!?" button in the upper left-hand side of the home page after you have logged in. This will take you through a nine-step orientation process that maps out the site and lists what it has to offer in very easy to understand terms.

Basic information available.

- "Navigation." Once you have registered and are logged on, click on the "Company Command" link at the bottom of the homepage. Once there, the best place to start searching for convoy operations information is on the left-hand side of the "Navigation" window. You can pull down topics such as "Leadership," "Warfighting," "Training," "Fitness," "Force Protection," "Maintenance," "Supply," "Soldiers & Families," "Pro Reading," "Rally Points," "Cdrs' Log," and—the most recent addition—"MBCT [medium brigade combat team]" CDR (HBCTs & IN BCTs) [commander (heavy BCT and infantry BCTs)]." Nearly anything that interests you can be found under these tabs, which are cross-referenced with additional links, articles, and personal experiences (especially from commanders on the ground in Iraq and Afghanistan.)
- "Warfighting." Once you open the "Warfighting" window, additional pull-down topics appear: "Afghan Commander," "Deploy," "TLPs" [troop-leading procedures], "Realities of War," "SASO" [stability and support operations], and "COIN [Counterinsurgency]." All these topics have further subcategories that you can examine as well. However, once you are on the "Warfighting" home page, many useful links to convoy operations information will jump out at you.
- "Featured in Warfighting." This window on the left side of the "Warfighting" window is an excellent starting point for looking through "Warfighting." It lists current commanders (in all branches) deployed to Iraq and Afghanistan as well as topics essential to convoy operations, such as "Hindsight is 20/20: Four Principles for a Commander in Combat," "Killing, PTSD [post-traumatic stress disorder], and Talking about it," "Twenty-Eight Articles: Fundamentals of COIN," "Convoy Operations Smart Card," "Joint Convoy Handbook," "OIF SOP Topics," and "Negotiation TTPs." It also has a link to the CASCOM Convoy Survivability Training site.
- Warfighting "Announcement." In the center "Announcement" tab on the "Warfighting" page, you can click on a topic titled "Tactical Convoys." It was posted by Major Dean Dominique on 23 September 2004. This may seem a bit outdated, but the date is only when this topic was first posted.
- "Tactical Convoys." After clicking on this topic from the Warfighting "Announcement" tab, scroll down the page to find the "Tactical Convoys Topic" discussion window. Here you will find great insights and questions from commanders and staff officers who are deployed or have just redeployed. These officers share their knowledge, experiences, and questions on topics such as "Box Method at Rally Points," "T&Eos [training and evaluation outlines] for Convoy Training," "Company Convoy SOP," "MTTP [multiservice TTP] for Tactical Convoy Operations," and "OIF Convoy Ops [operations] References." Each of these topics is open for further discussion through additional postings.
- "Idea, Story, TTP, or Lesson Learned" tab. This tab also can be accessed through the "Tactical Convoys" topic. Listed here, and changing from time to time, are vignettes that make very interesting reading, such as "Attack on the 507th Maint Co [maintenance company]" and "Convoy Operations Lessons Learned and TTPs." These are older articles, posted in 2003, but this site is consistently updated and contains recent comments about those topics.
- "Tools/OPDs [officer professional development]." This tab also can be accessed under the "Tactical Convoys" topic. Found here are already created documents and presentations entitled "Logistical Convoy Operations," "Convoy TACSOP [tactical SOP]," several "Convoy Trip Tickets," "Convoy Operations Smart Card," several "Joint/CALL Convoy Handbooks," "Convoy SITREP [situation report]/incident report," "Convoy Operations Checklists," and "Mounted React to Contact LFX [live fire exercise]."
- "Featured Challenge." Under the "Featured Challenge" window on the upper right-hand side of the "Tactical Convoys" home page is a leadership challenge scenario specifically for convoy operations. This is excellent officer professional development for the lieutenants and future convoy commanders in your area of operations.

Currency of information. This site is updated as soon as new information hits the postings. While it is not an "official" military Web site, the fact that you have to log in with your current command credentials keeps this site honest.

Completeness of information. You can find almost anything you want about any aspect of company command, from family readiness groups to combat logistics convoy training. Some articles are older, having been posted in 2003 and 2004. However, they are kept around by the authors of the site because they remain pertinent and useful; recent postings about these articles produce very interesting dialog by commanders now in the field.

User-friendliness. This is a very user-friendly Web site. If you are completely new to the Internet, a very helpful red button on the top left of the homepage titled "How to Start?!?" walks you through the process of navigating the site.

Useful links. On both sides of the home page, you will find very useful links to other Web sites, regardless of the category or subcategory you are checking. These links change to fit the category or subcategory you are searching. For example, if you are looking at tactical convoys, you will find links to tactical convoy training and information sites. This is an extremely helpful tool for those wanting more information on any topic found on this site.

Relevance. This site is *the* site for company commanders and company-grade officers. It talks at the commanding officers' level, no matter where they are deployed throughout the world. You will find a core element that is helpful, no matter who you are or what you are searching. This site is relevant for convoy operations because it allows you to actually hear and learn from convoy commanders on the ground, in real time. You learn from the best: our peers out there executing convoys day in and day out.

Best feature. The amount of information available is staggering, and the opportunity to get information from peers is unmatched.

Most challenging feature. So much information is available that you can lose yourself on this site for days. However, there is nothing wrong with that because you will be better off and more educated at your journey's end.

PlatoonLeader.com

Main idea of the Web site. As the creators of this site state, PlatoonLeader is "the professional forum for U.S. Army platoon leaders—current, past, and future." Participants in dialogs on the site "speak candidly, but always with respect for each other and our commission. We tackle our leadership challenges with a positive voice, focused solely on building and leading combat-ready teams. We welcome mulitiple, diverse perspectives on how we can achieve this common purpose."

Login. Go to http://platoonleader.army.mil to access this site. After signing in with your AKO credentials, you will need to create an account to access most of the pages and communities and not just be a "guest" on the site. To do this, you need to click on "Create an Account" at the bottom left-hand side of the home page. You also will have to complete another form to become a "member" of this site. Being a member will allow you to participate more fully and search on the site.

Basic information available.

- "Navigate." As on CompanyCommand.com, this is the best place to start. Topics in this window include the following: "Platoon Leader," "BOLC [Basic Officer Leader Course]-Unit Arrival," "Warfighting," "Leadership," "Maint/Logistics/XO [executive officer]," "Professional Reading," "Branch-specific," "Additional Duties," "Fitness," "Reserve/NG [National Guard] Affairs," "Hall of Honor," "Help/Feedback," and "Archive." Once you click on a topic, you will find the pages organized into several tabs: "Leaders," "Participate," "My Bookmarks," "Recent Activity," and "Live Commo Options." "Leaders" and "Recent Activity" are the two tabs that will be most useful to you on every page. The "Leaders" tab shows you a list with all the topic leaders under your specific navigation subject. If you click on someone's name or picture, it will take you to his profile as well as to topics he has posted recently under his "User Participation" tab. Under the "Recent Activity" tab, you will find knowledge and postings current to the topic you are studying. The most helpful topic for convoy operations is "Warfighting."
- "Warfighting." Here you will find "Topic Leaders" and what they have posted on the subject of warfighting. You can search through the "Topic Leaders" links or go to "Recent Activity" to find what is currently being posted and discussed about warfighting by the members on this site. You will find convoy operations as a common topic of discussion here.

Currency of information. The site is updated as new information is gathered. The information seems to be up to the minute. You can subscribe to different topics and have an email alert sent to you when your topic is updated with new information. The best part of the site is the recent postings from platoon leaders on many interesting topics.

Completeness of information. The site is a very good resource for junior lieutenants. It allows them to network with others of the same grade on any

topic a lieutenant would find useful. The site has almost too much information; it is very easy to get bogged down in profiles and discussion pages when you only want to find information on one topic like convoy operations.

User-friendliness. This site is moderately easy to navigate. It does not have all of the resources and links on one consolidated home page that CompanyCommand.com offers, but using it is generally self-explanatory. You will find this site confusing if you are not familiar with subscribing to bulletin board topics or participating in community-wide discussions.

Useful links. There is no general "LINKS" tab. You have to search through different topics to find links that pertain to your topic.

Relevance. This site is relevant to the junior lieutenant just starting his career. It helps lieutenants with little experience to network with those who are, or recently have been, in Iraq. It also is a great source for new SOPs and presentations that can be very useful to new officers.

Best feature. The best feature of this Web site is that allows you to get up-to-date information and TTP from lieutenants who have boots-on-the-ground experience in Iraq and Afghanistan. You can have real-time discussions and ask specific questions on how they handled different issues dealing with convoy operations.

Most challenging feature. The most challenging feature is navigating through bulletin boards and profiles trying to find stand-alone presentations and documents on convoy operations. This site is more useful as a forum for lieutenants to gather and post real-world experiences than it is as a source of links to ready-made convoy operations products.

NCO Battle Command Knowledge Center

Main idea of the Web site. This site is a link from the "www.NCOTEAM.org" Web site, which is designed to develop ready and relevant leaders in the NCO corps. However, both of these sites are useful to warriors of all ranks.

Login. You can enter this site at www.squad-leader.com/cybrarian/convoy.htm. You may be required to log in with your AKO login to access this site.

Basic information available.

- "Tactics, Techniques, Procedures." This tab leads to a list of easily accessible and downloadable sites such as "Convoy Leader Training Handbook" (a field guide prepared by the 32d Transportation Group in Kuwait for convoy leaders conducting long-haul operations); "Vehicle Load Card" (a vehicle load plan can be prepared right on this handy card); "Convoy Checklist" (a checklist from the U.S. Army Europe and 7th Army Safety Office); "OPERATIONAL HAZARD ANALYSIS AND RISK ASSESSMENT PHASE OF OPERATION: CONVOY OPERATIONS" (a convoy checklist from the 2–6 Cavalry Battalion); "Convoy Commanders Checklist" (from the Army Transportation School at Fort Eustis, Virginia); and "Vehicle Hardening" (a checklist from the Center for Army Lessons Learned Web site.)
- "Training." This tab contains a list of easily accessible and downloadable sites, such as a "Convoy Safety" PowerPoint presentation from V Corps and the following word documents: "Direct Convoy Defense Operations," "Implement Defensive Procedures when Under Enemy Attack (Convoy)," "Perform Duties as Convoy Commander," "Drive Vehicle in a Convoy," and "Perform Duties as Serial-March Unit Commander."
- "Doctrinal References." Here can be found easily accessible and downloadable sites in PDF and html formats: FM 55–30, Army Motor Transport Units and Operations, and its Annex B, Convoy Checklist; Army Regulation 385–55, Prevention of Motor Vehicle Accidents; Training Circular (TC) 7–98–1, Convoy Operations, Chapter 7; and CALL Handbook 03–6, Tactical Convoy Operations.
- "Web Links." Links are provided to many articles, such as "Company-Level Convoy Operations In Today's Smaller Army," "Convoy Operations in a Peace Support Environment," and "Convoy Live Fire Exercise: Training Soldiers."
- "Unofficial" sites. Found here are links to a list of various unofficial Web sites, many maintained at GeoCities, such as an article about Vietnam convoy operations by James Rose; the Marine Corps Convoy Operations Handbook; a PowerPoint presentation from Task Force 2–69 Armor, "Operation Iraqi Freedom Convoy Lessons Learned"; and a tactical convoy Web site maintained at GeoCities by former Joint Readiness Training Center observer/controller and Transportation School tactical convoy expert Major Dean J. Dominique.

Currency of information. Many links are outdated by several years. However, once you follow the links, you can find a plethora of current information.

Completeness of information. This site is very broad. It covers everything from training to Web links that can be useful for convoy operations.

User-friendliness. This is a very easy site to navigate. Just point and click on the presentation, document, or Web site that you find interesting. They are all convoy related.

Useful links. The entire site consists of links to useful sites.

Relevance. This site is a simplified clearinghouse with links to some outdated material but mostly to very relevant sites. No original documents are contained on this site.

Best feature. For the user, everything is available in one place, from training to unofficial Web sites.

Most challenging feature. The site offers some outdated information, and several links go to sites that no longer exist.

Army Toolbag

Main idea of the Web site. This site is self-described as a one-stop, get-what-you-need site for military leaders.

Login. Go to www.armytoolbag.com/index.html. Login and registration are not required. However, to access most files, including those on convoy operations and warrior tasks and drills, you must log in with your AKO account. Then you must minimize the AKO window once you are logged in to access files.

Basic information available.

• The home page contains the following tabs: "Home," "Additional Duties," "Admin," "Classes," "Maint," "Operations," "Software," "SOPs," "Supply," "Videos," "Warrior Training," "Search," and "More . . ." Each tab takes you to a Web page that is divided into three sections: the left window displays the categories of files that the tab has to offer; the middle window says if you have to log in to AKO to view the files; and the right window displays links to Web sites that offer additional information on your chosen topic. The tabs "Classes," "Videos," and "Warrior Training" are specifically useful for convoy operations.

• "Classes." Click the "Warrior Classes" link in the left window. The middle window will fill up with class topics, from "Armored Security Vehicle" to "Warrior Tasks." Click on the "Deployment Tng (TSIRT [theater-specific individual readiness training])" link. The middle window reveals over 40 presentations containing many documents related to convoy operations, such as "Convoy Safety," "Convoy Movement," "Convoy Safety," "React to IED," "Combat Stress," "Gun Truck Duties," and other related subjects. Click on the "Leader Tng (TSIRT)" link. The middle window contains presentations such as "Convoy Leader Tng," "Dealing with the Media," and "EPW [enemy prisoners of war] Point of Capture."

• "Videos." Click the "Training Videos" link in the left window. The middle window then will list video clips that have some training value. Many of these clips concern convoy operations and would be a great aid to anyone preparing a presentation, briefing, or class dealing with convoy operations.

• "Warrior Training." This is the most useful tab on the site. The left window lists "Battle Drills," "Combatives," "Communications," "Convoys," "Crowd Control," "Culture," "EPW," "Field," "First Aid," "Fratricide," "IEDs," "Land Navigation," "Movement Tech," "Reports," "SASO," "Urban Ops (MOUT [military operations on urban terrain])," "Vehicle Operator," "Warrior Ethos," "Warrior Skills (CTT [common task training])," and "Weapons." Several of these topics contain critical information on convoy operations that is extremely useful; in particular, click on "Convoys" and "IEDs." The "Covoys" folder contains over 25 convoy operations-specific documents such as CALL handbooks, convoy TTPs, convoy movement formations, logistics convoy cards, and convoy battle drills. The "IEDs" folder contains some extremely significant documents, from smartcards to handouts dealing with IEDs in association with convoy operations.

Currency of information. This site says that it is updated constantly. You also can subscribe to a weekly newsletter that will keep you up to date on changes.

Completeness of information. This site is particularly complete. Although not as current as the CALL Web site, it is much easier to use and contains everything from video clips to handbooks to aid in any warrior task or battle drill, especially convoy operations.

User-friendliness. This site is extremely easy to navigate. It is structured in tabs, topics, and subcategories that will keep you busy for hours.

Useful links. Links are probably the best feature of the site. Under each tab, the right-hand window is completely dedicated to links directly related to the topic of choice. This alleviates the problem users experience on most Web sites, where one tab lists many sites that they have to surf through trying to find what they want. This site lists links to sites specifically tailored to your topic.

Relevance. This site is incredibly relevant. Although it is not dedicated solely to convoy operations, you can find a wealth of information on this topic as well as relevant warrior tasks, drills, and other information related to being out on the road and under fire.

Best feature. The best features are the Web site's organization into tabs for easy use and the separate links to other Web sites under those tabs.

Most challenging feature. Some of the files do not open, even after you log in with your AKO credentials. However, the Web site seems to constantly monitor itself; if a file does not download or open, you are prompted to send an email identifying the specific link that does not work.

Resourcing the Force in the Midst of Complexity: The Need to Deflate the 'ppb' in PPBE

BY DR. CHRISTOPHER R. PAPARONE

In a 1969 article in *Public Administration Review,* Frederick C. Mosher, a professor of government at the University of Virginia, offered a compelling critique of the Planning, Programming, and Budgeting System (PPBS) that was then being touted as the forerunner of the "millennium for rationality and efficiency in public management." [PPBS is now called the Department of Defense (DOD) Planning, Programming, and Budgeting Execution (PPBE) process.] Mosher's list of PPBS flaws and defects included these points—

- The effectiveness of PPBS is oversold, narrow, and often misrepresented.
- The managerial engineering approach (reminiscent of Frederick Taylor, an American efficiency expert noted for his innovations in industrial engineering and management) oversimplifies the complexities of the real world.
- It is a fallacy to assume that the objectives decisionmakers state up front can be determined quantifiably and will remain stable independent of competing political interests.
- PPBS relies too much on "medieval models of hierarchy" without regard to the "cumulative process" of collaborative decisionmaking, where the executors of policy (public service professionals) interact with their clients (political decisionmakers).

I submit that these criticisms may be even more valid today than they were almost 40 years ago. We need to consider a more transformational view—a post-positivist perspective—of the complexities associated with resourcing the force in a world full of highly complex, or "wicked," problems.

Faith in Rationality

The modern concept of rationality is relatively new in history. The 17th century French scholar René Descartes was an important framer of the "enlightenment" idea that the world can be objectified through the emerging philosophy of Newtonian science. The central idea of Cartesian scientific (or technical) rationality is that objectivity can be verified and that positive knowledge can be determined empirically (hence the concept of "positivism"). The Newtonian-based assumptions behind DOD strategic planning include a belief that predicting pathways to achieving goals will bring finality to solving problems.

PPBE and its associated processes (based in the "logical positivism" that underpins operations research and systems analysis) have become manifestations of a cultural ideology of strategic planning in DOD. This ideology reflects an unquestioned belief in the merit of applying numeric values, or metrics, to cause-and-effect relationships that can be isolated, predicted, and tested in ways that can be reproduced. The discovery of these relationships through technical analyses (such as the Joint Strategic Planning System, Quadrennial Defense Review [QDR], and the Defense logistics and acquisition systems) is believed to be unbiased by emotions and minimally affected by ethical, political, cultural, and psychological preferences.

Assumptions Behind PPBE

Although Defense strategic planning has evolved into a very intricate series of programmed events, process offshoots, and an ever-growing pile of planning and programming documents, PPBE and its associated analytical technologies have always been rooted in the linear steps of the generic rational decisionmaking process. These steps include—

- Define the problem (reduce the complicated to a manageable dependent variable) and present all facts and assumptions bearing on the problem (determine what affects the dependent variable).
- Develop courses of action (COAs) to solve the problem (search for the correct independent variable).
- Select the best COA based on objective criteria for analyses (find ways to make the independent variable more powerful in a reproducible way).
- Implement and provide feedback (analyze and report the results in preparation for the next cycle).

The technically rational paradigm in which PPBE resides assumes that problems can be defined unilaterally in relative independence from other conditions through a process called "reductionism." For example, in DOD force management, the current practice is to reduce and categorize problems (treated as dependent variables) and associate them with potential funding of solutions in doctrine, organizations, training,

materiel, leadership and education, personnel, and facilities (DOD's list of standing independent variables). The fundamental belief is that the outcomes of PPBE unemotionally present the case for obtaining and using public resources.

Through the PPBE lens, managers also assume that Defense problems are relatively stable; the problems we have now generally will be the same ones we routinely solve in 5 to 7 years. Other assumptions are that those at the top of the governmental hierarchy perceive no better way to control spending; that the President and Congress unconditionally expect DOD to propose the most efficient single COA for spending; and that the PPBE approach is the most influential way to obtain consensus and use resources in our system of government. These assumptions are so ingrained in the fabric of the DOD culture that they have the quality of tacit knowledge. However, there is evidence that these assumptions are vulnerable to criticism.

For example, the 1993 *Report of the Bottom-Up Review* (the precursor to the QDR) envisioned only one force structure counterterrorism task during "peace enforcement and intervention operations." The task—"securing protected zones from internal threats, such as snipers, terrorist attacks, or sabotage"—was too vague to tie to any specific program or budget. A later example is found in *A National Security Strategy for a New Century,* published in 1998. This plan had a section on "Transnational Threats" that grouped terrorism with drug trafficking and international crime. Counterterrorism goals were addressed as follows—

> Our policy to counter international terrorists rests on the following principles: (1) make no concessions to terrorists; (2) bring all pressure to bear on all state sponsors of terrorism; (3) fully exploit all available legal mechanisms to punish international terrorists; and (4) help other governments improve their capabilities to combat terrorism.

Conspicuously absent was the need to prosecute a global war on terrorism of the magnitude we face today. The *Army Vision,* published in 1999, emphasized air mobility and speed and did not use the words "expeditionary" or "modularity," nor did it allude to the current Army movement toward a brigade-based force structure. Another strategic document, *Joint Vision 2020,* published in 2000, focused on a force protection, antiterrorism goal without mentioning a major DOD role in combating terrorism offensively.

Knowing what we know today, it is clear that these strategy documents hardly guided the creation and acquisition of DOD capabilities for countering terrorism. The documents were insufficiently visionary to mobilize the military toward the Global War on Terrorism that emerged within future-year defense planning. None of these documents foresaw the need for large-scale military support for stability, security, transition, and reconstruction operations.

Complexity Challenges the Myth of Rationality

Episodic strategic planning under complex conditions is analogous to trying to play chess with all the moves planned out in advanced. Modelers of complexity have calculated that there are 10^{120} variations of chess moves possible in a single game. John H. Holland, in his 1998 book, *Emergence,* proposes that chess has ". . . enough emergent properties that [it] continues to intrigue us and offer new discoveries after centuries of study. And it's not just the sheer number of possibilities. There are lines of play and regularities that continue to emerge after years of study, enough so that a master of this century would handily beat a master of the previous century." The point is that chess, with only a dozen or so rules, creates extraordinary complexity that defies prediction. In the much more dynamic situations involving national defense, how can planners expect to map strategies when the rules not only are difficult to discern but small changes in the environment can cause dramatic change in a short period?

More recently, post-Newtonian scientists (or "post-positivists") have challenged the Cartesian assumptions associated with predicting the future. As the chess analogy implies, post-positivists maintain that the world is far too complex for our conceptualizations of it to be objective. The common sense associated with the Cartesian concept, "I think, therefore I am," is replaced with the less commonsense premise, "I think, therefore I imagine." The rise of post-positivism reflects a growing awareness that objective reality is only partially explained by our professional diagnoses and theories for action. Unless we understand the limits of our knowledge, we will be continuously disappointed when our predictions and solutions fail in a world full of surprises.

To be more specific, I see at least four problems with belief in the Cartesian paradigm—

PPBE creates myopic learning. Plans, programs, and budgets (PPBs) spawn specified expectations. As a result, they can blind managers who focus too much on confirming predictions rather than on updating their thinking and that of their organizations, especially when they face ambiguous conditions. For example, when large programs (as "buckets of resources") are emphasized, they gain precedence over emergent solutions to emergent problems because those solutions do not logically fall into the existing buckets. This issue is more evident as we integrate practices with potential interstate, interagency, and international solutions in the midst of complex globalization.

PPBE undercuts organizational creativity and improvisation. Although PPBs seem to provide some contingent actions (such as plans for branches and sequels) based on present views of required capability, managers tend to shun ad hoc ways of dealing with the unexpected and yearn for standard ways of reestablishing stability. However, in a troubling, puzzling, and unstable world, "adhocracy" may serve them and their clients better than institutionalized or newly programmed solutions. Creativity and improvisation are required to bounce back from errors and cope with surprises in the moment.

PPBE fosters "mindless" decision traps. Regulatory approaches to budgeting make even the smartest executives prone to repeat actions that worked in the past. (Metaphorically, they are trapped in a "psychic prison.") On the other hand, focusing on the uniqueness of situations can make the pursuit of so-called best practices, benchmarks, doctrines, organizations, and off-the-shelf technologies seem like high-risk propositions. The PPBE process, by not recognizing important contextual differences, leads managers to discover *the* solution while assuming the accuracy of the decision. Social psychologist Karl E. Weick, in his 1995 book, *Sensemaking in Organizations (Foundations for Organizational Science),* suggests focusing more mindfulness on defining the question using the inventive process of "plausible speculation."

PPBE has characteristics of a mythical rite to power. PPBE may serve as a ritualistic activity where, as Russ Marion portrays in his book, *The Edge of Organization,* "Strategic planning can provide leadership with an opportunity to reinforce its position in the pecking order. It is a statement that says management—like the shaman at primitive rain dances—is potent and in control." Witness the plethora of strategy and planning documents that permeate the Pentagon, creating well-intended pockets of technical rationality. When I read and compare them, they add to my confusion and reveal irreconcilable, competing interpretations. These often loosely coupled interpretations cannot be addressed by simply tightening the PPBE process. The organizational hierarchy, no matter how powerful, cannot, through strategic communications generated from the top down, simply change the assumptions that went into each document. In the minds of those who produced them, the documents seem right at the time; in light of the ambiguity and randomness of the environment the producers are trying to deal with, these strategies all have an equal chance of being wrong, no matter from which level of the hierarchy they are generated.

Contemporary Operational Environment

The contemporary operational environment (COE) that DOD faces is best described as turbulent and characterized by our perceptions of unstable and maladaptive patterns. One convincing alternative to the positivistic worldview associated with PPBE is explained in Horst Rittel's and Melvin Webber's article, "Dilemmas in a General Theory of Planning," published in a 1973 issue of *Policy Sciences.* They observe, "Social problems are never solved . . . at best they are only resolved—over and over again." According to Rittel and Webber, wicked problems share a number of characteristics. As I interpret their findings in the context of PPBE, they are—

No definitive formulation. This includes the recognition that complex problems are ill defined and that more information does not make complex problems less ambiguous.

No stopping rule. Past solutions or best practices may continue even if conditions change, and the conditions of the problem change so rapidly that PPB changes cannot keep up. So the solution becomes disconnected from the problem as the problem morphs in relation to others. Turnover of participants in the affected organization further confounds the process.

Not true or false, but bad or good solutions. Solutions are politically, culturally, and psychologically charged. They are infused with the sometimes-hidden values of those who have power. Unseen value judgments and intuition—not Cartesian reasoning—can and will dominate.

No immediate or ultimate test for unintended consequences. Because matters of national policy are so complex and have variables that exhibit the dynamics of mutual causality, no individual or group can predict what will happen. The future-year defense plan approach will likely solve the wrong problems with the myth of precision.

May have only one shot because of irreversible consequences. Even if a top-level manager commits resources to a single COA, the dynamics of taking action will change the environment and the previous conditions will be impossible to retrieve.

No enumerable or exhaustive set of solutions. COAs can seem like "bad or worse," or the lesser of two evils, or may even be incomprehensible. I have overheard military planners metaphorically call this phenomenon the "solving world hunger" kind of impossible challenge, which is not unlike the intractable messes associated with prosecuting "irregular" warfare with the conventional PPBE-like analytical model associated with the military decision-making process.

Contextual uniqueness. It is hard to find benchmarks or best practices from the past because each case is unique.

Probably a symptom of another problem. It is impossible to develop a single problem statement

because the systemic network of interactive and interdependent problems is too complex to unravel.

Ambiguous discrepancies. The perceived gap between the ideal end and the current situation can be explained in many ways, and there is no systematic procedure to get to the right answer. This makes Cartesian processes fruitless and solutions spurious.

No right for the planner, programmer, or budgeter to be wrong. Top-level Defense managers who subscribe to the Cartesian paradigm are hardly allowed to complain about being wrong. However, they constantly deal with the reality of a large, complex, adaptive system—an organized anarchy—that experiences dynamic, unpredictable trajectories fraught with ambiguity and complex causal webs that defy the articulation of an "end state." Evidence that managers do not have the right to focus on failure can be found by studying how many goals stated in past strategy documents were realized and how often DOD strategy documents are replaced with qualitatively new ones. It would be interesting to see how fast old strategy documents disappear from official Web sites when new ones are published.

The process of making sense in the midst of wicked problems reveals that the nature of the COE is not something managers have to deal with as external to their daily lives and the routine workings of DOD. Indeed, both managers and their organizations interact within the interconnected workings of the COE in a dynamic, never-ending way. It is implausible, if not impossible, to separate the world of PPBE and its associated, technically rational processes from the backdrop of the COE and the intervening world of the technically irrational political players.

Yet some people believe, often quite passionately, that it is essential to disconnect these worlds. Making sense ("sensemaking") of the COE only in a context framed by the technical rationality assumptions of PPBE is a naïve undertaking if we perceive the COE also to be politically dynamic. As Russ Marion states, "Rationality, of course, is a moot issue when causality is poorly understood."

Professional-Client Collaborative Sensemaking

Although PPBE is based on the idea of being technically rational about the future, Defense professionals must contend with the world of their clients—the policymakers (and the American people they represent). In his book, *The Reflective Practitioner: How professionals think in action,* Donald Schön said that technical rationality is the belief that all problems can be solved "by the application of scientific theory and technique." Those who believe in the worldview of technical rationality tend to disparage political reasoning, which takes place in a world of complex social systems, ambiguous causal relationships, and emotions. Hence, technical rationalists view political reasoning as irrational.

To contend with wicked problems, professionals must realize that the myth of technical rationality is the ability to frame knowledge about a future that no one can foretell. In that regard, PPBE rests on the thin-ice assumption of predictability when the world is viewed by politicians. Although the world of politics has no irrefutable assumptions of technical rationality, political reasoning can be better viewed by Defense professionals as a sensemaking bridge between the illusion of predictability framed by PPBE and the reality of uncertainty framed in the context of the COE. In short, clients try to imagine something indefinable as something that is a workable subject for research. (For example, will going to war eventually lead to a more stable and economically sound global economy?) The astute Defense professional should work beyond the presumed isolated context of the PPBE process and be willing to share insights with his clients. As Karl Weick has proposed, this can be accomplished by "comprehending, redressing, constructing meaning, interacting in pursuit of mutual understanding, and patterning."

By following Weick's proposal, Defense professionals and their clients also may find new ways to think beyond the sense of clarity assumed to be the result of PPBE. They may have to consider the possibility that PPBE is DOD's cultural construction of reality that serves not to predict the future but to lower anxiety and bring a false sense of clarity in the fog of chaos. In *Beyond Objectivism and Relativism: Science, Hermeneutics, and Praxis,* Richard Bernstein proposes that those who are inculcated with technical rationality can suffer from "Cartesian anxiety"—that is, the pain and suffering associated with rejecting the Newtonian assumptions of cause and effect. Rather than developing symptoms of Cartesian anxiety (cynicism and distrust) from observing the political process, professionals should participate in the political reasoning process to create collaborative, mindful relationships with their clients.

If Defense professionals and their clients both embrace the need for collaborative inquiry, strategic framing (usually associated with the PPB aspects of PPBE) can no longer be the sole responsibility of those at the top. Any attempts to communicate planning strategically from the top down without strong participation from the public service professional may be perceived by the more enlightened as a form of propaganda. It could reflect from those in powerful positions a Machiavellian desire for the subordinate to accept mindlessly the superior's approved construction of reality. Top-down framing force-fed to the more

passive professional will, at best, instill cynicism. Activist professionals will learn to operate as "heroes under a tent," doing what they perceive they need to do despite top-down orders and espoused strategies to the contrary. (The term "heroes under a tent" was coined by Donald Schön.)

In this light, the unchallenged, top-down framing associated with the PPB in PPBE can create "psychic prisons," in which organizational power is configured to suppress differences and increase hierarchical dependency rather than to accept variations in professional opinions as part of a collaborative process of cumulative decisionmaking. The Marine Corps (in my mind the most post-positivistic service) makes this abundantly clear in Marine Corps Doctrinal Publication 6, Command and Control—

> As with decision making, we should decentralize execution planning to the lowest possible levels *so that those who must execute have the freedom to develop their own plans.* [Italics printed in original.] A plan should dictate a subordinate's actions only to the minimum degree essential to provide necessary coordination unattainable any other way. Ideally, rather than dictating a subordinate's actions, a good plan should actually create opportunities for the subordinate to act with initiative.

Transforming Beyond PPBE

In the midst of complexity, professionals must be permitted to emerge more naturally as leaders, with significantly less emphasis on formal, hierarchical appointments. In the sensemaking about the COE, which is undeterminable and fraught with mutually causal variables, the need for shared leadership among professionals and their clients is better described as heterarchical (networked) rather than hierarchical (pyramidal). Ironically, Al Qaeda and other terrorist networks seem to have already realized this to their strategic advantage.

We must help future public service professionals learn to use a collaborative sensemaking approach with their clients. We should emphasize professional inquiry with more effective metaphors (fewer mechanical images and more organic ones), a variety of mental models (those derived from systems thinking, complexity and chaos theories, and competing political theories of the policy process), and multiple interpretive schemes (those rooted in various post-positivist perspectives that transcend the Cartesian paradigm associated with PPBE). We have to deemphasize lessons learned, instantly obsolete doctrine and techniques, and other formal assertions that falsely convey a sense of known cause-and-effect relationships.

We must create opportunities for inventive thinking within the larger context of shared professional-and-client sensemaking about the COE, and be cautious about mechanical processes that can lead to bureaucratic mindlessness. For example, Donald Schön compares the philosophy of educating based on "action-research" with that of the traditional model of education as follows—

> Complexity, instability and uncertainty are not removed or resolved by applying specialized knowledge to well-defined tasks. If anything, the effective use of specialized knowledge depends on a prior restructuring of situations [through action-research] that are complex and uncertain. An artful practice of the unique case appears anomalous when professional competence is modeled in terms of application of established techniques to recurrent events . . . . It is difficult for them to imagine how to describe and teach what might be meant by making sense of uncertainty, performing artistically, setting problems, and choosing among competing professional paradigms, when these processes seem mysterious in light of the prevailing model of professional knowledge.

In short, DOD managers and educators need to be equipped to facilitate adaptive learning rather than teach forms of reductionism inherent in to Newtonian science.

We must recognize that the traditional distinction between training and education is a cultural invention that is no longer important. The distinction may not be helpful because both categories of learning should deal with unique cases in the wake of wicked problems. Training, like educating, should stress more individual and group experiential learning and shared sensemaking under realistic and interactive free-playing scenarios and less scripted exercises. Training is continuous and is neither episodic nor curtailed during any phase of operations. We need to deemphasize the determinism associated with the task, condition, and standard model of success. The notion of success comes instead from valuing resilience, creatively forming new ways to accomplish things with what is at hand.

We must learn ways to reframe tasks, conditions, and standards as we learn to conceive of them as being constantly in flux within the COE. For example, the "orchestration" metaphor for command and control of operations and training should change to the "jazz" metaphor associated with network fluidity, impromptu leadership, and improvisation. In short, we should train and educate for ambiguity and find ways to promote the value of improvisation and adhocracy.

Training and educating with this new mindset should make the "ppb" in PPBE seem less valuable to

planners. We especially need to address the ritual of planning (of which programming and budgeting are merely different aspects). Margaret J. Wheatley, in her 1994 book, *Leadership and the New Science,* put it this way—

> The search for new shamans has begun in earnest. Our seventeenth-century organizations are crumbling. We have prided ourselves, in all these centuries since Newton and Descartes, on the triumphs of reason, on the absence of magic. Yet we, like the best magicians of old, have been hooked on manipulation. For three centuries, we've been planning predicting and analyzing the world. We've held on to an intense belief in cause and effect. We've raised planning to the highest of priestcrafts and imbued numbers with absolute power. We look to numbers to describe our economic health, our productivity, our physical well-being. We've developed our graphs and charts and plans to take us into the future, revering them as ancient mariners did their chart books. Without them, we'd be lost adrift among the dragons. We have been, after all, no more than sorcerers, the master magicians of our time.

A transformed professional-client sensemaking should be based on executing budgets while exploring ill-defined, intractable issues and acknowledging the existence of wicked problems. In the COE context, executing budgets must be viewed as a continuous and collaborative sensemaking process rather than the episodic output of a top-down PPB process accompanied by the overvalued Cartesian quest for certainty. The plan for allocating resources should become a "plan to learn" model under normal conditions of surprise and uncertainty rather than a "plan to know" process based on a myth of creating top-down control. DOD professionals must learn to treat their leaders as clients with whom they must have open and honest dialog to build sensemaking bridges as they walk on them. Through this sensemaking-centered partnering, the façade of Cartesian rationality is removed and the culture is transformed.

The dialog will lead purposefully to a political acceptance of significantly less orientation on the performance-based government codified by Cartesian laws and rules and the PPBE process. (This is exemplified by the Government Performance and Results Act of 1993). Such a cultural transformation would constitute a real paradigm shift toward rewarding invention and learning and collectively realizing that today's successes are short lived as the COE continues to be dynamic and as our organizations face unpredictable trajectories. Together, professionals and their client community should work to find ways to deemphasize the "ppb"in PPBE and be attentive to learning while executing resource management.

To achieve maximum collaboration, the concept of hierarchical authority must transform to heterarchical leadership, characterized less by symbols of rank and position and more by the quality of sensemaking. Collaboration becomes the ability to communicate to others new ways to pay attention to emergent patterns and embrace inevitable surprises. Investing in the ability of a heterarchical organization to be sensitive to weak signals of emergent patterns in the COE is far superior to allocating resources based on the short attention span of those at the top of the hierarchy.

A prominent characteristic of complex sensemaking is less reliance on hierarchical decisionmaking and more deference to sharing expertise with those who are artful framers of the reality of the COE. Authority should be given to people with a humble attitude toward learning and with the imagination and shared ethical values needed to deal with an emergent threat or opportunity. The paradox is that experience alone is no guarantee of expertise; experienced people may be trapped in dysfunctional cultural patterns of repeating what has worked in the past.

Building more elaborate heterarchical communications networks can enable more enlightened and improvisational forms of sensemaking by facilitating new sources of expertise, both inside and outside the cultural boundaries of DOD. In a flexible communications environment (like that exploited by Al Qaeda), it is fruitless to try to predict where leadership might emerge. The primary role of the postmodern professional organization is no longer to be a producer of knowledge, stability, and certainty; rather, it is to be a constant organizer in a never-ending condition of complexity—spawning a spontaneous approach to replacing tools that are not working.

A more holistic and collaborative intra-organizational and interorganizational approach to sensemaking signals a transformed, looped pattern of acting and learning (mutual, real-time, interdependent responsiveness during execution) from the more familiar unidirectional cause-and-effect paradigm associated with the PPBE and the rain dances of "ppb". **ALOG**

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ALOG NEWS

(continued from page 1)

provides basic information on field artillery tactical doctrine and technical information on field artillery munitions support.

The information contained in the handbook was gathered from field manuals, technical publications, and the input of field artillery and logistics subject-matter experts. The handbook offers an introduction to field artillery—

- Missions and operations.
- Force structure.
- Key personnel and organizations, including their duties and responsibilities, at the battalion, battery and company, and platoon and section levels.
- Concept of support and tactics, techniques, and procedures, including unit trains, split trains, ammunitions resupply planning, and methods of resupply.
- Munitions types and packaging.

The handbook is being issued to graduates of the Combined Logistics Captains Career Course (CLC3) at ALMC as part of a take-away compact disc. It has been posted on the Sustainment Portal, where it can be accessed using Army Knowledge Online (AKO) identification. Go to https://vports.atsc.army.mil/home.html and look under "CG Corner" to access the handbook.

LEADER DEVELOPMENT PORTFOLIO NOW AVAILABLE TO CIVILIANS

The Army's on-line system for fostering leader self-development, the Leader Development Portfolio, is now open to civilians at and above the GS–11 level. It already was available to Active Army, Army National Guard, and Army Reserve Soldiers.

The Leader Development Portfolio is designed to allow each participant, over the course of his career, to assess himself as a leader and then obtain candid, confidential feedback on his progress from peers, subordinates, and senior leaders of his choice. The resulting information is stored in a secure digital file that the participant can use to assess his leader development over time. The system is voluntary, anonymous, and accessible only to the user.

The Leader Development Portfolio is the centerpiece of the Army Benchworks initiative. This initiative was created by the Army Chief of Staff to achieve one of the 15 focus areas he announced in October 2003—leader self-development. The idea underlying the creation of the Leader Development Portfolio is that increasing self-awareness among Army personnel is the foundation for developing the adaptable leaders the Army needs. The goal is to build a "bench" of adaptable and creative leaders.

A participant can use the system by logging on to Army Knowledge Online (AKO) and following the link to the Leader Development Portfolio.

For more information, see the Army Benchworks Web site at www.benchworks.army.mil or email bench.works@us.army.mil.

ARMY LEADERSHIP MANUAL RELEASED

The Army issued its keystone manual on leadership, Field Manual (FM) 6–22, Army Leadership: Competent, Confident, and Agile, last October.

FM 6–22 establishes leadership doctrine for all Army personnel, military and civilian. It describes "the fundamental principles by which Army leaders act to accomplish their mission and care for their people." The manual defines an "Army leader" as—

> anyone who by virtue of assumed role or assigned responsibility inspires and influences people to accomplish organizational goals. Army leaders motivate people both inside and outside the chain of command to pursue actions, focus thinking, and shape decisions for the greater good of the organization.

It defines "leadership" as—

> the process of influencing people by providing purpose, direction, and motivation while operating to accomplish the mission and improving the organization.

The manual uses the formulation "BE-KNOW-DO" to illustrate the key factors involved in leadership. As stated in the manual—

> What leaders DO emerges from who they are (BE) and what they KNOW. Leaders are prepared throughout their lifetimes with respect to BE-KNOW-DO so they will be able to act at a moment's notice and provide leadership for whatever challenge they may face.

The new manual describes the levels of leadership as follows—

- Direct leadership is face-to-face or first-line leadership. It generally occurs in organizations where

subordinates are accustomed to seeing their leaders all the time: teams and squads; sections and platoons; companies, batteries, troops, battalions, and squadrons. The direct leader's span of influence may range from a handful to several hundred people. NCOs are in direct leadership positions more often than their officer and civilian counterparts.

• Organizational leaders influence several hundred to several thousand people. They do this indirectly, generally through more levels of subordinates than do direct leaders. Organizational leaders generally include military leaders at the brigade through corps levels, military and civilian leaders at directorate through installation levels, and civilians at the assistant through undersecretary of the Army levels.

• Strategic leaders include military and Army civilian leaders at the major command through Department of Defense (DOD) levels. The Army has roughly 600 authorized military and civilian positions classified as senior strategic leaders.

The manual identifies eight leader competencies to "provide a clear and consistent way of conveying expectations for Army leaders": "leads others," "extends influence beyond the chain of command," "leads by example," "communicates," "creates a positive environment," "prepares self," "develops leaders," and "gets results."

FM 6–22 supersedes FM 22–100, Army Leadership: Be, Know, Do.

SDDC WESTERN REGIONAL TRAINING WORKSHOP SET FOR JUNE

The Military Surface Deployment and Distribution Command (SDDC) will host the Western Regional Training Workshop on 4 to 7 June at the Holiday Inn Riverwalk in San Antonio, Texas. This year's theme, "On the Horizon for Transportation," will showcase trends affecting the movement of Department of Defense (DOD) commodities and address current transportation challenges.

In order to enhance the attendees' knowledge of the end-to-end distribution and deployment processes in the Defense Transportation System, the workshop will focus on both distribution and deployment. The workshop also will provide a forum in which users of DOD automated systems can identify current issues and generate possible solutions to improve current processes.

The workshop is designed for functional-level Active and Reserve component personnel, DOD civilians, and contractors who work for DOD. For more information, visit the SDDC Web site at www.sddc.army.mil. Click on "Upcoming Events" for updates and registration information. Workshop points of contacts are Robert Covington at (757) 878–1802 and Harriet Martinez at (757) 878–8026.

ARMY TO LAUNCH COMPREHENSIVE SELF-SERVICE PERSONNEL SYSTEM

The Army plans to launch a new secure, self-service Web-based human resources system that will give Soldiers around-the-clock access to their personnel data. The Defense Integrated Military Human Resources System (DIMHRS) is a congressionally mandated program administered by the Department of Defense. It is scheduled to be on line in early 2008.

A Joint Precision Airdrop System (JPADS) delivers supplies to troops in Afghanistan after being dropped from a C–130 Hercules cargo plane. Use of JPADS, which guides its load to its intended destination by a means of a Global Positioning System, allows resupply of Soldiers in remote areas not accessible by road. A JPADS component, the JPADS Mission Planner (JPADS–MP), was first used in Afghanistan last summer. JPADS–MP is a laptop computer that hooks into the cockpit of a cargo plane and sends information, such as updated weather conditions or new targets, to the JPADS airborne guidance unit, which guides the payload to its target. The Air Force developed JPADS–MP, while the Army developed the airborne guidance unit.

Using DIMHRS, Soldiers will be able to update and review key personnel and family information without having to see a personnel specialist. The self-service system will allow Soldiers to avoid some of the traditional written or verbal processes that are time consuming and costly. For example, DIMHRS will enable Soldiers to initiate requests for assignments, training, retirement, record updates, awards, family-member travel, enlistment extensions, and enlisted commissioning programs.

DIMHRS' self-service capabilities also will allow Soldiers to start, stop, or modify discretionary allotments and savings bonds; complete employee withholding and reissue request forms; change personal direct-deposit information; and change their state-of-legal-residence declarations.

Soldiers will be able to track the progress of their requests from submission to approval. Electronic signatures, email notifications, and automatic routing are also available. Other key DIMHRS functions include a view-only screen that lets Soldiers view personnel and pay items; Certificates of Release or Discharge from Active Duty (DD 214); group life insurance elections; leave and earnings statements and wage and tax statements; records of civilian and military education, awards, contracts, and evaluations; and Department of the Army photos.

For more information, visit the DIMHRS Program Office Web site at www.armydimhrs.army.mil or the DIMHRS page on Army Knowledge Online at https://www.us.army.mil/suite/page/308853.

ARMY NATIONAL GUARD TESTS NATIONAL MAINTENANCE WORK REQUIREMENTS

Iowa Army National Guard mechanics at the National Maintenance Training Center (NMTC) at Camp Dodge, Iowa, have teamed with Tank-automotive and Armaments Command (TACOM) Life Cycle Management Command (LCMC) equipment specialists to verify the accuracy of draft National Maintenance Work Requirements (NMWRs). An NMWR is a set of standards developed by TACOM LCMC that detail the procedures, sources of repair, tools, and parts needed to rebuild military equipment and components. Basically a step above a technical manual, an NMWR provides a step-by-step guide for rebuilding a piece of military equipment.

To validate each NMWR, the NMTC mechanics complete the procedures described in the NMWR—page by page and line by line—to ensure that all steps are included and described correctly. At each step, the mechanics confirm that all words and artwork detailing the procedures are accurate and easily understood. The goal of this 3-week process is for each NMWR to be 100-percent correct when published.

The NMTC provides technical maintenance training to all Army components. At right, a mechanic consults the procedures in a draft NMWR; below, a mechanic works on the engine of a palletized load system.

CORRECTIONS

The news story on page 55 of the January–February issue of Army Logistician incorrectly lists the number of the Soldiers' Guide for Field Maintenance Operations. It should be DA Pamphlet 750–3.

The caption of the top photo on page 9 of the January–February issue incorrectly identifies the aircraft. It is a C–141 Starlifter, not a C–130 Hercules.

Writing for *Army Logistician*

If you are interested in submitting an article to *Army Logistician*, here are a few suggestions that may be helpful. Before you begin writing, review a past issue of *Army Logistician*; it will be your best guide. Keep your writing simple and straightforward (try reading it back to yourself); attribute all quotes; avoid footnotes (*Army Logistician* is not an academic journal); and identify all acronyms and technical terms. *Army Logistician's* readership is broad; do not assume that those reading your article are necessarily Soldiers or that they have background knowledge of your subject.

Do not worry too much about length; just tell your story, and we will work with you if length is a problem. However, if your article is more than 4,000 words, you can expect some cutting.

Do not submit your article in a layout format. A simple Word document is best. Do not embed photos, charts, or other graphics in your text. Any graphics you think will work well in illustrating your article should be submitted as separate files. Make sure that all graphics can be opened for editing by the *Army Logistician* staff.

Photos are a great asset for most articles, so we strongly encourage them. Photos may be in color or black and white. Photos submitted electronically must have a resolution of at least 300 dpi (.jpg or .tif). Photo prints may be submitted by mail. Please try to minimize use of PowerPoint charts; they usually do not reproduce well, and we seldom have the space to make them as large as they should be.

Army Logistician publishes only original articles, so please do not "market" your article. Ask your public affairs office for official clearance for open publication before submission to *Army Logistician*. A clearance statement from the public affairs office should accompany your submission. Exceptions to this requirement include historical articles and those that reflect a personal opinion or contain a personal suggestion. If you have questions about this requirement, please contact us at alog@lee.army.mil or (804) 765–4761 or DSN 539–4761.

Submit your article by email to alog@lee.army.mil or by mail to EDITOR ARMY LOGISTICIAN/ALMC/2401 QUARTERS RD/FT LEE VA 23801–1705. If you send your article by mail, please include a copy on floppy disk or CD if possible. We look forward to hearing from you.

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Coming in Future Issues—

- **Logistics Task Force 548 in Iraq**
- **Tie Down for Safety and Mission Accomplishment**
- **Materiel Management**
- **Reconstitution in Afghanistan**
- **Closing the Loop on Property Accountability**
- **SSA Support at Camp Taji**
- **Contingency Contracting and LOGCAP Support in MND–B, Iraq**
- **Writing Doctrine From the End of a Wrench**
- **Combined Joint Distribution Cell in Afghanistan**
- **Joint Asset Visibility: Why So Hard?**

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