Reader Survey
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ARMY LOGISTICIAN

SEPTEMBER-OCTOBER 1999

Testing Force XXI CSS Concepts

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ARMY LOGISTICIAN

PROFESSIONAL BULLETIN OF UNITED STATES ARMY LOGISTICS

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ARTICLES

DEPARTMENTS

COVER

The forward repair system-heavy shown on the cover was one of the systems tested in a logistics-focused exercise at the National Training Center at Fort Irwin, California. For more information on the results of the exercise, see the article beginning on page 3.

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Mission: ***Army Logistician*** is the Department of the Army's official professional bulletin on logistics. 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.

Disclaimer: Articles express opinions of authors, not the Department of Defense or any of its agencies, and do not change or supersede official Army publications. The masculine pronoun may refer to either gender.

Submissions: Articles and information on all facets of logistics operations and functions are solicited. Direct communication is authorized and should be addressed to: EDITOR ARMY LOGISTICIAN/ALMC/2401 QUARTERS RD/FT LEE VA 23801-1705. Phone numbers are: (804) 765-4761 or DSN 539-4761; Fax (804) 765-4463 or DSN 539-4463; e-mail alog@lee.army.mil. Articles may be reprinted with credit to ***Army Logistician*** and the author(s), except when copyright is indicated.

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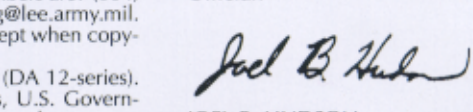
This medium is approved for the official dissemination of material designed to keep individuals within the Army knowledgeable of current and emerging developments within their areas of expertise for the purpose of enhancing their professional development.

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
9916203

Coming in Future Issues—

- Managing Hazardous Substances
- Third Party Logistics Supply Distribution
- Third Party Logistics Depot Maintenance
- Contractors on the Battlefield in the 21st Century
- Preserving Strategic Rail Mobility
- 1st Cavalry Division Wins War on Excess
- Supporting the Army in Italy
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- Funding and Fielding Warfighting Systems

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ALOG NEWS

GENERAL JOHN G. COBURN

General John G. Coburn recently was appointed Commander of the Army Materiel Command. General Coburn, who previously served as Deputy Chief of Staff for Logistics, replaces General Johnnie E. Wilson, who has retired from the Army. Major General Charles S. Mahan, Jr., has been nominated as the Army's new Deputy Chief of Staff for Logistics.

ALOG CELEBRATES 30 YEARS IN PRINT

Army Logistician observed its 30th year of publication this year by printing a special anniversary issue for January-February 1999. At the request of General Coburn, then Deputy Chief of Staff for Logistics, the issue was devoted to the "Revolution in Military Logistics." The actual anniversary of this professional bulletin is marked by the issue you are reading. The first issue was dated September-October 1969.

This issue is the 181st printing of ***Army Logistician,*** and it represents a major milestone for the staff. As we begin our 31st year, we want to thank our readers and contributors for their continued support. We anticipate many more years of providing you with accurate and up-to-date logistics information.

ODCSLOG CLARIFIES FUTURE MAINTENANCE POLICY

Major General Julian A. Sullivan, Jr., Director of Supply and Maintenance, Office of the Deputy Chief of Staff for Logistics (ODCSLOG), recently sent a letter to ***Army Logistician*** that explains a major change in maintenance policy. This change will be incorporated in AR 750-1, Army Materiel Maintenance Policies and Retail Management Operations. To read General Sullivan's letter, please turn to page 2.

(News continued on page 53)

NEWS

(News continued from page 1)

MTMC ADOPTS WEB-BASED FREIGHT MANAGEMENT SYSTEM

The Military Traffic Management Command (MTMC) has developed a plan to meet the Deputy Secretary of Defense directive to reengineer defense transportation documentation and financial processes. The plan includes implementation of the commercial payment and reconciliation system used by U.S. Bank—PowerTrack—for making transportation payments and the continental U.S. (CONUS) Freight Management (CFM) System Electronic Transportation Acquisition (ETA) suite of Internet-based applications for managing freight services. The system will be fully implemented within the next year.

Training for the new transportation management system began in May at Fort Eustis, Virginia, for 32 Army transportation officers from high-volume freight sites. The 1-week course provides hands-on, computer-based training on the entire suite, including ETA Freight Acquisition Shipping Tool (FAST), Spot Bid and Transportation Discrepancy Reports (TDR's), Transportation Facility Guide (TFG), Carrier Added Value Suite (CAVS), and PowerTrack. Upon completing the course, students are issued passwords to access ETA/Power Track upon return to their duty stations.

Most other users will be trained using distance learning tools, including self-paced CD's, a live Internet simulator, on-line tutorials, and Internet classroom training. Limited classroom instruction will continue to be offered at Fort Eustis.

For more information on ETA, visit the MTMC website at http://www.mtmc.army.mil/transys/cfm, call (703) 696–8762, extension 2062, or send e-mail to henryc@mtmc.army.mil.

NEW TRANSPORTATION OFFICER COURSE AVAILABLE ON WEB

The Army Transportation School at Fort Eustis, Virginia, has developed a new Senior Transportation Officer Qualification Course (STOQC) as a web-based training program. The course is on the school's website, http://www.transchool.eustis.army.mil. The previous version of the STOQC has been deleted from DA Pamphlet 351–20, Army Correspondence Course Program Catalog.

STOQC provides field-grade non-Transportation Corps officers (both active and reserve component [AC and RC]) with a working knowledge of the duties and responsibilities of a Transportation Corps officer operating at the battalion level or higher. The course will branch-qualify RC officers and familiarize AC officers from other branches who have been assigned to a transportation staff position or transferred to the Transportation Corps. Also, it will branch-qualify non-Transportation Corps RC officers who have been selected to command a transportation unit. In addition to the STOQC, at least 1 year of documented experience in a transportation position is required to branch-qualify in transportation.

There are two versions of STOQC—a highway/rail track and a marine/terminal track. Officers select the appropriate track during the enrollment process.

For more information, call (757) 878–6928 or DSN 927–6928, send e-mail to westp@eustis.army.mil, or visit the Transportation School's website.

ENGINEERING DRAWINGS LISTED ON INTERNET

Logisticians, engineers, and maintenance personnel who need technical drawings to ensure that Department of Defense (DOD) weapon systems and spare parts are ready when they need them now can locate and generate a request for engineering data on the World Wide Web.

The Military Engineering Data Asset Locator System (MEDALS), DOD's central index for engineering data since 1988, has been upgraded from a mainframe system to a midtier graphic user interface design that is accessible from the World Wide Web. The new web-enabled query capability allows users to locate engineering drawings using a browser, such as Microsoft's Internet Explorer or Netscape Navigator. MEDALS identifies the locations of engineering data for users and indicates whether they are available digitally online or on compact disk, aperture card, hardcopy, or mylar.

Although engineering data are not available online, MEDALS gives users all the information they need to download it themselves from systems such as DOD's standard Joint Engineering Data Management Information and Control System. However, MEDALS

does support a feature permitting users to generate an electronic drawing order request for technical drawings that are available in offline media, such as compact disk, aperture card, hard copy, and mylar. MEDALS electronically sends the orders to the appropriate technical data repository for processing.

MEDALS indexes more than 26 million DOD technical drawings and saves the Government approximately $6 million annually by cutting storage costs, preventing duplicate purchases of engineering data, and saving procurement and management time. In the past, it sometimes took weeks to locate technical data; MEDALS locates this information in seconds.

For more information, visit the Defense Logistics Information Service's MEDALS website at http://www.dlis.dla.mil/MEDALS, or contact the MEDALS program manager at (616) 961–4068. Send e-mail inquiries to medals@dlsc.dla.mil.

ARMY MAINTAINERS RECOGNIZED

Despite a high pace of operations, Army equipment readiness has never been better. That was the conclusion of General Dennis J. Reimer, then Chief of Staff of the Army, as he recognized the Army's best maintenance units for 1999.

During a Pentagon ceremony in May, General Reimer thanked the award winners for their long hours, personal sacrifices, and work done in austere conditions. "You are doing a great job," he said.

As an example of austere conditions, General Reimer described one of his favorite pictures as that of a "Humvee" stuck in the mud in Albania with a soldier's legs and boots sticking out from under it. "That was a maintainer working on that Humvee. That is where the rubber meets the road and the wrenches meet the steel."

Units receiving the Army Chief of Staff Award for Maintenance Excellence were—

Active Army
(Modification Table of Organization and Equipment)

Light. Headquarters and Headquarters Company, 7th Signal Brigade, Mannheim, Germany, Army Forces Command.
Intermediate. 58th Signal Company, Mannheim, Germany, Army Forces Command.
Heavy. 324th Signal Company, Mannheim, Germany, U.S. Army, Europe.

Active Army
(Table of Distribution and Allowances)

Light. Ground Mobility Division, 1st Battalion, 81st Armor Regiment, Fort Knox, Kentucky, Army Training and Doctrine Command.
Intermediate. Headquarters and Headquarters Company, 111th Military Intelligence Brigade, Fort Huachuca, Arizona, Army Training and Doctrine Command.
Heavy. 751st Military Intelligence Battalion, Camp Humphries, South Korea, Army Intelligence and Security Command.

Army Reserve

Light. 942d Transportation Company, North Charleston, South Carolina, Army Forces Command.
Intermediate. 425th Transportation Company, Salina, Kansas, Army Forces Command.
Heavy. Headquarters and Headquarters Company, 479th Engineer Battalion, Watertown, New York, Army Forces Command.

Army National Guard

Light. 210th Finance Battalion, Jackson, Mississippi, Mississippi Army National Guard.
Intermediate. 1086th Transportation Company, Jena, Louisiana, Louisiana Army National Guard.
Heavy. 527th Engineer Battalion, Ruston, Louisiana, Louisiana Army National Guard.

CODING SIMPLIFIES "GREEN" PURCHASES

Thanks to an initiative undertaken by military supply managers and the Defense Logistics Agency, the Department of Defense (DOD) has a new coding system for all Federal supplies that will make it easier for Government workers to purchase environment-friendly products.

All Federal agencies, as well as manufacturers, commercial producers, and a number of foreign governments, use the Federal Logistics Information System (FLIS) as a reference source. The FLIS is a computerized list of more than seven million supply items covering everything from office supplies to military hardware. In addition to tracking national stock numbers for Federal supply purchases, the FLIS offers guidance on acquiring, storing, distributing, transporting, using, and disposing of items used by the Government.

Supply managers will update the FLIS with codes that show which stock items meet or exceed environmental

guidelines set by organizations such as the Environmental Protection Agency and the Department of Energy. New environment-friendly product codes will be added to the list as they are developed and identified.

"This initiative will save the American taxpayers millions of dollars by encouraging DOD purchasers to buy products that are more energy efficient and environmentally sound," said Sherri Goodman, Deputy Under Secretary of Defense for Environmental Security. "It will encourage our people to make better use of environmentally oriented products, including recycled items and items able to be recycled."

Goodman explained that the DOD has a strong commitment to purchasing "green" products. She said, "With our large purchasing power, we can play an important role in helping create a bigger market for environmentally-oriented products."

More information on this effort can be found at the website for the Joint Group on Environmental Attributes at http://www.jgenvatt.dla.mil, or from the Defense Logistics Information Service website at http://www.dlis.dla.mil.

☐ Customers located 10 to 50 miles from the 98th Area Support Group self-service supply center (SSSC) in Wurzburg, Germany, now can call in an order to the SSSC and have it delivered within 24 hours. The SSSC began delivery service in July 1998 with delivery to three installations. The program now serves 650 delivery accounts with 642 line items and saves the Army $35,000 per month in personnel, vehicle maintenance, and fuel costs. Above, SSSC personnel load supplies for delivery to a customer.

LEADERSHIP MANUAL ISSUED

The new Field Manual (FM) 22–100, Army Leadership, provides an easy-to-understand framework for developing leadership built on Army values; places more emphasis on the total Army, including civilians; takes cultural diversity into consideration; and includes leadership at all levels.

The leadership manual was revised for the first time in almost a decade. It consolidates and supersedes doctrine found in the 1990 version of FM 22–100, Military Leadership; FM 22–101, Leadership Counseling; FM 22–102, Soldier Team Development; FM 22–103, Leadership and Command at Senior Levels; and DA Pam 600–80, Executive Leadership.

The pre-publication version of the manual is available on the World Wide Web at www.fm22-100.army.mil. The hard copy manuals will be distributed to units in August. For more information, contact the Center for Army Leadership by e-mail at fm22100@leav-emh1.army.mil.

LOG MANAGERS SET CONFERENCE DATE

The annual conference of the Council of Logistics Management (CLM) will be held 17 through 20 October at the Metro Toronto Convention Centre in Toronto, Ontario, Canada. The theme of this year's conference will be "Enhancing Global Relationships: Passport to the Future." Registration closes on 1 October. For more information, visit the CLM home page, http://www.clm1.org, or call (630) 574 0985.

TITANIUM STRENGTHENS TANK ARMOR

The Army has developed new protective armor for M1A2 Abrams tanks using titanium metal converted from the Defense National Stockpile Center's stock of titanium sponge. The titanium armor provides added ballistic protection while reducing the overall weight of the tank by 10 percent (or 5 to 6 tons). Possible titanium components include the turret blowoff plates, armor side skirts, parts of the commander's hatch, and the gunner's primary sight cover.

The titanium armor can be used not only on new equipment but also to upgrade current equipment. Resulting weight reductions will permit installation of new

equipment designed to improve soldier survivability and lethality.

Titanium is a strong, lightweight metal with high corrosion and erosion resistance. These factors, plus its availability from the Defense National Stockpile Center, make it a choice, affordable means of addressing equipment weight-reduction requirements.

Plans are currently underway to use titanium in other Army equipment such as M2/3 Bradley fighting vehicles, Stinger and Sidewinder missiles, and the new lightweight 155-millimeter field howitzer.

ELECTRONICS VANS UPGRADED

Sheet metal mechanics, electricians, and electronics technicians from Tobyhanna Army Depot, Pennsylvania, are modernizing 66 communications-electronics vans for units at Fort Carson, Colorado, and Fort Hood, Texas. Installing the $115,000 electronics kits in the vans will add 10 years to their life span.

Five-ton expandable vans are used as command and control centers, many of them by the 4th Infantry Division (Mechanized) at Fort Hood, the Army's first digitized division. Tobyhanna experts are removing all of the electronics equipment, racks, wiring, entry boxes, and electrical fixtures from the vans. They are installing a new power and signal entry with local area network capability, video interfaces, telephone and fiber optic/tactical fiber optic cable assemblies, new racks, map boards, antenna mounts, and workstations. A new AC power distribution box sends power to outlets, workstations, environmental control units, and lights. A DC power distribution box provides power to various radios. The floor is being reinforced, and a weapons rack is being added.

The upgrade kits were designed and fabricated at Tobyhanna. A five-member team of two electricians, two sheet metal mechanics, and one electronic technician installs the kits on site, a process that takes about 2 weeks.

CBC's SOLVE EQUIPMENT SECURITY PROBLEMS

The family of cargo bed covers (CBC's) offers an inexpensive, secure, and readily deployable solution to the transportability and equipment security problems on tactical vehicles. CBC's are lightweight, rigid, and easily mounted on tactical vehicles and trailers (see photo above right). They can be modified with electrical outlets to increase their utility. Previously, soldiers used standard bows and canvas or constructed makeshift plywood covers for storing equipment on vehicles and trailers. These structures offered no security and only limited protection from the elements. They often failed transportability standards and frequently were discarded before deployment.

The CBC-equipped vehicle conforms to all requirements for ground, air, and sea transportation. Covers will be available to fit the following vehicles and trailers—

- High-mobility, multipurpose, wheeled vehicle (HMMWV).
- 2½-ton M35A2 truck/light mobile tactical vehicle (LMTV) and LMTV trailer.
- 5-ton M923A2 truck/mobile tactical vehicle (MTV) and MTV trailer.
- 1½-ton M105A2 trailer.

The family of CBC's was developed by the Soldier Center of Excellence (formerly the Army Natick Research, Development, and Engineering Center) and managed by PM-Soldier Support in Natick, Massachusetts. For more information about CBC's, visit the Natick website at http://www-sscom.army.mil, or send e-mail to jdoucet@natick-emh2.army.mil.

FIBRIN BANDAGE COULD SAVE LIVES

Scientists of the Army Medical Research and Materiel Command and clinicians of the Army Medical Command, working with the American Red Cross, have developed a dry fibrin sealant bandage that could save lives by controlling bleeding on the battlefield.

The fibrin sealant is made from two proteins in human blood that aid in coagulation. The proteins are freeze-dried onto a 4-inch by 4-inch bandage with an absorbable backing. When applied with direct pressure, the freeze-dried protein material on the bandage is pressed into the wound, where it quickly dissolves and coagulates. The pressure slows bleeding, and the high concentration of the proteins clots the blood in approximately 1 minute.

Research shows that the bandage can reduce blood loss by 50 to 85 percent and prevent shock associated with battlefield injuries. In far-forward areas, the bandages can be applied to wounded soldiers either by medics or other soldiers, greatly increasing a casualty's chances for survival.

The Red Cross plans to conduct clinical tests on the new bandage and seek approval of its use from the Food and Drug Administration within the next 3 years.

NONDESTRUCTIVE TESTERS TO MEET

The 48th Defense Working Group on Nondestructive Testing (DWG–NDT) will be held at the Holiday Inn Hotel and Suites, Historic District, Alexandria, Virginia, from 1 to 4 November.

Engineers, scientists, technicians, and managers from all commands and U.S. Government activities who are responsible for developing or applying NDT methods in research, engineering, maintenance, and quality assurance will attend. The meeting is hosted alternately by the Army, Navy, Air Force, and Defense Logistics Agency. This year it is hosted by the Naval Surface Warfare Center, Indian Head Division, Indian Head, Maryland.

Those interested in presenting a problem or a technical paper at the conference may submit an abstract on line by visiting the DWG–NDT website, http://members.aol.com/dodndt/dodndt.html, by calling (301) 743–4152, or by sending e-mail to BurtchetteDE@ih.navy.mil).

ARMY DEVELOPS NEW BULLET

The Army has developed a new M16 round that has replaced the lead core with a tungsten and tin core. The new 5.56-millimeter bullets are ballistically and visually identical to the old ones, require no special handling, and have proven to be slightly more accurate than the lead rounds during testing.

The bullet was developed in an effort to reduce lead in the environment. With the new rounds, bullets fired on ranges will not contain lead that could leach into the soil. According to Jim Arnold, Chief of the Pollution Prevention and Environmental Technology Division at Aberdeen Proving Ground, Maryland, lead contamination is not currently a problem at outdoor military ranges. The Army is addressing the situation before it becomes a problem.

The first million rounds will be produced at Lake City Army Ammunition Plant, Missouri, and will be available for troop use soon after production. Once the 5.56-millimeter rounds prove successful in actual field use, researchers will begin work on 7.62-millimeter, 9-millimeter, and .50-caliber tungsten-tin rounds.

SYSTEMS

The information presented in Army Logistician's 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.army.mil or phone (804) 734–1207 or DSN 687–1207.*

MOVEMENT TRACKING SYSTEM PROTOTYPES SUCCEED IN REAL-WORLD MISSIONS

The shrugging of shoulders that sometimes accompanies the question, "Where's the truck?" has been replaced, in test units, by computer screens that plot truck locations on a digital map and allow movement controllers to redirect shipments. A truck driver doesn't have to ask "where am I?" In his cab, he plots his location on his laptop, which also allows him to communicate with movement control using the Movement Tracking System (MTS).

MTS is an adaptation of a commercial technology that will make make its transition into military operations with only minor technical modification. Coupled with emerging transportation and supply management systems, MTS will give managers near-real-time, in-transit visibility of vehicles and their cargoes.

MTS is not just for special cargoes. Beginning in the third quarter of 2000, this capability will be a regular part of how the Army manages transportation and its loads. The Army plans to announce the award of a $400-million contract to track its fleet of trucks globally using MTS. System prototypes have proven themselves already in exercises in Korea, at the National Training Center at Fort Irwin, California, and in III Corps at Fort Hood, Texas. In Europe, various versions of the MTS are on over 1,000 vehicles, providing information as they move from points of debarkation in Germany to their final destinations in Bosnia in support of Operation Joint Forge.

The need for MTS is based on evolution of warfighting doctrine that calls for increased maneuverability and enlargement of the battle area. These changes require situational awareness not only for combat leaders but also for those in support. The fielding of this new family of information technology devices will give users the ability to pinpoint the location of common-user logistics transports and transport watercraft, track their progress, and electronically communicate with them.

The expansion of the Force XXI corps battlespace (240 percent larger than the Army of Excellence) represents a dramatic increase in operating area and presents numerous challenges that outstrip the ability of current tactical communications. Overlaying the corps battlespace on American geography illustrates the challenge. Corps-level transporters will be responsible for delivering supplies and equipment in an area that would stretch from Baltimore, Maryland, to Roanoke, Virginia. Given this distance and the average speed of tactical vehicles on secondary roads, transit time could be as long as 23 hours. If we view Operation Desert Storm as an indicator of the velocity of war, we can see that a lot can happen in 23 hours. Trucks and their loads must be able to react on the move to support the developing battle. In addition to the expansion of the operating area, transporters also must contend with the reality of the asymmetrical, nonlinear battlefield, in which combat is encountered over the entire battlespace and not confined to the forward edge. To support operations in such an environment, a system is needed to provide continuous command and control for the transportation assets that provide support to warfighters and to coordinate force protection.

As its mission statement reads, MTS will support missions through the full spectrum of military operations from peacetime to war. It will provide commanders and managers with near-real-time data on the location and status of movements. The system will improve effectiveness and efficiency of limited distribution nodes, provide the ability to reroute supplies to higher priority needs, and inform operators of hazards and changes to unit locations.

MTS relies on satellite communications rather than cellular or tactical radios because of its large geographic operating area. Satellites serve two purposes. They provide location data using a global positioning system (GPS). Control stations and mobile units use a GPS and

digitized maps to show users the precise location of assets, hazards, and directions. Satellites also permit MTS operators at control stations and mobile units to exchange messages.

MTS consists of ruggedized laptop computers, subscriber controller hardware and antennas for communications, and a GPS. Satellite communications provided by commercial vendors must provide specific area coverage and data quality and meet response specifications.

Although MTS currently is a stand-alone system, interfaces are planned for the Transportation Coordinators Automated Information for Movements System II (TC AIMS II) and the Global Combat Support System-Army (GCSS-Army). MTS, coupled with radio frequency tags, will allow GCSS-Army and TC AIMS II to provide the virtual status of shipments, including manifests and document numbers. On the battlefield, this MTS/GCSS-Army/TC AIMS II information system will permit pinpoint distribution and redirection of materiel. At the strategic level, managers operating the Global Transportation Network, the Joint Total Asset Visibility system, and the Logistics Intelligence Data Base using data from GCSS-Army and TC AIMS II would be able to manage and direct resources down to the shipment level.

MTS prototypes operating in various environments and operations have demonstrated that a mature commercial technology can be adapted to military application. The challenge now is to train operators and managers and to employ the system on a global basis.

For more information, contact Jon Quinn, CASCOM MTS project officer, at (804) 734–2672 (DSN 687–2672), or send e-mail to quinnj@lee.army.mil.

LOGISTICS COMPUTER SUPPORT TRAINING OFFERED

Logistics computer support training is being offered at the Army National Guard Professional Education Center in Little Rock, Arkansas. The Combat Service Support Automation Management Office (CSSAMO) Course, as its name implies, is for personnel assigned to CSSAMO's in modification table of organization and equipment units or table of distribution and allowances-equivalent organizations.

The course provides systems maintainers hands-on training in the fundamentals of hardware and software troubleshooting, data recovery, and reloading of system software. It covers the legacy Standard Army Management Information Systems: Standard Property Book System-Redesign; Unit Level Logistics System (ULLS); ULLS-Ground, -Aviation, and -S4; Standard Army Retail Supply System (SARRS)–1; and Standard Army Maintenance System (SAMS). Core training includes an overview of all the systems, their operating environments (Windows and DOS), local area networks, and system communications in both tactical and garrison settings. SARSS training includes UNIX and Solaris web server instruction. Following the core training are 56 hours of system-specific troubleshooting instruction.

This course is being conducted by Logistics Management Resources (LMR), Inc., of Prince George, Virginia. Development of the course was a cooperative effort among the Army Combined Arms Support Command, Army National Guard, Army Reserve, Army Forces Command, and U.S. Army, Pacific. LMR conducted similar training last year for U.S. Army, Europe.

Personnel in the logistics information support field who wish to take this course should contact the logistics headquarters on their installation to schedule training. Army Reserve personnel should contact the Deputy Chief of Staff for Logistics in their regional support commands, and Army National Guard personnel should contact the director of logistics at their respective state area commands.

AMC TO OUTSOURCE MANAGEMENT INFORMATION SYSTEMS

The Army Materiel Command (AMC) will contract operation and maintenance of two of its major wholesale information management systems under a program known as the Wholesale Logistics Modernization Program (WLMP), or LOGMOD. Affected are the Commodity Command Standard System (CCSS) and the Standard Depot System (SDS). CCSS performs wholesale asset management, requirements determination, financial management, and life cycle support functions at the national level. SDS automates depot functions such as depot maintenance, ammunition management, transportation, and internal depot support. A request for proposals was released in April 1999, and a source selection board convened from late June through August 1999. Board results and an award of contract are expected by the second quarter of fiscal year 2000. AMC's Army Communications and Electronics Command (CECOM) is the executive agent for LOGMOD. For more information, contact the CASCOM LOGMOD action officer, Greg Kropp, at (804) 734–0288, or send e-mail to kroppg@lee.army.mil.

DEPARTMENT OF THE ARMY
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6 May 1999

Supply and Maintenance Division

Editor
Army Logistician, ALMC
2401 Quarters Road
Ft. Lee, VA 23801-1705

Dear Editor:

I am writing in reference to the article on page 18 in the May-June issue of ALOG, "Combat Service Support—Rising to the Challenge of Shrinking Resources." The article detailed how the Equipment Support Center, Mannheim (ESCM), 51st Maintenance Battalion, in USAREUR has adapted to shrinking resources and an evolving mission while still delivering quality service by adopting the inspect and repair only as necessary (IRON) concept. While the article was well written and certainly highlighted significant accomplishments, I feel that I must take this opportunity to comment on the future direction of Army maintenance policy.

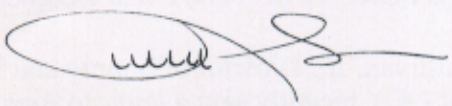
Under the Single Stock Fund and National Maintenance Programs, the focus for national level maintenance is to support the process of repair and return to stock. This national maintenance mission, coupled with a realization that the Army is experiencing declining mean time between maintenance actions for items ordered from stock, due to items being repaired and returned to stock to differing maintenance standards, has led the Army to establish a single quality standard for items repaired and returned to stock. The single quality standard for all items repaired and returned to stock will be overhaul, regardless of the maintenance activity performing the maintenance action. Overhaul is defined as maintenance that restores equipment or components to the equivalent useful life of a newly acquired item. This process involves inspection and diagnosis according to the depot maintenance work requirement (DMWR) or similar technical documentation that identifies all components exhibiting wear or age and directs the replacement or adjustment of those items to original equipment specifications.

With the establishment of one quality repair standard—overhaul—reliability will increase, thereby reducing the number of maintenance actions required. Individual repair costs may go up, but overall operating and support costs will be reduced because the number of repair actions will be drastically reduced.

Under this policy change, IRON will no longer be an acceptable concept of maintenance for items repaired and returned to stock. The intent of this change in policy is to ensure that when a field unit pays full AMDF price for an item, regardless of the source of repair, they will receive a part that is repaired to the same quality standard and has a "like new" expected service life.

This policy change is incorporated into the latest version of AR 750-1, which is due for publication and distribution in the first quarter of FY 00.

Sincerely,



Julian A. Sullivan, Jr.
Major General, U.S. Army
Director of Supply and
Maintenance

A Logistics-Focused NTC Rotation

by Major Eric E. Smith

Force XXI combat service support concepts and unit redesigns recently received a realistic evaluation at the National Training Center.

The Army's combat service support (CSS) community recently made significant progress in evaluating its emerging Force XXI CSS doctrine and division support command (DISCOM) redesign during an exercise at the National Training Center (NTC) at Fort Irwin, California. The exercise, NTC 99-05, was designed to challenge and stress the Force XXI CSS units while they supported a heavy/light maneuver force in conflict with the NTC's Krasnovian Army.

So what was so different about this rotation? To answer that question, you have to understand that most unit redesigns are tested and evaluated in simulations, where the resolution of issues facing lower-echelon units is vague and logistics dilemmas often are "magically" repaired by exercise gurus who have access to large piles of cached supplies. By contrast, the NTC subjects units to a stressful and realistic scenario that challenges leaders at all echelons to think through a multitude of problems, and resupply does not magically "happen" at the NTC. NTC 99-05, unlike other NTC rotations, focused on the logistics issues affecting Force XXI.

Previous Force XXI Exercises

In March 1997, the Army conducted an event similar to NTC 99-05: an advanced warfighting experiment (AWE) at the NTC featuring a brigade task force reconfigured and equipped with Force XXI's futuristic technologies. That rotation demonstrated the capabilities of many new warfighting systems and the tremendous potential offered by using advanced technologies to support battlefield tactical operations. But while the rotation showed a great deal of promise for the military as a whole, the performance of the CSS units was rather bland and inconclusive.

The Army next conducted the follow-on phase of Force XXI development, the Division AWE, which focused on division-level operations on a futuristic, computerized simulation battlefield.

An NTC Rotation Focused on Logistics

After the task force and division AWE's, the Army's Combined Arms Support Command (CASCOM), at Fort Lee, Virginia, and the 4th Infantry Division (Mechanized), headquartered at Fort Hood, Texas, determined that there were several issues affecting the new designs that had to be resolved before they would be ready for fielding in 2000. In response, the 4th Infantry Division's commander, Major General Scott Wallace, donated one of his NTC rotations to assist the CSS community in improving the Force XXI CSS design. Thus was born NTC 99-05, the Logistics-Focused NTC Rotation.

The 4th Infantry Division requested that CASCOM assist in conducting the rotation, and the CASCOM commanding general, Major General Daniel Brown, began allocating resources to make the exercise a success. CASCOM provided support in three areas: defining Force XXI CSS concepts; providing subject-matter experts to observe the rotation; and coordinating for the

availability of materiel enabling systems and monitoring their performance. To assist in this effort, CASCOM solicited the expertise of the Army Training and Doctrine Command Analysis Center at Fort Lee and the Operational Test and Evaluation Command, Alexandria, Virginia.

NTC 99-05's main participant was the 1st Brigade Combat Team (BCT) of the 4th Infantry Division. The 1st BCT's subordinate units included three heavy ground battalions (two armor and one mechanized infantry), a light infantry battalion [from the 25th Infantry Division (Light), headquartered at Schofield Barracks, Hawaii], an engineer battalion, an artillery battalion, a utility helicopter battalion, a forward support battalion (FSB), and representative slices of the division base. The division also deployed parts of its DISCOM sustainment cell and division and aviation support battalions. The 164th Corps Support Group (U.S. Army Reserve) provided echelons-above-division support. The CSS focal point of the rotation was the FSB, which was reorganized with a base support company, supporting units located in the brigade rear area; three forward support companies (FSC's), each supporting a ground maneuver task force; a forward support medical company; and a headquarters and headquarters company.

Objectives and Definitions of Success

In preparing for NTC 99-05, the 4th Infantry Division developed specific CSS objectives and definitions of success for an FSB supporting a BCT. The CSS objectives for the rotation were to—

- Refine and mature CSS support concepts.
- Exercise limited enabling and experimental systems.
- Exercise distribution management and gain insights on a distribution-based logistics system.
- Exercise force protection over extended lines of communication.
- Refine the areas of operation and the boundaries of the 1st BCT and the 4th Infantry Division.
- Exercise the Army Battle Command System (operating without the Force XXI Battle Command Brigade and Below [FBCB2] system).
- Develop and exercise tactics, techniques, and procedures for contractors on the battlefield.
- Provide an opportunity for documenting requirements for the changes in the training base.

The 4th FSB's definitions for a successful rotation were to—

- Ensure that the 1st BCT has sufficient combat power to cross the line of departure as required by NTC guidelines.
- Ensure that the 4th FSB maintains sufficient CSS combat power to sustain the 1st BCT until the end of the mission.
- Ensure that CSS units maintain a high degree of survivability until EOM.

CASCOM's Mission

In addition to producing definitions of concepts and enablers, CASCOM assisted the 4th Infantry Division and the NTC in developing and executing the rotation's tactical scenario. Before the rotation, CASCOM developed 16 CSS vignettes, or dilemmas, designed to set the stage for specific events during the rotation. The division used the vignettes to produce the rotation scenario, while NTC used them during the rotation to inject difficult situations to which the division's leaders would have to respond.

To support its subject-matter experts in observing and collecting data during the rotation, CASCOM developed a data collection and management plan. The process began by defining 22 CSS concepts and developing evaluation questions for each. The final product consisted of 321 questions that addressed the functioning of Force XXI CSS concepts, 8 materiel enabling systems, and 5 experimental systems.

Overall Comments on the Rotation

The exercise was very successful in assessing the Force XXI CSS concepts "in the dirt." Some of the findings confirmed pre-rotation intuitive thoughts, but they also demonstrated that there is still work to be done. The rotation definitely has caused my colleagues at CASCOM and me to focus our attention on specific areas. Some general thoughts about the exercise include the following—

- Through this exercise, we began to see the power of situational awareness and the ability of the enabling systems to increase combat power.
- We saw the potential of the Force XXI CSS concepts to maximize limited resources.
- The exercise demonstrated the need to field all of the enabling systems.
- We observed that some refinements are needed to tactics, techniques, and procedures, field manuals, and standing operating procedures, especially in the areas of direct support relationships, movement control, and security.
- The base support company, engineer maintenance support, and FSC support operations officer position still need some redesign work.

Initial Insights

At the conclusion of the exercise, we developed the following conclusions and insights. Our final report will contain more detailed findings and conclusions.

Forward support company. All commanders (both

combat and CSS) agree that the FSC is a responsive and extremely useful organization. Unity of command exists under the Force XXI CSS force structure, but only if the FSC remains under the control of the FSB.

Each FSC needs a support operations officer and section.

Maintenance. The forward repair system-heavy (FRS–H) and the Electronic Tech Manual-Interface (ETM–I) enhance the combat repair team's ability to build and sustain combat power forward on the battlefield. By combining organizational and direct support maintenance, supported by outstanding performances by enabling and experimental systems (FRS–H and ETM–I), the BCT maintained an average operational readiness rate and combat power rates consistent with the last 15 rotations at the NTC. The BCT always crossed the line of departure above the minimum readiness rate required by the NTC.

Force XXI combat repair teams possess a tremendous advantage over the Army of Excellence maintenance support teams because of their organic command and control elements. They are effective in combined organizational and direct support maintenance in reducing not-mission-capable times for combat systems. Combat repair teams demonstrated the capability to execute the concept of replace forward/repair rear. The combat repair teams also repaired systems in forward areas when repair parts were available. The personnel and military occupational specialty structure in the combat repair teams appears to need work to meet unit requirements; we need to verify the numbers of organizational versus direct support mechanics.

Doctrine. Currently, the draft Force XXI manuals need further refinement to execute the new force design adequately. Lessons learned from this rotation and the associated train-up will assist in this effort.

To provide responsive support to the engineer battalion, brigade reconnaissance troop, and brigade headquarters and headquarters company, the 4th Infantry Division recommended placing a support area forward on the battlefield. This concept, called the brigade forward support area, should be reviewed for possible refinement to provide more responsive support to forward units.

Enabling and experimental systems. The palletized loading system (PLS) and load handling system (LHS) greatly reduce the need for load handling and materials-handling equipment and further increase the speed at which sustainment flows through the distribution pipeline.

The mobile expandable container system facilitates the rapid establishment of repair parts supply operations by providing an expandable shelter that can be set up and torn down while being transported by the PLS/LHS.

The ETM–I reduces the time needed to transmit preventive maintenance checks and services (PMCS) data and increases the accuracy rates of the PMCS data being entered into the Unit Level Logistics System (ULLS).

The armored medical evacuation vehicle (AMEV) proved to be an effective platform for the BCT commander to use when evacuating casualties. The AMEV uses a Bradley fighting vehicle chassis and is a tremendous improvement over the M113 armored personnel carrier chassis ambulance.

The Combat Service Support Control System (CSSCS) demonstrated its potential to serve as a decision support tool for CSS commanders and logistics planners. A common operating picture is critical to the success of Force XXI CSS. During the rotation, CSSCS received feeds from two Standard Army Management Information Systems (STAMIS's), the Standard Army Maintenance System (SAMS) and the Standard Army Retail Supply System (SARSS). However, a lack of feeds from the FBCB2 system resulted in a reduced common operating picture because unit data and information were input manually. This made anticipatory logistics and the surging of logistics support very difficult.

Continuing Force XXI Actions

As the results of NTC Rotation 99-05 are studied and changes considered and implemented, the Force XXI CSS development process will continue. There will be modifications to selected structure designs, such as the base support company and the engineer support platoon, and there will be significant improvements to the 63-series field manuals for DISCOM subordinate units. The 4th Infantry Division will complete its conversion to the Force XXI design in fiscal year 2000. The division then will participate in a capstone exercise in fiscal year 2001. Finally, the 1st Cavalry Division, at Fort Hood, is scheduled to convert to Force XXI in fiscal year 2002, followed by III Corps in fiscal year 2004.

The Logistics-Focused NTC Rotation represents one more step forward in the process of developing, evaluating, and refining Force XXI CSS doctrine and structures. Its results offer encouragement that the Army envisioned in Force XXI will indeed have the support needed to ensure dominance on the battlefield. **ALOG**

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More Tooth, Less Tail: Contractors in Bosnia

by Colonel Herman T. Palmer

The Army's experience in Bosnia offers a preview of how important contractors will be in future deployments.

On 18 September 1997, elements of the U.S. Army comprising Task Force Eagle were directed by the commander of NATO's Stabilization Force (SFOR) in Bosnia-Herzegovina to seize and maintain control of the transmission tower on Mount Zep, in the Multinational Division (North) sector of Bosnia. The tower was part of a media network that transmitted continuous, inflammatory anti-SFOR messages to the public. Because it served as a powerful means of inciting the Bosnian people in contravention of the General Framework Agreement for Peace (the Dayton Accords), the tower had to be silenced until it ceased hostile broadcasts.

The U.S. soldiers, after careful planning and swift execution, took the hilltop tower without resistance and immediately began securing it. Within 30 minutes after the last infantryman dismounted his vehicle and took up a hasty defensive position, an M1074 palletized loading system (PLS), bearing a contingency package of sandbags, plywood, barbed wire, and pickets, roared to a stop on the hilltop. The troops were surprised at its arrival, and even more surprised when a civilian jumped from the vehicle and began preparing to drop its cargo.

The truck was there with needed supplies almost before the soldiers realized that supplies were needed. Logistics planners working behind the scenes had anticipated requirements, identified sources of supply, and determined means of delivery. Plans already had been laid for contractor-supported living quarters, showers, latrines, and, most importantly, hot food for deserving soldiers. Within weeks, Mount Zep was transformed into a small American base camp, with most of the amenities found at other base camps in the U.S. sector of Bosnia. That first civilian, operating Army equipment and following the combat elements by no more than half an hour, exemplified the successes the Army experienced with contractors as a force multiplier in its peace enforcement operations in Bosnia.

Contractor Support in a Mature Theater

When elements of the 1st Armored Division first crossed the Sava River from Croatia into Bosnia as part of the U.S. contribution to Operation Joint Endeavor, Task Force Eagle looked much different than it did nearly 2 years later, when elements of the same division occupied Mount Zep. Initially, the division deployed with nearly its entire division support command. The whole division was trained, organized, equipped, and fully pre-

☐ Contractors capably augmented Army transportation elements with vehicles such as this civilian truck, which was modified to accept a flatrack from a palletized loading system.

pared to enter the controversial Balkan operational environment. Indeed, a gunfight was expected—and U.S. Army elements were ready to deal with any belligerents with decisive force. At that time, there was little concern with logistics support provided by contractors on this potentially high-intensity-conflict battlefield. Contractors were relegated to safe havens in Hungary and Croatia, where they set about serving hot meals to transient soldiers and providing other services vital to the well-being of an Army in transit.

The theater matured slowly through Operations Joint Endeavor, Joint Guard, and, most recently, Joint Forge. As this occurred, political and military decisions were made that permitted the Army to reduce its footprint in the Balkans and, by necessity, the size of its combat service support (CSS) force. While these reductions in the force structure were planned, functions that potentially could be performed by civilian contractors were identified and studied for transfer.

However, reductions in committed troops were not the only reason that led U.S. planners to consider expanding the support provided by civilian contractors. As the theater matured and freedom of movement over the inland lines of communication increased, the number of serious incidents declined and signs of lawlessness became less visible. As it became clear that contractors could operate in what had been a war-torn country in a generally safe and effective manner, with minimal need for soldiers to provide force protection, their expanded use became more plausible.

Multifaceted Contractor Support

For soldiers familiar with the Bosnian area of operations, the name "Brown & Root Services Corporation" (BRSC) became synonymous with "contractor support." Elements from BRSC operated dining facilities at numerous U.S. base camps and provided much-needed bulk potable water, laundry service, bulk class III (petroleum, oils, and lubricants) storage, and limited support in other areas from late 1995 to 1998.

As the United States prepared to enter Operation Joint Forge with a reduced force structure, BRSC was solicited to expand its services into other, less traditional areas of support. The Task Force Support Command had been "rounded out" since October 1997 with a reserve component truck company equipped with PLS's from Army war reserve stocks in Germany. A cost analysis determined that it could be cheaper to replace the transportation and distribution support provided by that truck company with contractor assets. After considerable review, funding was secured, and the entire mission of the truck company was absorbed into the BRSC contract. U.S. civilian drivers hired by BRSC assumed the transportation and distribution functions throughout the U.S. sector.

BRSC also performed other functions at the request of the Army. Nearly 2 full years after it deployed, Task Force Eagle sought ways of replacing low-density water purification specialists so they could return to their home stations and rejoin their parent organizations. BRSC again seemed like the best alternative, so it was solicited to provide trained operators and maintenance specialists; these personnel would supply soldiers with clean water using water purification units provided by the Army. BRSC began operating the Army's only remaining water purification point in Bosnia late in May 1998.

This movement toward greater contractor support permitted the number of deployed CSS soldiers to be reduced and allowed the operational commander greater latitude in designing his force. Indeed, the combination of increasing levels of contractor support and smaller numbers of "green suit" logisticians produced a lot more "tooth" and less "tail" than would have been possible otherwise.

More Than One Contractor

Soldiers who deployed to the Balkans as part of Task Force Eagle will always remember the seemingly omnipresent BRSC. But BRSC was by no means the only contractor present throughout this period. Other contractors, such as Lockheed-Martin and United Defense, provided valuable maintenance support for ground vehicles. Others, such as Raytheon and Bell, supported critical aviation assets. Still others, such as AT&T and Sprint, provided valuable support for communications systems. The intelligence community relied upon contractors such as Mantech and GTE for reliable sustainment support of their systems. The majority of interpreters used in Task Force Eagle were employees of BDM International, Inc.

A Croatian contractor, INA, ultimately received the mission of delivering fuel directly to three major U.S. base camps, which reduced the requirement for soldiers with tactical fuel tankers. This service was further expanded to include direct delivery of fuel to U.S.-run aviation and tank-and-artillery ranges at locations more than an 8-hour drive from other U.S. base camps.

Another Croatian contractor, ESKO, delivered class A rations directly to dining facilities at U.S. base camps. Bread and doughnuts were obtained from local contract bakers. All in all, there were no less than 52 separate contractors providing support in one form or another to U.S. forces at the time of transition from Operation Joint Guard to Operation Joint Forge.

Of particular significance was the major role contractor personnel played in the major base camp upgrades undertaken during the summer and fall of 1998. A comprehensive, aggressive program to get soldiers out of canvas tents and into sturdier facilities was combined

☐ A soldier clears a living area at Comanche Base in August 1998. The contractor role in such construction projects increased as the theater infrastructure matured.

with an initiative to close base camps and consolidate forces at centrally located, operationally important sites. The available construction work force of BRSC, with its special skills, was combined with Army corps and divisional engineers and elements from a Naval mobile construction battalion ("Seabees"). This unique blend of vertical and horizontal construction capabilities allowed Task Force Eagle to undertake more than 100 complex construction projects that would have required many more military personnel if attempted by military engineers alone.

Advantages of Contractor Logistics Support

Some of the advantages of contractor support are clearly evident. Soldiers who otherwise would be engaged in performing important support missions can be freed immediately for redeployment or for assignment to other missions at other locations. Often, using civilian contractors can be less expensive in the long run than using soldiers, especially when the training and deployment costs of soldiers are considered. Civilian contractors can be used to provide support capabilities that are in short supply in the active and reserve components, thus reducing the frequency and duration of deployments for soldiers with low-density, high-demand technical skills.

Several studies were conducted to quantify and qualify the capabilities that civilian contractors brought to Task Force Eagle, in terms of the numbers of soldiers displaced through the use of contractor logistics support. One such study concluded that, to replace BRSC alone (not considering any other contractors), the Army would have needed approximately the equivalent of a reinforced corps support group and two engineer battalions capable of vertical and horizontal construction. Each deployed soldier, of course, requires food, water, living accommodations, medical support, postal service, and all the other "support" services that soldiers deserve and have come to expect. So support soldiers themselves become consumers of resources and generate additional requirements for even more support soldiers.

Other advantages of using contractors in peace enforcement operations are not quite so evident to the soldiers being supported. When local civilians are hired, contractor support becomes a vehicle for putting hard-pressed local nationals back to work in a depressed economy. Vital skills, perhaps missing for a generation, can be taught to young people and thus infused into a suffering society. Finally, the goods and services procured by the Army from contractors can have a positive effect on rejuvenating a country's domestic production and transportation infrastructure. The use of contract labor in support of the peace enforcement mission in Bosnia had a definite economic impact on the region secured by U.S. forces and supported a basic pillar in the commanding general's strategic campaign plan.

In addition to the socioeconomic benefits for the local population, contractor support often can be faster, cheaper, and more efficient than using "green suit" assets. In the case of the reserve component truck company, distribution operations provided by a contractor using Government-furnished equipment proved to be considerably less expensive when the deployment and redeployment costs for the reserve component replacement unit were taken into consideration. In terms of efficiency and expense, local national contractors (who

are generally responsible for their own life support) are considerably less expensive than their U.S. soldier counterparts. Additionally, civilian contractors do not require the same levels of mail support, off-the-job medical care, and other support afforded to their soldier, sailor, airman, and marine counterparts.

On the Down Side

Civilian contractors, regardless of their utility, are not totally interchangeable with their well-trained military counterparts. Contractors do not travel with their own gun trucks. In times of heightened force-protection levels, for example, contractors servicing base camps and traveling daily distribution routes required armed military escorts throughout the divisional area. Allotting soldiers to these force-protection missions required a significant amount of staff coordination and synchronization time and the dedication of nearly two infantry companies on a daily basis.

Of particular relevance to the mission in Bosnia was the sensitivity of using local national employees of one ethnic background in territory inhabited by members of another ethnic group. Care routinely was exercised to avoid exposing any members of the three formerly warring factions (Serbs, Bosnians, and Croats) to unnecessary danger in the ethnically divided divisional area of operations. Conversely, both Serbs and Bosnians demonstrated that they were fully capable of working with each other on at least one U.S. base camp, where they jointly performed service and maintenance functions under their U.S.-based employer.

Using Contractors in the Future

As any theater matures, decisions that facilitate the introduction of contractor logistics support must be made early. Matrices should be built early when designing the concept of support for contingency-based peace enforcement missions. These matrices should answer such questions as: When is it safe to introduce contractor support? When will the requirements of the supported unit commander exceed organic CSS capabilities and require augmentation from contractor logistics support? When will the sociopolitical climate allow the introduction of contractors? How can the "triggers" be identified that will lead to a recommendation to introduce contractor support? On what evidence will these recommendations be based? What is the collection plan for this evidence so that solid recommendations can be made? When should organic CSS assets be redeployed after civilian contractors displace them? Clearly, every operation in every theater will be different. The opportunities for economies of scale to be gained by contracting some CSS functions will differ, as will the skills and competence that various contractors can bring to the operation.

Every soldier-logistician knows that contractors will be present to some degree on every future battlefield. As areas of operation become more mature and increasingly stable, opportunities to transfer functions to contractors increase. However, the capabilities and limitations of possible contractor support must be understood, as well as how to protect these vulnerable assets in all conditions. Only by refining existing doctrine and exposing soldier-logisticians to that doctrine early in the officer and noncommissioned officer education processes can they fully understand the unique contributions that can be made by judiciously using contractors in some functional areas. In general, the pervasive use of civilian contractors in contingency operations has not been reflected in revisions of Army logistics doctrine or in the Army education system.

☐ This forklift operator was one of the contractor personnel helping soldiers at the division's supply support activity at Eagle Base in Bosnia.

The logistics support provided by a diverse set of contractors was a significant combat multiplier for the operational commander on the ground in Bosnia. The use of dozens of different U.S. and local contractors in a wide variety of functional areas undeniably provided more "tooth" and less "tail" in a difficult and often dangerous environment. The Task Force Eagle use of contractor logistics support will serve as a model for study by soldier-logisticians far into the future. **ALOG**

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ISM in the Army Reserve

by Major Sandra J. Raveling

The U.S. Army Reserve Command (USARC) has worked very hard to establish a training program for its ordnance military occupational specialties (MOS's). All maintenance companies in the Army Reserve rotate for training to Camp Dodge, Iowa, and the National Training Center (NTC) at Fort Irwin, California. Sometimes they gain training through overseas missions or training at their home stations. This cycle does not include the many diverse maintenance support missions the units are involved in throughout the year. For example, maintenance companies regularly participate in exercises such as POLEX (a petroleum transportation field exercise) and Roving Sands (a joint air defense training exercise) and rotate to the Joint Readiness Training Center at Fort Polk, Louisiana.

Two of the five maintenance battalions in the Army Reserve, the 521st Maintenance Battalion at Fort McCoy, Wisconsin, and the 387th Maintenance Battalion at Fort Hunter Liggett, California, are implementing a maintenance training program called Operation Platinum Wrench (OPW). OPW is a 2- to 4-month program that integrates the operations of direct support (DS), general support (GS), and service (also known as collection and classification) companies under a unified training program. The concept, which was introduced in 1997 at Fort McCoy, uses USAR soldiers and facilities to support USAR installations and to rebuild and overhaul USAR equipment, thus saving limited USAR funds.

Integrated Sustainment Maintenance

OPW focuses on developing a model USAR integrated sustainment maintenance (ISM) annual training operation. Sustainment maintenance includes all maintenance performed above the DS level, including GS, depot, and contractor maintenance. Under ISM, basic requirements are defined to ensure that sustainment maintenance is conducted as efficiently as possible in support of current Army missions. The efforts of all sustainment maintenance repair facilities are coordinated by a single, stratified management structure. The Army implemented the ISM 4 years ago after testing proved its effectiveness.

Technical Maintenance

OPW also focuses on the technical maintenance mission. Soldiers receive sustainment training in their MOS's, which results in a better trained force and helps retain soldiers in the Army Reserve. With OPW comes a new challenge to the Army Reserve to maintain the high level of credibility and standards that were ingrained in the soldiers when they originally trained at Camp Dodge. OPW currently is in its infancy, so many issues and concerns are being worked out to maintain the high level of training that the Army Reserve requires and demands. Soldiers will be required to implement production and unit goals, a process most soldiers become familiar with when they rotate to Camp Dodge or NTC. There they also learn to complete reports such as daily updates on work orders, parts, and man-hours using the Standard Army Maintenance System-Level 1 (SAMS–1).

USARC is coordinating various DS- and GS-level work orders during annual training cycles. Presently, DS-level mechanics rotating to Fort Hunter Liggett can expect to work on 3-kilowatt generator sets, gas-to-diesel conversion, and conversion of the M101A2 trailer to the M101A3. The DS mechanics also will support the equipment concentration site at Fort Hunter Liggett. The 63d Regional Support Command has relocated some of its mechanics to Fort Hunter Liggett to provide maintenance support. The DS mechanics also will provide area recovery support to the installation. There also is a collection and classification mission at Fort Hunter Liggett, and controlled cannibalization of equipment is implemented there during annual training.

The 387th and 521st Maintenance Battalions together

In an annual program called "Operation Platinum Wrench," soldiers are trained to perform integrated sustainment maintenance above the direct support level.

held an initial planning conference at Los Alamitos, California, last November. All 11 customer units were represented, and selected representatives from Fifth Army, USARC, various regional support commands, and battalion staffs also were present. The OPW mission involves 6 of the 10 regional support commands.

OPW Implementation

The 387th Maintenance Battalion rotated to Fort Hunter Liggett for OPW in June and July. The 387th Maintenance Battalion is scheduled to head up the OPW mission at Fort Hunter Liggett for the next 3 years. The Fort McCoy OPW mission began in May and continues through August. Currently, OPW is being implemented only at Fort McCoy and Fort Hunter Liggett, but USARC plans to establish a similar program at Fort Dix, New Jersey, in the next few years. Because OPW is a unique program in the Army Reserve, it is sure to grow even more in the next few years.

During training year 1999, 11 maintenance companies will participate in OPW. The 521st Maintenance Battalion will have eight companies assigned to it this year. In addition, the 521st will integrate a German Army Reserve unit into OPW. The 387th Maintenance Battalion, under the 63d Regional Support Command, will host three maintenance companies at Fort Hunter Liggett. Each company will send only a slice of its unit to participate in OPW.

The 521st Maintenance Battalion is hosting units assigned to the 88th, 90th, 94th, and 99th Regional Support Commands at Fort McCoy, Wisconsin, in 1999. The 387th Maintenance Battalion is hosting units assigned to the 223d and 271st Maintenance Companies (DS) and the 850th Service Company (Collection and Classification). This type of cooperation between maintenance units helps to build communications in the maintenance career field and assists the maintenance battalions by providing better quality training programs in the Army Reserve.

The maintenance companies participating in OPW in 1999 also will rotate to their primary annual training events, such as Exercise Roving Sands or an NTC rotation. Company commanders, who are responsible for all routine missions, must make sure their soldiers are placed in annual training slots that benefit the unit as well as the soldiers.

Benefits of OPW

As OPW is implemented, the readiness of maintenance battalions will improve. This new concept eventually will evolve into year-round training for soldiers in the maintenance career field. In addition, Reserve soldiers are fixing USAR equipment during annual training and during weekends of inactive duty training, which results in a substantial saving to the Government and the USAR.

In the future, it is hoped that all five maintenance battalions will be allowed to meet at an annual conference to coordinate with USARC on training opportunities for soldiers in the maintenance career field. In addition, such a conference would allow the maintenance battalions to share experiences and programs that have had excellent results. This type of partnership among maintenance battalions only can benefit the Army Reserve, especially at this time when we are doing more with less. One thing is for certain: the future looks challenging and rewarding for maintenance battalions. **ALOG**

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Joint Training: Reserve Components In the Bay Area

by Colonel Gary C. Howard, USAR, and Major Gregory K. Johnson, USAR

It isn't new math, but reservists in the San Francisco Bay Area have found that one plus one equals three. Reserve component soldiers, sailors, marines, airmen, and coast guardsmen there have discovered a secret weapon in joint training.

The San Francisco Bay Area is particularly rich in Army Reserve transportation assets. With its mission of providing terminal operations in the theater, our former unit, the 483d Transportation Battalion (Terminal) in Oakland, enjoys a wealth of functionally related subordinate units, including a heavy boat company (equipped with eight landing craft, utility [LCU]-2000-class vessels), a cargo transfer company, a port construction engineer company, and a movement control team. Its peacetime higher headquarters is a terminal transportation brigade, which is a Military Traffic Management Command-affiliated unit. In addition, a medium truck company is within an easy 2-hour drive.

> While we must "train the way we fight," both fighting and training will be joint in the next century. The Army learned long ago that tough training up front means readiness and saving lives in the long run. This basic truth applies to joint forces as well. A force of such diverse capabilities and complexity will necessitate rigorous experimentation and training to meet the demands of team cohesion, high operational tempo, and operational agility.
>
> —General Dennis J. Reimer
> Chief of Staff of the Army

Region Is Rich in Military Resources

The Bay Area also has other transportation resources, including units from the other services. The Naval Reserve has a cargo-handling battalion, a battalion of ammunition stevedores, and members of the Office of Control of Naval Shipping and the Military Sealift Command. The Coast Guard and Naval Reserve combine to provide a coastal harbor defense group. The Marine Corps Reserve is represented by two companies of a landing support battalion. The Air Force Reserve has an airlift control team at nearby Travis Air Force Base. In addition, the Bay Area has excellent natural harbors, outstanding port facilities, and a large population base. This concentration of functionally related units, military personnel, and equipment, in combination with other local resources, creates outstanding training opportunities.

Joint Training Reflects Reality

The practical reasons for working together are obvious. Reserve component units rarely have all of the resources they need for training. By combining units, equipment, and other resources, they can achieve a critical mass for training. More realistic training improves soldier skills. All personnel involved gain striking psychological and morale benefits from the training. As the units work together, soldiers gain a sense of pride in their ability to contribute to the greater effort. Each unit's mission takes on a new sense of importance when placed in a larger context. Soldiers can see how the whole system works. All of this can be achieved with essentially no added expense.

There are other good reasons for joint training. Our National Military Strategy now relies heavily on the reserve components. In fact, the Army no longer can go to war without calling on the reserve components. The Army Reserve's combat service support core competencies are even more important in operations other than war. The downsizing of military forces and the increasingly diverse nature of contemporary military missions also encourage the joint deployment of U.S. forces. Joint operations offer many more opportunities to build a task-oriented force of just the desired mix.

Training Together Improves Readiness

Joint training allows reserve component units to make the most of available resources. In our case, by pooling the resources found in the Bay Area, we were able to look for natural synergies that enhanced the quality of

training. Each unit has soldiers, expertise, and equipment that complement those of other units. For example, the heavy boat company has LCU-2000-class watercraft, the cargo transfer company has materials-handling equipment, and the terminal transportation brigade has cargo documentation capabilities. These combine well with the Naval Reserve cargo-handling battalion's ready access to Haugland cranes on the Maritime Administration's Ready Reserve Force ships lay-berthed at Oakland. The coastal defense teams add another facet to exercises, and the Marines are involved in many capacities.

The result can be measured in enhanced readiness. At its most basic, readiness in the reserve components consists of attracting and retaining trained soldiers. Drill attendance and unit status report (USR) personnel ratings are the most visible manifestations of readiness in reserve component units. The key factors that impact personnel readiness (such as recruiting, retention, and drill attendance) are all direct functions of the quality of the training. Weekend drill training—the training that a reserve component soldier receives every month—is the single most crucial element of a total training strategy. Training together means better training.

Unit Benefits From Joint Training

The result in our case was a series of outstanding joint training opportunities. These opportunities allowed us to leverage the resources of each unit, thereby improving mission-essential task list (METL) training for all. For example, in February 1997 our battalion conducted an instream cargo-discharge exercise in which the Naval Reserve cargo-handling battalion lifted our battalion's vehicles from a Maritime Administration ship and then lifted them into and out of Army watercraft. In February 1998, our battalion conducted a joint transportation exercise involving units from the Naval Reserve, Marine Corps Reserve, and Coast Guard Reserve. All of our battalion's units are members of the Air Force Reserve's Affiliation Training Program and have completed training in airloading and planning. During a Wartrace command post exercise, Naval Reserve and Coast Guard Reserve representatives acted as watch officers. In return, members of our battalion have participated in exercises conducted by the other services. The battalion has sponsored two significant transportation conferences in 2 years (a third is planned for this year) that brought together units of the various services. If these units are ever required to support a theater deployment, they will have a much greater understanding of how ports are run in a theater.

Our de facto center of transportation excellence had many advantages beyond the opportunities for high-quality inactive duty training. Using the battalion as a point of contact also allowed enhanced communication with its doctrinal components. Training at a distance became more efficient, and valuable technical resources could be used more effectively. We were able to help our commanders obtain access to the latest technical and doctrinal guidance.

To be at their most effective, reserve component units need to have training and experience in a joint environment. Yet opportunities to conduct joint training in the reserve components are limited. Many reserve component units have little understanding of the capabilities and roles of units from the other Services, despite the clear likelihood that interactions with those units will be a rapidly growing possibility for many reservists.

As drilling members of the Army Reserve, we have observed these changes firsthand. In particular, we recognize the real-world impacts of joint training for the reserve components, including the difficulties of keeping current on rapidly changing doctrine and of obtaining first-class joint training opportunities. We have further experienced the practical advantages of joint training in terms of pooling resources for monthly training.

Although our example has focused on transportation in the San Francisco Bay Area, several other areas also are rich in transportation assets, including Baltimore, Maryland; Tampa, Florida; and Tacoma, Washington. Concentrations of units in other areas of logistics can be found in many locations around the country. We believe our model of joint training is applicable and adaptable to other settings. The synergies resulting from the pooling of resources will result in enhanced training and readiness for all units involved. ALOG

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Ultrareliability: Pillar of the AAN

by Richard W. Price

The Army After Next will face a battlefield that will require weapons and equipment that can operate for long periods without failing. To meet that standard, all systems will have to be designed to be "ultra" reliable.

The reliability of Army After Next (AAN) weapons and equipment will need to be quantum leaps higher than that of current conventional systems. This need for ultrahigh reliability will be driven by the nature of AAN battle force operations—dispersed, lethal, agile, nonlinear—and by limitations on available battle force support.

"Ultrareliability" is one of six pillars being used to develop concepts for battlefield support of AAN warfighters. The AAN program itself was established to conduct broad studies of warfare looking ahead to about the year 2025. Its purpose is to frame issues vital to developing the Army after 2010 and to provide those issues to senior Army leaders for integration into the Army Training and Doctrine Command's combat developments programs.

AAN Visions

Combat service support concepts for the AAN are expected to be radically different from those in use today. These differences will be revolutionary rather than evolutionary. The nature of operations envisioned for the AAN battle force will demand that it be more self-sufficient than today's force. A battle force must be able to operate with complete independence for short periods of time and with minimal reliance on support organizations for extended periods. This need for operating with little or no support is a key factor behind the need for ultra-reliable systems and equipment.

The AAN battle force will be flexible and highly agile and will employ highly maneuverable weapon platforms and futuristic weaponry. The technologies required for some futuristic capabilities are still beyond the technological horizon. Nontraditional energy sources, armaments, and ultralight major weapon platforms are envisioned. Within a battle force's engagement area, the expected distances that units will travel and the hours that systems will operate will be at least double those of today. Not only will engagement areas be very large, but they likely will be far removed from higher-level support organizations.

The visions of battle force operations now being developed foresee infrequent equipment failures, most of which will be corrected by crews or operators using modular replacement. The maintenance philosophy will be to replace forward and repair rear. Modularity of design will be emphasized. Design for maintainability will call for crews to remove and replace failed modules instead of components; weapon system crews will have a limited number of on-board spare modules.

Advanced maintenance and recovery vehicle (AMRV) crews will have limited maintenance capabilities beyond those of system operators. Their primary tasks will be recovering failed and damaged systems, moving them to extraction points, and performing quick battle damage assessment and repair. Mechanics will be multicapable maintainers qualified to maintain an entire weapon system rather than focus on a narrow specialty.

Failed or damaged equipment that cannot be repaired readily by the operator or AMRV crew will be removed to a distant battle unit support element. Designing equipment for self-recovery will be emphasized, so that, in those unusual instances in which a system malfunctions or breaks down during an engagement, the system can move itself to an extraction point. In addition to self-recovery, a disabled asset can be moved to an extraction point by another vehicle of the same type or by an AMRV. The limited number of AMRV's will be used as a last resort. Recovery from the extraction point to the battle unit support element will be accomplished by air, using the advanced airframe.

More Than a Goal

The goal of ultrareliability as a pillar of the AAN is to provide failure-free operations for the battle force. More than a goal or a choice, fielding ultrareliable weapons and equipment is a "must." Increased operational tempo, greatly expanded distances, and the remote, self-reliant nature of the battle force will drive the Army to ultrareliability.

Though unknown today, specific ultrareliability characteristics tied to each type of system and equipment will unfold as more knowledge is gleaned from AAN wargames and further development of concepts.

What is Reliability?

Reliability is an attribute that reflects system dependability. By definition, it is the probability that an item will function as intended without failure for a specified period under specified conditions. Reliability is usually expressed as a probability, either as a percentage or decimal fraction. Total system reliability is the net result of a complex combination of the reliabilities of components and subassemblies.

An alternate parameter sometimes used to determine reliability is the average interval between failures. Two parameters commonly used today are the mean time between essential function failures and the mean time between system aborts. Where appropriate, "miles" or "rounds" are used in lieu of "time" in these parameters. With the AAN need for failure-free operations, one can easily see that average intervals between failures must increase immensely over those of today's systems.

A Change in Focus

Revolutionary differences in AAN battle force operations and support call for similar revolutions in reliability requirements. For the past 20 years, materiel system reliability requirements have focused on a weapon system's essential functions. This focus so far has met Army needs adequately. In most cases, reliability requirements have been driven by a need to minimize mission risk to personnel and equipment while maximizing the likelihood of mission success by the unit. A few cases have been driven by logistics constraints. The reliabilities needed for mission performance typically far exceed those required for adequate logistics responsiveness.

While reliability requirements focusing on essential function failures and system aborts will continue to be significant, new ones focusing on nonessential function failures may become important. Today, failures to nonessential functions are corrected as time allows and if and when parts and maintenance personnel are available. They are significant contributors to the proverbial "logistics tail." AAN distribution and maintenance systems must focus on essential support. Therefore, reliability requirements for AAN weapons and equipment may need to limit the likelihood of experiencing nonessential function failures as well as failures affecting essential functions.

Not only will essential function reliability continue to be important, it will become even more critical in the future. The lengthy, remote, high-tempo, self-reliant operations expected of the AAN battle force will require quantum improvements in this area of reliability. Today's system reliabilities will need to grow to ensure that a battle force can be confident of accomplishing its objectives with minimal risk of mission failure and at minimal risk to soldiers and equipment. For a battle force to achieve such levels of mission reliability, individual weapon systems, equipment, and their components must be ultrareliable.

Ultrareliability: Today or Tomorrow?

Ultrareliability is incorporated in many products we use daily. Take the television set, for example. In the 1960's, home visits by the TV repairman were frequent. Operational defects were numerous and varied, and problems like vertical picture rolling were common. However, today's younger viewers have never seen a television with that problem. In fact, it is not uncommon for a television today to last 20 years without needing service or repair.

Such longevity is found in many other consumer electronic products. Today's automobiles are outstanding examples of greatly improved system reliability. The term "tune-up" today has an entirely different meaning than it did in the 1960's and early 1970's. Then, automobiles required a tune-up every 3,000 miles. This usually included cleaning and adjusting the ignition points and condenser, adjusting engine timing, and cleaning and adjusting the carburetor. The points and condenser needed replacement every 6,000 miles, and spark plugs had to be changed every 10,000 miles. Today, a tune-up has been reduced to changing spark plugs every 50,000 to 100,000 miles. Cadillac's Northstar System boasts 100,000 miles before the first tune-up is needed.

Automobile tires are another dramatic example of the development of ultrareliability. Customers paid a premium in the 1960's to purchase a set of passenger car tires with a life expectancy (warranty) of 40,000 miles. Only a few companies offered such tires, and their prices were considerably higher than for other tires. Yet today, passenger car tires routinely are good for 60,000 to 80,000 miles, and brand-name tire manufacturers commonly offer automatic warranties of 60,000 to 80,000 miles at no additional cost.

Tremendous improvements in reliability of consumer products are partially attributable to technological advances. However, the key factor is an up-front focus on design for reliability, resulting in much higher

☐ **The Bradley fighting vehicle is one of the Army's reliability success stories. Testing of the A2 version has achieved 750 mean miles of operation between failures.**

reliability inherent in each product.

Such an emphasis on designed-in and built-in reliability is the first and foremost building block for achieving ultrareliability in AAN systems. It begins with ultrareliable parts and components and carries through to ultrareliable systems integration.

Ultrahigh reliability then can be achieved by using informed, anticipatory maintenance coupled with highly maintainable system designs. AAN systems and equipment will have built-in prognostics and programmable sensors to alert their crews of impending failures. Dual-role operator-maintainers will use predictive readings to correct impending problems before actual failures occur, thus avoiding the more serious consequences of system failure. In addition to on-board prognostics, drive-through diagnostic shelters will be used before combat engagements. Components and subassemblies likely to fail in an upcoming engagement will be identified and preemptively replaced. Though such preemptive part replacement has no effect on a system's inherent reliability, mission reliability may be enhanced.

What is Behind Ultrareliable Products?

Military customers and producers are unquestionably different than customers and producers of consumer products. Current ultrareliable consumer products disprove the popular notion that reliability is only limited by the amount of money one is willing to spend in production or purchasing. The pressures of market demand and competition are the impetus behind ultrareliability in consumer products. However, they are not the reason these products are so highly reliable. The reason is a conscious decision by producers to design and build in high reliability from the very beginning of product conceptualization. The old, traditional process of designing and building a product first, then modifying it to improve reliability has been abandoned, and for good reason. Consumer product companies realized that "tweaking" an existing design to achieve higher reliability was indeed very expensive. By changing their process to include design for reliability as an integral part of their initial design efforts, they were able to produce highly reliable products in a timely and profitable manner.

A similar conscious decision by the Army to develop and field ultrareliable weapons and equipment is needed to ensure that ultrareliability is achieved for the AAN. The key to success, as with consumer products, is an unwavering willingness to step away from the entrenched, traditional processes and seek innovative solutions. Instead of offering lists of excuses for why the Army can't achieve ultrareliability, the reality is that the

Army *must* achieve ultrareliability in order to meet AAN demands.

Army Reliability Success Stories

The Army is not without its own reliability success stories. Notable achievements have been realized in improving the reliability of some current systems. Such successes are testimony that better reliability is achievable today, not tomorrow. Here are some examples of Army success. (Note that reliability for these systems is expressed in several different forms of average interval between failures.)

Family of medium tactical vehicles (FMTV) cargo variant reliability is nearly double its original requirement. The original FMTV cargo variant contractual requirement for hardware reliability was 3,000 mean miles between hardware mission failures. But the truck demonstrated 5,500 mean miles between hardware mission failures in production testing. Consequently, the contractual reliability requirement for follow-on buys has been raised to 5,500 mean miles between hardware mission failures.

Single-channel ground and airborne radio system (SINCGARS) reliability improved two- to threefold over the original requirement. Initially, the radio fell far short of its 1,250-hour mean time between failures reliability requirement. Improvements during development helped SINCGARS finally achieve its requirement. Other reliability enhancements have been incorporated through the years, causing the radio's reliability to increase further. Today, SINCGARS demonstrates a reliability in the range of 3,000 to 3,500 hours mean time between failures.

Abrams main battle tank reliability improved approximately 25 percent between the original vehicle and the second block improvement. Additionally, maintainability improved threefold. When originally fielded, the M1 Abrams tank demonstrated 304 mean miles between combat mission failures. This increased to 403 for the M1A1 and to 419 for M1A2. The fact that reliability grew at all is phenomenal because each successive block improvement made the tank much more complex, thereby introducing many more opportunities for failure. Even more significant than reliability improvements, maintainability in terms of maintenance man-hours per operating hour decreased from 2.67 for the original M1 to 0.85 for M1A2.

Bradley fighting vehicle reliability grew 250 percent between original development and the second block improvement. In 10 years, Bradley reliability improved dramatically, even as the vehicle itself became increasingly complex as a result of two block improvements. The Bradley demonstrated a level of 289 mean miles between failures at the end of initial development. Ten years later, Government production testing of the A2 version demonstrated 750 mean miles between failures.

While none of these examples constitute ultrareliability, they clearly show that higher reliabilities are achievable without necessarily adding more cost. As these systems increased in capability and complexity, reliability was not an oversight. Instead, preserving or enhancing reliability was an objective, along with the objective of adding new capabilities to the systems.

Major Cultural Change Needed

Resistance to change is the foremost roadblock to achieving ultrareliability in Army weapons and equipment. Major changes do not occur easily. Moving from the reliabilities of today's weapons and equipment to those needed by the AAN is a gargantuan leap. The entire Army acquisition community must undergo tremendous change in processes and perspective. This change must span the requirements determination, research, development, contracting, and test and evaluation communities. Processes and practices must be reengineered to meet the objective of ultrareliability. Openness to new ideas and nontraditional thinking are the keys to this reengineering effort.

Transformations of this magnitude do not occur without a major cultural change. This change must transcend the Army and its supporting cast of private contractors and defense industries. Requirements developers must shift their analyses to reflect the aggressive operating tempo expected of the AAN battle force and its austere support constraints. Materiel developers must seek creative ways to contract for ultrareliability. Defense industries must develop design and production methods that deliver ultrareliable products. Testers and evaluators must develop innovative approaches to measure and assess the attainment of numerically high reliability requirements. A much higher reliance on decision risk analysis will be needed, accompanied by an increased tolerance of the unknown by decision makers.

Above all, the most difficult task will be to break away from the many paradigms surrounding the traditional system development process. These paradigms restrict creative thinking and openness to new ideas. To achieve ultrareliability, the Army must follow the lead of consumer product companies by seeking nontraditional approaches, inspired by innovation and challenge. **ALOG**

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U.S. National Support Element Operations

by Major Timothy J. Marshall

An undetermined threat situation, the inadequate Bosnian infrastructure, and a lack of host nation support prevented U.S. forces from deploying directly into Bosnia. The national support element in Kaposvar-Taszar provided a secure environment from which to stage.

When the Army began planning for a potential deployment to Bosnia just before Christmas in 1995, senior leaders and planners soon realized they would need a secure environment from which to stage. The site chosen to support this intermediate staging base (ISB) operation was in the neighboring Hungarian towns of Kaposvar and Taszar.

The Taszar-Kaposvar site was selected for a number of reasons. The area is a multinodal transportation hub where road, rail, and air transport converge. There is also a robust road network in all directions, and the area offers multiple railheads. Perhaps most significantly, Taszar has the closest airfields to Bosnia and Croatia capable of landing strategic aircraft such as C–5's and Boeing 747's.

Another advantage of the Taszar-Kaposvar area was the significant Hungarian military infrastructure that existed in the region. This infrastructure consisted of the Kaposvar Military Barracks, Taszar Military Barracks, Taszar Airfield, Kaposujlak Airfield, and a large ammunition holding area. Additional factors, such as adequate electrical and communications grids and Hungarian host nation support, made Taszar-Kaposvar the perfect location.

In addition to the clear advantages provided by a support base in Hungary, there were some obvious reasons why deployment directly into Bosnia was not possible. First and foremost was the unclear threat situation. The second determining factor was the inadequacy of the Bosnian infrastructure to support a U.S. deployment. As a result of years of war, the railroad lines were destroyed, bridges were collapsed, and runways were cratered. These factors, when combined with the complete lack of host nation support, ended any thoughts of deploying directly into Bosnia.

In the Beginning

When the first Army elements arrived in Taszar in November 1995, no U.S. facilities existed there. Instead, units were spread over 20 locations in leased factories and warehouses. The arriving organization originally was named the U.S. Army, Europe (Forward), and the first commander was Lieutenant General John N. Abrams, who held the command until October 1996. (The present commander is Colonel George Murati.)

During the first 2 months of the Implementation Force (IFOR) deployment—November and December 1995—approximately 25,000 soldiers passed through Taszar. One year later, in February 1997, the name of the organization was changed to the U.S. National Support Element (NSE).

The concept of a forward staging base to support deploying forces certainly was not new. During World War II, Allied forces used support bases in England before the Normandy invasion. As the threat situation stabilized and the theater matured, the support bases were "right-sized." The support base in Taszar provided a secure location near the theater of operations from which to conduct reception, staging, and onward movement (RSO). The location also provided an ideal forward base to support intelligence activities.

Right-Sizing

The peacekeeping forces in Bosnia have transitioned from the IFOR to the Stabilization Force (SFOR) and, along with the NSE in Taszar, have been restructured continually. Between February 1996 and October 1998, U.S. Armed Forces in Bosnia "right-sized" on four different occasions. Functions at Taszar such as intelligence collection and forward basing of Task Force Eagle contingency stocks constantly require reassessment based on threat evaluations.

The General Framework Agreement for Peace in Bosnia and Herzegovina, commonly referred to as the Dayton Peace Accords, consists of two major elements. The first element is the military portion of the agree-

ment, which was the main responsibility of the IFOR. When the military portion of the agreement was largely completed, the focus of international effort shifted to the second major portion, civilian implementation. This portion of the agreement required less involvement by the military, which enabled U.S. forces to draw down and facilitated the transition from the IFOR to the SFOR. During this period, the operation in Bosnia transitioned from Operation Joint Endeavor to Operation Joint Guard (now called Operation Joint Forge).

Since December 1995, the number of U.S. Army soldiers serving in Bosnia has dropped from 18,500 to 6,900. During this same period, manning at the NSE has dropped from 3,500 soldiers to less than 650. In addition to manpower reductions, other efficiencies have been achieved. Over the past 2 years, the theater's lines of communication have matured significantly. As a result, deploying forces are less dependent on temporary engineer bridges at river crossings, and equipment can be transported by rail all the way into Bosnia.

Continuous Improvements

One of the most significant infrastructure improvements was the opening of the Tuzla Airfield in Bosnia to strategic air traffic in October 1998. A major cost-saving action was the decision to maximize the use of pre-positioned equipment. Deploying forces now make full use of a Bosnia equipment set, which reduces the number of heavy vehicles deployed into and out of theater. In addition, the number of U.S. helicopters in Bosnia has been reduced by 50 percent, and all U.S. artillery has been withdrawn.

Kaposujlak Airfield and Kaposvar Military Barracks have been returned to the Hungarian military. RSO has been streamlined and is now only a 4-day process for units that are not part of the SFOR's Multinational Division North. These right-sizing moves have decreased the NSE's footprint drastically.

Current Mission

The NSE today is far more than a deployment center. According to its current mission statement, it serves as the executive agent for force protection in its area of responsibility; provides base operations support for Department of Defense forces and civilians deployed in Hungary, Croatia, and Bosnia (less the Multinational Division North); and coordinates with Hungary for all host nation support of Operation Joint Forge. In addition, it provides for RSO of back-up units and individuals deploying or redeploying in support of Operation Joint Forge (less the Multinational Division North) and serves as a transportation node on the theater line of communication by providing a 1,000-bed facility for overnight stays.

Until 1 December 1997, the NSE's area of responsibility consisted of only Hungary and the eastern portion of Croatia. Then the area of responsibility was expanded to include all of Hungary and Croatia and all of Bosnia except that portion occupied by the Multinational Division North. Today, all U.S. actions in Hungary are coordinated closely with the host nation government through constant contact with the U.S. SFOR liaison officer permanently stationed at the U.S. Embassy in Budapest.

During the division transfer of authority in Bosnia, the NSE was a transportation focal point for both the 1st Cavalry Division and the 1st Armored Division as they moved into and out of Bosnia from August through October 1998. Soldiers from the 1st Cavalry Division remained overnight at the NSE after arriving by strategic air, and soldiers of the 1st Armored Division stopped at the NSE to eat and change buses. Additionally, the NSE was a key player in supporting operations at the Port of Rijeka, Croatia, where over 800 pieces of 1st Cavalry Division equipment were offloaded from the *USNS Soderman* and railed and trucked to Task Force Eagle in Bosnia.

Base operations support responsibilities continue to keep the NSE busy, with over 1,000 customers spread out in three countries at more than 10 locations. To assist in this mission, the NSE established national support teams (NST's) in the cities of Zagreb, Croatia, and Sarajevo, Bosnia. These NST's provide support to their satellite customers. In turn, the NSE supports the NST's.

Since the arrival of the first C–130 at Taszar Airfield on the cold, clear morning of 8 December 1995, over 160,000 soldiers have passed through the Taszar support base, which has a robust organizational infrastructure to support the forces. Today, nearly 4 years later, with additional missions, the NSE in Taszar has streamlined its structure to provide first-class support in all areas of responsibility at a minimum cost in soldier manpower and tax dollars. The NSE's future is uncertain. However, it will continue to provide unequalled support as long as soldiers are deployed to Operation Joint Forge. **ALOG**

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Motivation Through Competition?

by Joseph R. Bainbridge

Americans historically have enjoyed taking part in all kinds of competition. Occupations and recreational activities routinely are based on trying to exceed a standard or beat out competitors. The free market system depends on competition to improve products and lower prices.

Competition is prevalent in basic childhood activities such as tossing a ball (hand-eye coordination) or learning to spell. As children mature, they must compete with siblings, fellow students, and others for opportunities to play on the school team, enter college, or even date desirable people. Long ago, military leaders found they could motivate their soldiers to achieve higher levels of performance or endurance if a competitive environment was established and the winner rewarded.

In his book, *A General's Insights Into Leadership and Motivation*, Major General Charles R. Henry (U.S. Army, retired) observed that there is only about a 5-percent difference between winning and losing in both athletics and business. Contests are often so close that a photograph examination or some sort of tie breaker is necessary to determine the winner. Yet the loser is deprived of significant recognition for his effort.

Military Competition

U.S. servicemembers seldom fight valiantly for "causes," abstract sociopolitical values, or extra hazardous-duty pay. They fight to survive, for a leader they know and are committed to, and for their fellow soldiers to whom they are bonded by common circumstances. American military professionals achieve high levels of effectiveness because of overwhelming allegiance to a group and its leader. A powerful factor during the development of group identity is competition. Soldiers compete individually and, more importantly, as members of teams against mental and physical obstacles or other soldiers (friend or foe).

The military uses competition to motivate servicemembers and to make important decisions. Two Services may compete for a mission functional area or assignment. A higher level of execution may be achieved because the "group" is a more important entity than the "self." For example, the winning group in a contest may be granted liberty by the commander while the losers must remain on station.

A study conducted by the Navy Personnel Research and Development Center concluded that, in Navy technical schools, competition (performance comparison to other students) correlated closely to achievement.

The United States has encouraged competition as a motivator among the Services, and among major factions within them, for many years. The pride and parochialism often has manifested itself as extra effort toward notable achievements. Many long-standing commands have a heritage of great accomplishments and associated pride, often based on a comparison to the performance of similar elements (competitors) during battles. The Army has an Institute of Heraldry to document these records.

Fierce Service pride, rivalry, and competition continue to have positive outcomes today. However, we are changing rapidly to a single integrated force in the theater. In future operations, one military Service will provide selected common support to most or all forces in an area. That supporting Service cannot give preference to its own elements. The Defense Logistics Agency is assuming more of the logistics support role every year, including during hostilities. The next operation likely will be directed by a joint task force commander.

Undesirable Effects of Competition

The simplified goal of any operation may be to neutralize enemy personnel. A commander decides to motivate his soldiers by establishing a competition with a desirable reward for the most enemy personnel neutralized. A soldier could struggle, take prudent risks, neutralize 13 enemy troops, and hope that no one else exceeded that number (a good outcome for the commander). He also could determine who his closest competitors were, take actions to lessen their success, and win with five enemy troops neutralized (not as good an outcome for the commander). In the latter situation, the

"defending" part of the contest (preventing the opponent from succeeding or scoring) is a negative aspect of motivation using competition.

In an article in *Personality and Social Psychology Bulletin*, Jennifer A. Epstein and Judith M. Harackiewicz demonstrated that competition has the potential to both enhance and reduce interest. When people focus on winning to the exclusion of intrinsic aspects of the task, competition may undermine interest in the task. Having to compete with others who are perceived to be superior performers can discourage competitors to the point that they withdraw their entry. In coalition operations or industrial-base product development, a decision not to participate could have a very undesirable impact.

I have observed officers taking an advanced training course where scores on tests accumulated toward a success threshold. Near the end of the course, three groups could be identified: a large group of rather carefree "I have enough points" people, a smaller group of hard-working "I need more points" people, and a very small group of totally unmotivated "I can't get there, I give up," people. Only the second group is still benefiting from the competition for points. By the last week of the course, there aren't any people in this group, and there is very little intrinsic motivation evident either.

Consider some negative aspects of competition—

- To be motivated, a participant must perceive a chance to win or at least to have a good outcome. Once defeat is inevitable, the motivation is gone.
- Pooling or combining knowledge and capabilities among competitors to achieve even greater success is unlikely.
- Competition may cause resentment toward competitors that continues well past the conclusion of competition. Revenge for the loss may be sought.
- Intended or not, the results of competition will be interpreted as A is the best, therefore B, C, and D are less than the best.

Team members tend to "take care" of teammates before others. This may be acceptable in some circumstances but can be undesirable in others. Competitors may choose to lessen the success of their rivals rather than improve their own performance.

Alternatives to Competition

It may be time to replace much of the competition-oriented behavior in the Army with an evaluation system based on efficient and effective advancement of Department of Defense initiatives. To continue to foster a "we can beat them" attitude toward other servicemembers with whom we work and upon whom we depend may produce an unfavorable end state.

Modern people-management and leadership books, such as *Mission Possible* by Ken Blanchard and Terry Waghorn, or *The Key to Great Leadership* by Peter Burwash, emphasize empowerment of capable individuals and development of core competencies in natural leaders and the "talent" they direct. Vested interests and critical roles on the team are what motivate the people. A "beat your fellow worker" approach, with points awarded for completed tasks, is noticeably absent from these guidebooks. Finding an employee's value is stressed instead of forcing a temporary high performance.

Engaging in a task for the sake of performing the task is a powerful motivation. This is the intrinsic motivation mentioned earlier. It offers the individual an opportunity to satisfy inner needs. Cognitive evaluation theory assumes that two components are necessary for a favorable outcome. One is believing that you are competent or capable; the other is perceiving self-determination. Self-determination in a military context is difficult to assess. Servicemembers choose to serve and often volunteer for challenging assignments. Yet they often are compelled to perform a specific mission in a certain way when neither the assignment nor the method is what they might have chosen. Competition often affirms one's competence. Competitions that stress beating opponents reduce intrinsic motivation, because identifying losers cannot be avoided in such competitions.

Focus on Desired End State

Some contests are, and should be, conducted specifically to find "the winner." However, in situations where everyone must contribute his best, success certainly is not achieved by proclaiming one winner and many losers. Logistics cooperation or departmental interaction may be affected adversely because of the inevitable feelings instilled in those who do not "win." In the military, if more peaceful actions fail, we want to defeat the enemy, not a competing servicemember, unit, Service, or agency of our Government.

Recreational competition is fun. Comparative competition to choose the best product or provider is useful. Competition among those working toward a common goal may not be wise. The motivation to fight in future joint environments must be intrinsic and not rely on comparisons to other elements pursuing the same goals for the same joint force commander. The Department of Defense is blending together now for more efficiency. Tomorrow's joint task force members will have to be inspired to perform by their leaders, not by competition.

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Division Cavalry Squadron Maintenance Techniques

by Major Michael Senters and Captain Santiago G. Bueno III

The cavalry squadron is clearly the most diverse and flexible battalion-sized unit in a heavy division. The squadron's 41 M3 Bradley fighting vehicles, 27 M1A1 Abrams tanks, and 16 OH–58D Kiowa Warrior helicopters provide the squadron commander with a lethal combination of weapon systems. However, they also present him with unique maintenance challenges not found in any other unit. First Squadron, 10th Cavalry Regiment (1-10th Cavalry), 4th Infantry Division (Mechanized), Fort Hood, Texas, has developed some maintenance techniques that can be useful in planning and executing scheduled and unscheduled maintenance despite the high operational tempo of today's Army.

Common-Sense Maintenance Checks

Junior leaders, who often lack a basic understanding of maintenance operations, are required to check maintenance work and supervise maintenance operations. For many years, the aviation community has taught these leaders a simple, common-sense approach to checking maintenance called the P4T2 method. This method was created by Brigadier General Richard A. Cody, now the Assistant Division Commander (Maneuver), 4th Infantry Division. P4T2 stands for "problem, people, parts, plan, tools, and time."

To better adapt the P4T2 method to ground maintenance, the 1-10th Cavalry added a third T, for "training," to make P4T3. Here's how P4T3 works.

Problem: Have we identified all of the problems and faults? Diagnosing the fault using established troubleshooting procedures is the first task the crew and maintenance personnel must complete to standard, particularly during unscheduled maintenance. Disciplined use of technical manuals (TM's) and adherence to troubleshooting procedures are critical. Incorrect diagnosis at the start of maintenance can waste time and repair parts. If the maintainers cannot diagnose the problem, experts should be involved early. Direct support maintenance personnel or logistics assistance representatives can aid in the troubleshooting process.

People: Do we have the right people to do the job? To conduct maintenance properly, the right type and number of people are required. The platoon leaders, platoon sergeants, and section sergeants are responsible for ensuring that maintenance operations are supervised properly. This supervision includes personnel in technical military occupational specialties (MOS's) who are called in for specific jobs or repairs. Troop commanders (TCO's) and troop first sergeants (1SG's) must continually manage the use of low-density-MOS soldiers to ensure that they are performing jobs requiring their technical skills instead of working on non-job-related details or duties. The squadron executive officer (SXO), squadron maintenance officer (SMO), and squadron maintenance technician (SMT) must check daily to make sure that each function is being managed by the correct level of supervision.

Parts: Do we have all of the right parts to finish the job? Having the right parts on hand is important to completing any repair job or service. Junior leaders must ensure that the right parts are on order if they are not on hand in the troop's prescribed load list (PLL). Proper flow of Department of the Army (DA) Form 5988–E, Equipment Maintenance and Inspection Worksheet, is essential to this process and requires strict enforcement. Platoon sergeants must verify and report deadlined equipment to the troop maintenance team. This team must verify all faults, order the right parts by referring to up-to-date TM's, and deliver the 5988–E's to the Unit Level Logistics System (ULLS) clerks for action. After the ULLS clerks order and return the 5988–E's, the platoon leaders must check them for accuracy. Mechanics and crews must tag and store serviceable parts taken off a vehicle during maintenance to make sure the parts are on hand and serviceable when it is time to put them back on.

Plan: What is the plan for doing the job from start to finish? Commanders, junior leaders, and supervisors must enforce a rigorous, thorough maintenance plan. The maintenance plan for scheduled services must contain adequate details to ensure uniformity. The unit standing operating procedure (SOP) and troop maintenance plan are the first steps toward ensuring a solid basis for quality control. Planning for unscheduled maintenance

☐A 1-10th Cavalry soldier makes sure he has the right tools for replacing track pads on an M1A1 Abrams tank.

takes place after the fault is identified. This planning is conducted like any other battle drill. Together, the platoon leaders and troop maintenance team must identify quickly the resources needed to do the job. Junior leaders can start the planning process by asking all of the P4T3 questions.

Tools: Do we have the right tools to do the job? Supervisors must identify the tools required to do the job and make sure they are on hand and serviceable. Using the wrong tools only wastes time and can result in injury to mechanics or additional damage to equipment. Junior leaders must educate themselves on the different tools and enforce TM standards.

Time: How long is the job going to take? The estimated completion date of maintenance that will bring a vehicle to fully mission capable status is extremely important in forecasting combat power within a squadron. Time management is critical in maintenance operations. Leaders must allow adequate time for maintainers to work on the equipment. If additional problems are identified or shortages of resources occur and the estimated completion date is extended, platoon leaders must inform the TCO. Promptly making the SMO and SMT aware of unforeseen maintenance problems is critical.

Training: Who and what tasks can we train during this job? Using scheduled and unscheduled maintenance to conduct cross-training or on-the-job training maintains essential maintenance skills. Mechanics and crews must train to obtain and sustain the skills they need to maintain vehicle readiness.

Command Maintenance Program

A command maintenance program ensures that all vehicles and equipment receive thorough weekly inspections. Performing preventive maintenance checks and services (PMCS) to standard is the cornerstone to identifying and repairing faults and reducing the risk of equipment damage or personal injury due to failures. Units must set specific objectives to focus the efforts during command maintenance.

Unit and individual discipline is critical to a quality command maintenance program. Junior officers and noncommissioned officers (NCO's) must enforce adherence to maintenance standards prescribed in the squadron SOP, Army regulations, and TM's. Command maintenance in the 1-10th Cavalry consisted of four major actions: PMCS, PMCS reconciliation, adherence to squadron and troop command maintenance objectives, and radio checks.

PMCS. During the first command maintenance period of each month, operators and crews perform the monthly PMCS. During the remaining command maintenance days each month, the crews complete the weekly PMCS. Platoon sergeants must verify the 5988–E before the troop maintenance team acts.

Units must review how PMCS is conducted during field operations. An article written by Captain Steven V. Karl and Dr. Matthew Lewis, "Redesigning PMCS to Build Combat Power" (*CTC* [Combat Training Center] *Quarterly Bulletin No. 97-18,* September 1997), contains many good suggestions on streamlining the PMCS process. One recommendation is that units develop an abbreviated PMCS checklist that can be accomplished in 30 minutes to 2 hours. The items on this checklist will be determined by the field experience of the SMO's and SMT's, maintenance team chiefs, and master gunners.

PMCS reconciliation. Vehicle commanders must ensure that faults reported and parts ordered on a 5988–E are still valid. If the 5988–E is not current, the vehicle commander reports the changes to the platoon leader or sergeant. The platoon leader or sergeant then reports the deficiencies or changes to the troop maintenance team chief, who verifies faults, orders parts, and repairs or evacuates vehicles as necessary. PMCS reconciliation is not complete until all faults are identified and repaired or parts are ordered.

Maintenance objectives. Command maintenance is not complete until both the squadron and troop command maintenance objectives are met. These are general in nature and can focus on off-season tasks. For example, checking heaters during late summer or early fall allows crews and mechanics enough time to order parts and repair faults before cold weather. The SMO and SMT submit the squadron command maintenance objectives to the squadron commanding officer (SCO) for approval.

The TCO and TXO must set the troop-level maintenance objectives. These objectives focus on upcoming missions, such as weapon maintenance and turret checks

before gunnery. TXO's provide comments on the status of all command maintenance objectives at the daily maintenance meeting.

Radio checks. The squadron signal officer (SIGO) is responsible for planning and executing the long- and short-range radio checks. The SIGO publishes a letter of instruction spelling out the requirements of the radio checks. The objective is to ensure that radios are working at optimal levels and in the most secure mode available. Radio checks also provide the opportunity for crews to learn to configure and operate radios in the cipher text and frequency hop modes. Squadron communications section personnel must be available to assist in troubleshooting any problems encountered during radio checks. The SIGO uses the log kept during radio checks to report the results to the SXO.

Command Maintenance Work Day

A schedule is fundamental to accomplishing all tasks and objectives during command maintenance. During an 0900 squadron formation on the first day of command maintenance in the 1-10th Cavalry, the SCO highlights his maintenance focus and reviews the squadron-level command maintenance objectives. The TCO and 1SG review and give direction on the troop-level objectives. After morning formation, crews perform –10 level and unscheduled maintenance. Repair parts for unscheduled maintenance are installed, and mechanics are on hand to check any deadline faults.

From 1300 to 1500 hours, the TXO and maintenance team chief review the 5988–E with vehicle commanders and operators. Each platoon review should last 20 to 30 minutes. Afterward, the maintenance team chief prioritizes work on the platoon's 5988E and directs his mechanics to start checking deficiencies. Troop mechanics have until 1700 hours on the third day to complete –20 level checks. On day four, the TXO and maintenance team chief review the 5988E to ensure that only needed parts are ordered. The 5988E is sent to the PLL clerks, who order the necessary parts.

Standardization Techniques

Scheduled maintenance services are a team effort in a division cavalry squadron and the foundation of a solid maintenance program. Leaders at all levels must ensure that platoons are given full support to perform this mission. Squadron and troop leaders must supervise and analyze maintenance services to improve the program.

In the 1-10th Cavalry, leaders and maintainers designed a service packet for every vehicle in the squadron. The packet contains a copy of the service SOP, preprinted DA Forms 2404, Equipment Inspection and Maintenance Worksheet, and service checklists. The DA Forms 2404 are preprinted with all –20 level checks.

☐ Soldiers prepare to conduct a progressive phased maintenance inspection in the field.

These include communications checks, checks on equipment belonging to the crews and vehicles located in the troop nuclear, biological, chemical (NBC) room and arms room, and a personal assets inventory.

During long-range planning, the SMO gives the squadron S3 a scheduled service window to include on the long-range training schedule. Eight weeks out, troop commanders place services on the troop training schedule and confirm with the squadron S3 that the dates are on the squadron training schedule. The TXO is the point of contact for services at the troop level. The TXO must make sure that all required service packets and –10 and –20 manuals are on hand and that service kits are available or ordered.

Three weeks out, the goal is to have service packets completed and identified by bumper number. Troop motor sergeants and the TXO review the service SOP and service tasks with crews and mechanics.

Two weeks out, the TXO coordinates with the troop NBC NCO, the arms room, and the squadron communications section for support. He also coordinates with the SMO, the SMT, and the Headquarters and Headquarters Troop (HHT) XO to identify conflicts and problems. One of the most important steps at this point is coordinating for additional lift if required. The HHT XO and the TXO must coordinate HHT recovery section assets in advance if the troop does not have adequate lift available. A not-mission-capable M88 recovery vehicle is no excuse for delaying the start or completion of a scheduled service.

One week out, platoon leaders issue an operation order (OPORD) for the platoon maintenance service. Present at this OPORD issue are a squadron communications section representative, the troop NBC NCO, the armorer, the supply sergeant, and the training NCO. The OPORD covers all aspects of service from day 0 to completion. During the OPORD issue, the platoon leader assigns wash racks and bay spaces and answers all questions about the service.

During execution week, everyone involved with scheduled services starts work at 0900 and stops work at 1700. Crews will have the service packet and checklist

with them to reference and record the tasks completed each day. During a service, a platoon is broken down into two sections, one for hull maintenance and the other for turret maintenance. Weapons, basic issue items, and individual records are checked during this week. Personnel will update their training records and may even take a physical fitness test if needed. Daily situation reports on services are submitted by the TXO through the SMO to the SXO. The SXO tracks and updates the SCO on the status. Coordination meetings are held daily at 1500 by the SMO or SMT with the TXO to discuss progress. At this meeting, resources may be redirected to overcome problems that have occurred.

Three weeks after the platoon service is complete, the platoon leader submits a written after-action review (AAR) to his troop commander and the SXO. This AAR focuses on lessons learned and recommendations for improving the next service. The SXO consolidates and analyzes every troop AAR in an effort to identify trends and significant issues. The SXO brings to the SCO's attention any area that may need command focus.

The SMO or SMT coordinates with the squadron S3 to make sure scheduled services do not conflict with long-range training events. As the primary adviser to the SCO, the SMO must make sure maintenance activities are coordinated with training on the squadron long-range training calendar. During services, the SMO and SMT spot-check service packets. The SMO and SMT are the SCO's representatives during services and must focus on areas that require particular attention. During spot-checks, the SMO and SMT must make sure crews and mechanics are performing services using all required TM's and the lube order and service packets. They also must ensure that mechanics are using checklists with the corresponding manual.

☐An NCO monitors preventive maintenance checks and services.

Progressive Phased Maintenance

The progressive phased maintenance (PPM) program for the OH–58D Kiowa Warrior provides the most scheduling flexibility to commanders and maintenance officers during any type of contingency. PPM contains 15 inspections conducted at intervals of 40 flight hours. Inspections can begin 4 hours early, but must be completed before the next inspection can begin. During PPM inspections, mechanics and supervisors use a PPM checklist. PPM inspections 8 and 15 require general maintenance test flights and can be maintenance-intensive. Other maintenance test flights are completed as needed during the PPM cycle. More time is required to complete the PPM if a fault is found during an inspection. One of the advantages of PPM is that it usually allows units to complete individual inspections without grounding the aircraft. The crew can fly for the entire 40 hours, complete one inspection, and immediately complete the next one. This allows the commander to use the aircraft for almost 80 hours between PPM inspections.

In addition to PPM inspections, the OH-58D requires DA Form 2408–18 (Equipment Inspection List) inspections and services. Due to the ever-changing nature and modernization of aircraft, the DA Form 2408–18 inspections sometimes can be more involved than the normal PPM system. The SXO must have a working knowledge of these inspections. The squadron production control officer is the best source of information on PPM and DA Form 2408–18 requirements.

Making It Work

The SXO is responsible for the overall planning and evaluation of the squadron maintenance programs for both ground vehicles and aircraft. The squadron maintenance program must have a common standard for both ground combat vehicle and helicopter maintenance. Whether the SXO is an aviator or an armor officer, he must know and help manage both ground vehicle and helicopter maintenance. Here are some techniques the 1-10th Cavalry SXO uses to monitor and direct maintenance actions within the squadron.

Squadron stand-up staff meeting. The SXO holds stand-up staff meetings every morning. The squadron staff, minus the S3, attends this meeting. The SMO and SMT attend every meeting and update the SXO on the status report. Daily and weekly maintenance goals and objectives are updated and reviewed in detail by the SMO and SMT. On Wednesday, all TXO's attend the stand-up staff meeting. Maintenance status and goals are the

□ **Adequate lift support is critical to successful completion of a scheduled maintenance service.**

primary topics of discussion, but any other maintenance-related topic needing emphasis can be reviewed.

Daily SMO/SMT maintenance meeting. The SXO periodically attends the SMO/SMT's daily maintenance meeting. This allows the SXO to observe the SMO, SMT, and troop maintenance team chiefs in action and learn what their objectives are. The SXO also can learn what problems are being encountered at troop level and may be able to provide additional resources. If the troop maintenance team is having trouble obtaining parts or specific tools, the SXO sometimes can help by directing the S4 to purchase the items locally using the International Merchant Purchase Authorization Card (IMPAC). After the meeting, the SXO reviews the results of the meeting with the SMO and SMT and discusses the focus for the next meeting.

Aviation production control officer. The 1-10th Cavalry SXO talks to the aviation production control (PC) officer daily to stay abreast of aviation maintenance. They review aircraft status and maintenance goals and objectives. During production control and quality control meetings, the PC officer reviews and directs maintenance actions for helicopter maintenance.

Walking the line. The SXO "walks the line" daily in the motor pool and hangar to check maintenance. He sees firsthand what is going on and asks questions. He checks the service line and aircraft progressive phase maintenance to determine the real status of maintenance, using the P4T3 method and referring to daily status reports. If the paper status reports do not match the actual status of equipment, he talks with the SMO or PC officer to find disconnects. At the end of the day, he makes pen-and-ink changes to the status report and ensures that the SCO has the most current information. The SCO requires daily status updates on readiness, so walking the line is a good method of cross-checking the reliability of the information the SCO receives.

Relationship with the direct support unit (DSU). A strong working relationship between a cavalry squadron and the maintenance DSU is critical to timely and reliable support. In the 1-10th Cavalry, the SMO and SMT have an excellent working relationship with the DSU and can depend on the DSU to have someone on call to handle walk-through requisitions for parts when needed.

Each unit must establish its own approach to maintaining equipment. The methods used by the 1-10th Cavalry are offered as one successful approach to maintaining operational readiness of armored vehicles and aircraft. The division cavalry squadron is the most flexible and powerful unit in a heavy division, but only if the equipment is fully mission capable and operational readiness can be maintained during the fight. **ALOG**

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Reader Survey

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Army Logistician's goals are to provide information that will increase our readers' awareness, knowledge, and understanding of logistics and support functions; contribute to the professional development of those providing logistics support; and keep those who rely on logistics support informed of developing capabilities.

The *Army Logistician* staff invites our readers to complete this survey. This document is important to us, because it lets us know the type of information you need to do your jobs better. Individual responses to the survey are completely confidential, so be as candid as you wish. Only group statistics will be compiled, tabulated, and published. No individual responses will be disclosed. We will publish the survey results in our January-February 2000 issue.

Please complete the survey and mail by 1 November 1999 to Editor, *Army Logistician*, Army Logistics Management College, 2401 Quarters Road, Fort Lee, VA 23801–1705. If you prefer, you may complete the survey on line on our web page, http://www.almc.army.mil/alog.

1. Have you seen an issue of *Army Logistician* in the past year?
   - O No (skip to question 21)
   - O Yes (continue with question 2)

2. Which of the following six issues of *Army Logistician* have you seen?
   - O July-August 1999
   - O May-June 1999
   - O March-April 1999
   - O January-February 1999
   - O November-December 1998
   - O September-October 1998

3. Usually, how much of each issue did you read?
   - O All or almost all
   - O More than half
   - O About one-fourth
   - O Almost none

4. *Army Logistician* is produced bimonthly and mailed approximately 20 days before the cover date. How soon after *Army Logistician* was mailed did you receive a copy? For example, did you receive the September-October issue—
   - O Before the cover date (e.g., before 1 September)
   - O During the first month cover date (e.g., September)
   - O During the second month cover date (e.g., October)
   - O The month after the second cover date (e.g., November)
   - O Varies from issue to issue

5. How do you usually get a copy of *Army Logistician*?
   - O Mailed directly to me
   - O Unit or office distribution
   - O Unit dayroom
   - O Library or education center
   - O Paid subscription
   - O World Wide Web
   - O Other

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   - O Yes
   - O No

7. After reading *Army Logistician*, I usually—
   - O Route it through the unit/office
   - O Give it to someone else
   - O Clip what I want to keep for reference
   - O Keep entire issue for reference
   - O Leave it in the dayroom, library, or office
   - O Throw it away

8. For each of the statements below about *Army Logistician*, select the one that most nearly describes how you feel.

1	2	3	4	5
Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree

Statement 1: It is easy to read.
Strongly Disagree 1 2 3 4 5 Strongly Agree

Statement 2: It is easy to understand.
Strongly Disagree 1 2 3 4 5 Strongly Agree

Statement 3: It is well written.
Strongly Disagree 1 2 3 4 5 Strongly Agree

Statement 4: It contains new and useful information.
Strongly Disagree 1 2 3 4 5 Strongly Agree

Statement 5: It contains information that helps me on my job.
Strongly Disagree 1 2 3 4 5 Strongly Agree

Statement 6: It contains information that makes me think.
Strongly Disagree 1 2 3 4 5 Strongly Agree

Statement 7: It provides me with source material.
Strongly Disagree 1 2 3 4 5 Strongly Agree

9. For each of the statements below about the appearance of *Army Logistician*, select the choice that most nearly describes your feeling.

1 — 2 — 3 — 4 — 5

Strongly Disagree | Disagree | Neutral | Agree | Strongly Agree

Statement 1: The cover gets my attention.
Strongly Disagree 1 2 3 4 5 Strongly Agree

Statement 2: The type is clear and easy to read.
Strongly Disagree 1 2 3 4 5 Strongly Agree

Statement 3: Charts and graphs are easily understood and helpful.
Strongly Disagree 1 2 3 4 5 Strongly Agree

Statement 4: Photos are informative, interesting, and illustrate text.
Strongly Disagree 1 2 3 4 5 Strongly Agree

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Strongly Disagree 1 2 3 4 5 Strongly Agree

Statement 6: Color gets my attention.
Strongly Disagree 1 2 3 4 5 Strongly Agree

10. Subject matter in *Army Logistician* over the last six issues has become—
- O More interesting
- O Stayed about the same
- O Less interesting
- O Don't know

11. Over the last six issues, *Army Logistician* has—
- O Covered more subjects that interest me
- O Covered fewer subjects that interest me
- O No opinion

12. How helpful is *Army Logistician* in keeping you informed and up-to-date on changes and developments in logistics?
- O Very helpful
- O Sometimes helpful
- O Seldom helpful
- O Not helpful

13. Over the past 12 months, I have used suggestions, ideas, or information from *Army Logistician* to better understand my logistics job, improve my performance, or solve logistics problems in my unit or organization–
- O Very frequently
- O Frequently
- O Sometimes
- O Seldom
- O Never

14. How helpful is the News column?
- O Very helpful
- O Sometimes helpful
- O Seldom helpful
- O Not helpful

15. I would like to see the News column—
- O Expanded
- O Kept about the same
- O Reduced

16. How helpful is the Systems column?
- O Very helpful
- O Sometimes helpful
- O Seldom helpful
- O Not helpful

17. I would like to see columns added on—
- O Career programs, training, and courses
- O Calendar of events
- O Other (Explain in space provided after question 20.)

18. I would like to see (more) (fewer) articles on logistics operations at the—

More	Fewer	Unit/company level
More	Fewer	Battalion/brigade level
More	Fewer	Division/corps level
More	Fewer	Major command level
More	Fewer	Joint/unified/specified command level
More	Fewer	Department/Secretary of the Army level

19. I would like to see (more) (fewer) feature articles on—

More	Fewer	Supply
More	Fewer	Maintenance
More	Fewer	Transportation
More	Fewer	Services (food, clothing, medical, finance, postal, chaplain, etc.)
More	Fewer	Facilities (installation logistics, housing, installation management, etc.)
More	Fewer	Logistics management (acquisition, contracting, procurement, etc.)
More	Fewer	Environmental issues (management, protection, hazardous-materials handling, etc.)
More	Fewer	Professional development (education/ training opportunities and courses)
More	Fewer	Joint logistics (joint exercises and operations, combined operations, etc.)
More	Fewer	Defense and Army logistics plans, programs, and policies

20. I would like to see *Army Logistician* publish articles on these subjects (be as specific as possible):

If you would like to comment on issues not covered above or expand on answers given to a specific question, please attach a separate sheet of paper to your completed questionnaire and indicate the number of the question you are answering.

We need to know the demographics of *Army Logistician's* readers. Please help by answering the following questions as specifically as possible.

21. I am—
- O Active Army
- O Army National Guard
- O Army Reserve
- O Army civilian employee
- O Other (please specify)

22. I am a member of the—
- O Navy
- O Air Force
- O Marine Corps
- O Coast Guard

23. I am—
- O Commissioned in branch functional area ____
- O Warrant officer in military occupational specialty___
- O Enlisted in military occupational specialty ____
- O Civilian in career management field ____

24. I serve at—
- O Company level
- O Battalion/brigade level
- O Division/corps level
- O Major command level
- O Joint command level
- O Department/Secretary level
- O Department of Defense level

25. My pay grade is—

Military
- O E1-E4
- O E5-E6
- O E7-E9
- O WO1-WO5
- O 01-03
- O 04-06
- O 07-010

Civilian
- O GS8 or below
- O GS9-11
- O GS12-14
- O GS15 or above
- O SES
- O Other (specify)

26. My age is—
- O 20 or under
- O 21-24
- O 25-29
- O 30-34
- O 35-39
- O 40-49
- O 50 or over

27. My current duty is—
- O Member of team, squad, or platoon
- O Troop leader
- O Commander
- O Staff position
- O Joint command/staff
- O Other

28. I am currently stationed in—
- O Continental United States
- O Alaska or Hawaii
- O Pacific or Far East (other than Hawaii)
- O Europe
- O Middle East
- O Panama, Caribbean, or Latin America
- O Other

29. I provide a logistics support function.
- O Yes
- O No

30. My education level is—

Civilian
- O Less than high school
- O High school or GED
- O Some college, no degree
- O Associate degree
- O Bachelor's degree
- O Master's degree
- O Doctoral degree

Military
- O MEL 1
- O MEL 2
- O MEL 3
- O MEL 4

Thank you for taking the time to complete and submit this survey. Your ideas, comments, suggestions, and recommendations are important to us, and the questions you have answered will help us improve our service to you. If you have a specific question that you want us to answer, please send by e-mail to alog@lee.army.mil.

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ADAMS: Can You Get There From Here Without It?

by Lieutenant Colonel F. Keith Jones

A complicated system can help simplify strategic deployments for NATO countries.

If you and a few hundred of your closest friends wanted to travel to far-off places in Europe, how would you get there? Well, if you knew ADAMS and had some form of strategic transportation, vehicles for traveling around the theater, and supplies, you and your friends could be on your way! I want to tell you about ADAMS (the Allied Deployment and Movements System), its origin, the different modules that comprise it, and how you can use it to complete your travel plans within North Atlantic Treaty Organization (NATO) countries.

Origin

ADAMS was developed to fill the need for a standard European deployment tool that all NATO nations could use. The computer information system personnel at the NATO Consultation, Control, and Communications Agency (NC3A), The Hague, the Netherlands, were tasked to develop a prototype deployment system capable of providing the theater commander with strategic deployment information on the dates, times, locations, and equipment of arriving forces. The parameters specified a stand-alone system and a local area network (LAN)-capable, Windows-type environment that would be user-friendly for all member nations. (At the time, there were 16 countries in NATO, but the addition of the Czech Republic, Hungary, and Poland brings the total number to 19.) Encryption capabilities were required also, because many nations prefer to keep information on their forces classified.

Design Hurdles

The task did not seem too complicated until the various types of equipment and the multiple data bases of equipment information in European armies were considered. To handle and read these separate data bases, the NC3A developed a common data base that breached the multiple systems in use. Then they developed an internal data base for the various modes of conveyance. This was a large task considering the various sizes of trucks, railcars, and planes many European nations own and contract.

Another consideration was the emergence of new Russian, former Eastern European, and non-NATO friends after the end of the Cold War. NC3A had to consider all the transportation equipment they might wish to contribute to a NATO deployment as Partnership for Peace nations. These new friends required larger, more complex data bases for their information.

Still another issue that had to be addressed was increments of measure. Most Europeans used the metric system of measurement, but the largest troop-contributing nation, the United States, used the British (Imperial) system of measurement. This meant that all measurements by United States forces and any other forces using the Imperial system of measurement had to be converted to the NATO metric standard.

These were only a few of the problems that surfaced while figuring out how to compile information on the forces. A bigger problem was gathering information on

all possible deployment nodes within and *outside* of Europe. According to an early 1990's change in NATO doctrine, NATO forces must be prepared to deploy to operations outside of Europe. This was another big change that affected how ADAMS was developed. How would data base information on ports of embarkation (POE's) and ports of debarkation (POD's) be provided?

Establishing this data base required all participating nations to input specific POE and POD data into the system for use in planning and executing deployments. This requirement, along with information on types of strategic transportation assets, various national forces, and national infrastructures, meant that there was an extremely large programming requirement for numerous simultaneous tasks and a need for a large quantity of computer storage space.

The tasks mentioned above were not insurmountable when viewed from the larger perspective of NATO as an institution. But if you have ever tried to get something done that required agreement from more than one person, you have some idea of the difficulty of getting the 19 NATO nations to agree on a single, standard computer system dealing with deployments of their national forces. What was important to one country was not necessarily important to another. This was the type of environment within which the NC3A worked while developing and refining ADAMS.

What ADAMS Is Not

ADAMS is not a movement control program. It cannot manage the movement of forces past their final destination. ADAMS provides visibility of movements projected or reported over time rather than real-time movements; it does not provide real-time intransit visibility (ITV). During the development of ADAMS, ITV was considered but not incorporated, because the changes required to make ADAMS compatible with current ITV systems within the various nations were small and relatively insignificant.

What ADAMS Is

What does ADAMS do for a strategic deployment? ADAMS is NATO's answer to both the Transportation Coordinator-Automated Command and Control Information System and the Joint Operations Planning and Execution System rolled into one system. It was designed for planning and monitoring strategic deployments within NATO's area of responsibility.

ADAMS allows nations to submit detailed deployment plans (DDP's) on forces contributed to any deployment. It permits Supreme Headquarters Allied Powers Europe (SHAPE) to activate an allied movement coordination center to review these national deployment plans and, if required, deconflict movements into the theater's POD's. During this deconfliction process, there is direct dialogue and coordination between the troop-contributing nations and SHAPE on the forces' arrival into theater. This is a very delicate and time-sensitive process. SHAPE does not want to discourage troop-contributing nations from providing forces, but it does want to manage the arrival of forces based on the commander's operational preferences and future force order of implementation. Deployments at this level also must be managed because there often are restrictions at the reception ports. A majority of these ports have limited infrastructure, equipment, and space, which influence the number of forces arriving in the theater of operations. ADAMS monitors deployments to the unit's final staging area, which is similar to what is done with the Joint Flow Analysis System for Transportation used by U.S. regional commanders in chief to project U.S. deployments based on operational plans.

ADAMS Components

ADAMS is divided into seven specific components—

- Geo Manager Module (GEO).
- Force Data Management Module (FDM).
- Supply Package Module (SPM).
- Transport Asset Module (TAM).
- Deployment Planning Module (DPM).
- Deployment Display Module (DDM)
- General Deployment Model (GDM).

When integrated, these seven modules become the final product—the deployment plan. A key point to remember with ADAMS is that all data entries must be completed in a logical sequence, using a step-by-step process. This is a part of the NATO standardization procedures. If this sequence of steps is not followed, problems occur later when information is compiled and transmitted.

The GEO module allows access to the geographical location management data base, which contains the latitude and longitude of the locations from which units will deploy. This module lists and updates the logistics links at a specific geographical location (the transportation modes the location will accept). This information is used later in the DPM module. The GEO module also provides information on the infrastructure of the location, which can be added to the data base. This allows specific details to be input that show the characteristics for each deployment location. The information is different for each location, and there are specific data windows for entering these data into the system. It also is possible to create sets of maps and transportation networks in a Program Evaluation and Review Technique-type diagram (PERT chart) using the GEO module.

The process of identifying forces and associated equipment needed for possible deployment begins in the FDM module. This module allows nations to input specific equipment data—basically all of the information

that is contained on the equipment data plates. Then new force lists are created, or old lists are updated. These lists contain all of the details about various types of units. After this information is input, the selection, or building, of the deploying force can begin. The force selection process allows the building of the force scheduled for deployment and the selection of its equipment and personnel.

There are four items commonly associated with building a force: the plan for the operation; the statement of requirements developed by the operational staff and used by the nations to identify the forces they will contribute; national force contributions (the forces a nation will contribute to support an operational plan); and a disposition list (called either an allied or national disposition list), which matches force contributions to requirements.

Once the building of forces in the FDM is complete, the list of forces and their equipment and structure can be updated, and any forces that have become unnecessary due to mission changes can be deleted. FDM combines the force selection process and the equipment data portions of the data bases in ADAMS. The FDM allows the operator to allocate the national force contributions according to the plan.

The SPM is stored in the central data base and is used to determine consumption rates. This module uses standardized consumption rates based on climatic and environmental conditions, types of operations, vehicles, and unit organizational structures. It allows planners to determine supply requirements rapidly for the deploying force. This module also determines the transportation requirements for supplies based on the consumption factors stored in the data base and allows this information to be incorporated into the deployment plan.

The TAM lets each nation establish a national transportation asset data base. The TAM is one of the most important data bases, because it is where ADAMS maintains the transportation asset portions of each deploying nation's equipment and facilities. This data base and the editing modules in GEO, FDM, and SPM make up the ADAMS data base management modules.

Planners use the DPM most often. This is where the DDP is constructed for the national force list. In this module, forces are organized based on method of deployment, such as advance party, and matched to their mode of transport. Assets then are assigned for deployment, planning for estimated supply packages is completed, and time schedules are arranged based on the method of deployment into the theater. The DPM, which facilitates planning of movements by all modes from all available facilities, becomes the brains of ADAMS. In the DPM, determinations are made on transportability and height and width restrictions, which influence the types of assets that will be sent and the routes they will follow into the theater.

Using the DDM, ADAMS performs major analysis and deconfliction of the proposed movements in accordance with the DDP's. ADAMS examines the DDP and uses the system to deconflict national movements. This is done to equalize the use of various reception nodes based on their capabilities rather than on force flow.

The GDM is a simulation model that uses many "what if" scenarios to develop various options to the basic plan. This model evaluates the "what if" of possible changes to deployment assets, infrastructure, and timelines based on the existing plan. After these scenarios are run, the results can be analyzed to determine the effects of changes on the basic plan. This is a valuable tool for planners to use because of the constant changes that normally occur before a deployment. Commanders derive the most benefit from this option as they refine their plan, because they have the opportunity to see what effect changes have on the basic plan.

In this article I have presented only a broad-brush picture of ADAMS. For a more detailed description, contact the NC3A and request a tutorial manual on ADAMS. You may wish to request a national slot for a comprehensive 1-week training session conducted four times a year at SHAPE Headquarters in Mons, Belgium. One thing to remember about operating ADAMS: It is a very perishable skill if it is not practiced continually.

Although it is a somewhat complicated system to learn, and one that must be used consistently to maintain proficiency, ADAMS has proven over time to be a very capable strategic tool. Can you get there from here without ADAMS? If you're in a NATO country, the answer is "no." ADAMS is a "must-have" tool for any strategic NATO deployment today or in the future. **ALOG**

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The Logistics of an Exercise

by Chief Warrant Officer (W–2) Dirk J. Saar

A lot has been said about readiness exercises. More often than not, these discussions focus almost exclusively on the tactical aspects of these events. The intent of this discussion is to analyze, identify, and describe the logistics of such exercises; in other words, the planning and preparation for an exercise. A readiness exercise does not occur simply because an operation order has been issued. Appropriate planning and preparation are necessary before the exercise can begin. Of course, the level of planning and amount of preparation required are proportionate to the magnitude of the exercise. In addition to magnitude, planning and preparation also depend upon the purpose of the exercise. In light of this, I'd like to discuss a recent deployment exercise, Firepower Deploy-Ex Phase I, that the 191st Ordnance Battalion, Miseau, Germany, conducted last December.

Firepower Deploy-Ex Phase I was the first in a series of exercises designed to test the battalion's ability to prepare, stage, and deploy its vehicles and equipment by rail, air, and road. For the purpose of this discussion, the exercise can be broken down into three major events: initial planning and preparation, support requirements determination and vehicle preparation, and after-action review. This was a phased deployment exercise, but because a company deployed and redeployed each day for a period of 5 days, some overlap in the phases occurred. However, whether deploying or redeploying, the required actions or tasks were essentially the same.

Initial Planning and Preparation

Early in the planning phase, the battalion commander, Lieutenant Colonel Paul R. Plemmons, formulated his intent for the exercise. Each company assigned to the battalion would plan, train for, and execute a deployment using ground and rail conveyances. Upon conclusion of the exercise, each unit would possess validated rail-load teams and updated movement folders that included load plans and convoy procedures. The exercise goal was to deploy 75 percent of the companies' rolling stock while maintaining a rear detachment capable of sustaining limited daily logistics support.

By defining the exercise goals, Lieutenant Colonel Plemmons provided the direction and purpose needed to guide the actions of the staff throughout the planning, execution, and completion of the exercise. Armed with the commander's intent, which equated to the "why and what" of the exercise, the battalion staff was able to start its work toward answering the remaining questions about the exercise: where, when, who, and how.

Although the exercise focused on developing and evaluating the ability of the battalion to deploy by rail and road convoy, the location to which the battalion was to deploy was also of some importance. The area selected had to be large enough to accommodate at least two company-size elements. Additionally, because of the self-imposed time limitations of the exercise, the site selected needed to be relatively near the home station but far enough to provide viable convoy training. The battalion staff considered several locations: Baumholder,

☐ **The preventive maintenance inspection team conducts vehicle inspections.**

Grafenwoehr, and Breitenwald Training Areas and a site located in Mannheim. Of those considered, Breitenwald Training Area was finally selected as the best choice for Firepower Deploy-Ex Phase I.

The exercise originally was slated to take place in conjunction with range density week and common task testing in October. Scheduling difficulties with the Baumholder range control office made this impossible. So, based on guidance from the battalion commander, the exercise was scheduled to take place in Breitenwald 30 November through 4 December. This timeframe was selected because it was after Thanksgiving and before any major holidays in December.

Although the 191st Ordnance Battalion consists of six modification table of organization and equipment (MTOE) company-size units and several table of distribution and allowances (TDA) activities, the decision was made early in the planning process that the TDA activities would not participate in the deployment exercise. Instead, these activities would continue to perform their daily missions and, whenever possible, the missions of the units participating in the exercise. Additionally, the TDA activities were charged with providing logistics support to the deploying companies.

Of the six MTOE companies assigned to the battalion only three are collocated with the headquarters. The others are scattered across Germany, with the farthest, the 702d Ordnance Company (Explosive Ordnance Disposal [EOD]), in Grafenwoehr. This dispersion made it impractical for all assigned companies to participate in the exercise. As a result, only those units located in the Kaiserslautern-Heidelberg area—Headquarters and Headquarters Detachment (HHD), 191st Ordnance Battalion; 23d Ordnance Company; 563d Ordnance Company; 5th Quartermaster Detachment (Airdrop); and 720th Ordnance Company (EOD)—participated in the exercise.

One of the first tasks that had to be accomplished was to identify the vehicles that would be rail-loaded and used to convoy to the selected field site. For this, the S4 section relied almost exclusively on input from the companies. Each unit submitted an equipment density listing. Equipment lists were transcribed to an Excel spreadsheet, where the data were supplemented with vehicle dimensions extracted from Technical Bulletin 55-46-1 on CD ROM. Once complete, a draft copy of the spreadsheet was submitted to the branch movement control team (BMCT) in Kaiserslautern for their initial review. The BMCT faxed a copy to the movement control team (MCT) in Karlsruhe that handles the actual coordination of the required trains. Concurrently, copies were sent to the participating units for last-minute changes and approval. Later that day, the MCT contacted the battalion movement officer to discuss vehicle configuration requirements for rail-loading. During this review, they discovered that several oversized vehicles would have to be reduced in size before rail-loading so they could pass through tunnels and underpasses on the movement route.

Before the vehicle density lists were submitted, the battalion contacted the BMCT to discuss the feasibility of conducting a rail-load exercise. To meet the commander's stated intent for the exercise, units needed to be able to load vehicles and selected equipment onto railcars and have the loads certified by a German Federal Railway System wagon meister. Once certified, the trains were to travel to a turn-around point and return the same day for offloading and onward movement by road. At one point, the question arose whether there was a need for the train to move. It would be cheaper to have 20 railcars pre-positioned at the railhead in Miesau and have units practice loading and offloading without moving the cars. Notwithstanding cost concerns, it was decided that the sense of urgency soldiers experience during an actual deployment could not be replicated by loading equipment onto static railcars. Consequently, the BMCT was told that the railcars, once loaded, would need to be picked up, taken to a turn-around point, and returned to Miesau the same day for offloading. The BMCT was very responsive to our requirements and assured us that they could support most any type of training event as long as they were given adequate time to plan and prepare.

Unfortunately, all the planning in the world is wasted unless adequate funds are available to implement the planned actions. During the early part of 1998, when the battalion submitted its budget request for fiscal year 1999, the cost requirements for Firepower Deploy-Ex Phase I were not considered. Hence, no funds were identified to conduct the exercise. The S4 contacted the resource management office to inquire into how the planned exercise could be funded. The resource manager and the property book officer researched the situation and found funds earmarked for the purchase of MTOE authorized equipment that no longer was needed because of lateral transfers, planned unit inactivations, and changes in authorization documents. Approximately $10,000 was needed to conduct the exercise; cost savings realized through the decrease in the funds required to support equipment shortages freed up more than $30,000.

Once changes requested by the units and the BMCT had been made to the equipment lists and a fund cite added, the approved lists were resubmitted to the BMCT to coordinate and schedule the trains. It was not long, though, before the MCT contacted the battalion movement officer to report that, because of the variations in train size required to support each participating unit, the German Railway Company could not support daily departures. Instead, it was suggested that a train depart

☐ **The 5th Quartermaster Detachment loads their vehicles onto railcars.**

every 2 days, thus giving the railway company adequate time to reconfigure the trains during the off day to prepare for loading and departure the next day. This suggestion was adopted, and rail-loading schedules were changed accordingly. More specifically, rather than train departures occurring daily, starting with the loading of the HHD on 30 November, units were rescheduled to load trains in accordance with the times listed in the table below. However inconvenient this change may have been, it was not a showstopper and had very little effect on the convoy schedule.

While coordination of rail support was underway, arrangements were being made for the convoy movement called for in the exercise operation order. U.S. Army, Europe (USAREUR), Regulation 55-1, United States Army Motor Vehicle Operations on Public Roads, governs the movement of vehicles on German highways (autobahns). This document and USAREUR Regulation 55-26, Unit Movement Planning, were indispensable in planning the convoy movement that occurred during Firepower Deploy-Ex Phase I. These regulations set forth the actions required of the battalion movement officer to carry out the convoy portion of the exercise. For example, when traveling on the autobahn in a convoy formation, movement authorization (convoy credit) is not necessary unless the convoy includes either oversized vehicles or more than 30 vehicles. The largest convoy that the battalion was going to move at any given time during the exercise consisted of 18 vehicles. So, from that perspective, convoy credits were not needed. But because the convoys included oversized vehicles, the battalion had to submit requests for convoy credits. These requests were sent to the highway movement control team in Mainz, where they were approved and faxed to the battalion S4 within 4 working days.

Briefings and "rock drills" are integral parts of the planning process. These events are used to review progress, answer questions, and discuss possible problems and opportunities. This exercise was no different and included its share of briefings and a rock drill. During the rock drill, the battalion S4 officer laid out the staging area, convoy route, and vehicle inspection, rail-load, and field sites. In addition, specific movement information was discussed, such as when unit vehicles would be inspected, when vehicles would be rail-loaded, and when convoy movements would begin. The rock drill was a forum in which the battalion commander was kept up-to-date on the progress of exercise planning, unit commanders and unit movement officers could ask questions, and concerns could be addressed. As such, the rock drill could be considered one of the most important tools in the planning process.

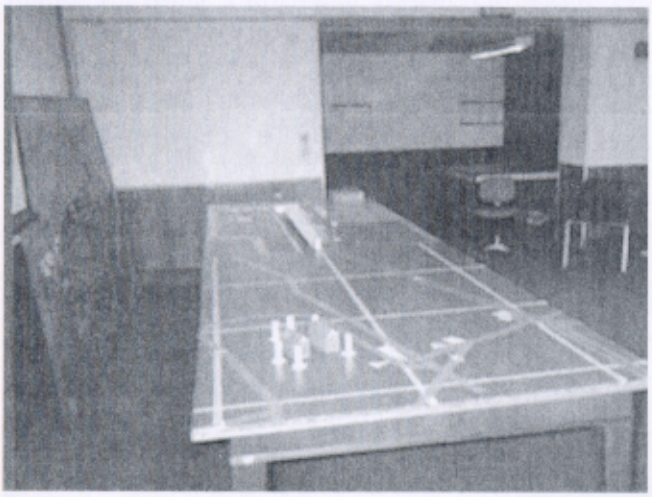
Support Requirements Determination

With these "irons in the fire," the battalion S4 moved on to the task of identifying the equipment and tools that might be needed for the rail-loading operations and road movements. Of particular concern were the requirements for blocking, bracing, and tie-down (BB&T) materials. Because the exercise was scheduled with very little advance notice, it was not certain that the battalion would have enough BB&T on hand or would be able to acquire it to support the number of vehicles to be rail-loaded. The intent was to load more than 70 pieces of rolling stock. To secure this number of vehicles on the railcars required a substantial amount of BB&T.

USAREUR Regulation 55-26 and USAREUR Regulation 55-8, Loading and Securing of Military Wheeled and Tracked Vehicles on European Railcars, were used as references to identify the type and quantity of BB&T needed to support our requirements. For example, to load and secure one high-mobility, multipurpose, wheeled vehicle properly, the battalion had to have 8 wooden chock blocks, 4 turnbuck-

Unit	Preventive Maintenance Inspection Date/Time/Place	Vehicle Staging Date/Time/Place	Safety Briefing Date/Time	Uploading Date/Time
HHD 191st ORD	23 Nov / 0900 HHD motorpool (M/P)	30 Nov / 0600 Railhead	30 Nov / 0615	30 Nov / 0630
720th ORD	30 Nov / 0800 Transportation M/P	30 Nov / 0830 Railhead	30 Nov / 0845	30 Nov / 0900
5th QM	24 Nov / 1300 5th QM M/P	30 Nov / 0900 Railhead	30 Nov / 0915	30 Nov / 0930
23d ORD	30 Nov / 0900 23d ORD M/P	2 Dec / 0600 Railhead	2 Dec / 0615	2 Dec / 0630
563d ORD	24 Nov / 0900 563d ORD M/P	2 Dec / 0600 Railhead	2 Dec / 0615	2 Dec / 0630

☐ **Unit rail-loading schedule.**



☐ During the rock drill, the battalion S4 officer laid out the staging area, convoy route, and vehicle inspection, rail-load, and field sites.

les, 4 15-foot pieces of wire rope, 4 metal clamps, 4 shackles to attach the turnbuckles to, and between 32 and 48 nails, depending on the wagon meister present during the rail-load operations. Multiply these items by 70 (the number of vehicles the battalion was loading), and that is a lot of material.

Fortunately, as a result of previous deployments, the battalion had most of the needed materials on hand. Only chock blocks and shackles had to be acquired. For the chock blocks, the movement officer coordinated with the support operations officer and the carpenter shop at Miesau Army Depot. The carpenter shop is one of the TDA activities that support the depot's ammunition operations. This very busy section went out of its way to make the chock blocks on short notice. As for the shackles, a couple of hard-charging noncommissioned officers coordinated with the Kaiserslautern Industrial Center (KIC) for their issue, and, as always, KIC came through despite the last-minute request.

Once all of the necessary materials were available, they were placed inside a warehouse where participating units picked up the materials they needed to rail-load their equipment. At the last in-process review, the 23d Ordnance Company's first sergeant pointed out that trestles would be needed to secure some of the trailers that were being rail-loaded. The carpenter shop was contacted again and asked to manufacture five trailer trestles.

USAREUR Regulation 55-1 made determining the type of equipment needed to conduct convoy operations easy. Each convoy needed two rotating amber warning lights (RAWL's), two convoy signs indicating a convoy in English and German, and three convoy flags (green for the lead vehicle, blue for the last vehicle, and black and white for the convoy commander). The battalion had enough of everything except for the RAWL's. Attempts to acquire the needed warning lights through local purchase before the exercise started were unsuccessful. So the battalion used existing RAWL's for convoy operations.

Vehicle Preparation

The equipment to be deployed rates second in importance only to the soldiers who operate it. Just as soldiers must undergo various inspections or processes to ensure that they are fit and prepared for deployment, the vehicles identified for movement also must pass inspection.

In the 191st Ordnance Battalion, the maintenance section is charged with ensuring that battalion equipment is ready for movement. To meet this obligation, the battalion maintenance officer and battalion maintenance sergeant established a preventive maintenance inspection team (PMIT). The mission of a PMIT is to ensure that all equipment either destined for the field, used for daily missions, or being deployed by air, ship, or ground has received required preventive maintenance checks and services; has been properly dispatched; is safe to operate; and is in a high state of readiness. The PMIT accomplishes this by conducting maintenance inspections during emergency deployment readiness exercises, unannounced roll-outs, roadside spot inspections, prerail and air-load inspections, and at the request of the battalion commander. Because the PMIT inspects vehicles and equipment regardless of which unit owns them, the composition of the PMIT reflects this battalion-wide mission. Hence, the PMIT consists of the battalion maintenance officer, the battalion maintenance sergeant, and the company motor sergeants.

During Firepower Deploy-Ex Phase I, the PMIT traveled to the inspection sites identified in the operation order and inspected every vehicle that participated in the exercise. Those vehicles that did not pass initial inspections were sent back to the owning unit for repairs and were reinspected after repairs were completed.

After-Action Review

Overall, the exercise was considered a success. The commander's intent was met. Units involved were able to validate their rail-load teams by participating in a realistic operation, and movement folders, including load plans, were updated. All of the soldiers who participated in the exercise were excited and enjoyed the training. Nevertheless, some minor problems that needed to be corrected were identified during the operation.

First, let us consider the way the vehicle density lists were created. Units manually prepared the density lists,

☐A German Federal Railway System wagon meister inspects loaded train.

some of which were submitted on scrap paper. The best approach to this task would have been for unit movement officers to update their automated unit equipment lists (AUEL's) using the Transportation Coordinator-Automated Command and Control Information System (TC–ACCIS) and to create deployment equipment lists (DEL's).

TC–ACCIS is a transportation information management system used to create AUEL's and DEL's for Army units. These lists include a wealth of information that is essential for scheduling road and rail deployments. For example, the AUEL and DEL identify the length, width, height, and weight of the equipment to be moved. The primary difference between an AUEL and DEL is that an AUEL lists all of a given unit's deployable equipment and a DEL lists only those assets that actually will be deployed. Once a unit has been notified of an impending deployment and the commander has decided what force package to send, unit movement officers should travel to their nearest TC–ACCIS site and create a DEL for the operation. This procedure requires that the unit have an updated AUEL (a quarterly requirement in USAREUR). Using TC–ACCIS during exercises streamlines the movement planning process and ensures that the units have correct movement data in the form of an updated AUEL should a real-world deployment be looming around the corner.

The second problem identified during the after action review was site preparation. During initial planning and coordination, the need for warming tents, hot soup, coffee, and floodlights was established, and responsibilities for them were assigned. However, on the first day of the exercise, the stoves in the warming tents were not lit until over 2 hours after the operation started; coffee and soup were not immediately available; and the floodlights were not turned on until daybreak, when they were no longer needed. Fortunately, these problems were corrected by the time the next unit had to load trains. In addition to these problems, the first unit to load underestimated the amount of time it would take to clear snow and debris off the railcars, resulting in an hour delay in loading. Luckily, the train schedule provided some flexibility, which kept the operation on track and allowed units to meet their convoy times.

Finally, once actual loading started, it became apparent that some units were not prepared. For example, one unit did not have the right tools, such as hammers and crowbars, to do the job; one unit did not bring nails; and another brought the wrong type of chock blocks. The plan called for the use of metal chock blocks for vehicles weighing 2½ tons or more. Because of time constraints, the unit concerned was permitted to use wooden chock blocks.

Aside from the lack of an adequate number of RAWL's and convoy flags, the convoy portion of the exercise exceeded everyone's expectations.

As a result of the problems identified in the after-action review, the battalion decided to create standard rail-load and convoy kits. Despite the problems, however, Firepower Deploy-Ex Phase I was a success and confirmed the battalion's ability to prepare, stage, and deploy itself in times of crisis.

A training exercise does not begin or end with the planned activity. An extensive amount of coordination, planning, and preparation goes into executing a deployment or readiness exercise. Even on a small scale, the preparations required are extensive. Lessons learned during an exercise serve as a basis for improving future endeavors. **ALOG**

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Stairstep Technologies in the Supply Support Activity

by Major Peter D. Crean

In every major deployment in its history, the Army has had problems with effective logistics distribution. These problems reached epic proportions in World War II, Vietnam, and the Persian Gulf War, where soldiers at the front often had to "scrounge" for needed equipment while ports of embarkation and debarkation were overcrowded with supplies waiting to be processed and moved forward. This tendency, coupled with large fiscal and personnel cuts in the last 8 years and a revolution in the civilian transportation industry, have forced the Army to reassess how it distributes supplies, in both peace and war.

The Army is experimenting with several technologies that can improve distribution management. Three key "stairstep" technologies that are found in the supply support activity (SSA) are the bar code, the optical memory card (OMC), and the radio frequency (RF) tag. SSA's in U.S. Army, Europe (USAREUR), lead the Army in using these new technologies, but not without difficulties.

Definitions

Some key components of distribution management systems used by the USAREUR SSA's are—

Automated Manifest System (AMS). AMS is an integrated automatic identification technology (AIT) that consists of OMC's, RF tags, and bar code scanning capabilities. AMS automates standard Department of Defense (DOD) transportation and supply functions, such as breakbulk, receiving, issue, freight consolidation, redeployment, and retrograde operations.

Bar codes. A bar code is a bandwidth of sequential lines that is read by lasers or lights to transmit data to a data base for processing. Bar codes are usually either linear or two-dimensional (2–D). Examples of both types can be found on the back of the U.S. military identification card (DD Form 2). The linear bar code is the one found below the date-of-birth block on the DD Form 2, and the 2–D type is found below the date-of-issue block.

Optical memory card. Also called an AMS card, an OMC is a credit-card-sized AIT component that provides electronic supply and transportation information. The OMC can interface with the Standard Army Retail Supply System (SARSS) for automatic receipt processing. It has a data capacity of up to 2.8 megabytes but cannot be erased and reused.

Radio frequency identification (RFID) equipment. RFID refers to a system consisting of tags, an interrogator (reader), a computer, and a docking station. It is an omnidirectional data collection and storage device that uses radio frequencies to read and transmit data. RF tag information can be sent to a data base either by conventional phone lines or by international maritime satellite. The standard SAVI systems RF tag currently used in DOD has 256 bytes of standard memory storage and 128 kilobytes of extended data storage capacity.

Movement Tracking System (MTS). Also called Defense Transportation Tracking System or Defense Transportation Reporting and Control System, the MTS is an adaptation of civilian equipment that uses satellite communications to provide visibility of the location of transportation assets, engine and systems status, and e-mail communications with the vehicle operator.

Intransit visibility (ITV). ITV refers to the ability to track the identity, status, and location of DOD unit and nonunit cargo and passengers from point of origin to the designated consignee or destination.

Lessons From the Past

To meet the logistics challenges created by a smaller force with increased deployment responsibilities, the Army has had to rethink battlefield distribution. In the last 9 years, Operations Desert Shield and Joint Endeavor have shown how far the Army has progressed to meet the new challenges. The logistics portion of the Operation Desert Storm deployment, though successful, is arguably a case study in how *not* to support a theater of war. At the beginning of the conflict, the Army had no standardized procedures for packing, marking, shipping, and tracking containers and equipment into the theater. As a result, the port of debarkation quickly became overloaded.

When the Army deployed to Bosnia for Operation Joint Endeavor 5 years after Desert Storm, overcrowding

was avoided, because the senior logisticians took steps to control the flow of supplies and equipment moving into the theater. Every container sent from Germany to the intermediate staging base (ISB) in Hungary, and on to Croatia and Bosnia, had an RF tag affixed to it that identified its owner, destination, and contents. The 574th Supply Company's mission was to run the container-holding yard in the ISB. Through the use of RF technology, the 574th was able to maintain absolute accountability of thousands of equipment items and supply containers.

Problems With Stairstep Technologies

The Army developed the AMS to increase the velocity of a wide range of supply and transportation functions. However, simply attaching an RF tag to a container does not solve the Army's distribution management problems. First, a soldier must scan the bar code stickers attached to the items he intends to ship as he builds the pallet or stuffs the container. The materiel release order control system (MROCS) bar-code scanner interfaces with a variety of supply and transportation systems to consolidate data and produce OMC's. OMC's accompany the container or pallet to its destination and provide total asset visibility (TAV) of the shipment's contents. The cards enable the destination SSA to do a batch receipt of the supplies, thus saving hours of labor otherwise needed to process each item individually. OMC's can be used to "burn" data onto RF tags that provide ITV of the container as it moves through the transportation system.

Together, the three stairstep technologies show where supply containers are located (ITV) and what they contain (TAV). Linear bar codes only give information about a specific item in a load and do not provide ITV or TAV. OMC's give TAV information about a container but cannot provide ITV during shipment. Military RF tags provide ITV but do not have enough memory to hold TAV data. Because they do not have a direct interface with SARSS (or, in the future, the Global Combat Support System-Army), military RF tags do not allow for automatic receipts when shipments arrive at SSA's.

USAREUR Dilemmas

At the distribution management center (DMC) in Kaiserslautern, Germany, I worked with the theater distribution center (TDC) on a daily basis. The TDC serves as a transportation hub for all interdivisional referrals, all military airlift supplies coming into Europe from the United States, a limited amount of supplies for the DOD Dependent Schools system and the Army and Air Force Exchange Service, and supplies going to Operation Joint Forge in Bosnia by ground transportation. A common problem at the TDC is maintaining the accuracy of data on loads moving through the hub.

Typically, air pallets received from the United States are properly packaged with bar codes, OMC's, and RF tags, allowing for expeditious processing and visibility of cargo as it moves through the TDC. For various reasons, many SSA's do not have the capability to create OMC's and RF tags. Those SSA's have to process referrals with hard-copy documentation only. Therefore, cargo coming into the TDC from within the theater as a result of referrals from SSA's has only hard-copy documentation, which causes processing delays and lost visibility. At the TDC, shipments are broken down and sorted by destination DOD Activity Address Codes (DODAAC's). During the sorting process, cargo from many sources is consolidated for shipment to a final destination. Cargo coming into the TDC with OMC's is mixed with cargo accompanied only by paper documentation.

The TDC's mission is to ship cargo through without delay. Cargo that arrives with only paper documentation is not entered into the TDC's data base, because that can be both a timely and labor-intensive process. As a result, no data on items manifested with paper documentation are captured on an outbound OMC produced by the TDC. To further complicate matters, a batch receipt accuracy problem is created when the nonautomated cargo arrives at an SSA in the same container with items accompanied by OMC's. When this happens, the receiving SSA cannot use the OMC to conduct a batch receipt action for the supplies and SSA personnel lose confidence in the technology.

While building an OMC is not difficult, it is an additional step for SSA soldiers. When SSA's lose confidence in technology, they are less apt to take the time to create OMC's for cargo departing their facilities. OMC's also can be lost easily or separated from their load. Many of the multipack loads coming into the TDC contain separate OMC's for each consignee. The cards easily become separated from their corresponding cargoes, and time is lost sorting them out again. The result is lost time in shipment or loss of asset visibility.

Improved Confidence and Readiness

RF tags are used widely in USAREUR. In Operation Joint Endeavor (which later evolved into Joint Guard and then Joint Forge), over 20,000 RF tags were used between December 1995 and July 1998. Because RF tags provide real-time location data over the Internet about customer shipments, many units use RF data on a daily basis. Units that understand the benefits of RF technology typically place great confidence in the accuracy of data it provides, both for TAV and ITV.

To get the most current information on the movement of critical maintenance repair parts, SSA's can use an RF interrogator to access a USAREUR data base that is

kept current by established sites, both in the United States and in Europe. The 1st Armored Division used data provided from RF technology to improve readiness and build confidence among its units in the supply and transportation system. Because they were confident that the part was on its way, they could reduce stocks on hand and avoid reordering, which allowed them to save money.

Using RF technology also can improve readiness. For example, in the 1st Armored Division, one brigade uses RF tag data instead of SARSS or Logistics Intelligence File supply data to gain the most current supply status and improve its maintenance readiness.

While the Army is migrating toward RFID, we currently do not make full use of that technology. The United Parcel Service (UPS) uses an international distribution hub-and-spoke-style operation that is similar to the one used by USAREUR today. UPS does not use OMC technology of any type. All cargo moving through the UPS system is marked with and tracked by bar codes and RF technology. The bar code is scanned into a local Windows-based data base that feeds the central UPS data base at various times during a 24-hour period. The system has real-time query capability that permits tracking of specific items, even between scheduled data feeds. The ITV of cargo is provided by a system of RF transponders located at 24 locations in the UPS hub and on each of their delivery trucks. The individual truck driver has an electronic clipboard that the customer signs (with an electronic "pen" device) when the package is delivered. The clipboard documents that the customer has received the item and sends the information back to the data base using a RF and satellite uplink jack in the vehicle. Although expensive, the RFID system eliminates the need for OMC capability.

Overcoming Technological Challenges

If the Army adopted a suite of technologies that linked detailed supply data with applicable transportation data using bar codes and RFID, it could eliminate OMC's. However, this is easier said than done. Currently, the RF tags in the Army supply system do not contain enough memory to replace OMC's. This is not true in the civilian sector, as a scan of the Internet will confirm. (One site I visited recently lists more than 60 producers of RF technologies.)

Increased-capability RFID is only half of the equation. Current linear bar codes do not have the capacity to hold all of the supply data needed to populate a Standard Army Management Information Systems (STAMIS) data base. To do that, the current MROCS reader system would have to be updated to accept the newer, high-resolution, two-dimensional bar codes. These new bar codes can sustain damage and still be useful, while current linear bar codes are unreadable when even slightly damaged. This is an important factor when considering the field conditions in which forward SSA's often operate. Investment in two-dimensional bar code readers and associated technologies would keep pace with current trends in the civilian sector.

However, simply replacing OMC's with more powerful RF tags is not enough. If we want a truly seamless supply system, we have to know what is in the box and where the box is. RF tags provide visibility of what is in the box and the last known location by which the tag passed. However, they do not provide current data or the ability to redirect loads. MTS does that. By linking RF and MTS data to the supply and transportation STAMIS, we could achieve just-in-time logistics. Distribution managers on the battlefield could redirect supplies as they move on the main supply route to more urgent destinations.

The capital investment for these improvements is not cheap. Although the Army already is moving in this direction, fiscal constraints and conservative mindsets keep it from achieving a seamless logistics system. As we have seen with the OMC's, if even one SSA is not equipped with the complete suite of technologies, the system will not work. The Army will have to outfit all SSA's, transportation hubs, and maintenance facilities with the enablers at the same time in order for the system to work.

We are not far from the day when a supply clerk can process a requisition and follow the item through the supply and transportation systems by looking at one screen. As the UPS example shows, the civilian business sector is doing that now. The military only needs to adjust how it uses bar codes and RF tags to link ITV and TAV. A capital investment to purchase expanded memory RF systems and reconfigure STAMIS systems to accept 2–D bar codes can achieve that linkage in the near future. The payback will come in the form of a faster and more accurate distribution system. Investment in these technologies makes the concept of a seamless supply chain possible. **ALOG**

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Logistics and the British Defeat in the Revolutionary War

by Major John A. Tokar

When war erupted in the American colonies in 1775, the British Army was unprepared logistically. Compared to the logistics organization of the rebelling colonies, the British logistics system was, on the surface, the epitome of efficiency. Faced with a 3,000-mile line of communication across the Atlantic Ocean, Britain ensured that its soldiers were reasonably well equipped and never starved. Indeed, a logistics feat of this magnitude would not be repeated for over 150 years, until the Allied invasion of North Africa in World War II. However, significant shortcomings in the resupply system did exist, and before they were identified and corrected, they contributed significantly to the British Army's defeat.

An analysis of how Britain supplied its army, both from home and in the colonies, demonstrates how the presence, or absence, of critical commodities affects military operations. Ultimately, the lack of sufficient reserve supplies, combined with cautious generalship, insufficient transportation, widespread corruption, and the lack of a coherent strategy to maximize the potential support of British loyalists in the colonies, ensured British failure. These factors forced the British Army to fight a guerilla war—the only kind of war that the upstart United States could hope to win.

The British experience in the American Revolutionary War holds particular relevance for today's military. Even though there have been enormous changes in military technology and organization over the last two centuries, U.S. forces still struggle with many of the same issues that plagued the British resupply effort. Logisticians in a force projection army still confront the challenge of supplying forces over enormous distances, overcoming resource constraints, and relying upon host nation support. Most importantly, military operations still suffer when logistics is not planned in detail.

British Logistics Organization in the 18th Century

In the late 18th century, Britain had a system to support its widely dispersed colonial armies, but it was plagued with many internal problems. When that support system was pressured by a quick succession of overseas conflicts, these faults were quickly exposed. The British, to their credit, were able to correct many of the deficiencies before the end of the Revolutionary War, but not in time to win.

Three bureaucracies supported the colonial armies: the Treasury Department, the Navy Board, and the Ordnance Board. When hostilities began in North America, the Treasury Department had overall responsibility for supplying the army. A division of labor did exist, but it was not rigidly maintained, and there was some duplication of effort. In addition to overall coordination, the Treasury was responsible for food supplies, including forage for animals. The Navy Board was responsible for transport of infantry and cavalry soldiers, clothing, hospital supplies, and tents and other camping equipment. The Ordnance Board was responsible for artillery, guns, and other ordnance stores, including ammunition, and engineers.

The Treasury Department was not well prepared for the initial stages of war. The British Army at the time was primarily a colonial garrison force, and there was no general staff in England to serve as a central command. In fact, there were no army officers in the chain of command above the regimental level before the Revolutionary War. The result was a sharp learning curve for those appointed to staff positions in the various boards and departments created to support the army in the field. The Navy Board was slightly better organized than the Treasury, probably because of Britain's preeminence as a sea power.

The Quartermaster General and his department had existed in the British Army since 1689, and the Quartermaster Department was the army's senior service department. But unlike today, when quartermaster duties are strictly logistical in nature, the British Quartermaster General of the 18th century had other duties. He was primarily a "chief of staff" to the Commanding General, and supply issues were only one of his areas of concern. He also was responsible for coordinating all the other staff agencies (such as intelligence and operations) and served as a troop commander when the army went on the offensive. Obviously, it was difficult for him to devote the proper attention to matters of supply.

The Commissary was the next largest department in

the service corps. The Commissary General was a civilian, and his staff in the colonies gradually expanded to about 300 men. Procurement of fresh food became the primary supply problem of the war for the British. Unfortunately, this department was traditionally rife with corruption, and the first Commissary General, Daniel Chamier, was not only dishonest but also incompetent. Chamier's biggest failing was an inability to report accurately the total number of individuals in the colonies who required rations. The Treasury could only base its ration acquisition and shipping requirements on the numbers supplied by Chamier. Largely through ineptitude, the total requirement sent to England by Chamier was routinely short by an average of 4,000 rations; it also failed to account for officers, wives, children, refugees, and others who were entitled to army-provided rations.

The Barracks Master General not only was responsible for ensuring that the troops were quartered properly in garrison, but he also had to provide them with the tents, cots, stoves, and other camping gear they needed to live in the field. He was responsible for providing fuel (first firewood, then, later in the war, coal). The Barracks Master General, like many of the army's service support corps, was likely to exploit his position for personal gain. Medical and Engineer departments rounded out the Commanding General's support staff in the colonies.

Corruption and Profiteering

Corruption and profiteering were rampant in many areas of the British logistics organization. The British Army's service corps had no shortage of unethical individuals in its ranks. However, many practices that we define as corrupt today were not crimes under British law, and they rarely were considered to be morally or ethically wrong in the 18th century.

Commissaries routinely kept the "fifth quarter" of butchered livestock for themselves, that being the head, hide, and tallow. These parts then would be sold for personal profit. Such sales were deemed acceptable, but they invariably led to more unscrupulous acts. A common practice among the contractors in England who provided food for shipment, as well as the commissaries in the colonies, was to furnish quantities of dry goods (such as flour or rice) that were less than the standard measure. Barrels of flour could be short as much as 10 percent. No record exists of what eventually happened to the millions of crates, boxes, barrels, bags, and other containers shipped to America. Much of their contents arrived in very poor condition and would have been disposed of, but one can assume that the commissaries sold much for profit.

Another policy heartily abused by the Commissary General and his men concerned captured cattle. Since fresh meat was in great demand, the army agreed to pay soldiers one dollar (1/2 pound sterling) per head for cattle brought to the commissaries for army use. However, the Commissary General routinely paid the soldiers the dollar they were owed from his own pocket and then sold the livestock to the army at market value, thus making a considerable personal profit.

Similarly, the practice of reimbursing civilians for commandeered provisions was converted into a moneymaking scheme for the men of the commissary. If the army in the field had to commandeer provisions from local farmers, the soldiers were supposed to provide each farmer with a receipt to take to the commissary for reimbursement. However, the locals rarely appeared to claim the money they were due, either because they were afraid or because they were convinced that reimbursement was unlikely. The commissaries then pocketed the money set aside for the farmers and reported the claims as paid.

Transportation was another source of corruption and profiteering in the British logistics system. A Parliamentary commission appointed to review the expenditure of public funds in 1781 discovered that the majority of wagons and horses hired to support the British Army in America were owned by officers in the Quartermaster General's department. These were the same officers who were responsible for doing the hiring, which by today's standards would constitute a clear violation of ethics. The total cost of land transport from 1777 to 1782 averaged over 200,000 pounds a year. The owner of 50 four-horse wagon teams could expect a profit of nearly 10,000 pounds annually, a very considerable sum for that time. Although this and other profitable practices were not necessarily crimes by 18th century standards, there is evidence that many of the officers knew that what they were doing was improper. As historian R. Arthur Bowler observed, "They went to some lengths to conceal their ownership and even, when defending the system of hiring wagons before a board of general officers in New York in 1781, did not reveal their proprietal interest in the service."

Most major forms of profiteering and corruption were brought to a halt by 1780, but the damage had been done, and the precedents, once set, were hard to erase. Minor ethical transgressions continued to occur. For example, officers were not entitled to free rations while in garrison, but many made arrangements with the commissary agents to provide them, their families, and their friends with free food. When campaigning in the field, officers would subsist on army rations; however, the existing policy of garnishing their wages to pay for those rations was almost never followed. The danger was that, by allowing these seemingly minor abuses to persist, commanders opened the door to further transgressions. Soldiers and officers alike witnessed tacit approval of these actions, and some then were emboldened to attempt

larger crimes. Minor infractions also had a negative impact on the morale of the fighting force, because the common British infantryman inevitably was aware of the large-scale profiteering of the quartermasters, as well as the fact that officers and their families routinely ate much better than he did.

Strategic Logistics and Host Nation Support

The problems of supplying the army from Great Britain were great, and the most serious challenge was that of providing food over such a tremendous distance. Cork, on the coast of Ireland, was the primary victualling port. This was chiefly because of its large natural harbor and its location (which was nearer to the American colonies than English ports), but also because the farms of Ireland were a major source of food. Southern Ireland also was an important recruiting center for the army, and thus it was easy to put troops aboard victuallers (food ships) for transport to America.

Contractors hired from throughout the British Isles were required to deliver their goods to the port already packaged for shipment. However, their packaging was often very poor, and the voyage to America was long, rough, and damp. Barrels routinely did not survive the journey, and if they did, they often were no longer strong enough to be moved onto wagons and shipped overland. Corruption and incompetence were problems with contractors in England, too, but they were not held responsible for their products once those products were delivered to Cork.

Initially, quality control was lacking. Flour barrels were frequently 5 to 6 percent lighter than the contractor advertised, and a 200-pound barrel of meat or pork could be short as much as 20 pounds. In one convoy in 1775, five ships departed with 7,000 barrels of flour; on arrival in Boston, 5,000 of those barrels were condemned. So instead of 12,000 men having bread for 5½ months, that particular shipment was consumed in only 47 days! In 1778 alone, flour deficiencies amounted to over 640,000 pounds—enough to feed 20,000 soldiers for over a month. An attempt was made in 1776 to ship hard biscuits instead of flour, but the result was not promising: at best, rotten biscuits were mixed in with edible ones. The commissaries also were guilty of leaving good food to spoil on the docks, due either to mismanagement or lack of transportation.

That the Treasury was trying to do its best for the army was undeniable. In October 1775, the department undertook a remarkable effort to supply the army in Boston with enough quality fresh provisions to last through the winter, so that the soldiers would be well fed and rested for a spring campaign. The firm of Mure, Son & Atkinson was contracted to furnish enough fresh food to fill 36 ships. According to Bowler—

> Besides the usual beef, pork, bread, [peas], and oatmeal, they loaded on board . . . some 500 tons of potatoes, sixty of onions, fifty of parsnips, forty of carrots, and twenty of raisins, as well as 4,000 sheep and hogs and 468,750 gallons of porter . . . Considerable care attended all this. The contractors noted that they had gone to great trouble to determine the best method of storing potatoes, and they were loaded very gently into the ships "so as not to bruise them." Onions were packed in hampers for the same reason, and as the several tons of sauerkraut being shipped would not have completed the fermentation process, each cask was fitted with a spring-loaded pressure relief valve. Finally, in recognition of the perils of shipping livestock, a premium of two shillings and sixpence was promised to the masters of the transports for each animal delivered alive.

All this hard work was for naught, as one of the worst storms in years struck the convoy. Many of the ships were forced to turn back to England, others were diverted to Antigua, and still others spent weeks sailing up and down the eastern seaboard of America waiting for the weather to break while their cargoes rotted. American privateers also took their toll.

Only 13 ships eventually made it to Boston, and very little of their cargoes survived. Only the preserved food (sauerkraut, vinegar, and porter [a type of beer]) survived intact. Most of the other provisions were rotten, damaged, or dead (only 148 of the livestock survived). Out of 856 horses shipped, only 532 survived the voyage. This convoy marked the last time that Britain attempted to ship fresh food and livestock to its army. The demand for supplies was not too much for British shipping to accommodate, but under the combined effects of bad weather and profiteering, the supply system broke down.

Living Off the Land

Because shipment of many commodities from Britain was deemed impracticable, the army resorted to local sources for fresh food, fodder, and transportation. Although British logisticians performed significantly better than their American counterparts, their shortcomings had a much greater impact on the course of the war. The undying hope of the British Government that its army could subsist locally in America stemmed, in part, from the success the British had during the Seven Years' War (known in North America as the French and Indian War) from 1756 to 1763. Most of the support for the army during that conflict had been acquired locally, and shipment of supplies from Britain was limited. The Treasury had organized a system of subcontractors throughout Canada (then French) and the colonies, and had not even appointed a Commissary General.

During the Revolutionary War, conditions were quite different. The enemy was more determined, and the British overestimated both the amount of loyalist support and their own ability to cultivate it. At the beginning of the war in New England, acquiring subsistence locally (by foraging) was impossible once the rebels laid siege to the British garrison in Boston. After the main British army occupied New York in the summer of 1776, hopes that the troops could live off the abundant farmlands of New Jersey and Long Island were soon crushed. Foraging parties sent into eastern Long Island met with resistance and ended up consuming more supplies than they could gather.

George Washington's Christmas counterattack at Trenton, New Jersey, in 1776 ended all British hopes of gathering supplies from New Jersey farms. The logistics battle really began in earnest as a result of the British defeat at Trenton. After the British occupied Philadelphia a year later, their logistics situation looked promising at first. Pennsylvania farms were bountiful, and the British hoped to find abundant loyalist help, but again that support dried up. The continuing hope that enough provisions and supplies could be procured within the colonies must have stemmed, in part, from the belief held by many in the British Government and Army that it was only a matter of time before the rebels came to their senses and returned to British rule.

Flour was needed for making fresh bread, and other grains and vegetables were important to the soldiers' diet. Fresh meat, however, outranked nearly all other foodstuffs. Units in the field went to great lengths to obtain fresh beef, pork, mutton, poultry, and other meats. The policy of paying individuals for captured cattle was only one procurement method. In one instance, British soldiers reported subsisting on alligators and oysters, complemented by Madeira wine they found on a shipwreck off the South Carolina coast.

Probably of equal significance to meat (at least to the infantryman) was alcohol. Copious amounts of porter were shipped initially, but eventually a spruce beer brewery was established in the colonies. At the discretion of the commander, soldiers were authorized one pint per day in garrison and two pints per day in the field. Fresh ingredients in the beer were thought to offset the likelihood of contracting scurvy. Rum also was available, from the West Indies, and was rationed at two quarts for every six men. The rum presumably was used to purify drinking water, but it certainly was abused to some degree.

British efforts to subsist locally could have been more successful if they had developed a coherent strategy to use loyalist support. Loyalists in the colonies accounted for perhaps half the population and were typically conservative, cautious, and pacifist. Many of the more fundamental religious sects were largely loyalist, or at least neutral. They were not ideal conscripts for military service, but they could have served as a greater source of logistics support. The army repeatedly misjudged not only their character, but also the overall amount of popular support for the Crown in a given area of operations.

The army was not able to resupply its troops solely from Great Britain, and that possibility was never seriously considered by the Government. The army could not sustain itself strictly with what it obtained locally, either, but a proper balance was never achieved. The formidable logistics hurdles, coupled with the inconsistent and inefficient civilian hierarchy, ensured that whatever momentum British generals were able to generate would be extremely difficult for them to maintain.

Transportation

The challenges encountered in conducting the transport of provisions, supplies, ordnance, and troop reinforcements were enormous. Insufficient shipping was the primary cause of food shortages suffered by the British Army. Most ships were contracted and controlled by the respective government boards. Many were old, not seaworthy, and manned by merchant crews. The departments often could not cooperate, and in their zeal to acquire more shipping assets they bid against each other and drove prices higher. Many British merchants did not want to lease their ships to the war effort because it was not profitable for them. They could not find return tonnage, and their ships could wait as long as 8 weeks before they were unloaded in American ports. The Netherlands and Germany were scoured for available ships, and many were subsequently hired. French merchant ships were available early in the war, but the British held the quality of those vessels in contempt and would not consider their use.

The voyage from Cork to America was long and dangerous for man and animal alike. As one officer of the Guards testified, "There was continued destruction in the foretops, the pox above-board, the plague between decks, hell in the forecastle, the devil at the helm." Many soldiers became sick and even died from scurvy and smallpox. To cite one example, out of a contingent of 2,400 German soldiers who left Europe for New York in 1781, 410 were sick upon arrival and 66 were dead. Many horses suffered a similar fate. In 1777, live horses were thrown overboard as a "humane alternative" to watching them die from hunger and thirst; they had been provided with only 3 weeks of forage for a journey that lasted 40 days in good weather.

Impact of Logistics on Operations

British commanders believed that large reserves of food, fodder, and other supplies were vital, so the ab-

sence of sufficient quantities of those items must be viewed as the greatest failing of the British supply system. The generals felt that they needed at least 6, but preferably 12, months of supplies in reserve before they could begin an offensive campaign. But over the course of the 8-year war, they began only two campaign seasons with what they considered to be the necessary amounts of supplies. Furthermore, when supply reserves dropped below the 2-month level, which they often did, British generals stopped thinking about offensive action and began to plan evacuation. Abandoning a garrison was no simple task, due primarily to the shortage of transportation. Since the army never had enough ships to move the entire force in one lift, withdrawals had to be planned in detail and carefully executed.

The British Army repeatedly attempted to subsist through the practice of foraging, but it was never entirely successful for several reasons. Foraging was no longer part of conventional strategy. It was time consuming and tiring, and many British soldiers considered it to be beneath them. Foraging parties required a covering force, which was a further drain on manpower and consumed even more supplies. To compound the problem, many foraging expeditions produced little or nothing, which not only was demoralizing but also placed a further drain on supplies.

Conventional tacticians of the time did not trust living off the land, because it could be bad for morale and could lead to looting, unauthorized foraging, and desertion. Under the 18th century concept of limited war (at least the British model), civilians from whom supplies were taken were supposed to be reimbursed. But it often was easier to take what was needed by force. Such pillaging alienated Americans who were sympathetic to the British or neutral. Worst of all, foraging exposed great numbers of British soldiers to guerilla warfare, including ambushes and snipers. Foraging parties grew as large as 5,000 men, but they habitually were harassed by small parties of rebels. British losses in these types of skirmishes soon equaled those suffered in the larger pitched battles.

Nearly every time the British Army appeared ready to strike a decisive blow at the rebelling Americans, it seemed that a shortage of reserve supplies and a lack of faith in resupply prevented action. British generals, particularly William Howe and Henry Clinton, were not willing to gamble their forces in offensive campaigns without considerable supplies in reserve. The failure of the Government to provide the armies with adequate provisions was not due to neglect but to a logistics system that was inadequate and poorly managed. In defense of British generalship, gambling with their armies on extended campaigns with meager provisions and no guarantee of when the next shipment was coming was a large risk indeed. Howe and Clinton could not afford to lose the army, for there were no replacements in England.

An aggressive offensive war was the only type that was going to retain the colonies for Britain. To have any hope of victory, the British had to seek out the rebel army and defeat it. Yet far too often their soldiers were forced to sit and wait or, worse, to evacuate a position, garrison, or city that had already been gained through difficult fighting. The effect that logistics deficiencies had on these decisions to wait or pull back is undeniable. The battles of Trenton in 1776 and Saratoga in 1777 clearly demonstrated how the long delays caused by insufficient supplies and the resulting caution shown by commanders allowed the rebels repeatedly to concentrate their forces at critical locations or to avoid a potentially crushing defeat.

Supply shortages affected the conduct of the war in many ways. Most importantly, shortages diverted troops from their primary task (fighting) because they had to forage the countryside in order to survive. Foraging operations were time consuming and increased the already high level of stress on both soldiers and leaders. The number of soldiers who died or were wounded on foraging missions was a very real byproduct of logistics deficiencies. Questionable generalship, corruption and profiteering, and a largely hostile American population also had far-ranging implications for an army that could not afford to occupy port cities and wait for the enemy to capitulate.

Lessons From the British Experience

The lessons offered by the British experience in the American Revolutionary War for modern military strategy and logistics planning and operations are numerous. Strategic lift of forces and supplies into the theater of operations remains the most immediate concern for a deploying army. Current U.S. military strategy is based on force projection, which often rests on the assumption that there will be sufficient time to build up supplies and combat power before hostilities begin. The British did not have sufficient time to build up supplies, given the limitations of their logistics organization, and British generals never felt that they had sufficient stores to campaign effectively against the rebels.

The British experience also provides lessons in the use of host nation support and the transportation of bulk cargo. The British expected to benefit from loyalist support in the colonies; they counted on what we call host nation support. Today, the U.S. military bases a significant amount of its force projection strategy on the premise that host nation support will be available to augment the logistics assets that can be brought into the theater. This has been demonstrated in every military action of the 1990's, from the Gulf War through the current Balkan engagements. The ability to gather intelligence about available local assets and the disposi-

tion of the population to provide support has advanced significantly in 200 years, but the primary lesson should not be lost: the United States cannot assume automatically that host nation support will be provided willingly by every nation from which it intends to stage military operations.

Transportation managers still wrestle with packaging certain commodities, and, when depending on civilian support, they may see the negative influence of the profit margin on supply operations. A modern example was the shipping of airdrop cushioning material ("honeycomb") for use in the Bosnian humanitarian airdrop mission, Operation Provide Promise, in 1993 to 1994. The cushioning material is very bulky, yet so lightweight that civilian shipping agents and trucking companies routinely would not accept it at normal rates. This is a direct parallel to some of the problems encountered by the British during the Revolutionary War. Merchant shipping agents routinely rejected contracts from the Treasury Board because certain cargo, such as animal fodder, was too light to be profitable.

A broader critique of the British inability to integrate strategy and logistics successfully shows that they did not recognize the importance of such modern logistics tenets as responsiveness. Despite overcoming enormous geographical obstacles and displaying occasional flashes of logistics brilliance, the flaws in the administrative system contributed greatly to Britain's failure. In the final analysis, British logisticians lacked responsiveness; they consistently failed to get the right supplies, men, and equipment to the right place at the right time. At the strategic level, the system lacked flexibility. When shipping prices rose or certain commodities were temporarily unavailable, for example, the ministers of the various departments seemed incapable of developing alternative solutions. These same ministers (and others in positions of influence) often were petty and unable to work together for the common good of the deployed army.

Modern logistics doctrine emphasizes the importance of centralized planning and decentralized execution for support tasks. FM 100-16, Army Operational Support, perceptively notes that "too much centralization often results in rigidity and sluggish response, while too little often causes waste and inefficient use of critical resources." This was a tenet that the British never grasped, for they were always highly centralized in their logistics planning and execution. Instead of using the positive qualities of centralization to their advantage, they robbed their units in the field of critical flexibility and responsiveness by not decentralizing at all. Moreover, a limited duplication of assets and management not only is justified when executing military operations but is mandatory to mission success.

Weighed against its modern counterparts, 18th century logistics operations would appear to be relatively simple. The challenges faced by the British from 1775 to 1783, however, were not of lesser significance than today's logistics hurdles, just of a different nature. Instead of having to maintain high-technology weapons and manage supersonic transportation assets, the suppliers of that time had to contend with ships at the mercy of winds and currents and the challenge of providing fresh rations without the benefit of canning or refrigeration. At the height of the war in 1780, Britain was maintaining over 92,000 troops overseas, including those in Florida and the Caribbean, and the majority of those soldiers had to be fed and equipped from the British Isles. This was at a time when it could take 3 months to receive an answer to a simple communication or request. Delivery of certain items often took more than a year.

Many of the challenges faced by the British during the 8 years of war in the colonies have not changed significantly in two centuries. Operations still suffer when logistics is not planned in detail. Corruption and unethical behavior, although not as significant in today's force, still can have a negative impact on an army's ability to fight. These problems inevitably are compounded when operating in a theater where the supply system cannot rely on host nation support, or at least on a population that is friendly or neutral. These irrefutable facts make the study of British logistics during the Revolutionary War particularly rewarding to any logistician in today's military, and the lessons derived from that war can be educational on many levels. Logistics greatly influenced the outcome of the Revolutionary War. While not the primary cause of British defeat, its impact was, without question, significant. **ALOG**

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Bombs to the Balkans

by Staff Sergeant Christopher Larsen, USAR,
and Major Dick Tremain, USAR (Ret.)

The recently concluded NATO air campaign in the Balkans changed the daily routine of many U.S. military personnel. In a pattern typical of a major military contingency, soldiers, airmen, marines, and sailors, including many from the reserve components, set aside their normal peacetime tasks and assumed missions in support of the NATO effort. Servicemen and women dropped what they were doing and undertook new jobs created by the operation. One place where this phenomenon of war could be observed was Hawthorne Army Depot, Nevada, which became a beehive of activity thanks to the Air Force's need for munitions. This demand for munitions diverted a contingent of Army Reserve soldiers from their normal training to provide support.

At Hawthorne, crews of reservists and civilian contractors banded, packed, loaded, and transported bombs and other ordnance for use in the Balkans as part of Operation Noble Anvil. Thirty soldiers from three reserve units were sent to the depot to handle the shipping. The troops, from the 3d Corps Support Command in Des Moines, Iowa; the 802d Ordnance Company in Gainesville, Georgia; and the 357th Ordnance Company in Romney, West Virginia, spent almost 2 weeks—their entire annual training period—working to fulfill an urgent request from the Air Force for more ammunition. Ultimately, more than 16,000 750-pound bombs were transported, along with tail fin assemblies, fuzes, and boosters.

When the three units were tasked with the new mission, they were taking part in Exercise Golden Cargo '99 at Tooele Army Depot, Utah, and Sierra Army Depot, California. Golden Cargo is an annual exercise in which Army Reserve units transport ordnance as part of a program to reposition Army war stocks. The 802d Ordnance Company had just arrived at Tooele when it was ordered to Hawthorne, 450 miles to the west.

As Chief Warrant Officer (W–3) David Kalb, the operations officer for the mission, saw it, the diversion of the units to Hawthorne offered them "a real-life mission. This is the best training we can get. Mixing the military with the civilian contractors works very well." Kalb, an insurance agent in civilian life, observed that the movement operations also helped to teach the reservists the technical aspects of their mission.

☐ **Two Army Reserve soldiers from the 802d Ordnance Company place bands around a 750-pound bomb to secure it on a wooden pallet for shipment to Europe**

Heavy Work

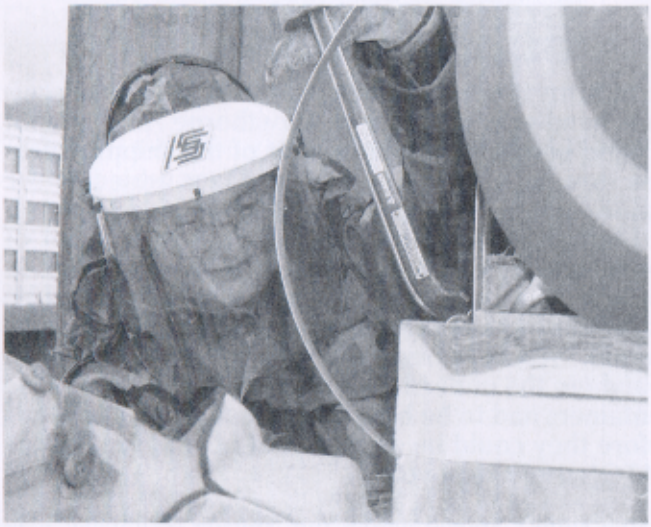
The mission these Ordnance Corps soldiers had to perform was a heavy one: 750-pound bombs had to be prepared to go nearly halfway around the world. The bombs, sitting on metal racks inside concrete storage bunkers, first were transported to "work pads" scattered throughout the depot grounds.

Staff Sergeant James Hoopaugh, a member of the 802d Ordnance

When the Air Force placed a rush order for more ammunition for NATO's air war in the Balkans, a group of Army Reserve soldiers shifted from training to providing real-life support.

Company, was responsible for moving some of the bombs. Hoopaugh, a machine operator for Wrigley's chewing gum in civilian life, drove the forklifts with practiced skill, gently placing several tons of high explosives on top of a work rack.

Once at the work pads, the bombs were checked to ensure that they were in good shape and then placed on the new, wood pallets on which they would be traveling. In one area, Specialist Cynthia Lemon of the 802d worked with a banding machine to strap the bombs onto



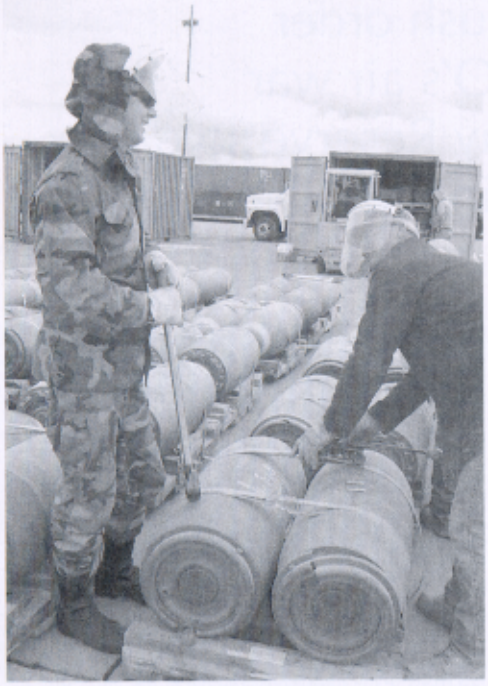
☐ In these photos, reservists tighten the bands around bombs on pallets. Note the "bander" the soldiers are using to make the bands as tight as possible.

the pallet. The "bander," as it is called, looks like a cross between a big pliers and bolt cutters. Her face protected by a plastic visor and her hands clad in thick leather gloves, Lemon worked the ratchet, tightening the tape until the bombs were strapped securely to the wood. Lemon, who is a student at the University of Georgia in Athens, checked the bands, nodded approval, and moved on to the next pallet.

Ready to Go

Once the bombs had been strapped to pallets, they were picked up again by forklifts and taken to a long row of green and red steel shipping boxes, similar in appearance to trailers. Each container can hold 48 bombs. After the containers were loaded, they were put on railcars for shipment to a West Coast seaport. At the port, they were placed on containerships for transport to Europe.

Sergeant Kevin Naughton and Specialist George Prime, both of the 802d, were two soldiers who worked on readying the containers for loading with munitions. The containers were well used, and some of them needed some work before they could be loaded. Naughton used a long-handled pipe wrench to bang on the bottom of one container in order to bend it back in place, while Prime used a sledgehammer to do the same job on another container. Once the containers met the standards for use, they were loaded with cargo and moved to the railhead to wait for the flatcars that took them to the port.



☐ An Army Reserve soldier joins with a civilian munitions handler who works at Hawthorne Army Depot to band bombs to pallets as part of the shipping process (top left). Working with civilians added to the realistic nature of the training the reservists received. At bottom left, an Army reservist moves a pallet of bombs into position for shipment to the Air Force in Europe. The containers in which the pallets will be loaded for shipment to Europe can be seen in the background. Above, a reservist uses a sledgehammer to straighten the underside of a shipping container. The containers had to be brought up to military standards before they could be used to transport munitions for NATO's use in Kosovo.

Getting ammunition ready to be shipped for combat isn't a simple 9-to-5 job. The reservists and civilian crews worked 12 to 16 hours a day for more than a week in order to meet their mission requirements. For many people taking part in the operation, it was the first time they had loaded munitions that would be used in a combat situation, and the serious nature of their work was etched on their faces.

Some might worry about having so much explosive power lying around. But as Staff Sergeant Ken Boyd of the 802d explained, everything is stabilized before shipping. "We're putting blocking into the MILVAN. It keeps the rounds from moving."

In addition, the entire depot's bunkers are constructed in such a manner that, if there is an accident, the force of the explosion will be directed upward and away from the surrounding storage area. The depot is an impressive sight. Spread across the Nevada scrubland, it is visible from almost 20 miles away. Surprisingly for early June, when the three units were working at Hawthorne, the temperatures were in the 40's and 50's.

Although the work was hard, the days long, and the weather cool, the soldiers of the three units completed their mission. They made sure that the Air Force would have the power it needed to bring the air operation over the Balkans to a successful conclusion. **ALOG**

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