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Field Feeding in the 21st Century

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ARTICLES

DEPARTMENTS

COVER

A soldier of the 82d Airborne Division gets water from the containerized kitchen of the 10th Forward Support Battalion from Fort Drum, New York, during the Joint Contingency Force Advanced Warfighting Experiment at Fort Polk, Lousiana. The containerized kitchen is one of the key components of the Army Field Feeding System-Future. An article beginning on page 18 examines how Army field food service is changing and what further changes may be needed.

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ALOG NEWS

NEW FMs LAY FOUNDATION FOR TRANSFORMATION DOCTRINE

The Army has issued new versions of its capstone field manuals (FMs) that set the doctrinal foundation for Army Transformation. As the Army Chief of Staff, General Eric K. Shinseki, observed, "These manuals define who we are, what we do, how we do it, and the road ahead."

FM 1, The Army, replaces the 1994 version of FM 100–1 (also titled "The Army") as the Army's capstone manual. It describes the Army's purpose, roles, and functions and provides basic doctrine for using land power in support of the National Security Strategy and National Military Strategy. FM 1 has four parts: the Army's role in the profession of arms; the Army's place in strategic and joint military operations; the Army's core competencies; and the Army's future.

FM 3–0, Operations, replaces the 1993 version of FM 100–5 (also titled "Operations"). It fleshes out the basic principles in FM 1 by establishing doctrine on the conduct of military operations and pointing operations toward transformation to the Objective Force. FM 3–0 describes how the Army will conduct operations across the full spectrum of military operations and sets a framework of offense, defense, stability, and support operations. According to General Shinseki, "FM 3–0 must be studied and understood by all Army leaders . . . it provides a professional intellectual framework for how we operate."

The new manuals are numbered to correspond to the Department of Defense numbering system (Joint Publication 1, Joint Warfare of the Armed Forces; Joint Publication 3–0, Joint Operations). FM 1 and FM 3–0 were released on the Army's 226th birthday, 14 June.

ARMY ANNOUNCES FOUR NEW IBCTs

On 12 July, Secretary of the Army Thomas E. White and Army Chief of Staff General Eric K. Shinseki named four more units to be converted to the interim brigade combat team (IBCT) design. They are the 172d Infantry Brigade (Separate) at Fort Wainwright, Alaska; the 2d Armored Cavalry Regiment (Light) at Fort Polk, Louisiana; the 2d Brigade, 25th Infantry Division (Light), at Schofield Barracks, Hawaii; and the 56th Brigade, 28th Infantry Division (Mechanized), a Pennsylvania Army National Guard unit in Philadelphia. These latest brigade selections for the Interim Force are conditional upon the outcome of an ongoing Army Programmatic Environmental Impact Statement that is projected to be completed in the fall.

The Army currently has two IBCTs, the 3d Brigade, 2d Infantry Division, and the 1st Brigade, 25th Infantry Division, both at Fort Lewis, Washington.

The Army is coordinating with the contractor of the interim armored vehicle (IAV) to determine appropriate ways to accelerate IAV fielding for the two IBCTs at Fort Lewis. The Army plan is to complete fielding of the IAV for the other four brigades within 3 years after the Fort Lewis brigades are fielded.

"These interim brigades will help us move towards a force that is more strategically responsive and dominant across the spectrum of military operations," said Secretary White. "Their improved deployability and lethality will enhance deterrence and meet an operational requirement that does not currently exist."

Army officials anticipate that transformation of an active-component brigade to the IBCT design will take about 1 year. Transformation of the Army National Guard brigade will take about 2 years.

MPH WOULD PRODUCE PARTS ON THE BATTLEFIELD

Engineers and scientists at the Army Tank-automotive and Armaments Command's (TACOM's) National Automotive Center, working with partners in industry, have designed a demonstration trailer that someday may allow Army maintenance professionals to make their own repair parts on the battlefield. The Mobile Parts Hospital (MPH) trailer combines the latest manufacturing infrastructure and technologies in a mobile unit that can deploy quickly when required. Both standard and unique parts can be manufactured in the trailer from technical data and computer-numeric control codes.

The MPH demonstration trailer is a standard tractor-trailer equipped with a vertical milling machine that has

(News continued on page 40)

Convoy Casualty Evacuation

by Major Therrel L. Brown, Jr.

It is 1047 hours, and the convoy is winding its way along main supply route Iwo Jima to the brigade support area (BSA). The convoy commander, First Lieutenant Bryant, is confident, even comfortable, with the route since this is the fourth day that he has taken this scheduled convoy to the BSA along this course. The brigade has been fighting the Krasnovians for 3 days, and he knows that it has been hard fighting. He wonders what the brigade is planning and what it will mean to the main support battalion.

Suddenly there is an explosion behind him, followed by automatic rifle fire. The driver of Lieutenant Bryant's high-mobility, multipurpose, wheeled vehicle (HMMWV) immediately speeds up, clearing the ambush site as he was trained. Lieutenant Bryant reaches for the radio, yells out a spot report to the battalion, and then tries to regain control of his elements. He yells to the driver to turn around as additional explosions and rifle fire continue. To his dismay, he sees two trucks burning and soldiers thrown clear of them on both sides. A truck that had been following too closely has slammed into one of the destroyed vehicles, and, though not burning, it is clearly disabled. Only two soldiers are returning fire sporadically from the ambush site.

To make matters worse, the ambush happened at a crossroad, and the four trail vehicles have taken the wrong fork while going around the destroyed trucks and are disappearing in a trail of dust. Lieutenant Bryant again reaches for his radio, turns to the convoy frequency, and calls to the vehicles headed the wrong way. As the moments pass, with no response, he realizes that no one in the section of convoy disappearing down the wrong road has a radio.

Quickly gathering the vehicles that are with him, Lieutenant Bryant organizes a group to rescue the injured soldiers. He contacts the battalion, provides an update of his situation, and requests assistance. The battalion informs him that they have requested division military police and host nation police support and are preparing to launch the quick-reaction force with an ambulance. Lieutenant Bryant knows that help is at least an hour away.

The rifle fire subsides, and the enemy ambush team seems to have broken contact. Lieutenant Bryant and his "fire team" proceed to the ambush site. Two soldiers are dead, and five are seriously wounded. Lieutenant Bryant calls in an update to the battalion, giving details of the wounded, and learns that the quick-reaction force and ambulance have not departed yet. He knows that the wounded need to be treated and evacuated, but he realizes that he has no medics or combat lifesavers in his convoy. He also neglected to bring stretchers. He directs the soldiers to load the wounded into two HMMWVs, continue with "buddy aid," and send them back to the battalion aid station at Irwin Military City. Once they depart, he realizes that his two radios have departed with them.

This sounds like a bad dream, but it has happened as we train convoys at the National Training Center at Fort Irwin, California. Casualty evacuation (CASEVAC) is a difficult task for any unit. By their nature, convoys are attractive targets for guerrilla forces. Convoys tend to travel at set times along set routes, carry commodities that are crucial to heavy forces, and, as a result, frequently have to defend themselves. Convoys often travel without dedicated medical support on routes that stretch 30 to 40 kilometers and pass through both division and brigade areas.

Field Manual (FM) 8–10–3, Division Medical Operations Center Tactics, Techniques, and Procedures, states that medical coverage is provided on an area support basis. However, the availability of echelon 1 (battalion aid station) or echelon 2 (medical company clearing station) care is seldom the issue. Historically, soldiers who reach echelons 1 and 2 care have a high survival rate. Providing treatment at the point of injury and evacuating casualties to echelons 1 and 2 care are a convoy's greatest challenges.

Planning the Convoy

Convoys begin with the convoy commander receiving his mission brief from the battalion tactical operations center. This brief is typically a joint effort of the support operations section, which covers the mission requirements, and the battalion S2/3, who provides tactical information. A key element of this briefing is the S2/3's analysis of the threats to the convoy. There is a tendency to focus on the actions of the combat units and the enemy facing them. This is important information, but the analysis of how those actions may affect the convoy itself is more important. These potential enemy

actions serve as a starting point for the convoy commander's tactical risk assessment. Clearly, any potential enemy action could cause casualties and requires the convoy commander to take steps to control or minimize the risks.

Planning Medical Support

FM 55–30, Army Motor Transport Units and Operations, gives the convoy commander the responsibility for considering medical support when planning his convoy. In this planning, the convoy commander must coordinate for support beyond his capability. The convoy mission brief should identify the supporting medical units and their locations, the routes from the convoy route to each medical unit, and the frequencies and call signs for the medical units. It also should address the transition of support from one unit to another as the convoy crosses unit boundaries. Establishing an ambulance exchange point, where convoy vehicles carrying injured soldiers can meet ambulances if evacuation is required, can assist the convoy commander. The battalion S2/3 should inform the medical units that the convoy will be operating in their sectors so they can be prepared to assist the convoy.

The convoy commander can request medics and ambulances from his unit's supporting medical company to accompany the convoy. This is not as difficult as it might seem on the surface. Ambulances routinely travel between the main support battalion and the forward support battalion to carry nonemergency casualties. Incorporating ambulances into the convoy provides additional protection for the ambulances and a higher level of medical support to the convoy. This only requires synchronizing ambulance and convoy movements.

Finally, the convoy commander can request stretchers and backboards for the convoy's use in case casualties have to be moved. These items can enhance greatly the evacuation of casualties on nonstandard vehicles.

Within the convoy itself, the convoy commander can take a number of steps to reduce risks to casualties. He can—

- Provide detailed information on medical support, including the location of medical support units, on the driver's strip maps and in the casualty battle drill plan provided to convoy control personnel and drivers.
- Incorporate inspection of combat lifesaver bags into precombat checks and inspections and ensure that additional medical items such as stretchers and equipment needed to establish a landing zone for medical evacuation aircraft are on hand.
- Integrate combat lifesavers throughout the convoy rather than place them in one vehicle.
- Dedicate vehicles to serve as nonstandard evacuation platforms. If this is not possible, identify the vehicles that will serve in that role if required. It is important to identify alternate vehicles in case the evacuation vehicle is disabled by enemy action.
- Rehearse casualty drills before beginning the convoy. Everyone has a role in CASEVAC: providing aid; establishing a landing zone for aircraft; serving as litter bearers; and providing security, communications, or command and control.

Rehearsing CASEVAC

CASEVAC rehearsals must incorporate "triggers" that indicate when the location of the closest medical support changes. For example, evacuating a casualty 30 kilometers back to the convoy's point of origin when the nearest aid station is only 10 kilometers ahead is impractical and is not in anyone's best interest. Everyone must know these triggers in case the enemy figures out that the HMMWV with all the antennas carries the convoy commander and targets that vehicle or, as in Lieutenant Bryant's convoy, some convoy elements become separated.

The commander should ensure that his convoy has multiple communications capabilities and should plan which vehicles with communications equipment will be used for CASEVAC so he can continue to communicate while evacuating his casualties. Since vehicles with mounted radios are in short supply, incorporating Single-Channel Ground and Airborne Radio System squad and platoon radios into a convoy provides flexibility, particularly if an enemy successfully targets the command and control vehicle.

CASEVAC must be planned not only to respond to tactical hazards. Evacuation may be necessary for injuries caused by accidents. Planning and training for CASEVAC will prepare a unit to take care of its soldiers in all situations and will boost soldiers' confidence in the care they will receive if they are wounded or injured.

Convoys will remain a means of providing support over extended distances, and they will continue to be tempting targets for enemy forces as well as potential sources of accidental injuries. Preparing our convoys to care for and evacuate their casualties is an important element in ensuring support and protection of our logistics forces. **ALOG**

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Nuclear Power: An Option for the Army's Future

by Robert A. Pfeffer and William A. Macon, Jr.

The Army Transformation initiative of Chief of Staff General Eric K. Shinseki represents a significant change in how the Army will be structured and conduct operations. Post-Cold War threats have forced Army leaders to think "outside the box" and develop the next-generation Objective Force, a lighter and more mobile fighting army that relies heavily on technology and joint-force support. More changes can be anticipated. As we consider what the Army might look like beyond the Objective Force of 2010, nuclear power could play a major role in another significant change: the shift of military energy use away from carbon-based resources. Nuclear reactor technology could be used to generate the ultimate fuels for both vehicles and people: environmentally neutral hydrogen for equipment fuel and potable water for human consumption.

Evolving Energy Sources

Over the centuries, energy sources have been moving away from carbon and toward pure hydrogen. Wood (which has about 10 carbon atoms for every hydrogen atom) remained the primary source of energy until the 1800s, when it was replaced with coal (which has 1 or 2 carbon atoms for every hydrogen atom). In less than 100 years, oil (with two hydrogen atoms for every carbon atom) began to replace coal. Within this first decade of the new millennium, natural gas (with four hydrogen atoms for every carbon atom) could very well challenge oil's dominance.

In each case, the natural progression has been from solid, carbon-dominated, dirty fuels to more efficient, cleaner-burning hydrogen fuels. Work already is underway to make natural gas fuel cells the next breakthrough in portable power. However, fuel cells are not the final step in the evolution of energy sources, because even natural gas has a finite supply. Fuel cells are merely another step toward the ultimate energy source, seawater, and the ultimate fuel derived from it, pure hydrogen (H_2).

Environmental Realities

There are three geopolitical energy facts that increasingly are affecting the long-term plans of most industrialized nations—

- Worldwide coal reserves are decreasing. At the present rate of consumption, geological evidence indicates that worldwide low-sulfur coal reserves could be depleted in 20 to 40 years. This rate of depletion could accelerate significantly as China, India, and other Third World countries industrialize and use more coal.
- Most major oil reserves have been discovered and are controlled by just a few OPEC [Organization of Petroleum-Exporting Countries] nations. Some of these reserves are now at risk; Bahrain, for example, estimates that its oil reserves will be depleted in 10 to 13 years at the current rate of use.
- The burning of carbon-based fuels continues to add significant pollutants to the atmosphere.

These and other socioeconomic pressures are forcing nations to compete for finite energy sources for both fixed-facility and vehicle use. For the United States, the demand for large amounts of cheap fuel to generate electricity for industry and fluid fuel to run vehicles is putting considerable pressure on energy experts to look for ways to exploit alternate energy sources. The energy crisis in California could be the harbinger of things to come. The threat to affordable commercial power could accelerate development of alternative fuels. It is here that private industry may realize that the military's experience with small nuclear power plants could offer an affordable path to converting seawater into fuel.

Military Realities

Today, the military faces several post-Cold War realities. First, the threat has changed. Second, regional conflicts are more probable than all-out war. Third, the United States will participate in joint and coalition operations that could take our forces anywhere in the world for undetermined periods of time. Finally, the U.S. military must operate with a smaller budget and force structure. These realities already are forcing substantial changes on the Army.

So, as we consider future Army energy sources, we foresee a more mobile Army that must deploy rapidly and sustain itself indefinitely anywhere in the world as part of a coalition force. In addition, this future Army will have to depend on other nations to provide at least some critical logistics support. An example of such a

cooperative effort was Operation Desert Storm, where coalition forces (including the United States) relied on some countries to supply potable water and other countries to provide fuel. This arrangement allowed U.S. cargo ships to concentrate on delivering weapon systems and ammunition.

But consider the following scenario. The U.S. military is called on to suppress armed conflict in a far-off region. The coalition forces consist of the United States and several Third World countries in the region that have a vested interest in the outcome of the conflict. Our other allies are either unwilling or unable to support the regional action, either financially or militarily. The military effort will be a challenge to support over time, especially with such basic supplies as fuel and water. How can the United States sustain its forces?

One way to minimize the logistics challenge is for the Army to produce fuel and potable water in, or close to, the theater. Small nuclear power plants could convert seawater into hydrogen fuel and potable water where needed, with less impact on the environment than caused by the current production, transportation, and use of carbon-based fuels.

Seawater: The Ultimate Energy Source

Industrial nations are seeing severe energy crises occur more frequently worldwide, and, as world population increases and continues to demand a higher standard of living, carbon-based fuels will be depleted even more rapidly. Alternative energy sources must be developed. Ideally, these sources should be readily available worldwide with minimum processing and be nonpolluting. Current options include wind, solar, hydroelectric, and nuclear energy, but by themselves they cannot satisfy the energy demands of both large, industrial facilities and small, mobile equipment. While each alternative energy source is useful, none provides the complete range of options currently offered by oil. It is here that thinking "outside the box" is needed.

As difficult as the problem seems, there is one energy source that is essentially infinite, is readily available worldwide, and produces no carbon byproducts. The source of that energy is seawater, and the method by which seawater is converted to a more direct fuel for use by commercial and military equipment is simple. The same conversion process generates potable water.

Seawater Conversion Process

Temperatures greater than 1,000 degrees Celsius, as found in the cores of nuclear reactors, combined with a thermochemical water-splitting process, is probably the most efficient means of breaking down water into its component parts: molecular hydrogen and oxygen. The minerals and salts in seawater would have to be removed by a desalination process before the water-splitting process and then burned or returned to the sea.

Sodium iodide (NaI) and other compounds are being investigated as possible catalysts for high-temperature chemical reactions with water to release the hydrogen, which then can be contained and used as fuel. When burned, hydrogen combines with oxygen and produces only water and energy; no atmospheric pollutants are created using this cycle.

Burning coal or oil to generate electricity for production of hydrogen by electrolysis would be wasteful and counterproductive. Nuclear power plants, on the other hand, can provide safe, efficient, and clean power for converting large quantities of seawater into usable hydrogen fuel.

For the military, a small nuclear power plant could fit on a barge and be deployed to a remote theater, where it could produce both hydrogen fuel and potable water for use by U.S. and coalition forces in time of conflict. In peacetime, these same portable plants could be deployed for humanitarian or disaster relief operations to generate electricity and to produce hydrogen fuel and potable water as necessary. Such dual usage (hydrogen fuel for equipment and potable water for human consumption) could help peacekeepers maintain a fragile peace. These dual roles make nuclear-generated products equally attractive to both industry and the military, and that could foster joint programs to develop modern nuclear power sources for use in the 21st century.

So What's Next?

The Army must plan for the time when carbon-based fuels are no longer the fuel of choice for military vehicles. In just a few years, oil and natural gas prices have increased by 30 to 50 percent, and, for the first time in years, the United States last year authorized the release of some of its oil reserves for commercial use. As the supply of oil decreases, its value as a resource for the plastics industry also will increase. The decreasing supply and increasing cost of carbon-based fuels eventually will make the hydrogen fuel and nuclear power combination a more attractive alternative.

One proposed initiative would be for the Army to enter into a joint program with private industry to develop new engines that would use hydrogen fuel. In fact, private industry already is developing prototype automobiles with fuel cells that run on liquefied or compressed hydrogen or methane fuel. BMW has unveiled their hydrogen-powered 750hL sedan at the world's first robotically operated public hydrogen fueling station, located at the Munich, Germany, airport. This prototype vehicle does not have fuel cells; instead, it has a bivalent 5.4-liter, 12-cylinder engine and a 140-liter hydrogen tank and is capable of speeds up to 140 miles

☐ The MH–1A *Sturgis* floating nuclear power plant, a 45-MW pressurized water reactor, was the last nuclear power plant built and operated by the Army.

per hour and a range of up to 217.5 miles.

Another proposed initiative would exploit previous Army experience in developing and using small, portable nuclear power plants for the future production of hydrogen and creation of a hydrogen fuel infrastructure. Based on recent advances in small nuclear power plant technology, it would be prudent to consider developing a prototype plant for possible military applications.

The Army Nuclear Power Program

The military considered the possibility of using nuclear power plants to generate alternate fuels almost 50 years ago and actively supported nuclear energy as a means of reducing logistics requirements for coal, oil, and gasoline. However, political, technical, and military considerations forced the closure of the program before a prototype could be built.

The Army Corps of Engineers ran a Nuclear Power Program from 1952 until 1979, primarily to supply electric power in remote areas. Stationary nuclear reactors built at Fort Belvoir, Virginia, and Fort Greeley, Alaska, were operated successfully from the late 1950s to the early 1970s. Portable nuclear reactors also were operated at Sundance, Wyoming; Camp Century, Greenland; and McMurdo Sound in Antarctica. These small nuclear power plants provided electricity for remote military facilities and could be operated efficiently for long periods without refueling. The Army also considered using nuclear power plants overseas to provide uninterrupted power and defense support in the event that U.S. installations were cut off from their normal logistics supply lines.

In November 1963, an Army study submitted to the Department of Defense (DOD) proposed employing a military compact reactor (MCR) as the power source for a nuclear-powered energy depot, which was being considered as a means of producing synthetic fuels in a combat zone for use in military vehicles. MCR studies, which had begun in 1955, grew out of the Transportation Corps' interest in using nuclear energy to power heavy, overland cargo haulers in remote areas. These studies investigated various reactor and vehicle concepts, including a small liquid-metal-cooled reactor, but ultimately the concept proved impractical.

The energy depot, however, was an attempt to solve the logistics problem of supplying fuel to military vehicles on the battlefield. While nuclear power could not supply energy directly to individual vehicles, the MCR could provide power to manufacture, under field conditions, a synthetic fuel as a substitute for conventional carbon-based fuels. The nuclear power plant would be combined with a fuel production system to turn readily available elements such as hydrogen or nitrogen into fuel, which then could be used as a substitute for gasoline or diesel fuel in cars, trucks, and other vehicles.

Of the fuels that could be produced from air and water, hydrogen and ammonia offer the best possibilities as substitutes for petroleum. By electrolysis or high-temperature heat, water can be broken down into hydrogen and oxygen and the hydrogen then used in engines

or fuel cells. Alternatively, nitrogen can be produced through the liquefaction and fractional distillation of air and then combined with hydrogen to form ammonia as a fuel for internal-combustion engines. Consideration also was given to using nuclear reactors to generate electricity to charge batteries for electric-powered vehicles—a development contingent on the development of suitable battery technology.

By 1966, the practicality of the energy depot remained in doubt because of questions about the cost-effectiveness of its current and projected technology. The Corps of Engineers concluded that, although feasible, the energy depot would require equipment that probably would not be available during the next decade. As a result, further development of the MCR and the energy depot was suspended until they became economically attractive and technologically possible.

Other efforts to develop a nuclear power plant small enough for full mobility had been ongoing since 1956, including a gas-cooled reactor combined with a closed-cycle gas-turbine generator that would be transportable on semitrailers, railroad flatcars, or barges. The Atomic Energy Commission (AEC) supported these developments because they would contribute to the technology of both military and small commercial power plants.

The AEC ultimately concluded that the probability of achieving the objectives of the Army Nuclear Power Program in a timely manner and at a reasonable cost was not high enough to justify continued funding of its portion of projects to develop small, stationary, and mobile reactors. Cutbacks in military funding for long-range research and development because of the Vietnam War led the AEC to phase out its support of the program in 1966. The costs of developing and producing compact nuclear power plants were simply so high that they could be justified only if the reactor had a unique capability and filled a clearly defined objective backed by DOD. After that, the Army's participation in nuclear power plant research and development efforts steadily declined and eventually stopped altogether.

Nuclear Technology Today

The idea of using nuclear power to produce synthetic fuels, originally proposed in 1963, remains feasible today and is gaining significant attention because of recent advances in fuel cell technology, hydrogen liquefaction, and storage. At the same time, nuclear power has become a significant part of the energy supply in more than 20 countries—providing energy security, reducing air pollution, and cutting greenhouse gas emissions. The performance of the world's nuclear power plants has improved steadily and is at an all-time high. Assuming that nuclear power experiences further technological development and increased public acceptance as a safe and efficient energy source, its use will continue to grow. Nuclear power possibly could provide district heating, industrial process heating, desalination of seawater, and marine transportation.

Demand for cost-effective chemical fuels such as hydrogen and methanol is expected to grow rapidly. Fuel cell technology, which produces electricity from low-temperature oxidation of hydrogen and yields water as a byproduct, is receiving increasing attention. Cheap and abundant hydrogen eventually will replace carbon-based fuels in the transportation sector and eliminate oil's grip on our society. But hydrogen must be produced, since terrestrial supplies are extremely limited. Using nuclear power to produce hydrogen offers the potential for a limitless chemical fuel supply with near-zero greenhouse gas emissions. As the commercial transportation sector increasingly moves toward hydrogen fuel cells and other advanced engine concepts to replace the gasoline internal combustion engine, DOD eventually will adopt this technology for its tactical vehicles.

The demand for desalination of seawater also is likely to grow as inadequate freshwater supplies become an urgent global concern. Potable water in the 21st century will be what oil was in the 20th century—a limited natural resource subject to intense international competition. In many areas of the world, rain is not always dependable and ground water supplies are limited, exhausted, or contaminated. Such areas are likely to experience conflict among water-needy peoples, possibly prompting the deployment of U.S. ground forces for humanitarian relief, peacekeeping, or armed intervention. A mobile desalination plant using waste heat from a nuclear reactor could help prevent conflicts or provide emergency supplies of freshwater to indigenous populations, and to U.S. deployed forces if necessary.

Promising Technology for Tomorrow

Compact reactor concepts based on high-temperature, gas-cooled reactors are attracting attention worldwide and could someday fulfill the role once envisioned for the energy depot. One proposed design is the pebble bed modular reactor (PBMR) being developed by Eskom in South Africa. Westinghouse, BNFL Instruments Ltd., and Exelon Corporation currently are supporting this project to develop commercial applications.

A similar design is the remote site-modular helium reactor (RS–MHR) being developed by General Atomics. If proven feasible, this technology could be used to replace retiring power plants, expand the Navy's nuclear fleet, and provide mobile electric power for military or disaster relief operations. Ideally, modular nuclear power plants could be operated by a small staff of technicians

and monitored by a central home office through a satellite uplink.

The technology of both the PBMR and the RS–MHR features small, modular, helium-cooled reactors powered by ceramic-coated fuel particles that are inherently safe and cannot melt under any scenario. This results in simpler plant design and lower capital costs than existing light water reactors. The PBMR, coupled with a direct-cycle gas turbine generator, would have a thermal efficiency of about 42 to 45 percent and would produce about 110 megawatts of electricity (MWe). The smaller RS–MHR would produce about 10 to 25 MWe, which is sufficient for powering remote communities and military bases. Multiple modules can be installed on existing sites and refueling can be performed on line, since the fuel pebbles recycle through the reactor continuously until they are expended. Both designs also feature coolant exit temperatures high enough to support the thermochemical water-splitting cycles needed to produce hydrogen.

For military applications, RS–MHR equipment could be transported inland by truck or railroad, or single modules could be built on barges and deployed as needed to coastal regions. The Army's nuclear reactor on the barge *Sturgis*, which provided electric power to the Panama Canal from 1968 to 1976, demonstrated the feasibility of this concept. In fact, the military previously used several power barges (oil-fired, 30-MWe power plants) during World War II and in Korea and Okinawa as emergency sources of electric power.

Research teams around the world also are examining other reactor concepts based on liquid-metal-cooled reactor systems with conventional sodium or lead-alloy coolants and advanced water-cooled systems. The Department of Energy (DOE) is supporting research and development of innovative concepts that are based on ultra-long-life reactors with cartridge cores. These reactors would not require refueling, and they could be deployed in the field, removed at the end of their service life, and replaced by a new system. The proposed international reactor innovative and secure (IRIS) design, funded by DOE's Nuclear Energy Research Initiative, would have a straight burn core lasting 8 years and may be available by 2010. Based on increasing costs of fossil fuels, a growing consensus that greenhouse gas emissions must be reduced, and a growing demand for energy, there is little doubt that we will continue to see significant advances in nuclear energy research and development.

Nuclear power is expected to grow in the 21st century, with potential benefits applicable to the military. Small, modular nuclear power reactors in mobile or portable configurations, coupled with hydrogen production and desalination systems, could be used to produce fuel and potable water for combat forces deployed in remote areas and reduce our logistics requirements. Assuming the inevitability of hydrogen fuel replacing fossil fuels, a clearly defined objective that was missing in 1966 now exists.

The partnership between DOD and the former AEC to develop Army nuclear reactors contributed to the technology of both military and small commercial power plants. This historical relationship should be renewed based on recent technological advances and projected logistics requirements. DOD logistics planners should reconsider military applications of nuclear power and support ongoing DOE research and development initiatives to develop advanced reactors such as RS–MHR, IRIS, and others. For the Army to fight and win on tomorrow's distant battlefields, nuclear power will have to play a significant role.

Would this necessarily lead to a rebirth of the old Army Nuclear Power Program, with soldiers trained as reactor operators and reactor facilities managed by the Corps of Engineers? Probably not. A more likely scenario would be a small fleet of nuclear power barges or other portable power plant configurations developed by DOE, operated and maintained by Government technicians or civilian contractors, and deployed as necessary to support the Federal Emergency Management Agency, the Department of State, and DOD. Construction, licensing, refueling, and decommissioning issues would be managed best under DOE stewardship or Nuclear Regulatory Commission oversight. As an end user of these future nuclear reactors, however, the Army should understand their proposed capabilities and limitations and provide planners with appropriate military requirements for their possible deployment to a combat zone.

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Establishing the Optimal CSS Tactical Operations Center

by Captain Michael J. Kunzer

The late 1990s saw monumental advances in information management and computer capabilities. New technologies have made their way into the defense community and are affecting the way tactical commanders fight battles. Now, these technologies have worked their way into the combat service support (CSS) community. Today's CSS commanders must embrace these emerging technologies so they can support the combat forces better. The Army also is becoming a rapidly deployable force, with a requirement to have forces on the ground in 96 hours. An easily deployable CSS force thus is needed to support a rapidly deploying combat force. In view of these technological and deployability changes, a new, more mobile CSS tactical operations center (TOC) is needed to manage and control CSS units and to track the combat force's requirements.

TOC Design Limitations

In considering the design of a more mobile CSS TOC, we must remember that the Department of the Army has placed limitations on the design of TOCs. The Army Combined Arms Center at Fort Leavenworth, Kansas, has developed additional guidelines and requirements for TOC development. Two of the major parameters placed on TOC design and development are—

- Procurement. No new equipment will be purchased. Current equipment or equipment currently in the acquisition process must be used to build and equip the TOC.
- Personnel. No personnel should be added to the TOC. Any additional personnel required for the TOC must be taken from another unit's strength.

TOC Design

With the vast amount of equipment in the Army's inventory, many options present themselves for the design of a more mobile CSS TOC. Some of the ideas for TOC design include using a standard integrated command post (SICP); tracked vehicles; high-mobility, multipurpose, wheeled vehicles (HMMWVs); International Organization for Standards (ISO) 20-foot containers; 5-ton expansible vans (expando vans); and fixed- and rotary-wing aircraft.

The TOC's requirement to be able to move quickly and use current technology eliminates some of these design possibilities. SICPs require too much time to set up and break down. Also, more trucks are needed to carry the SICPs, radios, computers, tables, chairs, and other TOC equipment than are practical. HMMWVs have high mobility, but they are too small to act as a TOC. Fixed- or rotary-wing aircraft are not practical because of their maintenance costs and their limited numbers. Their use also is restricted by weather, the number of hours they can be airborne, and the possible absence of air superiority. Aircraft are far more useful elsewhere on the battlefield.

With the TOC design limitations is mind, two good possibilities for creating a new CSS TOC present themselves. The first is using two 20-foot ISO containers that can be moved around by palletized load systems (PLSs), and the second is using two 5-ton expando vans.

Based on current Army doctrine and future requirements and using the 20-foot ISO containers, the following equipment and configurations are recommended for the future CSS TOC—

- One power generator.
- Four desks.
- Four Combat Service Support Control System (CSSCS) computers.
- Radios.
- Mobile subscriber equipment (MSE) or digital nonsecure voice terminal (DNVT) phones.
- Video projection system.
- Lights.
- Climate-control system.

All the equipment will be fixed in place to enable the TOC to be moved and established quickly. This also allows for "on-the-move" operations. The container also should come with an SICP that can be set up, if needed, to expand the size of the TOC.

If an expando van is used, most equipment must be movable so it can be moved to the van's center when the van's sides are collapsed for moving. Movable equipment will include two double desks, CSSCS computers, radios, MSE or DNVT phones, a video projection system, and a power generator (towed by the van). Fixed equipment will include lights and the climate-control system.

Personnel

TOC personnel are the key to the success of any operation. During operations, the TOC needs two work-

ing cells—a planning cell for future operations and an operations cell to track the current operation. Thus, the TOC needs two containers or vans—one for each cell.

Currently, 19 personnel work in a CSS TOC. Of those personnel, 13 are assigned to the TOC and 6 are from the brigade S1 and S4 shops. The technology used in the new TOC will enable the number of personnel to be reduced from 19 to 16. The table below shows the personnel needed in the TOC for operating 24 hours a day.

TOC offices situated in either the vans or the containers can support the needed personnel. Each van or container will contain one office composed of four workstations. One office will be for the planning cell and the other for the current operations cell.

Using either the van or the containerized TOC design reduces the size of the rear command post because the brigade S4 and S1 will not need a separate TOC vehicle. The support operations officer, battalion S3, brigade S4, and brigade S1 occupy one office; this would be the planning side of the TOC. The battle captain, battalion S2, supply and services officer, and maintenance officer track and report on the status of the operation in the other office. Either TOC vehicle can meet the needs of these personnel. Neither has an advantage over the other since both have the same capabilities to meet the needs of the mission.

TOC Personnel

Planning Cell	Current Operations Cell
Support operations officer	Maintenance officer
Support operations non-commissioned officer in charge (NCOIC)	Maintenance NCO
	Supply and services officer
Support battalion S3	Movement control NCO
Battalion operation sergeant	Battalion S2
	Communications NCO
Brigade S4	Battle captain
Brigade S4 NCOIC	Battalion nuclear, biological, and chemical NCO
Brigade S1	
Brigade S1 NCOIC	

Capabilities

When deciding whether to use the container or the expando van to house the TOC, deployability, mobility, versatility, ease of setup and breakdown, site layout, interior layout, communications and computer systems, and ability to operate on the move should be considered.

Deployability. The CSS TOC must be capable of deploying to the theater by several methods. Currently, the Army deploys by four different methods: air, sea, rail, and road. All the Army's equipment can easily by deployed by sea, rail, and road. With the requirement for units to be more deployable in less time, it becomes necessary for equipment to be airmobile as well. Therefore, air deployability becomes a factor in the design of the TOC.

Since only a few aircraft are available in the Air Force's inventory for equipment transport, the most common cargo aircraft, the C–130, is most likely to be used to deploy forces. While most equipment will fit in a C–17 or a C–5, the C–130 is the primary aircraft for deployment and has the smallest cargo space. A TOC design should be C–130 deployable; this would enable the TOC to deploy using any of the Air Force's cargo aircraft. The maximum height and width a C–130 can accommodate are 96 inches and 104 inches respectively. The expando van cannot be deployed on a C–130 or a C–141 because it is too tall. It can, however, be deployed by C–17 and C–5. The 20-foot container could fit easily into a C–130 or any other cargo aircraft. This gives the container a significant advantage over the expando van.

Mobility. The new TOC must be capable of being moved over the different types of terrain that may be encountered while supporting a combat force. The TOC also must move with enough speed to keep pace with the combat forces.

The expando van can be moved across the battlefield at a rate that would keep pace with the combat forces. The ISO container fits on a flatrack and is hauled by a heavy, expanded mobility, tactical truck-load handling system (HEMTT–LHS) or a PLS, thus giving the container the mobility needed to keep up with the forces. The HEMTT–LHS and PLS are more mobile than the expando van. A PLS with a trailer can haul two containers, or the entire battalion TOC, which gives the container TOC a slight advantage over the expando van TOC for mobility.

Versatility. The TOC must be modular to meet changing Army missions. By standardizing the equipment inside a TOC module (one van or container), the TOC becomes a highly versatile element. Thus, all expando van TOCs will have the same capabilities, and all container TOCs will have the same capabilities. Designing the TOC in modules makes additions simple for both containers and vans. Having the battalion TOC consist of either two 20-foot containers or two 5-ton expando vans enables the CSS commander to split them to provide command and control support from different locations, run split-base operations, or move in echelons.

Another capability that both modules have is to function for several different command and staff elements. A standardized TOC module with all the basic functions can be used for different elements such as the division support command, division materiel management center, corps, and theater units. These levels above the battalion only need to add more vans or containers to meet their command needs.

Setup and breakdown. The ability to establish the TOC quickly is critical, as is the ability to break down the TOC quickly for relocation. The expando van re-

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☐ The expando van is self-mobile. However, the sides of the van must be expanded and the interior set up before a TOC can operate inside.

quires more time to set up because the van must be expanded and leveled, and the equipment inside must be moved into place. Since all the equipment in the ISO container is locked in place inside the container, the TOC can be dropped from the truck and set up quickly.

To break down the expando van, the equipment must be packed up and moved to the center of the van so the sides can fold up. The container only needs to be closed and picked up by a truck. This gives the advantage to the containerized TOC over the expando van TOC.

Site layout. The layout of the TOC's site can have several different configurations depending on the mission, terrain, time, commander's preference, and other factors. The TOC site layout should be as compact as possible so it will be a small, easy-to-defend target.

A container placed on the ground creates a smaller target than an expando van, because the container is shorter and narrower than the van. If, however, the containers are left on the PLS or HEMTT–LHS, the expando van gains the advantage of being a shorter target. Overall, when more vans are added to the TOC, its size grows faster than the size of a TOC assembled from the same number of containers. Thus, containers placed on the ground have the advantage for site layout.

Interior layout. The inside of any TOC should be configured for maximum use of space and efficiency. It should allow the commander to see and analyze the situation and make decisions. The container offers less workspace and less room for the commander to move around the TOC than does the van. The container allows for some area behind the workstations and provides a hallway-like area in which the commander can move and see what is happening. If SICPs are attached to the containers, the commander has more work area and more space to hold meetings if necessary. The expando van offers a larger area inside the van for the commander to move around. The van has the advantage for interior layout because of the ease in which people can move around inside the van.

Communications and computer systems. Another essential part of any TOC is communications. The ability to talk to other elements on the battlefield is critical, both in receiving and sending information. Communications also are the key to keeping the computer systems "talking." The communications and computer systems need to be standardized in both TOCs because of their critical importance.

The TOC should be equipped with four radio nets and MSE or DNVT phones. The computer system in the TOCs must be a hardened computer unit with the CSSCS software as prescribed by the Chief of Staff of the Army. Both types of TOCs are capable of supporting both the communications and the computer systems.

On-the-move control. One critical factor in considering the best design for a TOC is how to maintain operations while on the move. The information coming from supported forces needs to be tracked and decisions need to be made while the TOC is in transit. Continuity of support to the combat forces must be maintained. Therefore, it is critical that the TOC have an on-the-move capability. The best solution would be to move one module of the TOC forward, then break down and move the remaining module. Another option would be to mount a CSSCS system in a HMMWV to act as the mobile TOC.

One advantage the container system has is that it can operate while mobile. Since all its systems are fixed in place, the TOC can function while loaded on a moving PLS truck. Safety is an issue for anybody inside the container while it is moving, but bolting the chairs down and equipping them with seatbelts can minimize that risk.

The expando van cannot operate while on the move. It must be expanded to be functional. The ability of the container to function while moving gives it a slight advantage over the expando van.

The CSS TOC is a critical hub for supply information and requests. This center must be a functional facility that is deployable, mobile, versatile, and modular, and it must have a quick and efficient setup and breakdown process. Looking at the different systems in the Army's inventory, the 20-foot container offers the best solution. While the expando van has many good qualities, its inability to be C–130 mobile seriously restricts its ability to meet the requirements of a TOC. The container TOC is easier to set up and break down, presents a smaller target, and can operate while on the move.

Captain Michael J. Kunzer is currently a student at Florida Institute of Technology. He has a B.A. degree in physics from Western Maryland College and is a graduate of the Quartermaster Officer Basic Course, the Combined Logistics Officers Advanced Course, Rigger School, and the Army Logistics Management College's Logistics Executive Development Course, for which he completed this article.

Configuring Airdrop Packages for the IBCT

by Major John V. McCoy

The author shows how airdrop can help interim brigade teams meet their 96-hour deployment requirement.

The Army Vision states that the Army "will develop the capability to put combat force anywhere in the world in 96 hours after liftoff—in brigade combat teams for both stability and support operations and for warfighting." The Army Chief of Staff, General Eric K. Shinseki, says the Army must have "the ability to put forces where needed on the ground . . . to directly affect the outcome of the situation or crisis at hand within hours of a decision . . . regardless of the environment."

The interim brigade combat team (IBCT) is the force the Army is developing to accomplish that mission. The Army Deployment Process Modernization Office has determined that deploying an IBCT to a theater requires the theater's airfield to have a maximum-on-ground (MOG) capacity of at least six aircraft in order to support the arrival of an IBCT within 96 hours. However, the MOG airfield capacity has been less than six aircraft during a number of past military operations; in the recent military operation in the Balkans, the MOG capacity at the primary destination airfield in Skopje, Macedonia, was only two aircraft. How can the Chief of Staff's 96-hour deploy-anywhere IBCT vision and directives be met if the destination theater MOG airfield capacity is less than six aircraft? The answer is airdrop.

Airdrop Feasibility

The recommended IBCT air-land and airdrop deployment concept requires the joint capabilities of both the Air Force and the Army. Successful airdrop also requires that supplies and equipment survive the ground impact associated with various types of airdrop.

The Air Force has properly designed airframes to support the airdrop portion of the deployment and sufficient lift capabilities to support both the air-land and airdrop portions of the deployment. An Air Force C–17 Globemaster III aircraft can airdrop single items of equipment weighing up to 60,000 pounds and has a total airdrop cargo weight of 110,000 pounds. Each C–17 has a container-delivery system capacity of 40 containers, with a total rigged weight of 2,350 pounds each. Air Force C–130 Hercules and C–141 Starlifter aircraft can drop planeloads of all types of wheeled vehicles, supplies, and other equipment. In other words, the Air Force can support any airdrop requirements an IBCT may have.

For airdrop to be feasible from an Army standpoint, the Army must have sufficient rigging capabilities. Army Quartermaster light and Quartermaster heavy airdrop supply companies can rig loads that weigh up to 42,000 pounds each for airdrop. A company can rig 200 tons of supplies per day for airdrop using single A–22 cargo bags that measure 4 feet by 4 feet by 100 inches or double A–22 cargo bags that measure 4 feet by 8 feet by 100 inches. Airdrop equipment support companies pack the parachutes and rig the supplies for airdrop.

Defense depots can assist airdrop efforts by rigging supply items destined for the IBCT at the depot. The rigged supplies then can be transported to the theater and airdropped where needed. Having the supplies rigged for airdrop before they leave the depots makes airdrop more feasible.

Army supplies and equipment can be "free-dropped" with no parachutes by using limited energy-dissipating packing material such as honeycomb cardboard. Subsistence items; packaged petroleum, oils, and lubricants; and ammunition can be delivered by high-velocity airdrop, where parachutes keep the loads upright and descending at 70 to 90 feet per second. Vehicles, bridging, and artillery can be airdropped by low-velocity airdrop using parachutes that reduce the rate of descent to no more than 28 feet per second.

Potential Airdrop Package Modularity

According to the recommended IBCT deployment

concept, the IBCT commander must designate the equipment to be deployed and the manner in which it is deployed. An overriding factor affecting his decision is the air-land capacity of the destination theater. If the MOG airfield capacity at the destination is at least six aircraft, then no airdrop is needed to meet the 96-hour deployment requirement. If the MOG airfield capacity is five aircraft, some airdrop is needed. If the MOG airfield capacity is considerably less than six aircraft, a large amount of additional equipment must be deployed by airdrop to meet the 96-hour time limit.

IBCT equipment can be broken down into modules, with each module containing equipment that provides a full and distinct combat capability as opposed to a combination of partial capabilities. The breakdown is tailored according to the MOG airfield capacity available at the destination theater. However, the modules could include combinations of partial capabilities if a commander so desired. The variety of the breakdowns is limited only by the amount of planning time available to the deploying IBCT.

Recommended Airdrop Packages

Based on the developing IBCT force structure, airlift requirements for elements of the IBCT are distributed as follows (in rounded numbers): 5 percent for passengers; 3 percent for brigade headquarters and headquarters equipment, 36 percent for three infantry battalions' equipment, 14 percent for artillery battalion equipment, 3 percent for signal company equipment, 15 percent for brigade support battalion equipment, 16 percent for reconnaissance squadron equipment, 2 percent for military intelligence company equipment, 3 percent for antitank company equipment, and 4 percent for engineer equipment.

These percentages were used to assemble the following hypothetical IBCT deployment airdrop packages for various destination airfield MOG scenarios—

- ***MOG 5.*** Air-land passengers, IBCT command and control element equipment, equipment for two infantry battalions, and artillery, signal, support, reconnaissance, military intelligence, and antitank unit equipment. Airdrop engineer unit equipment and unit equipment of the one non-air-land infantry battalion.
- ***MOG 4.*** Air-land passengers, IBCT command and control element equipment, equipment for one infantry battalion, and artillery, signal, support, and reconnaissance unit equipment. Airdrop all engineer, military intelligence, and antitank unit equipment and equipment of the two non-air-land infantry battalions.
- ***MOG 3.*** Air-land passengers, IBCT command and control element equipment, equipment for one infantry battalion, and artillery, signal, and support unit equipment. Airdrop reconnaissance, engineer, military intelligence, and antitank unit equipment, as well as unit equipment of the two non-air-land infantry battalions.
- ***MOG 2.*** Air-land passengers, IBCT command and control element equipment, equipment for one infantry battalion, and artillery unit equipment. Airdrop signal, support, reconnaissance, military intelligence, antitank, and engineer unit equipment, as well as equipment of the two non-air-land infantry battalions.
- ***MOG 1.*** Air-land passengers, IBCT command and control element equipment, and equipment for one infantry battalion. Airdrop all artillery, signal, support, reconnaissance, military intelligence, antitank, and engineer unit equipment, as well as unit equipment for the two non-air-land infantry battalions.

A plan for providing accompanying, follow-up, and routine supplies to the IBCT by airdrop should supplement each deployment plan. In addition, a portion of an airdrop supply company should be sent to the Defense depot responsible for initial supply to rig supplies so they can be airdropped in the contingency area without using the limited in-theater airfield capacity.

Airdrop packages are not required at destination airfields with a MOG of six or higher because the theater throughput capacity possible at such airfields can sustain a 96-hour total IBCT air-land deployment. Even if civilian aircraft are used to transport passengers, the airdrop deployment packages described above remain relevant options for deploying equipment.

Tactical and Logistics Advantages

Incorporating airdrop into IBCT deployment concepts has a number of advantages. For example, supplies that have been rigged for airdrop at the servicing Defense depot in the continental United States can be dropped into the theater in a timely manner without congesting limited airfield capacity. Prolonged operations require follow-on forces, so resupply by airdrop allows those forces to use a limited-capacity airfield without losing or delaying IBCT supplies at airfield choke points.

Substituting airdrop sorties for air-land sorties reduces the exposure of fixed-wing Air Force aircraft to antiaircraft threats near the destination. Also, unless operational security for the mission has been compromised, the exact destination of each airdrop mission cannot be anticipated easily by an adversary, as is possible with air-land missions that must seek out a designated airfield.

When airdrop is used in the deployment process, an IBCT can be deployed quickly to a more isolated area than if air-land is the sole deployment option. When airdrop is used in the deployment process, the number of potential touchdown sites for equipment in theater is not limited to the number of available runways. It is possible to integrate IBCTs into the mission more quickly

using multiple drop zones as opposed to receiving equipment only at available runways, staging it at the airfield, and then moving it on to the integration area.

Another advantage of using airdrop is that it reduces the amount of lift that must be allocated early to ground handling equipment. The success of the deployment mission also becomes less dependent on the readiness of ground handling equipment. Including airdrop in the deployment concept also improves overall aircraft usage availability because the aircrew does not have to wait at the destination for the aircraft to be unloaded.

Airdrop's advantages, coupled with the fact that it enables 96-hour deployment of an IBCT to a theater with limited MOG airfield capacity, make it a highly feasible option. However, disadvantages such as the need for more airdrop rigging equipment, more specialized personnel requirements, and less "hands-on" control of the equipment as it initially arrives on the ground are obstacles that still must be overcome.

Future Technological Enablers

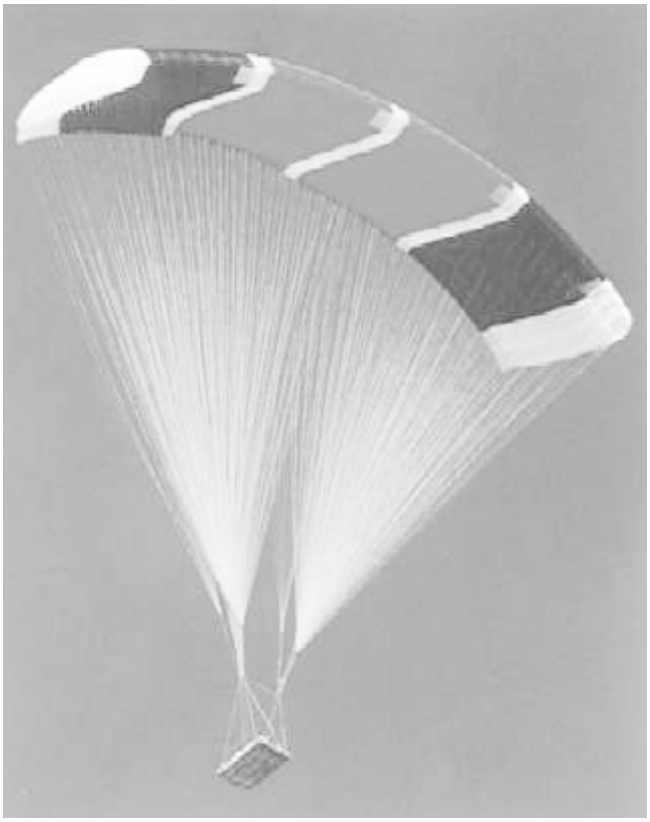
Future airdrop methods are expected to improve the utility of airdrop in military operations. Improvements in airdrop precision involving global positioning systems and airfoil parachute design are advancing the logistics efficiency of airdrop to new levels.

A revolutionary C–17 dual-row airdrop system (DRAS) developed by Boeing, the Army Soldier and Biological Chemical Command's Natick Soldier Center, and the Air Force maximizes the C–17's airdrop capabilities by dropping eight 16-foot modified equipment or supply platforms simultaneously using a gravity release system.

The Natick Soldier Center and its military, academic, and commercial partners have developed a family of autonomously guided airdrop systems called Advanced Precision Airborne Delivery Systems. These systems will allow one delivery aircraft to conduct precision airdrop to multiple targets. The Guided Parafoil Air Delivery System (GPADS)-Heavy can drop a high-mobility, multipurpose, wheeled vehicle (HMMWV) from 25,000 feet to within 100 meters of its designated target. The GPADS-Light can airdrop from a position offset laterally 20 kilometers from the target and have its payload conduct a controlled descent to a point within 100 meters of the designated offset landing point.

Advances in airdrop precision should reduce the uncertainty and risks involved in airdrop missions and improve their usefulness in supporting IBCT deployments. These advances will reduce further the direct threat to airlift assets while enabling successful deployment and logistics resupply missions to areas with limited airfield capacity.

Airdrop is a feasible deployment option that will enable 96-hour IBCT deployment to theaters for which the MOG airfield capacity is five aircraft or less. The ability to develop multiple IBCT airdrop modular design units provides IBCT planners with many options for including airdrop in their deployment concepts. Today's state of the art airdrop deployment options offer commanders many tactical and logistics advantages, while advances underway in airdrop technology promise to make airdrop an even more relevant IBCT deployment option in the future. ALOG



The GPADS–Heavy can drop a HMMWV from 25,000 feet to within 100 meters of its target.

Major John V. McCoy is pursuing a master's degree in logistics management at Florida Institute of Technology's Fort Lee Graduate Center. He has a bachelor's degree in electrical engineering from Rensselaer Polytechnic Institute in New York. He is a graduate of the Infantry Officer Basic Course, the Combined Logistics Officers Advanced Course, the Combined Arms and Services Staff School, the Army Transportation Officer Branch Qualification Course, and the Army Logistics Management College's Logistics Executive Development Course, for which he completed this article.

Medical Maintenance Requirements in Special Forces Groups

by Captain Thomas S. Wieczorek

Army Special Forces groups have many organic medical capabilities, including medical, dental, veterinary, lab, x-ray, preventive medicine, medical operations, and medical supply services. They need these diverse capabilities because of the types of missions they execute and because the austere environments in which they operate require them. However, it is important to note that, in spite of all of these medical capabilities, Special Forces groups do not have any type of organic medical maintenance support.

In a garrison environment, Special Forces groups must rely on the installation medical support activity for medical maintenance support. However, when deployed, the groups have to develop their own plans to handle medical maintenance requirements. Would Special Forces groups benefit from having their own medical maintenance support, such as a medical equipment repairer (MER) with military occupational specialty (MOS) 91A? These groups have unit-level automotive maintenance support and even limited maintenance capabilities for communications, parachutes, and combat diving equipment. I believe they should have their own medical maintenance support as well.

Medical Maintenance Overlooked

The Army has seven Special Forces groups: five are Active Army units, and two are Army National Guard units. These groups all fall under the control of the U.S. Army Special Forces Command (Airborne), a major subordinate command of the U.S. Army Special Operations Command (USASOC). Because USASOC is its own major Army command (MACOM), it does not fall under the control of the U.S. Army Forces Command (FORSCOM) as do the majority of Army combat forces. Because most medical doctrine writers focus on the medical functions within FORSCOM units, smaller organizations, like USASOC, do not have the benefit of detailed medical doctrine, especially medical maintenance doctrine. Thus, medical maintenance does not receive adequate attention or is overlooked altogether.

In June 2000, the Army special operations community published its own medical field manual (FM). FM 8–43, Combat Health Support for Army Special Operations Forces, along with USASOC Regulation 40–6, Health Services: Medical Supply Policies and Procedures (Draft), are the only two special operations-specific medical publications that contain medical maintenance information. Unfortunately, neither document addresses the tactics, techniques, and procedures for conducting medical maintenance in a *deployed* setting. FM 31–20, Doctrine for Special Forces Operations, does mention a few planning considerations for medical maintenance, but it does not go into detail. So how can a Special Forces unit write a field standing operating procedure that contains medical maintenance guidelines when higher level doctrine does not address them at all?

What the Experts Say

In a confidential e-mail survey of the officers or noncommissioned officers (NCOs) in charge of medical maintenance coordination for six of the seven Special Forces groups in the Army (one of the National Guard groups did not have an officer or NCO to handle medical logistics and maintenance issues at the time of the survey), three stated that they do not have a requirement for organic medical maintenance, while the other three stated that they did.

The groups that indicated they did not have a requirement provided three reasons. First, they noted that the periods of their deployments typically were not long enough to require medical maintenance. Second, they stated that they coordinated for any required maintenance before the actual deployment. Third, they maintained that often the most sophisticated equipment that requires maintenance, such as x-ray equipment, is not taken on missions.

However, of the three groups that denied the requirement for organic medical maintenance, two admitted that they would have a requirement if the deployment was battalion-sized or larger and of long duration. The prevailing theme in all six surveys was that no one wanted to lose a current authorization for any of their current MOSs in order to gain a slot for an MER. However, if their table of organization and equipment (TOE) authorized an MER without having to lose any other authorization, they gladly would take one.

What the Numbers Say

An objective way to analyze if the Special Forces groups require an MER is to look at manpower re-

Manpower Requirements Formula

1. Use the following equation to determine workload-based requirements for Medical Equipment Repairer (MOS 91A)—

Where:

(A X B) / C = R

A = Annual maintenance man-hours (AMMHs) per piece of equipment
B = Density of equipment (Section II, TOE)
C = Annual MOS availability factor (from Table C–1, AR 71–32)
R = Manpower requirements

2. Annual MOS availability factor (AMAF) data—

TOE	Name	MARC Code	AMAF
31803L000	Support CO, SF GP (ABN)	33B	4,380
31806L000	HQ Det, SF BN (C Det)	13B	4,380
31807L000	SF CO, SF BN (ABN)	13B	4,380

3. Calculations—

4660.1 Total AMMH / 4380 AMAF = 1.06 MERs

Legend:

ABN = Airborne
BN = Battalion
CO = Company
Det = Detachment
GP = Group
HQ = Headquarters
SF = Special Forces

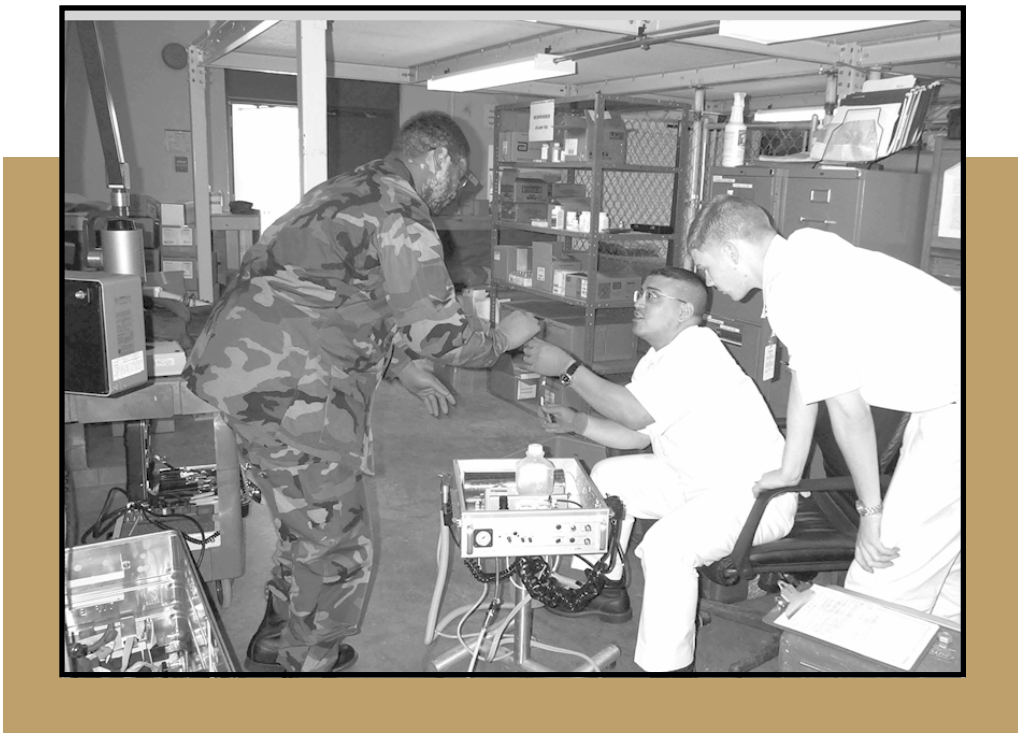
quirements criteria (MARC). Specifically, in the area of medical maintenance, the U.S. Army Force Management Support Agency (USAFMSA) outlines a standard formula for determining manpower requirements (see chart above). The first step in this process is to determine the annual maintenance man-hours (AMMHs) for each piece of medical equipment in a Special Forces group. These numbers can be found in a database maintained by USAFMSA, which is accessible on line at http://www.usafmsardd.army.mil. The next step is to multiply the AMMHs by the TOE-authorized quantities of each piece of equipment. The product of these two figures yields the numerator for using the MARC formula (A X B on the chart).

The denominator for the MARC formula (the annual MOS availability factor [AMAF]) is determined by applying the MARC codes for the various Special Forces subordinate units that have medical equipment to Table C–1 of Army Regulation 71–32, Force Development and Documentation—Consolidated Policies. (The MARC code is a three-digit code located on the header data of every TOE.) In the case of the Special Forces groups, the resulting AMAF is 4,380. By doing the appropriate calculations, the manpower requirement is 1.06. In other words, according to MARC data, each Special Forces group should be authorized one MER.

An important thing to remember is that, since the MARC data used in this study deal only with TOEs, the resulting requirement applies only to the TOEs and not to the modification TOEs (MTOEs) for each of the Special Forces groups. In other words, even if USAFMSA added an MER to the TOE, the MACOM "bill payer" (USASOC) could decide not to accept the position, in which case the position would be shown in the "Required" column of the MTOE but not in the "Authorized" column.

All Missions, All Equipment

Some members of the Special Forces groups surveyed stated that their missions were typically of short duration. Doctrine writers and people who determine requirements for units look at many possible missions for



☐ **Medical equipment repairers from Womack Army Medical Center conduct semiannual maintenance inspections on equipment belonging to the 3d Special Forces Group (Airborne) at Fort Bragg, North Carolina.**

those units, not just the typical ones. Consequently, those units need to be prepared to provide support in a longer conflict.

In some cases, a unit cannot wait until its mission is over to perform maintenance. Paragraph 6-20b of FM 8–55, Planning for Health Service Support, states, "Medical equipment maintenance support must be provided as far forward as possible. Ideally, equipment items should be diagnosed and repaired on site if conditions permit, either by organic MERs or by mobile support teams . . ." This would be the case especially when the Special Forces are operating in austere environments; for example, running a "guerilla hospital" during one of their unconventional warfare missions. In any event, it is critical to have the right type of support whenever the customer needs it, not just for typical missions.

MARC data could justify adding MERs to the Special Forces groups because of the quantity of authorized equipment they possess. But what about their equipment that is not authorized on their TOEs or MTOEs? Four of the six Special Forces groups surveyed said they have a number of defibrillators and pulse oximeters that are not part of their TOEs or MTOEs but are authorized by special letters. Those items also must be captured in the units' medical equipment densities so they can be maintained properly.

Army Special Forces groups have a legitimate requirement for organic medical maintenance, specifically MERs. The MARC numbers prove that. I believe the USASOC should add one MER (MOS 91A) and his corresponding equipment as requirements to the TOE for the medical section of the Special Forces group support company (TOE 31803L000). The groups should not have to surrender another MOS in order to obtain a 91A.

Medical maintenance is overlooked all too frequently. The time to make sure medical equipment is working and calibrated is not after the bullets start flying on the battlefield. Having a technical maintenance professional alongside all the other medical specialists within the Special Forces groups would be the smart thing to do.

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Field Feeding in the 21st Century

by Chief Warrant Officer (W–4) Carlos N. Keith

> To guide a biscuit from Lisbon into a man's mouth is a matter of vital importance, for without biscuit, no military operation can be carried out.
> —Arthur Wellesley, Duke of Wellington, 1812

Today's battlefields demand ration support systems that adequately provide for the needs of the warfighter in all types of scenarios. The Army's field feeding systems must provide acceptable and nutritious meals to warfighters. Revolutionary approaches to field feeding are needed to support the Objective Force.

For the Army to have a viable and adequate plan for feeding the force in the 21st century, it needs to develop new programs and policies for procuring, managing, and distributing its food supply. New ways to preserve, prepare, store, and distribute food on and off the battlefield are on the horizon. The principles of focused logistics will guide logisticians in providing the battlefield commander the right meal, at the right place, and at the right time.

General Henry H. Shelton, Chairman of the Joint Chiefs of Staff, recently said, "The quality of combat rations is very good, probably as close to home cooking as you can possibly find." Today, the U.S. soldier is the best fed soldier in the world. To maintain this high standard, the Army needs to emphasize modernizing the current field feeding systems and developing ration systems that will keep pace with the Army's transformation.

The Army is aggressively seeking new means of providing fully integrated combat rations and improved field feeding equipment. However, the Army field feeding program needs leap-ahead technologies that will help warfighters achieve full-spectrum dominance. One of the ways the Army can achieve this is by aggressively exploring robotic field feeding kitchens, irradiated foods, and National Aeronautics and Space Administration (NASA) feeding initiatives.

Field Feeding in the Past

Ever since the Army first "drew its line in the sand" at Lexington, Massachusetts, in the days of the Revolutionary War, its commanders have been responsible for providing their soldiers with quality, nutritious meals in various environments and tactical situations. From the first formal military program in 1775 to a class I (subsistence) ration breakdown point in Operation Desert Storm, the Army's food service program has undergone many changes in an ongoing attempt to adapt to soldier needs on an ever-changing battlefield.

During World War II, field feeding procedures focused on a typical company kitchen consisting of three gas-fired stoves, an ice chest, several 32-gallon cans, and immersion heaters for sanitizing utensils. In an attempt to push subsistence forward to soldiers, several initiatives resulted in converting 2½-ton cargo trucks into mobile kitchens. However, the Army found this practice unsafe and returned to the traditional tent kitchens.

After World War II, and during the Korean War, no visible efforts were made to improve the Army's inventory of field feeding equipment or subsistence systems. The methods of warfare also remained basically the same. Everything in front of the forward edge of the battle area (FEBA) was enemy territory, and everything behind the FEBA was secure. Cooks would prepare hot A rations (fresh food) or B rations (dehydrated or semiperishable food) directly behind the FEBA. This allowed soldiers to eat hot meals three times a day, unless they were out on patrol. When hot rations were not available, soldiers ate the meals, combat, individual (C rations). C rations consisted of canned meat products, such as pork, beef, and spaghetti, that were designed to be eaten cold.

In the mid-1970s, the Army introduced the mobile kitchen trailer (MKT) in another attempt to push subsistence support forward on the battlefield. The MKT replaced the M1948 field mess tent and is still the Army's primary field kitchen after 25 years. Many MKTs are old and in desperate need of repair. In an effort to maintain MKTs, the Army has increased the MKT maintenance expenditure limit. This helps, but putting new parts on 25-year-old trailers eventually will become uneconomical, and the MKTs will have to be refurbished or replaced. This is extremely important because the MKT is the Army's primary feeding system. For this reason, the Army needs to take a good look at revitalizing the aging fleet of MKTs to meet the demands of the

future, starting with the oldest and most worn.

In the 1980s, the Army lost 3,000 cooks and other logistics military occupational specialty spaces as a bill payer for an increase in its warfighting capability. This reduction in the cook force structure placed serious limitations on the Army's ability to prepare and serve A rations in the field. Because of this cut, the Army had to modify the ration-feeding standard to serve one meal, ready-to-eat (MRE), and two heat-and-serve rations per day, with an A ration served every third day. Commanders lived with this less-than-satisfactory standard through Operation Desert Storm. After Desert Storm, the Army initiated policies that gave commanders the flexibility to serve A ration meals daily (depending on mission, enemy, terrain, troops, and time available).

Army Field Feeding System-Future

In the 1990s, the Army established a special task force to conduct a worldwide study to determine how to fix the existing field feeding system and to develop a field feeding strategy for the future, which became known as the Army Field Feeding System-Future (AFFS–F). The task force recommended and received approval from the Army Chief of Staff to restore 400 cook spaces to the existing force structure for the maneuver battalions and 66 food service warrant officer spaces.

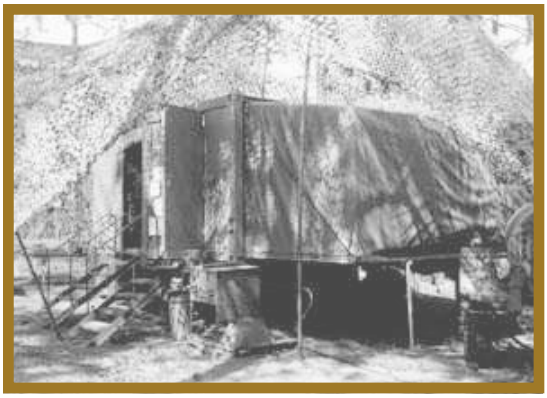
The study also recommended upgrades in field feeding equipment and an automated tactical class I distribution system. So far, an automated tactical class I support system has not been implemented, and class I operations are conducted using mostly manual methods.

Though AFFS–F was approved 10 years ago, current policy and staffing limit the types of rations commanders can provide their troops in the field. For example, the current field feeding policy in Army Regulation 30–21, The Army Field Feeding System, limits the types of rations used during field training to one heat-and-serve unitized group ration (UGR–H&S), one MRE, and one UGR–A ration per day. Though some would argue that serving the soldiers two A rations in the field would place a tremendous burden on a few cooks, I believe that the benefits to the individual soldier more than outweigh that argument. Therefore, I recommend that the major Army commands review the current field feeding policy and allow each commander more flexibility to choose the type of ration mix based on his unit's mission, the unit's ability to support the mission, and the soldiers' preferences.

Current Feeding Initiatives

The AFFS–F has led to significant changes in our food service system. However, we are still far from where we need to be. Some of the ongoing AFFS–F upgrades and improvements are—

- ***MREs.*** Improvements to MREs include approval of more than 80 new items since 1993; replacement of the 14 least-acceptable items; increase of meal varieties from 12 to 24; addition of four vegetarian meals; development of a new, easy-open meal bag with commercial-like colors and graphics; and addition of nutritional labeling.
- ***UGRs.*** The UGR is designed to simplify and streamline the process of providing the highest quality meals in the field by integrating the components of heat-and-serve rations and A rations with quickly prepared, user-friendly, brand-name commercial products. The intent of the UGR concept is to consolidate everything needed to prepare a meal into one unit. It uses commercial items such as sauces and mixes to reduce preparation time in the field. The UGR greatly reduces the need to handle rations several times in the field, such as at bulk ration break points, and enhances and supports the battlefield distribution plan.
- ***Kitchen, company-level field feeding-enhanced (KCLFF–E).*** The KCLFF–E is a component of AFFS–F that comes with a high-mobility, multipurpose, wheeled vehicle (HMMWV) and a high-mobility trailer. The KCLFF–E is designed to feed soldiers a hot meal in remote locations. It can be used to heat, deliver, and serve one heat-and-serve ration per day for up to 200 soldiers.



☐ The containerized kitchen will replace the MKT.

☐ This photo shows the kitchen equipment included in the KCLFF–E.

• ***Modern burner unit (MBU).*** The MBU is replacing the M2 gasoline burner. The MBU reduces the logistics burden and safety hazards of gasoline use because it burns less volatile JP–8 fuel. The MBU is ignited in place with an electronic ignition system, thus saving time by eliminating the pre-heat period required with the M2 and reducing the hazards associated with lighting and carrying lit burners into the kitchen.

• ***Containerized kitchen (CK).*** The containerized kitchen is a combination of existing military standard kitchen equipment and commercial components integrated into an expandable 8-foot by 8-foot by 20-foot container. It is mounted on a tactical trailer and towed by the family of medium tactical vehicles (FMTV) 5-ton cargo truck. The major features of the CK include electric power from an on-board generator; environmentally controlled heating and cooling; 54 cubic feet of refrigerated storage space; the capability to perform roasting, grilling, boiling, frying, and baking; running water; a protected serving line; and a ventilated exhaust system.

The mobile kitchen trailer has been the Army's primary food preparation facility in the field for more than 25 years.

Future Field Feeding Systems

The emerging Total Army Field Feeding-2010 concept will establish a new field feeding concept for providing soldiers with the nutrition they need to accomplish their missions. The focus is to support the Objective Force while continuing to support the current and interim forces. To accomplish this, the Army needs ration systems and equipment that can meet the demands of all three forces.

As food technology continues to advance, the Army must improve its delivery systems. The Army currently is researching three key pieces of field feeding equipment considered leap-ahead food service technology. They are—

• ***Battlefield kitchen (BK).*** The BK will be an integrated, highly mobile field feeding kitchen. It will include cooking, refrigeration, and sanitation equipment while incorporating co-generation technology in order to reduce the logistics footprint. It is intended to be a direct MKT replacement. The requirement document for this piece of equipment is currently under development.

• ***New types of rations.*** These include self-heating group rations that do not require a cook to prepare, compressed entrees that can be prepared and eaten in the future combat vehicle, and a first-strike ration that provides an eat-out-of-hand capability for use during the initial stages of deployment, providing increased carbohydrates with less packing and waste.

• ***Refrigeration.*** The Army must move away from ice chests to refrigeration. This can come in many forms: the multitemperature refrigerated container, which will allow the distribution of perishable and semiperishable rations on a single platform; the use of commercial refrigerators such as those found in the CK; and technology such as the advanced design refrigerator 300, which provides 300 cubic feet of thermally efficient air transportable refrigeration.

New Food Technologies

Researchers are making advances in food science, biotechnology, and food processing that will affect the Army's feeding plan and food choices well into this century.

A number of problems associated with feeding soldiers adversely impact food quality. Since most of the Army's food supply must be shelf stable, the only currently acceptable food preservation options are thermostabilization (preservation by heat, usually under pressure, to destroy all microorganisms), dehydration, and freeze-drying.

Food miniaturization is one area of food science in which scientists have made progress. They are miniaturizing fruits and vegetables in order to reduce waste and already have produced miniature lettuce and watermelons.

Food irradiation is another process on the rise. Moderate doses of radiation destroy the microorganisms present in food. Irradiated foods can be stored in sealed containers at room temperatures for extended periods without spoiling. The fact that irradiation extends the shelf life of most foods has strategic implications for all of the armed services. Using irradiated food would mean that food could be pre-positioned in much the same way as equipment is pre-positioned. Unfortunately, the American public has yet to accept fully the idea of consuming irradiated food.

☐ A 300-cubic-foot refrigerator such as this may be used to provide refrigeration in the field.

Today's Challenges

As the Army moves into the 21st century, it no longer can rely on the craftiness of food service managers to keep soldiers fed. The next full-scale conflict promises to be a fast-paced and volatile situation. To keep up, class I automation must be flexible, responsive, and precise. It must be able to track and shift assets while in transit in order to deliver tailored food packages that support strategic, operational, and tactical operations.

Funding is one of the biggest challenges to acquiring new and improved equipment to meet the demands of the 21st century. Until field feeding becomes a priority, the Army will never have the type of leap-ahead technology it needs to meet the warfighter's subsistence needs. Every year, field feeding competes with digitization equipment, fuel, ammunition, and weapon systems for funds. This has caused a system of "piecemealing" field feeding equipment and systems to the units so that some have the new and improved AFFS–F equipment and others have a combination of old and new equipment.

For example, in fiscal year 1999, some maneuver battalions in U.S. Army Europe (USAREUR) received their first KCLFF–Es. Before being released to USAREUR units, these systems sat in a depot for 2 years because there was no funding to complete the fielding process. After receiving the systems, USAREUR found that 200 of the HMMWVs had rusted front posts and needed repair before they could be issued. The units also were being fielded KCLFFs equipped with M2 gasoline burners and simultaneously being fielded the new MBUs. The MBUs were swapped with the M2s upon receipt. However, some units must still maintain both M2s and MBUs on their hand receipts until the Army completes fielding the systems to USAREUR, which is scheduled for fiscal year 2004.

The Army is not likely to be able to meet the field feeding needs of the Objective Force by incrementally improving existing systems. The Army needs significant improvements—the kind that will make a major impact on the way it feeds soldiers in the field. Only revolutionary changes in the current field feeding systems can achieve this. Loosely integrating systems into the field creates costly, cumbersome systems that are often out of date before they are fielded completely. The Army must improve the time lines for fielding new equipment and ensure that each unit receives its total authorization. Program managers must ensure that the equipment is released to the units as quickly as it becomes available.

A growing concern is the use of contractors versus military cooks on the battlefield. The Army is moving toward replacing military cooks with civilian contractors. Contractors can be used to reduce the operating tempo and its inherent burden on soldiers. Using contractors, particularly in relatively benign environments, reduces the need to send soldiers to perform field feeding. This can have a positive affect on soldiers' quality of life and ultimately on retention. For the most part, contractors have their role in a stable field feeding environment. However, will they stick around when bullets start flying? The Army probably will use a combination of contractors and soldier support, depending on the tactical situation.

Given the rapid changes in logistics operations and the current state of our field feeding systems, is the Army prepared for the unique challenges of feeding soldiers on the battlefield? No one knows how the Objective Force will be fed in the field. While the Army has taken steps to improve the current field feeding systems, it still has a long way to go before it will be able to support a fast-moving force while maintaining a smaller logistics footprint.

Tomorrow's senior logisticians have several challenges. First, they must be able to articulate the importance of leap-ahead technology in field feeding systems. Second, they must push for the development of an automated tactical class I system. Finally, the Army needs to fix the process for fielding new equipment by fielding it as a complete package. For the Army's subsistence program to meet the challenges of tomorrow, some significant investment must be made today to upgrade its current field feeding systems. ALOG

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JLOTS: Ship to Shore

The Army and Navy conducted a joint logistics over-the-shore (JLOTS) operation at Camp Pendleton Marine Corps Base, California, as part of Exercise Turbo Patriot in September 2000. The 143d Transportation Command, an Army Reserve headquarters from Orlando, Florida, oversaw the exercise. The 7th Transportation Group (Composite) from Fort Eustis, Virginia, the Navy's Amphibious GroupThree from San Diego, California, and the Military Sealift Command provided forces, ships, and equipment.

Equipment belonging to the 25th Infantry Division (Light) from Schofield Barracks, Hawaii, was loaded aboard the *USNS Seay*, a large, medium speed, roll-on-roll-off (LMSR) ship, at Pearl Harbor, Hawaii, and sailed to the California coast. There the equipment was downloaded in the open ocean and moved to a bare beach by Army and Navy lighters.

Stevedores from the 567th Transportation Company of the 7th Transportation Group prepared cargo and moved it down the ship's roll-off ramp onto the Navy's floating roll-on-roll-off discharge facility, which was moored alongside the LMSR. The equipment then was driven aboard Army landing craft, utility, provided by the Army Reserve's 481st Transportation Company (Heavy Boat) from Mare Island, California, or onto causeway barge ferries belonging to the Amphibious Construction Battalion One (Seabees) from Coronado, California.

The containerized equipment moved toward the shore on lighters and was downloaded onto a 1,500-foot elevated causeway pier built by the Seabees. Causeway ferries that moved other equipment were operated by sailors and by soldiers from the 7th Transportation Group's 331st Transportation Company, the Army's only causeway unit. The 331st Transportation Company soldiers also constructed a 1,200-foot floating causeway pier in the open ocean from sections they assembled in the Del Mar boat basin. Then they sailed the causeway the 9 nautical miles to the shore, where it was beached and secured. The company maintained the floating pier throughout the operation despite the dangerous waves and 8- to 12-foot ocean swells that occurred day and night for 4 days.

☐ Above, the Army's only floating causeway pier, called the Trident, is stabbed into the beach at Camp Pendleton, California.

☐ **Left, equipment and vehicles are moved toward the shore using a causeway ferry.**

☐ **Above, a landing craft-mechanized (LCM-8) pulls alongside the causeway ferry and roll-on-roll-off discharge facility, bringing a new crew shift to the watercraft to continue operations around the clock.**

☐ **Right, the Navy's elevated causeway is used to move cargo over the beach toward the staging areas.**

Once the equipment was on the shore, the 53d Movement Control Battalion from Fort McPherson, Georgia, supervised the loading of 176 wheeled vehicles, trailers, and engineer equipment on flatbed trucks for the 218-mile journey to the National Training Center (NTC) at Fort Irwin, California, for the 25th Infantry Division's rotation. The 169th Port Operations Cargo Detachment from Fort Eustis loaded, blocked, and tied down the equipment on the trailers. The 206th Medium Truck Company, an Army Reserve unit from Mobile, Alabama, transported the equipment from Camp Pendleton to the NTC.

During this exercise, soldiers and sailors also practiced interfacing the Army's and Navy's petroleum distribution systems. The *SS Chesapeake* pumped over 450,000 gallons of seawater, to simulate fuel, through the Navy's Offshore Petroleum Distribution System, operated by the Seabees of Amphibious Construction Battalion One, and into the Army's Inland Petroleum Distribution System, operated by the 19th Quartermaster Company from Fort Story, Virginia. The water then was pumped into the Marine Corps' amphibious assault bulk fuel system, where it was verified as clean and returned to the ocean. **ALOG**

The Army Logistician *staff would like to thank Captain Sean M. Herron, the plans officer for the 7th Transportation Group (Composite) at Fort Eustis, Virginia, for providing information and photos for this article.*

☐ Above, the roll-on-roll-off discharge facility is positioned alongside the LMSR to transfer equipment to an Army lighter for movement to the beach. Top right, a 5-ton truck begins moving down the ramp of the LMSR *USNS Seay* to the roll-on-roll-off discharge facility. Right, convoys prepare to move the equipment to the NTC.

☐ **Top, the *SS Chesapeake* heels to one side and dumps the 750-ton single-anchor legmooring to the sea bottom, where it connects the ship to the underwater pipeline that carries petroleum to the beach. In the bottom photos, the Inland Petroleum Distribution System pumps seawater, simulating fuel products, into bladders for movement inland.**

Making the Forward Support Company Work

by Lieutenant Colonel Kevin D. Poling

The author proposes some ways to improve the expertise of FSC officers and the critical relationship between the FSC and its maneuver battalion.

I read with great interest Major Darrel G. Larson's article, "FSC Staffing and Training Needs," in the January-February 2001 issue of *Army Logistician*. I believe that he raises some legitimate questions about the experience levels of the personnel who will fill critical support positions under the conservative heavy division (CHD) redesign for combat service support (CSS). I also am concerned about how our doctrinal literature addresses the relationship between the forward support company (FSC) and the maneuver battalion it is assigned to support and the effect on planning, preparing for, and executing tactical missions. I would like to offer some thoughts on these issues, tempered by my observations of two rotations of digitized battalions at the National Training Center (NTC) at Fort Irwin, California.

> When everyone is thinking alike, then no one is thinking.
> —General George S. Patton

Under the CHD redesign, the logistics elements of maneuver battalions (except for the medical platoon) have been taken out of those battalions and consolidated in FSCs. These FSCs now support each maneuver battalion in a brigade combat team (BCT). The FSCs are composed of the maintenance and support platoons that were part of the headquarters and headquarters company (HHC) of an Army of Excellence (AOE) battalion. The platoons now work in a direct support role to the CHD maneuver battalion as part of the FSC. The FSC is assigned to the brigade's forward support battalion (FSB), which serves as its parent headquarters. The FSB also has undergone changes to complement the FSCs and better support the BCT as a whole. In sum, the entire logistics system is moving to a distribution-based and efficient-delivery-based system through the use of improved technologies that produce better CSS situational awareness.

Personnel Experience Levels

The first aspect of the CHD CSS redesign that has raised some concerns is the experience of the key leaders manning the FSC as compared to the leaders of the old HHC and the impact of their perceived lack of experience on mission execution. The units once led by combat arms officers intimately familiar with the supported unit now are supported by outside units led by CSS officers, although the functions and tasks performed by each have remained relatively the same. See the chart on page 27 for a comparison. A quick review shows that the FSC has less experienced personnel than its HHC counterpart.

No matter how much technology we inject into the support process, these companies always will be charged with conducting—

- Effective and timely company movement.
- Efficient site occupation.
- Local security and force protection.
- Logistics package (LOGPAC) and maintenance operations to sustain the maneuver unit.
- Efficient reverse logistics release point (LRP) operations to restore unit basic loads (UBLs) to the company.

These fundamental operations at the HHC and FSC levels must be mastered by tacticians and logisticians alike, no matter the organization or the technology. In a way, the company-grade logistician supporting a heavy maneuver battalion (in other words, manning the FSC) must be a better tactician than ever before, because he has more in common with his counterpart in the AOE HHC than he does with his counterpart in the AOE FSB. The CSS redesign has not changed the fundamental mission of the maneuver battalion's support company and

AOE HHC *(Assigned to the battalion)*	**CHD FSC *(Direct support to the battalion)***
HHC commander (Captain) -Normally a second command and the most experienced captain in the battalion. -Fully understands the technical and tactical requirements of the battalion. -Runs the field trains command post logistics troubleshooter and is the executor for the battalion in the brigade support area.	*FSC commander (Captain)* -Can the same be said? -Can the same be said? -Runs the battalion/task force support area and is the single logistics operator for the battalion
HHC XO (Senior first lieutenant) -Normally a second XO position and one of the most experienced lieutenants in the battalion -Has experience in a maneuver company and possibly a specialty platoon	*FSC XO (Senior first lieutenant)* -Can the same be said? -Technical knowledge of the supported unit?
Battalion Support Platoon	**FSC Supply & Transport Platoon**
Support Platoon leader (Senior first lieutenant) -Normally one of the best and most experienced lieutenants in the battalion who is the main logistics executor supporting the unit -Understands the technical and tactical employment considerations for the maneuver battalion	*Supply & Transport Platoon leader (Lieutenant)* -A new lieutenant just out of the Transportation Officer Basic Course? -Can the same be said?
Battalion Maintenance Platoon	**FSC Maintenance Platoon**
Battalion maintenance officer(Captain) -Normally an Advanced Course graduate -If not, then one of the most experienced lieutenants in the battalion who has been a maneuver company XO and has technical familiarity with the unit's combat systems	*Maintenance control officer(Lieutenant)* *Maintenance Platoon officer(Lieutenant)* -Both new lieutenants out of the Ordnance Officer Basic Course?
No Equivalent	**FSC Support Operations Section**
	Support operations officer (Lieutenant) -A new lieutenant just out of the Quartermaster Officer Basic Course?

☐ A comparison of personnel experience levels in the Army of Excellence headquarters and headquarters company and the conservative heavy division forward support company.

its tasks, whether that company is an AOE HHC or a CHD FSC.

Are we now prepared to execute support under the redesign? I would say no. Major Larson's thoughts on improving the preparation CSS lieutenants receive before assignment to a CHD FSC or FSB are sound. Any schoolhouse effort to put better prepared officers in the field to serve in FSCs and FSBs deserves to be implemented. Initial training, however, only goes so far in compensating for lack of experience, as Major Larson pointed out.

Where I strongly disagree with Major Larson is with his basic recommendation on how to remedy this situation, which is to upgrade the rank structure of FSC commanders from captain to major and of support operations officers (SPOs) from lieutenant to captain to provide greater experience in these positions. Why do I think this course of action is neither feasible nor suitable? To stay within force levels, it would require an increase in the number of logistics majors in the force and a corresponding reduction in the number of logistics lieutenants. I assume that the number of captains would remain the same because captain modification table of organization and equipment slots would convert from FSC commander to FSC SPO. Major Larson's solution would require an increase of 63 logistics majors and a reduction of 63 logistics lieutenants, which would turn Officer Personnel Management System XXI on its head by requiring more transfers of combat arms lieutenants to logistics branches as captains in order to feed the needed increase in field-grade logisticians. Do we really want to return to this old system? Do we need majors in command of these FSCs, which have only two line platoons and a headquarters platoon? This solution also reflects a misunderstanding of how the FSC and maneuver battalion actually function in conducting CSS operations.

I think there are several other ways to address the inexperience of officers slotted into FSCs. One involves the normal progression of lieutenants and captains within the FSB. As much as possible, we should place new lieutenants, fresh out of officer basic courses, in the FSB's headquarters and distribution company and brigade support company so they become familiar with their operating environment and gain experience in supporting a heavy BCT. As much as possible, experienced lieutenants then should be slotted into the FSC's critical support positions.

The same can be said for the FSC command slotting process. If an advanced-course-graduate captain comes into an FSB possessing a heavy FSC background, then he most probably is better prepared to assume command of an FSC than his counterpart who possesses a light background. Heavy maneuver battalions deal with this issue on a recurring basis as advanced-course-graduate captains with light infantry and light cavalry backgrounds are assigned to heavy brigades and require some acclimatization. Shouldn't our future FSC commanders get the same benefit in adjusting to a heavy environment? How we select FSC commanders, and who we select, not only will affect the ability of FSCs to support maneuver battalions but also will serve to mitigate the lack of experience of lieutenants in FSCs.

There are numerous methods available to ensure that we place the most experienced personnel possible in critical FSC positions. Certainly, revising entry-level officer training to produce more multifunctional logisticians would increase the focus and preparation of the officers who will man our FSCs and FSBs. As much as possible, officer basic courses should familiarize these tactical logisticians with the tactical employment and technical capabilities of the heavy maneuver battalion, while remembering the experience and skills of the combat arms officers whose roles they are assuming in sustaining the battalion. I also advocate a very detailed analysis of how we assign young officers to our FSBs and how we develop them once they are in the unit, in order to maximize the FSC's effectiveness.

Redesign Implications

New pressure points have been created under the CSS CHD redesign. The maneuver battalion commander has not been relieved of accountability for the combat power status, operational readiness rate, and tactical mission accomplishment of his unit, but he has been relieved of the organic assets for sustaining his unit. Those assets now are within a different chain of command, and the relationship that is established between supported and supporting units will be critical to the battalion's mission accomplishment. Our current doctrine must address this critical relationship as well as take into account the inevitable impact of human nature upon it.

The FSC-maneuver battalion relationship creates a challenge that is more comprehensive, and much more visible on a daily basis, than a normal direct support relationship between maneuver units and direct support units from other battlefield operating systems (BOSs). Why? Because the CSS BOS reaches into the very heart of the heavy maneuver battalion, affecting the importance, visibility, and timeliness of the sustainment mission while also reengineering what had been an organic maneuver-battalion task. The CSS redesign requires daily synchronization among units from different chains of command and at lower levels than we have experienced before in order to accomplish sustainment. In many ways, this redesign runs counter to the historical

trend of permanently organizing combined arms units at lower and lower levels. One only has to look at the interim BCT initiative to see this theory being put into action.

Chapter 1 of Field Manual (FM) 63–20–1 (final draft), Forward Support Battalion, notes that the new CSS redesign supports the theory of unity of command by putting one person in charge of CSS at each level. This argument rings hollow, both in terms of how people act and how we plan for, prepare for, and execute tactical missions. Field Artillery, Air Defense, Engineer, and other combat arms commanders are equipped with improved technologies to support the maneuver battalion's tactical mission and can be considered the single operators for their BOS assets. However, we as an Army do not advocate the maneuver battalion's refraining from participating in planning or preparing to use those assets. In fact, it is the responsibility of the maneuver battalion commander to synchronize his maneuver plan with battlefield assets and activities across the other BOSs. Why should CSS planning and operations be different? I believe the current version of FM 63–20–1 treats the CSS BOS differently from other BOSs in terms of maneuver plan synchronization.

So, in effect, the FSC commander has two bosses—the FSB and the maneuver battalion commanders—who potentially could, and sometimes do, give conflicting guidance in garrison and during execution of the service support plan in tactical missions. I recommend that our doctrinal literature for the FSB and FSC (FM 63–20–1) give some guidance to our FSC and maneuver battalion personnel in the field on how to make the system work.

CSS Operations

What guidance might we then include? In fact, the answer to this question lies in a further analysis of Major Larson's primary solution. Why do we need a captain SPO and a major commander in the FSC to address battalion CSS when we already have a captain and major who are charged with that mission? I refer to the maneuver battalion S4 and executive officer (XO). They are the two main players within the unit, designated as the chief logistics planner and chief logistics integrator and synchronizer, respectively.

We do not need another major and captain injected into the process when we already have two officers who, if used properly in conjunction with the FSC, will serve to mitigate some of the inexperience of FSC leaders. The maneuver battalion S4 executes his role as the chief logistics planner for the unit, develops the CSS plan based on his analysis of the brigade's service support plan and the maneuver battalion's mission, and then executes his doctrinal role in the battalion's military decision-making process (MDMP). If we view the S4 and FSC SPO as working in tandem rather than as two separate entities, then the inexperience of the FSC SPO is compensated to some degree by the experience and skills of the maneuver battalion S4.

The same argument holds for the maneuver battalion's combat trains command post (CTCP), which includes S1 and S4 personnel, and the FSC Support Operations Section, which is collocated with the CTCP. Instead of treating these sections as separate but collocated operations, as FM 63–20–1 does, our doctrine should advocate that these personnel work as a seamless team to monitor the maneuver battalion's CSS situation as a whole, plan for the next mission, and function as the battalion's command and control node for all CSS operations. In addition, the FSC maintenance platoon at the unit maintenance collection point should receive guidance from this combined operation so it can provide planning input to the S4 and FSC SPO on how best to provide recovery and maintenance support.

The CTCP, manned by both FSC and maneuver battalion personnel, would serve as the primary command and control (C2) node for integrating CSS into the battalion's maneuver plan. It would work in close communication with the FSC commander in the task force support area (TFSA), the battalion's medical platoon leader, and the brigade S4 and FSB SPO in the brigade support area. However, FM 63–20–1 makes little mention of how and for what purpose the FSC interfaces with the maneuver battalion staff. I think it should. What better place to establish the link between maneuver battalion logisticians and FSC logisticians than this forward-located C2 node? Planning for the next mission will occur at the maneuver battalion's tactical operations center, which is in close proximity to the CTCP and will allow the S4 and FSC SPO to participate in the battalion's MDMP. The current plan for outfitting the CTCP and FSC SPO with digital CSS C2 systems supports this arrangement by maximizing the potential of the maneuver battalion-FSC relationship to provide CSS to the battalion.

Under this arrangement, the FSC SPO and his section can better perform the tasks assigned to them. They can leverage the tactical and technical experience of the maneuver battalion S1 and S4 sections and then integrate the FSC commander's guidance and the overall brigade CSS situation into the running logistics estimate maintained by the FSC SPO and the maneuver battalion S4. The result should produce both better situational awareness and situational knowledge than would be obtained by executing operations separately from the maneuver battalion's logisticians. Combined with entry-

level officer basic course training and FSB assignment progressions, the potential inexperience of the FSC SPO can be heavily mitigated, much to the benefit of both the FSC and the supported maneuver battalion.

As doctrine should be reexamined to address the relationship of maneuver battalion S4 and FSC operations, so should doctrine also address the relationship between the maneuver battalion XO and FSC operations. We do not need another major injected into the equation; that is because we have the maneuver battalion XO functioning as the officer charged with ensuring that CSS, along with the other BOS, is integrated with the battalion maneuver plan and that CSS activities are synchronized to best support the tactical mission. Who can better perform this role than the maneuver battalion XO, who is the person who supervises the battalion's MDMP?

Redefining roles is necessary because what I propose conflicts directly with FM 63–20–1's pronouncement that the FSC commander is the "single CSS operator at maneuver BN/TF [battalion/task force] level." I believe that the FM is saying that the FSC commander should be the sole CSS planner and executor for the maneuver battalion, based on his situational awareness and guidance from the FSB commander and staff. His plan, based on the FSB operation order, should become the maneuver battalion's service support plan. Chapter 6 of the FM, which addresses the specifics of FSC operations, does not state or imply anything to the contrary.

I believe that the FSC commander might have better situational awareness and visibility of the technical aspects of the CSS situation through input from his digital C2 systems and an understanding of the FSB's sustainment situation. But he cannot fully understand how CSS will be integrated and synchronized with the maneuver battalion's plan until he either receives the unit's operation order or participates in the battalion's planning process. The FSC commander is fully engaged in executing his fundamental tasks, and, based on my observations at the NTC, I do not believe he could participate in the unit's MDMP while also performing his basic role as company commander. Because of his physical location on the battlefield in the TFSA and his critical mission, the FSC commander is engaged fully as a logistics executor and troubleshooter to ensure that both his company and the maneuver battalion it supports are prepared to accomplish their missions. He could not function as the CSS planner and be present at the maneuver battalion's MDMP while also executing his missions in and around the TFSA. No digital C2 systems currently being fielded will allow the FSC commander to be both CSS planner and CSS executor.

If the FSC commander cannot be both CSS planner and executor, who performs this mission? I believe that the battalion S4 and FSC SPO are the primary players in developing the maneuver battalion's CSS plan, with input from the FSC commander, medical platoon leader, S1, and maintenance control officer. The battalion XO then ensures that the CSS plan is integrated and synchronized with the maneuver plan, while the CTCP functions as the primary C2 node for controlling CSS assets during the battle. The XO retains his role of ensuring that all BOS, including CSS, are integrated into battalion maneuver plans. Therefore, we do not need a major as the FSC commander.

Solutions

I believe a clear definition of roles and responsibilities should be codified in FM 63–20–1 so that the supporting unit (the FSC) can interface with the supported unit (the maneuver battalion) to provide CSS in a timely and efficient manner. In addition, FM 63–20–1 should mirror FM 3–91.2 (formerly FM 71–2), The Tank and Mechanized Infantry Battalion Task Force in CSS Operations.

Maneuver battalion and FSC personnel need straightforward doctrinal language to guide the building of the new, comprehensive direct-support relationship, nurture the extremely important human dimensions of this relationship, and fully maximize the potential of digital C2 systems. My recommendations also are supported by the doctrinal definition of direct support and the actions that the parent and supported units can take. In terms of a direct support relationship, the supported unit (the maneuver battalion) is the one that positions assets and sets the priorities of the direct support unit (the FSC), and I believe my recommendations support this existing guidance.

In addition, our doctrinal language should not be so rigid as to decree that direct support is the one and only relationship that can exist between these two units. Our doctrine writers should explore the benefits and implications of using differing command and support relationships to give units in the field varying options based on their situations. The other BOS have done this, and the CSS BOS should do so as well. As an example, I know of many AOE heavy maneuver battalions that did not retain the centralized structure of the battalion maintenance platoon within the HHC; instead, they permanently attached the line company maintenance teams (now called combat repair teams under CHD) to the line maneuver companies. Why? These battalions made an assessment that the benefits of team building and small unit cohesion created by this arrangement outweighed the benefits of centralized support. Doctrine should provide the force with the pros and cons of differing command and support relationships in order to increase unit flexibility.

As I have outlined my observations and recom-

mendations, I have been careful to restrict them to the FSC-maneuver battalion relationship, because it is at this level, I believe, that the Revolution in Military Logistics is least evident. The "old" fundamentals still apply at this level, whether we execute them with an AOE HHC or a CHD FSC. To use a football analogy, the larger game has changed, but the basics of blocking and tackling still apply along the line of scrimmage and are just as important to a team's success as they were decades ago. I certainly believe this truth applies to CSS at the maneuver battalion level.

One of the most critical aspects of the relationship between the maneuver brigade's logisticians and FSB leaders is how the brigade's CSS plan is conveyed to the brigade as a whole. I recommend that paragraph 4 of the brigade's operation order be used to outline and explain the brigade's service support plan. Close cooperation among the brigade logisticians (S1 and S4) and the FSB planners (FSB SPO and Support Operations Section), with guidance from the FSB commander and brigade XO, are critical to ensuring that the brigade CSS plan supports not only the brigade's maneuver plan but also sets conditions for the maneuver battalions and FSCs to develop their own service support plans successfully. Using the brigade's paragraph 4 will help to ensure that the CSS plan is integrated with the brigade's maneuver plan.

The worst scenario for the maneuver battalion-FSC relationship is that the service support plan published in the brigade operation order is not the same plan prepared by the FSB. Such a disconnect in the brigade's service support plan puts pressure on the FSC commander. The FSC commander then is given two conflicting plans to support, one from the maneuver battalion commander that is based upon the brigade operation order and one from his FSB commander.

A prime example of this disconnect is the synchronization of maneuver battalion LOCPAC delivery and turn-around (which is based on the battalion's maneuver plan) with reverse LRP (which is needed to ensure that FSCs are restored to full UBLs). The reverse LRP is executed through a combination of supply-point distribution from either corps-level assets or the FSB's Headquarters and Distribution Company. If these operations are not synchronized across the brigade and in the maneuver battalions, the FSC will execute LOGPAC operations at a time and place that will not allow it to meet the reverse LRP time window and restore its UBL. This situation will cause the CSS system to become "reactive" rather than "proactive," as the FSC commander scrambles to sustain his company in order to execute LOGPAC operations for the next time window.

Many of my recommendations at the FSC-battalion level certainly can be applied to the FSB-brigade relationship for planning and preparing to accomplish the brigade's tactical mission. What we say in FM 63–20–1 about the FSB should mirror what we say in FM 3–91.3, The Armored and Mechanized Infantry Brigade. The tenor of the relationship established at home station also has an impact on how well units execute CSS operations during training events. I suggest that we organize home-station activities and schedules to facilitate team-building between the maneuver battalions and their FSCs in order to make the transition to field and deployment activities seamless.

Laying out major training events, maintenance and recovery periods, and vehicle service schedules for the training year would provide a useful foundation for synchronizing battalion and FSC calendars. That would allow each unit to understand when and where direct support and integration occur at home station. Representatives of maneuver battalions and the FSB could attend each other's battalion-level training meetings to maintain visibility of training events, schedules, and calendars. Any creative method that fosters and maintains the maneuver battalion-FSC relationship in the conduct of home-station activities would have great benefits when that relationship transitions to the rigors of major training events and deployments.

The tactical mission success of our heavy maneuver battalions under the CHD design rests squarely on how well the FSC performs and executes its sustainment mission. I hope my thoughts will assist personnel in the field and writers of doctrine in shaping the relationship between the FSC and its supported maneuver battalion as more divisions convert to the CHD design. This relationship is critical to sustaining the legacy force as well as fostering the necessary team-building and small-unit cohesion necessary to win decisively on the next battlefield. ALOG

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The Right Force for the Battle: The Theater Support Command

by Master Sergeant John J. Blair

The author suggests that the theater support command is similar to the concept that enabled the Germans to win the World War I Battle of Tannenberg.

In recent years, change has occurred at a greater pace than at any other time in U.S. military history. In a short time, many ideas have gone from concept to reality. One such idea is the theater support command (TSC). The TSC promotes force projection more efficiently than does a structure that supports large, forward-deployed forces, such as those deployed in Operations Desert Shield and Desert Storm. In a change from the Cold War mentality of deploying and fighting with an extremely large force, the TSC is designed to deploy with incremental modularity only those elements needed to meet mission requirements and with the smallest possible logistics footprint.

☐ Of the 150,000 Russian soldiers participating in the Battle of Tannenberg, 92,000 were taken prisoner.

A TSC enhances support coordination under the Army service component command. The functional components of a TSC are an engineer command, a medical command, a personnel command, a finance command, and a transportation command. Other types and sizes of organizations can be added, depending on the support requirements. Support is provided to the tactical forces more efficiently because the TSC has combat service support and certain general support units under one command, as well as a materiel management center (MMC).

Centralized distribution management is handled within the TSC by the distribution management center (DMC). The DMC is the TSC staff agent for synchronizing the theater distribution system. Support operations for all the services in the theater can be coordinated by the TSC. The flexibility of the modular design means that only elements with capabilities that match the mission requirements are deployed to the theater. Modularity involves incrementally deploying only the minimum capabilities required in a theater. This creates the smallest footprint possible and uses all involved military resources most effectively. Communication systems and automated hardware and software not only are critical for coordination among the various parts of the TSC, but also are needed so the majority of the logistics can be managed from fixed-base locations as part of split-based operations. Commanders within the theater must furnish cells to coordinate with other elements. Two examples of this are a liaison officer from a functional commander attached to the TSC and a cell appointed by the MMC to serve as a port expediter team.

Although the TSC concept is relatively new, it is not completely untested. A battle fought and won by a small army against a much larger one almost 90 years ago shows the value of the principle underlying the TSC concept: design an army for the battle, rather than the other way around.

The Russian Invasion of Prussia

August 1914 found the German High Command in a difficult position. The conflict now known as World War I had just started. Most of Imperial Germany's

☐ The Russian infantry on the march.

forces were advancing in the west through Belgium and France in an effort to knock France out of the war quickly to avoid a war on two fronts. The French, reeling from the speed of the German invasion, put pressure on their Russian allies to help them by opening a second front in the east. Because of its huge reserves of manpower, the Russian Army often was called the "Russian Steamroller." Many observers believed that, because of its numerical superiority, the Russian Army could roll over any opponent. Russia surprised Germany with a relatively quick, although haphazard and incomplete, mobilization. Soon, a force of 450,000 Russians was attacking the thinly spread German 8th Army in the east.

The Russian invasion was to be a two-fisted blow, one from the Russian 1st Army commanded by General Pavel Rennenkampf and the other from the 2d Army commanded by General Alexander Samsonov. The 1st Army was to punch through the corridor between the Baltic Sea and the Masurian Lakes region to the south. The 2d Army was to swing south of the lakes. The two armies would then pinch the German defenders between them.

The Russians crossed the border into Germany on 21 August 1914. General Max von Prittwitz und Graffron commanded the German 8th Army, which was defending Prussia (Germany's easternmost province—now northeastern Poland). After an inconclusive engagement with the Russian 1st Army, Prittwitz was intimidated by an advancing enemy at his front and the fresh Russian 2d Army moving toward his rear. He ordered a general withdrawal.

The German High Command immediately ordered Prittwitz's dismissal. Field Marshal Paul von Hindenburg, a decorated officer called out of retirement at age 67, replaced Prittwitz. Hindenburg had been raised in the area, had served there during his military service, and thus had spent countless hours becoming familiar with the Masurian Lakes and the treacherous marshes and bogs of the lake region.

Forty-nine-year-old General Erich Ludendorf, who recently had distinguished himself on the western front, was selected as Hindenburg's chief of staff. Throughout the rest of the war, Hindenburg and Ludendorf proved to be a formidable team whose talents complemented each other. In contrast, the Russian commanders, Samsonov and Rennenkamf, were not even on speaking terms, and there was little coordination between their armies.

Hindenburg and Ludendorf recognized a flaw in the Russian advance: There was a large gap between the two enemy armies in the lakes region. A daring counterattack was planned to encircle the 2d Army. The Germans were long on confidence but short on manpower, so on 24 August, they withdrew two army corps from the north that were defending against the Russian 1st Army. Only two German brigades were left to keep the Russian 1st Army in check.

Two days later, the Germans began executing their plan by attacking Samsonov's flanks while presenting his army with a soft middle. The Russian flanks were pushed back even as Samsonov pushed his center forward. Because the Russian rail system ran on different gauge tracks than Germany's, all Russian supplies had to be transported to the battle by horse-drawn wagons. In addition, Samsonov's communication with his various elements was poor. The end of August found the tired, poorly fed, and ill-coordinated 2d Army with its center forced into the marshy region of the lakes and its flanks in disarray.

The Harder They Fall

The Germans encircled the Russians at Tannenberg in eastern Prussia on 28 August. According to historian Willis John Abbot, the Russian 2d Army was penned in a "bewildering and fatal maze of marshes, creeks, lakes, and quagmires" covering about 200 square miles. Attempting to escape, the Russians "broke and took to the fields, only to find that what appeared to be solid ground was in fact an impassible bog in which horses, men, and guns slowly sank from sight."

The 1st Army to the north did not answer Samsonov's

☐ The Imperial Russian Army in action.

appeals for help. Furthermore, there was no communication among elements of the 2d Army struggling to flee from the trap. That army became demoralized as "regiments and brigades were swallowed up, and the death toll taken by Hindenburg's artillery was moderate in comparison to the numbers of men swallowed up in the mud and water. The accounts of eye-witnesses are ghastly in their descriptions of the cries of whole battalions of men rising out of the night from some dark quicksand in which they were being slowly engulfed."

Samsonov, despairing in his great defeat, shot himself on 29 August. The Russian 2d Army had lost 30,000 men, and an additional 92,000 were taken prisoner. German casualties were estimated at between 10,000 and 15,000 men. On 29 and 30 August, the remnants of the Russian 2d Army, tired and plagued by supply problems, surrendered. Most had not eaten for several days and were starving.

Not content with the annihilation of the Russian 2d Army, the Germans turned north on 5 September and engaged the Russian 1st Army in battle. On 9 September, a portion of the German 8th Army, striking though the Masurian Lakes region, severed the already anemic Russian supply and communication lines to their rear. Rennenkamf reacted better than Samsonov and retreated faster than the 2d Army had. Even so, Russian casualties were again numerous and those of the Germans were few. The Russian "Steamroller" not only was destroyed and thrown back, but it was months before the Russians again were capable of offensive operations. The Allies learned in time that the Russian logistics system was inadequate and that, quoting Abbot, "the Russian supplies of munitions of war had been exhausted."

What Happened?

In 1917, while World War I was still raging across Europe, Abbott published the first book about the Battle of Tannenberg. He believed that the superior deployment of the German forces, combined with their intimate knowledge of the terrain, enabled the Germans to destroy the Russian Army. While this strategic assessment is certainly true, modern historians such as John Macdonald recognize the great importance that logistics played in the Russian battlefield disaster, noting that "Russia certainly had an abundance of manpower, but was woefully lacking in administrative ability; nor was there competent machinery to keep thousands of soldiers supplied in the field."

The German High Command had put together an organization to confront the Russian threat, beginning when Hindenburg was ordered out of retirement to lead the 8th Army. In addition to the forces available to confront the Russian 2d Army, Hindenburg and Ludendorff had drawn two corps from the north defending the Russian 1st Army and forces from as far away as Flanders, on the western front. It follows that the logistics support for these forces was cobbled together as well.

Although guided by circumstance and the forces available, rather than by fielding a preconceived organization, the German commanders responded quickly to the unique battlefield situation they confronted. They designed the organization they needed to match the specific mission requirements dictated by the Russian invasion.

The Russian Army at Tannenberg was defeated for many reasons, one being its poorly planned, coordinated, and executed logistics. From deploying cavalry to an area ill suited for cavalry operations, to inadequately supplying the 2d Army with food, the Russian logisticians failed to create the environment necessary for their army to achieve victory.

Conversely, the German forces under Hindenberg and Ludendorf gathered the minimal forces at their disposal and, through adept organization and coordination, destroyed a numerically superior enemy force with little effort. Although the Russians had mobilized faster than expected, the Battle of Tannenberg showed that victory does not always go to the army that gets there "the firstest

☐ Left, Germans are entrenched in Masurian Lakes country. Below is a German machinegun trench.

☐ German troops clean out a captured Russian trench.

with the mostest," but rather to the army that deploys with what it needs to win as dictated by theater requirements.

The military historian and other followers of battle often see only the combat arms elements, and those only as pieces on a chessboard. The logistician must see all elements as threads on a spider's web, all connected in a way that makes them interdependent. The United States has many types of arsenals at its disposal. The organizational arsenal of the TSC concept will help achieve victories for the United States military on the battlefields of the future much as a similar concept enabled the Germans to win the World War I Battle of Tannenberg.

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Commentary

Surprise, Initiative, and Battlefield Superiority

by Dr. Derek Povah

It is 1 July 1863, the first day of the Civil War battle at Gettysburg, Pennsylvania. Confederate Brigadier General Alfred Iverson's brigade has crossed the Mummasburg Road with flags flying. At about 3 p.m., the soldiers enter an unobstructed grassy field. Unbeknown to the Confederate leaders, Federal troops of the 83d New York, 97th New York, and 88th Pennsylvania Regiments have formed under cover of woods and behind a stone wall.

As Iverson's men march across the field, they are drifting in and out of formation. This indicates to the Federal troops a lack of leadership, which is indeed the case because Iverson is well to the rear of his brigade. The Federal soldiers just watch the Confederate advance and wait for the order to begin shooting. At 80 yards, the Federal troops open fire, totally surprising the approaching Confederates. From the first volley, almost 500 Confederate soldiers go down. After approximately 5 to 10 minutes, almost all of Iverson's brigade is annihilated. Those who were not hit lay on the ground and attempt to surrender by waving their hats, clothing, or anything else available to attract attention. The New York and Pennsylvania troops, seeing an opportunity to inflict further damage, advance from their cover toward the downed Confederates with muskets and bayonets.

Surprise

The fate of Iverson's men at Gettysburg shows how lack of good leadership, inaccurate gathering of data, poor situational analysis, and poor communications and guidance can provide an opponent with the opportunity to deliver a devastating surprise attack. The concept of surprise is still vital to today's Army. In Field Manual (FM) 100–5, Operations, surprise is included under "The Foundations of Army Operations" as one of "The Principles of War," where it is defined as the ability to "strike the enemy at a time or place or in a manner for which he is unprepared." Surprise can decisively shift the balance of combat power.

In reality, surprise can be a factor in the success of any organization. In the private sector, when a company is beaten by its competition, the reason usually is that its leaders were caught off guard, surprised, or outmaneuvered. The leaders had not kept themselves apprised of current events and had not attempted to safeguard the future. To enable organizations to stay ahead of their competition, leaders must develop skills in outmaneuvering the opposition (maneuver dominance). Today's organizational leaders have become very conscious of building up their organization's security (security dominance), which enables them to protect their products, research and development, marketing niches, and customer base in order to survive.

From the single Gettysburg incident, we can learn the importance of good leadership. Leaders should look ahead (be visionary), collect and analyze data and intelligence, use the data to make good decisions—and avoid being caught off guard and surprised. Most importantly, leaders should develop their subordinates' trust in their leadership, so that those subordinates know that their leaders will be around in times of trouble.

Initiative

"The Foundations of Army Operations" in FM 100–5 also includes initiative as one of "The Tenets of Army Operations." In general, initiative is the ability to see and take advantage of an opportunity or to initiate a course of action that will prove beneficial to an organization. The Army views initiative as an action that sets or changes the terms of battle; it implies an offensive spirit in the conduct of all operations.

An Army example of initiative is the deception operations phase of Operations Desert Shield and Desert Storm. The purpose of the deception operations was to mislead the Iraqi enemy and cause him to unwittingly plan and conduct activities that actually benefited the objectives of the U.S.-led coalition force. The deception operations were very successful in attaining those objectives.

The coalition commanders ascertained that the Iraqi Republican Guard was the enemy's center of gravity. The coalition forces then took the initiative to launch deception operations designed to make the Iraqis believe that the main attack was going to be delivered from the Persian Gulf. By building up Navy and Marine Corps assets in the Gulf and south of Kuwait, the deception operations gradually began to affect the Iraqi commanders' decision making. Information age technology and aerial attacks further deceived the Iraqis into thinking that the main attack was coming from the east and south.

Even the mass media were manipulated into reporting the coalition buildup.

While all of these deception operations were being implemented, a large coalition force was moving over the western desert to deliver the actual main attack. That attack, called the "left hook," was going to hit at the Republican Guard's rear. The positioning of the coalition forces in the left hook configuration also cut off the enemy's escape route back to Baghdad and left them with only one actual line of retreat. The Iraqis concentrated their forces to the east and were totally surprised when the attack came from their rear.

This account of deception operations shows how the coalition commanders, by applying the Army's tenet of initiative, took the first step during the Gulf War in creating advantages that enabled them to obtain their overall objective.

Maintaining Battlefield Superiority

Army Vision 2010 identifies six patterns of operations that will ensure that Army forces maintain battlefield superiority: project the force, protect the force, shape the battlefield, achieve decisive operations, sustain the force, and gain information dominance.

When the Army refers to projecting the force, it is attempting to create an image in the minds of any adversary of an unstoppable force of unequaled competence. This is achieved by obtaining the upper hand through constant dominant maneuvering. Projecting the force requires anticipation, careful planning, second guessing, and staying ahead of the enemy at all times. All of these will present to an enemy a force ready and willing to fight under great leadership, able to use the best technology, and able to fight for the duration of the conflict due to an enormous sustaining base capability.

To reach its objectives, the whole Army must be protected. This protection is derived through a holistic approach. Constant reliance on technological advances and operational intelligence remains the means of providing a protective shield over the entire force both at home and abroad. Private industry plays a big part in protecting the force by conducting research and development, manufacturing materiel, and providing delivery systems and services.

Linked to protecting the force is information dominance. Information dominance is achieved by information operations. Information operations consist of both offensive and defensive efforts to create a disparity between what the Army knows about the battlespace and operations within it and what the enemy knows about his battlespace. Psychological operations, deception operations, and feints are all used to obtain information dominance. Information dominance is achieved by continued sharing of information among all services, allies, and coalition partners.

Shaping the battlefield is linked directly to decisive operations and begins with obtaining early information dominance. By achieving information dominance, the commander can better decide on high-value targets, detect those targets, and deliver the correct munitions to destroy them. After the initial attacks have been carried out, an assessment of the targets determines battle damage and the need for reengagement.

Having pre-positioned stocks of equipment available to be delivered at a moment's notice anywhere in the world only provides a limited amount of support to the troops. During a conflict, the Army will not take long to run out of equipment, food, water, petroleum, spare parts, clothing, tents, ammunition, personnel, medical materiel, and many other necessities. The Army must be replenished on a timely basis with the correct supplies delivered to the right location. This pattern of operations is called sustaining the force. Sustaining the force depends on communications (information dominance again), a large transportation capability, trained personnel, technology to track assets at all times, tailored delivery packages, commonality of weapon systems, and maintenance capabilities. Sustaining the force depends not only on delivering the goods but also, in many cases, on bringing them back home as well across long distances and over all types of terrain.

The six patterns of operations identified in Army Vision 2010 do not stand alone: they are linked to each other. Nor does the Army stand alone; achieving the patterns of operations depends in part on continued acquisition of advanced technologies, partnering with industry, and maintaining quality people. These patterns of operations will continue to ensure that the Army maintains battlefield superiority and will be able to exercise those historically vital factors of battlefield success: surprise and initiative.

Dr. Derek Povah is a logistics management specialist in the Power Projection Logistics Division, Office of the Deputy Chief of Staff for Logistics, Army Forces Command, at Fort McPherson, Georgia. He is a graduate of the Army Management Staff College Sustaining Base Leadership and Management Program.

Commentary

Technology, Soldiers, and Trust

by Colonel Christopher R. Paparone

The Army logistician's true love is the soldier he serves. However, our infatuation with technological answers to problems of mission performance may lead to problems of trust among our soldiers.

I recall my first experience with this problem as I led my support battalion through the intermediate staging base (ISB) in Hungary after 11 grueling months in Bosnia. The corps commander and theater logistics leaders possessed near-perfect information about the redeployment processing status of every company in the division. The network of information gathering and reporting at the ISB was astonishing.

But, as always, there was a catch. My authority, and that of my platoon leaders and company commanders, was the cost of this near-perfect "situational awareness" by senior logistics leaders. The small unit leadership that was valued in Bosnia had served as a source of trust and confidence. This trust was taken apart piecemeal in the centralized "management" of redeployment by the theater logistics and corps headquarters generals and their staffs. Is this loss of trust the price of technological advances in communications and situational awareness? Is this what the transformed Army will cost?

I also recall the trust between my battalion and the brigade we supported. The climate was one of mutual respect and admiration. When the brigade and supported battalions asked for support, even if the battlefield situation was ambiguous, they knew we would come through. When my battalion and the brigade support area required force protection, it was provided without debate. This kind of symbiotic "maneuver-logistics" relationship can exist only in a climate of mutual trust.

What is "trust," anyway? Maybe our problem is that the Army does not have an operational definition of trust. Maybe the word trust does not fit neatly into the "LDRSHIP" acronym that officially expresses our Army values. You cannot put your finger on trust, or measure it like weapon system effectiveness. But you know when it's there and when it's not.

According to Gareth R. Jones and Jennifer M. George, in a 1998 *Academy of Management Review* article, values contribute to the experience of trust and create a propensity to trust that surpasses specific situations and relationships. Soldiers who are trustworthy tend to see others as trustworthy. For the Army, trust is based on the enduring values of soldiers.

Attitudes, emotions, and moods interact with values to determine trust. Attitudes are the thoughts and feelings soldiers have about other soldiers, teams, and units. Attitudes interact with values, because attitudes and values combine when we evaluate others. The climate of a maneuver-logistics support relationship may well rest on these evaluations. Emotions and moods also affect the development of trust, influencing how soldiers interact with each other and sometimes compounding the effects of a loss of trust.

Jones and George note that there can be three levels of trust. "Conditional" trust is "a state of trust in which both parties are willing to transact with each other, as long as each behaves appropriately." This level is not adequate in soldierly matters of life and death. "Unconditional" trust, on the other hand, "characterizes an experience of trust that starts when individuals abandon the 'pretense' of suspending belief, because shared values now structure the situation." Each soldier's trustworthiness is ensured by his confidence in his comrade's values. "When unconditional trust is present, relationships become significant and often involve a sense of mutual identification."

My subordinates and I experienced the third kind of trust in Hungary: "distrust." In states of conditional or unconditional trust, any violation or discrepant behavioral exchange will reduce trust. According to Jones and George, "Distrust will appear at the point where the ability to suspend disbelief that the other is not trustworthy is lost." The result is that the soldier's values, attitudes, emotions, and moods are tainted, causing a perhaps-irreversible downward spiral in an organization.

In large, hierarchical meritocracies such as the Army, trust begins at the top. Senior leaders need the unconditional trust of their subordinates. Without that unconditional trust, the organization may experience only conditional trust, or even distrust.

The challenge for senior leaders is this: how to set conditions so subordinates (and supporting logisticians) trust you and you trust them unconditionally. Do not forget that, in the Army hierarchy, trust is not a 50-50 or quid-pro-quo arrangement. The senior leader has most of the responsibility for ensuring that individual and organizational competencies are sufficient to warrant such unconditional trust. Equally important for senior leaders is earning unconditional trust by demonstrating their competence—a much more challenging proposition.

We cannot let our love affair with technology (actually, our quest for certainty) ruin a soldier's relationship with the Army and his fellow soldiers. This is the cornerstone objective of Army Transformation.

Colonel Christopher R. Paparone is participating in the Army War College Professorship Program, working toward a doctor of philosophy degree at Pennsylvania State University at Harrisburg.

Commentary

War on a Shoestring

by Dr. Burton Wright III

During the early years of the Vietnam War, the Viet Cong often searched the dead and wounded of both sides for usable equipment. It was not uncommon for U.S. troops to find booby traps made from discarded U.S. ration cans and to defuse U.S. bombs and artillery shells that had failed to explode and been found and repaired by the Viet Cong. The Viet Cong often fought on a "shoestring" budget. A strike by B–52 bombers could unload ordnance worth several hundred thousand dollars; that same amount of money could supply a Viet Cong main-force battalion for weeks.

The U.S. Army has a justified reputation for abundance in war. During the Civil War, for example, Union soldiers normally did not lack for supplies. Their Confederate opponents, on the other hand, frequently had to either do without or search the battlefield to find a dead Northern soldier who was better shod, clothed, and equipped. In fact, Union armies often were oversupplied. When General George B. McClellan's Army of the Potomac retreated from Richmond to Malvern Hill, Virginia, during the Seven Days Campaign of 1862, they left behind enough materiel to keep the Confederate Quartermaster Department busy for nearly a year salvaging what was abandoned. Thousands of rifles, artillery pieces, general military equipment, and cannonballs were recovered and reused by the South against the North.

In every war the United States has fought since the turn of the 20th century, U.S. forces usually have had not only enough supplies to do the job but an overabundance of supplies when compared to their adversaries. That overabundance, of course, existed at the end of the war, but it was not necessarily present at the beginning.

In World War II, U.S. aerial bombardment strategy was based almost wholly on using air power to cripple the enemy's ability to support an army in the field. Day after day, hundreds of bombers took to the air to destroy the ability of German industry to supply the German army. If you believe the Strategic Bombing Survey, the daylight bombing of Germany was decisive. While there was some truth to this, as the Germans themselves admitted, the reality was somewhat more complicated. Until nearly the end of the war, the German Army was still capable of strong resistance, even if they did not have the wealth of supplies the Americans did.

It would have been difficult to find American soldiers rooting among the debris of war for replacement equipment and weapons in the wars of this century. There simply was no need to do so. The powerful industry of the United States always has produced a wealth of food and equipment unmatched in military history. Most American soldiers in Kosovo today live far better than the natives they are protecting.

To think of Americans fighting on a shoestring is a radical notion, yet it is something we should consider. One day, we might have to fight for a time with only what we can bring in the first lift. More ominously, there may come a time when a thoughtful enemy will devote time and energy to striking at our industrial heartland as part of his initial combat operations, much as we did to Germany during World War II. If our industrial system was damaged to any significant degree, the power of our military would be blunted.

Take the air offensive in Serbia in 1999. The U.S. Air Force used smart munitions to attack most targets. Eventually, so many of these munitions were used that the ammo locker began to run dry. In the future, if logistics planners miscalculate their requirements just a little bit, especially for items like smart munitions that are not replaced so readily, the military may get cut short in ending a war. We could lose the war because we miscalculated what was absolutely necessary to win and did not energize our industrial base to supply it.

There might come a time when we have to fight on a much more frugal basis and husband smart weapons for use only on a really good target. The lack of logistics may restrain our tactical and strategic actions. How can we manage our resources to keep this from happening? First, we must acknowledge that the problem may exist. Second, we should calculate, based on previous experience, how much we need to achieve the goals of a war or campaign. Third, we must maximize what the enemy can give us. Finally, we should streamline operational planning to put as little burden on our logisticians as possible.

There will be no lessening of U.S. commitments in the future. The Army leadership therefore is in the process of lightening the load for air and sea transportation to ensure that we can "get there firstest with the mostest." Part of our success will be in knowing how much is enough. That is not as easy as it sounds.

Dr. Burton Wright III is the command historian of the Army Chemical School at Fort Leonard Wood, Missouri.

NEWS

(News continued from page 1)

The MPH's touchless, laser-point scanner. Scanning a part, even a broken one, yields engineering data needed to manufacture a replica part.

been modified to serve also as a lathe; a selective laser sinter machine that converts powdered rubber, metal, plastics, and ceramics into actual parts; and a laser-point scanner. The trailer also has the latest communications technology, including connections to satellites, various computer networks, web-based technologies, and cellular phones.

The MPH will be able to send and receive digital, manufacturing-ready data as a self-contained, self-sustaining mobile design, simulation, and mini-manufacturing center. It will slash long part procurement times by providing repair parts near the point of need in the battlespace.

As the program evolves, the MPH likely will be housed in ISO containers. Using ISO containers would permit the MPH to be deployed by air in C–130 aircraft, thereby meeting the Army's 96-hour deployability goal.

The program currently is funded for two phases. Phase I, which focused on building the demonstration trailer, began in June 2000. Phase II goals include manufacturing larger parts, increasing the number of parts in the MPH database, refining the technology needed to create 3-dimensional part data when no engineering data are available, inserting maturing manufacturing and rapid prototyping technology into the first prototype in ISO containers, ruggedizing the platform to ensure and retain accurate machine calibration, and testing the parts made in phase I to establish reliability data.

Phase II also will focus on creating agile manufacturing cells at several Army depots in the continental United States. Depot personnel would manufacture parts too big for the MPH's capacity or that were outside the scope of mobile manufacturing. Data could be sent to and from the MPH via satellites, cell phones, or web-based browsers. Cell staff could produce the part and send it to the area of operation via express mail.

"Right now, this is just an R&D [research and development] program," explained Coryne Forest, MPH program manager. "We're only able to produce a repair part, not a 'fully qualified' replacement' part. However, in a few years, the technology will be there to produce those high-quality parts with the same life expectancy as an original part."

DLA TEAM MOVES TO TUZLA

The Defense Logistics Agency (DLA) team that supports Operation Joint Forge moved from Taszar, Hungary, to Camp Comanche near Tuzla, Bosnia-Herzegovina, in April. This move reflects the theater's maturity, which allows DLA to support operations from within Bosnia and centralize the DLA support structure. The agency provides deployed U.S. and North Atlantic Treaty Organization forces in Bosnia with food, fuel, spare parts, and other supplies.

The new location brings the team closer to fuel operations in Split, Croatia, and food delivery operations in Zagreb, Croatia, and will facilitate DLA coordination with planners in Sarajevo, Bosnia. As DLA's representative to the front-line customers in Bosnia, the team provides a storefront where Army logisticians can come to resolve DLA issues.

A small, contractor-operated reutilization and marketing office remains in Taszar.

CONTAINER MANAGEMENT GOING COMMERCIAL

The Military Traffic Management Command (MTMC) has decided to let private enterprise manage its 10,000 ammunition containers and provide leasing services to Department of Defense customers. The decision to contract for container management was made in May by Major General Kenneth L. Privratsky, MTMC commander. A contract could be effective by 1 October 2002.

MTMC is developing a statement of work that will support a contract under which a single contractor will maintain ammunition containers at key facilities and

geographic locations. The contractor will be responsible for leasing the containers, replacing them as they are shipped, and maintaining container serviceability.

Currently, MTMC's containers are supposed to be stored at the Operations Support Command-managed ammunition depots in the continental United States. However, containers delivered overseas often remain there for prolonged periods because returning empty containers is expensive. While at the overseas locations, the containers often are used for other purposes, rendering as many as 25 percent of them unsafe for hauling ammunition.

After the container-management contract is awarded, MTMC-owned containers that are still serviceable will be transferred to other military users. Containers in poor condition will be disposed of through the Defense Reutilization and Marketing Service or used for nontransportation purposes such as storage.

Functional oversight of the container-management contract will be exercised by the Office of the MTMC Deputy Chief of Staff for Operations.

For more information, send an e-mail to strausbaught@mtmc.army.mil or call (703) 428–2436.

FMTV PARTS AVAILABLE ON LINE

The Defense Logistics Agency (DLA) has formed an innovative partnership with Stewart & Stevenson Tactical Vehicle Systems, LP (TVSLP), to obtain parts on line for its Family of Medium Tactical Vehicles (FMTV). The program streamlines after-market sales and increases efficient delivery of parts to FMTV users.

A pilot program called the Defense Supply Center Inventory Locator Network (DILNet) provides a central database that indicates the availability of off-the-shelf parts available to DLA's Defense Supply Center Philadelphia (DSCP) from participating vendors. DLA buyers can view near-real-time inventories of parts located at the vendors' warehouses and order the needed parts on line.

TVSLP, the only original equipment manufacturer participating in DILNet, provides DSCP with a daily update of spare FMTV parts in stock at its Sealy, Texas, facility. DLA then lists available parts in a database accessible to DLA buyers. A DSCP customer can send a purchase order for parts on line to TVSLP, and, if the parts are available, TVSLP will deliver them directly to the customer in the field.

The partnership agreement between TVSLP and DLA was signed in February, and TVSLP shipped out its first on-line FMTV order in early March. This collaboration between DLA and TVSLP decreases customer wait times and enables DLA to reduce its inventory at DSCP by allowing customers direct access to vendor-based inventories. Pending successful testing of DILNet at DSCP, DLA expects to expand DILNet to its other supply centers in Richmond, Virginia, and Columbus, Ohio.

UPGRADED FMTV FIELDED TO RESERVE

The Army Reserve has received its first shipment of Family of Medium Tactical Vehicles (FMTV) A1 trucks, upgrading its limited fleet of A0 model FMTV.

Ninety-three FMTV A1s are being fielded to Army Reserve units in Arkansas, Louisiana, Oklahoma, New Mexico, and Texas. The new FMTV will help fill some of the Reserve's most critical equipment priorities. The Army Reserve provides 30 percent of the Army's combat support and 45 percent of its combat service support.

The trucks, manufactured by Stewart & Stevenson Tactical Vehicle Systems, LP, of Sealy, Texas, have 2.5-ton and 5-ton payloads in 14 variants with 85 percent commonality of parts. The FMTV can perform a variety of missions, including line haul, local haul, unit mobility, unit resupply, and other combat support missions.

☐ An FMTV 5-ton cargo truck. *(Photo courtesy of Stewart and Stevenson.)*

AMC ORGANIZATION RECEIVES ISO 9001:2000 CERTIFICATE

The Army Materiel Command's Center for Continuous Change Management received the Army's first International Organization for Standardization (ISO) 9001:2000 Certificate of Registration in May. ISO 9001:2000 registration is an internationally recognized certification that indicates that the recipient has achieved a documented systematic approach to managing change that focuses on the customer, leadership, fact-based decision making, and continual improvement. Achieving certification to the ISO 9001:2000 standard shows that an organization conducts its business exactly as it says it does, with a high level of quality and commitment to its customers.

DEPLOYABLE CAMPUS ENHANCES TRAINING

A new Army digital deployed training campus can be shipped anywhere in the world and set up and ready to train soldiers in about 3 hours.

The deployed campus uses the Internet and a two-way video and voice system. It consists of 17 laptop computers; multiplex equipment that can handle video, voice, and fax; telephones; and a deployable antenna. It fits into 19 specially designed boxes that can be loaded onto a C–130 loading pallet.

☐ CWO5 Charlie Bos explains the digital campus equipment and operation to training developers and managers at Fort Monroe, Virginia.

Forerunners of the Deployable Training Campus have been in operation in the Sinai, Kosovo, Bosnia, Macedonia, and Germany, some for as long as 6 years. So far, the system at Vilseck, Germany, has saved U.S. Army Europe about $7 million to train soldiers in the Battle Staff Noncommissioned Officers Course (BSNCOC). Three times a year, instruction is beamed via satellite from the Sergeants Major Academy at Fort Bliss, Texas, to soldiers who need the training. Although soldiers from installations around Europe travel to Vilseck for the training, the cost is much less than sending them to the United States for training. Soldiers from deployed areas such as Bosnia can be included in the training without having to leave their operational areas.

The new system was built for about $400,000, including research and development. "These systems will hopefully cost less than $200,000 by the end of the next iteration. And they'll be twice as powerful and half the size," said Chief Warrant Officer (W–5) Charlie Bos, chief of the Deployed Training Branch in the office of the Army Training and Doctrine Command's Deputy Chief of Staff for Training.

"This prototype supports the Army's concept of training soldiers in the environment they're going to fight in," said Bos. "They can be trained on their critical tasks and remain proficient."

The first priority for the Deployed Training Campus is military training, according to Bos. Next on the priority list is individual professional military development, followed by civilian education. Live classes are beamed from institutions such as City Colleges of Chicago and the University of Maryland after duty hours to deployed troops. Classes are scheduled through the Network Control Center (NCC) at Fort Eustis, Virginia. The NCC handles communications and schedules classes for all the deployed training sites.

Morale and welfare is the fourth priority. When not in use for training, soldiers can use the digital campus to call their families if the calls are local to Fort Eustis or can be patched through using the Defense Switching Network. Computers are available to get on the Internet to correspond with families and friends. Deployed soldiers also can schedule video visits with families through video teleconference centers on installations in the United States and overseas.

Two more digital campus prototypes are undergoing initial acceptance tests at Fort Eustis. When those systems are certified, one will be put into use at Camp Bonnefield in Bosnia, and the second will replace the equipment in Kosovo.

CARRIERS' HELP SOUGHT IN SPEEDING OVERSEAS SHIPMENTS

The Military Traffic Management Command (MTMC) is looking to commercial carriers to help trim

OPERATION SHARPENS PEACE ENFORCERS' VISION AND AIM

☐ In the photo at left, an optometrist from the Heidelberg Medical Activity performs an eye exam on a Ghanaian soldier. The exam resulted in the soldier receiving a pair of eyeglasses.

Last May, approximately 200 U.S. soldiers who were deployed to Bundase, Ghana, and Thies, Senegal, as a part of Operation Focus Relief, performed vision checks and provided marksmanship training to Ghanaian and Senegalese battalions in order to prepare them for future peace-enforcement missions. The operation was part of an initiative announced by President Bill Clinton in August 2000 to equip and train battalions from West African countries to conduct tactical operations up to the infantry company level.

☐ A soldier in Ghana's 64th Infantry Regiment loads a magazine into his new rifle.

The majority of the deployed soldiers were assigned to the 3d Special Forces Group (Airborne) and the Army Special Operations Command, Fort Bragg, North Carolina. The remaining participants were Special Forces soldiers assigned to U.S. Army Europe.

During the operation, more than 750 soldiers were screened by optometrists from the Heidelberg Medical Activity, and between 150 and 200 pairs of eyeglasses were provided to the future peacekeepers. The Ghanaian soldiers then put their improved vision to the test during marksmanship training, focusing on grouping shot patterns and zeroing in on targets by aligning the sights on the M16A1 rifle.

The U.S. Army provided the Ghanaian and Senegalese soldiers with approximately 1,500 sets of individual equipment, including rucksacks, canteens, new uniforms, and boots. Other items of military hardware provided to both countries included light machineguns, 2½-ton cargo trucks, medical sets, and communications equipment. The deployment lasted approximately 10 weeks, with the U.S. forces redeploying in mid-August.

overseas freight shipping times. Military freight shipments, from requisition to receipt, to U.S. military units in Germany now take approximately 56 days. MTMC wants to shorten that time to no more than 40 days by synchronizing cargo between transshipment points.

While a ship's voyage across the Atlantic usually takes only 8 or 9 days, considerable time is lost in transshipment synchronization. Each military service has its own distribution system that is not coordinated and synchronized with those of other services. As a result, containers sometimes sit in a terminal several weeks waiting for an ocean shipment.

In a meeting with MTMC officials in January, shipping executives agreed to work with MTMC to speed shipments.

Cutting shipping times on maritime shipments is part of the Strategic Distribution Management Initiative, which is an effort by the U.S. Transportation Command and the Defense Logistics Agency to speed freight shipments.

SOLE ISSUES CALL FOR PAPERS

SOLE—the International Society of Logistics—will hold its 4th Annual Professional Development Workshop and Technical Conference 11 through 13 April 2002 at the Holiday Inn Hampton Hotel and Conference Center in Hampton, Virginia. The theme of the conference is "Logistics: Beyond 2002." The conference offers logisticians an opportunity to present professional papers that showcase new concepts, innovations, and changes in approach or evaluation techniques and individual success stories in any area of logistics. One- or two-page abstracts of papers proposed for presentation at the conference should be sent not later than 1 November to: Eric R. Nelson, 106 Wharf Row, Yorktown, Virginia 23665. Abstracts also can be sent electronically to ernelson57@hotmail.com. For more information and conference registration forms, visit the SOLE Mid-Atlantic Log web site at www.mid-atlantic-log.addr.com.

☐ In May, 30 AH–64 Apache helicopters were partially dismantled, shrink-wrapped, and towed from the Army airfield in Sandhofen, Germany, to the nearby NATO barge site in Lampertheim, Germany, to begin a land and sea journey to the United States. The helicopters had flown to the airfield from various locations. In Lampertheim, the helicopters were loaded on barges to be shipped to Rotterdam, The Netherlands. There, they were transferred to a ship headed for Charleston, South Carolina. After a major overhaul, which is expected to take about a year and cost $15 million per aircraft, the helicopters will be returned to Europe. The shipping operation was managed in Germany by the 2/502d Aviation Regiment.

DOD MAINTENANCE SYMPOSIUM SET

The 5th Annual Department of Defense (DOD) Maintenance Symposium, sponsored by the Office of the Secretary of Defense in conjunction with the National Defense Industrial Association, will be held 29 October through 1 November at the Hyatt Regency Crown Center in Kansas City, Missouri. The theme of the symposium is "Meeting the Readiness Challenge Through Innovative Maintenance." For more information, visit the NDIA Symposium web site at http://register.ndia.org/interview/register.ndia.

COMMON ACCESS CARDS ISSUED

A number of Army installations, including Fort Monmouth, New Jersey; Fort Meade, Maryland; Tobyhanna Army Depot, Pennsylvania; Fort Hamilton, New York; Fort Detrick, Maryland; and Fort Myer, Virginia, have begun issuing Common Access Cards (CACs).

The CAC eventually will replace the standard military identification card, Department of Defense (DD) Form 1173, for active-duty and selected Reserve component members of all services, Department of Defense civilians, and some contractors. Retirees and military family members will continue to use DD Form 2 (Reserve retired identification card) or 1173–1 (family member identification card), as appropriate.

In addition to the privileges and access permitted by the current identification cards, CACs will allow users to log on to Department of Defense computer networks and systems and digitally sign and encrypt e-mail. Program officials predict that the CAC eventually will allow keyless entry into equipped Government buildings and controlled areas.

Fielding of the CAC to all Army installations will continue through July 2002. Dr. Linda S. Dean, director of the Army's Electronic Commerce Office, says, "If I had just one message to get out to the field, it would be to find ways to use the Common Access Card in your business processes, because its capability is going to continually expand."

NEW BOOTS PROMISE WARMER, DRIER FEET

An improved intermediate cold/wet boot with a removable insulating liner and softer, more flexible midsole is now available to soldiers.

An earlier variant of the boot fielded in the early 1990's filled the void between standard-issue leather combat boots that offer minimal protection in cold and damp conditions and extreme cold weather vapor-barrier boots that lock out the cold and water with their rubber-enclosed air chambers but do not "breathe."

The new boots' uppers are made from leather that is produced according to military specifications. The leather is bonded to a Gore-Tex lining and is highly water-resistant and breathable. The 200-gram insulation liners can be pulled out and exchanged with dry ones if they get wet, allowing soldiers to continue wearing the same boots. Two sets of liners come with the boot, but more will be available if needed.

The new boots are made with soft polyurethane midsoles and have rugged, aggressive-tread Vibram vulcanized rubber outer soles. The boot tongues also are made from the more breathable leather.

"[The new material is] especially important when it's cold because the previous mid-sole materials stiffen," said Chris Palmer, project officer for military footwear at the Army Soldier Systems Center at Natick, Massachusetts. "The flexible forefoot should mean less rubbing and [fewer] blisters at the heel. It doesn't change as much in cold weather, and it's easier to walk in, especially going uphill."

In a test by recruits at Fort Jackson, South Carolina, the improved cushioning provided by the polyurethane in the new boots yielded a 30-percent reduction in lower extremity injuries. The boots also were tested in Alaska and Vermont. Troops there found them highly acceptable, with the boots staying much drier and warmer.

NDTA ANNOUNCES TRANSPORTATION AND LOGISTICS FORUM

The National Defense Transportation Association (NDTA) will hold its 56th Annual Transportation and Logistics Forum and Exposition at the Hilton Hotel–Milwaukee City Center and Midwest Express Convention Center in Milwaukee, Wisconsin, 29 September to 3 October. This year's theme is "Gaining Momentum in the New Millennium." Additional information is available on the NDTA web site at www.ndtahq.com.

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Coming in Future Issues—

- **Contingency Contracting in the Pacific Command**
- **Logistics Support Element Planning Model**
- **The CAISI Connection**
- **Army Logistics Management College**
- **Munition Logistics Readiness Support Plan**
- **An Estimation Technique for Transport Missions**
- **Logistics of Countermine Modernization**
- **Building Roads on Soft and Sandy Soils**
- **Putting an End to Rear-View Mirror Logistics**
- **Combat Health Support**
- **CSS Support in the Force XXI Divisional Engineer Battalion**
- **Forming Europe's EAC Logistics Backbone**
- **The Inland Petroleum Distribution System**
- **Army Transporters Part the Black Sea**

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