ARMY LOGISTICIAN

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Do Stryker Brigade Combat Teams Need Forward Support Companies?

The Chief of Staff's Imperatives and the Army Field Support Brigade

The Art and Science of Terminal Operations

Wartime Host Nation Support on the Korean Peninsula

Enhanced Logistics Tracking and Monitoring Through Sensor Technology

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Cover: The Stryker brigade combat team (SBCT) is designed to be a rapidly deployable force, bridging the gap between the traditional light and heavy brigades. Unlike the heavy and infantry brigade combat teams, the SBCT does not incorporate forward support companies (FSCs) in its logistics structure. But should it? Would FSCs fill shortfalls in SBCT sustainment? Or would adding FSCs to the SBCT just make it heavier and less agile? In the articles beginning on pages **26** and **33,** the authors offer opposing views on this question. In the cover photo, an SBCT artillery repairer with B Company, Brigade Support Battalion, 2d SBCT, 25th Infantry Division, wipes grease from an M777 155-millimeter howitzer during the weapon's annual servicing at Camp Taji, Iraq.

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

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A Fond Farewell

BY LIEUTENANT GENERAL MITCHELL H. STEVENSON

On 3 June, I turned over command of the U.S. Army Combined Arms Support Command (CASCOM) and Fort Lee, Virginia, to Major General Jim Chambers. I could not be more comfortable that CASCOM is in the best of hands, and Nancy and I wish Jim and Elaine the very best in this pivotal position in Army logistics.

As I settle into my new job as the Deputy Chief of Staff, G–4, Department of the Army, allow me to express my sincere gratitude and reflect on a few of the significant accomplishments of the unsung heroes within the CASCOM Team. These accomplishments and countless others were possible only because of the hard work, dedicated efforts, and commitment to the fight of the entire CASCOM Team—Soldiers, civilians, joint and allied military personnel, and contractors. The CASCOM Team's focus was always on ensuring that the Army's sustainers are prepared to Support Victory in operations on the battlefield of today and tomorrow.

Army Transformation has continued to move forward rapidly, and the CASCOM Team has continued to refine the great work producing in the Modular Force logistics concept. Feedback from the field indicates that our new sustainment structure is working pretty well—but we know we didn't get it exactly right (which we knew would be the case), and a number of refinements are already under way.

One forum established to ensure we stay in touch with what our sustainment units are experiencing out on the ground is the "Reverse Collection and Analysis Team," or R–CAAT. R–CAATs bring redeployed sustainment commanders and key members of their staff to CASCOM to share their experiences. The use of R–CAATs has paid enormous dividends by providing an excellent method for directly infusing lessons learned into our sustainment doctrine, organization, training, and all other facets of DOTLMPF (doctrine, organization, training, materiel, leadership and education, personnel, and facilities). The R–CAAT program has helped to rapidly close the gap between how we envisioned things working and how they actually work out where the rubber meets the road, and we hope to continue to be able to use them.

History was made with the establishment of the new Logistics Branch, which has joined officers of the Quartermaster, Ordnance and Transportation regiments into one unified branch that emphasizes the multifunctional nature of Army logistics. Today, and into the foreseeable future, logistics officers *must* be multifunctional and able to operate effectively amidst uncertainty and unpredictability in the full spectrum of operations. I think our new Logistics Branch will enable us to achieve just that.

To further ensure that we have especially competent and highly trained logistics planners in our operational-level sustainment headquarters, the Army Logistics Management College (ALMC) developed the Theater Logistics Studies Program (TLog) to replace the long-running Logistics Executive Development Course. TLog will equip logistics planners with the operational- and strategic-level tools they need to deploy and sustain the Modular Force and solve large-scale theater-level logistics problems.

In an effort to ensure that our operational-level sustainment headquarters are put through their paces before deploying to Operations Iraqi Freedom and Enduring Freedom, CASCOM's training developers developed and executed a complex, multilevel collective training exercise dubbed the "Logistics Training Exercise" and have as of this writing already put three expeditionary sustainment command headquarters through it, helping to ensure they were ready for about any challenges they would face once deployed. Additionally, each of the schools within CASCOM has aggressively provided mobile training teams throughout the Army in an effort to bring training to units and ease some of the stress on an Army with an already high operating tempo.

To assist in the transformation of sustainment training, the CASCOM Team moved forward with a concept called "lifelong learning" and established the "Sustainment Center of Excellence Lifelong Learning Portal" (SCoE–LLP). The SCoE–LLP, which operates with the virtual muscle of the SCoE Sustainment Knowledge Network (SKN) (now available on line), is the hub supporting lifelong learning and collaboration for the CASCOM, Ordnance, Quartermaster, Transportation, Soldier Support Institute, and ALMC learning domains.

But probably the best and most significant thing that's happened to CASCOM since its creation was the decisions of the 2005 Base Realignment and Closure (BRAC) Commission. As a result of BRAC, the centerpiece of the transformation within the Army Training and Doctrine Command is the establishment of four multibranch "centers of excellence"—and one of these four will be the Sustainment Center of Excellence at Fort Lee, where all training and combat development for all of Army logistics will be centralized by 2011. There is an enormous amount of work

ongoing in each of CASCOM's logistics schools right now, preparing for the BRAC moves and laying the groundwork for what will be. The power of what the Sustainment Center of Excellence will enable has yet to be realized.

I could go on, but let me just say that I am extremely proud to have served with the men and women of the Combined Arms Support Command and Fort Lee. Thank you all for a job well done. I have great confidence that the CASCOM Team will continue to ensure mission success and serve as the voice of combat service support training and doctrine development for the Army Training and Doctrine Command. And to all Army logisticians wherever you might be serving, I encourage you to maintain a lifelong connection to the combat and training developers and schools of the Combined Arms Support Command—we need your feedback, and we want to help you solve your problems.

Support Starts Here!

Lieutenant General Mitchell H. Stevenson is the Deputy Chief of Staff, G–4, Department of the Army. He served as the commanding general of the Army Combined Arms Support Command and Fort Lee, Virginia, from October 2005 to June 2008.

RECENTLY PUBLISHED DOCTRINE

Field Manual (FM) 1–02, Operational Terms and Graphics (2 April 2008), provides an updated glossary of terms that includes joint and Marine Corps terms commonly used by the Army. FM 1–02 now incorporates new terms found in FM 3–0, Operations, and other field manuals due out later this year. It also contains operational acronyms and abbreviations; multiservice brevity codes and procedure words; unit, equipment, and installation tactical mission graphics; country codes; and military decisionmaking process graphics. FM 1–02 is the proponent publication for Army military symbols and the repository for all graphic control measures.

FM 1–02 is not available in paper form. To obtain the current digital version of FM 1–02, access https://akocomm.us.army.mil/usapa/doctrine/DR_pubs/dr_aa/pdf/fm_1.pdf. A working copy of the terms and definitions chapter of FM 1–02 is now available on the Combined Arms Doctrine Directorate website of Army Knowledge Online. Only doctrinally approved terms and definitions are listed. Questions on current or proposed terms, abbreviations or acronyms can be sent to harold.s.orenstein@us.army.mil.

FM Interim (FMI) 3–0.1, The Modular Force (28 January 2008), lays out changes to the modular force structure as the Army transforms. Modular force symbols, designations, and subordinate modular brigade structures and modular force sustainment concepts have been updated. Emerging concepts for Army force generation and readiness were added, and the Army's "full spectrum operations" concept was incorportated. FMI 3–0.1 discusses joint sustainment operations and their benefits to all services and the Army's capability to attach individual units to other service branches without interference from higher Army headquarters. The FMI also lays out the groundwork of sustainment brigades, which provide consolidated functions previously performed by corps and division support commands. FMI 3–0.1 does not supersede existing Army operational or tactical doctrine, but it does offer modifications to basic concepts found in 3– series field manuals.

FM 3–04.1113, Utility and Cargo Helicopter Operations (7 December 2007), describes operational concepts for general support aviation battalions (GSABs) and assault helicopter battalions (AHBs). The GSAB's primary missions include air movement of supplies, equipment, and personnel, including logistics over-the-shore operations when applicable; aeromedical evacuation; command and control support; and air traffic services.

FM 3–11.21, Multiservice Tactics, Techniques, and Procedures for Chemical, Biological, Radiological, and Nuclear Consequence Management Operations (1 April 2008), is designed for chemical, biological, radiological, and nuclear (CBRN) responders who plan and conduct consequence management in domestic, foreign, or theater operational environments. This multiservice publication incorporates consequence management guidance and framework identified in Joint Publication (JP) 3–40 and 3–41. The guidance in the JPs did not exist when the previous manual was written.

FM 3–21.75, The Warrior Ethos and Soldier Combat Skills (28 January 2008), adds new information for the individual Soldier's skill set. The introduction explains the operational environment, the Army values, the Warrior Ethos, the law of land warfare, warrior culture, battle drill, and warrior drills. A chapter on individual readiness has been added to make Soldiers aware of predeployment procedures and proper maintenance of weapons in extreme environments. The Army has also added a chapter on unexploded ordinance and improvised explosive devices (IEDs), the threats they pose, and proper procedures used to identify, report and isolate them.

MDMP at the SDDC:
The Art and Science of Terminal Operations

BY LIEUTENANT COLONEL MARSHALL N. RAMSEY AND MAJOR RYON F. ADAMS

According to Field Manual (FM) 5–0, Army Planning and Orders Production, military planning is both a science and an art. In the field of terminal operations, this means using existing doctrine (the science) to create plans and orders capable of safely accomplishing the Army's deployment and redeployment missions. This must be accomplished while accounting for myriad possible contingencies and branches (the art). The 842d Transportation Battalion in Beaumont, Texas, has turned that understanding into practice through the military decisionmaking process (MDMP).

The MDMP is an established and proven analytical planning system. According to FM 5–0, it includes seven steps (see below). Recently, the 842d Transportation Battalion had the chance to place the MDMP into action while supporting the deployment of the 3d Armored Cavalry Regiment (3d ACR) from Fort Hood, Texas. The 842d adapted the MDMP to best suit its operational environment. The final output of the process is an executable order that enables the Military Surface Deployment and Distribution Command (SDDC) to support deploying or redeploying units in a manner consistent with the best interests of the Government.

Seven Steps in the Military Decisionmaking Process

- Step 1: Receipt of Mission
- Step 2: Mission Analysis
- Step 3: COA Development
- Step 4: COA Analysis (Wargame)
- Step 5: COA Comparison
- Step 6: COA Approval
- Step 7: Orders Production

Mission Analysis

The 842d initiated a deliberate planning process for the deployment of the 3d ACR in the summer of 2007 by visiting with regimental and installation representatives at Fort Hood. At that time, the 842d received the mission requirements and the regiment's deployment timeline. Mission analysis commenced immediately with the consideration of rail and truck requirements and labor needs. The daily operations meeting provided a forum for the staff to conduct mission analysis and then develop and discuss possible courses of action (COAs). Personnel had to plan for the arrival of over 2,100 pieces of cargo (including nearly 500 tracked vehicles and 34 aircraft) and the staging, documentation, and uploading of the equipment to vessels. The unit expected to receive eight full trains' worth of cargo and considerable commercial line haul vehicles with 3d ACR equipment.

During the mission analysis, the 842d incorporated composite risk management by developing a risk assessment of the operation. Once the battalion commander approved the risk assessment, the unit safety officer forwarded it to the 597th Transportation Group at Fort Eustis, Virginia, for review. In the course of the mission analysis, the staff listed key facts and assumptions; specified, implied, and essential tasks; and constraints. The type and quantity of equipment were known facts, and it was assumed that these numbers would not significantly change.

One major constraint was the unavailability of the Port of Corpus Christi, Texas. The 842d determined that the high volume of commercial cargo that would be present in the Port of Corpus Christi during that time would leave insufficient space available to receive, stage, and prepare the 3d ACR's aircraft. As a result, all COAs that involved Corpus Christi were screened out of the process. Planners assumed that all cargo could be accommodated in Beaumont, Texas, because the Port of Beaumont's commercial operations would not impede the deployment operations and sufficient labor would be available.

COA Development

COAs were then developed that would enable the battalion to stage all cargo in a manner that best facilitated safety, accountability, and ease of upload without conflicting with the port's commercial requirements. According to FM 5–0, all COAs must be feasible, acceptable, suitable, distinguishable, and complete.

Planners compared the COAs and a preliminary plan and developed a concept of support for each COA. Key outputs during the mission analysis phase included pre-stow plans, a matrix warning order, and the publication of the commander's critical information requirements (see charts on next page). The planners then wargamed the chosen COA.

Wargaming the COA

FM 5–0 specifies eight steps in wargaming (see right). The 842d Transportation Battalion used a map board with pieces. The unit's operations officer was responsible for selecting the wargaming technique to be used in the exercise. He chose the "box method," which is a detailed analysis of a critical area of the battlefield—in this case, the Port of Beaumont.

The wargame included all relevant staff members, including the battalion commander, executive officer, operations officer, chief of operations, transportation officer, marine cargo specialists, and security manager. The 3d ACR's regimental transportation officer and unit movement officers from the various 3d ACR subordinate units also were present. Representatives from the stevedore contractor, Ports America, Inc.; the Fort Hood Directorate of Logistics port support activity; the Port of Beaumont; and the Coast Guard were also present.

Eight Steps in Wargaming

1. Gather tools.
2. List friendly forces.
3. List assumptions.
4. List unknown critical events and decision points.
5. Determine the evaluation criteria.
6. Select a wargaming method.
7. Select a method to record and display results.
8. Wargame the battle and assess the results.

The operations officer gathered the tools needed for the wargame—specifically, the relevant staff members, the map board on which the game was conducted, and the game pieces needed to depict equipment and other entities. The map board was a scale drawing of the Port of Beaumont itself, detailing all staging areas, storage areas, and berths.

The battalion staff listed all relevant assumptions, key facts, and decision points. The key decision points

Planners used this map board of the Port of Beaumont while wargaming the courses of action for deploying the 3d Armored Cavalry Regiment.

Commander's Critical Information Requirements
Essential Elements of Friendly Information
(Do NOT discuss with personnel who don't need to know.)

Vessel schedule
Cargo schedule flow into and out of the port
Arrival of sensitive items
Security/force protection plan
Daily situation reports

Commander's Critical Information Requirements
Friendly Force Information Requirements
(Report to commander, 842d, within 1 hour of occurrence.)

Accident resulting in personal injury or equipment damage
Delay of more than 1 hour on vessel discharge due to: Customs, USDA, loss of crane or critical materiel handling equipment support, weather
Labor non-availability
Dead time exceeding 30 minutes
Train departure delayed more than 1 hour
Truck driver waits more than 1 hour for CBL (goal is less than 15 min)
IT Systems down (WPS/EEDSK/GFM/ETA/Powertrack)
Commercial activity adversely affecting vessel schedule
Final destination change
Misrouting of any equipment
Visitor (lieutenant colonel or equivalent and above)

Commander's Critical Information Requirements
Priority Information Requirements
(Report affirmative answers to commander, 842d, upon discovery.)

Will any vessel be delayed in its scheduled arrival due to weather, maintenance, or other reasons, with latest time information of value to known berths?
Are there any commercial vessels whose berthing schedules might conflict with a vessel carrying military cargo?
Is there any civilian cargo staged on the port which will conflict with our current staging plan, or cause it to change?
Is there a named tropical storm of any magnitude in Gulf of Mexico?
Are there weather conditions that are likely to impede operations?
Is there a labor dispute of any kind that is likely to delay or suspend operations?
Are there any suspicious persons on the port, the presence of whom could constitute a breach of security?

included the selection of the vessels to be loaded and the decision by the 3d ACR on whether any of their aircraft would be deployed by strategic air assets. Key evaluation criteria included safety, feasibility, and expediency.

The unit also incorporated composite risk management into the wargame by including its approved risk assessment and considering possible accident and reaction contingencies. Safety is one of the key operational considerations, so the unit's safety officer was present to provide feedback at each turn.

The 842d initiated a deliberate planning process for the deployment of the 3d ACR in the summer of 2007 by visiting with regimental and installation representatives at Fort Hood. At that time, the 842d received the mission requirements and the regiment's deployment timeline. Mission analysis commenced immediately with the consideration of rail and truck requirements and labor needs. The daily operations meeting provided a forum for the staff to conduct mission analysis and then develop and discuss possible courses of action (COAs).

The commander of the 842d provided the overall direction for the wargame and served as its referee. This wargame took the battalion through its planned COA shift by shift. At each turn, representatives from terminal operations, traffic management, safety, and physical security stated their actions. As appropriate, the commander of the 842d then proposed possible reactions based on contingencies, such as weather. The staff then offered counteractions.

To record the results of the wargame, the operations officer produced a synchronization matrix on the overhead projector and recorded the results of the wargame turn by turn. At the end of the wargame, the commander determined that the chosen COA was feasible and approved it. The operations officer then produced a matrix order and concept of support containing the completed plan and published it for all relevant parties.

MDMP Advantages

The MDMP, particularly the wargaming phase, was an effective tool for the 842d because it allowed the unit to better execute branch and sequel plans. Often, during the course of the wargame, staff members noted that tentative plans had been developed to deal with various contingencies. Then, at the end of the wargame, unit personnel were able to finally say, "yes, let's do this if that happens." The wargame was also useful because it allowed terminal operations and traffic management personnel to work together and walked everyone through the entire operation. It enabled the unit to forecast and anticipate friction points and properly allocate resources.

Since planning support operations does not take place in a vacuum, the MDMP was ideal because it incorporated Coast Guard, Port Authority, and other non-Governmental agencies into the process. Feedback from Department of the Army civilian employees was almost universally positive, and nearly all looked forward to the opportunity to participate in the planning process.

The MDMP enabled the 842d to formulate the best possible COA for deploying the 3d ACR safely and successfully. The battalion plans to continue applying MDMP principles in all operations as it holds fast to being "First in Warfighter Support" throughout the Gulf Coast region. **ALOG**

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Carrier Association Reporting System

BY FRAN WILLIS AND CHERYL L. FREEMAN

At the beginning of fiscal year 2007, the Transportation Officer of the 842d Transportation Battalion had a vision that resulted in a standard tool for collecting data and evaluating the performance of commercial line-haul carriers serving the Port of Beaumont, Texas, and its area of responsibility throughout the Gulf Region. This tool is known as the Carrier Association Reporting System (CARS).

CARS is a unique, locally developed tool that uses Microsoft Access to monitor and track the line-haul services of commercial carriers supporting the 842d Transportation Battalion's freight management operations at the Port of Beaumont. The goal of CARS is to measure and track timely surface movements of retrograde and reset equipment from Operations Enduring Freedom and Iraqi Freedom.

The greatest challenge faced in developing CARS was implementing a system capable of monitoring the performance of more than 100 carriers that provide the 842d Transportation Battalion with high-volume freight moves. The carriers' information, including service failure codes and electronic transportation acquisition nonuse codes, was entered into a carefully constructed table. The next step was creating selected tables, assigning data fields, and, ultimately, establishing a relationship among all the tables. The task of planning and setting up a workable database proved to be time consuming and format sensitive, but the final product was a functional database.

In the past, some in the motor carrier industry believed that movement of military cargo was just business as usual—nothing more, nothing less. Some drivers failed to meet scheduled pickups, supplied the wrong equipment, refused to provide additional protective services, or just refused to carry a military load altogether. Such incidents required the traffic management specialist to reschedule truck operations, resulting in delayed equipment movement to the warfighter.

CARS, by design, is both a monitoring tool and a means of sending a message to the commercial motor carrier industry that the 842d Transportation Battalion is serious about its traffic management business and the customer's required delivery dates. It will hold drivers and their companies, agents, or brokers accountable for their actions. Penalties to the carrier can range from a written warning to notice of non-use for a specified length of time.

Management of the CARS database has generated a new responsibility for the traffic managers in its terminal operations. However, CARS replaces a manual Microsoft Excel spreadsheet-based system with a more automated process. The traffic management specialist can record incidents immediately by inputting remarks in the database field. This database enhances awareness, creates focus, and provides increased proficiency, which results in a 1-day reduction in the established 10-day port clearance standard.

The CARS concept meets the guidelines in Department of Defense (DOD) Regulation 4500.9–R, Defense Transportation Regulation, Chapter 207, Carrier Performance, which states that the Carrier Performance Program (CPP) is designed to ensure that DOD surface shippers get the best available service from continental United States commercial cargo carriers. The CPP establishes specific elements of services as key indicators of carrier performance. It also establishes minimum levels of satisfactory performance and describes procedures for denying DOD cargo shipments to any carrier who fails to provide satisfactory service. Chapter 207 also outlines procedures for accomplishing the CPP objectives and assigns the transportation officer enforcement authority and responsibility for various segments of the CPP.

The purpose of CARS is to streamline a business process and add automation to an old system—to invigorate the CPP, identify and assess challenges, and develop possible public and private sector strategies to mitigate their negative effects and focus on possible solutions. It is Lean logistics in its basic form, connecting transportation procurement and benchmarking the process.

CARS became the 842d Transportation Battalion's first charter project 1 in the Lean Six Sigma certification for Green Belt qualification. The emphasis on helping improve the business service process will identify best value and reliable commercial carriers up front and identify elements of carrier service failures. CARS is proving to be a successful measure in the 842d Transportation Battalion's efforts to eliminate waste and harvest savings that benefit its customers, mission, and employees. **ALOG**

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Wartime Host Nation Support on the Korean Peninsula

BY LIEUTENANT COLONEL KAM S. GUNTHER

The reception, staging, and onward movement of U.S. forces arriving in Korea during a contingency are not possible without extensive logistics support from the host nation. To meet this need, the United States has developed and routinely tests an extensive wartime host nation support (WHNS) program with the Republic of Korea.

WHNS Mission

Under the WHNS program, the Republic of Korea provides military and civilian resources and assistance for the reception, staging, onward movement, integration, and sustainment of U.S. forces in times of crisis, hostilities, or war, as set forth in agreements between the governments of both nations. The mission of the Korean-U.S. WHNS plan is to allow the rapid deployment of U.S. combat forces to the Korean Peninsula during a crisis, using Republic of Korea-provided logistics assets that may be reinforced by U.S. logistics units and equipment later in the fight.

The WHNS program is coordinated by the Republic of Korea Ministry of National Defense (MND) and the WHNS branch of the U.S. Forces Korea (USFK) Assistant Chief of Staff, J–4. The MND and USFK J–4 serve as conduits between both governments for all WHNS matters. During times of peace, they develop plans and memorandums of agreement for using WHNS assets during hostilities. During war, they execute those plans, prepare to receive the approved WHNS assets, and acquire unforeseen host nation support for subordinate units with assistance from functional area proponents on the USFK and component staffs. The WHNS has an "unforeseen support" process that is available to expeditiously satisfy any new requirement (or requirements previously submitted but not yet approved) by the Republic of Korea MND.

A U.S. using unit checks the performance of a crane's boom and cable during a field transfer exercise in Pyeongtaek.

Implementation of the WHNS Program

The capstone document of the WHNS program is the Umbrella Agreement, which was signed in 1991 by the U.S. Secretary of Defense and the Republic of Korea Minister of National Defense. The WHNS program was formally established in 1992 when the Republic of Korea National Assembly ratified the agreement. U.S. forces submitted their first requirements to the Republic of Korea MND in 1994. The first Republic of Korea Provisional Support Plan was published in 1995; this plan continues to be updated biennially for implementation in January of odd years.

Under the Umbrella Agreement, the Republic of Korea agrees that, during conflicts, it will provide resources that fall into 12 categories: ammunition services; communication services (domestic and international circuits); engineering equipment and services; field services; maintenance equipment and services; medical supplies and hospitals; nuclear, biological, and chemical equipment; personnel; petroleum; security; subsistence; and transportation. The procedures for acquiring host nation resources depend on the particular functional area.

A WHNS requirement must meet specific criteria in order to qualify as a valid WHNS request. By agreement, WHNS assets are authorized only for the support of U.S. forces. This means that noncombatant evacuation operations (NEO) and nongovernmental requests will not go through the WHNS process. NEO and nongovernmental requests must go through the Ministry of Foreign Affairs and Trade, but WHNS requests go through the MND.

WHNS assets are available only after a declaration of mobilization and approval by the Republic of Korea Government. Occasionally, units will receive assets or services that are not what they asked for. When requesting WHNS assets, units must identify their requirements carefully and be very specific. Requested assets or services must fall into 1 of the 12 functional area categories mentioned above.

Peacetime WHNS Validation

The USFK WHNS system is validated during peacetime through WHNS exercises. WHNS exercises are a critical part of ensuring that the WHNS program can be executed. It takes an extensive amount of coordination and planning to execute, observe, and evaluate these events. The validation includes several exercises to ensure that WHNS contractors or assets will be able to fulfill their purposes.

Field transfer exercises. During a field transfer exercise, assets from a Republic of Korea civilian company are delivered to a U.S. using unit. The U.S. unit inspects and tests the assets to see if they meet the need. If the assets pass the test, the using unit then signs a receipt for the items. The USFK J–4 conducts field transfer exercises for the receipt of assets like trucks, buses, forklifts, cranes, fuel tankers, and shower and bath services.

Site surveys. U.S. using units conduct terrain walks on WHNS real estate. The unit ensures that the site is still suitable for use and meets all requirements. The units are encouraged to assess security, accessibility, environmental concerns, and utilities when conducting the site survey.

Coordination exercises. U.S. using units meet with Republic of Korea civil providers to validate and refine how WHNS assets will be used. For example, a U.S. unit might meet with a Republic of Korea construction company to ensure that the company's capabilities and assets are still suitable for U.S. use. As with site surveys, security, accessibility, availability of utilities, and other concerns also are reviewed.

Communications exercises. U.S. units validate point-of-contact information of a WHNS asset by contacting the Korean providing unit and confirming that phone numbers are up to date. U.S. units also confirm that the Republic of Korea is prepared to delete the asset from the record if needed. U.S. units are required to complete communications exercises with all WHNS assets during two annual exercises. The J–4 WHNS branch updates the database to reflect changes discovered during communications exercises.

WHNS Submission Process

U.S. forces submit their planned WHNS requirements during even-numbered years. The MND approves the WHNS Provisional Support Plan during odd-numbered years. For example, the 2005 Republic of Korea WHNS Provisional Support Plan became effective on 1 January 2006. New submissions for the 2007 plan were provided to MND in June 2006. The U.S. requirements are developed using mission analysis at the unit level and are submitted through an automated, web-based process that is reviewed at the component, functional, and USFK levels. The intent is to fill as many equipment, services, and real estate shortfalls as possible through the use of local national assets.

U.S. military personnel meet with the owner of a commercial barge during a WHNS site visit at North Incheon Port.

U.S. and Korean personnel should remember that the United States has military forces in the Republic of Korea to support Korean forces during wartime, not the other way around. U.S. forces must maintain continuous contact with their Republic of Korea counterparts to finalize security plans, coordinate WHNS support, and maintain positive relationships with their Korean counterparts at all times. Through their combined efforts, USFK and the MND have developed—and are continually improving—procedures for effectively planning and executing WHNS support. WHNS is a combat multiplier that allows USFK to effectively support the Combined Forces Command mission. WHNS is a shining example of the USFK commander's motto of "Katche kapchida," which means, "We go together." **ALOG**

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Chinese Logistics Modernization

BY CAPTAIN DAVID A. PAYNE

China's military recognizes the importance of logistics on the battlefield, and it is taking steps to maximize its logistics capabilities.

China's military, the People's Liberation Army (PLA), is undergoing a complete logistics transformation. The PLA has been slowly improving its logistics concepts since the mid-1990s, but it was not until 2002, when Hu Jintao—then vice president of the People's Republic of China—issued an order to transform PLA logistics, that rapid renovation really began. Now that Hu Jintao is China's President and also the chairman of the Central Military Commission, PLA logistics is a top priority.

Hu's order to transform PLA logistics was inspired by several military events. The first was the PLA's lack of success during the Sino-Vietnamese War in 1979. During this conflict, the PLA never established dominance over the ill-equipped and smaller Vietnamese military. Hu blamed the PLA's Korean War-era logistics support plan for the failure of this operation. In the 1990s, Hu and other top officials cited the U.S. Army's Operation Desert Storm as a logistics model to emulate. They were impressed by how the United States defeated the Iraqi military in a matter of days with higher levels of technology and weaponry.

Transforming PLA Logistics

PLA logistics doctrine in the year 2000 still depended heavily on the "people's war" concept and not on military assets. A portion of this doctrine stipulated that an individual must carry his own support and sustainment packages while fighting the enemy on the front lines. Since the 1930s, the PLA philosophy had been that company-sized units had to grow their own subsistence on small farms throughout the Chinese provinces.

Thanks to efforts by the General Logistics Department (GLD), the PLA gradually began to shift from supporting itself to purchasing subsistence from civilian markets. The GLD began implementing privatization measures to reduce the size of the standing army. Functions like managing barracks and building maintenance shifted from PLA units to civilian companies. The GLD and PLA are linking civilian and military logistics to provide what the former chairman of the Central Military Commission, Jiang Zemin, called "precision logistics." This term is still recited today in an effort to encourage PLA leaders to continue the transformation of Chinese logistics.

Transportation is a PLA specialty that leaders have improved in order to keep pace with the U.S. military. According to the Department of Defense, the PLA is purchasing heavy lift assets from Russia to move their heavy brigade combat teams (HBCTs) to outlying provinces, including Fuzhou. In turn, the Chinese defense industry complex is building cargo planes and ships that will replace foreign-purchased ships and aircraft by 2012. The Fuzhou Province is important because it is the gateway to Taiwan, and if Taiwan decides to declare independence from the People's Republic of China, the PLA will use Fuzhou as a platform to invade Taiwan.

The drawback to the PLA's operational planning is that their current lift capabilities (both air and sea) are limited to moving one division at a time. The modest lift capability also limits the quantity and size of service and support packages that can be sent to maneuver units stationed in China's outlying provinces. However, once the PLA develops its own lift capability, the plan will allow the movement of three corps of equipment, personnel, and supplies. The PLA should have this lift capability around 2012.

Catalyst for Change

The catalyst for change in Chinese logistics was the need to keep pace with U.S. military transformation. Historically, the PLA relied heavily on small loads that were transported by 2½-ton and 5-ton vehicles. This logistics philosophy coincided with the PLA's light infantry tactics and doctrine. It also gave the PLA an advantage in terms of mobility, as was evident during the Chinese Revolution and the Korean War.

Few logistics improvements were implemented by the PLA from the end of World War II to the Sino-Vietnamese War. Transportation assets captured from Japan and purchases from the Soviet Union were the only new logistics assets that the PLA acquired. Field feeding advances were never implemented because the PLA did not place importance on subsistence upgrades. This deficiency was cited by PLA leaders in the Sino-Vietnamese War.

To make up for the lack of progress, Hu Jintao and Jian Zemin both focused on information technology improvements. They made it clear to the PLA and its subordinate units that the Chinese military needed to

focus on achieving parity with the U.S. military. Hu and Jian knew that if this transformation were implemented correctly, it would permit a precise logistics flow to PLA units.

Recent Progress

PLA logistics has suffered from the axiom "do more with less" since the 1930s. Since transforming from the Soviet-era doctrine of heavy units with little mobility to the HBCT format, the interest in matching the capabilities of logistics units to those of the maneuver elements has increased. The GLD took charge of this ongoing modernization process. After the creation of the GLD, the PLA received new combat uniforms and protective equipment and maneuver units were given field feeding assets. However, PLA units still lack high-mobility transportation assets, modular equipment, and automated tracking systems, and the PLA still has not developed logistics packages that can support the HBCT concept.

During the Sino-Vietnamese War, PLA soldiers could not forage for food, so they started to receive moderate rations of eggs and rice near the end of the conflict. Insufficient field feeding capability still exists in the PLA, but the GLD is attempting to solve the problems by mandating that company-sized elements receive two to three garrison meals per week. Contracted civilian companies have been employed to provide better meals, and the PLA will soon receive new mobile containerized kitchens that can feed 4 hot meals per day to up to 300 soldiers.

Improvements to the PLA's procurement process have also been successful. During the summer of 2004, the PLA and civilians in northeast China held a successful training event that focused on implementing the transformation of field feeding and the procurement of supplies through civilian sources. The overall success of that event has led to the employment of a supply chain management system and an increased reliance on civilian support.

Privatizing Like the U.S. Military

The privatization of several components of PLA logistics is similar to how the U.S. military shifted many of its own logistics responsibilities to private sector vendors. During the 1970s, the U.S. military transferred portions of its contracting, purchasing, and delivery responsibilities to civilian companies. Likewise, the PLA and GLD are making progress toward privatizing procurement, transportation, and building construction and maintenance. To fix the shortfall for the time being, the PLA bought enough lift assets from Russia to move a division's worth of personnel and supplies to any province in mainland China and to remote parts of the world. The long-term solution lies with the civilian sector defense industry, which will produce enough lift capability to move three corps by 2012.

Military and Civilian Cooperation

The PLA's shift to a more modern logistics system will be gradual. This can be partially attributed to China's political and economic structures. Distrust between the PLA and China's civilian populace is deeply rooted because of the last 100 years of political turbulence. In 1907, the Chinese were still living in the last days of the Qing Dynasty, which lasted until China transformed into a republic in 1911. The republic lasted until 1949, when the Communist Revolution, led by Mao Zedong, pushed Chiang Kai-shek's republican forces to the island of Taiwan. Political instability led to other mistakes and to the people's distrust of Chinese military forces and political leaders.

The catalyst for change in Chinese logistics was the need to keep pace with U.S. military transformation.

Now, as China expands its regional presence, both civilian and military leaders can see the larger picture and are putting aside their distrust. The civilian leaders see the opportunity to grow the Chinese economy, and the PLA sees the opportunity to increase its military strength. These similar goals have now brought these two parts of the People's Republic of China together, which facilitates transformation and modernization.

The PLA's current modernization campaign will enable China to support future offensive operations outside of its mainland. PLA precision logistics is modernizing rapidly. U.S. military logisticians should take note of China's current and future capabilities so that they may assist with future U.S. operations planning. As an ancient Chinese maxim states, "If you know your enemies and know yourself, you will win a hundred times in a hundred battles. If you only know yourself, but not your opponent, you win one and lose the next. If you do not know yourself or your enemy, you will always lose." **ALOG**

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New Gear for Afghan Commandos

BY PETTY OFFICER FIRST CLASS DAVID VOTROUBEK, USNR

To a U.S. Soldier, the weapons and equipment on any base in Afghanistan would look familiar. The difference is they are now in the hands of Afghan soldiers. The Afghan National Army's (ANA's) 1st Commando Kandak (Battalion) has completed its training, and its soldiers have received the same equipment U.S. Soldiers use.

The field-issue items and personal weapons used by the 1st Commando Kandak are modeled after a U.S. Army ranger battalion's organizational equipment. All six of the ANA commando kandaks will be equipped similarly, which will make interoperability and standardized training much easier.

U.S. weapons and equipment were chosen for their reliability, their obtainability, and the commando trainers' familiarity with them. Quick procurement is important because the ANA expects to have all six of its commando kandaks equipped and trained by September.

The kandak soldiers are being issued new weapons—including M4 carbines, M240 machineguns, and M249 squad automatic weapons—communications equipment, clothing, sleeping gear, and field equipment. The kandaks will even have portable kitchens for cooking hot meals in the field.

With the assistance of the ANA leaders, the Combined Security Transition Command-Afghanistan (CSTC–A) identified what the commandos needed and procured it. This took a tremendous amount of coordination. The CSTC–A supplied the ANA from its logistics and supply stocks, but many items needed to be obtained quickly through U.S. Department of Defense foreign military sales. It was truly a team effort among CSTC–A's mentors at Camp Morehead in Kabul Province, contracting personnel, legal advisors, comptrollers, and logistics personnel.

The security assistance office in CSTC–A's CJ–4 logistics section worked behind the scenes to get new equipment fielded. The CJ–4 staff spent many personal hours researching and calling vendors to complete purchases on time. By paying close attention to both the needs and budget cycles, CJ–4 was able to obtain materiel in 2007 that would have not been funded until 2008 or 2009.

Afghan National Army commandos train using their new equipment that is based on U.S. Army ranger equipment.

The Afghan commandos worked hard to make the transition successful. They not only learned how to use the new weapons and radios but also produced almost 300 more trainees than anticipated. The commander of the 1st Commando Kandak, Lieutenant Colonel Mohammad Farid Ahmadi, believes that his unit worked out supply and logistics issues that will make it easier for the next kandak.

CSTC–A made history when the 1st Commando Kandak graduated on 26 July 2007. It was the first ANA unit to be completely trained and equipped with U.S. gear, but it will not be the last. After six commando kandaks are trained by CSTC–A, the ANA will assume the mission of training commandos at Camp Morehead. **ALOG**

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Enhanced Logistics Tracking and Monitoring Through Sensor Technology

BY JANINA W. PLINSKY AND JERRY RODGERS

During peace and in war, the U.S. Army loses millions of dollars annually to spoilage, mishandling, and theft of supplies while in transit and in storage. In Southwest Asia, medical sets awaiting transportation from the airfield can be exposed to temperatures of over 120 degrees Fahrenheit. Soldiers using those medical sets conduct visual inspections, but they cannot be certain how long the items were exposed to high temperatures and whether or not they remain viable. Each year, the Army destroys a significant amount of valuable medical materiel because of the unknown effects of environmental conditions that it endured.

Destroying medical materiel increases medical costs on the battlefield and affects patient care. Many of these losses could be mitigated with automated sensor technology that monitors and reports on the condition of environmentally sensitive assets. The ability to monitor the condition of assets in austere environments makes it possible to determine if those supplies can be safeguarded and delivered in serviceable condition for the Soldier. With the development and use of microelectrical mechanical systems (MEMS) sensors integrated with radio frequency identification (RFID) technology, Soldiers can now automatically capture and report critical environmental and security information.

Radio Frequency In-Transit Visibility

During Operations Desert Shield and Desert Storm, thousands of containers had to be opened, inventoried, resealed, and reinserted into the transportation system because logisticians did not have visibility of their contents. The volume of materiel moving through the logistics pipeline far exceeded the Army's ability to track materiel, maintain accurate records, and provide timely information to commanders. As a result, the receiving ports and container yards became "iron mountains" of containers filled with undocumented supplies and equipment.

Realizing that an automated solution was required, the Army began testing commercial off-the-shelf active RFID tags to track supplies. RFID tracking devices were installed throughout the supply chain in locations like military and commercial air and sea ports, supply depots, and warehouses. The Army now has a robust worldwide infrastructure that includes a radio frequency in-transit visibility (RF–ITV) server that collects RFID data and stores, processes, and distributes asset location and "in-the-box" identification information.

Over the past few years, the RF–ITV infrastructure has expanded rapidly to meet the needs of deploying expeditionary forces. Since the beginning of the Global War on Terrorism, the worldwide RF–ITV infrastructure has quadrupled in size and currently has 4 regional servers and more than 4,000 read-and-write sites located in 40 countries. The RF–ITV servers allow users to track shipments, observe activity at a specific location or site, determine the operating status of RFID interrogators, and obtain RF–ITV metrics and statistics over selected periods of time. Integrating active RFID with MEMS sensor-based environmental condition monitoring technologies adds a third dimension of asset visibility to augment identity and location recognition.

MEMS RFID

MEMS are technologies that combine modern electronics with mechanical systems on a small scale to sense, control, and act on changing events. MEMS sensors trigger proactive alerts for items that exceed temperature, humidity, vibration, shock, and light thresholds. RFID devices with integrated MEMS

USAMMCE personnel test the placement of sensor tags inside medical sets at the USAMMCE in-transit visibility demonstration.

Deployable medical systems are the subject of a MEMS RFID demonstration at Sierra Army Depot, California.

sensors improve the ability to preserve materiel while it is in storage and in transit. The integrated MEMS RFID devices can track and monitor shelf life and environmental factors that may affect assets. These devices can also send alerts when intolerable environmental conditions occur before materiel is received downrange. Department of Defense and Army efforts are aimed at integrating identity, location, and condition capabilities into a single microtechnological form under one automatic identification technology (AIT) solution.

Monitored conditions could also include chemicals, acoustics, pressure, motion, and voltage. This holds great potential for future logistics applications because the capability would span all classes of supply and all business processes. Through a common information structure, the data collected on an item could remain associated with that specific item for its complete life cycle.

MEMS RFID Testing

The Army recently conducted condition monitoring demonstrations to test the effectiveness of MEMS RFID specifically for—

- The long-term storage of assets in deployable medical systems (DEPMEDS) at Sierra Army Depot, California.
- In-transit nodal monitoring of medical sets, kits, and outfits (MESKOs) that are shipped from the U.S. Army Medical Materiel Center-Europe (USAMMCE) depot in Pirmasens, Germany, to customer destinations in Iraq and Afghanistan.
- In-transit security monitoring of Defense Logistics Agency containers with class I (subsistence) items that are shipped from facilities and ports in the United Arab Emirates to Afghanistan in support of U.S. and coalition forces in the U.S. Central Command (CENTCOM) area of operations (AO).

Long-term storage monitoring. DEPMEDS hospitals hold medical materiel and associated hospital equipment. They are also used for transportation and provide functional workspace for clinicians. The DEPMEDS are stored outdoors at Sierra Army Depot in 20-foot deployable military vans and expandable tactical shelters until needed for deployment.

The Army Logistics Innovation Agency, the field operating agency of the Army G–4, tested the use of MEMS RFID for DEPMEDS at Sierra Army Depot at the request of the Army Materiel Command and the Army Tank-automotive and Armaments Command, in collaboration with the U.S. Army Medical Materiel Agency (USAMMA). The intent was to assess the capability of MEMS RFID to monitor the environmental conditions to which DEPMEDS were exposed and extrapolate the results to guide decisions on further testing or actual fielding of MEMS RFID.

Before MEMS RFID, condition monitoring at Sierra Army Depot consisted of labor-intensive monthly visual examinations of containers and inspections for deterioration of seals on the expandable containers. The inspections were necessary because exposure to high humidity and extreme temperatures for long periods of time can affect the mission capability of stored medical equipment or result in the loss of that equipment.

Throughout the demonstration, MEMS RFID sensors collected and stored hourly readings of temperature and humidity data in the containers. Whenever established environmental thresholds were exceeded, notifications were automatically sent to Sierra Army Depot and USAMMA users. During the demonstration, MEMS RFID provided the ability to view DEPMEDS environmental data remotely and receive automatic alerts of high and low temperatures or humidity conditions. Automated MEMS RFID readings provided significantly more accurate and reliable humidity data than visual readings.

In-transit nodal monitoring. USAMMCE manages the assembly, disassembly, and reconstitution of MESKOs, which consist of medical products, including items that are vulnerable to extreme environmental conditions such as temperature or humidity. MESKOs are packaged according to the projected environment of the destination region. However, USAMMCE's process lacked a method for monitoring environmental data that would help Soldiers make informed decisions on the longer term viability of assets. For the USAMMCE MEMS RFID demonstration, which was conducted by the Army Logistics Innovation Agency and the Product Manager Joint-Automatic Identification Technology (PM J–AIT), an ST–674 sensor tag was placed inside each MESKO to monitor, record, and transmit data on environmental factors that influence the operational service life and condition of the assets.

PM J–AIT integrated a commercial sensor application with the RF–ITV server and upgraded the ITV network nodes with sensor read capabilities along the

MEMS enables logisticians to monitor not only where the materiel is while in transit, but allows the monitoring of temperature and vibrations (shock readings) while in transit. This technology meets an important mission requirement for the logistics community.

—Colonel Kelvin B. Owens
Commander, USAMMCE

demonstration's distribution routes from USAMMCE to final destinations in Iraq and Afghanistan. When a temperature parameter or shelf-life timer was breached en route or in storage, an alert was sent automatically to USAMMCE users through the RF–ITV network. The alert notified USAMMCE of the unacceptable environmental condition and the time and nodal location of the event. The demonstration showed how MEMS RFID is suitable for onward shipment and use and supports proactive management through asset viability.

In-transit security monitoring. Sensor tags can also be used to detect intrusion. Prompted by incidents of active RFID tags being destroyed, damaged, and stolen from containers without command knowledge, PM J–AIT conducted a limited operational test in the CENTCOM AO of the new ST 675–I security sensor container tag. In addition to temperature and humidity condition sensors, the ST 675–I tag monitors container security by using open door, light, and shock sensors while the container travels along the supply chain. The ST 675–I checks, time-stamps, and logs door security status and environmental data at frequent intervals using local flash memory. During the demonstration, the tag beaconed and transmitted alert messages to the RF–ITV network whenever an alert event occurred. The test successfully demonstrated the potential for sensors to enhance container security.

The Next Steps

The demonstrations at Sierra Army Depot and USAMMCE and in the CENTCOM AO have paved the way for future MEMS and sensor tag implementations. The demonstrations validated the use of sensor-enabled RFID technology for automated in-transit and in-storage condition and intrusion monitoring.

Although the demonstrations focused on specific assets that show possible high-payoff applications of MEMS RFID, the benefits of sensor technology extend to all classes of supply and logistics processes and across all services. Clearly, these capabilities are particularly appropriate for life-limited assets, such as medical supplies and food, but the applications are many and varied and each application must be evaluated based on individual merit. Key considerations for implementing the technology include examining business rules, integrating the supporting automated information systems, establishing policies and standards, and developing training programs for the schoolhouses. As sensor, RFID, and satellite-based location and tracking systems become more interoperable, these sense-and-respond networks will help improve the quality, integrity, and safety of products in storage and in transit.

Currently, PM J–AIT is working to integrate MEMS RFID technology into the RF–ITV infrastructure so that users can view the identities, locations, and conditions of their shipments. This will support improved readiness by increasing visibility and providing tools to ensure the efficacy of life-limited Army assets. USAMMCE is continuing to use the capability. The Army Materiel Command is working with PM J–AIT and USAMMA to implement active RFID container security sensor tags in all DEPMEDS in storage at Sierra Army Depot. The medical community is exploring the use of sensors and associated alert capabilities for monitoring refrigerated shipments and medical chemical defense materiel. The Army Medical Department is collaborating with PM J–AIT, Army G–4, Army Central Command, and other stakeholders to identify requirements for fielding, sustainment, and user training.

Using MEMS RFID is an effective way to reduce or eliminate losses caused by extreme environmental conditions and security issues. MEMS RFID provides logisticians a unique opportunity to transform the logistics process by providing more timely and accurate support to Soldiers. As the technology becomes more widespread, it will allow logisticians to gain near real-time situational awareness, giving them the ability to make responsive decisions based on timely, condition-based information. As a result, Soldiers will have greater confidence in the viability of their assets, and logisticians can improve packaging techniques, learn more about environmental effects on assets, and deliver serviceable supplies more quickly. **ALOG**

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Fostering Iraqi Army Logistics Success

BY LIEUTENANT COLONEL THOMAS M. MAGEE, USAR

The Iraqi Army has made great progress in its efforts to organize and become self-sustaining over the past 2 years. Now its greatest challenge is to develop a logistics program that will support an independent force.

The news today is full of stories about Iraq. Inevitably, those stories generate a great deal of frustration here in the United States and within the Army. As the Nation sails through its fifth year in Iraq, many people wonder: Why can't that problem just get fixed?

The Iraqi Army has been stood up. Many people question why the United States cannot just pull up stakes and leave Iraq for the Iraqis now that they have an army. I contend that part of the reason why this has not happened is the Iraqi Army's difficulty with mastering the field of logistics. I say this because I saw that problem up close as a member of a military transition team (MiTT) in Iraq, advising the Iraqi Army's 4th Motor Transport Regiment (MTR).

The MTR is now one of the few field logistics units within the Iraqi Army. An MTR has four truck companies and one security, or military police, company. The main trucks the unit is equipped with are U.S. 5-ton and Russian 8-ton trucks. The security company is equipped with U.S. high-mobility multipurpose wheeled vehicles (HMMWVs). The regiment normally is commanded by a colonel.

Iraqi Army Growth

A lot has happened in the Iraqi Army in a very short period. The Iraqi government has only gained control of most of its army in the past couple of years. The Ministry of Defense in Baghdad now runs everything connected to Iraqi Army units.

With each passing day, the Iraqis are running more of the show. However, more work must be done to stand up the Iraqi Army fully because it is still heavily dependent on the United States for logistics. It is important, however, to view this situation in the context of Iraq, not the United States.

The "low-hanging fruit" analogy clearly applies to the Iraqi Army. You could think of the low-hanging fruit as the initial work of putting the army together. This includes tasks like purchasing and fielding equipment, recruiting and training the initial cohort of soldiers, and purchasing other equipment. Those tasks are low-hanging fruit because they are finite, short term, and tangible.

Just like in an orchard, the next wave of work is getting the fruit that sits higher on the tree or, for whatever reason, is harder to reach. Now coalition forces must help the Iraqi Army through the next phase. The tasks in this next phase will be more difficult because they involve nontangible tasks, such as applying knowledge or integrating complex activities across a broad spectrum—something the entire Iraqi culture is struggling with. I think these tasks will require more work because insurgent groups are fighting to stop those very things.

Logistics is part of that hard-to-reach high-hanging fruit. To have an effective logistics program, an army needs both the hardware and the software for the program. Software, here, is the knowledge to make the logistics program run effectively. Logistics must be mastered in order to stand up the Iraqi Army and send the U.S. troops home. The dilemma the U.S. Army faces now in Iraq is how to help the Iraqi Army advance to the next stage.

Iraqi Army Logistics

To address what needs to be done next, it is important to review where the Iraqi Army is now. The initial work has been done. The Iraqi Army is fielded, so to say. They have 10 field divisions, with another division to come. These new divisions have anywhere from three to five brigades apiece. Most of these units are equipped along the lines of light infantry. The soldiers in these units have completed 5-week basic training programs at various posts throughout Iraq. This training is a "one size fits all" kind of training. They have no specialized training. The challenge comes in helping the Iraqis master planning, logistics, and other complexities connected to running those units.

Right now, the Iraqi Army has a unique supply system. At face value, it looks like a system set up for peacetime. It certainly is not set up for rapid movement in the field. Units draw their supplies from a garrison

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supply unit or a regional supply unit. Both of these units are static, not designed to go anywhere. Regional supply units tend to provide equipment, while garrison supply units tend to provide supplies. Larger units have an internal supply platoon. Unlike the U.S. Army, the Iraqi Army has no field supply units to run supplies to tactical units. Internal support platoons have nothing to hook into if their unit is in the field for a long time or out of their usual operating area.

> Another time, a convoy was attacked and reported its location incorrectly. After that attack, the Iraqis realized the importance of knowing where they were on the map, something they had not quite grasped before.

The Iraqi Army is facing a severe maintenance crisis. Since it received all of its equipment at the same time, all of the maintenance services are due at the same time and all of the same parts seem to be wearing out at the same time. Thus, all of the equipment will need to be replaced or fixed simultaneously.

Right now, the Iraqi Army is facing several brewing supply problems. All Iraqi units suffer from a lack of class IX (repair parts) for their U.S. vehicles. Class IX problems once threatened to stop the Iraqi unit I worked with completely. Our unit had an internal security unit within the truck regiment that received all of its trucks at the same time. This company used HMMWVs for gun trucks, and all the HMMWV brake pads started to wear out at the same time. A shortage of HMMWV brake pads almost deadlined the whole company. Several innovative supply steps taken by both the Iraqis and their U.S. trainers averted disaster at the 11th hour.

Another of my unit's problems was clothing. The uniforms issued at induction 2 or 3 years ago were starting to wear out. However, the Ministry of Defense has yet to act on the issue of new uniforms for the troops. This probably is because other actions have more priority. Inefficiency and corruption within the Iraqi government also could be part of the problem in maintaining equipment and supplies for the Iraqi Army.

Units have the same problem with personnel. They are only getting piecemeal replacements for losses. For key positions, the old patronage system seems to kick in. People with connections come in to fill key jobs. Higher commands, like divisions, might have no say on who fills the key jobs. The Ministry of Defense fills those jobs intermittently. Many units always seem to be under strength.

I know everyone reading this article has ideas about how to change things. I am sure those ideas are very valid, but you must remember that the issue is in Iraq and not in a U.S. unit. Iraq has certain dynamics that complicate things. The Iraqi units are conducting real-world missions while they are getting organized and learning how to operate. And nothing seems to happen quickly in Iraq because of a wide range of cultural, economic, and political conditions.

Iraqi Army Personnel

The composition of Iraqi Army units can be a challenge. Frequently, Iraqi units will have a majority of one ethnic group, like Shia, with some other groups intermingled. Our group at the 4th MTR was primarily Shia, but small pockets of Sunni soldiers could be found mixed in. The main group in the 4th MTR comes from an area of Iraq far from the unit's location. When they go home for their monthly leave, they have to travel a great distance. It is expensive and hard to move within Iraq because of the violence and poor state of affairs. Cultural issues and family ties still draw the soldiers home. Many will spend half their pay just to get home, which creates a definite morale problem over time. The level of violence everywhere also means troops stand a chance of not coming back. One officer I advised was killed by his Shia neighbors while home on leave. In cases like that, the training often must start over again with the replacement.

The officers are a different issue. Officers over the rank of first lieutenant are primarily "old army." They sometimes have a problem with the new army's permissive ways. These officers could have obtained their posts based on either their reputation in the old army or their political connections. Officers at the 4th MTR were primarily Sunni. Some senior leaders came from the old army, while others had political connections. Several Kurdish officers also were in the unit. This creates an interesting dynamic; the ethnic groups that are fighting in the streets now occupy the same unit area.

Overall, the officers try to present a one-Iraq face to operations within the army. This may be the only place in Iraq where you see that. However, armies reflect the culture they come from. The tension on the streets between the ethnic groups at times affected how soldiers interacted with each other. It is impossible to avoid completely the sectarian strife that is tearing up communities. That tension surfaces subtly, through decisions made or not made. Those indirect issues can affect operations in combat and elsewhere.

Training Issues

Now the issue is how to train an Iraqi Army culture that often seems to ignore logistics. The Iraqi Army suffers from a lack of doctrine on logistics and almost every other subject. No manuals are available to the troops for training. Of course, everyone has his past to draw from; that past might have been from the old army or from the anti-Saddam resistance. One officer in one of the shops I advised was a 20-year veteran of the Iraqi Army. Another officer in the same shop had worked 20 years in the Kurdish resistance. They definitely had different perspectives, which led to some interesting challenges.

The Iraqi Army is only just now setting up basic enlisted military occupational specialty schools at training posts throughout Iraq. The war is taking its toll on this training program. Resistance groups, placing improvised explosive devices (IEDs) on roads to shut down transportation, have had a negative effect on basic training. Soldiers must get to the Iraqi basic training site on their own initiative. If a road leading to a base has a lot of IEDs, many people in the next recruiting class at that base will not show up or will show up significantly late. That decline in numbers for a recruiting class will lead, in turn, to a reduction of people showing up at their assigned units.

The average Iraqi soldier often does not seem to embrace classroom instruction. Although Iraqi soldiers attended the classes we set up, our educational methods did not seem to reach them. To overcome that dilemma, many U.S. training teams are using basic rote memorization and set steps to teach the Iraqis. That method of teaching works for basic tasks, but it does not bring about quick proficiency on more complex jobs. A different strategy is needed.

Bridging Cultural Differences

Much has been said about the cultural differences between Iraqi and U.S. Soldiers. Cultural differences are a big factor in operations for both the Iraqis internally and for U.S. elements working with the Iraqis. It is difficult to describe this chasm. Unwritten rules tend to shape everything Iraqis do. We in the United States might say they are bound to the past through these cultural mores. They would say they are respecting the past through those mores.

Some cultural differences are more literal. One example is in definitions. I was the unit security and intelligence adviser. When I talked to the Iraqis about physical security, I got nothing back but blank stares. After 30 more minutes of conversation, I found that they define security in active terms, such as picking up spies, not in more passive terms, such as using locks and chains. I also found out in other circumstances that interpreters did not say quite what I wanted to say. Subtle differences in word choice can make all the difference in the world. I found myself repeating myself on purpose in different ways to ensure I got my point across.

The Iraqi Army is coming to grips with where it is in its development. It is learning the hard way that it needs to acquire more skills. I think any new organization would probably develop this way. Iraqi soldiers seem to prefer learning from experience to learning in a directed learning environment. A good example of what I am talking about is their use of local knowledge. Iraqis can do amazing things with their inside knowledge of culture. They can spot a non-Iraqi instantly through little cues. At other times, this local knowledge holds them back. They will favor their local information and ignore other information if there is a discrepancy. For example, on one occasion the local road report said not to go on a road because of IEDs and other threats. I told the Iraqi soldiers, and they ignored me and traveled on the road anyway because local habits or something else said to go there. They paid the cost for that decision because they were attacked. After that, they quickly learned to apply intelligence information to missions.

Learning the hard way is the surest way to drive home a lesson. We tried to explain the importance of planning missions and making sure their convoys were well-stocked with food, fuel, and other supplies. But the Iraqis continued to plan poorly for their convoys until some of their vehicles ran out of fuel before they could return to base. They did not make that mistake again, and convoys never again ran out of fuel. Another time, a convoy was attacked and reported its location incorrectly. After that attack, the Iraqis realized the importance of knowing where they were on the map, something they had not quite grasped before.

Taking the Next Step

The U.S. Army seems have a dilemma on how best to advise the Iraqi Army. This issue was the subject of intense debate among the team I was on and in other parts of the U.S. Army. Many in the U.S. Army want to jump right in and tell the Iraqis how to do it and then "empower" the Iraqis to do it. Many want to do much of the hard work for them to help move things faster.

We found out that the more you do for the Iraqis, the less they do. Naturally, that is not the best way to get them to stand up by themselves quickly. Part of what causes that situation is cultural. Iraq has always been a centralized authority-driven nation. For the past 30 years, people who showed any initiative were in danger of being lined up against a wall and shot. The authoritarian nature of the Iraqi government also

stifled the incentive to do anything more than the minimum requirement. It is hard to overcome those habits in a short period.

The Iraqis should be taught higher-end staff skills. They have to learn better planning skills and how to coordinate internal and external activities. Lacking planning skills is a great inhibitor to more efficient operations. The Iraqis will have to plan and coordinate their own support missions in the future, so those skills will benefit them.

U.S. troops are constantly relearning how to deal with the Iraqis. As the Iraqis grow in their capabilities, we have to reexamine how we deal with them. The cultural differences between Iraq and the United States also must be taken into consideration. One of these differences is the U.S. love affair with technology. Many people in the U.S. Army cannot or will not do anything without a computer. Nowadays, the average U.S. Soldier lives on a computer. However, the average Iraqi is only just now becoming acquainted with computers. We have to avoid computer-dependent solutions.

As more and more Iraqi units are moving around their country and taking on more responsibilities, the U.S. Army has to reexamine how it communicates with the Iraqi Army. In the past, the Army just contacted the U.S. MiTT that was working with that Iraqi unit. Toward the end of my tour, the unit we worked with grew in its capacities. It frequently had several convoys on the road at the same time. The MiTT is not big enough to be with all the convoys at the same time. Iraqi units have very few communications devices, and those they do have do not work with U.S. communications equipment. Those things make it very difficult for the MiTT members to communicate with Iraqi units. Those issues are being worked out daily. At most U.S. bases, Iraqi Army units that come on base are searched and funneled into certain gates that have more security. I think most people can imagine what message would be sent if you invited a friend over and then propped him up against a wall and searched him. I saw this done a few times.

Things in the Iraqi Army are improving, though. I saw some drastic changes in the year I was living with the Iraqis. When I started working with the 4th MTR, the Iraqi Army had no headquarters and no system set up to handle anything on an army-wide basis. When I left, they had a rudimentary staff system set up for all major areas. I saw that change in the course of just 10 months. The Iraqis have set up contractor-run dining facilities at most of their bases, which seem to be working well. They have set up a local purchase program that is meeting some of their needs. The Ministry of Defense is now tackling issues like future equipment acquisition.

People forget that scores of Iraqi units also participated in the big surge in Baghdad and in the Basra area. These units moved in and out of the area from all over Iraq using Iraqi vehicles. They figured out their own ways to support those units. In the beginning of my tour, it was hard for a unit from one part of Iraq to get support in another area. When I left, the Iraqis had figured out ways to support the 4th MTR on missions in Baghdad.

> Unwritten rules tend to shape everything Iraqis do. We in the United States might say they are bound to the past through these cultural mores. They would say they are respecting the past through those mores.

The big issue for the U.S. Army now is how to move the Iraqi Army along. If we do too much, it will shut down their efforts. The U.S. answer may not be the best answer for them. That answer might not be practical for the Iraqis for a variety of reasons. I also think there is a pride factor. They want help but do not want to be seen as beggars. Interactions with them also should be constructed with that in mind.

I don't have any easy answers for quickly fixing the Iraqis' logistics problems in a long-term, sustainable way, but something has to be done. If the Iraqi Army is going to move to the next level, it has to master logistics and retool processes to handle more-complex logistics.

Right now, the Iraqi Army is very dependent on the U.S. Army for certain parts of its logistics program. I know the U.S. Army is trying to deal with that. Some plan should be laid out quickly. The past sacrifices of the U.S. Army would be for naught if we do not help the Iraqis master logistics. Any solution must be Iraqi in nature. U.S. responses will have to be general and establish broad program parameters. We will have to let the Iraqis figure out the details if the solution is to last. I acknowledge that will take a lot of time.

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Field-Portable Propellant Stability Test Equipment

BY ELENA M. GRAVES

The safety of ammunition stocks has been improved with the development of field-portable propellant stability testing equipment, which allows more ammunition samples to be tested.

The U.S. military has stockpiles of ammunition, new and old, that can present safety hazards. The primary ingredient of the propellant used in these rounds, nitrocellulose, can deteriorate with age and become prone to autoignition. To avoid the destruction that could occur from the self-ignition of this propellant, the Department of Defense (DOD) has established a program for testing ammunition stocks to determine the thermal stability of the nitrocellulose propellants they contain.

History of Nitrocellulose

Shortly after French chemist Theophile Jule Pelouze nitrated cotton in 1838 and created the world's first batch of nitrocellulose, potential users recognized that it could be a dangerously unreliable explosive. Practical use of nitrocellulose began in the mid-1840s with the advent of Christian Shönbein's improved manufacturing process. However, its use was short-lived because of frequent explosions of the impurely processed batches. It was another 20 years before Frederick Abel of Britain produced a good quality, commercially viable nitrocellulose known as guncotton.

Unlike black and brown powders, the new nitrocellulose powders had the desirable characteristics of being relatively smokeless, powerful, and nonhygroscopic. [Hygroscopic items readily absorb moisture from the air.] However, they still decomposed at an unreliably fast rate, causing so many accidental explosions in storage and among gun crews that black and brown powders remained the favored gun propellants on land and sea through the end of the 19th century.

Nitrocellulose-based powders finally replaced black and brown powders in the early 1900s, first at sea in the world's navies and then on land. Since reliable means of stabilizing the nitrocellulose propellants had not yet been developed, these powders were still in danger of decomposition and, thus, instability. Devastating accidents, like those aboard the French battleships *Liberté* and *Iena* and the Russian *Imperatritsa Mariya*, lent urgency to the search for an effective stabilizer.

Propellant Stabilizers

As nitrocellulose-based propellants decompose, they release nitrogen oxides. If the nitrogen oxides are left free to react in the propellant, they can react with the nitrate ester, causing further decomposition and additional release of nitrogen oxides. The reaction between the nitrate ester and the nitrogen oxides is exothermic. (It produces heat.) Heat increases the rate of propellant decomposition, and the exothermic nature of the reaction may generate sufficient heat to initiate combustion.

Stabilizers are chemical ingredients added to propellants at the time of manufacture to decrease the rate of propellant degradation and reduce the probability of autoignition during its expected useful life. Stabilizers that are added to propellant formulations react with free nitrogen oxides to prevent their ability to react with the nitrate ester. The stabilizers are scavengers that act like sponges, but once they become "saturated," they are no longer able to remove nitrogen oxides from the propellant. At this point, self-heating of the propellant can occur unabated and may reach the point of spontaneous combustion.

Propellant Stability Testing

Propellant autoignition accidents continued to occur after the introduction of modern stabilizers during and after World War I, but at a vastly reduced frequency. Most early propellant powders were stabilized with diphenylamine or ethyl centralite. Later 2-nitrodiphenylamine and Akardite II also became common stabilizers in the United States. The type of stabilizer used depended on propellant formulation.

Shortly after the end of World War I, the Navy and the Army each established permanent propellant surveillance laboratories to monitor the safe status of their propellants throughout their entire life cycles. Both services adopted the 65.5 degrees Celsius surveillance test as their primary tool. This test is a type of accelerated aging test and is known as the fume test. It is designed to preempt the autoignition of propellant in

A technician opens a bag to select a propellant test sample during thin-layer chromatography training at Tooele Army Depot.

storage by forcing it to happen much earlier in the laboratory. When a tested propellant lot's "days to fume" reach a defined minimum level, all quantities of that lot, wherever stored, are ordered destroyed. Until 1963, Navy ships had propellant labs on board to conduct this test. Although techniques have improved over the years, the accelerated aging test is still conducted by the Navy service lab at Indian Head, Maryland, and the Army lab at Picatinny Arsenal, New Jersey.

Testing the days-to-fume on permanent laboratory samples was not the only propellant surveillance performed. Propellant fires continued to occur occasionally, and it was known that the propellant in field or fleet storage might not age at the same rate as the master sample in the service lab. Both services developed programs to bring propellant samples from the field or fleet and test them for available stabilizer at the service lab. Still active today, those programs are known as the Stockpile Propellant Program in the Army and the Fleet Return Program in the Navy.

A variety of test methods were used over the years, and, by the early 1980s, both labs had settled upon high-performance liquid chromatography (HPLC) as the best method for determining remaining effective stabilizer (RES) for most propellants. The HPLC method is still favored today by service labs and test labs worldwide. [Chromatography is a range of physical methods used to separate and analyze mixtures.]

In addition to the goal of maintaining master samples for all nitrocellulose-based propellants in the Army stockpile, each year the Joint Munitions Command (JMC) orders hundreds of propellant samples

from a variety of storing locations to be prepared and shipped to the Army Propellant Surveillance Laboratory (APSL) at Picatinny Arsenal. The APSL has been testing samples on an annual basis since the early 1970s.

Because of the time it takes to process, prepare, and ship samples to the APSL and the lab's resulting workload, routine sample test results are usually not available until several months after JMC initiates the stability test. Propellant samples that are identified as priority for testing can be processed quickly on an exception basis. However, it is clear from the volume of material that needs testing that most of the propellant lot samples cannot be treated as priority propellants.

Unfortunately, as robust as it is, our propellant surveillance system has not put an end to autoignition accidents. Seven propellant autoignition incidents, some involving 100,000 pounds or more of powder, occurred at Army installations in the 1980s and 1990s. Although it has been 10 years since the last accident, constant vigilance is required.

Excess and Obsolete Propellant Stocks

With the retirement of some weapon systems and modernization of others, greater reliance on artillery rockets, and the reduction in the size of the force, DOD has found itself with an immense quantity of excess, obsolete, and otherwise unwanted propellant. Much of the propellant is in separate-loading bag charges for Army and Marine Corps artillery. Millions of pounds of Navy gun charges have no purpose since capital ships are no longer equipped with major caliber guns. DOD also has many millions of pounds of excess propellant locked inside cartridge cases of obsolete or unserviceable fixed rounds and mortar projectiles. Along with the active stockpile, the propellant in the demilitarization account (ownership code B5A) requires close surveillance for stability.

The Army, as the single manager for class V (ammunition) demilitarization assets, assumes ownership of all ammunition and explosives of each service transferred to the B5A account. Hence, the Army Propellant Stability Program becomes increasingly burdened with providing sample testing of these propellants.

Conducting stability surveillance for bulk-packaged propellant, separate-loading propelling charges, and small component charges, such as those for mortar ammunition, is relatively straightforward. These items are mostly identified on stock records by their propellant lot or index number. Therefore, they are automatically included in the stockpile test portion of the Propellant Stability Program. This is not the case with propellants in fixed or semi-fixed cartridges. The Army considers such propellants so unlikely to autoignite in an uploaded-round configuration that the propellants are not included in the stockpile test program, and the propellants are not closely tracked.

Complete rounds, including ammunition for small arms, mortar, and artillery, are identified on stock records by the complete round lot number. When component lot information is listed, it contains lot numbers of items such as the fuse or the ball and tracer but not the propellant the rounds contain. The ammunition data card must be viewed to find the lot number of the propellant that is loaded into these rounds. In a number of cases, especially for small arms cartridges, the loaded propellant lot is not represented in the master sample program at APSL. Thus, much of the propellant loaded into cartridges of all calibers has not been tested for stability since the day it was loaded. For some older cartridges, this can mean the propellant has not been monitored since the 1950s or even earlier. Although the Army considers propellant in fixed rounds as not hazardous, when these rounds are no longer needed and are processed for demilitarization, propellant stability becomes an immediate safety issue.

Picatinny Arsenal stored master samples of small arms powder as shown in photo in 1922. This facility, which was built in 1920, was destroyed in 1926 by an explosion at the Lake Denmark Navy explosives facility adjacent to Picatinny Arsenal. All buildings at Picatinny Arsenal were destroyed in the explosion.

Generating Bulk Propellant From Download

With the exception of most small arms ammunition, when fixed rounds are demilitarized, the projectiles are usually pulled apart from the cartridge cases and the propellant inside is emptied into a large container—usually a fiber drum—that will hold from 50 to 100 pounds of propellant. A single demilitarization project may generate hundreds of drums of propellant, usually of many different lot numbers. Suddenly, propellant that has spent its entire life in a configuration that was considered inherently safe from the risk of autoignition is now bulk packaged and stored in a concentrated mass that may be sufficient to allow autoignition to occur. If unstable propellant is unknowingly packed into a bulk container, autoignition could occur within weeks or even days. Once a demilitarization job begins, there may not be time to prepare and ship a sample to the APSL and wait for the test result to know if unsafe material is being retained.

Military propellants are becoming increasingly valued as a commercially viable product. Unwanted propellants can be used as an ingredient in the manufacture of industrial blasting gels and slurries, remanufactured as smokeless powder for small arms, or processed into agricultural fertilizers. Even if the installation that is demilitarizing munitions has the capability and necessary environmental permits to burn the propellant (and many do not have them), propellants today have become a marketable commodity that can and should be recycled.

To retain the propellant or transfer it to a third party for recycling, the stability of the propellant needs to be determined. Shipping it to APSL is slow and expensive. Establishing a small propellant surveillance laboratory with HPLC capability at the installation level is not considered economically feasible or sustainable. We needed to find a better way.

Field-Portable Stability Test Capability

In the mid-1990s James Wheeler, then Associate Director for Demilitarization Technology and chair of the demilitarization subgroup of the Joint Ordnance Commanders Group, requested proposals for designing and building a field-portable propellant stability tester. He envisioned an easy-to-use device or kit that could be carried by one person, moved to wherever propellant is located, operated by existing ammunition logistics or surveillance personnel with minimum training, and, most importantly, produce real-time results considered safe and accurate. Jim Wheeler's vision resulted in the development of two propellant stability field test kits: the ammunition peculiar equipment (APE) 1995 near infrared (NIR) propellant stability analyzer and the thin-layer chromatography (TLC) propellant stability test kit.

Both of these test sets are capable of providing qualitative data to determine safe stability levels for the storage, transport, or ownership transfer of nitrocellulose-based propellants. Although RES levels are identified by each test and may be expressed quantitatively in terms of percentage of RES by weight, the test results are used in more of a "go/no-go" fashion. The "no-go" RES level for both test sets is considerably higher than the level that we use to identify propellants as stability category D (less than 0.20 percent RES) and is higher than the level for minimum stability category C (less than 0.30 percent RES). Using a higher level of stability (between 0.35 percent and 0.45 percent RES) as a cutoff for our field test sets gives us a greater margin of safety. Propellants that test at or below the cutoff levels will be either demilitarized or sent to the APSL for a HPLC test.

APE 1995 NIR Propellant Stability Analyzer

The APE 1995 is a model of simple operation. Once assembled on a workbench or small tabletop, individual propellant samples can be sequentially analyzed for stability at a rate of no more than 5 to 10 minutes per sample. Since the test is completely nondestructive and requires nothing more than electricity to conduct an analysis, it generates no hazardous chemical or energetic wastes. The APE 1995 was developed for the Army Defense Ammunition Center (DAC) by a division of Science Applications International Corporation, formerly known as Geo-Centers, Inc., at Picatinny Arsenal.

The APE 1995 is made up of three major components: a FOSS NIRSystems Spectrometer, Model 5000II; a laptop computer; and an uninterruptible power supply. The operator loads propellant into a removable cell and places the cell into the unit's transport module. The optical window-side of the cell faces a tungsten-halogen light source as the cell moves through the light. Any differences in the sample, such as color, size, shape, or grain orientation, are averaged. The light is reflected onto detector elements of silicon and lead sulfide. Differences in the reflected light patterns (spectra) indicate varying stabilizer levels. These spectra are compared to predictive chemometric models of the same propellant type that are stored in the computer. The results of these comparisons indicate if the sample's stabilizer level is at or below the cutoff level that requires more extensive analytical testing.

Two of the strongest features of the APE 1995 NIR analyzer are its simplicity of operation and speed of analysis. If samples are made available to the operator,

Stability Category	Percent Effective Stabilizer
A	0.30 or more
B	0.29 – 0.20
C	less than 0.20

A – Acceptable stabilizer loss. Lot is safe for storage until next required retest date.

B – Significant stabilizer loss. Lot does not represent an immediate hazard, but it is approaching a potentially hazardous stability condition. This level of stabilizer loss does not adversely affect functioning in a finished round configuration.

C – Unacceptable stabilizer loss. The lot presents a potential safety hazard and is an unacceptable risk for continued storage as bulk propellant, bulk-packed components, or as separate loading propelling charges. The risk of autoignition of propellant in stability category D increases with time. Demilitarization must be completed within 60 days of notification for bulk propellant, bulk-packed components, and separate loading propelling charges.

Table 13–2 from Supply Bulletin 742–1, Ammunition Surveillance Procedures

propellants can be analyzed at a comfortable rate of 10 to 12 lots per hour.

In September 2002, the Joint Propellant Safety Surveillance Board (PSSB) validated the APE 1995 NIR Propellant Stability Analyzer as a screening tool for determining the general stability of solid propellants. The PSSB is the joint services technical advisory board of the Joint Ordnance Commanders Group quality assurance subgroup for policies and procedures pertaining to gun propellant stability. Since the PSSB endorsement, the APE 1995 units have been fielded to Arifjan, Kuwait, and to Tooele Army Depot, Utah, for use in demilitarization operations, and a unit has been sold to the Saudi Arabian National Guard. Indiana Ordnance Works, Inc., is also operating an APE 1995 in conjunction with an Army propellant recycling contract. APE 1995 units are slated for issue to Hawthorne Army Depot in Nevada, Crane Army Ammunition Activity in Indiana, and Anniston Munitions Center in Alabama.

At least a dozen different models of artillery and small arms propellant, including the most-used types, such as M1, M6, M8, M9, and WC-series, are currently within the APE 1995's test capability. Work continues to expand the types and models of propellants that APE 1995 is capable of testing.

TLC Propellant Stability Test Kit

Eight years of research and development by the Lawrence Livermore National Laboratory's Forensic Science Center led to the TLC propellant stability test kit, a field-portable set that gives trained quality assurance specialists (ammunition surveillance) (QASASs) and others the ability to produce lab-quality results in an onsite, real-time mode. A miniaturized wet laboratory with single-person portability, the kit is powered by either a redundantly designed, dually capable 110-volt wall current or self-contained, rechargeable batteries. The TLC test kit can be used almost anywhere to test for safe levels of RES in solid propellants that are stabilized with diphenlyamine, 2-nitrodiphenylamine, ethyl centralite, or Akardite II. The ability to analyze all four of the most-used stabilizers makes it possible to test almost all of the propellant powders in the DOD inventory.

The TLC method provides a go/no-go response within a critical range of RES levels; propellants with results that fall below the predetermined cutoff level are either demilitarized or subjected to a full chemical analysis by HPLC. The TLC method was developed for the Army to be used as a screening tool to determine the amount of stabilizer contained in solid propellant that is not in the active stockpile (third party assets or demilitarization assets). When directed by the JMC-managed Propellant Stability Program, both the NIR and TLC methods may also be used to test propellants in the active stockpile.

Conventional TLC analysis is routinely used in analytical laboratories worldwide for qualitative and semi-quantitative characterization of unknown materials. Although TLC is ideal for rapid screening, is highly sensitive, and readily identifies the analytes sought in the complex propellant stabilizer samples, it has previously been considered a technique appropriate for use only in the laboratory, never for the field environment.

Unlike column chromatography approaches, such as HPLC or gas chromatography-mass spectrometry, that can only process single samples sequentially, a single TLC plate can accommodate and analyze multiple samples and standards. Samples are chromatographed simultaneously in a solvent tank, separating the stabilizer analytes from the sample matrix. Semi-quantitative assessments with nanogram detection limits are readily obtained by inspection of the plates. The kit is designed and equipped with sufficient supplies and equipment for

the analysis of up to 30 individual samples by a single operator per day.

Once the chromatography is completed, the resolved propellant stabilizer components that appear as separated spots on the TLC plates are further enhanced by coloring with a unique reagent if the samples are diphenlyamine or 2-nitrodiphenylamine stabilized propellant types. If stabilized with ethyl centralite or Akardite II, the spots are viewed under the ultraviolet light that is fitted to the camera box. Quantitative analysis is performed using the digital imaging box, camera, and data acquisition equipment. The major advantages of the TLC method are simultaneous chromatography of multiple samples and standards, extremely low detection limits, the ability to calculate within a given range, and simplicity of operation.

TLC Endorsed by Joint Services Board

The Joint PSSB, which was chartered to "Establish criteria used to evaluate the safety of propellant inventories," prepared a validation test plan that was used to evaluate the TLC test kit and its methodology. The results of the validation tests led to the endorsement by the board.

The NIR propellant analyzer was brought into the Army inventory as an item of APE. However, the TLC test kit was developed for Army use with the intention of transferring the technology to industry. The transfer began in 2005, when Lawrence Livermore began to work with Pelatron, Inc., of Honolulu, Hawaii, to initiate the commercialization process. In 2006, DAC issued a contract through the Army Corps of Engineers, Honolulu District, that brought the talents of Pika International, Inc., into the final equipment fielding effort.

The fielding of a TLC test kit involves a 2-week training course on kit operation and the handing-off of kit and supplies at the receiving installation. In 2006 and 2007, personnel from Pika International and Pelatron led a fielding team that included scientists from Lawrence Livermore as well as hands-on involvement and management oversight from DAC. Using personnel from Lawrence Livermore as a technical resource, the training and fielding events were planned, managed, and conducted by a mobile analysis team that trained QASASs and other users to become certified TLC operators.

Pelatron has assumed final and future commercial development, manufacture, distribution, maintenance, and management of the TLC test kit. The Army and other Government kit holders will use Pelatron for supplies and services.

Fielding of the TLC Kit

The first training and fielding event occurred at Tooele Army Depot, Utah, in August 2006. Four Tooele personnel were trained, and a TLC test kit was issued for their use. Tooele personnel began actual propellant stability screening tests during fiscal year 2007.

Hawthorne Army Depot was next to receive the TLC capability in January 2007. Anticipating the installation of a blasting agent manufacturing facility on the depot during 2008, Hawthorne needed the ability to conduct onsite TLC testing that would allow its personnel to screen propellant from the demilitarization stocks that would become a component of the blasting slurries. The TLC test kit is primarily used to test the propellants for which the APE 1995 is not calibrated.

Personnel from Aberdeen Proving Ground, Maryland, and Yuma Proving Ground, Arizona, were trained at Aberbeen Proving Ground in April and May 2007, with special emphasis placed on the wide variety of nonstandard propellants that require stability testing. The proving grounds maintain hundreds of lots of very small quantities of propellant that are frequently not represented in the master sample program. The Army Test and Evaluation Command plans to use the TLC test method to maintain effective safety surveillance of these assets.

Safety surveillance of artillery and small-arms propellants for safe stability levels will be required for as long as we continue to use nitrocellulose as a primary energetic material. The continuing work of the service propellant laboratories and effective field surveillance programs have prevented most autoignition accidents that might have occurred. The Army still has a large stockpile of active propellants. The decreased reliance on major caliber gun systems both on land and at sea has resulted in the retirement of many gun systems and the accumulated storage of tens of millions of pounds of unneeded propellants. These excess propellant powders, ranging in age from nearly new to over 60 years, will remain an additional burden on the propellant surveillance community until their final disposition through sale, reuse, ingredient recovery, or destruction. The growing availability and use of field-portable propellant stability test equipment, such as the NIR and TLC systems, will help APSL implement a more robust, responsive, and flexible propellant surveillance program to meet our current and future needs. **ALOG**

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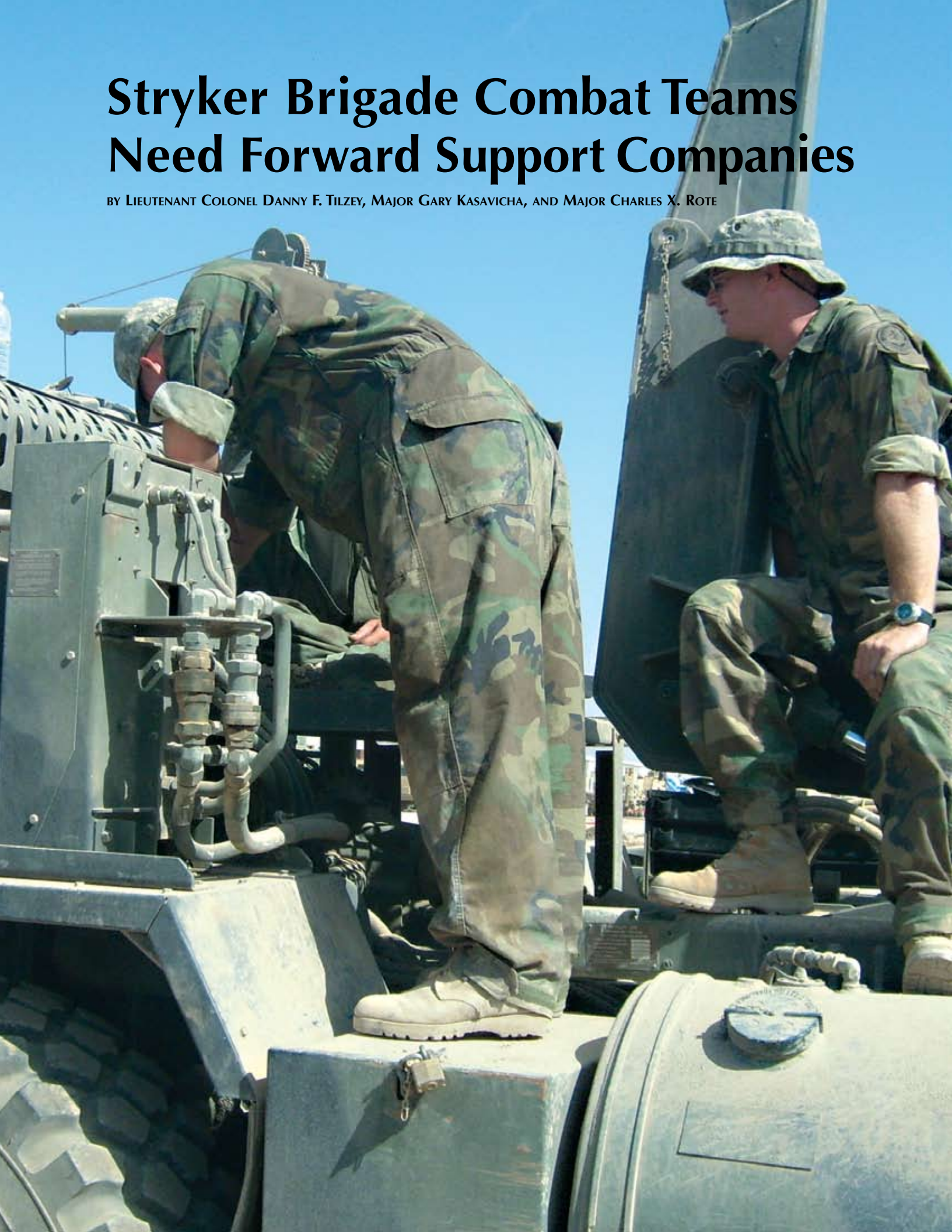
Stryker Brigade Combat Teams Need Forward Support Companies

by Lieutenant Colonel Danny F. Tilzey, Major Gary Kasavicha, and Major Charles X. Rote



Heavy and infantry brigade combat teams are organized with forward support companies. The authors believe the Stryker brigade should be no different.

The Army needs to build the sustainment capability of the Stryker brigade combat team (SBCT). The SBCT, which currently has equipment, personnel, and capability shortfalls, needs to be better equipped for future conflicts that will occur in immature theaters of varying levels of intensity. The Army is proposing to add Soldiers to the SBCT table of organization and equipment (TOE) to increase the capability of the brigade support battalion (BSB). As it currently stands, the BSB consists of a headquarters and headquarters company (HHC), a distribution company, a maintenance company, and a medical company. In this article, we propose how to slot BSB Soldiers most effectively and recommend TOE changes that would more adequately support the SBCT, namely by creating forward support companies (FSCs). (See chart on page 28.)

While the SBCT has been overwhelmingly successful throughout Operation Iraqi Freedom (OIF), the brigade's inherent capability gaps must be addressed if it is going to operate in more austere environments during future conflicts. The SBCT needs to be redesigned to bridge the gap between its modular organization and that of its counterparts, the heavy brigade combat team (HBCT) and the infantry brigade combat team (IBCT).

The Bottom Line

Using existing personnel and equipment in its inventory, the Army can increase the SBCT's BSB sustainment capability with the addition of 238 personnel and associated equipment. This increase would expand the BSB's sustainment capability from 4 companies to 10 and would add logistics capability to the SBCT by placing an FSC in each battalion. Even with this proposed change, SBCT units would retain a simple support structure.

To put the proposed increase in perspective, we can look at the modification TOE (MTOE) of our SBCT, the 2d Stryker Cavalry Regiment (2d SCR). According to its MTOE, dated 16 June 2007, the 2d SCR's authorized strength is 4,039. The 2d SCR's regimental support squadron (RSS), which is the equivalent of a BSB, is currently authorized 722 personnel. The Army can maximize the 2d SCR's combat power while minimizing the overall footprint by realigning assets, such as field feeding teams and combat repair teams, under FSCs. The result of this realignment would be a total of 960 logistics Soldiers supporting the brigade in the RSS and FSCs.

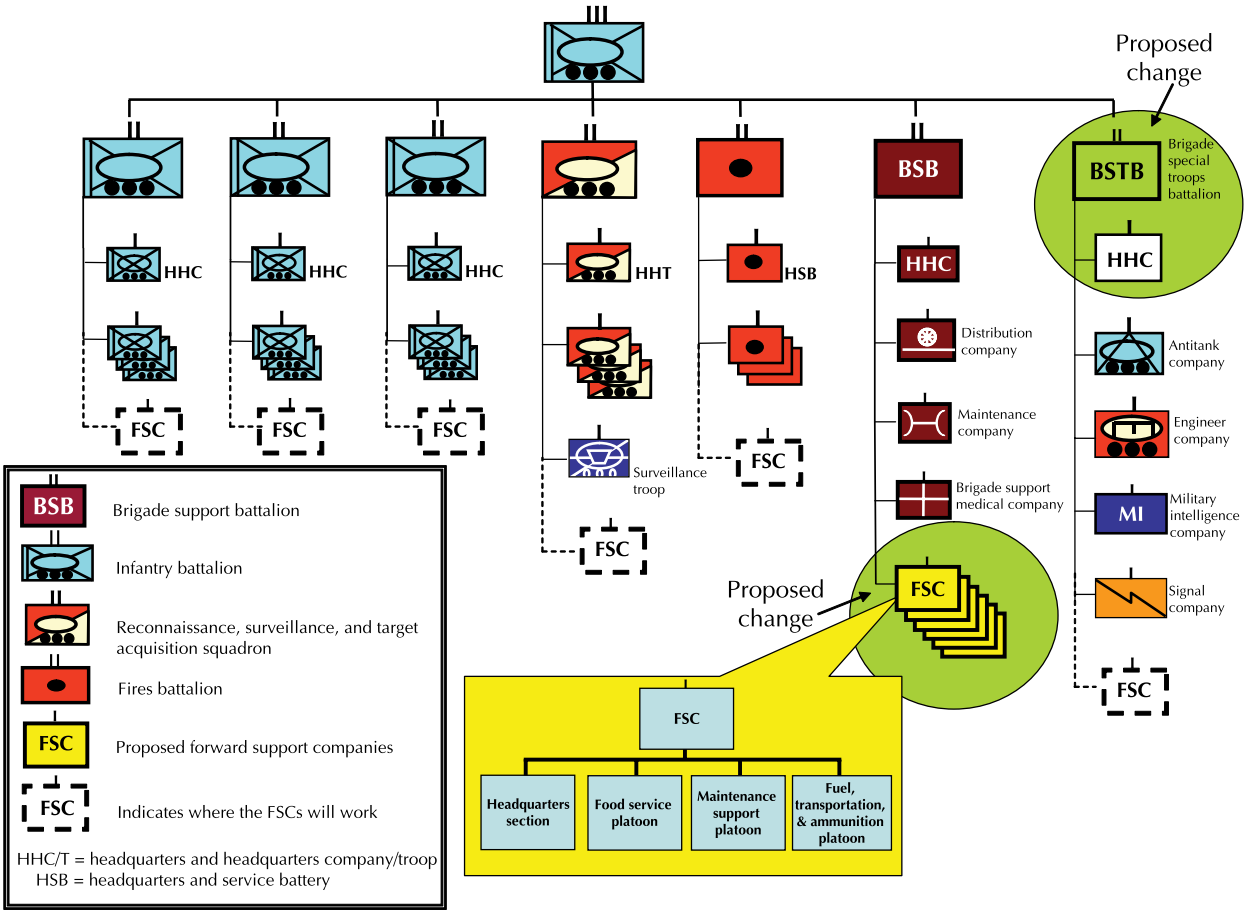
History of the SBCT

The SBCT was originally developed to be a lethal, rapidly deployable, technologically advanced fighting force. The interim BCT, as the SBCT was known in its infancy, was envisioned by then Army Chief of Staff General Eric Shinseki as a medium force that would essentially bridge the gap between the light and heavy divisions. This force would be quick to deploy, yet it would maintain adequate firepower to engage any enemy threat. Originally, the interim BCT was going to consist of 5 maneuver battalions, a support battalion, and 6 separate companies totaling approximately 3,900 personnel. Under the original organization, the support battalion consisted of only 318 Soldiers.

To increase the number of maneuver units in the brigade by one infantry battalion, all sustainment power was consolidated in the support battalion (borrowing from the Force XXI concept of aligning the support and maintenance platoons in the support battalion). This reduced the sustainment capability to a level lower than what was found in traditional heavy or light brigades. The absence of support platoons in the maneuver battalions placed the entire mission of supporting all SBCT sustainment operations on an undersized support battalion.

In October 2001, the interim BCT was tested in a series of exercises in Yakima, Washington. These exercises determined that the size of the support battalion was inadequate to provide sufficient sustainment to the brigade. To fill the shortfall, 300 personnel were added to the MTOE, bringing the total number of support personnel to 618. The increase included the formation of a separate combat service support company (CSSC) in an attempt to augment the brigade's sustainment capability. The CSSC personnel were quickly absorbed into the BSB during training and garrison requirements, and the company was dropped from the SBCT TOE in fiscal year 2004. The interim BCT officially became the SBCT in its current form on 24 September 2002, and it has performed admirably during five rotations in support of OIF.

Two Soldiers from the Regimental Support Squadron, 2d Stryker Cavalry Regiment, work on the hydraulic system of a load-handling system, which is a key transportation platform for moving critical classes of supply throughout the operating environment.



This chart represents the authors' proposed modifications to the current SBCT organization. The changes include adding FSCs to the BSB for employment in the maneuver battalions and placing the engineer, signal, antitank, and military intelligence companies (which currently operate independently) under the command of a brigade special troops battalion.

Doctrinal Mission of the SBCT

Field Manual 4–90.7, Stryker Brigade Combat Team Logistics, states—

> The BSB is designed to perform centralized C2 [command and control] of all logistics operations, including Army Health System (AHS) support under the C2 of the BSB headquarters. The BSB staff executes logistics operations through a C2 system complemented with an array of digital information systems. In addition, the BSB has the capability to integrate into BSB operations the logistics assets required to support units or personnel augmenting the SBCT.

The BSB maintains all SBCT sustainment assets except for the medical platoons. Sustainment assets are managed by the battalion's support operations officer (SPO), who, along with the brigade S–4, develops and uses the concept of support to commit assets and ensure that mission failure is never the result of insufficient sustainment support.

SBCT doctrine states that the support battalion will rely on echelons above brigade (EAB) to provide support and to fill the gaps of the organic support battalion. In theaters like OIF with very large sustainment bases and contractor support readily available, the SBCT does not have to rely solely on the support battalion. Contractors, such as KBR, provide contracted food, laundry, and shower services in forward operating bases throughout Iraq and Afghanistan. Unlike Soldiers, logistics contractors do not perform guard duty or participate in patrols or convoy security; their sole responsibility is to provide logistics services.

The challenge begins in austere environments, where hardened operating bases are unavailable and the enemy situation is deemed too dangerous to allow contracted support. The SBCT by design may be employed during the initial phases of an operation, and the mission's logistics requirements could exceed the brigade's current sustainment capability of approximately 96 hours. Battalions also routinely conduct decentralized operations in which platoons and companies are spread out across the operating environment. Under these conditions, dedicated contract support, such as that provided by KBR, would not be feasible and the EAB support would not be available until the operating environment was secured.

The Reality of Logistics in an SBCT Today

To ensure the concept of support is successful, SBCT support battalions rely on the formation of logistics support teams (LSTs). An LST is essentially a team of logistics Soldiers and equipment formed from BSB assets and typically attached to a maneuver battalion in the brigade. If it is not fully attached, it has a relationship with the maneuver brigade resembling a direct support relationship with operational control or tactical control. (Some would say it is an ad hoc version of "attached.") Stryker units have various names for LSTs, such as "forward area support team," "forward support element," or the traditional "forward logistics element." The bottom line is that they all have the same task and purpose: to provide dedicated sustainment support to an assigned maneuver battalion.

Although LSTs do begin to address an overall capability shortfall, the concept is merely a "band-aid" to ensure mission success. LSTs have few sustainment and manpower resources, and they lack leadership from the support battalion. Because the resources that an LST has are informally dedicated to its maneuver battalion, using the LST concept makes it harder for the BSB to reroute redundant resources to other efforts.

During combat operations, the 2d SCR RSS attaches the LSTs directly to the maneuver squadrons, which use the assets to replicate the functions of a support platoon. The LSTs work and live with the units they support and provide sustainment support within the maneuver battalions' operating environments. The integration of support assets into the maneuver battalions does, however, come with a cost. The LST does not have the capability to meet most contingencies; to resource it to that extent would strip the BSB of key sustainment assets and personnel and reduce the BSB's ability to support the overall brigade mission.

The BSB has to task-organize its assets to fulfill the support platoon mission while simultaneously fulfilling its requirement to support the brigade as a whole. The goal is to meet the maneuver units' requirements and have enough sustainment capability to support most unforeseen missions. But the BSB can only meet both requirements if changes are made to its organization.

Capability Shortfalls in the BSB

Discussions about the SBCT BSB's capability shortfalls have occurred since the inception of the SBCT; however, those shortfalls should be looked at with renewed interest in light of the "Grow the Army" initiative. The SBCT force design update and the Army Infantry Center have recognized that the SBCT has several capability gaps. Currently, the upgrade of the SBCT BSB to the modular BCT standard is in the works and will likely occur in fiscal year 2010. In the proposed changes, some prioritization issues exist and some capability shortfalls remain unaddressed.

Historically, the bill payer for the increased combat capability in SBCT force design has been sustainment forces. To meet deployment timelines and personnel limits, assets had to be cut from the SBCT force structure, and the majority of the reductions in personnel strength and equipment were from the BSB. Experience proved that, even though the organization has enormous combat capability, the SBCT will always be hindered if it does not have sufficient sustainment. Correcting critical shortfalls in the BSB must be made a priority for changes in sustainment shortcomings to have greater operational significance.

Modifying the SBCT's Organization

Ideally, all of the SBCT's maneuver battalions should have on their MTOEs the organic logistics personnel needed to man FSCs sufficiently. Then the BSB, which should be equally well-equipped, could focus on reinforcing sustainment support. Unfortunately, this scenario is currently not possible because of the direct combat probably coding (DCPC) classification, which prevents female Soldiers from being assigned in forward combat arms units. Many female Soldiers are assigned to FSCs, so an FSC cannot fall under the MTOE of the maneuver battalion that it supports. Because of the DCPC, each FSC is required to fall under the MTOE of the support battalion; the BSB owns the FSCs and attaches them to the maneuver battalions.

Regardless of the current coding, the belief that this coding is a deciding factor in the employment of logistics assets in the current operating environment is a fallacy. The argument about employing female Soldiers "forward" should be revisited based on the fact that the linear battlefield no longer exists.

The SBCT will experience increased success and efficiency in sustainment operations if the sustainment structure is modified to include an FSC for each maneuver battalion. FSCs will allow the support battalion to push logistics support effectively to units. The FSCs would be MTOE-structured organizations, which would work, train, and live with the units they support during garrison and tactical operations. The FSCs would be fully integrated into the daily operations and training plans of their supported battalions, leading to stronger customer relationships through routine interaction.

Proposed FSC Design

Personnel, fuel support, sustainment, movement, armament, and maintenance changes are all required for the SBCT to accommodate FSCs. By employing FSCs, the support battalion can provide the necessary support to the maneuver battalions and still have enough assets and capabilities remaining to support the SBCT as a whole.

Personnel. The FSC command and operations element, like any company, will have a designated commander, who will be a logistics branch captain or a senior first lieutenant. So, the number of command slots will increase by six. Logistics officers must be familiar with the key differences in supporting HBCTs, IBCTs, and SBCTs. The Combined Logistics Captains Career Course is the ideal venue to provide this program of instruction. Each FSC will also have a first sergeant, who will manage enlisted functions, and an executive officer to serve as the operations officer. The executive officer will work with the maneuver battalion S–4 and operate according to the battalion commander's intent.

The FSC will include a headquarters and three platoons: a food service platoon (FSP), a maintenance support platoon, and a fuel, transportation, and ammunition platoon. Each platoon will have a platoon leader and a platoon sergeant to perform the required leadership functions. Each FSC will require the same fuel, transportation, food service support, armament, and maintenance military occupational specialties (MOSs) that the LSTs currently have, but the additional personnel will augment the LST's current capabilities.

Fuel. The FSC will require two M978 heavy expanded mobility tactical truck fuelers, six 500-gallon collapsible fuel blivets, and two forward area refueling equipment (FARE) systems to support class IIIB (bulk petroleum, oils, and lubricants) storage and distribution requirements. The additional fuel blivets and FARE systems will provide the unit with the ability to configure flatracks of class IIIB and drop them at specific locations for rapid refuel operations.

Water. Bulk water will be required for hygiene, medical operations, food preparation, and maintenance operations. Bulk water is essential in locations where bottled water is not available. Each FSC will require one "Hippo" water tank rack system for rapidly refilling 900-gallon "Camel" water trailers and 5-gallon water jugs for resupplying company and platoon locations.

Field feeding. Each FSC will require an FSP to replace the current field feeding team. The FSP will use the containerized kitchen and the kitchen company level field feeding (KCLFF) system to provide centralized and decentralized food service support for the battalion. The KCLFF system can be used for preparing all standard rations in the Army supply system.

Movement. To improve transportation capability, each FSC will require two M1120 load-handling systems (LHSs) with M1076 palletized load system (PLS) trailers. This equipment will provide each maneuver battalion with the capability to move all bottled water and classes I (subsistence), II (clothing and individual equipment), IIIP (packaged petroleum, oils, and lubricants), IV (construction and barrier materials), V (ammunition), and IX (repair parts) in support of battalion operations. To carry supplies and equipment, each LHS trailer system requires two container roll-in/roll-out platforms (CROPs), for a total of four.

Ammunition. The FSC requires a five-Soldier team of MOS 89B ammunition specialists to request, receive, draw, and store class V for the battalion. The ammunition section requires one LHS and PLS trailer (with two CROPs). Additional transportation requirements will be coordinated through the FSC operations officer, who is the FSC executive officer. The section also requires one 6,000-pound rough-terrain, variable-reach forklift for materials-handling requirements. The ammunition section of the FSC will manage class V throughout all training and tactical operations.

Maintenance. The current maintenance company's combat repair team (CRT) and some additional personnel will form the maintenance support platoon (MSP), which will provide the field-level maintenance required for battalion operations. The MSP will perform component and major assembly replacement for supported equipment. The MSP will use Standard Army Management Information Systems (STAMISs) and the very small aperture terminal system to perform the principal tasks of assessing and reporting maintenance requirements according to Army regulations.

The MSP platoon leader and maintenance technician (an MOS 915-series warrant officer) will provide the updated maintenance status and make recommendations to battalion leaders regarding maintenance management. The platoon leader and maintenance technician will assess the MSP's ability to restore combat power and decide if any equipment is beyond the unit's ability to repair. They will coordinate with the FSC executive officer to request back-up maintenance support from the BSB (allocated through the SPO). Delivery of class IX to the platoon is required to facilitate continuous forward maintenance operations.

A significant modification to maintenance operations is the pending initiative to transfer maintenance tasks from General Dynamics Land Systems (GDLS) contractors to Soldiers. This initiative, called "GDLS to Green," requires the addition of Stryker-specific class IX and special tools to the Army supply system. Currently, Stryker parts and tools are owned and managed by GDLS, but the Army will order and manage them through the Standard Army Maintenance System-Enhanced.

Required Modifications in the HHC

In the HHC, three changes in the SPO section must be addressed. The staff design of the SPO section is one of the best templates for successful sustainment management and has been adopted into the development of other modular brigades. However, shortfalls exist in the manning of the mortuary affairs and

Critical Stryker repair parts and tires are loaded for a combat logistics patrol using a load handling system and palletized load system trailer.

combat service support automation management office (CSSAMO) sections and in contracting capability.

Additional mortuary affairs personnel. The 2d SCR's current MTOE authorizes one MOS 92M, mortuary affairs specialist, who is the sole proponent in the brigade for all actions involving the processing of remains and personal effects. The mortuary affairs noncommissioned officer provides technical advice on mortuary affairs issues, including establishing a hasty collection point. In the mature theater of Iraq, that process averages 16 hours from the time of the incident to the time the remains depart the theater. When multiple losses occur, the time is cumulatively longer. This significant shortfall could be addressed with an MTOE change, specifically by increasing the grade of the mortuary affairs noncommissioned officer from sergeant to staff sergeant and by adding another sergeant.

Organic CSSAMO capability. The SBCT is peculiar in that it is an organization on the cutting edge of technology, yet it lacks organic CSSAMO capability. The SBCT maintains many STAMISs that provide the situational understanding needed to make sustainment support decisions. Currently, units pay millions of dollars for this ability in the form of contracted support. Those funds could be better spent by establishing organic CSSAMO capability.

Contracting. The last recommendation for change in the HHC is to reinstate the contracting officer positions in the SPO section. The original TOE called for a contracting officer at the rank of major, but the requirement was dropped in fiscal year 2004. Over the last few years, it was determined that the contracting officer team requirement is valid.

The SBCT has a requirement to manage over 70 contractors who deploy with the brigade, but the capability to do so is either absent or dispersed throughout the organization. To address the problem, the Army has created contingency contracting teams (CCTs). Doctrine calls for each deployed BCT to have a CCT, but these new formations have yet to be fielded to prove their effectiveness. SBCTs must maintain a contracting team on their MTOEs.

Heavy Recovery Capability

When the SBCT was in its infancy, it was widely understood that many SBCT concepts were based on technology that had not yet been developed. Keeping the Nation's Army the most powerful in the world requires this type of visionary force structure development. However, early plans for advanced equipment cannot be used to excuse current shortfalls. The Army's inventory now has systems available to cover shortfalls in the BSB's recovery capability. The BSB needs two M88 recovery vehicles and five heavy equipment transporters. With the vehicles' associated crews and trailers, this equipment meets the recovery requirements of an SBCT in OIF. Equipment capability deficiencies were addressed with theater-provided equipment, and Soldiers received additional driver and recovery training to operate the equipment; the same could be accomplished in future MTOE changes.

Product managers have mentioned the importance of developing and fielding a vehicle that can recover a Stryker that has been catastrophically damaged or has rolled over. While waiting on the fielding of a new system, the lack of recovery capability is no more acceptable than choosing to leave a Stryker on the battlefield. Doctrinally, the SBCT is supposed to be able to deploy within 96 hours. This is unrealistic when you consider the requirement for organizational heavy recovery assets on the battlefield mentioned above. Adding Stryker recovery assets will make the SBCT heavier than it was designed to be, but this capability is needed now.

Medical Capability

Because of the shortfall of the Stryker medical evacuation vehicle (MEV), the SBCTs' brigade support medical companies were fielded the M997 field litter ambulance (FLA) to be used as a MEV. Initially, the FLA was acceptable to meet deployment timelines and medical evacuation standards, which were based on the linear battlefield. But the current medical company requires an armored ground evacuation platform to meet the demands of the current operating environment. This operational need was approved at the Department of the

Army level on at least two separate occasions through the equipment common operating picture, but it still has not been resourced. In order to man the MEVs, an additional 15 healthcare specialists (MOS 68W) are needed to fill the requirement for a third crewmember in each MEV. The three Soldiers that are required in the vehicle are a driver, a vehicle commander, and a medical attendant for patient care on site and during movement.

The SBCT's medical capability can be strengthened in other ways as well. The brigade medical warehouse must be authorized a school-trained medical logistics officer (area of concentration 70K) in the grade of first lieutenant. The brigade medical supply office mission requires pharmaceuticals and narcotics management, so an additional pharmacy specialist (MOS 68Q) also must be added to the MTOE.

Meeting the Most Unforeseen Circumstances

A strong comparison can be made between the FSC's relationship to a battalion and the old forward support battalion's relationship to a brigade. One capability that should be considered for the BSB is the ability to replace the personnel and equipment in an FSC, just as the main support battalion was able to do in the old division support command. In the future, the U.S. military's undisputed dominance of a theater of operations may not be as certain as it has been in recent times. The ability to reconstitute an FSC that is rendered ineffective by an enemy would enable the SBCT to be a strategically responsive force.

In order to supply a replacement FSC, the BSB MTOE would have to contain redundant personnel and equipment. For example, the HHC would maintain a field feeding team that is manned with enough cooks and equipment to be able to push personnel and equipment to a maneuver FSC in the event that the FSP is rendered incapable of performing its mission. The distribution company would retain enough personnel and equipment to replace the FSC's loss of fuel and transportation assets. The maintenance company would have a CRT embedded in the wheeled vehicle repair platoon that could quickly detach and fill the requirements of the FSC's maintenance support platoon, if needed. This design would allow commanders to pull individual sections or resource an entire FSC. The BSB, as a customer, would normally use the brigade special troops battalion's FSC for food service, distribution, and maintenance support.

The use of FSCs will allow maneuver battalions to conduct autonomous operations across a spectrum of conflict. Fundamentally, an SBCT must see first, understand first, act first, and finish decisively; it does this by incorporating digital capability into the combined arms fight and by relying on intelligence that is available within the brigade. The FSC is nested in the concept that "intelligence drives maneuver." FSCs allow maneuver battalions to plan and execute operations without relying on additional support. An LST could never support a maneuver battalion without significant augmentation. Combat operations in OIF 04–06 and OIF 07–09 demonstrated the importance of battlefield agility; future operations will be no different.

As the Army continues to transform and redesign its fighting forces, changes needed for the support battalion to meet the brigade's sustainment requirements become more apparent. The current capabilities of an SBCT BSB are not adequate to support seven battalions and maintain the flexibility needed to push sustainment assets where and when they are needed. The BSB's capability gaps will only continue to expand when the SBCT has to perform tactical operations in a logistically undeveloped theater. A determined enemy that can operate in land combat operations and pose an increased threat will take advantage of these gaps. We believe that the resources proposed in this article will provide the BSB with the capability to meet the sustainment requirements of current and future SBCT missions. Now is the time to address these requirements and develop a TOE that will allow this premier fighting organization to meet the warfighting challenges presented now and in the future. **ALOG**

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Successful Implementation of Logistics Support Teams in an SBCT

by Lieutenant Colonel Dwayne M. Butler, Major Kenneth C. Bradford, and Captain Juliane C. Schwetz

Do Stryker brigade combat teams need forward support companies? The authors argue no—the LST can provide the responsive support that SBCTs need.

Stryker brigade combat teams (SBCTs) have a reputation of moving faster and farther in shorter amounts of time than any other formation on the battlefield today. Undoubtedly, this can be attributed to the SBCT's ability to sustain itself over extensive distances through the use of tailored, modular logistics support packages. The brigade support battalion (BSB) uses logistics support teams (LSTs) to accomplish this mission and enable the SBCT to be a truly unique and flexible combat power.

Many people believe that the Army should add forward support companies (FSCs) to the SBCT's organization, but the BSB can operate efficiently and effectively without changing to the FSC concept of support. Although FSCs have proven to be very effective in the other types of brigade combat teams, they are not necessary in SBCTs.

FSCs are not needed in SBCTs for two reasons. First, the SBCT's original concept documents called for a formation that would be agile, adaptive, and creative in its employment. Adding FSCs would make the SBCT heavier and less agile. The BSB has a sufficient number of personnel and key leaders and an adequate amount of equipment to support the brigade. Second, the protracted conflict that our Nation is fighting has placed a tremendous burden on the manning requirements of the total force. This burden has led to a need to increase the size of the Army. As we simultaneously conduct operations in the contemporary environment, transform the force, and prepare for future contingency missions, several key positions cannot be filled because of personnel shortages—particularly company-grade logistics captains. Creating additional manpower requirements for our logistics infrastructure is not necessary, economical, or beneficial to the total force.

A maneuver unit's buffalo is loaded by a local national crane onto a heavy equipment transporter from the forward operating base's main support unit.

Transformation and the LST Concept

Even at the highest levels, sustainment organizations are changing at a historic rate. As part of the Army's transformation, innovative and adaptive critical thinking brought about the concept of the expeditionary sustainment command (ESC), which has assumed the duties of the traditional division support command and corps support command. Before the transformation of logistics at the tactical level (or battalion task force level), the Army embedded maintenance, distribution, and field feeding teams into combat battalions as part of those battalions' headquarters and headquarters companies. When the Army transformed to the brigade combat team organization, combat battalions' maintenance, distribution, and field feeding assets were transferred to FSCs assigned to BSBs. The SBCT concept of support evolved even further, requiring the SBCT's BSB to provide adaptive and modular support to meet the changing demands of each supported unit.

To provide adequate logistics support, one SBCT developed the LST concept—a leader-centric concept that organizes tailorable and modular support packages under the command and control of an officer in the BSB. Ideally, the LST leader is an experienced lieutenant from the BSB. Lieutenants were deemed not only to be adequate for this duty but also to provide the greatest economy of leadership force.

LSTs, which consist of a combat repair team, a field feeding team, and distribution elements, are tailorable and responsive support packages that offer economical employment of the equipment and personnel already assigned to the SBCT BSB. With all of the logistics assets in the SBCT consolidated under the BSB, the LST provides an adaptable solution that allows the SBCT to provide the warfighter with a sufficient amount of logistics support.

The use of tailored packages has been practiced and proven to work in combat by many SBCTs. The LST concept has transitioned from being just a part of specific units' tactics, techniques, and procedures to a solution that is outlined in Field Manual (FM) 4–90.7, Stryker Brigade Combat Team Logistics. Now every SBCT BSB supports its brigade with teams of

A combat repair team mechanic teaches a class on Stryker recovery to Soldiers from another unit on the same forward operating base.

logisticians, led by company-grade officers from the BSB, using packages of equipment that are specific to the needs of each supported maneuver battalion.

The LST Leader

The LST's structure enables the BSB to employ its junior leaders and develop them as multifunctional logisticians. While the maneuver battalion is in garrison, the LST leader functions in the BSB in his assigned position, such as platoon leader or company executive officer. Five weeks before training begins, the LST leader participates in the supported maneuver battalion's training meetings so that he can anticipate sustainment requirements, integrate the LST into predeployment activities, and build a collaborative relationship with the maneuver battalion commander and key staff. At the onset of battalion-level training exercises (which typically require two or more commodities from the BSB) or operational deployments, the LST leader works within the maneuver battalion to provide logistics support.

The LST leader serves as his supported maneuver battalion's representative to the BSB support operations officer (SPO). He supervises all logistics operations within the battalion and tracks all BSB personnel and equipment operating in the LST. He also ensures that the battalion provides adequate force protection and convoy security for all logistics operations. The LST leader assists the battalion or squadron S–4 with the development of operational logistics requirements and forecasts and ensures that logistics status reports are completed and passed on to the BSB SPO. The LST leader provides command and control on the ground for both BSB logistics resupply point operations and internal battalion resupply missions.

The LST leader also serves as a liaison between the BSB and the maneuver battalion executive officer and S–3. This relationship increases situational awareness and situational understanding for the BSB SPO and commander. With the LST leaders providing information to the BSB from their maneuver battalions, the BSB SPO can ensure that each commodity and field service is adequately resourced for each battalion. The SPO becomes more of a deputy commander for operations and external support—a significant increase in his scope of duties and responsibilities.

Selecting the right LST leader is critical for success in today's fast-paced operational environments. When assigning personnel, battalion commanders and SPOs consider the capabilities of potential LST leaders and the personalities of each maneuver battalion's leaders. The BSB should implement officer professional development programs to prepare the LST leader for multifunctional tasks. Although the LST leader will retain traditional platoon leader responsibilities in garrison, he will be exposed to many duties that will enhance his officer development, provide a sense of purpose, and offer connections to higher operational functions.

Selecting the right LST leader is critical for success in today's fast-paced operational environments.

Although an LST leader has many of the same responsibilities as an FSC commander, an FSC commander also handles traditional command duties, such as property book reconciliation, administrative actions, and training. Employing junior officers as LST leaders enables BSB elements to focus on accomplishing support missions and creating truly multifunctional logisticians at a very early point in their professional careers.

Economy of Force

Maintaining the current SBCT BSB structure enables each maneuver battalion to have the necessary support while minimizing the logistics footprint on the battlefield. The LST is responsive to the warfighter's needs. It does not encumber the maneuver battalion commander with additional assets, and it allows the BSB SPO to surge sustainment assets if required. The LST concept is simple in planning and in execution. However, it does require the LST leader and the maneuver battalion leaders to develop a unique relationship prior to operational deployments. The LST concept provides an extremely flexible sustainment solution for the BSB commander. Through detailed mission analysis, the BSB SPO can move assets based on mission change or task organization change. This is more challenging to do with an FSC because of command and support relationships. The LST is minimal in nature, but adequate, so it is attainable with today's SBCT organization.

The LST is a sustainable concept and provides enough support to the maneuver battalion. Synchronization of equipment densities and personnel requirements for the LST is the dual responsibility of the BSB SPO and the LST leader. The LST is survivable because it has a smaller footprint than an FSC, so the maneuver battalion has fewer force protection responsibilities. The LST has the economic advantage of having sustainment Soldiers integrated into the maneuver battalion without creating the need for additional sustainment Soldiers and equipment on the battlefield. The LST leader can provide exceptional

mission integration between the BSB and the maneuver battalion and, as the resident subject matter expert, can assist the supported battalion's S–4 with the development of a viable sustainment plan.

Screening the LST

The screening criteria for operational courses of action—suitable, feasible, acceptable, distinguishable, and complete—apply to the selection and implementation of the LST.

Suitable. The LST is a suitable solution to sustaining SBCT maneuver battalions. It provides the appropriate level of capability with an adequate amount of command and control for any operational mission.

Feasible. Lieutenant Colonel Dwayne M. Butler and Major Eric J. Van De Hey outlined the feasibility of the LST in their article, "The Logistics Support Team: SBCT Combat Multiplier," in the November–December 2005 issue of Army Logistician. In this article, the authors articulated how the LST concept worked well in their unit's combat training center rotations and during deployment operations in Iraq. The LST provided a command and control node for direct support assets forward of the BSB and increased the sustainment capability for maneuver battalion commanders.

Acceptable. The LST concept is currently in place as an acceptable method of support as outlined in FM 4–90.7. The use of tailorable and flexible sustainment organizations should continue to increase in Army doctrine. This type of sustainment requires critical thinking and the development of concepts that do not fit into any established category.

Distinguishable. The LST is distinguishable from the FSC concept. The LST leader does not have Uniform Code of Military Justice authority over LST Soldiers or any administrative responsibilities for the equipment and Soldiers other than tactical readiness and mission execution.

Complete. The LST is a complete course of action with a command and control node and sustainment capabilities organic to the BSB. The flexibility to move assets allows the BSB SPO to optimize support for surge operations.

Drawbacks to the LST Concept

Although the LST approach is a sound concept in SBCT sustainment operations, this course of action has some disadvantages. First, maneuver battalion commanders would prefer to have sustainment capabilities indigenous to their organizations. But, as long as Title X regulations prevent females from being assigned to maneuver battalions, these organizations will not have organic logistics assets.

Second, the LST leaders and noncommissioned officers in charge must be taken out of current BSB positions, leaving the BSB area short of platoon leaders, sergeants, and squad leaders during full-spectrum operations. If all five maneuver battalions have an LST functioning in combat, five officer positions in the BSB will be left vacant. This problem can be relieved either by having the BSB's noncommissioned officers rise to the task or by shifting around lieutenants within the BSB before operational deployments. This risk is acceptable, but the effects must be mitigated through detailed training and systems integration by the BSB SPO. Another shortfall of the LST model is that individual LSTs may not habitually train with their supported battalions. The LST must be familiar with the supported battalion's standing operating procedures so that they can function together seamlessly in established battle drills. The fact that LSTs do not train with their maneuver battalions is understandable because the LST concept does not support the desire of many warfighters to "own" their logistics. Even with the FSC model, maneuver battalion commanders essentially lose their logistics assets. The unit's modification table of organization and equipment requires specific and thorough memorandums of

An LST leader confers with a combat repair team maintenance technician about supporting their maneuver battalion.

Combat repair team mechanics provide vehicle maintenance support to an explosive ordnance disposal unit.

agreement (MOAs) among commanders to mitigate conflict. These MOAs are often garrison-focused rather than operationally-focused.

Command and Control and Manning Issues

After taking an honest look at the Army and its current operational demands, we conclude that there are simply not enough personnel available to transform SBCTs to include FSCs. Creating FSCs to support each SBCT maneuver battalion would require 5 additional logistics captains and 5 additional first sergeants per SBCT, causing a total impact (over the seven current SBCTs) of 35 Combined Logistics Captains Career Course-qualified captains every 2 years. Currently, the "Grow the Army" initiative precludes the Army Human Resources Command from filling all of the Army's logistics captain requirements. Captain and major shortages already exist, and changing the SBCTs to include FSCs would just add more personnel requirements that will be left unfilled.

The FSC works well in other BCTs, but given the current manning and equipment shortfalls, the SBCT BSB can provide responsive support using LSTs. Changing the SBCT's table of organization and equipment to include FSCs is not necessary.

The FSC represents a well-known and easily understood concept for the leadership of today's Army. At first glance, the LST may appear to be a hastily developed, ad hoc unit, but the LST solution has evolved through critical thinking over multiple operational deployments and training exercises. Many commanders may be uncomfortable with the LST concept because of unfamiliarity or a lack of understanding in

Ammunition transfer and holding point Soldiers resupply ammunition while supporting operations in Baqubah, Iraq.

the implementation process. The LST concept requires exceptional sustainment synchronization and planning by the BSB SPO and increases the responsibility of logistics lieutenants. The BSB SPO must be intricately embedded into the SBCT's concept of operations and able to anticipate necessary changes in the LST's operational purpose and key tasks. Based on the SBCT's support requirements, the LST represents a course of action that the Stryker community should continue to follow.

The concept of the LST is a sound, viable, and executable sustainment organization for today's SBCT. The BSB commander and staff must provide additional training for LST leaders so they can be successfully integrated with the maneuver battalions. Today's SBCT BSBs are robust and can support the equipment requirements for the LST and provide appropriate personnel to man the organizations. The LST is the most advantageous solution for SBCT sustainment operations in today's ever-changing operational environment. LSTs empower junior leaders to become multifunctional logisticians early in their careers while enabling supported units to maintain a minimal footprint. Perhaps, instead of focusing on whether or not the SBCT needs to change to include FSCs, the discussion should be about when the Army is going to standardize LST doctrine. **ALOG**

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Executive Education for Depot and Arsenal Leaders

BY JERRY SHINN

An important contributor to the Army Materiel Command's (AMC's) drive to adopt private-sector best practices is the Depot and Arsenal Executive Leadership Program (DAELP). DAELP was established by AMC in 2003 to provide executive development for commanders and senior civilian leaders of the Army's depot and arsenal facilities. It is managed by the Institute for Defense and Business (IDB) in Chapel Hill, North Carolina, in conjunction with the Kenan-Flagler Business School at the University of North Carolina at Chapel Hill. The goal of the program is to give participants "a strategic overview of key functional, analytical and managerial elements required for effective leadership of large, complex organizations."

The 6-month program includes 5 weeks of resident instruction at Chapel Hill provided by faculty selected from Kenan-Flagler and other leading graduate business schools and corporate and military leaders. Participants spend 1 week on a group orientation tour of representative armed services depots and selected corporations. Each participant undertakes several worksite projects at his duty station and has 4 weeks of on-site residency with one of the program's host corporations. DAELP was designed for the Army, but participants now come from the Marine Corps, Navy, Air Force, and the Defense Logistics Agency.

In an interview after the May 2007 DAELP graduation, General Benjamin S. Griffin, AMC's commanding general, discussed the importance of DAELP's role in facilitating exchanges of information and experience between military and private-sector logisticians as part of the larger and ongoing transformation of military logistics. He described DAELP as "a place where good ideas come together." It exposes depot commanders to the latest information from a business school perspective, he said, and it provides a good environment for sharing ideas among depot commanders.

Among the innovations conceptualized through such exchanges of information with the private sector and the application of Lean Six Sigma principles, General Griffin mentioned the creation of Army field support brigades. "They are our face to the field," he said. "They provide support for folks in the field . . . and feedback" for AMC research and development.

DAELP is only one of a number of programs operated by IDB, a non-profit research and educational institute established in 1997 by the State of North Carolina and the University of North Carolina. IDB is supported by Department of Defense (DOD) appropriations, research grants, contract and tuition revenues, and corporate and philanthropic underwriting of educational and research projects. IDB's distinguishing concept is to bring participants from the military, Government, and private sectors together with business school faculty to teach, learn, discuss, and exchange information, in both structured and informal settings, primarily in the field of logistics.

In addition to its affiliation with the University of North Carolina at Chapel Hill, IDB works with faculty from other institutions, including North Carolina Agricultural and Technical State University, North Carolina State University, Carnegie Mellon University, and the University of Michigan.

Another IDB program is the Center of Excellence in Logistics and Technology (LOGTECH), established in 2000. LOGTECH offers a master of business administration (MBA) degree curriculum in logistics and technology in affiliation with Kenan-Flagler and the Kelley School of Business at Indiana University. AMC is the DOD executive agent for LOGTECH, which draws students, lecturers, and discussion leaders from all armed services and joint commands.

Through LOGTECH, the IDB also offers two executive education programs: the Program for Executives in Logistics and Technology, for flag-level military officers, executive-level civilians, and comparable private-sector executives; and the Advanced Program in Logistics and Technology, for O–4 to O–6 military officers, GS–13 to GS–15 civilians, and comparable-level participants from the private sector.

LOGTECH also organizes an annual Logistics and Technology Forum, involving approximately 90 military, academic, and private-sector leaders, and is a cooperating sponsor of the annual Focused Logistics Briefing held in London, England, which brings together military leaders from the United States and its major allies. The IDB and LOGTECH organize and manage numerous specialized programs by request of the military, including 1-week conferences and 1- and 2-day instructional programs.

The newest major IDB initiative is its Center for Stabilization and Economic Reconstruction, through which IDB provides education programs and delivers specialized support to the DOD in this increasingly important area. **ALOG**

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The Chief of Staff's Imperatives and the Army Field Support Brigade

BY LIEUTENANT COLONEL JORDAN S. CHROMAN

Army field support brigades like the 405th in Europe help tactical units sustain, prepare, reset, and transform.

General George W. Casey, Jr., the Chief of Staff of the Army (CSA), outlined the Army's path to success during his speech at the annual Association of the U.S. Army Eisenhower Luncheon in October 2007. He stated, "Four imperatives will frame what we need to do," and identified those imperatives as sustain, prepare, reset, and transform.

The CSA's imperatives form a theme that is echoed by many of the Army's leaders. In the "Enhance Logistics Readiness" portion of the Army Posture Statement 2007, Lieutenant General Ann Dunwoody, the Army G–4 at the time, asserted, "Building and sustaining combat power is paramount to the Army's success." She went on to say—

> While the Global War on Terrorism remains our top priority, we must also prepare for the Army's next challenge . . . Over five years of combat operations have taken a toll on Army equipment. The Army Force Generation (ARFORGEN) process identifies equipment requirements and permits a complete corporate view of equipment readiness. The Reset program enables us to meet those requirements and quickly restore unit capability.

Lieutenant General Dunwoody recognized the importance of the strength of the Army's personnel and equipment. The Army's senior leaders carry this message out to the field, and tactical commanders understand it and are embracing it fully.

If you had to summarize the roles of the Army Materiel Command (AMC), the Army Sustainment Command (ASC), and especially AMC's "face to the field" organizations, such as the 405th Army Field Support Brigade (AFSB) and its subordinate battalions, you could not come up with a better description than the CSA's four imperatives.

The Role of the AFSBs

Field Manual Interim 4–93.41, Army Field Support Brigade Tactics, Techniques, and Procedures, says that AFSBs "serve as the ASC's bridge between the generating force and the operational force" and "provide the first stop for coordinating Army ALT [acquisition, logistics, and technology] capabilities in support of Army Forces." AFSBs also command and control AMC sustainment maintenance, command and coordinate Army acquisition and materiel fielding support from the life-cycle management commands, and manage ALT-related sustainment, redeployment, retrograde, and reset operations in theater. AFSBs serve as AMC's link to the tactical Army for all relevant logistics and operational support.

These are incredibly important roles that support our Army at war. During the past several years of combat operations, many Army units have been deployed and have required extensive equipment reset to ensure that they are returned to a fully mission capable state. While equipment is being reset or upgraded, new and improved systems are issued to the unit and new personnel are assigned. Units receive new equipment training for newly fielded items so that they are prepared to operate efficiently.

Executing the CSA's Imperatives

The 2d Battalion, 405th AFSB, effectively executes the CSA's imperatives in the field. The 2d Battalion is headquartered in Vilseck, Germany, but the majority of the unit is scattered over about 200 miles of the eastern portion of Germany. The battalion provides a combination of direct support and area support to Army and joint forces operating in the U.S. Army Europe area of responsibility. The battalion focuses on supporting units like the 2d Stryker Cavalry Regiment; the 12th Combat Aviation Brigade; the 2d Brigade, 1st Infantry Division (which has since been reflagged as the 172d Infantry Brigade [Separate]); the 16th Sustainment Brigade; and tenant and transient units that occupy the 7th Joint Multinational Training Command areas of Grafenwoehr and Hohenfels. During the past year, the 2d Battalion, 405th AFSB, has assisted its supported

units with aspects of all four of the CSA's imperatives.

Sustain. Like all logistics units, the 2d Battalion's daily operations are focused on sustainment. The battalion supports units in a variety of ways, including providing support from logistics assistance representatives, locating hard-to-find parts, and troubleshooting extremely difficult maintenance procedures for low-density systems, such as the 2d Stryker Cavalry Regiment's interim high-mobility engineering excavator.

The 2d Battalion has supported the 2d Stryker Cavalry Regiment by working with the unit and the garrison to develop a central issue facility menu that supports the unit-specific individual equipment. The 2d Battalion also worked hard to acquire tire chains for Stryker vehicles and managed a series of major upgrades that dramatically improved the survivability and operability of the unit's 314 Stryker vehicles and their weapons and communications systems.

Prepare. As units prepare to deploy, they conduct a series of training and tactical exercises. When a task force from the 35th Infantry Division (Mechanized) arrived in Europe before assuming the Kosovo Force 9 mission, it participated in a series of predeployment exercises and training tasks located mainly at the Hohenfels training area. The 2d Battalion assisted the task force with training on weapon and communications systems, integrating Army battle command systems, filling equipment-on-hand shortages, and repairing aircraft that the task force shipped from the continental United States. The 2d Battalion's efforts were focused on ensuring that the unit was operationally and logistically ready to assume its vital mission in Kosovo.

AFSBs serve as AMC's link to the tactical Army for all relevant logistics and operational support.

Reset. After the 2d Brigade, 1st Infantry Division, returned to Germany following a 15-month deployment, most of the unit's equipment required extensive reset. Several months before its departure from Southwest Asia, the unit conducted reset planning through videoteleconferences and by using the logistics support activity's Army reset management tool. The brigade shipped many pieces of equipment directly from ports in Kuwait to designated reset sites in the continental United States. Other equipment, such as weapon systems and night vision devices, were brought back with the troops, and the 2d Battalion facilitated the reset of those systems at the unit's home station. Through AMC-sponsored reset initiatives, such as the small arms readiness and evaluation team with repair and the communications electronics evaluation repair team, groups of experts arrived at the unit's location to conduct depot-level repairs so that on-hand systems met the –10/20 standard.

The 2d Battalion also worked hand-in-hand with a large number of project mangers and program executive offices from the sustainment base to facilitate the reset of the systems sent to the continental United States. The goal was to get those systems back into the unit's hands as quickly, effectively, and efficiently as possible. With many units experiencing dwell times as short as 12 months, the timely return of reset equipment is critical to support the tactical commander's training and deployment plans.

Transform. Changes to tactical units are commonplace in today's Army. Recently, many units (like the 16th Sustainment Brigade) have moved locations, transformed, deactivated, or stood up, all while preparing for deployment and on very compressed timelines. AMC is a key supporter of transformation. Units like the 2d Battalion work with supported units to ensure that they are fielded new equipment from the sustainment base. They also correct errors that are revealed after fieldings, test newly issued items (such as tactical operations center systems) to ensure that they are fully functional and the unit understands how to operate them, provide new equipment training and over-the-shoulder training on new systems, and assist with rapid fielding initiative and rapid equipment fielding issues. The AFSB is a tangible link between the tactical unit and the sustainment base and focuses on these issues so that supported unit personnel can look to the future.

The CSA's imperatives are critical to the current and future success of our Army. AMC organizations like ASC and the 405th AFSB stand ready to be the advocate for tactical commanders. These organizations ensure that tactical units are sustained adequately, have the tools necessary to prepare for their next combat mission, have their equipment reset to the current Army standard in a timely manner, and have the assistance they need to transform in support of the Army of the future. **ALOG**

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On the Road to Condition-Based Maintenance for Army Vehicles

BY MARK S. BOUNDS, MARY CALOMERIS, MICHAEL POHLAND, AND MARGUERITE SHEPLER

The Army Materiel Systems Analysis Activity is developing onboard systems for tactical wheeled vehicles that will allow maintainers and operators to base preventive maintenance actions on actual vehicle conditions.

Condition-based maintenance (CBM) is a strategy that bases the performance of maintenance on the actual condition of the system and not on fixed time intervals. This strategy is made possible by the application of usage characterization, diagnostic, and prognostic processes executed on a health and usage monitoring system (HUMS).

"Usage characterization" refers to the evaluation of the manner in which a system is being employed and indicates how and why things may be broken or in the process of breaking. Usage characteristics include hours run, miles driven, time at idle, fuel consumed, number of hard brakes and hard turns, vehicle speeds over specific terrains, and so forth. "Diagnostics" are based on the symptoms or indicators of problems and use methods to find what is broken or breaking in a system. "Prognostics" are based on a combination of indicators and physics of failure methods; they result in methods for predicting when components are going to break. ["Physics of failure" refers to the analysis of the physical processes that result in system failures. Such an analysis can be used to improve system reliability and maintainability.]

The Army Materiel Systems Analysis Activity (AMSAA) at Aberdeen Proving Ground, Maryland, in conforming to the common logistics operating environment (CLOE) concepts developed by the Logistics Innovation Agency, is focused on developing ways for vehicles to self-diagnose and self-report their conditions. Specifically, AMSAA is working on predictive maintenance algorithms using both the maintenance and operating histories of vehicles. The onboard system that AMSAA has designed in conjunction with the Aberdeen Test Center collects data from a vehicle's onboard vehicle sensors, data bus, terrain sensors, and global positioning system (GPS) and analyzes the data to determine the vehicle's condition.

AMSAA's Strategy for CBM

CBM is being implemented in four phases. In phase 1, AMSAA identified appropriate hardware and software to be integrated into a HUMS that could be used for engineering development purposes—an engineering development HUMS (EDHUMS)—and completed initial testing and evaluation of these components in continental United States (CONUS) test and training environments. Phase 2 consisted of integrating these components into a robust, military-grade EDHUMS, designing a data analysis process, testing EDHUMS in the CONUS training environment, and beginning to field EDHUMS in operational units outside of CONUS, including the U.S. Central Command's area of responsibility. AMSAA is currently developing a solution for the information management process.

Phase 3 (also underway) consists of identifying a small, inexpensive focused HUMS (FHUMS)—a HUMS with limited but very specific capabilities that can be deployed across larger fleets because of its lower cost and that can be programmed with algorithms developed on the EDHUMS. Phase 4 of AMSAA's strategy includes integrating proven FHUMS hardware into platforms by the original equipment manufacturer at the time of manufacture or into other appropriate proven hardware.

AMSAA's approach to implementing CBM also includes the use of two data "prongs," which are diagnostics and prognostics and usage. AMSAA collects data from imbedded onboard sensors and added sensors, including the data bus, GPS, and terrain sensor. The data are fed into diagnostic and prognostic algorithms that then report impending failures and unsafe or damaging usage to the vehicle driver, maintainers, and commanders. The usage data are compiled and reported to fleet managers, engineers, and maintainers.

The final part of AMSAA's strategy for CBM implementation is testing in "parallel environments." Testing in both controlled and intheater environments allows for heavily-instrumented vehicles to be evaluated under many scenarios. Measurements can be made in a controlled and well-defined environment on known test courses. Such testing provides large data sets for developing damage models and prognostic

The eDAQ-lite is a commercial off-the-shelf data acquisition system that can provide onboard self-diagnosis and self-reporting of a tactical wheeled vehicle's health.

algorithms. Although AMSAA is able to use a commercial off-the-shelf (COTS) system to collect data in the test environment, the system must be militarized for the intheater environment.

Testing in an intheater environment is also beneficial. It provides immediate value by giving insights into real-world vehicle usage by Soldiers and the effect this usage can have on the prognostic algorithms that are being developed based on vehicle usage in a test environment. Installing HUMS in a theater provides a validation and verification process to determine if prognostic algorithms developed in a test environment are applicable to vehicles being used in current operations.

Vehicle Data Acquisition System

AMSAA engineers identified a rugged and modular COTS data acquisition system (eDAQ-lite) that has the functionality, flexibility, and ease of use needed to support the development of CBM and prognostic HUMS (PHUMS) algorithms and processes. (See photo above.) This system complies with the Army Integrated Logistics Architecture and with the CLOE strategy for onboard self-diagnosis and self-reporting of a vehicle system's health. It is also 100-percent compatible with current AMSAA data analysis software (Glyphworks, Matlab, and MathCAD) and processes.

The COTS vehicle data acquisition system that will be used on tactical wheeled vehicles must—

- Be dust- and water-tight.
- Be small in overall size.
- Have robust, military-grade cable connections.
- Accept 12- and 24-volt power inputs.
- Provide a method for remotely switching the unit on and off.
- Be compatible with the vehicle bus, GPS, and displacement, strain, acceleration, and temperature gauges.
- Operate in maximum outside ambient temperature of 49 degrees Celsius (120 degrees Fahrenheit) with a solar radiation load up to 1,120 watts per square meter.
- Meet conducted emissions and susceptibility requirements of Military Standard 461, Requirements for the Control of Electromagnetic Interference Characteristics of Subsystems and Equipment.
- Survive the vibration levels typically experienced by various tactical wheeled vehicles.

The base of eDAQ-lite contains the computer processing unit, memory, serial communications port, power circuitry, and battery backup. The layers, which are interchangeable and removable, contain the circuitry for handling analog and digital signals: the bridge layer for analog signals and the digital input/output for digital signals.

The eDAQ-lite design has some limitations. It was designed for industrial use, meaning use in an operating temperature of -10 to 65 degrees Celsius and with an operating voltage of 10 to 18 volts, and it has industrial-grade connectors. It has no additional electromagnetic interference (EMI) shielding and no tests for EMI, no internal relay for switching the unit on and off, and no internal motion sensors. Finally, the vehicle engine bus interface module is external to the unit.

Modifications and Additions to eDAQ-lite

To ensure the survivability of eDAQ-lite in the field, enhance its functionality, and control EMI to and from communications gear, AMSAA made a few changes and additions. First, a military-grade superstructure was designed in Pro/Engineer (a three-dimensional computer package for modeling solids) to house the eDAQ-lite data acquisition system and other essential support equipment and cables.

Support equipment also was added, including EMI filters and fuses on the power lines; a direct current/direct current converter to enhance the operating voltage range from 10 to 18 volts to 9 to 36 volts and provide protection against under- and over-voltages; a solid-state relay to switch the eDAQ-lite on and off; a motion pack to provide three angular rates and acceleration information along three orthogonal [right-angled] directions; and a vehicle bus interface module to provide communication between the vehicle bus and the eDAQ-lite.

Two thermal tests were performed to characterize the thermal behavior of the resulting Army eDAQ

tactical wheeled vehicle system under desert operating conditions (as specified in Army Regulation 70–38, Research, Development, Test and Evaluation of Materiel for Extreme Climatic Conditions). The first test was a steady-state, natural convection test designed to determine the maximum operating temperature of the eDAQ system. The second test was a solar-loading test designed to validate the operation of the eDAQ system when exposed to high solar radiation in conjunction with high outside ambient temperatures. A conduction-based cooling scheme was selected for the interior components (including the eDAQ-lite) and a natural convection-based cooling scheme was selected for the exterior. Thermally conductive grease, room-temperature vulcanizing, and gaskets were used on all wall interfaces. The current design includes a protective cover plate.

Data Reporting

AMSAA has successfully demonstrated the Army eDAQ tactical wheeled vehicle system's hardware and software capabilities, data quality checks, and rudimentary usage characterization. Many vehicles have been fully instrumented, and data are being captured from over 80 analog channels, multiple SAE [Society of Automotive Engineers] J–1708 bus channels, and GPS sensors. These vehicles have run over all Aberdeen Proving Ground test courses multiple times, providing detailed data for developing prognostic algorithms. The Aberdeen Test Center and AMSAA also have measured and analyzed data from many wheeled vehicles of several different types in Iraq for over a year. This has provided a significant amount of usage data and operating parameters that will be extremely useful for optimizing testing. The data also are being aligned with maintenance records to identify specific prognostic algorithms.

Fielding of the EDHUMS has been underway since June 2006, starting with the instrumentation of eight tactical wheeled vehicles at the National Training Center at Fort Irwin, California, and followed by intheater installations. Five EDHUMS systems were installed in Kuwait and Iraq in December 2006 and five more in March 2007. Six vehicles were instrumented in Afghanistan in September 2007. In addition to these independent installations, AMSAA is actively participating in the tactical wheeled vehicle portion of the heavy brigade combat team condition-based reliability analysis demonstration that is currently taking place at Fort Knox, Kentucky. With system installations completed in May 2007, data are currently being collected, reduced, and analyzed for reporting to fleet managers, engineers, and maintainers. In all of the installations mentioned, usage characterization and initial versions of diagnostic and prognostic algorithms are installed and, based on feedback from the field, are being refined.

Some of the analyses that AMSAA has been able to provide include time in gear, fuel consumption, Soldier thermal environment, time at speed, and some rudimentary terrain identification. AMSAA's goal is to generate this information using onboard algorithms, which will help to reduce the quantity of data that would otherwise need to be collected, transferred, and processed off line. Information can be presented in many ways, including graphical displays or a two-page vehicle usage summary report.

AMSAA continues to meet with customers to further identify the type of information they need and how they would like it displayed. The data flow processes from acquisition to reporting are being refined, and AMSAA is phasing in usage, diagnostic, and prognostic algorithms for verification and validation as they are developed. AMSAA continues to work with Soldiers, private industry, and other Government organizations to develop a robust CBM process that will result in improved readiness and significant logistics cost savings to the Army. **ALOG**

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A Predictive Diagnostic Maintenance System

BY STAFF SERGEANT MICHAEL WINKLER

The two-level maintenance system presents some unanticipated challenges to maintainers. The author suggests that an evidence-based maintenance system would help them accurately diagnose faults.

As part of its transformation, the Army is converting from a four-level maintenance system to a two-level maintenance system. Unit and direct support maintenance assets are being combined to create the field maintenance level, and general support and depot maintenance are combining to form the sustainment maintenance level. For two-level maintenance to work, I believe the Army should develop a better approach to diagnosing faults. Two-level maintenance would be more effective if the Army had vehicles that were uncomplicated or were designed specifically for two-level maintenance.

Although vehicles have become more and more complex, the Army has fewer mechanics and a smaller logistics footprint. One would assume that enhanced onboard system-monitoring capabilities would increase the reliability of vehicles and reduce the time mechanics need to spend on vehicle repairs. However, based on what I have seen, I think the "failsafe" in Army maintenance has been the reliability of vehicles' mechanical systems, not the electronic monitoring systems on those vehicles.

Sensor Reliability

To take this a step further, think about the last time a malfunction light came on in your car. The fault likely was caused by a sensor that almost certainly was in error. Onboard diagnostic systems can tell you that a sensor is malfunctioning. Why can't we develop a system that will predict when a sensor will fail? Why can't we determine (with a relatively small deviation) how often that sensor fails? Perhaps we need to develop a built-in sensor test, design around that sensor, or eliminate it.

All too often we seem to believe that adding sensors makes the hardware we are given the best available. I find that prognostics on ground vehicles are generally complex and cause more problems than they solve. This observation conflicts directly with the direction the Army is taking with ordnance military operational specialty skill sets. Each maintainer is now tasked to know multiple vehicle systems and repair systems. However, maintainers will probably never learn each system well enough to become proficient in troubleshooting them all.

Evidence-Based Diagnostics

In healthcare, Internet-based systems are available to help doctors identify possible causes for patient symptoms. One such statistical diagnostic assistant, called "Isabel," was developed by a father who sought to change the diagnostic system that affected the way his daughter (Isabel) was treated. This system is basically an intuitive system that takes advantage of all

The high-mobility artillery rocket system consists of a missile system and the truck that transports it. Both must be well-maintained and operational for the system to be effective.

previous diagnoses and provides the statistically most likely disease (fault) and treatment (repair).

The medical profession has done well to embrace evidence-based medicine; the Army maintenance community also might do well to embrace evidence-based maintenance. Not only would such a system speed troubleshooting and proper fault diagnosis, it would also perform the same function as prognostics by supporting the building of better authorized stockage lists. It would also provide a better grasp of whole-life and life-cycle costs. A system like this for Army maintenance could limit misdiagnosis of vehicle faults. An evidence-based maintenance system would reduce the multicapable maintainer's reliance on his intuition to make sound repair decisions and allow him to diagnose problems and correct them. His data then could be included in later regressions to ensure that faults were categorized correctly.

The program should be able to determine the result statistically. For instance, if the maintainers normally say that a certain fault is found during testing, we could probably determine what the true fault usually is (and more importantly, what the fix is) or if the "how found" data mean nothing to the outcome. I would say, at this point, that we do not really know if these data mean anything, because we have "intuitively" said they mean nothing.

The most intriguing benefit of intelligent fault diagnosis is that it eliminates the need for the intuition of the maintainer. A maintainer's intuition results from his general maintenance experience, training, and experience with the given piece of equipment. We need to find a way to capture the shop data and fault data from the Standard Army Maintenance System Enhanced or from a Department of the Army Form 2407, Maintenance Request, database that captures the "how found" data and ties them directly to the "how repaired" data.

Collecting Data

With the advances in controller area network bus technology over the past 10 years, several large commercial truckers have developed evidence-based service regimens based on what they have learned from their electronic monitoring systems. The Army needs similar systems that will support "fight with what you brought" because new prognostic-laden equipment and smart vehicle systems will not be widely used for years to come, but evidence-based maintenance is available today. It also would be free because the data are already there—just not being used. Worse yet, we are losing the information by not properly archiving it.

We have all the tools needed to use evidence-based maintenance without adding anything to the vehicle systems in current inventory. The type of bus used on virtually all heavy vehicle systems has the data we need and stores them quite accurately, but we rarely interrogate it.

Onboard Sensors

One might do well to study exactly what commercial, even consumer, products provide. OnStar offers a level of condition-based maintenance to the consumer. My truck lets me know, based on my driving habits over the past few months, that it will need an oil change soon. The onboard computer sends a message that generates an email telling me I am down to a percentage of oil life remaining. Lo and behold, a few days later my service engine light illuminates. Granted, all of this is done with the assistance of a few sensors, but I think more weight is given to the "profile" of miles driven (such as revolutions per minute duration) than to the oil condition itself.

Time and time again, I read on LOGNet about the need for simpler vehicles that align with the workload and skill set of the Army maintainer. Perhaps the greatest single issue that comes up is the complexity of maintaining a central tire inflation system (CTIS). Soldiers in the field seem to be content with vehicles that do not have CTIS or that have disabled CTIS systems. CTIS is a complex system, and many fleets still do not have it. I am not privy to the results of the surveys that take place, but I think units in the field have overwhelmingly said they do not want CTIS systems since any prognostics undoubtedly will increase the cost of the vehicles and make them inherently more difficult to maintain. Maintainers do not want to have more complicated vehicles unless they have the proper tools and adequate knowledge and understanding of the vehicle system. A proper tool, in this case, would be a diagnostic system that has the information needed to diagnose a fault properly with a high degree of accuracy.

Anything less than having a high degree of accuracy in troubleshooting diagnoses equates to simply changing parts. If we know more about the predicted actual fault, we can eliminate some of the practice of "changing parts until the fault goes away." More importantly, we might be able to use the data to redesign our resupply operations. To shrink the logistics footprint, we need to do several things. If we are not going to make vehicles simple, we need to make diagnosis simpler. We can do it without adding anything to the ground fleet.

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With this issue, Army Logistician *is beginning a department devoted to professional development information for Logistics branch officers. The Logistics Branch Proponency Office at the Army Combined Arms Support Command at Fort Lee, Virginia, is sponsoring these articles, with assistance from the Force Sustainment Branch of the Army Human Resources Command.*

ORB Management and Your Assignment History

As an Army logistics officer, officer record brief (ORB) management is crucial to looking your best before a promotion or command board. You should update your ORB, at a minimum, before every board event. Ideally, you should update it at least every 2 years and make sure that you have a current photograph of yourself wearing the Logistics branch insignia.

After graduating from the Combined Logistics Captains Career Course, your first board as a Logistics branch officer will be the majors promotion board. Your key developmental experiences at each rank can influence your career progression, and it is very important that your assignment history reflects your experience as accurately as possible.

Here are some general rules for cleaning up and clarifying your assignment history.

List jobs separately. Each different job should be annotated, even if it is within the same unit. If you were an executive officer and an operations officer within the same unit, you obtained new skills and experience in each position; listing them separately further defines your key developmental experience.

Show your deployment time in your history. This makes it is easier for the board to see where you have had each experience. If you served on an internal transition team (where you did not receive permanent or temporary change-of-station orders), you need to list that separately.

Simplify unit names and titles. Use the common abbreviations rather than the preset titles within the Total Officer Personnel Management Information System. Use commonly accepted duty titles and spell them out as much as possible. Try not to use abbreviations within duty titles. You can create a complete and polished job title by avoiding repetition within your ORB fields. List the name of your unit (for example, 548th Corps Support Battalion) on the appropriate line and then list your duty title (for example, shop officer) in the duty title block. When they are read together, a board member will then clearly see that you were a 548th Corps Support Battalion shop officer.

Clearly describe your assignments. Show the unit name, type, and level.

Check area of concentration (AOC) codes. Ensure that the AOC, to the right of the page, is correct for each job. Only forward support companies (FSCs), distribution companies, and headquarters and headquarters companies are coded 90A; all others will be coded 88, 89, 91, or 92. Check your unit modification table of organization and equipment or consult your unit S–1 for assistance.

Make sure you have key developmental experience. The board will be looking for time spent in key developmental positions; 12 to 24 months is the average for most officers. As a captain, company command is your required key developmental experience. While it is not necessary to have a particular type of command, like an FSC, the command in which you do gain experience could influence your choices and desires for future assignments. As a major, current Logistics branch key developmental positions are support operations officer, executive officer, brigade S–4, and battalion S–2/3 or operations officer (major authorized).

When recommending officers for promotion, board members give considerable merit to manner of performance in key developmental positions since they are among the toughest jobs within the branch. Board members then develop a clear picture of the officer's overall manner of performance and his potential for service in the next higher rank. As you compete for command, the type of unit in which you have your key developmental experiences will influence, in part, the type of unit that you may be most suited to command and may dictate your competitiveness within that command category. For example, if an officer desires to command a combat sustainment support battalion (CSSB), he should seek out key developmental opportunities within CSSBs. This does not mean that an officer would not be competitive for other types of units; manner of performance and senior rater comments on future potential are still the major contributing factors toward doing well on command boards.

These rules and methods for ORB management will net you a clean and concise ORB for all boards. Keep in mind that a new system, the Defense Integrated Management Human Resources System, will be in place sometime during fiscal year 2009. This new system has a slightly altered ORB, called a Soldier record brief (SRB), but the principles of ORB management remain the same.

For more information, contact the Logistics Branch Proponency Office at (804)734–0312/0315 or email leeeLogBrProOfc@conus.army.mil.

ALOG NEWS

THIRD-PARTY TRANSPORTATION MANAGEMENT BECOMES REALITY

The Defense Transportation Coordination Initiative (DTCI) began operations 31 March at Defense Distribution Depot Puget Sound, Washington. This initiative uses a third-party contractor to coordinate transportation management services among Department of Defense (DOD) organizations and commercial shippers. The DTCI contract was awarded to Menlo Worldwide Government Services, LCC, of San Mateo, California, in August 2007.

DTCI is an initiative of the U.S. Transportation Command as the DOD Distribution Process Owner, in cooperation with the Defense Logistics Agency, the services, and the private transportation industry. The program uses electronic data interface transactions to process shipment requests, confirm outbound shipping details, provide shipping status, and process billing. DTCI will give DOD and its customers in-transit visibility of goods and real-time access to shipment information.

DTCI will help to improve operational effectiveness, support strong small business participation, improve customer confidence, reduce the time from request to delivery for materiel, enable improvements in business practices, and protect operational capabilities, such as DOD critical infrastructure assets. The use of a third-party coordinator will allow DOD to secure on-time, cross-platform and cost-effective shipping options for materiel moving within the continental United States.

DOD will exclude some items from the program, including sensitive and classified shipments, arms, ammunition, explosives, bulk and missile fuels, household goods, and privately owned vehicles.

LOGISTICS LEADERS CHANGE

The commanding general of the Army Combined Arms Support Command (CASCOM) at Fort Lee, Virginia, Major General Mitchell H. Stevenson, was promoted to lieutenant general and assumed the position of Deputy Chief of Staff, G–4, Department of the Army, in June. He replaced Lieutenant General Ann E. Dunwoody, who became the deputy commanding general and chief of staff of the Army Materiel Command. General Stevenson is a former Chief of Ordnance and commanding general of the Army Ordnance Center and Schools.

The new CASCOM commanding general is Major General James E. Chambers. General Chambers was the Chief of Transportation and commanding general and commandant of the Army Transportation Center and School at Fort Eustis, Virginia.

HET UPGRADE BENEFITS VEHICLE RECOVERY

Oshkosh Defense has secured a contract to upgrade the Army's M1070 heavy equipment transporter (HET) with new technology and greater load-bearing capability.

The M1070A1 HET will be the first palletized load system recovery vehicle with the capability and payload capacity to recover heavy armored vehicles like the mine resistant ambush protected (MRAP) and Stryker vehicles. It will also be capable of uprighting vehicles, recovering vehicles on steep slopes, and pulling vehicles stuck in water, mud, sand, or snow. Use of the new HET will reduce wear and tear on recovered equipment by using flat towing, which places less pressure on vehicle axles and chassis during pulling. Improvements to the power train, including the engine, transmission, transfer case, and electrical systems, will also be part of the project. The new HET will feature improved axles, wheels, seats, a new hood, dash panel, airconditioning, and additional support for future armor upgrades.

Under the $11.333 million contract, Oshkosh will deliver six pilot vehicles for testing by January 2009.

ARMY LOGISTICS MANAGEMENT COLLEGE ALEDC COURSE IS CHANGING TO ATLog

Students currently enrolled in the Army Logistics Management College's (ALMC's) Associate Logistics Executive Development Course (ALEDC) have until December 2008 to complete all five phases of the current program before ALEDC becomes the Associate Theater Logistics (ATLog) Course. The ATLog Course will kick off with a pilot course in October before the full program is implemented in December.

Like ALEDC, the ATLog Course will include five phases that will have to be taken in order. Phase 1 is a 2-week resident phase at Fort Lee, Virginia, on theater logistics. Phases 2 through 4 will be online courses on data analysis and application,

capabilities and requirements and contracting, and materiel and distribution management. Phase 5 is a second resident phase at Fort Lee on operational logistics that is structured around a capstone exercise. Students must complete the Joint Course on Logistics before beginning Phase 4.

ALEDC students who have not completed all five phases of the current course before 31 December 2008 will not receive credit for the course. ALEDC phases are not transferable to the ATLog Course.

Students must register for the ATLog Course even if they were previously eligible for ALEDC. For more information, email leeeatlog@lee.army.mil.

NEW TRANSCOM FACILITY WILL HOUSE SDDC

The U.S. Transportation Command (TRANSCOM) broke ground on 3 April on a new $93.6-million facility at Scott Air Force Base, Illinois, that will include the new headquarters of the Military Surface Deployment and Distribution Command (SDDC). The three-story, 180,000 square foot building will also include a joint operations center that will house planning functions of SDDC, the Air Force Tanker Airlift Control Center, the Navy's Military Sealift Command, and the TRANSCOM Deployment Distribution Operations Center. The Joint Distribution Process Analysis Center will also be located in the building; this center will consolidate selected TRANSCOM, Air Mobility Command, and SDDC Transportation Engineering Agency personnel. Construction should be completed by 2010.

LETTERKENNY DEPOT LOOKING GREEN

Letterkenny Army Depot, Pennsylvania, has turned its Lean manufacturing processes green. Lean Six Sigma initiatives have greatly improved pollution prevention efforts, reduced waste, and eliminated sources of pollution. In fiscal year 2007 alone, the

The M982 Excalibur global positioning system/inertial navigation system (GPS/INS) artillery round was fired for the first time in Afghanistan at Camp Blessing in February. The 155-millimeter round is used with the enhanced portable inductive artillery fuse setter, which creates its GPS/INS capability. The fuse setter gives the round specific grid coordinates for its target. This "smart munition" provides capability to attack three target sets: soft vehicles, armored vehicles, and reinforced bunkers. The increased effectiveness of the Excalibur round lightens the logistics burden on deployed units. It also reduces collateral damage through a concentrated fragmentation pattern, increased accuracy, and a near-vertical decent. Here, Soldiers from C Battery, 3d Battalion, 321st Field Artillery Regiment, use the enhanced portable inductive artillery fuse setter to program target grid coordinates into an Excalibur round. *(Photo by Sgt. Henry Selzer)*

depot eliminated chemical hazards, reduced waste, and improved working condition through over 60 rapid improvement events.

For example, employees previously used aircraft paint thinner to clean paint guns manually. By purchasing automated paint gun cleaning systems, the depot was able minimize employee exposure to unsafe chemicals. The installation also purchased a robotic spray process, which reduced the amount of hazardous material that employees came in contact with and the amount of harmful emissions produced from paints and paint thinners. Less product used overall equals less pollution.

Letterkenny has made other changes to improve its environmental performance. Instead of disposing of spent blast media 55-gallon drums, the depot is using super sacks and large roll-off containers. This has produced a 77-percent cost reduction in media hazardous waste disposal and saves the depot $500,000 annually in handling and disposal fees. An installation-wide recycling program has reduced the use of hazardous chemicals and diverted 58-percent of its solid waste from entering local landfills. The depot has also acquired dual-fuel vehicles that will run on unleaded gasoline or E85 ethanol.

KNOW YOUR TERMS

Changes to Army doctrine in 2008 have brought about some significant changes in Army terminology. Logisticians should make sure they know what terms are now in use and what terms are obsolete.

Army doctrine will no longer use the venerable terms "combat service support" and "combat support," though those terms will continue to be used in joint doctrine. The term "battlefield operating systems" will be replaced by "warfighting functions." The warfighting functions will include "movement and maneuver," "intelligence," "fires" (formerly "fire support"), "sustainment," "command and control," and "protection." The terms "battlespace" and "deep," "close," and "rear areas" are rescinded; "close combat" will replace "close area."

The term "support operations" is rescinded as a type of operation. "Stability operations" is now considered coequal with offensive and defensive operations. The "protection" warfighting function (meaning "the related tasks and systems that preserve the force so the commander can apply maximum combat power") replaces the term "force protection." Force protection will remain in use under its joint definition in other services, but the Army will no longer use the term.

Army doctrine will follow joint definitions and common English usage for the terms "agility," "asymmetry," "operational fires," and "versatility." "Lines of effort" (defined as "lines that links multiple tasks and missions using the logic of purpose—cause and effect—to focus efforts toward establishing operational and strategic conditions") replaces the Army's former term, "logical lines of operations." "Individual initiative" will replace "subordinates' initiative."

For a complete introduction to new, modified, and rescinded Army terms, see Appendix D of Field Manual 3–0, Operations.

A supply chain partnership involving all of the services delivered more than 5,200 mine resistant ambush protected (MRAP) vehicles to the U.S. Central Command area of operations by April. Built to deflect blasts, the MRAPs will protect U.S. service members from the effects of improvised explosive devices. The U.S. Transportation Command's end-to-end distribution team is monitoring the process from production to arrival in theater to make sure everything runs smoothly. Shown here, a 447th Expeditionary Logistics Readiness Squadron fuels management flight technician at Sather Air Base, Iraq, notifies a driver that his MRAP vehicle is fueled up and ready to go. *(Photo by Staff Sgt. Jennifer Lindsey, USAF)*

New Army Terms

Army positive control	forward operating base	intelligence warfighting function	protection warfighting function
Army procedural control	graphic control measure	irregular warfare	situational awareness
civil support[1]	influence[2]	knowledge management	stability mechanism
combat power (Army)	information engagement	landpower	support (Army)
command and control warfare	information protection	line of effort[3]	supporter
command and control warfighting function	intelligence, surveillance, and reconnaissance integration	line of operations (Army)	sustainment warfighting function
compel	intelligence, surveillance, and reconnaissance synchronization	movement and maneuver warfighting function	unassigned area
defeat mechanism		operational theme	warfighting function
disintegrate			
dislocate			
enemy			
fires warfighting function			

[1] Replaces support operations and uses the joint definition with Army primary tasks.
[2] Adds a second definition to an existing term.
[3] Replaces logical line of operations.

Modified Army Definitions

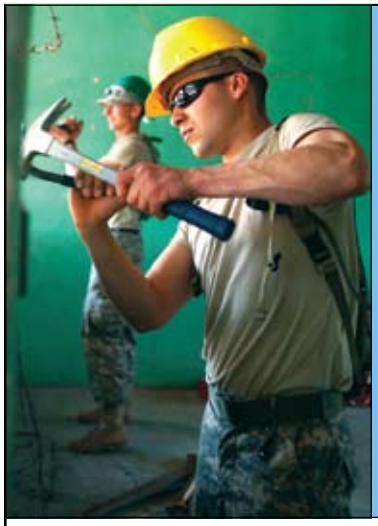
assessment (Army)	culminating point (Army)	intelligence, surveillance, and reconnaissance	preparation
battle command	decisive operation	isolate[3]	running estimate
close combat	defensive operations	main effort	situational understanding
combined arms	destroy[3]	mission command	stability operations[4]
commander's intent (Army)	essential element of friendly information	mission orders	supporting distance
commander's visualization	force tailoring	neutral	supporting range
common operational picture	full spectrum operations	offensive operations	sustaining operation
concept of operations (Army)	information management	operations process phase (Army/Marine Corps)	task-organizing[5]
control (Army)[1,2]	initiative (individual)	planning	tempo (Army/Marine Corps)
control measure	initiative (operational)		urban operations

[1] New definition for use in command and control context.
[2] Added second definition for use as a stability mechanism.
[3] New definition for use in operational art context.
[4] The Army uses the joint definition and assigns Army-specific tasks to this element of full spectrum operations.
[5] Army definition added to joint definition as an addendum.

Rescinded Army Definitions

agility[1]	combat service support[2]	logical lines of operations[4]	protection (Army)[5]
assigned forces[1]	combat support[2]	offensive information operations (Army)	rear area
asymmetry[1]	deep area	operational fires[1]	subordinates' initiative[6]
battlefield organization	defensive information operations (Army)	operational framework	support operations[7]
battlespace	force protection (Army)[3]	operational picture	versatility[1]
close area			
combat arms			

[1] Army doctrine will follow joint definitions and common English usage.
[2] Army doctrine will not use this term; joint doctrine will continue to use this term.
[3] Activities incorporated into the protection warfighting function. The Army will not use the joint term. See FM 3–10 when published.
[4] Replaced by lines of effort.
[5] Replaced by protection warfighting function. The Army will use the joint definition of protection. See FM 3–10 when published.
[6] Replaced by individual initiative.
[7] Replaced by civil support operations.



Beyond the Horizon, a U.S. Southern Command (SOUTHCOM) humanitarian exercise that provides infrastructure renovation and basic medical and dental care to rural parts of Latin American and Caribbean countries, tested Joint Task Force Bravo's ability to support forward-deployed troops over 3 months at Soto Cano Air Base, Honduras. Nearly 2,100 additional service personnel rotated through the base from April to June, requiring logisticians there to provide tents, customs clearance for exercise materials and equipment, and line-hauling for 50 vehicles and nearly 140 pieces of equipment. The exercise also required the provision of more than 6,600 field ration meals, 9,500 bottles of water, 8,000 gallons of fuel, and numerous medical and dental supplies. Joint Task Force Bravo is an element of SOUTHCOM based in Honduras. At left, Army Reserve Soldiers from the 672d Engineer Company in Missoula, Montana, were some of the 350 service members in Honduras for the exercise, where they helped to revitalize a local school.
(Photo by Sgt. Claude W. Flowers, 304th Public Affairs Detachment)

SECRETARY OF THE ARMY RECOGNIZES FORT BRAGG FOR SUSTAINABILITY

Fort Bragg, North Carolina, is the winner of the first Secretary of the Army Sustainability Award. Fort Bragg piloted the first installation sustainability program for the Army 8 years ago. Since then, it has served as a blueprint for the Army Strategy for the Environment and has set the bar for the Army's sustainability values.

The goal of sustainability is to meet the Army's current and future needs while improving its ability to organize, equip, train, and deploy Soldiers.

ARMY STUDENTS POST WAR STORIES ON INTERNET DISCUSSION BOARDS

As part of a broader effort to make Army officers better strategic communicators, the Army Command and General Staff College (CGSC) Department of Military History is requiring students to post their war stories to a historical Internet discussion board.

The writing assignment, which is part of the program, Sharing Our Story with the Nation, stems from a goal set by the commander of the Combined Arms Center, Lieutenant General William Caldwell, to "initiate opportunities for officers to engage the Nation and share their stories through media engagements and community outreach activities." The program includes community outreach activities, media interviews, and web-based events comprised of recognized blog sites. (These sites are public forums established by the military history department and edited by the faculty.)

For a preview of the assignments, visit http://interwar.livejournal.com on the World Wide Web. It is one of six sites hosting CGSC student papers.

DEFENSE ACQUISITION UNIVERSITY OFFERS PACKAGING TRAINING ONLINE

The Defense Acquisition University (DAU) has a new continuous learning module outlining the basics of defense packaging. The module highlights why packaging is necessary and describes its importance to the acquisition and sustainment of weapons systems and associated parts.

The continuous learning module is entitled CLL013, DOD Packaging, and is intended as an introductory overview. To register, visit the DAU website at https://learn.dau.mil/html/clc/Register.jsp.

The School of Military Packaging Technology, located at Aberdeen Proving Ground, Maryland, can provide additional information on packaging materiel for military distribution operations. Its website is located at http://smpt.apg.army.mil/.

PERFORMANCE BASED LOGISTICS CONFERENCE IN ARLINGTON

The Performance Based Logistics Conference will be held 14 to 16 July 2008 at the Hilton Crystal City in Arlington, Virginia.

The 3-day event will include workshops with leaders from across the Department of Defense logistics community. The program is geared toward program managers, deputy directors, chiefs, team leaders, or members of a defense program in the areas of logistics, integrated logistics support, sustainment, supply chain management, systems engineering, contracting and acquisition, life-cycle management, business development, aftermarket support, support and services, inventory management, and missile and space maintenance.

For a list of speakers or to register, visit the Performance Based Logistics 2008 website at www.pblusa.com.

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 or to a colleague). Attribute all quotes. 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.

The word limit does not apply to *Spectrum* articles. *Spectrum* is a department of *Army Logistician* intended to present researched, referenced articles typical of a scholarly journal. *Spectrum* articles can be longer than standard feature articles and are published with footnotes.

Instructions for Submitting an Article

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). Make sure to include a description of what each photo depicts. 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 send your article to other publications. 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 the requirement for public affairs clearance 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 leeealog@conus.army.mil or (804) 765–4761 or DSN 539–4761.

Submit your article by email to leeealog@conus.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 if possible. We look forward to hearing from you.

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Coming in Future Issues—

- **BSC3 as a Strategic Sustainment Tool**
- **Automatic Identification Technology**
- **Flexible Support for the HBCT**
- **Logistics Transformation in Europe**
- **The Distribution Dilemma**
- **Fifty Things You Need to Know About ITV**
- **Sense and Respond Logistics**
- **Integration of Contractors Into BSB Operations**
- **Added Combat Multipliers**
- **MDMP: One Tool in the Commander's Toolbox**
- **Army Reserve Centennial 1908—2008**

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