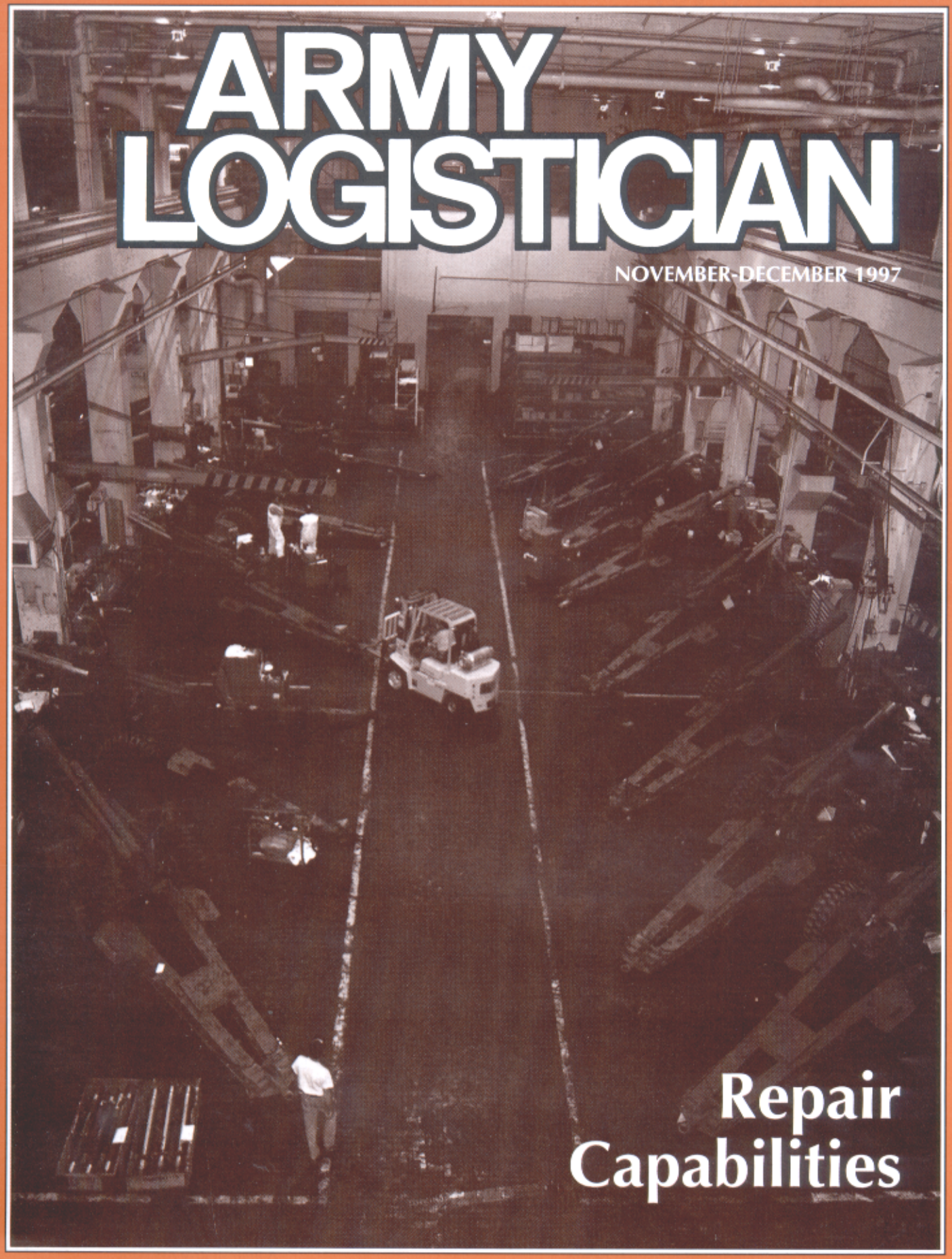
ARMY LOGISTICIAN

NOVEMBER-DECEMBER 1997



Repair Capabilities

PB 700-97-6 Headquarters, Department of the Army

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ARTICLES

DEPARTMENTS

Mission: ***Army Logistician*** (ISSN 0004-2528) is the Department of the Army's official bimonthly professional bulletin on logistics, prepared at the Army Logistics Management College and published by the Army Combined Arms Support Command, Fort Lee, Virginia. Its mission is to publish timely, authoritative information on Army and Defense logistics plans, programs, policies, operations, procedures, and doctrine for the benefit of all logistics personnel. Its purpose is to provide a forum for the exchange of information and expression of original, creative, innovative thought on logistics functions.

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COVER

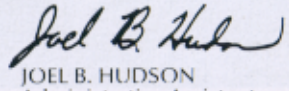
These M114 155-millimeter towed howitzers are being inspected and repaired at Rock Island Arsenal, Illinois. The 116 refurbished howitzers will be shipped to Bosnia and used by that Balkan nation's armed forces. The M114 howitzer dates back to the mid-1940's, underscoring the importance of the Army's repair capabilities. Articles about Army repair processes begin on pages 26 and 32. (Photo by Ted Cavanaugh, RIA.)

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.

By Order of the Secretary of the Army:

DENNIS J. REIMER
General, United States Army
Chief of Staff

Official:



JOEL B. HUDSON
Administrative Assistant
to the Secretary of the Army
03899

Coming in Future Issues—

- Desert Saber
- Repair Parts for Foreign Military Sales
- Transporters and Remote Area Infrastructure
- Future Logistics Critical Vulnerabilities
- Supporting Task Force Victory
- Understanding ISM
- Logistics in the French Army
- How to Fail at the NTC
- Power Projection Logistics on the Northern Frontier
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- Joint Operations and Logistics Support
- Synchronizing Sustainment Operations
- Modeling Cargo Flow
- Concept for Army Aviation Logistics

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ALOG DIGEST

VELOCITY MANAGEMENT MEETS PRECISION LOGISTICS

Precision logistics—the Marine Corps equivalent of velocity management (VM)—has been put to the test by the Defense Distribution Depot Susquehanna (DDSP), New Cumberland, Pennsylvania, and the result has been significant time and cost savings. DDSP is the Defense Logistics Agency's (DLA's) largest and most active depot, supporting 12 installations (8 Army, 1 Marine Corps, 1 Navy, and 2 DLA) with VM initiatives. DDSP was selected as a test site because it has more than 2,200 employees and operates three key areas relating to transportation and material release order processing: the East Coast Containerization and Consolidation Point, a 24-hour emergency support operations center, and an air line of communication.

DDSP's partner for the precision logistics test was the Intermediate Supply Support Activity (ISSA), 2d Supply Battalion, at Camp Lejeune Marine Corps Base, North Carolina (one of the 12 installations supported by DDSP). Since 1996, DDSP has been sending a dedicated truck containing all priorities of freight to the Camp Lejeune Transportation Management Office (TMO) three times a week. The TMO issues the supplies to the ISSA, which in turn delivers or stores the supplies. The ISSA receives 55 percent of its supply support directly from DDSP.

Both VM and precision logistics were created to reduce order and ship time (OST) and improve logistics processes. The ISSA had undergone a study of its logistics processes, so a benchmark for the precision logistics test was established. Using a dedicated freight truck between DDSP and Camp Lejeune had improved OST significantly.

When representatives from DLA and from DLA's Defense Distribution Region East and DDSP visited Camp Lejeune to examine their systems, processes, and initiatives, and to suggest improvements, they were not optimistic that they could suggest further enhancements. However, after their review, DDSP and ISSA initiated the following operational improvements that greatly reduced handling and, in turn, improved OST even further—

- Reporting unit code (RUC) consolidation. Further consolidation by DDSP of ISSA's RUC's (the Marine Corps equivalent to Department of Defense activity address codes [DODAAC's]) and the resulting consolidation of like units' stock in tri-walls reduces handling by the ISSA, expedites issuing, and reduces OST. ISSA now has four main RUC's.
- Load segregation by DDSP. ISSA's four main RUC's are now segregated and loaded sequentially onto the dedicated truck. This greatly reduces handling and improves unloading.
- Shipment volume and OST data collection. DDSP collects data on volume shipments, depot processing times, and OST for the identified commands. DDSP provides these data to the ISSA so they can monitor any improvements and build a basis for any following actions.
- Shipment delivery times modification. DDSP coordinates with the carrier to schedule deliveries at a time when a high number of employees are available to assist with offloading.

The ISSA and TMO also developed an internal plan that has greatly reduced freight handling, improved ISSA's efficiency, and moved ISSA closer to a cross-docking concept, thus ensuring that the customers receive their supplies even quicker.

The coordination among DDSP, ISSA, and TMO, although simple, will improve the logistics processes, lower OST, and reduce inventories, thus cutting costs three ways.

MTS OFFERS TWO-WAY MESSAGING

The Movement Tracking System (MTS), now being developed by the Product Manager (PM)–MTS in the office of the Project Manager-Integrated Logistics Systems (PM–ILOGS) at Fort Lee, Virginia, represents a quantum leap forward for every transportation asset coordinator and quartermaster staffer who has to answer the question, "Where's my stuff?"

PM–MTS is developing the MTS as part of the Warfighting Rapid Acquisition Program (WRAP). WRAP candidates are commercial systems or products that can be adapted quickly, easily, and inexpensively for military purposes.

There are two main components to the MTS—the mobile unit, which is mounted on a unit's vehicles, and the control station, which monitors the vehicle's location. Both components use the same basic communications software and hardware, although the control station uses a computer with a larger display and a faster processor. Communication between the two is provided by a commercial satellite vendor. This allows units to send and receive traffic over the horizon any time, anywhere.

Although the MTS was originally designed only to

monitor vehicle locations, advancing technology has allowed the PM–MTS to incorporate digital maps in the vehicles and two-way satellite messaging without any increase in cost. This means that transportation coordinators can talk to the driver of any truck anywhere in the world without having to put up antennas or involve more soldiers. By using digital maps in the vehicles, along with the global positioning system, drivers should never get lost again.

Two-way messaging also increases driver and vehicle survivability. Information on contaminated or otherwise hazardous areas can be broadcast to every truck in the unit, allowing the operators to drive around the dangerous area rather than through it.

Approval to field the new MTS hardware and software has been granted by the WRAP Army Systems Acquisition Review Council. MTS will adapt to future incorporation of radio frequency technology, automatic reporting of vehicle diagnostics, and other features that support in transit visibility.

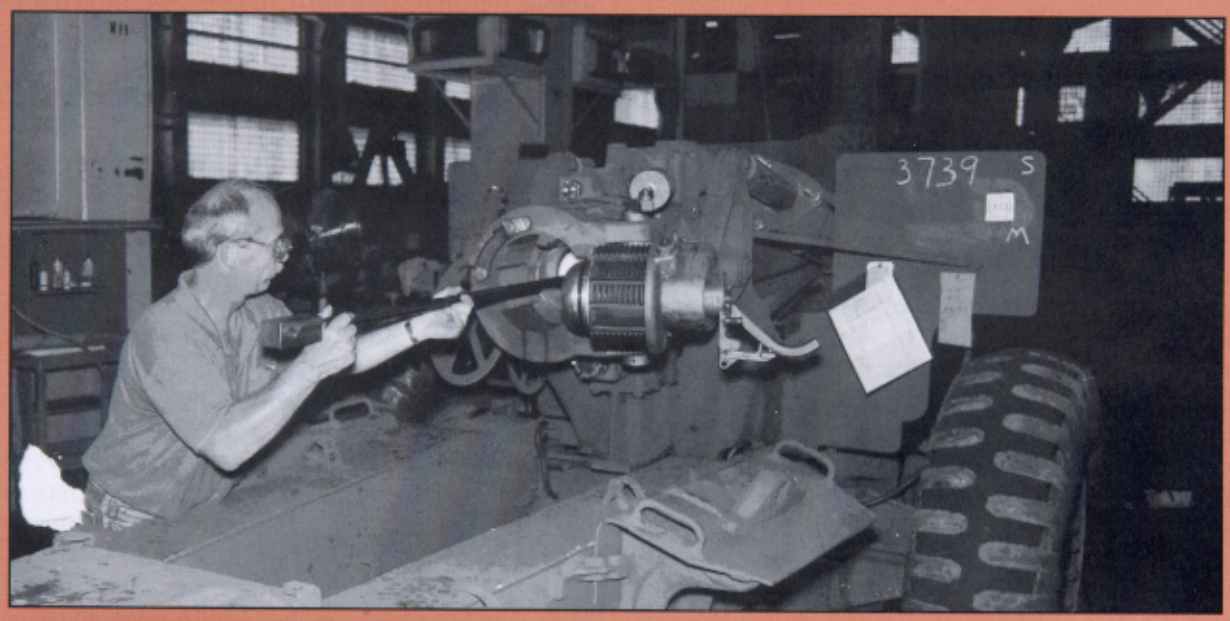
The MTS will be fielded initially to 1st Cavalry and 4th Infantry (Mechanized) Divisions, Fort Hood, Texas; 3d Infantry Division (Mechanized), Fort Benning, Georgia; and palletized loading system (PLS) truck companies. Delivery is expected to begin in third quarter, fiscal year 1998.

FUTURE DIGITIZED DIVISIONS NAMED

The 4th Infantry Division (ID) (Mechanized) at Fort Hood, Texas, will become the Army's first digitized division by the year 2000. In 2003, the 1st Cavalry Division, also at Fort Hood, will become the second digitized division, and the 3d Infantry Division (Mechanized), Fort Stewart, Georgia, will be digitized as soon as resources permit.

The 4th ID became the Army's Experimental Force in 1995. Its 1st Brigade became Task Force XXI and was outfitted with digital communications systems, new equipment, and new weapons systems.

In March 1997, the 1st Brigade was tested in an advanced warfighting experiment at the National Training Center (NTC), Fort Irwin, California. Its success against the NTC's opposing force was largely attributable to increased situational awareness that resulted from using digital communications. According to Brigadier General Robert T. Clark, the Army Training and Doctrine Command's (TRADOC's) Deputy Chief of Staff for Combat Developments, the expedited fielding of the experimental force was possible because of the collaboration among contractors, soldiers, and Army systems program managers at Fort Hood. "It is a new way of doing business, and we in TRADOC are



Rock Island Arsenal, Illinois, is preparing 116 M114 155-millimeter towed howitzers for transfer to the Bosnian Army. The M114—first produced in World War II and an artillery mainstay in both Korea and Vietnam—is no longer in the Army inventory. The 116 guns bound for Bosnia were refurbished in the 1980's and then stored. Above, an arsenal worker readies an M114 for exercising. (See another photo from this project on the cover.)

chartered with driving this process...so that we don't go back toward the linear, sequential, time-consuming and costly way of doing business," he said.

The 4th ID will continue to be the developmental organization that will test new Army concepts and technologies. That, and other divisions, will be reorganized to conform to an "interim division design." Fiscal constraints will allow only the cavalry squadron and one brigade in each division to be equipped with embedded digitized ground maneuver systems—M1A2 Abrams tanks, Bradley fighting vehicles, and selected enhancement programs The other brigades will have appliqué digitized systems. General William W. Hartzog, TRADOC commander, who oversees the development of Army XXI, said. "I think we're going to end up with a design that's a little smaller. Somewhere in the neighborhood of 15,000 soldiers."

ISM FIELDING ON SCHEDULE

Fielding of the integrated sustainment maintenance (ISM) program continues throughout the Army. ISM is an Army Deputy Chief of Staff for Logistics initiative that was developed by the Logistics Integration Agency. Implementation is being managed by a corporate board from major Army commands, with the Army Materiel Command acting as executive agent. Under ISM, a single structure of national, regional, and local sustainment maintenance managers is integrating operations of active and reserve component general support maintenance units, installation directorates of logistics maintenance, Army depot forward repair activities, and contractors performing maintenance on weapon systems. ISM will allow the Army to make more efficient use of limited resources by repairing more components, thereby reducing sustainment and procurement costs.

All active component ISM sites in the continental United States are now operational. Fielding to reserve component sites is underway and should be completed early in fiscal year 1998.

In July, an ISM team traveled to Germany, where they installed the Executive Management Information System (EMIS) and conducted initial user training at the 21st Theater Army Area Command's Theater Sustainment Maintenance Management Office and the Kaiserslautern Local Sustainment Maintenance Management (LSMM) Office. The team returned to Germany in September to install EMIS and train personnel at LSMM sites in Vilseck and Mannheim. ISM fielding to Eighth U.S. Army and U.S. Army, Pacific, sites is scheduled for late fiscal year 1998.

UNIT SUPPLY UPDATE BEING REVISED

Publications that are now contained in the Unit Supply Handbook (Update 2–series) are being revised and will be printed and issued as stand-alone publications. Each publication has been assigned an identification number (IDN). Units and activities should anticipate their needs and establish their DA 12-series subscription requirements according to the IDN's listed below. Requirements are to be submitted through normal publications initial distribution channels for review.

- Army Regulation (AR) 735-5, Policies and Procedures for Property Accountability (IDN 095510).
- AR 700-84, Issue and Sale of Personal Clothing (IDN 095509).
- AR 710-2, Inventory Management Supply Policy Below Wholesale Level (IDN 095501).
- DA Pamphlet 710-2-1, Using Unit Supply System (Manual Procedures) (IDN 095511).
- DA Pamphlet 710-2-2, Supply Support Activity Supply System: Manual Procedures (IDN 095512).

Subscription updates must be transmitted to the Army Publishing Agency's host system electronically, using any of the following: STARPUBS DDN Interface System (SDIS) (asqzim0@hoffman-emh1.army.mil); World Wide Web (WWW) (http://www-usappc.hoffman.army.mil); or USAPPC Bulletin Board System (BBS) (dial [703] 325–6736/6737 or DSN 221–6736/6737).

For more information, call Rosita Effinger at (703) 428-0542 or DSN 328-0542.

RATION HEATER WINS QUALITY AWARD

A nonflammable ration heater developed by the Soldier Systems Command's Natick Research, Development, and Engineering Center, Natick, Massachusetts, has won a 1997 Small Business Innovation Research Phase II Quality award. The award is given to recognize originality and innovation, relevance to the Army, and commercial potential.

The nonflammable ration heater (NRH) is an improved version of the flameless ration heater (FRH) now used by soldiers in the field to warm their meals, ready to eat (MRE's). The FRH is a pad that contains a small amount of a magnesium-iron alloy. MRE's are heated by placing the FRH pad into a separate pouch with the entree pouch and adding water. The metal alloy in the pad reacts with the water to produce heat. Although the FRH works well, the hydrogen that is released as a result of the chemical reaction is potentially flammable. The presence of hydrogen also causes

COVERS OFFER SHADE AND CONCEALMENT

Soldiers performing forward reconnaissance in the desert now can stay relatively cool without being exposed to the enemy. The 5- by 9-foot tent-like structures, called hide site covers, provide protection from blowing sand and the harsh desert sun. The lightweight shelters developed by the Natick Research, Development, and Engineering Center (NRDEC), Natick, Massachusetts, also provide visual concealment for soldiers in dry or rocky terrain where digging foxholes is difficult. The prototype version, the small unit solar shade, was made of beige fabric that blended well into desert terrain. Based on soldier input, NRDEC added a kit that includes several shades of brown fabric that can be cut into patterns and attached to the shelter as landscape colors change. Several shelters can be fastened together, if needed.

restrictions on the storage and transportation of the FRH's.

The new NRH contains basic and acidic anhydride powders that provide two sources of heat when activated with water—hydration and neutralization. The process emits no gaseous byproducts, so restrictions on handling of the heaters are lifted. For this reason, the NRH's will be more adaptable for use by commuters, truckers, construction workers, and others who must eat on the go.

Not only is the new NRH safer to use, it is projected to cost 10 cents less than the FRH. Considering that tens of millions are purchased by the military services each year, the savings to the taxpayer will be significant.

BEST MAINTENANCE UNITS NAMED

The Army's best maintenance units in 1997 were recognized by the Deputy Chief of Staff for Logistics, Lieutenant General John G. Coburn, and Robert M. Walker, Assistant Secretary of the Army for Installations, Logistics, and Environment, in a Pentagon award ceremony. Representatives from 23 active duty and reserve component organizations received Department of the Army Maintenance Excellence Award plaques. First-place winners are as follows—

Active Army MTOE Units

Light. 81st Quartermaster Detachment, FORSCOM, Fort Lewis, Washington.
Intermediate. Headquarters and Headquarters Troop, Support Squadron, 11th Armored Cavalry Regiment, FORSCOM, Fort Irwin, California.
Heavy. 725th Main Support Battalion, USARPAC, Schofield Barracks, Hawaii.

Army National Guard MTOE Units

Light. Headquarters and Headquarters Detachment, 540th Quartermaster Battalion, NCNG, Lenoir, North Carolina.
Intermediate. B Battery, 1st Battalion, 171st Field Artillery, OKNG, Clinton Oklahoma.
Heavy. B Company, 434th Main Support Battalion, MNNG, St. Cloud, Minnesota.

Army Reserve MTOE Units

Light. HHD, 467th Supply and Service Battalion, FORSCOM, Corpus Christi, Texas.
Intermediate. 1011th Quartermaster Company (Direct Support), FORSCOM, Independence, Kansas.
Heavy. 1007th Maintenance Company (General Support), FORSCOM, Hagerstown, Maryland.

Active Army TDA Units

Light. Pusan Storage Facility, Eighth U.S. Army, Pusan, Korea.
Intermediate. 34th Support Group, 19th Theater Army Area Command, Eighth U.S. Army, Yongsan, Korea.
Heavy. 751st Military Intelligence Battalion, INSCOM, Camp Humphreys, Korea.

Runners-up in each of the 12 categories also were recognized at the ceremony. The Army Awards for Maintenance Excellence program began in 1982.

ALOG EMPHASIS

THERE WHEN YOU NEED THEM

The Defense Distribution Depot Susquehanna, Pennsylvania, has an Emergency Supply Operations Center (ESOC) that operates 24 hours a day, 7 days a week, supporting customers around the world. To place an order, the inventory control point for the requesting activity must provide the ESOC with information such as exception data, shipping address, type of delivery (overnight, 2-day, or expedited), priority, and required delivery date. To check on the status of an order, call the ESOC at (717) 770-6192/6193/6194 or DSN 977-6192/6193/6194, send a fax to (717) 770-4134/4168, or send e-mail to esoc@smtp.ddre.dla.mil.

NVD SECURITY PAYS OFF

Due to a rise in the number of lost or stolen night-vision devices (NVD's) in 1995, Department of the Army officials reminded commanders to ensure that security and accountability policies were enforced. As a result, figures released in July showed a significant decline in NVD losses in 1996—only 121 compared to 207 losses reported in 1995. If losses in 1997 continue at the present rate—less than six per month—this will be the greatest decline since tracking of NVD losses began in 1991. The Security, Force Protection, and Law Enforcement Division, Office of the Army Deputy Chief of Staff for Operations and Plans, is soliciting "success stories" from agencies that reduced their NVD losses without incurring additional costs. If you have a story to share, contact Judy Sauls at (703) 697-2914 or DSN 227-2914.

RECALL NOTICE SYSTEM IMPROVED

The Department of Defense (DOD) is testing a centralized system for reporting recalled pharmaceutical or medical devices and equipment. The DOD Medical Materiel Quality Control (DODMMQC) message system is expected to eliminate duplication of effort and reduce paperwork for all four services. Recall messages are sent simultaneously to hospitals, clinics, and medical units aboard ships or on foreign soil. The Army Medical Materiel Agency (USAMMA), Fort Detrick, Maryland, prepares and disseminates the messages via the Internet (http://www.medcom.amedd.army.mil/usamma/), the USAMMA Bulletin Board, and communications center messages (hard copies). The messages contain all service-specific requirements, points of contact for return or disposition of the product, and other product information. For more information, call Paula Thorn, Chief, USAMMA Technical Operations Division, at (301) 619-4305 or DSN 343-4305.

(Continued on page 48)

ALOG EMPHASIS

(Continued from page 1)

NAME CHANGE FOR AWR

Army War Reserves (AWR) will now be called Army Pre-positioned Stocks (APS); for example, APS-1, APS-2, and so on. Headquarters, Department of the Army, announced on 18 June the decision to change the name of the Army's pre-positioned equipment sets. The change was made to prevent operational and budget decisionmakers from perceiving that these stocks are piles of supplies that may be called on in time of war. In fact, the APS are the Army's first-to-fight heavy brigade sets and sustaining supplies that are pre-positioned in likely combat zones. The name change will not require the renaming of any organization associated with the support of APS.

FORCE PROVIDER INFO ON CD-ROM

"Force Provider: An Overview" soon will be available on CD-ROM from Tobyhanna Army Depot, Pennsylvania. The CD describes the mission, design, capabilities, site and personnel requirements, cost, available training, and points of contact for the Force Provider system. The Force Provider system was designed to provide temporary shelter and personal services to the front-line soldier as a respite from the rigors of war. The overview is intended for commanders and staff planners who will use the system. To get a copy of the CD-ROM, call the Joint Visual Information Activity at Tobyhanna at (717) 895-7283 or DSN 795-7283, or fax a request to (717) 895-6106 or DSN 795-6106, and cite PIN 710745, CD 101-12.

HOT SHOWERS IN THE FIELD

The small unit shower (SUS), which premiered last year in the Soldier Enhancement Program, is now available for purchase. The SUS is a lightweight, portable shower system designed for small units deployed in forward areas. (For a description of the SUS, see page 47 of the January-February 1997 issue of *Army Logistician*.) The SUS will be authorized for units as a common table of allowances item. For more information, including how to order the SUS, call the Product Manager-Soldier Support at (508) 233-5543 or DSN 256-5543.

LOGCAP CONTRACT SET

The Logistics Civil Augmentation Program (LOGCAP) contractor for the next 5 years is DynCorp Aerospace Technology, Fort Worth, Texas. LOGCAP is an Army initiative to use contractor support during peacetime to plan for war and other contingencies. DynCorp replaces Brown and Root as the Army's primary source of contracted combat support and combat service support of wartime forces. The new contract provides fixed-price delivery orders for updating existing logistics plans and developing specific operational plans and cost-plus-award-fee delivery orders for executing logistics plans and participating in validation exercises. The contract has a base year and four option years and is expected to run through 31 January 2002.

*US GOVERNMENT PRINTING OFFICE: 1997–418-313 60001

ORDNANCE GAINS SMPT

Effective 1 October 1997, the School of Military Packaging Technology (SMPT) at Aberdeen Proving Ground, Maryland, was assigned provisionally to the Army Ordnance Center and School, also at Aberdeen. The transfer completes a cycle that began in 1950 when the Army Chief of Ordnance initiated the first Ordnance Packaging Training Course. The function has been renamed and transferred several times in the last 47 years and now will return officially to the command and control of the Chief of Ordnance on 1 October 1998. SMPT had been an element of the Army Logistics Management College, Fort Lee, Virginia, since 1985.

NEW RULE FOR CSM APPOINTMENT

Effective in September 1998, only sergeants major and promotable master sergeants who are attending the Sergeants Major Course will be considered for appointment to command sergeant major (CSM). In the past, up to 20 months elapsed from the time a soldier was selected for appointment to CSM to the time he actually assumed the position. During that time, master sergeants completed the required 9-month course at the Sergeants Major Academy at Fort Bliss, Texas. The new requirement is that selectees must be either graduates of or enrolled in the Sergeants Major Course when the E-9 selection board meets. According to officials in the Office of the Deputy Chief of Staff for Personnel, Department of the Army, the decision to narrow the "zone of consideration" for appointment to CSM will increase efficiency.

TRAVEL INFO ON INTERNET

The Department of Defense Per Diem, Travel, and Transportation Allowance Committee's home page (www.dtic.mil/perdiem) contains the latest information on per diem rates; continental United States, overseas, and variable housing allowances; overseas cost of living allowances; station allowance changes; and service lodging and dining facilities. The web site also contains the Joint Federal Travel and Joint Travel Regulations as well as an e-mail link to the committee for questions and comments.

ALOG LOG NOTES

Redesigning PMCS

In your July-August 1997 issue, the article on "Redesigning PMCS," by Major Steven V. Karl and Dr. Matthew W. Lewis, brought up some interesting points.

The discussion on the time lag of reporting using the automated 5988E can be resolved. Because of the Army's advancement with computer systems, it would be easy to include in crew equipment a laptop or hand-held computer system with the software for reporting maintenance faults. This computer system would need to be compatible with communications systems assigned to the crew so the modem inside the computer could hook up with a communications interface and download information to ULLS-G; then the ULLS clerk could do an up-date. The only requirement is that the first sergeant or commander would need to review the information and do a signature approval of the identified problem(s). If maintenance crews (maintenance support teams or the assigned detachment) are available on site, a printout of faults and required maintenance parts should be provided in hard copy. This would require that a minimum of one printer be available for printouts.

By having this equipment, the crew would be able to download the new 5988E from the ULLS clerk and, as corrections are made, update and return information. This could be worked out on a time schedule so that one communications interface, the protocol "BLAST," is made to the ULLS Center. This would increase the commander's awareness of combat readiness. This would put the maintenance status closer to real time and improve the maneuver commander's capabilities to develop courses of action.

The worry of information not getting to the correct person would also be removed. The system would need to be designed for use by the least trained operator in the crew. All personnel would need to be able to manage this system so that in war or any operations other than war the flow of information would continue.

The system can work, but it will only work as good as the person punching the buttons.

CPT Terry R. Stillman, USAR
Milwaukee, Wisconsin

I read with great interest the article, "Redesigning PMCS," by Major Karl and Dr. Lewis. Having spent time as a tank platoon leader, company executive officer and currently as a battalion maintenance officer, I can relate to the points brought out by the authors. However, there was one element that was not addressed: Leadership. Without leadership, no system will work, no matter how well designed. Our battalion commander always says, "Everyone has an attitude; it might as well be a good one."

Crews know how to do PMCS and they understand what is critical to mission performance. However, knowing how to do something and actually doing it are two very different things. Leaders within the unit must ensure their soldiers are maintaining their vehicles. Every time our tanks stopped, back decks came off to check oil levels, and skirts were opened to check suspension. By developing a routine, crews were able to eliminate many NMC [not-mission-capable] faults from occurring. Too often, crews are allowed to pull in to an assembly area and conduct everything *but* maintenance. LOGPAC pulls in, so that means chow, mail, and everything else enjoyable. Maintenance is the least liked but most important part of a crew's job. No one wants to jump into knee-deep mud at Hohenfels to check suspension, or stand on the back deck in 100-degree heat at NTC [National Training Center] and check oil levels, but it must be done. Platoon leaders and sergeants are the key to making that happen.

Our unit, 2-63 Armor, just finished an extremely successful rotation at the Combat Maneuver Training Center. The task force had nearly 100-percent combat power for every battle. This was in spite of the fact we had a very small direct support cell, no brigade or higher headquarters, and personnel shortages. Instead of focusing on what we did not have, the unit focused on the goal of defeating the enemy. Mission focus was at all levels. The result was a good flow of 5988E's, quick response with repair parts, good preventative maintenance at the operator level, and most importantly, the defeat of the enemy. Strong leader involvement in a unit that implements the systems described by the authors should significantly improve their maintenance posture.

1LT Kendric H. Robbins
Vilseck, Germany

Career Plans for Warrants Debated

I just finished reading the article, "Warrant Officer Corps: How to Get There From Here," written by CWO3 Long. Then I turned to the front of the magazine and read the mission. I found nothing in this article that fits the mission. The disclaimer states that the articles express the opinions of the authors, understand that. But who edits and screens these articles? The *Army Logistician* has always been a source of good informative articles.

I hope the magazine is not becoming a sounding board for disgruntled people. This article has the flavor of that.

CWO4 Albert R. Elgin
Fort Lee, Virginia

The article to which you refer was printed as a "Commentary," which is a section designed for airing logisticians' problems and suggested

solutions. We want to assure you that each article submitted to us is reviewed carefully and is judged for value to our readers and appropriateness for our publication. We're sorry you were disappointed with this particular article, and we hope you will continue to count on us for useful and interesting logistics information in the future. Please read on for another viewpoint.

—Editor

I agree with Chief Long on all points! He has touched on a sore that has been festering too long. Because of the shoddy management of the Warrant Officer Corps, I retired at 20 years. Had these ideas of Chief Long's been in place, I'm sure the Army would have had to force retirement on me. You now have CWO5's in some specialty fields that are holding down slots that a CWO2 should be filling.

There's a long road ahead of you, Chief, but you've made the first step in bringing attention to this problem. Kudos.

CWO2 Arthur J. George (Ret.)
St. Thomas, Pennsylvania

AMC Interns Experience NTC

The Army Materiel Command has revised the supply intern program so new supply interns not only learn about wholesale logistics but also gain first-hand experience with retail supply operations. In coordination with Forces Command, interns now attend the National Training Center, Fort Irwin, California, as part of their installation retail assignment.

The first interns experienced NTC for one week in June. Logistics assistance representatives from Fort Lewis [Washington] accompanied interns into the field to observe Army supply and maintenance operations under combat conditions. This allowed the future item managers to interact with soldiers and experience Army supply operations from the perspective of the user.

Understanding and experiencing Army supply from the user level will make interns more aware of the consequences of the decisions we will make as item managers. As a result, the experience at the NTC will allow us to better serve the customer, America's soldier.

Christopher Elliott
Fort Lee, Virginia

Hints for Successful Deployments

Having deployed to (and redeployed from) Haiti in 1994 and 1996, I have some additional comments on redeploying from "third world" areas that Captain Spencer addressed in "Redeploying From Haiti," in the July-August 1996 issue.

There is no "systemic Army problem" concerning rough terrain container handlers (RTCH's) in early stages of deloyments. The problem is getting the units that own this equipment, and whose mission it is to move equipment containers, into the theater of operations *early*. The typical terminal service company, for example, has 10 RTCH's. I would caution the 710th MSB on seeking approval for adding a RTCH to the battalion's MTOE. They are hydraulic-maintenance-intensive machines that require large maintenance budgets for upkeep (a single new tire costs around $5,000). Much like a soldier on patrol, you never want to send out just one either. You also need both high-mast and low-mast configurations for operation inside ships, as well as stacking capability. Their operation and maintenance are probably best left to those transportation units already authorized them. Hence, the need to program for these type transportation terminal and cargo units early in the deployment timeline.

Hopefully, we are educating our customer units in some of the important things to remember for successful deployments and redeployments—

- Cleanliness can't be overstressed when deploying. Some of us have seen an entire ship halted, turned around, and downloaded because the cargo (vehicles and equipment) hadn't been properly cleaned.
- Make sure each vehicle has all proper tie-down shackles. This is more important than anyone can realize. Equipment missing any shackles is usually "frustrated" and returned to the unit.
- Don't worry about your equipment maintaining unit integrity in the redeployment staging areas. We prefer to stage by equipment type, because that's the way we usually call forward and load (layman terms: all the heavy stuff on the bottom of the ship, light stuff on top).
- If convoys are needed between redeployment preparation sites, run them late at night. Streets are usually empty, thus enabling quick, safe movement of vehicles, equipment, and containers.

The solution remains getting the proper transportation unit(s) deployed with the proper equipment in an early enough phase to ensure successful deployment/redeployment operations for customer units.

CPT Kyle Waggoner
Denver, Colorado

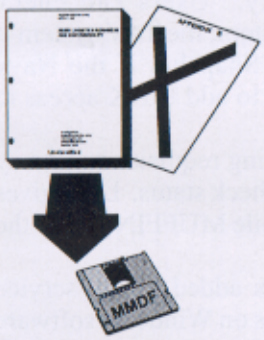
Log Notes lets you share your thoughts on logistics. You may want to comment on an *Army Logistician* article, take issue with something we've published or something happening in logistics, or share an idea on how to do things better. Your note will be edited only to meet style and space constraints. All notes must be signed and include a return address; if you request, your name will not be published. Mail notes to EDITOR ARMY LOGISTICIAN, ALMC SUITE C300, 2401 QUARTERS ROAD, FT LEE VA 23801-1705; send them by FAX to (804) 765-4463 or DSN 539-4463; or e-mail to alog@lee-dns1.army.mil.

ALOG SYSTEMS

The information presented in Army Logistician's ALOG Systems *is compiled, coordinated, and produced by the Army Combined Arms Support Command (CASCOM) Information Systems Directorate (ISD). Readers may direct questions, comments, or information requests to Lieutenant Colonel Thet-Shay Nyunt by e-mail at nyuntt@lee-dns1.army.mil or phone (804) 734-1207 or DSN 687-1207.*

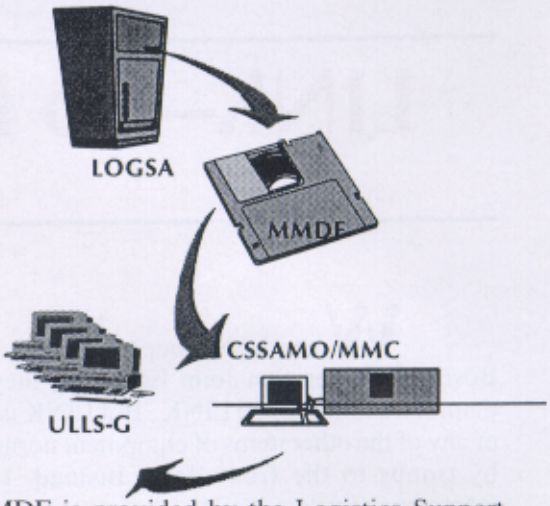
–Editor

MAINTENANCE SYSTEM'S POTENTIAL UNREALIZED IN MANY UNITS



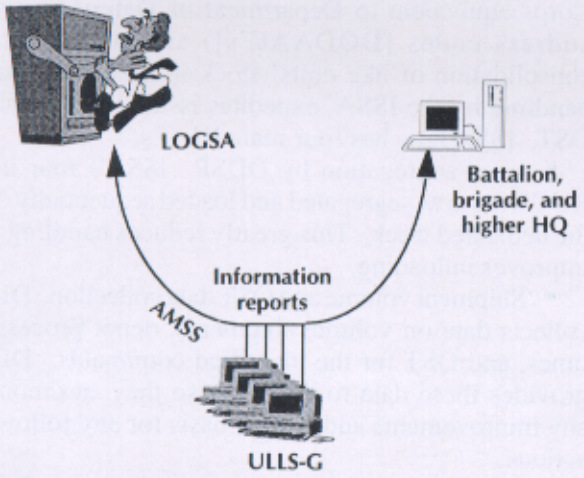
In August 1995, the Army Materiel Status System (AMSS) process made its debut in the Unit Level Logistics System-Ground (ULLS-G). AMSS was distributed as part of ULLS-G Software Change Package (SCP) 05-00 along with a support package explaining AMSS. Since that time, AMSS has met with mixed reviews from the field. The following brief overview should help clarify three potential problem areas and make AMSS more user friendly.

The distribution support package (DSP) sent to commands before the SCP 05-00 fielding included an equipment authorization worksheet. This worksheet should be filled out by managers and their property book officers to ensure all equipment on hand is entered into ULLS-G correctly. (Army Audit Agency and Command Logistics Review Program reviews indicate that required actions for updating data have not been completed fully by all units across the Army.) After the equipment authorization worksheet is completed, part of the training for SCP 05-00 includes having operators configure their weapon systems within AMSS. With the equipment loaded into ULLS, the next step is to select the desired administration numbers to complete system configuration using the Maintenance Master Data File (MMDF).



The MMDF is provided by the Logistics Support Activity (LOGSA) and has replaced annex B of AR 700-138, Army Logistics Readiness and Sustainability. The MMDF contains a list of reportable and nonreportable items with all associated information about the equipment. This information includes the appropriate technical manual and date, equipment identification code (EIC) and weapon EIC, national stock number, line item number, and more. The MMDF is the driver for much of what goes on behind the screen in ULLS-G. Reproduction and dissemination of this file should be dictated by standing operating procedures of your combat service support automation management office (CSSAMO). Central distribution of the MMDF ensures that it is standardized throughout the command. Non-uniform MMDF's within a command can result in mismatched data and adversely affect reporting accuracy. To confirm that you have the current MMDF, contact your local CSSAMO.

The last area that makes AMSS more user friendly is ULLS-G readiness reporting. There are two basic routes over which ULLS-G reports are transmitted routinely. AMSS reports go to LOGSA and to battalion, brigade, and higher echelons. The primary AMSS report is the end-of-month report that is passed to your battalion ULLS-G and sent to LOGSA through the Standard Army Maintenance System (SAMS). There is some concern about the fact that ULLS-G can pass data directly to LOGSA with no opportunity for management review. This is a calculated part of the design for AMSS. The ULLS-G information reporting can be accomplished at any time through the use of the "Send to Higher" and "Receive from Lower" process. This process allows managers time to review data before the end-of-month AMSS report that is routed to LOGSA. The reports sent to LOGSA contain data that are identical to the data available to managers on a daily and weekly basis. It is up to the manager to ensure that readiness reports accurately reflect unit equipment status. Careful input of data enables analysts at higher



headquarters and LOGSA to interpret data properly.

Initiatives on the horizon to improve AMSS reporting in ULLS-G include an automated interface with the property book (SPBS-R/ULLS-S4) for equipment on hand.

The AMSS point of contact is Master Sergeant Dale L. Sims, CASCOM ISD. His phone number is (804) 734-2163 or DSN 687-2163, and his e-mail address is simsd@lee-dns1.army.mil.

SYSTEMS BRIEFS

The Army's Integrated Combat Service Support System (ICS^3) (see *ALOG Systems*, December 1996) has been approved. ICS^3 is an evolutionary system, and elements of the system are now under development by the Project Manager-Integrated Logistics Systems (PM-ILOGS), Fort Lee, Virginia. ICS^3 strategy for the integration of Army data systems outside of traditional logistics channels has posed challenges to both combat and materiel developers. Army systems such as the Standard Installation/Division Personnel System (SIDPERS) and the Theater Army Medical Management Information System (TAMMIS) are long-standing systems that have unique architectures that house sensitive data. The data from those systems, while sensitive, are critical elements that leaders and planners must use to exploit information capabilities for combat service support operations. In July 1997, Major General Robert K. Guest, then CASCOM commander, presented a proposal to a board of senior general officers for resolving overall CSS system architecture issues. The proposal calls for the assignment of a four-star general to provide oversight and senior-level advocacy of ICS^3. ICS^3, using this high level of authority, will be empowered to cross "domains," commands, and proponencies to expedite interfaces and integration as required. Official approval and guidance are expected in November or December.

The Army Deputy Chief of Staff for Logistics has named the Logistics Integration Agency (LIA) as the Army staff functional proponent for the integration of automatic identification technology (AIT) into the logistics infrastructure. LIA has created the AIT Coordinating Group, which is composed of experts representing logistics functional, technical, and acquisition communities, to help execute the mission. Early group discussion topics included adoption of commercial AIT standard shipping labels and data identifiers, ammunition AIT prototype testing, and the Department of Defense/Army AIT implementation plan.

AIT capabilities and technologies have created considerable interest in a number of existing and emerging military systems. The Transportation Coordinators' Automated Information for Movements System II (TC AIMS II) is currently studying the role of AIT in that system's requirements architecture.

Aviation mechanics soon may have a new tool to assist them with maintaining and repairing their equipment. ISD has been asked to produce requirements documentation for the inclusion of the Soldier Portable On-System Repair Tool (SPORT) ULLS-Aviation (ULLS-A). SPORT is a highly portable diagnostics and technical support computer. ISD is providing the rationale to support the requirement to have SPORT issued along with ULLS-A as an independent resident program. SPORT will assist in and complement the transfer of ULLS-A data from the logbook to the local area network.

Final draft versions of the Standard Army Maintenance System (SAMS-1 and SAMS-2) manuals have been updated to include changes to both systems up through the most current SCP-10. The latest version of SAMS exists as a rehost to Windows NT. A CD ROM-based electronic technical manual (ETM) will be distributed to units authorized. The ETM may be operated from a CD ROM drive or loaded on the hard drive of the SAMS. The electronic manual will provide units with a capability to quickly move through the technical data and do searches for topics or areas of interest.

Initial coordination has begun with the Mortuary Affairs Center to identify functional requirements for inserting automated mortuary affairs capability into phase 2 of ICS^3. The Mortuary Affairs Center is looking for a means of tracking the movement of human remains from the point of entry until final disposition.

The Mayor's Cell

by Sergeant Jeffery M. James

During the winter of 1995, the Special Troops Battalion (STB), 3d Corps Support Command (COSCOM), Wiesbaden, Germany, was given a once-in-a-lifetime opportunity to test its mission-essential task list and doctrinal training in a real-world contingency—Operation Joint Endeavor. We were to deploy on 5 December to Kaposvar, Hungary, and participate in the establishment and sustainment of an intermediate staging base (ISB).

As the S4 noncommissioned officer (NCO), I was in charge of contingency and exercise contracting for life support items. But this was the first time I had been tasked to provide support to a community as large as the ISB being established. Several questions came to mind immediately.

First, how would I, with a staff of only four, create control measures for the support that would be required from contractors? Second, and more importantly, how would I satisfy everyone's needs in an environment that had virtually no existing support structure? Little did I know that pursuing answers to these questions would take me far beyond my doctrinal training into a totally unfamiliar civilian and host nation support structure.

Initial Stages

The doctrinal mission of the STB S4 is to deploy on order and provide life support commodities to a COSCOM and the rear elements of a corps staff that have a combined population of 800 soldiers. Our mission during Operation Joint Endeavor was to provide life support for 3,000 soldiers, known as "sustainers," who were permanent-party residents of the ISB. This meant that we would serve as the contract, real estate, and overall installation administrators for the independent ISB communities called "Kaposvar North and South." Making it work with so few internal resources would be a challenge.

Deployment to Hungary

The STB prepared in advance for the mission as much as possible. However, we deployed almost immediately to Kaposvar to become the STB, 21st Theater Army Area Command (Forward). As soon as we arrived, we began negotiating with the Hungarian Ministry of Defense for use of the Kaposvar Hunyadi Janos Barracks. A Hungarian military logistics brigade of about 1,000 troops was inhabiting our future community at the time. So, in conjunction with the negotiations, we began to make the most efficient use of the billets we already had.

Our first objective was to determine which authorized living areas would accommodate and provide for control of permanent and transient ISB residents. Since the U.S. troop population would exceed available living quarters, Russian Scud missile bunkers provided the only available shelter for transient troops who would occupy the ISB en route to Croatia and Bosnia. Our goal was to establish "tier 2" standards of living for every incoming soldier, even those who would be billeted in the Scud bunkers, within a period of 2 weeks, and all without an established logistics pipeline. ["Tier 2" is one of three levels of comfort for troops participating in the Bosnia operation. Tier 1 means that the units move in and set up their own tents, a mobile kitchen trailer, limited power generation, hasty showers and latrines, and other basic equipment. For tier 2 facilities, a contractor provides additional services to the basic encampment, such as hardwood floors and sides in the tents, lighting, heating, latrines and showers, water and power production and distribution, kitchen and dining facilities, food service augmentation, and waste management. Tier 3 is a further enhancement of these accommodations.] Many fundamental plumbing and electrical upgrades were needed.

The 550-seat main dining facility in Kaposvar South was managed by a contractor and 3d COSCOM food service personnel and operated by local nationals.

Some required the technical expertise and vast resources that are only available to civilian logistics agencies. But how could we organize to coordinate tier 2 support? How could we determine which of the ISB soldiers' immediate needs could be met by the local community?

Almost overnight, we transformed our small battalion staff into a miniature base support battalion. We elected our boss, the STB commander, the "mayor" of our newly acquired community of Kaposvar North and South and organized a council from the STB staff. We created a town hall to interact systematically with the many civilian, U.S. military, and host nation support agencies in the area. We called our town hall "the mayor's cell."

Providing Life Support

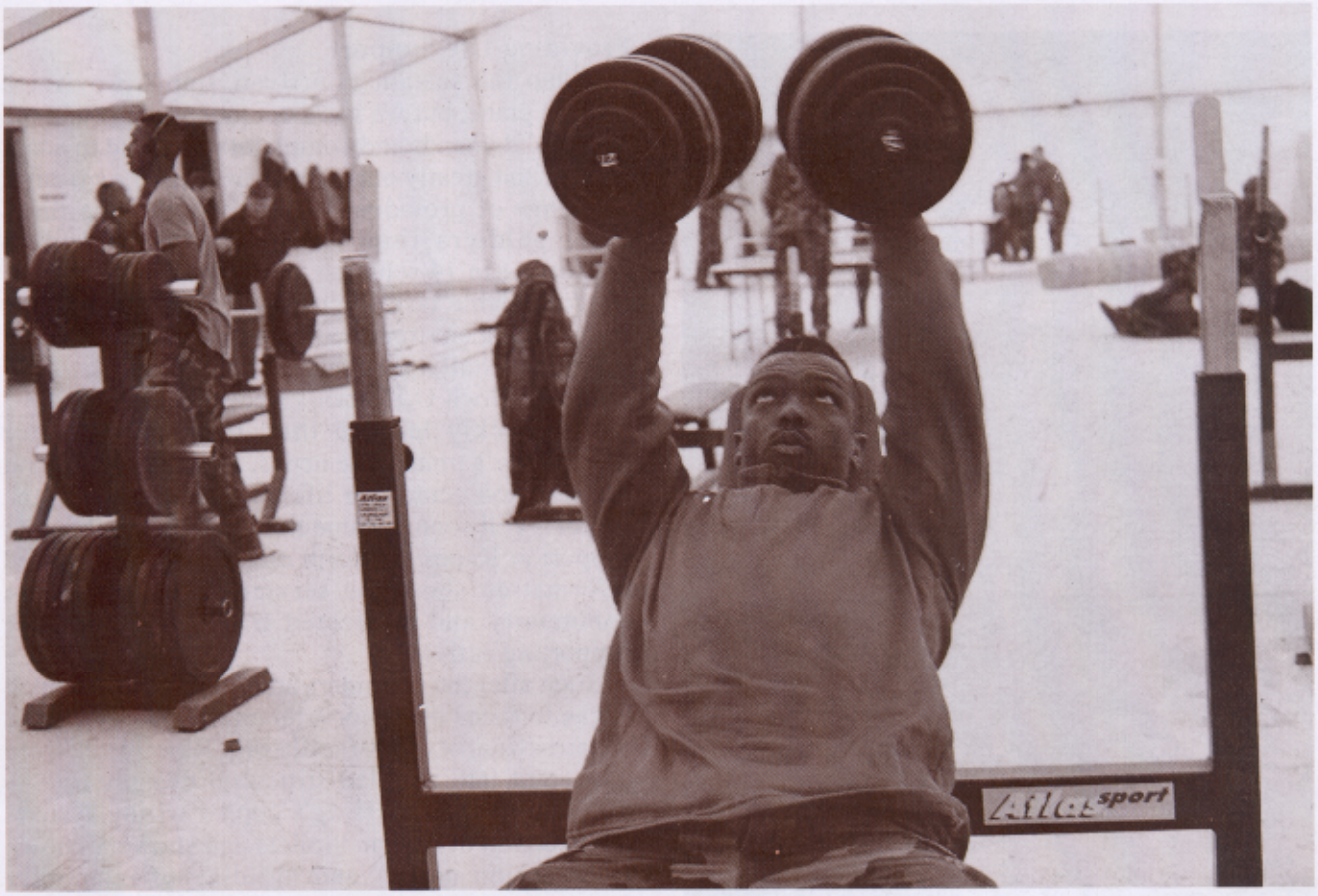
When the sustainers arrived, tier 2 provisions were in place, but we were not prepared to field the soldiers' demands and complaints. We had to adapt and expand greatly our mission as we met each day's challenge of providing life support to three times more soldiers than we were accustomed to supporting in 14 separate units. Added to this was the formidable task of creating an adequate living and working environment on an isolated Hungarian military installation that lacked the standards of living to which U.S. troops were accustomed.

We quickly learned that, to respond to our community's immediate needs, we needed a central coordination center for life support. As such, the mayor's cell soon became the heart and soul of life support at Kaposvar North and South. It provided information about the services available in the community and redirected traffic to the proper supporting activities.

Soon after the sustainers arrived, the mayor's cell began to focus on major structural renovations and construction of new facilities. Raw ideas were converted into detailed structural designs for the overhaul of each building's copper wiring system, construction of external toilets and showers known as "ablution units," and building of temporary framed buildings we called "seehuts" to be used as an Army and Air Force Exchange Service (AAFES) food court. Other projects included constructing a lighting system for streets; facilities for a contracted laundry; an AAFES dry cleaning service; a container storage area; parking lots; fest tents for morale, welfare, and recreation equipment; an education center; a barber shop; a volleyball court; an athletic field, and more. These construction projects were aimed at providing basic services common to a U.S. Army installation and necessary for the morale and welfare of soldiers on a year-long deployment.

Supporting Agencies

Civilian and other Government agencies provide many of the essential life support requirements on the modern battlefield. This means that the modern Army battalion staff logistician must coordinate and work very closely with those agencies. A whole new set of rules, regulations, and acronyms become common at this level of support, such as USACE (U.S. Army Corps of Engineers), DCMC-I (Defense Contract Management Command-International), "Red Horse" and "Prime Beef" [Air Force engineer squadrons that are part of the Force Provider joint soldier support system], COR (contracting officer's



The gymnasium in fest tent 2 in Kaposvar North was outfitted with high-tech aerobic and nonaerobic equipment provided by the Morale, Welfare, and Recreation activity.

representative), QAR (quality assurance representative), and ACO (administrative contracting officer). Also common to modern-day Army deployments is the logistics civil augmentation program (LOGCAP). Because of its mobility and vast resources, LOGCAP provides some or, in some cases, all of the construction and services support.

Just like any military operation, assigning and defining responsibilities and establishing good, clear lines of communication with supporting agencies are key to a successful operation. At Kaposvar North and South, the mayor's cell provided these invaluable services.

LOGCAP

LOGCAP provides numerous contracted services to the Army. This assistance includes laundry and food service, janitorial cleaning, waste disposal, chemical latrine service, plumbing repairs, and facilities maintenance. Since LOGCAP is a cost-plus Government contract, work performed must be within LOGCAP's "scope of work." Individual and unit requests for services must go through an intermediary and not directly to the contractor. At Kaposvar North and South, the mayor's cell was the intermediary for every unit on the installation and served as a fail-safe mechanism that prevented the units from making unauthorized commitments.

Our conduit to LOGCAP was through two different Government agencies that administered the LOGCAP contract. The first was DCMC-I, which monitored all service-related issues. The second was the USACE, which monitored all major and minor construction projects. These two organizations were the voices for all of our needs. Their representatives relayed our requests to LOGCAP. USACE and DCMC-I ensured that our requests were within LOGCAP's scope of work and that funds never were

committed illegally.

Requesting Minor Maintenance

In addition to planning and overseeing construction projects, the mayor's cell had to devise and implement a system for community residents to submit minor maintenance and service work requests. Since our operation depended on contracted life support commodities, we faced a major challenge. We were missing an avenue for feedback from supported units on the contractors' performance and a system for requesting maintenance services. We learned very quickly that we did not want every level of command in Kaposvar North and South interfacing directly with the contractors. We had to establish an element that would funnel requests from the supported units to the contractor and see that limited resources were applied to overall mission goals.

The mayor's cell established a service order and work request section that was responsible for receiving all requests for repair and maintenance of facilities and submitting requests for minor construction projects. We established a data log and invoicing system for service and work orders. In essence, we created a small Department of Public Works. The implementation of these systems improved the overall facility maintenance posture throughout Kaposvar North and South. The systems worked so well that DCMC-I adopted them for use throughout the theater area of operations.

The fact that DCMC-I and USACE have the primary responsibility for administering the LOGCAP contracts does not relieve military personnel from identifying deficiencies and giving quantitative reports of performance or non-performance. This is especially true of service-type functions such as waste removal, laundry, food service, transportation, and maintenance work. The most effective way for the mayor's cell to determine the quality of the performance provided was through the actual customers. If the vendor did not adhere to the scope of the contract, the mayor's cell surely heard about it in the town hall meetings.

Town Hall Meeting

The town hall meeting was the forum for collecting and disseminating information between supported units and supporting agencies. In our fluid environment, where the variety and availability of numerous service commodities routinely fluctuated, the town hall meeting provided to the community a daily update on future projects and changes in service times and procedures. It also offered the community an opportunity to voice preferences on the types of services contracted by the mayor's cell and to receive reports on the quality of the services provided.

For instance, if the unit representatives at the town hall meeting agreed that the bus schedule should be changed, the mayor's cell would revise the pickup and dropoff times to satisfy the majority of the community. In the long run, the meeting proved to be an efficient communication tool that reduced the number of routine walk-in inquiries and complaints and freed the staff to focus on the community's overall needs.

Self-Help

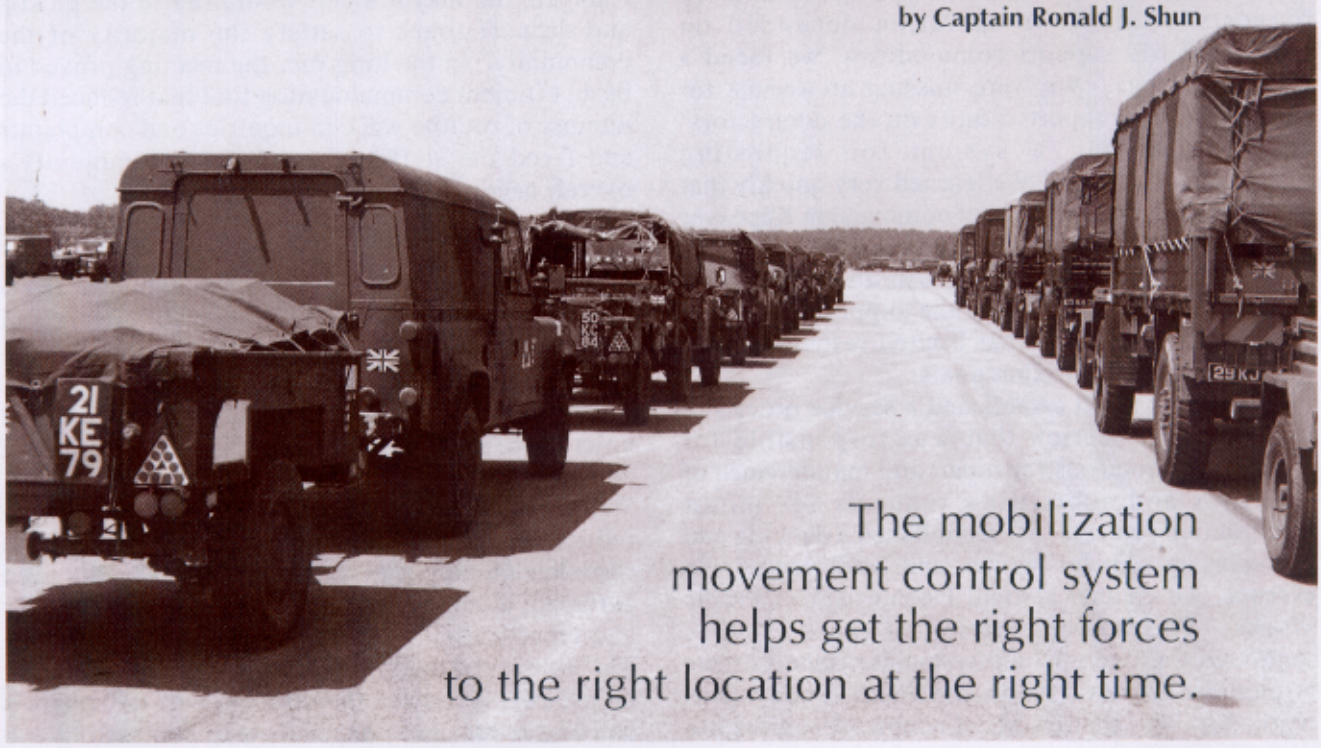
As the deployment progressed, funding for tier 3 provisions (luxury items such as wall lockers and picnic tables) became scarce, and many nonessential work orders were being denied by the mayor's cell. Therefore, we created a system through which tenant units could make minor facility improvements and construct small carpentry projects—a self-help store. With the self-help store in place, we were able to reduce the time needed to initiate, approve, and complete minor projects. When a nonessential need surfaced, it could be filled quickly using the talents and labor of soldiers from within the community. The time saved by allowing units to act immediately on projects increased the efficiency of the mayor's cell and reduced the paper flow to contracting and the Corps of Engineers.

The number and variety of tasks required to sustain soldiers and civilians in Kaposvar, Hungary, during Operation Joint Endeavor far exceeded our expectations. It was only through the establishment of the mayor's cell that our four-member S4 section was able to meet the unrelenting demands of the 3,000 residents of Kaposvar North and South.

Sergeant Jeffery M. James is the S4 noncommissioned officer specializing in contingency and exercise contracting of life support commodities for V Corps (Rear) and Headquarters, 3d Corps Support Command, Wiesbaden, Germany. He deployed to Kaposvar with 3d COSCOM, where he coordinated host nation support and was responsible for the transfer of two Hungarian posts to U.S. control. Sergeant James has attended the Combat Life Saver's, Small Arms Maintenance, and Contracting Officer's Representative courses.

Automating Convoy Operations

by Captain Ronald J. Shun



The mobilization movement control system helps get the right forces to the right location at the right time.

Managing military convoys in the continental United States (CONUS) in the late 1970's and early 1980's was cumbersome and inefficient. To improve the performance of this essential task, the Army initiated the mobilization movement control (MOBCON) program in 1985. The MOBCON program gives National Guard state defense movement coordinators (DMC's) an automated system that plans, schedules, and deconflicts convoys within CONUS. ("Deconflicting" means coordinating all convoy requests to ensure that only one unit occupies the requested road space at a time.)

Since its inception, the MOBCON automated system has proven its worth many times over. In 1996 alone, it scheduled and deconflicted over 17,000 convoys. Also in 1996, the system provided immeasurable support to the 3d Armored Cavalry Regiment during its move from Fort Bliss, Texas, to Fort Carson, Colorado. The system played an important supporting role during Joint Exercise Royal Dragon in and around Fort Bragg, North Carolina, in May 1996. In that exercise, some 38,000 American military personnel from all services and approximately 1,500 British troops convened for live-firing, parachute rigging, and airborne refresher training. Members of the North Carolina state movement control center, operating as part of the joint movement control center, worked out of a shop van for 45 days, providing on-the-spot permits, convoy clearances, and convoy deconfliction support to Army units from the XVIII Airborne Corps, Marine Corps forces, and the British Royal Air Force.

The success of the MOBCON system can be attributed to a coordinated effort among the Army National Guard (ARNG), Army Reserve (AR), and Army Forces Command. Originally, the system was used only to manage ARNG unit movements within CONUS. However, as more organizations realized the system's value, its customer base expanded. Now MOBCON schedules active component Army unit

At left, British equipment that will be used in Joint Exercise Royal Dragon waits in a staging area after being unloaded at the port at Morehead City, North Carolina. The photo above shows a 5-ton shop van that houses the MOBCON system at a remote exercise site.

movements and eventually will transition to a joint system.

How the System Works

When the MOBCON system was initiated, it was only capable of routing convoys. However, this was still better than deconflicting convoys manually. Since then, the system has been upgraded continuously. In addition to receiving, scheduling, and deconflicting convoys, the state DMC's also interact with state transportation departments and law enforcement agencies to receive up-to-date information on road construction, traffic congestion, accidents, road closings, and weather conditions. The DMC's transmit these data to technical support personnel at Oak Ridge National Laboratories in Tennessee, who enter them into their data base. This makes the information readily available to all state DMC's. Today, the system and the personnel who oversee its operation are crucial to convoy management.

When an active component, ARNG, or AR unit needs help in receiving, scheduling, or deconflicting a convoy, it submits a request by e-mail or fax through its installation to the state DMC. Personnel in the DMC check the request for accuracy and pertinent information. They then look for the ideal route, taking into consideration weather forecasts, traffic congestion, and road construction. They use the MOBCON system to select the best route for the unit to follow. As part of the scheduling and deconflicting process, the DMC also coordinates with all of the states through which the convoy will pass. Once the route is scheduled and approved, the state DMC sends the convoy clearance number, departure time, and projected time of arrival at destination to the installation or unit. While the unit is en route, the convoy commander periodically calls back to the state DMC to report the location of his convoy. In the future, this tracking may be accomplished with a global positioning system.

Training Support

To support the military's power projection strategy and make sure that all states have personnel trained to operate the MOBCON system, the National Guard Bureau has established a training course at the Professional Education Center at Little Rock, Arkansas. This course teaches attendees how to schedule and deconflict convoys, read reports, and interact with other agencies through the system's internal e-mail.

Value Added by the System

The MOBCON system supports the Army's force projection doctrine by ensuring that units have the most up-to-date information and the best route to a port of embarkation for deployment to an operation site. Since we are now predominantly a CONUS-based force, the system helps to make sure we get the right forces to the right location at the right time to meet our contingency needs.

If you would like more information about the MOBCON system, call me or my branch chief, Lieutenant Colonel James Lenoir, at (703) 607–7435 or DSN 327–7435. **ALOG**

Captain Ronald J. Shun is the transportation officer for the National Guard Bureau in Arlington, Virginia. He served previously as an instructor at the Army Transportation Center and School, Fort Eustis, Virginia; platoon leader, 68th Transportation Company; executive officer, 150th Transportation Company; and battalion maintenance officer, 28th Transportation Battalion, Mannheim, Germany.

Object-Oriented Logistics Planning: A Marriage of Convenience

by Dr. Robert M. Simmonds and Captain Garry W. McClendon

The marriage of expert and logistics systems allows planners to look at a variety of potential logistics planning configurations in a shorter period of time.

Field Manual 100-5, Operations, defines logistics as "the process of planning and executing the sustainment of forces in support of military operations." Planning the logistics support of a major military operation involves the application of leadership, experience, and known logistics requirements. The logistician needs a clear understanding of the mission and the commander's intent. He must have a complete grasp of the tactical situation in order to anticipate requirements, integrate logistics concepts and operations, be responsive to the commander, provide continuous support, and improvise as required.

To provide the force with adequate resources and capabilities to accomplish the mission, a logistician needs a variety of tools in his operation planning tool box.

One such tool we want to explore with you in this article is object-oriented programming (OOP) using a shell called KAPPA PC, which operates on a desktop computer. The OOP language enabled operations research analysts at the Army Logistics Management College, Fort Lee, Virginia, to develop an expert system that interacts with a logistics data base called Operations Logistics Planner 1997 (OPLOGPLN–97).

Using an Automated Data Base

Timely information is key to planning a successful logistics operation. At any level of the operation (tactical, operational, or strategic), the logistician needs accurate information to meet the soldiers' needs as well as those of the mission. There is a vast amount of logistics planning information available from many sources, such as field manuals, technical manuals, and technical bulletins. However, it would be time consuming and inefficient to rely on those resources for accurate logistics planning information. Automation is the most efficient way to explore all of the possible courses of action in logistics planning. Automated data bases help organize information; still, it can take hours or days to sort through the information.

OPLOGPLN–97 is one such logistics data base. This data base was designed to help logistics planners calculate supply-usage estimates to support operations. It is used in several logistics agencies and schools to help determine logistics requirements. OPLOGPLN–97 is maintained by the Army Combined Arms Support Command (CASCOM), Fort Lee, Virginia. It contains all published tables of organization and equipment for company, battalion, and selected higher echelon units. OPLOGPLN–97 contains information on 1,683 units and 1,276 line item numbers and is updated on a regular basis. New users can obtain a complete 2-disk set by sending an e-mail request to oplogpln@lee-dns1.army.mil or by calling the CASCOM Force Development Division, Directorate of Combat Developments for Combat Service Support, at (804) 765–0982 or DSN 539–0982.

How an Expert System Can Help

The purpose of an expert system is two-fold. First, it provides the user with a friendly interface in which a logistician can enter his requirements. Second, it

organizes the needs of the logistician, queries the data base (in this case, OPLOGPLN–97), and provides an output on logistics requirements that is tailored according to the user input. KAPPA PC provides both services to the user and requires little maintenance to accommodate upgrades to the system.

We selected KAPPA PC as our expert system shell because of its versatility and its ability to interface with Dbase IV, a widely used data base program that stores, organizes, and sorts through large amounts of data. The marriage of expert and logistics systems enhances the purpose and role of logistics in the Army.

KAPPA PC allows planners to look at a variety of potential logistics planning configurations in a shorter period of time than required for traditional data base searches. The planning time is shorter because the user can address various logistics questions on different computer screens. We built these screens to address the many different scenarios supported by the data in OPLOGPLN–97. Since the expert system interfaces with the data base, the expert system is working with only the portion of the data base identified by the user through the input. The expert system, depending on the speed of the computer, accesses the data base as the user moves between screens and provides the data requested by the user from the data base.

We believe the KAPPA PC system enhances logistics planning by allowing the logistician to use the computer to look at and analyze more constraints. The object-oriented model of the logistics system, which we call the "U.S. Army Logistics Planner-Transportation," includes the design, development, acquisition, storage, movement, equipping, distribution, and evacuation functions of supply, field services, maintenance, health service support, personnel, and facilities.

At the tactical level, logistics focuses on the traditional combat service support (CSS) functions of arming, fueling, fixing, manning, moving, and sustaining the soldier and his equipment. All force projection operations require comprehensive logistics support from initial planning at the strategic level to effective support for the soldier in the foxhole. OOP enables a soldier to perform the CSS functions of logistics quickly and accurately. It also provides low-level maintenance of the program to ensure that current logistics concepts are incorporated into the model for the soldier.

Characteristics of the area of operations, weather, enemy strength, and enemy disposition also play a key role in planning logistics operations. The object-oriented logistics planning model provides logistics requirements to the user in an easy-to-use graphical interface. At the same time, the logistician can retrieve information for "what if" drills and for answering command questions.

The object-oriented logistics model aids the logistician by reading the information from the OPLOGPLN–97 and guiding him through a series of screens that address the logistics requirements of the soldier and the mission. The model provides only pertinent information that the logistician needs to create quick and accurate estimates to support possible courses of action.

Using the model, the logistician can analyze each course of action and outline specific details on how it impacts the sufficiency of area, maintenance, supply, and transportation and the overall logistics estimate for each. The model's capability to provide the logistician with the advantages and disadvantages of supporting each course of action and methods to overcome deficiencies is what makes the "U.S. Army Logistics Planner-Transportation" object-oriented model so important. The program is nearly complete and will be expanded with full functionality as more agencies and schools accept the model.

For more information about object-oriented programming and the U.S. Army Logistics Planner-Transportation, call Dr. Bob Simmonds at (804) 765–4607 or DSN 539–4607, or send e-mail to simmondr@lee-dns1.army.mil. **ALOG**

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Captain Garry W. McClendon is the Project Leader, Simulation of Logistics Systems, Directorate of Combat Developments for Combat Service Support, Army Combined Arms Support Command, Fort Lee, Virginia. He currently is working on a simulation project using artificial intelligence technology called the simulation of logistics systems (SIMULOGS). Captain McClendon has a bachelor's degree in business administration from Missouri Southern State College.

MORE for Units in Korea

by Chief Warrant Officer (W–3) Richard W. Valkos

Eighth U.S. Army is using its management of redistributable equipment (MORE) program to make better use of excess items, save money, and improve unit readiness.

For units of Eighth U.S. Army (EUSA) in Korea, "MORE" means less—less unresourced equipment on hand to be maintained; fewer units with equipment readiness shortfalls; and, through redistribution of assets currently in theater, fewer dollars spent requisitioning equipment. In Korea, "MORE" stands for EUSA's management of redistributable equipment (MORE) program. It's a semiannual, cyclical program that assists commanders in accounting for and redistributing excess equipment at all levels throughout the major Army command (MACOM).

The MORE program, which was established by Lieutenant General Richard F. Timmons, EUSA's Commanding General, on 26 December 1995, is executed in four timed phases, with one entire cycle completed in a 150-day period, or two cycles completed each year. The first phase of each cycle is initiated on 1 May and 1 November, following the Department of the Army's semiannual validation of the Continuing Balance System–Expanded (CBS–X) data base and the release of the updated Supply Bulletin (SB) 700–20 (Army Adopted/Other Items Selected for Authorization/ List of Reportable Items) catalog. The 1 May and 1 November dates also coincide with the traditional effective dates for changes in authorization documents (modification table of organization and equipment [MTOE] and table of distribution and allowances [TDA]) for the great majority of EUSA units.

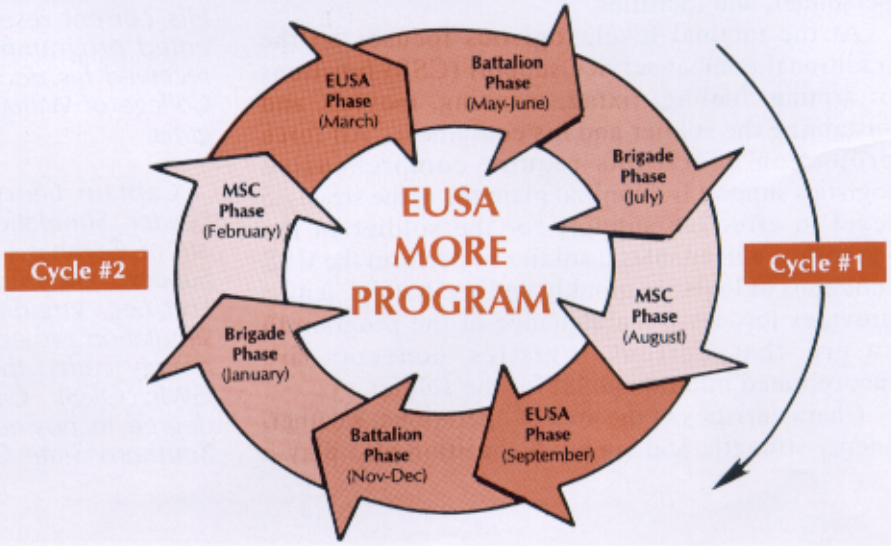
The MORE program is executed in two cycles a year, with each cycle consisting of four phases from the battalion to the MACOM level.

The 150-Day Program by Phase

The first phase of the four-phase program is the battalion phase. This is the most critical phase of all, because it lays the foundation that ensures success at every other level of the program.

During the battalion phase, commanders are allotted 60 days to complete the following actions—

- Account for *all* property. Ensure that all onhand property is correctly recorded on the unit property book, and process found-on-installation documents for all unaccounted for onhand property.
- Identify *actual* excess. There are two parts to this action. First, compare unit authorization documents, both current and future, to actual mission requirements. Then submit a request for a change in authorization documents—either DA Form 2028 (Recommended Changes to Publications and Blank Forms) or DA Form 4610–R (Equipment Changes in MTOE/TDA)—through operations channels to the MACOM resource



management office to correct discrepancies.

Second, document substitutions and in-lieu-of items. Verify the use of valid substitutions as authorized in Appendix H of SB 700–20. Submit a request to use those in-lieu-of items being retained pending receipt of authorized shortages. Document approved in-lieu-of items (according to AR 220–1, Unit Status Reporting) as substitutes on the property book.

- Cross-level battalion redistributable assets to fill valid equipment shortages.
- Document remaining excess items requiring further action to the brigade.

The brigade phase lasts 30 days, during which time commanders complete the following actions—

- Validate requests for authorization document changes (DA Form 2028 or 4610–R) submitted by subordinate commanders.
- Verify the use of valid substitutions as authorized in Appendix H of SB 700–20.
- Validate requests for use of in-lieu-of items pending receipt of authorized shortages.
- Cross-level brigade redistributable assets to fill valid equipment shortages.
- Document remaining excess items requiring further action to the major subordinate command.

During the major subordinate command (MSC) phase, which also is allotted 30 days for completion, commanders ensure completion of all actions outlined in the brigade phase and report all remaining excess requiring further action to the theater's materiel management center, the 6th Support Center.

The final phase of the MORE program is the EUSA, or MACOM, phase. During this 30-day phase, the theater materiel management center is responsible for completing the following actions—

- Cross-level remaining EUSA redistributable assets within the theater.
- Report excess equipment to national inventory control points in the continental United States.
- Provide to subordinate units final disposition information for all reported excess items.

Managing and Reporting Progress

Commander involvement is the cornerstone to the success of the MORE program. While the G4 or S4 manages the effort, only the commander can ensure total success. To monitor progress, each MSC provides a monthly status report to EUSA's Assistant Chief of Staff, G4. The Assistant Chief of Staff, G4, staff uses the requisition validation (REQVAL) data base to validate the reduction of excess line items as reported by the MSC commanders. Progress is briefed to the commanding general of EUSA at the monthly unit status report and quarterly review and analysis briefings.

A Proven Success

EUSA implemented its first MORE cycle on 1 May 1996. At its completion on 30 September 1996, a total of 17,191 redistributable items had been identified, with actions completed on 11,583 of them. These actions included lateral transfers, turn-ins, and authorization document changes submitted to support mission requirements. The other 5,608 reported items were pending final disposition.

In the 11,583 completed actions, 43 percent of the items were cross-leveled within the theater, 42 percent were turned in through normal supply channels as excess, and 15 percent were retained pending approval of authorization document changes submitted on DA Forms 2028 and 4610–R. (It should be noted that dollar values were not captured during the first cycle. The initiative to determine dollar values was implemented during the second cycle.)

On 1 November 1996, the second cycle was initiated. At its completion on 31 March 1997, there were 13,555 total redistributable items identified, with actions taken on 9,569 items totaling over $48.6 million and 3,986 reported items pending final disposition. Of the completed actions, 41 percent of the items, totaling over $16.3 million, were cross-leveled within the theater; 45 percent, valued at $22.8 million, were turned in through normal supply channels as excess; and 14 percent, totaling $9.5 million, were retained pending approval of authorization document changes.

In these days of austere budget conditions, the management and use of available resources, as well as prudent expenditure of allocated funds, must be at the forefront of every leader's decisionmaking process. The decrease of onhand excess items resulting from the MORE program represents a significant reduction in operation and support costs and an increase in the equipment onhand readiness posture across the MACOM. The MORE program continues to be a valuable tool used by commanders at all levels to enhance the overall logistics readiness of Eighth U.S. Army. **ALOG**

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Logistics Automation Support of OJE

by Thomas Manzagol

The author presents a personal account of some significant lessons learned in search of solutions to logistics support problems experienced during Operation Joint Endeavor.

Operation Joint Endeavor (OJE), the largest land-based surface deployment since World War II, generated major logistics support problems. Fueled by lessons learned from Operations Desert Shield and Desert Storm and the highly successful demonstration of phase I of the battlefield distribution concept, logistics managers had an arsenal of technology available to help manage their streamlined, evolving distribution process. [Editor's note: Battlefield distribution is an Army Combined Arms Support Command (CASCOM) initiative that established a central distribution point [hub] within the theater [Kaiserslautern, Germany] to facilitate efficient consolidation, control, and shipment of cargo. In Europe, the hub's capability was expanded further to include radio frequency (RF) tagging of shipments to guarantee positive control of supplies throughout the distribution process. Phase II evolved to include the RF interrogator network implemented to support OJE.]

The common thread throughout these available technologies is information integration. Most successful Fortune 500 corporations today integrate the term "shared information" into their definition of logistics. From common information exchange between customer and vendor, a cooperative relationship develops. A similar scheme of "open architecture" emerged for logistics automation support of OJE. Although not always perfect or seamless, the level of visibility logistics managers have experienced throughout OJE is unparalleled in the history of the Department of Defense. Only through a cooperative effort involving the Joint Staff through the 1st Armored Division did logistics support become the prime tenet of OJE's successful execution.

OJE unofficially began in October 1995. Although troops had not yet deployed, and the Dayton Peace Accords would not be signed until 14 December, there was a Herculean national effort to prepare and provide soldiers of the 1st Armored Division with the latest in extreme cold weather clothing, ammunition, and critically needed repair parts. Servicemen and women and civilians of the Defense Logistics Agency, Air Mobility Command, Military Traffic Management Command, and Military Sealift Command did a phenomenal job of ensuring that thousands of tons of critically needed cargo arrived in time to support the 1st Armored Division's deployment.

From a small corner in the center of the Pentagon, working as a civilian long-term trainee in the Directorate for Transportation, Energy, and Troop Support, Office of the Deputy Chief of Staff for Logistics (DCSLOG),

I was tasked to monitor the Defense transportation system "pipeline" using intransit visibility platforms, including Army total asset visibility and the prototype global transportation network (GTN). Like many of my colleagues who were assisting in the identification and amelioration of Defense transportation system problems, my direct involvement with U.S. Army, Europe (USAREUR), was limited to a few phone calls and e-mail messages. I had no idea of the extent to which all of that would change after accepting my new job with the Army DCSLOG Logistics Integration Agency (LIA) in January 1996.

My direct involvement with OJE began during a meeting with Major General James M. Wright, then Commander of the 21st Theater Army Area Command, and subsequent meetings with Brigadier General Larry J. Lust, USAREUR DCSLOG, in March 1996. Operation Joint Endeavor was now well into its fourth month, and after overcoming the enormous challenges of conducting forward support operations within an austere environment, the logistics support picture began to stabilize.

Because of the magnitude of the land deployment for OJE, there were unique intratheater deployment and sustainment visibility issues that had to be tackled. Over the past few years, U.S. European Command (EUCOM) and USAREUR, in conjunction with LIA and CASCOM, pioneered the use of various automatic identification technologies (AIT's) that supported the Automated Manifest System (AMS), such as RF tags, satellite tracking, and optical memory cards. Thus, the extension of AIT devices into a real-world situation was a logical evolutionary step for the European theater. In fact, the use of RF tags had become so entrenched by the 21st TAACOM that a splinter group of military personnel, Department of the Army civilians, and contractor personnel achieved acclaim for becoming what is still known today as the "RF rangers."

Early on, this small group of personnel, outfitted with aging M1010-series ambulances and a meager inventory of tools and repair parts, attached RF tags to containers, installed satellite transponders in vehicles, and trained unit personnel in the use of satellite, AMS, and RF technology. They built an initial RF interrogator infrastructure that eventually provided intransit and in-the-box visibility of consolidated shipments over an area of operational responsibility (AOR) that spanned nearly 1,000 miles. During the March meetings, when LIA was asked what support it could provide, the answer was clear—assist with the application of AIT, specifically RF and satellite tracking, and attempt to integrate disparate data from numerous sources. The first opportunity to do just that was the 1st Armored Division's redeployment.

From March to August 1996, LIA worked with EUCOM, USAREUR, and the 200th Theater Army Materiel Management Center to develop a redeployment support implementation plan. The goal was to attain 100-percent visibility of every container and air pallet shipped out of the OJE AOR. The scope of the operation was at least four times larger than RF tracking operations conducted previously in Haiti or Somalia. In addition, the OJE support mission would test the integrated use of laser-encoded optical memory cards, bar codes, RF technology, and vehicular satellite tracking (now the Defense Tracking System, or DTRACS). The ultimate objective of integrating these technologies was to enable the newly operational GTN to provide intratheater intransit visibility for the 1st Armored Division redeployment. In August 1996, Lieutenant Colonel George Kingsley (LIA) and I deployed to Germany to begin the implementation phase of the support operation.

In an effort to RF-tag and track approximately 2,000 retrograde and unit movement containers, a team of 10 enlisted soldiers volunteered to become part of the next generation of "RF rangers." Under the leadership of the 200th Theater Army Materiel Management Center, that small team of soldiers, along with Department of the Army civilians and contractors, deployed in early September 1996 from Germany to the OJE AOR.

With the command element located in Slavonski Brod, Croatia, two-man "RF burn teams" were deployed to Camp Angela, Tuzla Main, Camp Tampa, and Camp Gentry, all in Bosnia. Operating from the back of M1010 ambulances, the forward-deployed RF burn teams were able to enter shipment data onto RF tags from several different sources: imported Transportation Coordinator's Automated Command and Control Information System files, transportation control and movement documents, and automated unit equipment list extracts. Additionally, selected team members assisted in manifesting retrograde class II, IV, and IX cargo on RF tags, using bar code-collected materiel release order data. Information written to RF tags was transmitted back to a USAREUR-maintained regional server by satellite and local area network connection. RF write records that complied with military standard transportation and movement procedures were replicated onto the GTN, providing a near-real-time interface. As each RF-tagged container or pallet transited through the OJE AOR, a series of up to 20 RF

interrogators logged the arrival and departure times and updated the USAREUR regional server. The data provided to the server were available on the USAREUR ITV data base server World Wide Web Page (http://144.170.190.8), the GTN World Wide Web page (http://gtnwww.safb.af.mil), Army total asset visibility, joint total asset visibility, and the logistics anchor desk. During the operation, the RF tags were used routinely to locate, classify, and segregate cargo at several transshipment points, including the freight forwarding area in Taszar, Hungary, run by the 199th Transportation Company.

In addition to the RF burn teams, contractors were deployed to the various forward support battalions (FSB's) to install the AMS and train soldiers on how to use it. Using AMS, soldiers scanned in bar-coded excess supplies and produced transportation control and movement documents, packing lists, bar-coded military shipment labels, laser-read optical memory cards for tri-walls (triple-ply fiberboard boxes) and containers, and RF tags for the containers in which the tri-walls were packed. Trained soldiers could assemble and fully document tri-walls and their containers in a couple of hours.

When the 1st Infantry Division (Mechanized) covering force began to arrive in October 1996, the 299th FSB, deployed to Guardian Base, became the Division's center for logistics operations. Through their demonstrated success with AIT, the 299th FSB became the model for the fully automated FSB of the future. The deployed 299th soldiers used handheld RF interrogators to locate critical commodities arriving on pallets and in containers and stage them for break-down according to the priority of the cargo. Using bar-coded data from DD Forms 1348-1 (Department of Defense Issue Release/Receipt Documents) and optical memory cards on the tri-walls, soldiers scanned in individual items by bar code and compared the bar codes with those on the manifest written to the optical memory card. Shipment reconciliation, discrepancy reporting, and receipt became totally automated in this scenario.

Finally, the most visible of all technologies employed in the OJE AOR was vehicular satellite tracking. Eventually, satellite antennas, transponders, and keyboards were mounted on more than 470 M915, M1009, and M1025 trucks. Using satellite tracking, dispatchers and movement control teams could track, on an automated map, the locations of all key vehicles. Additionally, communications were now available where no tactical communications capability had existed before. The net results were remarkable stories of timely rescues of personnel from vehicle accidents on rural Hungarian, Croatian, and Bosnian roads and dramatically increased mission effectiveness. These success stories were directly attributable to constant communications between the dispatchers and drivers.

Experiments were conducted in reading the identification numbers from RF tags on containers into satellite transceivers and, with the first satellite position update, transmitting the RF tag identification numbers back to a central server. Because of the success of these experiments, it is now possible to track cargo and conveyances automatically at virtually any point during transit.

The positive lessons learned in using evolving AIT to solve real-world problems associated with OJE cannot be overstated. While there were difficulties attributable to everything from lack of institutional soldier training to failed power and communications, it was clear that the benefits of available automation technology integration far outweighed the costs of implementation. A conservative, independent cost benefit analysis by the Defense Logistics Agency Operations Support Office in April 1997 predicted an OJE net cost savings of over $21 million when extended over 5 years. In fact, the investment in OJE-related automation hardware, travel, and integration support, extrapolated over a 5-year period, was realized within the first year of the operation.

The ultimate logistics lesson learned from OJE is simple—automatic identification technology is here today, and Europe is our model. We, the Army logistics community, have to make the decision to integrate shared information into our definition of logistics and set our course to achieve that goal. The question, "Where's my stuff?," still begs our attention, and I believe we, as logisticians, owe an answer. **ALOG**

Thomas Manzagol is a logistics management specialist at the Logistics Integration Agency, Alexandria, Virginia. In addition to working automatic identification technology proponency issues, Mr. Manzagol serves as the Army service representative to the Department of Defense Automatic Identification Technology Task Force. He is a graduate of Michigan State University, with graduate work in logistics management at the University of Alabama and Florida Institute of Technology. He is an Army Reserve transportation officer and a graduate of the Transportation Officer Basic and Advanced Courses.

Logistics Automation on a Nonlinear Battlefield

by Captain Zulma I. Guerrero

The 1st Infantry Division found that e-mail was the best way to transmit logistics information in Bosnia.

Innovations in logistics automation are changing the way Army units in Bosnia conduct nonlinear logistics operations. In the past, units transferred data among Standard Army Management Information Systems (STAMIS) by truck, transporting diskettes with their supply requests from their Unit Level Logistics System (ULLS) sites to a Standard Army Retail Supply System (SARSS) site. However, the deployment of troops to the Operation Joint Endeavor theater—where the truck route between two sites can be impeded by uncleared mines, poor roads, ambushes, and other hazards—quickly made it clear that innovative changes to the traditional method of transferring data were needed.

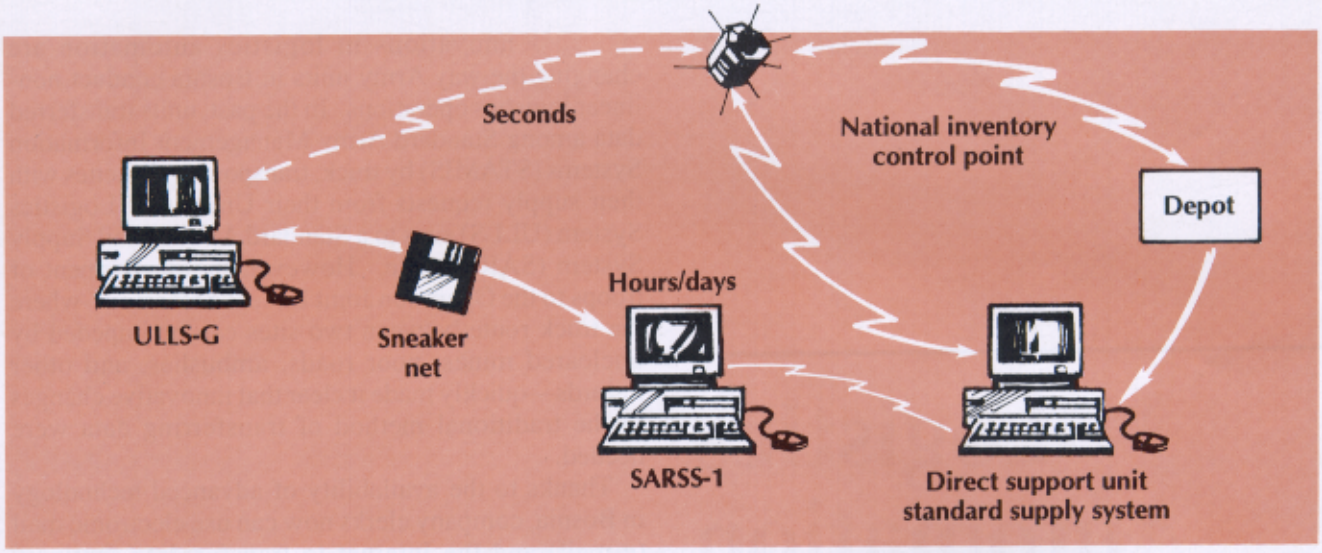
Thanks to the availability of advanced technology in Bosnia, company clerks now can use electronic mail (e-mail) and the Internet to transfer data routinely among STAMIS. As a result, the 1st Infantry Division (Mechanized) is no longer using the "sneaker net" to transfer data.

Searching for a Solution

Tactical logisticians and combat maneuver soldiers routinely rely on computer technology to request and track supplies. However, over 20 STAMIS on the tactical battlefield cannot "plug" into the Tactical Packet Network (TPN) because of TPN's classified rating. [TPN is the Army's tactical telephone and radio system.] In addition, users of STAMIS communications software must be able to dial into a computer system to transmit logistics data. This process is slow, consumes valuable bandwidth, and requires reliable phone lines. To solve these problems, the 1st Infantry Division G6 and combat service support automation management officer (CSSAMO), elements of U.S. Army, Europe's logistics automation development directorate, contractors, and the 5th Signal Command developed an electronic link to create an innovative, state-of-the-art communications network.

The chart at the top of page 18 shows the initial stages of data transmission using the existing communications package and the exportable logistics system (ELS). ELS is a menu-driven software package that operates with the blocked asynchronous transmission (BLAST) system. The user can upload and download electronic data to a "concentrator" for routing and temporary storage. [See Major Charles L. Radke's article on ELS, "Don't Truck That Floppy!" in the March-April 1997 issue of *Army Logistician*.]

The challenge for the 1st Infantry Division in Bosnia was to access the objective supply capability gateway using ELS with commercial and Defense Switched Network (DSN) lines. Although ELS software works in garrison, dialing out of the Bosnian theater from some



The old method of transmitting logistics data using the existing communications package and the exportable logistics system (ELS) is shown above. At right, the new method of transmitting logistics data in Bosnia using e-mail and the Internet is depicted.

base camps was impossible. And, according to the CSSAMO, despite the use of BLAST, the phone lines were of poor quality and required constant maintenance. For an innovative solution, the division turned to e-mail to transfer logistics data. As the CSSAMO observed, "E-mail uses the existing theater-wide data network and does the same thing ELS does."

Transmission Through E-Mail

The 1st Infantry Division soldiers now use e-mail to transfer STAMIS transaction files. Using available technology, the division merges and expands the existing communications equipment (mobile subscriber equipment) with Motorola's Network Encryption System (NES). NES allows unclassified e-mail data to write and push STAMIS data through the TPN. The NES connects to a "gateway server" that allows the unit to access the information when needed.

The chart at the top of the next page shows how the transfer of data within the theater works. A clerk using ULLS processes a requisition and produces a batch file. The user attaches the batch file to e-mail software and sends it to the forward support battalion (FSB) SARSS computer via a modem, using Internet or the local area network (LAN). The file is received automatically. The FSB clerk acknowledges receipt, inputs the file to SARSS, and processes the requisition in seconds. If the item is on hand, SARSS produces a materiel release order (MRO), and the item is issued. If the item is not on hand, the requisition is forwarded in the same manner to the server in the Central Region in Germany.

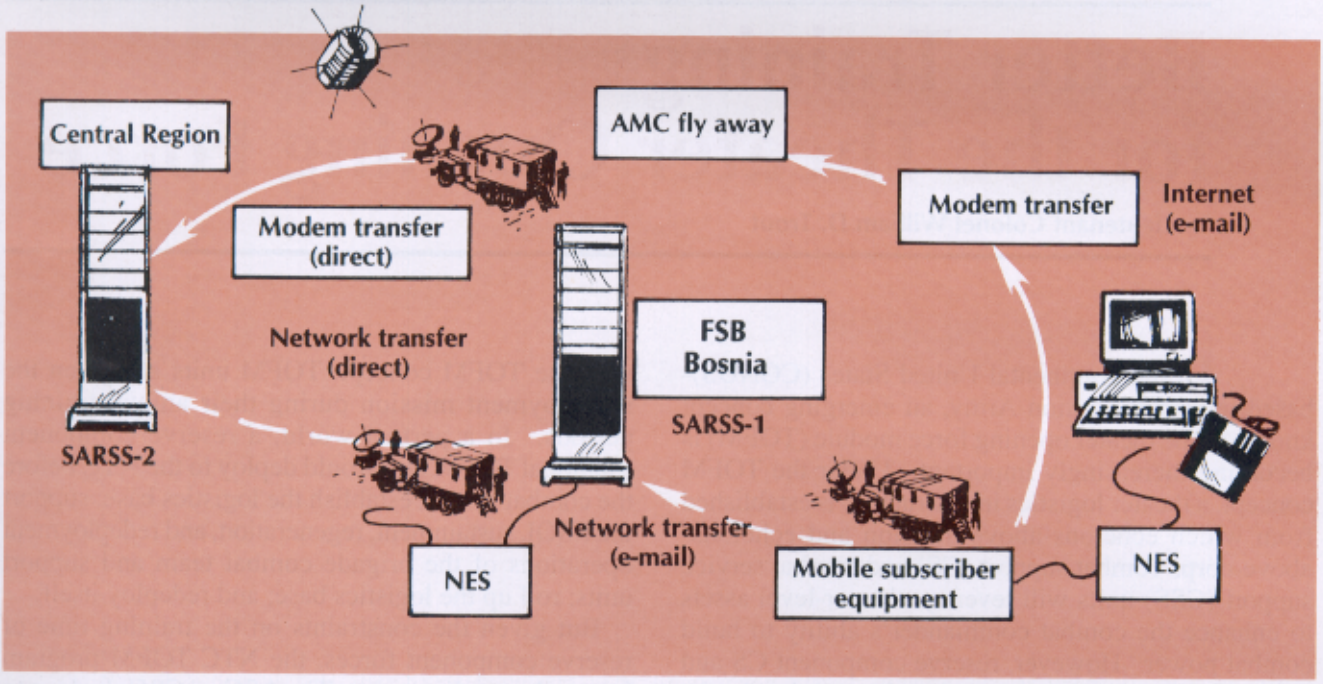
This procedure reduces the requisition processing time by 1 day by complying with one of the principles of velocity management. Allowing the user access to the Internet has helped reduce shipment time to Europe from 4 to 6 weeks to less than 1 week in most cases. The 1st Infantry Division has been successful in interfacing with ULLS-Ground (ULLS-G), the Standard Army Maintenance System (SAMS), SARSS-1/2, and the Department of the Army Movement Management System-Redesigned (DAMMS-R).

Logistics Distribution in Bosnia

Logistics automation plays an important role in the distribution system. The use of automation throughout the distribution process enhances sustainment by permitting speedier responses and greater awareness of the logistics situation on the battlefield. Effective logistics automation is not only critical but essential. Closely monitoring materiel in transit is an important tenet of a proactive logistics system.

For the distribution system in Bosnia, materiel moves from the Central Region. Items are either throughput to the FSB, or they are pushed to the intermediate staging base (ISB) in Hungary and shipped from there to the FSB in Bosnia. After the shipment arrives at the FSB warehouse, the item is scanned by a bar code reader, which transfers the receipt data to SARSS using infrared ports. This technology allows cable-free infrared communication between the bar code reader and the SARSS computer. SARSS updates the system and produces an MRO, and the item is shipped to the base camps in the next logpack.

The use of radio frequency tags, transmitters, interrogators, and optical laser cards have improved the distribution process in the division. When a customer



inquires about a shipment, the international transportation information tracking (INTRANSIT) terminal pinpoints the exact location of the pallet. Information is provided to the Army home page by the logistics intelligence file (LIF), a centralized data base operated by the Army Materiel Command (AMC).

The customer accesses the Army home page using an Internet web browser that gives him, among other things, access to intransit visibility data on assets in the logistics pipeline. In the Central Region, the 1st Infantry Division materiel management officer continuously monitors materiel shipments. In seconds, the officer accesses the home page, inputs the unit identification code, and produces a list that gives the exact location of all incoming shipments.

A Time for Change

Success on the future battlefield places an unprecedented demand on logistics automation and logistics situational awareness. Operation Joint Endeavor is providing an excellent test bed for new initiatives in logistics automation. The Army is leading the way in merging existing military communications equipment with state-of-the-art commercial communications technology. The objective is to provide the soldier in the field with the information he needs. Emerging communications capabilities will give the tactical logistician access to national and international logistics systems.

The Army must continue to merge new technologies and standardize systems. The current use of logistics automation in Bosnia demonstrates the need for systems integration and standardization. A single system, instead of many "stovepipe" systems, will enhance logistics operations on the battlefield. The Integrated Combat Service Support System (ICS^3) will provide this capability to the 21st century Army. Integrating these data with the Combat Service Support Control System (CSSCS) will provide commanders with the full scope of information required for effective decision support on the battlefield. CSSCS is the baseline for the future integrated logistics system.

As the new century approaches, tactical logisticians and combat maneuver soldiers require the use of logistics situational awareness and command and control devices embedded in powerful, portable computers. The logistics automation vision is simple: take hardware and software available in garrison to a tactical environment without major changes and reconfiguration. The challenge is to use this technology in the near term and provide the Army with a system on pace with the technology and business practices of private industry. **ALOG**

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Better Training for the Theater Opening Force

by Lieutenant Colonel William D. Trout

In our continental United States (CONUS)-based, power-projection Army, an emerging concept known as the theater opening force module (TOFM) is becoming increasingly important. Under the TOFM concept, a theater logistics infrastructure is established from which echelons-above-division and echelons-above-corps combat support (CS) and combat service support (CSS) units will leverage theater-level assets to enhance the combat commander's ability to build combat power. However, reserve component CS and CSS units do not always receive the training in the TOFM concept that they need. This training shortfall and the importance of the TOFM concept convinced the Commanding General of the National Training Center (NTC) at Fort Irwin, California, to develop a rotational training program using the TOFM concept for reserve component units.

TOFM Training at the NTC

The NTC's rotational TOFM training program not only fully integrates reserve component units into the training scenario at the NTC but also provides those units with valuable training in developing their staffs and executing their missions. In the NTC's program, a reserve component area support group (ASG) or corps support group (CSG) is identified as the command and control element for a rotation. The ASG or CSG, acting as a TOFM unit, is provided with a CS and CSS force structure that fully replicates the structure needed to conduct reception, staging, onward movement, and integration (RSOI); sustainment; and regeneration operations.

During RSOI operations, the reserve component TOFM unit performs myriad missions to enhance the combat commander's ability to build combat power and move forces to tactical assembly areas. (The chart at right depicts the RSOI support provided by units of the 326th Area Support Group during a TOFM rotation in July 1996. This support proved extremely valuable in developing the combat power of the 3d Brigade, 1st Armored Division.) The TOFM unit also assists in the regeneration of equipment in Army pre-positioned stocks and provides support to redeploy combat units.

Although redeployment operations are not associated with the TOFM concept, TOFM units are given the redeployment mission during their annual training periods. In a perfect world, a reserve component rotational TOFM unit would deploy to the NTC before the combat forces; establish the logistics base; support the RSOI, sustainment, regeneration, and redeployment operations of the brigade combat team and support units; roll up the logistics base; and redeploy itself.

But given the constraints on the training time of reserve component forces, the NTC TOFM program has made an adjustment. The ASG or CSG deploys to Fort Irwin and supports the regeneration of one brigade combat team as it completes combat operations; then, as that brigade redeploys, the ASG or CSG prepares to conduct RSOI operations supporting the follow-on brigade combat team. While this scheduling is contrary to the normal sequencing of events, it provides the maximum training benefit for the reserve component units. (The chart at the top of the next page depicts the degree of support provided to the 2d Brigade, 4th

- **Reduced command and control requirements for RSOI mission.**
- **Facilitated building of combat power.**
- **Executed 44 transportation movement releases.**
- **Permitted brigade to draw 1,022 vehicles in 2 days.**
- **Issued 129,600 meals.**
- **Distributed 30,000 gallons of water.**
- **Pumped 56,992 gallons of fuel.**
- **Configured 877.17 tons of class V (ammunition).**
- **Performed 361 man-hours of organizational and direct support maintenance.**
- **Expedited force closure.**

☐ The 326th Area Support Group provided valuable RSOI support to the 3d Brigade, 1st Armored Division, during a TOFM rotation in July 1996.

Infantry Division (Mechanized), by the 326th Area Support Group during regeneration operations in July 1996.)

Maximizing Training Benefits

In addition to its actual missions, the TOFM unit is given several notional missions that further stress its commander and staff by placing them in situations that require them to employ the deliberate and combat decisionmaking processes (as defined in Army Command and General Staff College Student Text 101-5). The NTC Deputy Commander for Logistics and his staff receive mission backbriefs from the commander and staff of the TOFM unit; these briefs permit the NTC personnel to provide coaching and mentoring on the deliberate decisionmaking process and the products generated by the TOFM unit's staff.

Based on the organizational and training proficiency of the rotational TOFM unit, the tempo of operations can be accelerated or slowed to maximize the training benefit to the unit. To further enhance the training process, an element of the 311th Corps Support Command (COSCOM) replicates the theater support command staff to provide the necessary command emphasis from a higher headquarters.

Preparing for a Rotation

The training for a reserve component rotational TOFM unit begins at least 1 year before its rotation date, when the reserve component short-term planning window opens. Representatives from the NTC and the 311th COSCOM provide leader training program-quality presentations to the commanders and staffs of the ASG or CSG and the downtrace units. These presentations include the NTC command brief; a lessons-learned brief from previous rotations; mission-essential task list development; TOFM concepts; transportation planning and execution; and the deliberate decisionmaking process.

In addition to these presentations, units are provided the 1st Theater Support Command operations plan, "Mojave Strike," and contingency plan, "Helping Hand." These plans develop the theater tactical scenario and provide the mission framework for the actual units conducting missions as well as the notional units required for a mature theater support command. The units also receive the complete rules of engagement published for operations at the NTC, the battlebooks supporting operations of the pre-positioned fleet, and any appropriate standing operating procedures.

The TOFM rotations provide reserve component ASG and CSG units excellent training in mission analysis, planning, and execution at a level that stresses the entire staff and forces dynamic staff coordination.

- **Reduced command and control requirements for redeployment.**
- **Executed 81 transportation movement releases.**
- **Issued 385 tons of class I (subsistence).**
- **Distributed 30,000 gallons of water.**
- **Pumped 43,954 gallons of fuel.**
- **Retrograded and turned in 290 tons of class V (ammunition).**
- **Performed 430 man-hours of organizational and direct support maintenance.**
- **Expedited force redeployment.**

☐ **The 326th Area Support Group supported the 2d Brigade, 4th Infantry Division (Mechanized), in regeneration operations.**

The pace of sustained operations precludes the commander from relying on one or two key personnel for success and forces the entire staff to perform their designated functions. The commander quickly learns that, to be successful, the entire staff must interact and provide the necessary expertise to ensure that the mission is executed properly.

Key points continually emphasized by the NTC and the 311th COSCOM to the rotational TOFM units are—

- The unit is deploying to a theater of operations (a tactical scenario).
- Commanders build combat power.
- The entire staff must be involved in mission planning.
- The unit is a theater-level asset.

Full reserve component integration is vital to a CONUS-based power-projection Army. The theater opening force module training at the National Training Center provides reserve component echelons-above-division and echelons-above-corps CS and CSS units the training required to accomplish their missions in support of America's Army. **ALOG**

Lieutenant Colonel William D. Trout is a U.S. Army Reserve training integration officer at the National Training Center, Fort Irwin, California. His duties include developing and executing CS and CSS training programs for reserve component echelons-above-division and echelons-above-corps units. He is a graduate of the Army Command and General Staff College and the Armor Officer Advanced Course.

Fluid Recycling Innovations

by Dennis A. Teefy

Maintaining tactical vehicles is an essential part of ensuring the overall readiness of the military. Tactical vehicles are unique among Army equipment in that they are periodically stored for extended periods of time with full fuel cells. In many instances, the fuel in the stored vehicles becomes contaminated with biota, dirt, and water. The costs associated with handling contaminated fuel, along with the Army's move toward a "single fuel on the battlefield" concept, prompted Army users to ask the U.S. Army Environmental Center (USAEC) at Aberdeen Proving Ground, Maryland, to develop a way to reduce, recycle, or reuse certain fluids used in Army vehicles.

In response to this request, the USAEC, in cooperation with the Fuels and Lubricants Technology Team (FLTT) at Fort Belvoir, Virginia, developed a fluid recycling program. The program is divided into two projects that concentrate on reducing the used fluid waste—recycling and decontamination.

Recycling

The first project deals with recycling of fire-resistant hydraulic fluid (FRH). FRH is used in a wide variety of military vehicles. Like all other vehicular fluids, it must be replaced periodically. The FRH drained from vehicles is contaminated with particulates and water. Currently, this fluid is disposed of as a hazardous waste. Numerous mandates to reduce hazardous waste, ensure proper vehicle maintenance, and reduce high procurement costs make recycling of FRH highly desirable.

The Army Tank-automotive and Armaments Command Mobility Technology Center at Fort Belvoir conducted a 2-year evaluation of the viability of recycling military-specification FRH. The results of the study showed that FRH may be reused if it is mixed with at least 25 percent new fluid.

Armed with those results, the FLTT kicked off 6-month field demonstrations at Fort Carson, Colorado; Anniston Army Depot, Alabama; and Fort Hood, Texas. Seven commercial recycling units were tested to evaluate their ability to meet specification cleanliness requirements. Four of the units proved capable of removing water and particulates to a level below the military specification.

The field demonstrations of the FRH recyclers revealed a need to make the recyclers more user-friendly and cost-efficient. As a result, in-line moisture and particulate monitors will be added to provide real-time data on contaminant concentration. The USAEC and FLTT are working to reach agreements with the manufacturers of the FRH recyclers to provide the technology for in-line monitoring. USAEC, FLTT, and U.S. Army Aberdeen Test Center (USATC) are seeking opportunities to implement and expand the recycling of FRH.

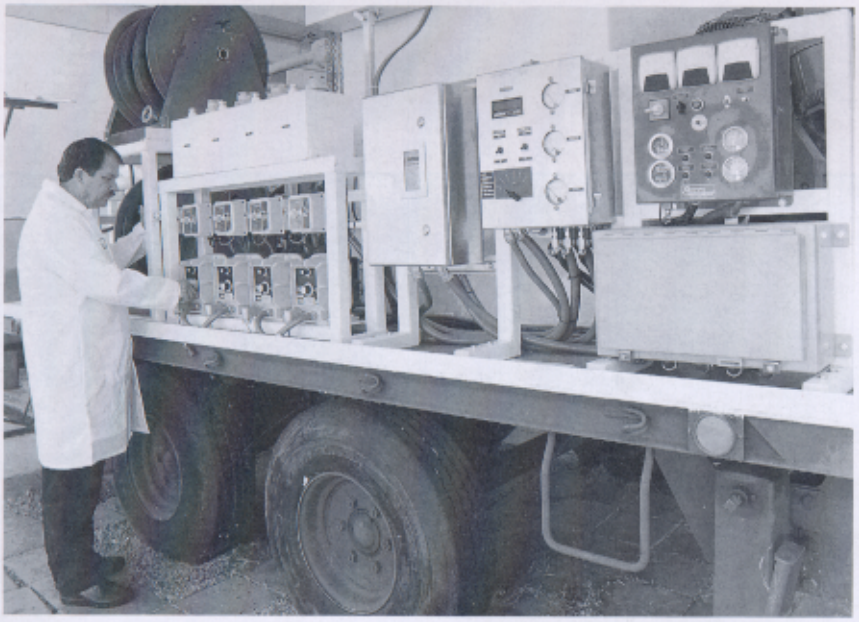
Decontamination

The other promising project coming from the fluid recycling program is the fuel filtration/additive unit (FAU). The need for this unit emerged because vehicle fuel cells become contaminated by free water, dirt, and biota. The contaminants rapidly plug the fuel filters and disable the vehicle, decreasing the vehicle's combat readiness. The current method of decontaminating the vehicle fuel cell is difficult, extremely labor intensive, and removes the vehicle from service for a period of time.

The FAU is a system of off-the-shelf technologies that decontaminate fuels and inject chemical additives. The Belvoir Fuels and Lubricants Research Facility at the Southwest Research Institute in San Antonio, Texas, developed, designed, and built the FAU. The fuel decontamination rate is a rapid 60 gallons per minute. The unit is mounted on a 5-ton trailer for maximum mobility and easy shipment. There is no need for external power, so the unit can operate independently in most environments. The FAU removes the fuel from the fuel cells and storage tanks of ground vehicles, separates the water and particles from the fuel, and then refuels the vehicle with the cleaned product.

An added feature of the FAU is its ability to inject up to four additives into fuel simultaneously. These additives can be used to convert jet A-1 fuel to JP-8 fuel, combat microbial growth, prevent free water accumulation, and stabilize the fuel.

By recycling the contaminated fuel, the FAU eliminates the need to dispose of it as a hazardous waste. The quick decontamination of fuel in vehicle fuel cells increases combat readiness and decreases valuable labor hours. The injection of additives makes it easy to adapt the fuel to any environment.



The FAU can decontaminate 60 gallons of fuel per minute and inject up to four additives into the fuel simultaneously.

The FAU has proven effective in a variety of field situations. At Fort Stewart, Georgia, the FAU was set up to remove a heavy concentration of water and particulate contamination from 243 vehicles. At Twenty-Nine Palms and Camp Pendleton Marine Corps Bases, California, the particulate matter found in fuel was finer than that at Fort Stewart because the fuel oil additive portion of MIL-S-53021 had been added to vehicle engines. The FAU was used to remove the minute particles, which corrected the fuel filter plugging problem. Additional tests were conducted at Blount Island, Florida. All of the users at the test sites were enthusiastic about the performance of the FAU.

The FAU can provide significant economic savings while preventing pollution. Its design is flexible and can be altered easily to adapt to individual installation needs. The prototype FAU has been shipped to Fort Knox, Kentucky, for a cost and operation field demonstration. USAEC and USATC are working in conjunction with Fort Knox to determine the cost effectiveness of the FAU and design a decision tree that will help users gauge the FAU's applicability to their own installations.

Aiding Military Readiness

The recycling of FRH will be a great aid in the maintenance of military vehicles. The recyclers will help extend the life span of the FRH, which will decrease procurement costs and keep the vehicles running at optimum performance. The time previously devoted to hazardous waste disposal and handling can be spent on maintenance efforts. Reducing particulates and water in FRH will allow it to function as it was designed.

The FAU will have a dramatic impact on the readiness of our mechanized troops as well. Because the FAU will mitigate the fuel filter plugging problem, vehicles can be held at a higher state of readiness. In the case of fuel contamination emergencies, the FAU can decontaminate large quantities of fuel quickly and safely. The additive system will allow fuels to be converted rapidly to different grades.

Fewer man-hours will be spent in the motor pool removing vehicle fuel cells, changing filters, and disposing of contaminated fuel. When fuel is decontaminated, it no longer has to be disposed of as a hazardous waste but can be reused instead. In addition, the procurement cost of the fuel is recovered.

The USATC and USAEC are soliciting Army users who are interested in procuring the FAU or FRH recycling units. Potential users are being queried through the Defense Environmental Network Information Exchange (DENIX). For more information, contact Dennis Teefy of the USAEC Environmental Technology Division at (410) 612–6860. His e-mail address is t2hotline@aec2.apgea.army.mil.

Dennis A. Teefy is an environmental scientist at USAEC. He has a bachelor's degree in agriculture from West Virginia University. His fluid recycling research was supported in part by an appointment to the Postgraduate Environmental Management Participation Program at USAEC, which is administered by the Oak Ridge Institute for Science and Education through an interagency agreement between the U.S. Department of Energy and USAEC.

USAREUR Focused Logistics

by Major Darren B. Zimmer

U.S. Army, Europe, logistics operations directly parallel the Army Vision 2010 concept of focused logistics.

In preparation for the Army's leap into the 21st century, logisticians of U.S. Army, Europe (USAREUR), have transformed the European theater support structure to conform to the Army's Vision 2010 model. This can be seen in USAREUR logistics operations for Operations Joint Endeavor and Joint Guard, which directly parallel the tenets of focused logistics stated in Army Vision 2010: fusion of information, logistics, and transportation technologies to provide rapid crisis response, to track and shift assets even while en route, and to deliver tailored logistics packages and sustainment directly at the strategic, operational, and tactical levels of operations.

Fusion of Information Technology

USAREUR's modern information technology has enabled managers to make accurate and expedient decisions for the logistics support of Operation Joint Guard and its predecessor, Operation Joint Endeavor. Total asset visibility of materiel in the distribution pipeline makes it possible for USAREUR to divert backlogged cargo to alternative modes of transportation as well as obtain critical items through expedited deliveries. USAREUR routinely uses the Defense Transportation Tracking System to locate convoys. This system also has a remote equipment monitoring and diagnostic capability.

By using radio frequency (RF) tags, combat service support (CSS) activities can locate specific containers of supplies, rapidly inventory them, tailor them as necessary, and quickly transport the resulting push packages to the supported unit. The Standard Army Retail Supply System, incorporated throughout the theater and within the area of operations, is used to leverage theater stocks, streamline requisitions, support split operations, and manage materiel distribution. USAREUR logisticians also have introduced numerous logistics wargaming simulations into the planning process so they can develop alternative plans before operations occur.

On the strategic and operational levels, the global transportation network, joint total asset visibility, and World Wide Web systems, together with RF tags and Defense Transportation Tracking System transponders, help USAREUR and Department of the Army logistics offices monitor the flow of materiel and supplies from

The photo at left is an aerial view of Guardian Base, the main logistics hub for U.S. forces in Bosnia-Herzegovina. The large building houses the Logistics Task Force Headquarters, maintenance bays, and the supply support activity warehouse. Above, line haul and fueler vehicles are lined up in the Guardian Base parking area. Below, a container-handling unit (CHU) is offloaded at a base camp in Bosnia-Herzegovina. The prototype CHU attaches to a palletized loading system truck without the need for a flatrack.

the United States directly to field units. This gives the decisionmakers information needed to streamline and enhance the logistics system where required. The Joint Operation Planning and Execution System integrates strategic and theater airlift, the theater rail system, and line haul. The Standard Theater Army Command and Control System is used to track real-time departures, in-transit locations, and arrival times of trains loaded with troops, equipment, and supplies. With this technology, the command logisticians can maneuver and redirect trains, buses, barges, and trucks that are en route, thus smoothing the flow through known choke points. Using these systems, the USAREUR logistics network is able to respond to the theater's challenges at speeds that were not possible with the rigid organizational capabilities of the past.

Tailored CSS Organizations

The USAREUR CSS organization has been tailored to use the vast capabilities of the forces in Central Europe to support the unique nature of Operations Joint Endeavor and Joint Guard. Logistics efforts are coordinated though a focal point at the intermediate staging base (ISB) at Kaposvar, Hungary. From their forward position in the ISB, logisticians can manage the system skillfully and match support to requirements. They also can coordinate the day-to-day services and support provided to the field soldiers by various national support agencies, such as the Defense Logistics Agency (DLA) and the Army Materiel Command.

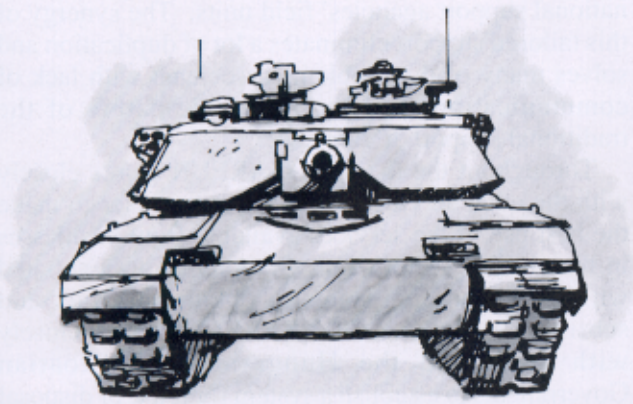
Within the Task Force Eagle area of responsibility, the support architecture is tailored similarly. Division direct support units are collocated with corps and echelons-above-corps support units as well as with the national support agencies' field units. The synergy of this tailored support eliminates a lot of duplication and solves many of the problems associated with lack of communications and the inflexible nature of the traditional support architecture.

Throughout the theater, USAREUR works closely with the other services and Defense agencies to make the best use of the services available from businesses in the civilian sector. For example, DLA negotiated with European companies to obtain bulk fuel and subsistence locally. Also, USAREUR worked closely with DLA and the Hungarian and Croatian Governments to establish a system for reuse or disposal of scrap and uneconomically reparable equipment and materiel. Probably the most efficient use of civilian resources in the theater is the hiring of local civilians through the Logistics Civil Augmentation Program (LOGCAP) to provide services that the Department of Defense cannot perform.

USAREUR has embraced fully the Army Vision 2010 concept of focused logistics. Continued development and refinement of this concept by USAREUR and the rest of the Army will provide tremendous value to future generations of joint logisticians and their supported units. **ALOG**

Major Darren B. Zimmer is the support operations officer for the 201st Forward Support Battalion, 1st Infantry Division (Mechanized), Vilseck, Germany. When he wrote this article, he was the operations officer in the Current Operations Branch, Office of the Deputy Chief of Staff for Logistics, U.S. Army, Europe, in Heidelberg, Germany. He is a graduate of Washington State University, the Transportation Officer Basic and Advanced Courses, and the Combined Arms and Services Staff School.

More on Reducing Rep



In his second article on the subject, the author shares his thoughts on what the maintenance community can do today to meet one of the Army's velocity management goals.

General Ronald H. Griffith, the Vice Chief of Staff of the Army, issued a message on 22 March 1996 that directed the implementation of velocity management at every Army installation. At the same time, he established several goals for velocity management. One of those goals was to reduce the Army's repair cycle time (RCT) by 50 percent. This article and another that appeared in the September-October issue of *Army Logistician* explore what the maintenance community can do today to help achieve that goal.

What Is Velocity Management?

Velocity management is the Army's primary combat service support reengineering effort. Currently, VM consists of four process improvement teams (PIT's) that work to improve VM processes by first defining the process, then measuring it, and finally improving it by implementing the lessons learned in the first two steps. Those PIT's are: order and ship, repair cycle, financial management, and stockage determination. It is important to emphasize that VM is not a computer program or a specific method of executing military logistics. Velocity management is a process improvement methodology. More information on the VM methodology and the various VM PIT's is available on the VM extension of the Army Combined Arms Support Command (CASCOM) home page (http://www. cascom. army.mil/vm).

Reducing 'Awaiting Parts' Time

For the M1A1 tank engine, the average time spent in each stage of the repair cycle for the jobs that met the goal and the jobs that missed the goal are shown on the chart on page 28. Notice that, for the jobs that missed the goal, the longest periods of time were concentrated in all of the "awaiting" areas: awaiting parts, shop, distribution, and pickup. Concentrating on these areas and the causes that contribute to the long periods of time needed for each job can reduce the overall RCT significantly.

air Cycle Time

The order and ship PIT is achieving dramatic reductions in order and ship time (OST). Those reductions already have reduced our "awaiting parts" times. However, OST starts in the maintenance facility when a mechanic identifies the need for a specific part. Mechanics directly affect OST with the accuracy of their diagnoses. Frequently, maintenance facilities have a locally imposed rule that states that parts must be ordered against a job within 3 days. While the intent of this rule is good, the effect on both OST and maintenance performance can be bad. With the increasing complexity of our weapon systems and the frequent lack of diagnostic capabilities, mechanics may require more time to diagnose problems accurately and requisition parts. One or 2 more days of diagnosis time is infinitely more desirable than submitting an incorrect requisition.

Mistakes aside, we still can reduce the front end of OST. For example, many maintenance shops have a long list of people who must approve the parts identified for a job before they are actually ordered. The mechanic must go to his section supervisor, who goes to the shop foreman, who consults with the shop warrant officer before going to the repair control supervisor. Finally, after the initial work has been checked by four people, the requisition is entered into the computer. At the organizational level, the company commander frequently is added to the process. He must sign off on the Unit Level Logistics System (ULLS) printout before the disk is passed to supply.

Shops should strive to reduce successive steps in the maintenance facility approval process as much as possible. For example, if a specific shop determines that the section supervisor is catching 99 percent of all mistakes, then the approval process should stop at that level. We have found that commanders rarely, if ever, disapprove ULLS requisitions. Most commanders admit that they rarely read the printout before signing it. The VM program recommends that the requirement for company commander approval be removed from the process unless funds are excessively tight or a pattern of abuse or mistakes has been identified. Similar recommendations apply to the higher levels of approval as well.

Reducing 'Awaiting Inspection' Times

Awaiting inspection time accumulates at both the front and back ends of the RCT. At the front end, the VM program recommends that no job be turned away for organizational faults unless those faults explicitly affect the maintenance facility's ability to conduct inspections and perform maintenance. For example, a vehicle with a broken tail light would not be turned away. However, a vehicle requiring organizational brake work that would impede road-testing the vehicle would be turned away.

We also can reexamine our inspection procedures. Why authorize only a small, dedicated group of people to inspect? Some mechanics are very skilled, and their work rarely fails inspection. Why inspect their work? Other mechanics are fresh from advanced individual training and need very close supervision. Their work requires inspection. If we identified those people who have demonstrated a level of competence that does not require final inspections, we could reduce the inspection work load significantly.

I believe that our inspection sections should be remodeled entirely. At present, separate inspectors who work for the commander are authorized or appointed on orders to reduce the chance of undue influence from a supervisor to "pass" a job. I do not concur with the mindset behind this practice and have faith that our soldiers will not abuse or misuse their authority. I believe we should consider either the shop foreman or shop warrant officer in each section as the head inspector for that area. That person then should certify as inspectors all of the individuals in his section who have demonstrated an acceptable level of competence. Jobs then can go directly to the shop sections instead of waiting for initial inspections and also can go directly to "awaiting pickup" instead of waiting for final inspections.

Incentives for Performance

All maintenance shops should establish incentives for performance. Nearly every unit in the Army has a physical training incentive for individuals and

This chart shows the job status time distribution for repair of the M1A1 tank engine.

units: gold, silver, and bronze streamers. Why not establish standards in the maintenance shops for gold, silver, and bronze mechanic awards? For example, a mechanic who is certified as an inspector and has achieved a 99 percent repair success rate (99 percent of his jobs do not get returned for the same fault within 30 days) for 90 consecutive days could be declared a gold mechanic. Post the information on a bulletin board for all to see. The Nebraska National Guard goes one step further. Each vehicle that passes through their maintenance facilities receives a label that reads "repaired by (mechanic's name)."

Moving Unserviceable Equipment

Vast amounts of equipment frequently sit awaiting evacuation to the next higher level of repair. Items on the local reparable exchange (RX) list frequently sit in supply activities for unknown and immeasurable periods of time before work orders are prepared and the items are moved to the maintenance facility. All equipment must be moved as rapidly as possible to the activity that will perform maintenance on it. To a large extent, this can be influenced only by direct leadership involvement.

However, we can change the retrograde process for items on the local RX list. Currently, those items first must be drained, cleaned, inspected, and sometimes packaged before they are turned in to the supply activity. The supply activity processes the item as a credit and then, some time later, moves the item to maintenance. Why not take the item directly to the maintenance activity and bring just the paperwork to the supply activity? That would put the item in the hands of the mechanics more quickly and also reduce the need to move it from supply to maintenance. Further, maintenance is a source of supply (due in from maintenance) to the RX line. Decreasing the RCT for RX items and returning the item to the shelf sooner may allow us to lower the requisitioning objective for those items. A generic flow chart for maintenance-to-maintenance retrograde is posted on the VM home page.

Another time-consuming and potentially expensive requirement is draining, steam-cleaning, and inspecting components of major assemblies before moving the item to the supply facility and then to the maintenance facility. The maintenance facility often promptly replenishes all of the fluids in the item and tests it. Also, high-pressure steam-cleaning causes water to accumulate in the item, where it can cause corrosive damage. To mitigate this, units spend a lot of time applying tape over the openings on major assemblies. Then the receiving facility requires an equal amount of time to remove the tape.

The Office of the Deputy Chief of Staff for Logistics, Department of the Army, has issued broad

policy guidance that covers maintenance from implementation to retrograde, eliminates the requirements for draining and cleaning of major assemblies at certain levels, and reduces the requirement for preparing damage statements for class IX (repair parts and components). A copy of that policy guidance is posted on the VM home page.

Further Reducing the RCT

More accurate and more plentiful diagnostic capability would help reduce the RCT dramatically. Improved diagnostic capability would simplify the fault identification process, make it more accurate, and ensure that the correct replacement part is requisitioned the first time. However, diagnostic capability costs a great deal and is not something that can be delivered today. The need has been identified and is a top priority for the Ordnance Corps.

Unavailability of mechanics or bay space causes increases in the awaiting shop times. Most maintenance facilities do not have their full authorization of mechanics, and the mechanics on hand frequently are not available. Many shops report a mechanic availability rate of 35 percent or less. Correcting the lack of bay space is obviously a high-dollar and long-term issue. Both factors affect awaiting shop times but are clearly beyond the scope and control of VM.

More efficient computerized maintenance systems also would help reduce the RCT. Functional requirements have been submitted for the development of the maintenance module of the Standard Army Maintenance System for the Integrated Combat Service Support System (ICS^3). ICS^3 is a single Standard Army Management Information System that will replace all of the supply and maintenance programs at the division level. Again, this is a long-term effort for which the VM program merely submits functional requirements.

Better training for mechanics also would lead directly to reductions in the RCT. However, additional training costs money and time. The need for better training is another priority being addressed by the Ordnance Corps.

Results of Reduced 'Awaiting' Times

Reductions in awaiting times have a direct impact on the maintenance activity's workable backlog. Installations that have achieved dramatic reductions in their OST have noticed a shift en masse from jobs awaiting parts to jobs awaiting shop. Maintenance facilities now may have to rethink how jobs are scheduled. Most maintenance facilities schedule jobs on a first-in-first-out basis by priority. However, a more efficient scheduling technique is scheduling jobs by shortest operating time. That means that, for the same item in the same priority group, jobs requiring the shortest time to complete would be completed first. Other, more time-consuming jobs actually would accrue more time in awaiting shop status and therefore more overall RCT, but the production rate overall for the shop would be more efficient. This would create a conflict in achieving the goal of a 50 percent reduction in RCT that would have to be addressed in the future. We could complete maintenance on more items per measured time period, but some items would have higher RCT's as a result. Shops would have to analyze job scheduling carefully to achieve the optimum level of production and still maintain reductions achieved in RCT.

Reducing the RCT by 50 percent is a challenging but doable goal. By combining the suggestions in this article with the frequent use of the RAND Corporation's RCT Report (discussed on page 11 of the September-October issue of *Army Logistician*) any maintenance facility can begin to make progress toward the 50-percent reduction goal. [To access the RAND file transfer protocol (FTP), select "RAND RCT Report FTP Site" on the CASCOM home page. Then select your location and unit identification code to view the reports that apply to you.]

This article does not include all of the actions that could lead to reductions in RCT. Velocity management is a team effort and a long-term commitment for the Army. Continuous improvement will remain the focus of all Army logisticians, now and into the 21st century. Suggestions from the field are welcome and essential to the efforts of the RC PIT to achieve the 50-percent reduction goal. Send your comments and suggestions to the appropriate e-mail addresses listed on the VM home page.

Major Andrew C. Eger is currently on a training-with-industry assignment at Boeing Aviation in Seattle, Washington. When he wrote this article, he was with the VM Repair Cycle Time Process Improvement Team at the Army Combined Arms Support Command, Fort Lee, Virginia. An Ordnance Corps and Acquisition Corps officer, he holds a B.S. degree in mechanical engineering from the U.S. Military Academy and an M.S. degree in management with a concentration in logistics management from the Florida Institute of Technology. He is a graduate of the Army Logistics Management College's Materiel Acquisition Management Course.

A Transportation Pl

A transportation company platoon leader shares his insight on the type of training needed to be successful at the National Training Center.

It was an overcast day during command maintenance at Fort Carson, Colorado, when my commander, Captain Rivard, pulled Lieutenant Davis and me aside. We are both platoon leaders in the 32d Transportation Company (Palletized Loading System [PLS]). The commander told us that our company had been tasked to provide 20 soldiers, a platoon sergeant, and a platoon leader to support a unit from Fort Riley, Kansas, the 24th Transportation Company, on a deployment to the National Training Center (NTC) at Fort Irwin, California, in less than 4 weeks. As a bonus, we would draw M931A2 tactical tractors and M871 tactical semitrailers. This was especially interesting, since few soldiers in our company were licensed to operate the M931A2.

As a former infantry officer, I really looked forward to leading a convoy during "combat" conditions, so I volunteered to be the platoon leader. We had very little information to go on, but we knew we had a long way to go and a short time to get there.

The following insight resulted from late-night after-action reviews. It is a record of some of the things that we could have been done better had we known about them before our deployment to the NTC.

Train-Up

The training that participants receive before deployment is vital to the success of any operation. Mounted land navigation training is a must before deployment. Training on the precision lightweight global positioning system receiver (PLGR) gives soldiers and leaders an "answer sheet" that assures them that they are indeed where they think they are. Knowing how to use way-points is very beneficial, especially when leading a convoy at night and taking several turn-offs in unfamiliar terrain. (It's all unfamiliar terrain at night.) PLGR training should be incorporated into mounted land navigation training. Also, additional training on navigation with a strip map would aid soldiers in navigating. It is imperative that soldiers be able to navigate using terrain and strip maps at the NTC.

Leading a convoy at night can be nerve-wracking. To ensure that "the Army owns the night," all soldiers should be qualified in the use of night vision goggles and extremely comfortable with using them. A lot of soldiers believe they can drive or see better without them. Wrong! At a minimum, either the driver or the accompanying truck commander should use night vision goggles. Training Circular 21–305–2, Night Vision Goggles: Training Program for Night Vision Goggle Driving Operations, outlines an excellent soldier certification training program. This training must be annotated on the soldier's military driver's license. In addition, units should schedule downrange training and night convoys to familiarize soldiers with using night goggles.

In most units, there are soldiers who have been to the NTC many times and know the terrain like the backs of their hands. Ask these soldiers to give a class on the prominent terrain features of the NTC using a map and sand table so soldiers will be familiar with names and places in advance. Post a map with all the common NTC terrain nicknames in the tactical operations center. The instructor also can explain ways soldiers can navigate by using the prominent terrain features to help find their own location on the map.

At the NTC

One of the best decisions we made before deployment was to take two of our own mechanics along. They were both hard working and tremendous assets when we were drawing and turning in equipment. I was always confident that they would take care of our vehicles.

The 24th Transportation Company has an excellent field standing operating procedure (SOP). Every soldier carried his convoy commander's "smart book," which details the 24th's SOP's. The smart book is small

atoon at the NTC

by First Lieutenant Dean J. Dominique

enough to fit in the battledress uniform pocket without being bulky. Before receiving any missions, the company commander went over the SOP's with all leaders to ensure that we understood them. He used a crawl-walk-run technique that ended in a night exercise in which convoys had to react to different types of enemy contact.

Once the rotation got into full swing, we were assigned a convoy mission. The company operations noncommissioned officer (NCO) completed an execution matrix that contained all of the information vital to the mission. Each soldier was given a copy of the matrix before the operation started. The front page of the matrix contained the names of the convoy and assistant convoy commanders, mission, radio frequencies, challenge and password, call signs, time line, enemy situation, checkpoints, space for a strip map, and other vital information. The convoy commander filled out the strip map, annotated checkpoints, and obtained the enemy situation 2 hours before departure. The assistant convoy commander filled out the second page. It contained a list of all vehicles in the order of march, names of participating soldiers, and a record of sensitive items being transported.

The final paperwork was the risk assessment. A copy of the second page of the execution matrix and the risk assessment went to the company and battalion tactical operations centers.

The hardest task in organizing a convoy was assembling all of the soldiers and checking out all of the vehicles from the various units. After preventive maintenance checks and services were completed and the vehicles were staged properly, the soldiers were released to prepare for the pre-combat inspection (PCI). A complete PCI checklist was included in every smart book to help soldiers prepare for the inspection. Squad leaders and NCO's also were extremely helpful in making sure soldiers had what they needed before the PCI.

To save valuable time, the assistant convoy commander performed the PCI's while the convoy commander gathered information for the convoy execution matrix (names and serial numbers). We learned that it is almost essential to have a mechanic available from the time of the PCI until departure. If at all possible, also have an extra vehicle dispatched. We learned these lessons the hard way. Ten minutes before the start time, a vehicle decided it wasn't going to run. The mechanic tried his best to get it started; however, we ended up dispatching another vehicle and departing an hour late. If we had had another vehicle on hand, we could have departed on time and missed the arrival of the feared observer-controllers. In addition to the normal PCI checks, we ensured that all vehicles had ice in their 5-gallon water jugs to guard against the extreme August heat.

After completing the PCI's, we gathered all of the convoy participants and briefed them on how to react in case of enemy contact. This also ensured that all participating units were up to snuff on our company's standards, which were high. After rock-drilling the actions to take on contact with the enemy, all convoy soldiers were briefed on the convoy execution matrix. This ensured that, if things went "to hell in a handbasket," the crew of each vehicle would have the information necessary to complete the mission.

Finally, and most importantly, came the safety brief. The 24th Transportation Company has a safety matrix that not only lists possible hazards but how to avoid them. In addition, the smart book contains a comprehensive safety brief that is part of all convoy briefs. During our rotation with the 24th Transportation Company, the only notable injury resulted from horseplay during down time.

I was disappointed that we did not get attacked by the opposing force (OPFOR) during our entire rotation. I looked forward to engaging and destroying the OPFOR. (The OPFOR sometimes takes transporters too lightly, which, in this case, could have resulted in its undoing!) Nonetheless, we learned a lot and returned safely to Fort Carson.

The National Training Center continues to offer a great opportunity for soldiers in the transportation field to live and train in "combat" conditions and become better soldiers. Those soldiers can use the lessons they learn at the NTC to train other soldiers when they return to their home stations. **ALOG**

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PC– OSRAP: Parts for Garrison and Field

by Ruth S. Dumer

The stocks of class IX repair parts needed in a garrison often differ significantly from those needed for a contingency operation because the operational environments are different. To solve this problem, the Army Materiel Systems Analysis Activity (AMSAA), at Aberdeen Proving Ground, Maryland, has developed an object-oriented personal computer program called the personal computer–optimum stock requirements analysis program (PC–OSRAP). With PC–OSRAP, the user can determine stockage levels for both garrison and contingency operations using optimizing methodologies in a user-friendly environment.

Garrison Versus Contingency

Historically, the Army has determined parts stockage by altering the current requisitioning objective (RO). This alteration has been based on add/retain criteria, which depend on the number of times a part was demanded within the last year; if the criteria were met, a new RO was computed based on operating-level days, order and ship time (OST) days, safety-level days, and the previous quantity demanded. Stockage decisions have been made regardless of whether the scenario involved garrison or contingency operations.

In the garrison, where OST and historical demand data are easily obtained, readiness and deployability are important, but cost is a critical consideration. And because cost is so important in the garrison, units are driven to repair secondary items as much as possible rather than simply order replacements.

By contrast, in a contingency or military operations other than war (OOTW) environment, OST is unpredictable, historical demand data usually are less useful than in the garrison, and, while cost is important, readiness and deployability are paramount. Under those conditions, a unit is more likely to replace than repair secondary items.

AMSAA developed a stock optimization methodology to support authorized stockage list (ASL) and prescribed load list (PLL) planning for a particular scenario, either a garrison or a contingency or OOTW situation. This methodology uses many of the same parameters as the current days of supply computation, but a part's impact on readiness and its price are now major factors.

AMSAA's methodology groups all parts for an end item and trades off failure and repair rates, prices, end item readiness required, and OST to compute an optimal RO for each part on each weapon system. In other words, it produces a package that meets readiness goals at the least cost.

The garrison portion of AMSAA's methodology provides an optimal class IX ASL based on historical unit demand data extracted from the Standard Army Retail Supply System–Objective (SARSS–O) or the Direct Support Unit Standard Supply System (DS^4). All previously demanded items are considered as "candidates" for the ASL optimization process, which usually results in an ASL that has a greater breadth of inexpensive parts and a smaller depth of some expensive parts. This readiness-based sparing methodology is an Army-recognized methodology for ASL computations and has been incorporated into the draft Supply Update 15 [AR 710-2, paragraph 3-9b(4)] as an alternative method for computing stockage levels.

The contingency or OOTW portion of AMSAA's methodology provides optimal class IX stock lists for area support groups (ASG's), corps support groups (CSG's), ASL's, and PLL's in a wartime or contingency environment. It uses data from the candidate item file (CIF) developed by the Army Materiel Command's major subordinate commands; combat damage data from the sustainability predictions for Army spare components requirements for combat (SPARC) also can be used as additional input.

PC–OSRAP

The goal of PC–OSRAP is to incorporate both scenario methodologies (garrison and contingency or OOTW) into one user-friendly model that provides the user with several options for determining optimal stock lists to meet both garrison and contingency or OOTW requirements. The program allows the user to create stock lists dynamically and conduct sensitivity analyses by eliminating or adding parts to be considered as candidates for optimization.

PC–OSRAP incorporates optimizing theory, in which the cost, weight, or volume of parts is minimized and weapon system operational availability or readiness is maximized. The idea is to stock an appropriate group of repair parts needed to maintain a weapon system or end item at a specified readiness level.

In order to produce the right parts package, several parameters must be input. They are—for both environments—OST, unit price of the part, repair cycle time, mean time to repair, and level of repair. For

garrison environments, the mean calendar time between failures is required for each weapon system group. For contingency or OOTW environments, resupply characteristics and weapon system densities are required. The user also is able to enter a usage modifier to simulate increased operating tempo. In most cases, the user can use the default values for these parameters until he feels confident enough to explore all the options of the model.

Dr. Meyer Kotkin, a well-respected analyst in Army logistics, developed the optimizing methodologies behind PC–OSRAP. PC–OSRAP is written in the object-oriented programming language, Visual Basic 4.0, for the Windows 3.1 software. It has multimedia applications and data base control with Microsoft Access files. The optimizing methodology routines are written in FORTRAN and compiled for the PC. AMSAA recommends that users have at least 40 megabytes free on their PC's for processing several iterations of the demand history file and the CIF data base. However, if the user has limited space, the model can be loaded and executed with only 15 megabytes free.

A Typical PC–OSRAP Application

How will PC–OSRAP operate in practice? Here is an example. A division class IX officer is preparing for an ASL review board and wants to develop a list of stock recommendations. First, he electronically extracts data on each item demanded from the appropriate files. (Data are extracted for the past 2 years for SARSS–O users or the past year for DS^4 users.) These data include such information as the number and quantity of items demanded and their unit price, weight, cube, and materiel category. The data then are formatted for input, which can be done either locally or with assistance from AMSAA. Locally, users can use PC tools such as Access or Excel; if those tools are not available, users can send raw data files to AMSAA for formatting (a 1-week turnaround time is needed).

Once the demand information has been loaded, the class IX officer can make adjustments in what items to include in the optimization process. Items with certain essentiality codes, nomenclatures, or acquisition advice codes can be included or excluded as needed. Next, because PC–OSRAP is a multi-echelon model that calculates stock requirements for ASL in garrison or at all support levels for a contingency or OOTW, the class IX officer inputs his support structure. This support structure data includes the number of air, missile, and forward direct support units (DSU's) or PLL, ASL, CSG, and ASG units.

Lastly, the class IX officer inputs the commander's operational readiness goals for each of the division's weapon systems. The model then is executed, and a recommended stock list for the main DSU and each supported DSU is produced. The resulting stock lists can be reviewed to ensure that other operational constraints, such as weight, cube, or funding, are met. For example, if funding is not available to support all recommendations, the class IX officer can review the operational availability performance curve for each weapon system to determine where adjustments in stocking parts might be made.

The officer might find that it costs an additional $150,000 to raise the operational availability of a particular weapon system from 93 percent to the commander's goal of 95 percent. The commander then may decide to "trade off" the extra 2 percent of availability in order to operate within his funding constraints. Similar reviews also could be made for all weapon systems to produce optimal and affordable stock lists. After the parameters are adjusted, the model can be executed any number of times to provide "what if" analyses that will aid in refining the stock packages.

The class IX officer would use the same process to develop stock lists to support contingency or OOTW operations, except that stock requirements would be developed based on equipment densities and CIF data (including end item and part failure rates and repair task distribution and maintenance task distribution information). Also, the class IX officer may elect to optimize weight or cube factors to meet deployability constraints. The flexibility, in the contingency environment, of using end item densities to determine stock requirements could be beneficial to nondivisional DSU's planning for support operations, where historical demand data would be difficult to obtain.

Once a stock list is computed, PC–OSRAP produces a file that can be input to SARSS–O or DS^4 to adjust current RO's.

AMSAA is continually adding features and enhancements to PC–OSRAP based on suggestions and comments from users in the field. Units may request a beta copy of PC–OSRAP by writing to the Director, Army Materiel Systems Analysis Activity, ATTN: AMXSY-LM, 392 Hopkins Road, Aberdeen Proving Ground, Maryland 21005-5071. Requesters will receive a user's guide, memorandum of understanding, and set-up diskettes containing operating programs and the most recent CIF data base. **ALOG**

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Pack Mules and Surf Boats

This year marks the 150th anniversary of the end of the Mexican War. However, the milestone is passing largely unnoticed, perhaps because the Mexican War long has been overshadowed in the popular imagination by the much larger and bloodier conflict that began in 1861. That the Mexican War is largely forgotten and usually relegated to the ranks of our Nation's minor wars is unfortunate, because its consequences were anything but minor and its successful prosecution was a major advance in American military development.

First and foremost, the Mexican War brought what is now the southwestern quadrant of the United States under the American flag. But that expansion also reopened sectional conflict over the status of slavery, which set in motion the chain of events that led to civil war just 13 years after peace with Mexico.

From a military standpoint, the Mexican War is often viewed as something of a proving ground for junior officers who later gained fame as leaders, on both sides, in the Civil War. Grant, Lee, Meade, Bragg, Davis, McClellan, and many others gained experience and learned lessons at Buena Vista and Cerro Gordo that later served them well at Antietam and Gettysburg.

But the Mexican War should be better known for its own military achievements and lore, not just as a dress rehearsal for the Civil War. It was in many respects an epic struggle, waged over great distances against a worthy opponent fighting to defend its homeland. Hindsight may lead us to believe that American victory was inevitable, but that was not the case; indeed, many European military experts of the time, probably mindful of the inconsistent American performance in the War of 1812, looked favorably on Mexico's chances of repulsing American attack.

But the American performance against Mexico was far superior to that demonstrated in the War of 1812, and it was highlighted by what is still one of the great achievements in U.S. military history—Winfield Scott's amphibious landing at Vera Cruz and overland campaign to capture Mexico City. The Mexican War was the first American war fought largely on foreign soil, which raised important questions of support as well as strategy. For logisticians, prosecuting a war over such great distances, so far from home, at a time when the railroad and telegraph were in their infancy and not yet of tactical value, created unprecedented challenges. For the most part, those challenges were met, and the Army's logistics performance was crucial to victory.

A War of Two Theaters

When the war began in May 1846, President James Knox Polk had three strategic objectives: defend the boundary of Texas claimed by the United States, which was the Rio Grande River; seize New Mexico and California, which would become part of the United States; and achieve sufficient military success in Mexico to force it to make peace on terms favoring the United States. (At that time, New Mexico embraced much of what is now the southwestern United States, not just the present state of New Mexico.) These were ambitious goals, but they also were limited; they did not envision a conquest of Mexico, and Polk thought they could be achieved in 6 to 12 months by operations confined to what was then the northern portion of Mexico. When American successes in the north, including the conquest of New Mexico and California, did not lead to Mexican surrender, Polk and his advisers turned to a more ambitious campaign against the Mexican heartland aimed at capturing the capital, Mexico City.

So the Mexican War was conducted in two theaters that developed sequentially. Leaving aside the conquest of California and Brigadier General Stephen W. Kearny's overland expedition from Fort Leavenworth to seize New Mexico (Kearny then went on to California), the two major theaters of the war were the northern, commanded by Major General Zachary Taylor (who later was elected President), and the central, commanded by Major General Winfield Scott. (There was a second, smaller army in the north under Brigadier General John E. Wool, which assembled at San Antonio, Texas. Army plans called for Wool's force to move south, capture Chihuahua, and then link up with Taylor.)

The Army that undertook the task of subduing Mexico was almost inconceivably small by modern standards. When the fighting started in May 1846, the regular Army had 6,562 soldiers, including 637 officers and 5,925 enlisted personnel. More than one-half of this strength (3,922 men organized in three brigades) was assembled in Texas under Taylor. During the course of the war, 1,016 officers and 35,009 enlisted soldiers

: Logistics in the Mexican War

joined the regular Army, so the total of regular troops engaged was 42,587. Another 73,532 men served in volunteer units, though not all of them reached the theaters of operations.

Dispute Over Texas Leads to War

The immediate cause of the war was a dispute over the boundary of Texas. Texas had been a province of Mexico that was largely settled by Americans. These Americo-Mexicans rebelled against their overlords in far-off Mexico City, established Texas as an independent republic, and eventually agreed to annexation by the United States. Mexico, while refusing to acknowledge the annexation, insisted that the southern boundary of Texas was the Nueces River, not the more southerly Rio Grande claimed by the United States. When Polk ordered Taylor's "Army of Observation"—the largest force assembled by the United States since the War of 1812—to move into the disputed territory between the Nueces and Rio Grande to assert the U.S. claim in the summer of 1845, war became inevitable.

The initial clashes, at Palo Alto and Resaca de la Palma (near present-day Brownsville, Texas) in May 1846, were decisive American victories that threw the Mexican force back across the Rio Grande. Those battles determined that the war would be fought on Mexican soil, with the Mexican Army almost always on the defensive. And that meant that U.S. forces would face the challenges of operating in hostile country and relying on very long lines of supply.

Organization of the War Department

The United States Army in 1846 did not have a general staff. Instead, the Secretary of War was assisted in the execution of his duties by several staff officers, each of whom supervised a bureau responsible for providing specified supplies, services, and administration. The officers responsible for logistics support included the Quartermaster General, Brigadier General Thomas S. Jesup; the Commissary General of Subsistence, Colonel George Gibson; the Chief of Ordnance, Colonel George Bomford; the Chief of Engineers, Colonel Joseph G. Totten; and the Surgeon General, Colonel Thomas Lawson. The bureaus were organized on a commodity rather than a functional basis. This meant that each bureau was responsible for procuring, distributing, storing, and, as necessary, repairing and maintaining designated equipment and supplies. The bureau heads reported directly to the Secretary of War and not to the Commanding General of the Army (at that time, Winfield Scott).

Subsistence

Food supply was the responsibility of the Subsistence Department. During the war, commissary officers bought food on the open market and passed it on to supply depots established in Texas and Mexico. Although accidents during transportation resulted in heavy losses of food, the depots were able to keep most troops well supplied. After the first 6 months of war, the field forces learned that they could obtain sufficient food locally. Many Mexicans were willing to ignore the prohibitions of their Government and sell food to the Americans. Living off the country became especially important in Scott's campaign against Mexico City. Feeding of recruits back in the United States was accomplished by contract; some field units also were fed under contracts.

Clothing

Following the abolition of the Purchasing Department in 1842, the Quartermaster's Department assumed responsibility for all aspects of clothing supply. The focus of this activity was the clothing depot at Schuylkill Arsenal in Philadelphia. Under the system then in effect, cloth was purchased from manufacturers, cut into garments by Government cutters at the depot, and farmed out to contract seamstresses and tailors, who finished the garments and returned them to the depot for a final inspection before acceptance. By the end of the war, the number of seamstresses and tailors under contract had expanded tenfold and the depot was delivering over 85,000 garments to the Army each month. A branch clothing depot was established in New York City in late 1846 to expand production as needed.

The increased production and procurement kept the regular Army troops well clothed. The volunteers didn't fare as well. Under the law in effect at that time, volunteers were not issued clothing but instead received a clothing allowance of $21 upon muster to purchase their own clothing. However, many volunteers used

all or part of their allowance for other purposes, sometimes buying cheap clothing and spending the remainder of their money elsewhere. To meet the problem of poorly clad volunteers, Taylor ordered that they be allowed to purchase clothing from the Government stores, while clothing was simply issued to volunteers in Scott's army, regardless of the law. In early 1848, after the fighting was over, Congress changed the law so that future volunteers would be issued clothing in the same way as regulars. Despite the problems with volunteers, clothing supply on the whole was quite satisfactory; indeed, at the end of the war, much clothing was returned to Schuylkill.

Before the war, the Army contracted for shoes. However, contractors' delays in meeting increased wartime demand led the Army to establish its own shoe manufacturing operation at Schuylkill Arsenal. This factory was turning out 12,000 pairs of shoes a month by the end of the war. The operation was so successful that it was retained after the war, and the contract system of shoe procurement ended.

Weapons and Ammunition

The Mexican War started as the Army was beginning to shift from flintlock to percussion weapons. Regulars went to war with flintlock muskets, but volunteers brought a variety of weapons, including percussion guns. By the end of the war, the Army had issued more than twice as many percussion caps as flints—a clear sign of the Army's transition to percussion weapons. Taylor's victory at Buena Vista on 22 and 23 February 1847 was the first major battle in history in which both sides were armed for the most part with percussion weapons. The variety of weapons soldiers carried complicated ammunition supply and weapon maintenance and repair. However, arms and ammunition supply generally were efficient and effective, and soldiers in the field never lacked firepower in battle.

The excellence of U.S. artillery (and artillerymen) was one of the great successes of the war and a crucial factor in more than one U.S. battlefield victory. Government armories and arsenals produced small arms, ammunition, and accouterments, but much artillery and artillery ammunition and accouterments were acquired from contractors. The growing capabilities of The U.S. industrial base can be demonstrated by one example. Soon after the capture of Vera Cruz on Mexico's Gulf coast (the starting point for the campaign against Mexico City), 49 10-inch mortars and almost 50,000 shells reached Scott's army. That ordnance arrived only 4 months after the contract for it had been let—an impressive performance when one considers the time needed to manufacture all those items and then move them from the northeastern United States to Mexico.

Transportation

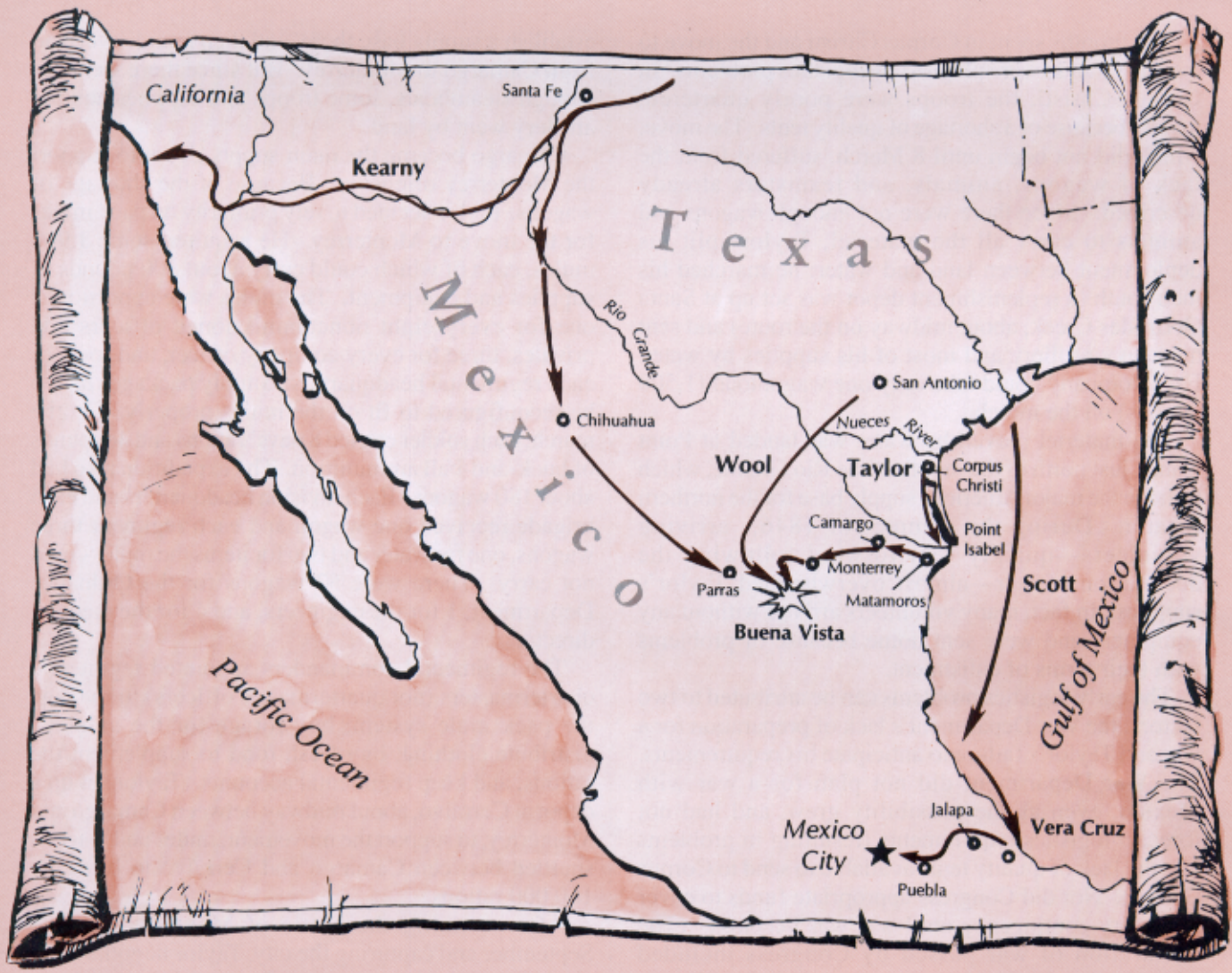
At the time of the Mexican War, transportation was a quartermaster responsibility. (The Transportation Corps would not be created until World War II.) Because the war was fought over such long distances, and so much of the campaigning took place on foreign soil, transportation inevitably became the Army's biggest logistics challenge. One revealing gauge of the central role played in the war by transportation can be found in the Army appropriations bill approved by Congress on 3 March 1847. This bill gave the Army $13.3 million, plus another $5.3 million in a deficiency appropriation to cover money already spent; of this total, $9 million (almost half) was for transportation expenses.

The transportation challenge required both water and land conveyances. Water transportation was needed to move the great majority of troops, weapons, equipment, and supplies from the primary U.S. port of debarkation, New Orleans, Louisiana, to the theater of operations in southernmost Texas and Mexico. Both oceangoing and riverine vessels were required. The Quartermaster's Department both chartered and purchased sea steamers and sailing vessels and contracted to have some light-draft schooners built; the latter were valuable for moving cargo through shallow coastal waters to shore landings. During the war, the Quartermaster's Department procured 38 sailing vessels and 35 steamships. These Government-owned vessels were manned by civilian captains, masters, and crews hired by contract.

The Mexican War saw the first major use of steamboats in war. (The Army made limited use of steamboats in the Second Seminole War in Florida from 1835 to 1842.) Steamboats were used to transport men and supplies down the Ohio and Mississippi Rivers to New Orleans for subsequent overseas movement. Steamboats also were used to establish a line of communication for Taylor's army along the Rio Grande when, after Resaca de la Palma, Taylor moved his army up the river in the first stage of an offensive against Monterrey.

Aside from the use of steamboats on the Rio Grande, transportation in the theater was largely by land. But land transportation was complicated by shortages of wagons and competent teamsters. Lack of wagons was a particular problem for Taylor's army early in the war. When Taylor repositioned his army before the war started, he had only 130 of the 265 wagons he needed to move from Corpus Christi, at the mouth of the Nueces, to the Rio Grande. After the fighting began, the use of steamboats on the Rio Grande to move supplies in part was a response to the shortage of wagons and animals.

The wagon deficit led to a great reliance on pack animals, particularly mules, which could be easily obtained in Mexico. Pack animals became a vital



The major campaigns of the Mexican War.

supplement to wagons for overland transportation and in some cases were the main mode of moving supplies. Their role was crucial to supporting the field forces in Mexico.

The Quartermaster's Department's biggest problem was obtaining and retaining qualified civilian support personnel, particularly teamsters. Civilians also were needed as laborers and mechanics. (Some civilians were hired to repair wagons). The department had to hire several thousand civilians at fairly high wages and then pay high transportation costs to get them to the theater. Most were willing to serve for only 6 months, and many of the teamsters were unreliable or incompetent. To solve the manpower problems, Jesup recommended that a corps of enlisted laborers be created, but Congress did not act on the proposal.

Medical Logistics

The small Medical Department added two surgeons and 12 assistant surgeons to the regular Army, but that was not enough to meet wartime demand for medical care. So the Medical Department augmented its strength by contracting for civilian doctors; most served at hospitals on installations in the United States, but a few accompanied Taylor's army in Mexico. As much as possible, the sick and wounded were evacuated to a large hospital in New Orleans. Later, another hospital was established at Baton Rouge, Louisiana. Medical supplies generally were adequate. Most medical supplies for the hospitals in Louisiana, for units passing through on their way to the theater, and for the supply depots in Mexico were procured locally in New Orleans.

Supporting Taylor's Army

As we have noted, Taylor's army was the first in the field: it was deployed to Corpus Christi, at the mouth of the Nueces, to protect newly annexed Texas in the summer of 1845. The force consisted of 5 regiments of infantry, 1 regiment of dragoons, and 16 companies of artillery. On 16 January 1846, President Polk ordered Taylor to move south to the mouth of the Rio Grande, opposite Matamoros, Mexico.

The months spent in Corpus Christi and the move to the Rio Grande were plagued by logistics problems. In Corpus Christi, the troops were poorly quartered, mainly because of a shortage of quality tents. The move, which did not begin until 8 March, suffered from the lack of wagons, animals, and teamsters already described. Since there were not enough wagons and animals to carry all the materiel, Taylor split his deployment between land and water: he marched his men south (a replenishment depot was set up at Santa Gertrudes Creek, about midway on the route) and sent his heavy artillery and most of his supplies by water. Each company could take only one wagonload (1,500 pounds) on the march.

The materiel moved by water was landed at Point Isabel, just north of the mouth of the Rio Grande, which became the major American supply base for the northern theater. During the summer of 1846, arriving volunteers—quickly sent forward following the declaration of war—almost overwhelmed Taylor's supplies. In fact, many volunteers arrived without any equipment and were sent home because of problems with their terms of enlistment.

The early logistics problems can be attributed to two factors: the War Department's lack of preparation for a war and Taylor's failure to anticipate his requirements. The War Department did not plan for a war with Mexico, even as the possibility grew, and had not forecast logistics requirements (resulting in problems like the lack of quality tents available to send to Corpus Christi). Nor did Congress appropriate funds to cover a military contingency until war was declared. (The declaration of war passed by Congress included authorization for 50,000 volunteers and $10 million to conduct the conflict.) Taylor not only failed to plan for his requirements, but he was slow in providing the War Department with information as his campaign developed. These lapses got the war's logistics effort off to a rocky start and elicited many complaints from Taylor's soldiers.

After Resaca, Taylor made Matamoros his base of operations. The Matamoros camp was plagued by much sickness among soldiers, mainly because the volunteers knew little about camp sanitation and had few medical supplies. (In the Mexican War, as in most 19th century wars, more soldiers died of disease than from combat—almost six times as many). Taylor set up a new supply depot at the mouth of the Rio Grande to unload materiel from oceangoing vessels for shipment up the river on steamboats.

Taylor's new objective was Monterrey. Polk believed that seizing and holding enough Mexican territory in the north would force the Mexicans to the peace table. To advance on Monterrey, Taylor decided to move up the Rio Grande to Camargo by steamboat, establish a supply base there, and then march overland from Camargo to Monterrey. But since there were not enough steamboats, some troops and supplies and the artillery went by land.

Camargo became the main supply depot to support the Monterrey offensive. Because of the shortage of wagons, Taylor decided to rely primarily on pack mules for the move to Monterrey. He acquired some 1,900 mules, each of which could carry about 300 pounds of supplies and equipment. The mules were apportioned one for every eight noncommissioned officers and privates, three for every company officer, and four for each regimental headquarters. Supply packages had to be reconfigured to fit on the mules properly. On the march, each soldier carried 8 days' rations and 40 rounds of buck-and-ball ammunition. The expedition also had about 180 wagons. Each division headquarters and each brigade received one wagon and each regiment three wagons, one for water and two for items the mules could not carry. There were 53 wagons for the Ordnance Department, 1 for the engineers, and 4 for the medical director.

The regimental commanders appointed regimental quartermasters (not quartermaster officers) to manage the pack mule system, buy forage for the animals, distribute clothing, buy fresh food to supplement the rations, and keep regimental accounts. Taylor set up a depot at Cerralvo, about midway between Camargo and Monterrey, to support the movement; mules and wagons shuttled between Camargo and Cerralvo to bring up 160,000 rations.

After winning the battle of Monterrey in late September and capturing the city, Taylor negotiated an armistice with his opponent. Taylor felt he needed a pause, in part to replenish his ammunition stocks. However, the armistice was rejected by his superiors in Washington, and as soon as the slow communications of the day permitted, Taylor received orders to end the armistice and resume offensive operations. In the meantime, Taylor had built up a large support base at Monterrey, using his growing fleet of mules to bring supplies forward from Camargo.

Taylor basically held his line in the vicinity of Monterrey for the duration of war as the offensive focus shifted to Scott's campaign in central Mexico. However, Taylor did have to fight one more major battle at Buena Vista, south of Monterrey, in February 1847. This battle repulsed a large Mexican army under General Antonio Lopez de Santa Anna (best known to Americans for his role at the Alamo in 1836) that was making one last attempt to destroy the American invaders. Buena Vista was a close contest that turned into a decisive U.S. victory. Of the 4,594 Americans engaged, 14 percent became casualties, including 272 killed, 387 wounded, and 6 missing.

Before leaving the northern theater, we need to mention Wool's army, which planned to move from San Antonio to Chihuahua by way of Monclova and Parras (basically south, then west). Wool's performance was an impressive logistics achievement. He moved his command with loaded wagons through extremely rugged, desolate country that Jesup thought no wagon train could negotiate. Not only did he complete his march to Monclova and then on to Parras without losing a man, but he also brought enough materiel so that, when ordered to come to the assistance of one of Taylor's subordinates threatened by Santa Anna at Saltillo (just southwest of Monterrey), he arrived with provisions for 60 days, 400,000 cartridges, and 200 cannon rounds.

Wool's success rested on careful preparation: he was much better than Taylor at determining his requirements and ordering supplies in a timely fashion. Initially, Wool's supplies were shipped to a depot established at La Vaca, on the Texas coast, and hauled by wagon 160 miles to San Antonio. When he was ready to move south, Wool had more wagons for his smaller force (3,000 men) than Taylor had for his much larger army.

Supporting Scott's Army

The decisive campaign of the Mexican War was Winfield Scott's overland offensive designed to capture Mexico City and end Mexican resistance. By October 1846, President Polk had decided to change strategy, holding Taylor on the defensive in the north and concentrating offensive efforts on seizing Vera Cruz and then moving inland to assault the capital. To capture Vera Cruz, Scott projected that he would need 4,000 regulars, 10,000 volunteers, and 1,000 marines and sailors; 50 transports of 500 to 750 tons to carry the force; and a siege train of 8-inch howitzers, 24-pounders, and 40 to 50 mortars. For the initial landing on the beach, he wanted 140 surf boats that could land 5,000 men and 8 artillery pieces.

The surf boats were the first American craft built specifically for amphibious landings. Designed by Navy Lieutenant George M. Totten and fabricated in Philadelphia for the Quartermaster's Department, the surf boats were double-ended, flat-bottomed craft that could carry 40 men and a crew of 8. The boats came in three lengths: 35 feet, 9 inches; 37 feet, 9 inches; and 40 feet. For shipment to the theater, they were nested within each other aboard the transports. Because of bad weather, only 65 surf boats reached Scott at Vera Cruz in time to be used in the landing, but they performed admirably.

The amphibious landing at Vera Cruz took place on 9 March 1847. Scott had organized his army into three divisions: two of regulars under Brigadier Generals William J. Worth and David E. Twiggs and one of volunteers under Major General Robert Patterson. Worth's division would deploy first, followed by those of Patterson and Twiggs. Steamers towed the surf boats to the transports, where they took on the soldiers, and sailors rowed the surf boats to the beach in a single file. The boats swept ashore and offloaded the troops aboard, while gunboats provided covering fire. The Mexican commander chose not to oppose the landing, so over 8,600 men were landed without a single loss in just over 4 hours. This was an unprecedented military achievement for the time. With the beachhead secured, the surf boats were used over the next several days to ferry supplies ashore. Supplies were soon piled along the beach for a mile. Following a brief siege, Vera Cruz surrendered on 29 March.

As Scott consolidated his base, he realized that, like Taylor, he lacked sufficient wagons and horses for his advance. Rather than delay, Scott decided to use what he had and leave what he could not carry in storage at Vera Cruz. If more food or forage was needed on the march, his quartermasters and commissaries would either buy supplies locally or send back to Vera Cruz to have supplies forwarded.

Scott planned to rely on local procurement for much of his support. In particular, he intended to purchase locally two-thirds of the horses and mules he needed. The first goal of his advance was Jalapa, where he expected to find considerable food and forage and many animals. Jalapa was captured after the Mexicans were defeated at Cerro Gordo on 18 April, but its fruits proved disappointing. Scott then moved his army on to Puebla, halfway between Jalapa and Mexico City. There he stayed from the end of May until early August, awaiting supplies and reinforcements brought up from Vera Cruz for the final push to the capital. Much of the buildup at Puebla was accomplished by local purchase, but Scott also sought resupply from Vera Cruz. His priorities were medicines and hospital supplies, clothing, salt, ammunition, horseshoes, and coffee, followed by knapsacks, blankets, hard bread, bacon, and kettles.

Several factors—the usual shortage of wagons and reliable teamsters, the poor roads in mountainous central Mexico, the threat of Mexican guerrillas, an army (11,000 men) too small to keep the line to Vera Cruz open and still advance in sufficient strength—made resupply over a long line of communication from the coast very uncertain. So, in moving from Puebla to Mexico City, Scott adopted a daring strategy: he would cut his line with Vera Cruz and for his support rely on his trains supplemented by what could be obtained along the way. This was a potentially dangerous move, for Scott risked isolating his army in the midst of a hostile countryside. No less an authority than the Duke of Wellington (the legendary victor over Napoleon), observing the war from England, predicted, "Scott is

lost! He cannot capture the city, and he cannot fall back upon his base."

But the gamble proved successful, and the army reached the outskirts of Mexico City on 18 August. Scott established a depot and general hospital at San Augustin, 10 miles south of the capital. After several hard battles—Contreras, Churubusco, El Molino del Rey, Chapultepec—the defenders surrendered, the Americans occupied the city on 14 September, and for all intents and purposes the war was over.

It had been a brilliant campaign in concept and execution. The Duke of Wellington thought Scott's achievement historic: "His campaign was unsurpassed in military annals. He is the greatest living soldier." In a modern assessment, historian K. Jack Bauer concluded, "Nothing like the Mexico City campaign exists in American military history for sheer audacity of concept except for MacArthur's Inchon-Seoul campaign of 1950."

With the signing of the peace treaty on 2 February 1848, the Army faced the unprecedented task of making an orderly withdrawal from foreign soil—a mission it would not face again for 50 years. When the treaty ratifications were exchanged on 30 May, the force—1,137 officers, 26,104 enlisted men, and more than 5,000 civilian mechanics, laborers, and teamsters—began leaving Mexico City, heading down the road to Vera Cruz and shipment home.

Much surplus property was left, which was evidence of the overall success of Scott's support, both during the campaign and the occupation of the capital. All property that could not be moved easily was sold in Mexico. All wagons and animals were returned to the United States, where the best were distributed to posts in the Southwest and the rest sold. The Quartermaster's Department kept some of its fleet, but most of its vessels were redistributed to the Navy and other Government agencies.

Problems and Achievements

On the whole, the Mexican War was a significant logistics achievement. Considering the great distances involved and the challenge of operating largely in foreign territory, the Army was well supported and able to execute the commanders' plans. No battle was lost because the troops lacked materiel.

There were many logistics difficulties, of course, particularly early in the war; and they can be attributed to several factors—

- Although trouble with Mexico had been brewing for months, the War Department had done little planning for war or forecasting of requirements. Aside from moving Taylor's army forward into Texas, the department did not really swing into action until war was declared.
- The political realities of the age played a role in the lack of preparation. Americans in the 1840's were hostile to the idea of a large standing army and would not have tolerated the existence, or expense, of a large logistics bureaucracy or mobilization for total war. The Congress of that day would not appropriate funds for war preparations until there actually was a war.
- The bureaus responsible for logistics were small organizations staffed for a small, peacetime Army that operated at a leisurely pace. Their procedures were designed to prevent fraud and waste in peacetime, not to facilitate rapid wartime expansion or permit flexible responses. Their personnel generally performed well, but sometimes they were almost overwhelmed by the increased demands war placed upon them. At one point, the Quartermaster General himself went to New Orleans to supervise support to the theater and straighten out problems.
- Commanders in the field, most notably Zachary Taylor, often paid little attention to logistics in their planning; they didn't anticipate their requirements or communicate their changing needs in a timely manner. As a result, the bureaus in Washington sometimes did not know what was needed or could not respond to demands from the field quickly, yet they received the blame of the commanders.
- Slow communications—a fact of life at a time when the telecommunications age had barely begun—hampered the transfer of logistics information to Washington. The great distances involved slowed resupply and sometimes forced armies to halt their advances for several weeks to wait for their supplies to be brought forward.

How the Army coped with these limitations varied from the distinctly low-tech—relying on pack mules to make up for wagon shortages—to the innovative—using steamboats to establish a line of communication up the Rio Grande—to the truly daring—Scott's abandonment of his supply line in his advance from Puebla to Mexico City. Along the way to victory, the Army made use of such concepts as living off the land and using civilians to provide specified logistics support (the latter with distinctly mixed results).

The Mexican War was of profound significance to our Nation, to the definition of our national domain, and the evolution of our history. For our military, it featured the first large-scale operations in a foreign country, the first overseas expedition, and the first joint Army-Navy operations. Army logistics—as always—provided the means to victory.

—Story by Robert D. Paulus

LINK—to Logistics Information

by Joseph Bulko and Roger McMillan

When U.S. troops moved into war-torn Bosnia for Operation Joint Endeavor, they took with them something called LINK. But LINK isn't a shovel or any of the other items of equipment normally carried by troops to the front line. Instead, LINK is an information system logisticians use to meet the supply needs of the troops they support. LINK stands for "logistics information network."

Richard Deering, a logistics assistance representative stationed at Aviano Air Base in Italy, is one of those familiar with LINK. He used LINK to track supplies while on assignment with Joint Endeavor forces. Of his experience, Deering observed, "During that deployment, LINK was the only tool I had on a daily basis to assist me in supporting units with supply information. It was as invaluable in the field as it has been in garrison." LINK traffic doubled during the buildup for Joint Endeavor, demonstrating that LINK was performing its intended job.

U.S. European Command (EUCOM) started LINK during Operation Desert Storm to solve the problems of lack of access to multiple data bases and slow network access overseas. Since then, LINK has grown to the point that it now provides access to 12 logistics data bases for users worldwide: the logistics remote users network (LOGRUN); the interrogation requirements information system (IRIS); the Defense Automatic Addressing System Center (DAASC) inquiry system; the Defense Logistics Agency's (DLA's) standard automated material management system (SAMMS [not to be confused with the Army system]); the logistics information processing system (LIPS); the Army's total asset visibility (TAV) system and logistics intelligence file (LIF); the Navy's Snapshot system and virtual master stock inventory record (VMSIR); the advanced traceability and control for Air Force (ATAC-AF) system; the Military Traffic Management Command's worldwide port system (WPS); and the General Services Administration's multi-use file for interagency news (MUFFIN). Because of LINK's expanded reach, EUCOM transferred management of the program to DLA.

LINK's single interface to many systems allows users to research supply items before ordering and then track the items through the pipeline. Researching an item before ordering can save time and money. Logisticians can use LINK to—

- Check LOGRUN for information about items, including an item's acquisition advice code, price, the routing identifier code (RIC) of the item manager, and its characteristics data.
- Check IRIS to see if items are available from surplus. Since the Government has already paid for surplus items, customers can get them for the price of shipping.
- Use the DAASC inquiry system to decode the RIC of the item manager obtained from LOGRUN. The customer will use this information to determine which system to check for asset availability.
- Check asset availability. Users can check SAMMS if DLA manages the item, the TAV system if the Army is the manager, or Snapshot if the Navy manages the item. DLA plans to add LINK access to the Air Force's D035 system.
- Track status after submitting requisitions. Army logisticians usually use LIF to check status. LIPS gives the status of all requisitions, while MUFFIN shows the status of FEDSTRIP actions.

The LINK support team has added a new service called PC LINK. PC LINK runs on Windows software and is faster and easier to use than the previous LINK software. Customers in the continental United States started using PC LINK in May 1996; European and Pacific customers are scheduled to gain access.

Richard Deering estimates that he has saved more than $1.5 million using LINK. For example, LINK's access to IRIS allowed Deering to locate four aviation ground power units in critically short supply. For users like him, LINK has lived up to its motto, "LINK: Your gateway to informed decisions." **ALOG**

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