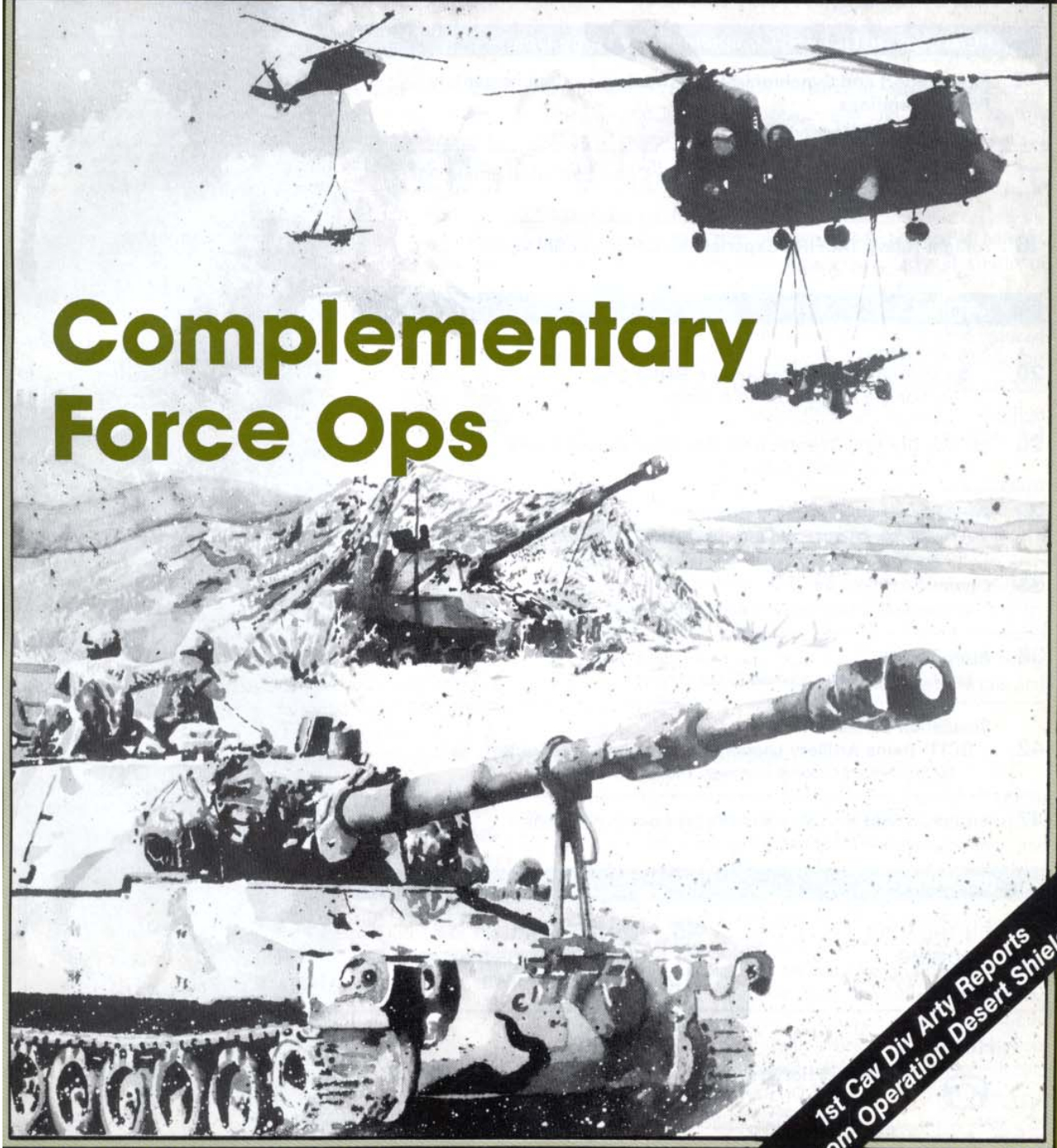
Field Artillery

A Professional Bulletin for Redlegs

February 1991



Complementary Force Ops

1st Cav Div Arty Reports from Operation Desert Shield

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INTERVIEW

FEATURE ARTICLES: Complementary Force Ops

ARTICLES

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PURPOSE (as stated in the first ***Field Artillery Journal*** in 1911): *To publish a journal for disseminating professional knowledge and furnishing information as to the Field Artillery's progress, development and best use in campaign; to cultivate, with the other arms, a common understanding of the power and limitations of each; to foster a feeling of inter-dependence among the different arms and of hearty cooperation by all; and to promote understanding between the regular and militia forces by a closer bond; all of which objects are worthy and contribute to the good of our country.*

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ON THE MOVE

MAJOR GENERAL RAPHAEL J. HALLADA

Heavy/Light Operations

"Because we know we can never be certain about the location, time and nature of future aggression against our interests, and because our defense resources are not unlimited, our forces must be flexible enough to respond to a variety of contingencies. Thus we field forces that are adaptable to a broad spectrum of conflict environments and missions."

Frank Carlucci, Secretary of Defense in his annual report to Congress, FY 89

There's been a lot of activity and interest across the Army in the past year on the subject of "heavy/light." In fact, most of you have probably been involved in several deep discussions on the subject. Some of you have asked, "Why all the concern? Heavy/light and light/heavy—it's not something new. We've been doing it for years."

True, but as the European threat disintegrates, we are more able to focus on our worldwide strategic requirements and capabilities. As our strategic focus broadens, we must consider the spectrum of conflict worldwide and tailor our forces accordingly.

Recent Information

Over the past year, the Center for Army Lessons Learned (CALL) has published several important studies on the subject. Each month, heavy/light is also covered in numerous articles published in other military journals and in the fine series we've included in this bulletin. They all discuss topics important to the professional artilleryman.

To understand the discussions, you must realize that principles and doctrine of fire support remain the same, but tactics and techniques are somewhat modified to fight with a heavy/light force.

As you study the subject, keep in mind an appreciation of the differences between light and heavy artillery—how to best use the strengths each brings into battle and minimize weaknesses.

You must understand the tactics and techniques of the supported maneuver force. There are many differences between light and heavy forces...the least of which is whether they have armored personnel carriers (APCs) and tanks. In a heavy/light force, resupply, transportation and a host of other differences must be carefully monitored to ensure coordination and proper support. Logistics and transportation take the forefront in planning. Command and control is absolutely critical for the success of the combined arms force.

The FSCOORD's Challenge

The strategically responsive flexibility of the light forces coupled with the tactical mobility and superior firepower of heavy forces create unique challenges for the fire support coordinator (FSCOORD). Analyzing the commander's mission statement, task organization and mission, enemy, terrain, troops and time available (METT-T) will provide a starting point for solving the problem.

But the FSCOORD must consider more than just those basic items. He must remain cognizant of the limitations and vulnerabilities of each type of force. His tactics and techniques must change to fit the situation, but the inherent flexibility of the fire support system must still be retained.

Light forces provide the Army versatility and strategic flexibility through their capability to deploy rapidly and reduced dependence on fixed facilities such as ports and airfields. But the factors that give light forces their exceptional abilities also present their greatest vulnerabilities. Without augmentation and transportation assets, they are restrained in their tactical mobility.

Heavy forces provide superior firepower and tactical mobility and can range over great distances. They are tailored to conduct sustained, mobile, combat operations against a similar or less-capable force while remaining able to concentrate rapidly when needed. But their advantages are also the source of their limitations. Heavy forces take longer to deploy and require tremendous transportation assets for strategic missions. Dependence on vehicular mobility restricts heavy forces in jungles, dense forests, steep and rugged terrain and built-up areas.

Solving the Problem

No one answer can serve as the solution in every situation. The best counsel is to study the lessons of those who have gone before you. Read issues of CALL's "Lessons Learned" and explore new alternatives when faced with a heavy/light task organization. Most important, read your professional bulletin for the latest lessons in fire support tactics and techniques from the Combat Training Centers.

As professional Redlegs, we must keep ourselves current on the latest tactics and techniques available to support the maneuver force and ensure victory on the modern battlefield.

The reality of heavy/light or light/heavy forces on the modern battlefield only requires us to refine our fire support doctrine . . . **not rewrite it.**

INCOMING LETTERS TO THE EDITOR

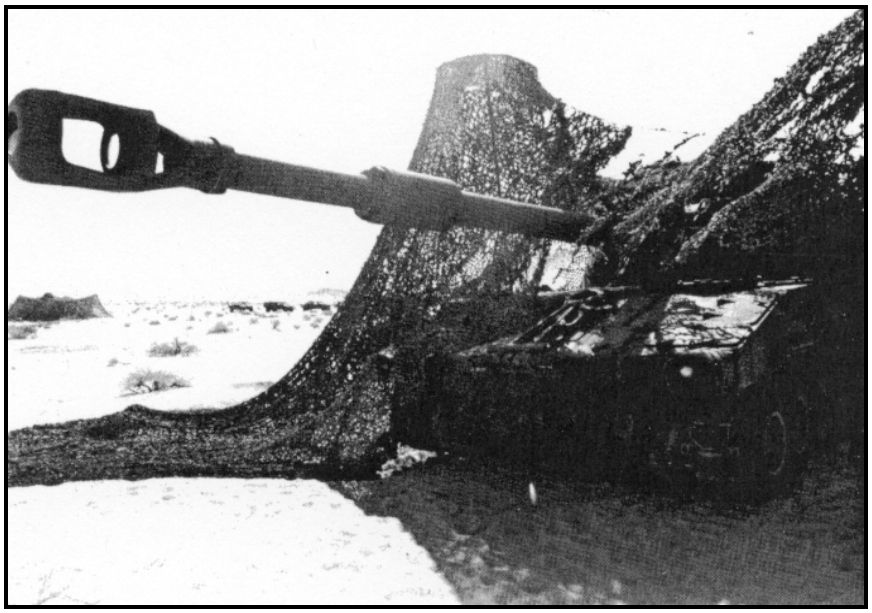
True Grit

The October [1990] edition of ***Field Artillery*** on "Massing Fires" was great. We especially liked the article "Starting Off on the Right Foot" [by the Honorable John Patterson]. I'm going to give my soldiers a class on how history repeats itself to instill an even stronger will to fight and win—if that happens to come about.

"Sand?" you ask. It's everywhere, even in the chow.

The morale of the soldiers of the 1st Battalion, 17th Field Artillery [75th Field Artillery Brigade] is the highest I've ever seen. We're trained and maintained—fit to fight. We stand proud and ready, holding our colors and streamers high.

CSM Glenn A. Blackwell, FA
1-17 FA, 75 FA Bde
Operation Desert Shield



Sat. Raymond Roman

Pentomic Division of the Mid-1950s

The October 1990 issue of ***Field Artillery*** lived up to the high standards now routinely expected of you. But the article "Massed Artillery—A Historical Perspective" by Major Donald A. Carter makes a couple of points that must be challenged.

In stating that the Pentomic Division structure was implemented in 1953, Major Carter is three or four years early. The Pentomic structure, limited to infantry and airborne divisions, appeared in the 1956-7 time frame.

The Field Artillery organizations of the Pentomic divisions experienced several evolutions. Major Carter's article cites the initial division artillery structure of the Pentomic concept. A subsequent restructured division artillery retained the howitzer/rocket battalion and was enlarged to include two 105-mm howitzer battalions.

This latter organization gave rise to a rather interesting fire support dilemma. In an effort to retain the highly successful direct-support technique, the two light battalions were each given the tactical mission of "support" to one *or more* battle groups. The support mission, while re-establishing the division artillery's ability to mass fires, presented the Field Artillery battalion commander with the interesting, if undesirable, dilemma of determining which of the supported battle groups should receive the preponderance of fires at any particular time.

Ultimately, the Pentomic division artillery structure had five small direct-support battalions along with the composite battalion. This organization obviously solved the dilemmas created by the support mission. Fortunately, the Pentomic organization never faced the test of combat.

Incidentally, while infantry and airborne divisions were struggling with the Pentomic organization, armored divisions retained the late World War II organization, based around three combat command maneuver headquarters, each with a mix of attached armor and armored infantry battalions for tactical operations. The division artillery consisted of three direct-support battalions and a general-support battalion. If that seems to resemble our current reorganizing of Army division (ROAD) structure, it certainly did.

COL(R) Griffin N. Dodge, FA
Santa Fe, NM

Response to "How Soon We Forget"

I am writing this letter to comment on the letter by Major Zachary P. Hubbard on "How Soon We Forget" in the October 1990 issue. In his letter, Major Hubbard discusses adding a US Naval officer qualified in surface warfare to various Army commands to help integrate naval gunfire.

Simply adding a surface warfare officer may not produce the desired results. In many cases, these officers may understand naval gunfire from the ship's point

of view but have little or no understanding of how to integrate fires into the fire support plan. Additionally, some may have no experience because they never were a gunnery officer aboard a ship.

In the Marine Corps, we have naval gunfire liaison officers in our tables of organization, and they attend a special course prior to or soon after their assignments. Upon successful completion of the course, they are then eligible for Navy Officer Billet Code (NOBC) of 9272, which designates them as Naval gunfire liaison officers.

The course lasts five weeks and is offered exclusively at the Naval Amphibious School, Coronado, San Diego, California. In the course, an officer is trained in spotting and planning naval gunfire and integrating the fire of supporting arms.

Based on my experience, the Naval officer who would provide the best support would be a surface warfare officer who is a graduate of the Naval Gunfire Liaison Officers' Course. Now—getting the Navy to assign these officers to Army commands is another story.

Maj. Roy K. Jones III, USMC
USMC Rep
Naval Amphibious School, Coronado

3x8 Platoon Leader's Position

I am writing in support of Major Richard P. Formica's letter (June 1990), in which he expressed the view that the 3x8 platoon leader belongs with the firing element, not with the advanced party. I am currently assigned to the 6th Battalion, 1st Field Artillery, which recently published standing operating procedures that leave the platoon leader with the line of metal. The gunnery sergeant is fully capable of handling advanced party tasks for the platoon.

Well-trained gunnery sergeants must be expert in several areas. Among these are map reading, radio procedures, route reconnaissance, establishment of directional control and NBC [nuclear, biological and chemical] detection and defense. They must have keen eyes for tactical howitzer employment and the leadership skills to balance the several simultaneous operations single-handedly. Additionally, they must be trained to interpret a firing position the same way the platoon leader or battery commander would.

Advanced party operations begin when the platoon leader receives movement instructions. He assembles the advanced party and issues his operations order. He must cover both the enemy and friendly situations, the mission and execution. Execution instructions must include new location, route and control measures, order of march, azimuth of fire, main body SP (start point) time, mission-oriented protective posture (MOPP) requirements and radio frequencies.

Advanced parties usually depart the area anywhere from 30 to 40 minutes prior to the main body. En route, the gunnery sergeant can provide the platoon leader valuable information, such as possible ambush, obstacle and emergency occupation sites.

Once at the new location, the gunnery sergeant leads the party on a security sweep and begins to prepare the position. Additionally, the battery commander usually (based on the situation) links up with the advanced party to provide survey data and further guidance.

When the main body arrives, the platoon leader immediately moves to the aiming circle to begin his independent lay verification. From that point, it's platoon occupation as usual.

The benefit of keeping the two most senior leaders (the platoon leader and platoon sergeant) with the firing element far outweighs the need to send the platoon leader forward. Gunnery sergeants are extremely experienced NCOs who can prove more valuable to the unit if used this way.

This technique proved successful for 6-1 FA, and I encourage other units to try it.

1LT Charles J. Ekvall, FA
Plt. Ldr., C/6-1 FA
Germany

FA Rangers Needed

The 75th Ranger Regiment routinely has openings for regimental and battalion FSO [fire support officer] and FIST [fire support team] chief positions. The Regimental Headquarters is located at Fort Benning, Georgia, and its three battalions are located respectively at Fort Benning; Hunter Army Airfield, Savannah, Georgia; and Fort Lewis, Washington.

FSO candidates should have previous FIST chief and battery command experience. Officers must be Airborne and Ranger qualified, physically fit and volunteer for this unique and rewarding assignment.

Top quality officers who are sincerely interested in being assigned to the Regiment should write Commander, 75th Ranger Regiment, P.O. Box 55843, ATTN: AORG-SA, Fort Benning, Georgia 31905-5843 or call AUTOVON 835-7551/5124 or commercial (404) 545-7551/5124.

CPT A. Kent Schweikert, IN
Asst. S1
75 Ranger Regt.

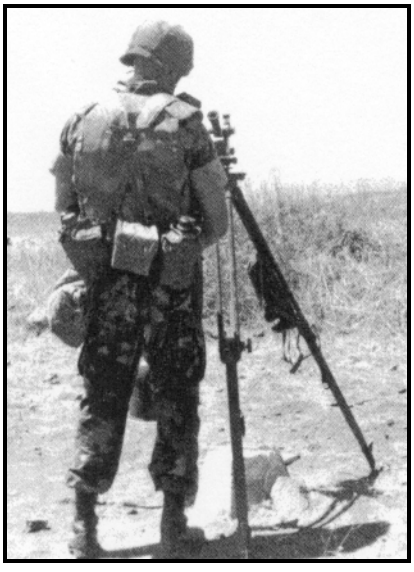
Surveying Problems in Desert Shield

Greetings from Saudi Arabia! The 11th Marines are doing well in this desert FIREX [fire exercise].

The purpose of this letter [dated 29 October 90] is to make Redlegs aware of some surveying problems encountered here. Sometimes high technology may turn against you.

Our topographic platoon didn't have the right equipment. In fact, we gave it data (trig lists, conversions, etc.). The 11th Marines also gave data and conversions to the 82d Airborne [Division]. (I've worked long and hard with the 82d and enjoyed it.) In addition, we helped the 1st Cavalry Division, the 24th Infantry Division [Mechanized] and the British 40th Field Regiment. It was lucky I understand geodetics and was able to help them. My point is our surveyors need geodetic training or at least instruction.

When we realized we might deploy to Saudi Arabia, I contacted the Defense Mapping Agency (DMA) in search of survey data (trig list) applicable to the area. Several volumes with extensive control data surveyed from the early 50s to the late 80s were promptly delivered. Surveying agencies included the US Navy, US Air Force, Arabian American Oil Company (ARAMCO) and British government. Methods of survey varied from the Navy's geodetic coordinates by astronomic observation to Doppler positioning



Getting firing units on a common direction is key to getting accurate predicted fires.

Marines in a fire direction center computing data.

by the Air Force. The trig list consisted of data compiled in Clarke 1880 Spheroid (Narwan Datum), International Spheroid (European Datum) and Hayford Datum 1910.

The maps available for the operation were produced by DMA in the World Geodetic System of 1972 (WGS 72), and the projections depicted were universal tranverse mercator (UTM) and (or) the military grid reference system (MGRS), depending on the scale selected.

We arrived in Saudi Arabia in mid-August 1990. With map-spotted coordinates as initial data for an inertial navigational surveying system called position and azimuth determining system (PADS), we located ARAMCO Station 166 on the desert floor. This Station, among others closer to the area of operations, was listed by latitude, longitude and height in the Clarke 1880 Spheroid trig listing.

Using a geodetic datum-to-datum conversion program in our hand-held calculators, we determined the Station's WGS 72 latitude and longitude and, ultimately, its WGS 72 UTM coordinates. [The software module for the survey section backup computer systems (BUCS) with the geodetic datum-to-datum conversion program is scheduled to be fielded throughout the Army and Marine Corps in May of 1991.] With this information, we then searched for and recovered several other stations within the area of operations and provided common control for starting, closing and updating stations to the battalion surveying section.

Because PADS software does not provide a WGS 72 Spheroid function code to survey under this model, we used the Australian National Spheroid, which is available and has very close parameter values to WGS 72.

To verify the accuracy of the PADS survey, we cross-tied by conventional traverse all the trig list stations recovered with the stations established by PADS, using Wild T-2E theodolites and Ranger IV electronic distance measuring devices (EDMDs). Findings were: an average error of +/- 0.16M easting, +/- 0.06M northing and +/- 0.4M in height.

The accuracy of the surveyed stations was further verified by comparing the computed azimuth between stations to the azimuth determined by astronomical observation of the sun and Polaris. The average difference was 0.014 mils; this also provided a positive check of directional control.

Three traverse schemes were necessary to check nearly 60 miles of survey. The accuracy ratio of these traverses were 1:24,000, 1:18,000 and 1:11,000. The accuracy ratio required to establish survey control points (SCPs) is 1:3,000.

I have concluded that a geodetic survey course or subcourse (not too deep, but not just an overview either) may be useful to the survey officers, and perhaps an overview explaining general terms (layman's geodesy) should be available for field grade officers.

CW4 L. R. Lozada, USMC
Survey Officer
HQ Btry, II Mar

Brigadier General Richard W. Tragemann, Former XVIII Airborne Corps Artillery Commander

Redlegs on the Front Line— Operation Desert Shield

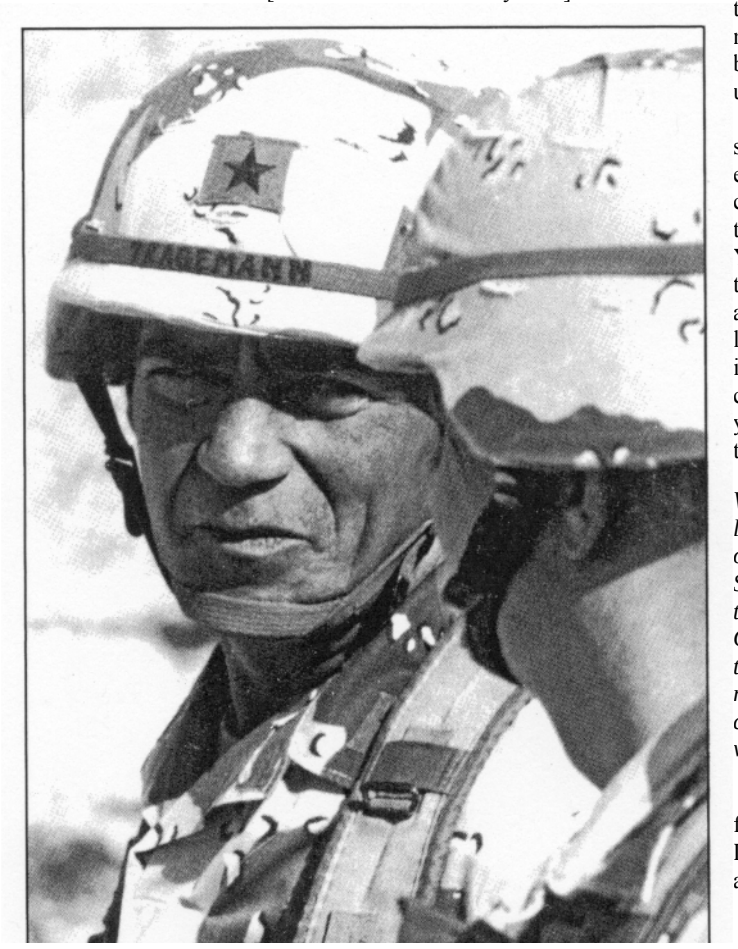
Interview by Major Colin K. Dunn, Editor

The following is an interview with Brigadier General Richard W. Tragemann on 30 November 1990. Just prior to the interview, Brigadier General Tragemann gave up command of the XVIII Airborne Corps Artillery in the Persian Gulf. In August 1990, he deployed the Corps Artillery in Operation Desert Shield.

The AirLand Battle-Future [ALB-F] concept proposes that the corps artillery will be decisively engaged in the early stages of any conflict as a single tactical entity. How would you apply these tenets of ALB-F in Operation Desert Shield? In other contingency operations we're likely to face?

In Desert Shield, we decided early to position a lot of artillery of all calibers forward and to employ it in the initial moments of any battle. That AirLand Battle-Future tenet has driven XVIII Corps fire planning to support the defense of Saudi Arabia. At the same time, it was clear in General Schwarzkopf's guidance that he didn't want to jeopardize his artillery and risk its loss in the covering-force area.

I can conceive of many contingencies in which a corps artillery would be employed as a tactical entity. Our improved ability to pinpoint targets deep in any theater and the additional range and accuracy we now have give us enhanced capabilities. We take full advantage of those capabilities when we employ artillery early to strike deep—before any maneuver elements fight.



What are the issues involved in employing heavy and light artillery forces together—command and control? Equipment?

From a command and control standpoint, the single biggest issue is interfacing TACFIRE [tactical fire direction system] units with non-TACFIRE units. We worked through that problem—spent hours training to make sure we could efficiently employ all our systems. We provided liaison teams with a VFMED [variable-format message entry device] to our non-TACFIRE equipped units so they could perform their missions and be supported by TACFIRE-equipped units.

From an equipment standpoint in the Desert Shield environment, one must consider the limited trafficability of towed units. You can't take towed artillery too far off the major road arteries. To do so, you risk losing them. So, trafficability is a very important consideration in terms of how you're going to organize for the fight.

What role do you see for our light artillery if conflict should occur in Operation Desert Shield? How does this compare to its role in Operation Just Cause [Panama, 1989]? Given that these two operations represent the likely range of conflicts of the future, how do we prepare for this spectrum?

There definitely is a role for the light artillery in Desert Shield. Certainly light artillery isn't going to take on

armored formations, but with our ability to use air assault assets to move quickly to pinpoint "soft" targets, light artillery has an important raid mission, among others.

While the SP [self-propelled] units are more trafficable, the light artillery units with that air assault capability can move rapidly from one sector to another. The beauty of light artillery, of course, is you can get it there quickly. Our total force must stay as light as possible.

I envision an Army in the 90s that is rapidly deployable. That rapid deploy-ability meant success in Operation Just Cause—we quickly deployed an overwhelming combat force capable of rapid victory.

As it turned out, because of our concern for collateral damage, we didn't heavily use all the light artillery at our disposal. But the very fact that it was there, if needed, contributed tremendously.

We must maintain a deployable force. But to think we're going to be able to buy and preposition large amounts of equipment all over the world in the future is not realistic. It's too expensive. I see an Army that is largely CONUS-based [continental US], extremely well-trained and rapidly deployable.

What equipment has been "worth its weight in gold" in Operation Desert Shield?

I think the most important item of equipment to the Operation that has been introduced into the artillery structure is the global positioning system [GPS]. In the desert, be it day or night, it's extremely difficult to navigate. But with GPS, we now always know precisely where our units are—before other means of survey control are established—so we can deliver accurate, first-round fires on any target more quickly than ever. The GPS has been worth its weight in gold.

So has the OH58D [helicopter]. We found very quickly in Desert Shield that the OH58D had an important role in aerial observation as well as in laser designation. I was gratified to see the enthusiasm with which aviators and artillerymen worked together to maximize the capabilities of the OH58D.

What difficulties have our fire support forces experienced in getting accurate survey data, maps and grid locations in Desert Shield? How are we resolving the problems?

> ***"Live-fire training was a real problem in the theater because of the nomadic Bedouins and camel herds. . . . You must . . . be prepared to interrupt live-fire training at any moment."***

When we first arrived in the theater, we learned that ARAMCO [Arabian American Oil Company] had developed a survey grid of the entire nation. That information was provided to us almost immediately. However, we quickly realized through the GPS systems used by our topographical engineer experts that the survey information was inaccurate. So we began to provide fourth-order survey with our topographical engineer units throughout the Corps sector.

That took some time—the XVIII Corps sector is roughly the size of New Hampshire and Vermont—but we now have fourth-order survey throughout the operational area.

Maps were a problem. There initially weren't enough 1:50,000 maps to give our units as many as they needed. That has since been rectified. But, again, this was only for a defensive situation. The problem remains if we take on an offensive mission and move outside the current Corps area of operations.

There's also a problem with the convergence of grid zones in that part of the world—moving from one map sheet series to another. We've had to work our way through that very carefully. With respect to PADS [position and azimuth determining system], we've had to use the Australian Spheroid algorithm.

Do you see a need to continue to use the Marine Corps' maritime prepositioning system [MPS] to improve the Army's strategic deployability? [MPS prepositions ships loaded with equipment to rapidly support contingencies worldwide.] If so, why? In what other ways could we improve our deployability?

By having certain classes of supplies readily available early in the theater, the maritime prepositioning system [MPS] served us extremely well in Desert Shield. If we hadn't had that system to support the Operation in the early days, we wouldn't have had enough ammunition for combat operations. With MPS, we had a variety of artillery munitions in large quantities on ships. Had we not had that, we would have been in a real trick.

The best way to move ammunition is by ship, but our vital ship assets were tied up moving units. With MPS, we didn't have to divert those fast ships to move Class V [ammunition]. I'm a big fan of MPS—not for storing a division's worth of equipment, but for storing certain classes of high-volume, heavy-weight supplies.

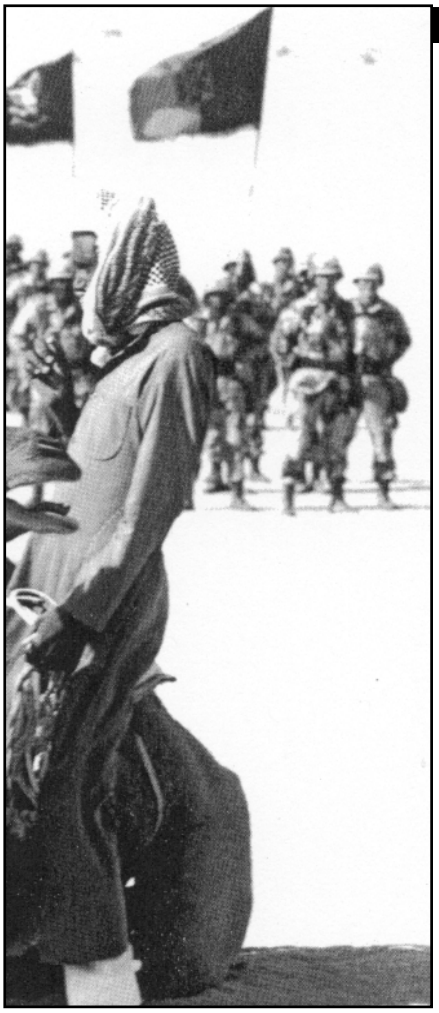
What's life in the desert like for the individual soldier?

Let me go back to the initial weeks of Operation Desert Shield. It was August, and the temperatures in the desert were routinely 125 degrees during the day—sometimes higher. It cooled down at night, but it remained oppressively hot. Our soldiers acclimated themselves remarkably well, and I was impressed with their mental and physical toughness in dealing with the most demanding conditions I've seen in 25 years of service. They're uncomplaining and able to function remarkably well in the environment.

We've had very few cases of heat injuries primarily because our soldiers are well-trained. Our commanders realized quickly that soldiers at mid-day could not perform at peak levels. So we adjusted and did a lot of our training at night.

Life in the desert for the individual soldier is tough, but he's extremely tough and deals well with it. Morale is high, given the conditions.

In your opinion, how should the Army rotate soldiers in and out of the Persian



Gulf if it becomes a long-term deployment: by entire units or by individuals? How often should they rotate?

If the Saudi Arabian government asked us to stay for a long time, I think we would stay as a much smaller force—probably a division with its normal support slice. We may also establish POMCUS [prepositioning of material configured in unit sets] stocks so we can quickly deploy soldiers to the theater should a similar threat come up in the future.

If we're going to maintain a presence over a long period, I'd prefer to see unit versus individual rotations into and out of the Persian Gulf. I think six to nine months would be about the right length for a rotation policy.

What training programs best prepared the XVIII Airborne Corps Artillery for Operation Desert Shield?

The two training programs that best prepared us were the BCTP [battle command training program] efforts throughout the corps and, secondly, the CENTCOM CPX [Central Command post exercise], which we conducted in July 1990. The CPX dealt with this theater—in fact, the scenario for that exercise was almost identical to the situation at the start of Operation Desert Shield.

The CPXs helped us refine our tactics, techniques and procedures for conducting fire support operations throughout the Corps in a way you can't do at each of the Corps installations. We must continue to conduct corps-level CPXs. They're absolutely vital to the corps artillery.

We also learned a lot in each of the division BCTPs—that program too needs to continue.

What sustainment training are artillery units conducting in the Persian Gulf?

Once our equipment arrived, we merged individual and collective unit training quickly. Concurrently, brigades conducted CPXs, tactical exercises without troops, reconnaissance of battle positions, route reconnaissance, etc. We trained with the greatest sense of urgency because we didn't know how much time we had.

Most of our early training had been dry-fire training, and we felt very strongly we needed to conduct live-fire. But the training has had to be limited to two different live-fire sites.

Live-fire training was a real problem in the theater because of the nomadic Bedouins and their camel herds. Despite clearance by the Saudi government to conduct live-fire training in a particular impact area, you can anticipate Bedouins and camel herds will migrate through the area at any time. You must be extremely conscious of that and be prepared to interrupt live-fire training at any moment.

What interoperability problems might we face with our sister services and Allies in contingency operations such as Desert Shield?

From a sister service standpoint, the coordination of fire support considerations has gone very well. That's largely because Marine Corps and Army artillerymen attend some of the same schools and work together often. Our systems are more standardized than the systems of other services.

Also, it's absolutely essential that you exchange liaison officers [LNOs] early with adjacent units and those you're working with to coordinate fire support. The LNOs will help you get through any coordination difficulties that come up.

A problem is that our TOEs [tables of organization and equipment] don't provide enough liaison authorizations for all the requirements generated in an operation like this. Right now, you have to take those liaison requirements "out of hide." That's something we need to fix.

The same thing applies when you're talking about coordination with Allies.

What message would you like to send Redlegs worldwide?

The XVIII Corps Artillery has trained for a while in the Saudi desert. If the Corps is called upon to fight, it's ready and will win.

If the battle never comes—and I hope it never does—then when our artillery units deploy back home, they'll bring with them the technical and tactical competence and professionalism that will serve the Field Artillery well in the years to come. In fact, they'll be the cadre that takes our Branch into the future. Based on their performance in Saudi Arabia, I'd say the future is very bright.

Brigadier General Richard W. Tragemann is the Commanding General of the Training and Doctrine Analysis Command, Fort Leavenworth, Kansas. Until 15 November, he was the Commanding General of the XVIII Airborne Corps Artillery, Fort Bragg, North Carolina, which deployed to Saudi Arabia for Operation Desert Shield in August. He also commanded two batteries in the 319th Field Artillery, 173d Airborne Brigade, and the Howitzer Battery in 2d Squadron, 11th Armored Cavalry Regiment, all in Vietnam. In addition, Brigadier General Tragemann commanded the 3d Cannon Training Battalion (One-Station Unit Training) in the Field Artillery Training Center, Fort Sill, Oklahoma, and the 101st Airborne Division Artillery, Fort Bragg. In his 25 years of service, Brigadier General Tragemann has commanded units for eight years.

Fire Support and Synchronization:
The Keys to Complementary Force Operations

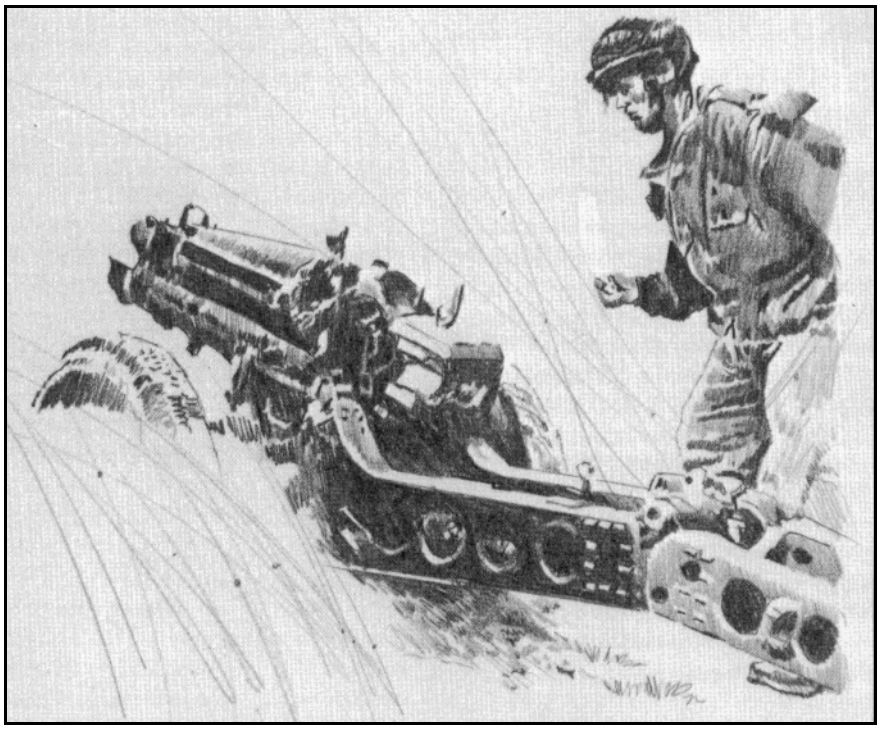
by Major Donald A. Carter

The young platoon leader scanned the horizon, anticipating the enemy's next move. Surely, he thought, the opposing tanks must be on their way. The Lieutenant wondered how long his light infantry platoon could hold. He hoped the close terrain would negate the mobility of the enemy's tanks. He checked his radio one more time, knowing he would need to call for indirect and long-range antitank fires.... soon.

Could this be the 82d Airborne Division in Saudi Arabia? Possibly. It also could have been Darby's 1st Ranger Battalion at Cisterna, Italy, in 1944 or the Red Devils of the British 1st Parachute Division in Operation Market Garden at Arnhem. The dilemma of a light infantry force facing a mechanized enemy is not new.

Recent developments in Central America and the Middle East have called attention to the Army's concept of complementary force operations. This integration of heavy and light forces is a critical component of AirLand Battle doctrine. Commanders create these heavy-light or light-heavy combinations to capitalize on the strengths of each component while compensating for its vulnerabilities.

As the opening scenario indicates, the concept for complementary force operations has been battle-tested. Combat operations throughout World War II involved the integration of light and heavy forces. Variations in terrain, forces available and the mission frequently caused commanders to task organize light infantry with mechanized and armored forces.



A light artillery piece of the British 1st Airlanding Regiment fires. (Sketch rendered from a photograph of the 1st Airlanding Regiment firing on Arnhem Bridge.)

The lessons we learned in World War II have become imperatives for today's complementary force operations. We must support our light forces with enough firepower to face enemy heavy forces or disaster is inevitable, as it was for Darby's Rangers at Cisterna. We must synchronize our operations to rapidly back up our light forces far forward or we program ourselves for defeat, as we did in Operation Market Garden. Though other factors come into play, such as good intelligence and resupplying our light forces, the keys to complementary force operations are fire support and synchronization.

As artillerymen, we must recognize our vital role in the complementary force link. Our aggressive, accurate fire support will hold the complementary force together.

Pacific Theater: Light-Heavy

In the World War II Pacific Theater, complementary force operations were largely light-heavy: light infantry organizations augmented with mechanized support where possible. Steep mountains, dense jungles and the diminutive coral atolls where most battles were fought limited the usefulness of tanks and heavy equipment. Where available, tanks moved at the pace of the infantry. They knocked out bunkers and fortified positions that light forces lacked the firepower to deal with.

Fire support for these light forces also presented special problems. Troops could not easily move heavy guns through the triple-canopy jungles of Guadalcanal and New Guinea. More important, the light units couldn't transport enough ammunition to maintain continuous fire support.

Often the Navy provided an effective alternative. On the smaller islands, ground forces were always in reach of naval gunfire. Land- and carrier-based aircraft also provided effective support for the light forces on the ground.

Sometimes, however, these forces were on their own. Units such as Merrill's Marauders in Burma or the 32d Infantry Division at Buna suffered heavy casualties in operations without adequate fire support (Samuel Milner, *Victory in Papua*, Center of Military History, Washington, D.C., 1957).

The Pacific terrain dictated a light-heavy mix for the Allies, but it also placed similar restrictions on the Japanese. Land battles in the Pacific were often light infantry affairs.

European Theater: Heavy-Light

In the European Theater, armored and mechanized forces swept across the deserts of North Africa, the steppes and plains of Russia and the rolling hills of France. Against the Germans, complementary force operations usually took the form of a heavy-light mix. Light infantry supported the armored forces and controlled the ground where tanks couldn't go.

Darby's Rangers and Fire Support

In Italy, the steep mountain spine of the Apennines limited the mobility of armored forces. Tanks operated effectively in the broad valleys but required light infantry to seize high ground and control the passes. Throughout operations in Italy, Colonel William O. Darby's Rangers supported the heavier ground elements.

At Anzio in January 1944, Darby's Rangers seized the port facilities ahead of the main landing force. This was the type of mission for which the Rangers were designed. A special breed of light infantry, they operated best as a quick-striking raider force.

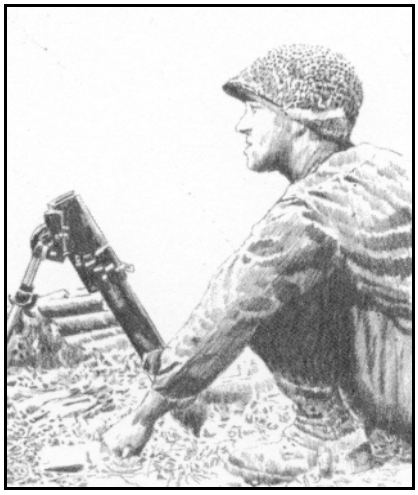
But as enemy defenses stiffened, Darby's men served more often as line troops. They lacked heavy support weapons and had many casualties, causing them to lose their finely honed edge.

This heavy support, particularly antitank and indirect fires, was essential if the light troops were to survive. It was the link that enabled them to operate in the mechanized environment. Light infantry units were particularly vulnerable to enemy indirect fires. They required aggressive counterbattery support to minimize their casualties.

On 30 January, Darby's Rangers acted as a spearhead for the VI Corps breakout of the Anzio beachhead. Their mission was to infiltrate German positions and seize the town of Cisterna, holding it for the heavy forces of the 3d Infantry Division.

Moving quickly at night, the Rangers met little resistance. But the Germans had reinforced positions around the town, and as the sun came up, they caught the Rangers in the open.

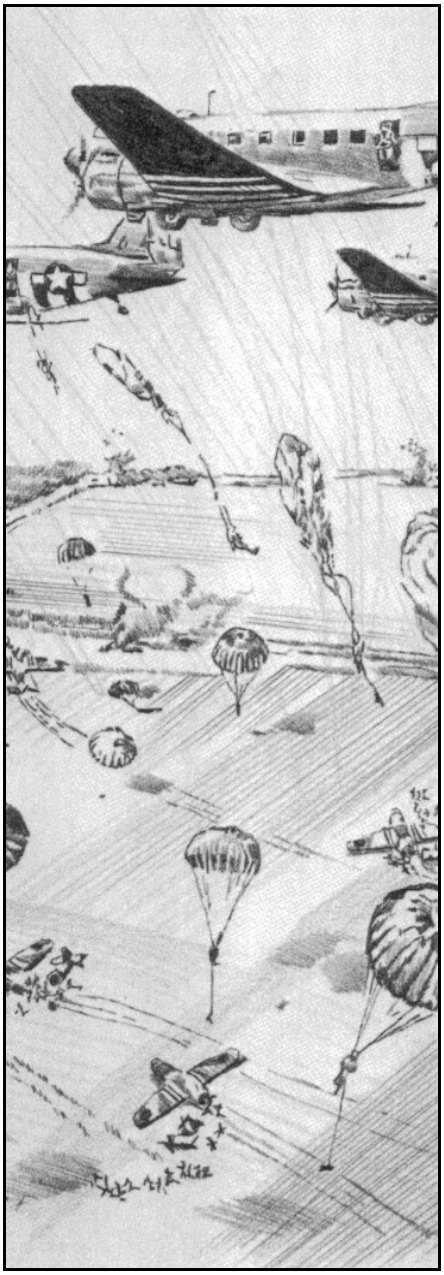
Colonel William O. Darby. His Rangers operated best as a quick-striking raider force.



A 60-mm M2 mortar used by the Rangers, the only indirect fire source readily available.

With only mortars readily available for indirect support, the Rangers couldn't stand up to the German counterattack. Of two battalions committed to the march on Cisterna, only six Rangers reached the safety of friendly lines (Darby and William H. Baumer, *We Led the Way,* Presidio Press, San Raphael, California, 1980, and *Rangers: Selected Combat Operations in World War II*, US Army Combat Studies Institute, Fort Leavenworth, Kansas, June 1985).

The experience of the Rangers in Italy illustrates many of the characteristics of light forces and the necessity of linking them to heavy forces with fire support.



On 17 September 1944, a wave of the First Allied Airborne Army troops landed in open fields about eight kilometers west of Arnhem Bridge.

Trained as an elite strike force, the Rangers lost their edge in prolonged contact with a mechanized enemy. At night and in rough terrain, the Rangers could take advantage of their flexibility and individual skills. On open ground, they were vulnerable to forces with greater mobility and firepower.

Even though they were part of a heavy-light attack, the light forces lacked responsive artillery and anti-armor support. With the heavy forces locked in their own battle along the front, they had little support to spare. Without aggressive indirect fire support, the light force was vulnerable to German artillery and armored attacks.

Market Garden and Synchronization

The synchronization of the light and heavy forces throughout an operation was often a key to its success. This was particularly true in September 1944 when the Allies launched the largest complementary force operation of the war, Operation Market Garden.

British Field Marshal Montgomery planned to drop three airborne divisions behind German lines to secure vital bridges leading across the Rhine. Once the bridges were secured, the British XXX Corps, a major armored force, would advance up the corridor held by the light forces and cross the Rhine into Germany. The entire plan depended on the heavy force's ability to reach and relieve each airborne division before it was overrun by German counterattack.

In its execution, Operation Market Garden lacked synchronization. While XXX Corps was able to reach and cross the initial bridges, it couldn't fight its way through to the Arnhem Bridge across the Rhine—The Bridge Too Far. For the British 1st Parachute Division dropped into Arnhem, the Operation became a nightmare.

Heavy German anti-aircraft fire forced the British to land on drop zones eight miles from Arnhem Bridge. From that point, the foot-mobile paratroops walked to their objective. In an operation requiring stealth and speed, this threw off the timing from the beginning.

Although the urban terrain provided ample cover for the light forces, it also concealed two German armored and mechanized infantry divisions. The British paratropers had few weapons to counter the enemy tanks. They could defend the town, but they had no heavy weapons with which to hold the more exposed drop zones.

As the Germans moved in, the British were cut off from all resupply. The light force in their position far beyond friendly lines couldn't be resupplied by land and also weren't within range of effective artillery support.

Ordered to hold the bridge for two days, the paratroopers held it for five. When they finally withdrew in the face of fierce German counterattacks, only 2,163 men remained of the original 10,005 who had jumped into Arnhem (Cornelius Ryan, *A Bridge Too Far*, Pocket Books, New York, 1974).

Mixed-Force Imperatives

Each of these actions illustrates the imperatives of complementary force operations. In each case, success depended on the synchronization between the light and heavy forces. Light infantry provided the heavy forces capabilities beyond their usual range. Using stealth and surprise, the light forces could seize key terrain before the enemy could react. They also could hold and defend terrain that heavy forces couldn't occupy. But they couldn't stand unsupported.

Even in the most favorable terrain, the light forces had to be resupplied, and they needed aggressive, accurate fire support. They lacked the staying power to remain on the line for extended periods of time. Commanders who heeded these imperatives and coordinated the interaction of light and heavy forces won their battles. Those who failed to synchronize the battle suffered defeat.

These same imperatives are routinely demonstrated in exercises at the National Training Center, Fort Irwin, California. We also can see them in the Army's most recent deployments. While the 82d Airborne Division deployed rapidly to the Middle East, commanders also recognized the requirement to support them with armored and artillery forces as soon as possible.

The Fire Support Community must recognize its critical role in the complementary force package. We're the firepower that maintains the light force on the battlefield. More than ever, we must be on time and on target. We're the force that links the mixed-force team together.

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Heavy-Light Fire Support

Light Force Ops

Centurion Shield 90

by Colonel William G. O'Connor

> ***"In mid- to high-intensity scenarios such as Southwest Asia or NATO, . . . light infantry divisions can be assigned missions that will free up mechanized and armored elements for decisive employment elsewhere on the battlefield."***
>
> Light Infantry Division White Paper 1984

During return of forces to Germany (REFORGER) Centurion Shield 1990, the 10th Mountain Division (Light Infantry), Fort Drum, New York, was used for much more than "freeing up" the mechanized and armored forces. The light forces were used effectively in "stay-behind" and infiltration missions to add depth to the battle-field as well as with cross-attached mechanized and armored forces to defend in the main battle area.

The synchronization of heavy-light fire support during Centurion Shield created some unique challenges. This article examines those challenges from a light fire support perspective and highlights key issues and lessons learned.

The Exercise

Centurion Shield provided a unique opportunity for heavy-light forces to train together from squad through corps levels and on terrain other than that of the Combat Training Centers (CTCs). The interchange on all levels across all battlefield operating systems has created a better understanding of how to employ heavy-light forces to maximize the strengths and minimize the weaknesses of each.

In the defensive phase, the 10th Mountain Division occupied the northern portion of the VII Corps sector. The 2d Armored Cavalry Regiment (ACR) was to conduct the covering-force battle and then hand off the battle to the Division in the main battle area. The Division task organization included two light brigades and a heavy brigade task force with its usual slice elements.

The Division Commander elected to fight the battle by using the three brigades in depth. One light brigade began the battle hidden in the 2d ACR covering-force area with the mission to conduct stay-behind and infiltration operations deep in the enemy's rear after the enemy pushed the covering force back. The heavy brigade task force with a cross-attached light battalion fought the first portion of the main battle area defense, and the second light brigade with a cross-attached mechanized task force was positioned behind them in a second defensive belt.

Fire support for the offensive phase consisted of the organic light artillery, which included two 3x6 105-mm direct-support (DS) howitzer battalions and one 2x4 155-mm general-support (GS) battery. In addition, we had one 3x8 155-mm DS howitzer battalion, which was the usual tactical fire direction system (TACFIRE) battalion supporting the heavy brigade, and one 3x8 203-mm GS battalion, the Corps TACFIRE battalion.

In the offensive phase, the 10th Division conducted infiltration operations forward of the attacking 1st Armored Division in the center portion of the VII Corps sector with one light brigade; plans for the other light brigade included deep air assault and contingency missions,

as required. The 10th Division Artillery (Div Arty) had the mission of general support reinforcing (GSR) to the 1st Armored Div Arty.

Light Lessons in Heavy-Light Ops

Although much of the recent discussions on heavy-light operations center on doctrine, the development of the light infantry concept and its integration into the Army's force structure is much broader. The Training and Doctrine Command (TRADOC) uses the threat to determine Army requirements and then defines our needs in the categories of doctrine, equipment, organization and training. The same categories apply when discussing fire support lessons learned in heavy-light operations.

Fire Support Doctrine

Centurion Shield showed we don't need to modify our basic fire support doctrine for heavy-light complementary operations. There are, however, a few "how to's" that present new challenges.

Field Artillery for Committed Combat Units. Field Artillery support always must be responsive to the committed combat units. The minimum support for committed units is considered to be one Field Artillery battalion in direct support of each committed brigade.

A quick glance at the Field Artillery organization for the 10th Division during the defensive phase might lead to the conclusion that three DS battalions and one GS battalion (plus one GS battery) is enough support. However, since light DS battalions are 3x6, we needed additional Corps assets.

The Corps plan recognized that fact by giving on-order missions to one additional 155-mm self-propelled 3x8 Corps battalion and a Corps multiple launch rocket system (MLRS) battery to reinforce the 10th Division after the covering-force battle. The reinforcing Corps assets were essential because of the lethality of the heavier artillery and the increased range and variety of munitions—particularly Copperhead and family of scatterable mines (FASCAM).

In addition, the counterfire capability of the light division needs to be augmented in a high-intensity environment. Our organic target acquisition assets include two Q36 radars, and our organic GS artillery consists of the M198 battery. During Centurion Shield 1990, the augmentation by VII Corps Arty allowed us to integrate our two Q36 radars with the remainder of the Corps Q36 and Q37 radars. The GS Corps battalion had the mission of coordinating the counterfire battle for the Div Arty.

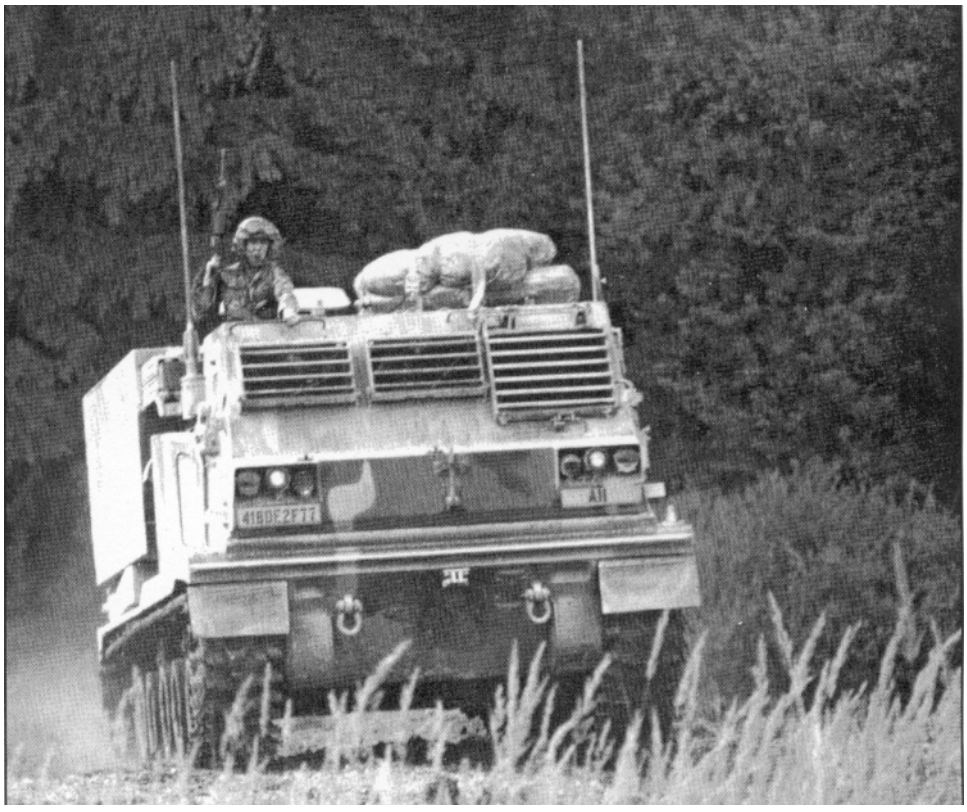
Traditional Missions. Usually, artillery units have one of four missions: DS, GS, reinforcing or GSR. As described earlier during the offensive phase, the 10th Div Arty had a traditional Field Artillery mission of GSR to the 1st Armored Div Arty.

While our Div Arty headquarters can handle the mission, the 105-mm howitzers are not good GS weapons. Their short range required us to position them well forward (in front of the heavy division DS systems), and we needed almost instant knowledge of the enemy situation to stay in range of the enemy as the attack progressed. In the defense, we needed the same knowledge of the enemy to avoid being overrun or bypassed.

When using the light Div Arty headquarters in a traditional GS or GSR role, the best organization is to place heavy artillery units under the light Div Arty's control. The light artillery battalions should be used to reinforce the DS battalions, thereby ensuring they're close to the forward line of own troops (FLOT) and have direct access to the enemy situation. Another possibility is to use the light artillery to support light operations such as stay-behind or air assault missions. A final alternative is to use 105-mm howitzers for rear-area security with the capability to move the system rapidly by helicopter, when necessary.

Fire Support Coordination Measures. The complexity of complementary force operations, particularly the stay-behind and infiltration missions, caused considerable difficulty when determining fire support coordination measures. In the defensive phase before the battle began, the first real challenge came with the positioning of the stay-behind brigade in the 2d ACR's covering-force area. To be most effective, stay-behind forces must disperse to the squad level throughout the area of operation (AO). However, the covering-force commander preferred the stay-behind brigade consolidate at the battalion level in areas where he didn't plan to fight.

Stay-behind forces positioned in that manner won't interfere with the covering-force



During the defensive phase, the Corps reinforced the 10th Division with additional assets, including an MLRS battery.

The stay-behind light forces consolidated in company-sized hide areas coordinated by the 2d ACR covering force and light brigade CPs.

battle but will require additional time after the battle to uncover and spread throughout the AO. Additionally, they won't be able to provide the commander as much intelligence and targeting information.

Our solution during Centurion Shield was to compromise. We consolidated the stay-behind forces in company-sized hide areas coordinated between the two forces. These became restricted fire areas (RFAs). In addition, and probably the most important key to success, we collocated the command posts (CPs) of the 2d ACR covering force and the light brigade. The light brigade commander and fire support coordinator (FSCOORD) collocated with the squadron CP that was the covering-force headquarters in front of the 10th Division. This ensured constant coordination during the battle. Once the battle was complete, the light brigade had its own AO forward of the heavy brigade, and fire coordination followed normal procedures.

The second challenge resulted from the decision to send one of the light brigade battalions on a deep infiltration mission beyond the stay-behind force and the designated fire support coordination line (FSCL). In current doctrine, the primary consideration for FSCL placement is that it should be located beyond the area in which the corps intends to shape its deep operations fight. According to doctrine, the FSCL should have been moved 30 kilometers deeper and the Division boundaries extended to the FSCL to keep from restricting the ground-force commander's ability to maneuver.

However, the infiltrating battalion was moving through a specific corridor to reach objectives, so we used RFAs to provide the needed fire support coordination measures without denying the entire area to target attack by air and ground weapons. The requirements to establish the RFAs on well-defined terrain and to coordinate with the tactical air commander and supporting elements were understood. The RFAs worked initially, but we eventually replaced them with maneuver boundaries in the form of AOs.

Fratricide. When operating with complementary forces on the extended battlefield, we always increase the risk of fratricide. But there are measures you can take to reduce the risk. First—and most important—clearly define and precisely draw maneuver boundaries. Next, collocate CPs to facilitate operations where a force is operating in or through another force's area. Then use RFAs for stay-behind and infiltrating force protection; they work well. Responsive fire support depends on timely, accurate knowledge of friendly unit locations throughout the battlefield, particularly when operating at the squad level behind enemy lines.

Fire Support Equipment

Our second major area of lessons learned was in fire support equipment. We faced several important equipment problems during the Centurion Shield complementary force scenario.

TACFIRE Interface. One of the toughest and most important challenges was the requirement to integrate the light artillery system (no digital capability) with the heavy artillery TACFIRE systems (all information passed digitally). Our ability to mass fires across the Corps was crucial to success, and our ability to interface heavy and light artillery was one key to making that happen responsively.

We initially considered collocating the 10th Div Arty tactical operations center

(TOC), also called the main CP, with the VII Corps GS artillery TACFIRE unit. That would allow the light artillery to operate in a totally voice mode from the fire support team (FIST) up through the Div Arty Headquarters. It would allow us access to the rest of Corps Arty on TACFIRE through the collocated Corps unit. It also would provide TACFIRE Interface between the heavy brigade's DS unit and the Corps GS unit in the 10th Division sector.

Although that solution would have worked, the Div Arty was able to get four light TACFIRE (LTACFIRE) briefcase terminals (BCTs) just before the exercise. (The four BCTs are only a portion of the LTACFIRE system scheduled to be fielded to light units.)

The BCTs were at the Div Arty Headquarters, Division tactical CP (TAC) and the two light DS TOCs. They automated the interface among those four locations as well as with the heavy TACFIRE system and significantly increased our ability to provide responsive fire support to maneuver commanders.

The addition of the BCTs greatly enhanced command and control capabilities, fire planning, maintenance of fire unit status, access to VII Corps Arty units and files and the ability to display and pass maneuver graphics, fire control measures and air corridors digitally. A good example of this increased capability occurred when, with the press of a button, we passed 20 RFAs protecting stay-behind and infiltration forces to all light and heavy artillery units capable of ranging the 10th Division sector.

Clearly the system would have been more effective if LTACFIRE devices had been available at the brigade fire support officer (FSO) and FIST levels as well, particularly when heavy and light units were cross-attached as they were during the defensive phase. The cross attachment created the situation where some FIST and FSOs had digital message devices (heavy TACFIRE) and some had to use voice in a single-brigade organization.

The lack of equipment meant that, at some point, we had to transition from voice to digital communications. When the LTACFIRE system is completely fielded, this won't be a problem.

Lightweight Laser Designator. During the exercise, infiltration and stay-behind forces needed light, man-transportable equipment. In situations where forces were moving on foot rapidly at night over extended distances, a 189-pound ground-vehicular laser designator (GVLLD) carried by two men was impossible. We need a lightweight laser designator weighing about 15 pounds. On numerous occasions, infiltrating and stay-behind forces, both in and outside friendly Field Artillery range, could have designated targets for Army and Air Force laser-guided munitions if we had had lightweight designators.

105-mm Howitzer on the High-Intensity Battlefield. It's easy to find reasons why the 105-mm howitzer shouldn't be employed in a high-intensity environment, such as Europe. Available 105-mm munitions aren't as varied or as effective as 155-mm munitions. The 105 is towed and, therefore, not as survivable or mobile as self-propelled howitzers. Finally, it doesn't have the range of the larger caliber weapons. However, a little closer analysis reveals a significant complementary role for the 105-mm in a European scenario.

In reviewing effectiveness data, it's no surprise to find that the 105-mm howitzer is ineffective against armored fighting vehicles in the motorized rifle regiment (MRR) and division (MRD). However, the 105 is very effective against soft-skinned systems, including wheeled vehicles, radars, mortars and the like. Those soft-skinned systems make up more than 50 percent of the MRR. Regimental and divisional artillery group tables of organization and equipment (TOEs) reflect an even higher percentage of wheeled vehicles.

There will be many targets suitable for engagement by 105-mm operating within a band from two to 15 kilometers behind the forward edge of the battle area (FEBA). We can use the 105-mm howitzer on the right type of targets in concert with the larger caliber weapons to produce an overall greater effect.

Without ballistic protection for the 105 in the fluid, lethal high-intensity battlefield, the key to survival has to be frequent movement and dispersal. The 105-mm howitzer is light and mobile, which makes frequent movement possible and allows positioning in terrain not suitable for the larger self-propelled howitzers.

In addition, employing howitzers by platoons dispersed within 1,000 meters of the fire direction center (FDC) enhances survivability by requiring the enemy to engage multiple targets to take out an entire battery. The procedure is not without cost, however, since light firing batteries aren't manned or equipped for continuous split-battery operations.

Light artillery has air assault capabilities, particularly useful when stay-behind and infiltrating forces can't be supported by organic or attached indirect fire support.

Light weapons add flexibility on the high-intensity battlefield with their air assault capabilities. This is particularly true in situations where stay-behind and infiltrating forces can't be supported by organic or attached indirect fire support and are out of range of main battle area systems. On the other hand, cross-country mobility and the ability to move with the more rapid armored forces, particularly in the offense, are system shortcomings.

The final area for concern is the relatively short range of the 105-mm howitzer. As previously discussed, there will be wheeled vehicle targets in range of the 105s positioned behind the FLOT. We can use the system very effectively in stay-behind operations where ammunition

can be cached and howitzers hidden. Operating by platoons at night with backup computer systems (BUCS) for computation allows us to engage key soft targets identified by the stay-behind force.

Once again, dispersal and hiding in locations off the major mechanized avenues of approach ensure better survivability. Hiding howitzers in rough, restrictive terrain will work well, as will hiding them in major built-up areas.

The number of howitzers committed to stay-behind support will be mission, enemy, terrain, troop and time available (METT-T) dependent. But in many cases, the 105s would be the only artillery able to range the identified targets.

Range of Artillery Systems in General. Given the quality of targeting provided by the infiltration and stay-behind forces in the defensive phase, it was essential to stay within Field Artillery range of the targets for as long as the main battle area fight would allow. Since the commander's concept was to fight the enemy simultaneously throughout the depth of the battlefield (+50 kilometers), it was clear that a maximum range of 30 kilometers (except for Lance) was going to be a problem.

We attached artillery to the stay-behind force so at least a limited amount of firepower was immediately responsive. Then we positioned GS and GSR artillery on the flanks of any enemy penetration of the main battle area to maintain continued support deep as long as possible. Finally, we used adjacent artillery units to augment fire throughout the battlefield.

The plan worked to some extent, but all too often targets were at the 30-kilometer range or greater. Accordingly, we used many conventional Lance missions and battlefield air interdiction (BAI) missions when nothing else would reach the targets. The same phenomenon occurred during the offensive phase.

How realistic and effective that would have been in actual war remains to be seen. The lesson is that a conventional capability beyond 30 kilometers is needed to take full advantage of complementary forces on the extended battlefield.

Long-Range Communications. While not strictly a fire support problem, the ability to communicate with stay-behind and infiltration forces was the critical link to providing responsive fire support in both phases. In the defense, attachment of a 105-mm battalion (-) to the brigade with the stay-behind and infiltration missions recognized that problem. It also supported the belief that, as the battle progressed, fewer and fewer of the artillery systems supporting the main defense would be able to range the targets in the enemy's rear.

By using multiple FM relays and the tactical satellite (TACSAT), we maintained communications. In one instance we communicated on FM relays more than 40 kilometers. Unfortunately, the more relays required, the less responsive the fire support.

Our communications problems over the length of the extended battlefield were probably the most troubling.

Fire Support Organization

The third major area of lessons learned deals with the light fire support organization and its applicability to the European scenario. The light infantry concept for high-intensity scenarios is for corps units to augment the light infantry to strengthen the light units' combat power and sustainability. The experience during Centurion Shield 1990 supports that concept.

Aviation Brigade. A key element of the light division was not present for the exercise—the Combat Aviation Brigade (CAB). The CAB didn't participate because of a limit on the divisional units that could deploy to Germany.

Clearly, the CAB is essential in a high-intensity scenario as it provides the light forces its main tank-killing capability. Even if the 10th CAB had been present, Corps planners still would have had to seriously consider augmenting the Division with attack helicopters, particularly with the increased capability provided by the AH64 helicopter.

Sustainability. Another area requiring Corps augmentation is sustainability. First, as with all other light units, we lack equipment redundancy. Each battalion has one wrecker and one tank and pump unit, with maintenance, mess and medical only at the battalion level.

Perhaps the most striking example of our lack of redundancy is our ammunition haul capability. A 3x6 light artillery battalion can carry 1,800 105-mm rounds on six 5-ton trucks and 18 high-mobility multipurpose wheeled vehicles (HMMWVs). A 3x8 M109 battalion can haul 6,500 rounds on 22 10-ton heavy expanded-mobility tactical trucks (HEMMTs), 24 prime movers and 24 ammunition carriers. It's clear that in a high-intensity scenario, corps augmentation is required.

The second perspective is one that was not a significant problem during Centurion Shield 1990, but it most certainly will be in actual war. The introduction of a weapon system not otherwise available in large numbers in a theater will cause significant problems with replacement systems, repair parts and, especially, ammunition.

Fire Support Training

Centurion Shield 1990 began with a series of heavy-light training opportunities in September 1989 and continued through the exercise itself in January 1990. The series of CP exercises (CPXs) and seminars in the continental US (CONUS) and Europe allowed fire supporters to discuss and execute detailed plans for complementary force operations.

It's fair to say that until now, the Army has had heavy and light proponents with a definite separation between them. The most significant lesson from Centurion Shield should be that heavy and light forces can complement each other over the full spectrum of conflict. Training together will show how to do it best.

Conclusion

Heavy and light forces properly employed do produce a synergistic effect that hastens the enemy's defeat. Synchronization of heavy and light fire support plays a key role in achieving that success.

Clearly the azimuth for the future is not either heavy *or* light, but how best to employ both fire support systems to complement each other and produce an overall greater effect on the enemy.

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A Light-Heavy TACFIRE Experience

Centurion Shield 90

by Major Lin B. Zulick

The story that follows is of one general support (GS) artillery unit's unique planning and implementing experiences integrating light and heavy tactical fire direction system (TACFIRE) technology. The experiences occurred while supporting the VII Corps battle during return of forces to Germany (REFORGER), Centurion Shield 90. It's a story worth telling from the perspective of the Clausewitzian ideas of "preparations for and conduct of war."

My observations are neither intended to promulgate new Field Artillery doctrine nor embrace light TACFIRE (LTACFIRE) as the system of choice for the modern battlefield. These are left to the discretion of the reader.

The principal players in this story are the 1st Battalion, 36th Field Artillery (1-36 FA) and the 10th Mountain Division Artillery (Div Arty). The first is a "heavy" TACFIRE, GS, M110A2 cannon unit assigned to the 17th FA Brigade in Germany. The second is a "light" TACFIRE, light fighting combat unit from Fort Drum, New York.

This unlikely partnership had an integral role in the VII Corps organization for combat to support a "force-on-force" battle during the first week of Centurion Shield 90—the defense.

The 10th Mountain Div Arty didn't have LTACFIRE equipment until November 1989. They received their brief case terminals (BCTs) after the VII Corps planning staff made the final decision to integrate the light fighting division forward with a heavy TACFIRE division.

The 10th Div Arty immediately brought in a training team from Litton Industries, the BCT manufacturer, and spent several weeks learning how to operate the BCT hardware and software. This was certainly an ambitious undertaking, for in two months they used it to fight a major force-on-force battle in Centurion Shield 90.

The training time to complete a new equipment training (NET) program is contingent upon the type of equipment being fielded. In this case, the 10th Div Arty had to abbreviate the usual NET training for BCT.

When any unit fields an automated system such as BCT, it's essential they align their radios for this advanced electronic emission. Unfortunately, time was not an ally in this case, and the radio alignments didn't occur.

Life in the 1-36 FA was less complicated preparing for this operation. That's not to say we didn't have our work cut out for us.

Although we were technically and tactically qualified on heavy TACFIRE procedures, we had no experience working with the BCT. System experts told us the BCT Version 9 software was compatible with our TACFIRE Version 7.7 software. We didn't have access to the BCT hardware or software program to confirm or deny the claim.

The added challenge we faced was creating the most efficient command, control and communications (C^3) "automated systems design" to bind these two computer technologies. Only then could we exploit the combat multiplier effect on the battlefield we sought. Since we were the experts on digital communications, the onus was clearly on us to devise a workable solution.

Two-Headed Spider

To understand our design problem and how we solved it, you must understand

the C^3 automated systems design we currently use under the heavy TACFIRE concept. The schematic shown in the figure characterizes our current heavy TACFIRE systems configuration. We fondly refer to it as "The Two-Headed Spider."

At first glance, it appears very cumbersome and simply too convoluted to be effective. I thought the same the first time I was introduced to this model. However, a number of high-speed exercises in the maneuver rights area, the battle command training program (BCTP) and live-fire exercises at the Grafenwoehr Training Area left no doubt about the viability of this system.

Basically, the Spider is designed so the Div Arty headquarters manages the close-in division fight with its organic battlefield operating systems. Concurrently, the brigade headquarters manages the division's counterfire battle with its organic and attached divisional assets.

There are two features of this system that make it so effective. First, superb C^3 redundancy is built into the system. The Div Arty and brigade TACFIRE shelters continuously exchange files between the data bases. Both computers operate on the same digital fire direction nets, and either Div Arty-level fire control element can access any firing unit through the TACFIRE auto-relay function. In case of a catastrophic failure in either computer, the other headquarters is set to assume control of all firing units with minimum rearranging of communications hardware and software.

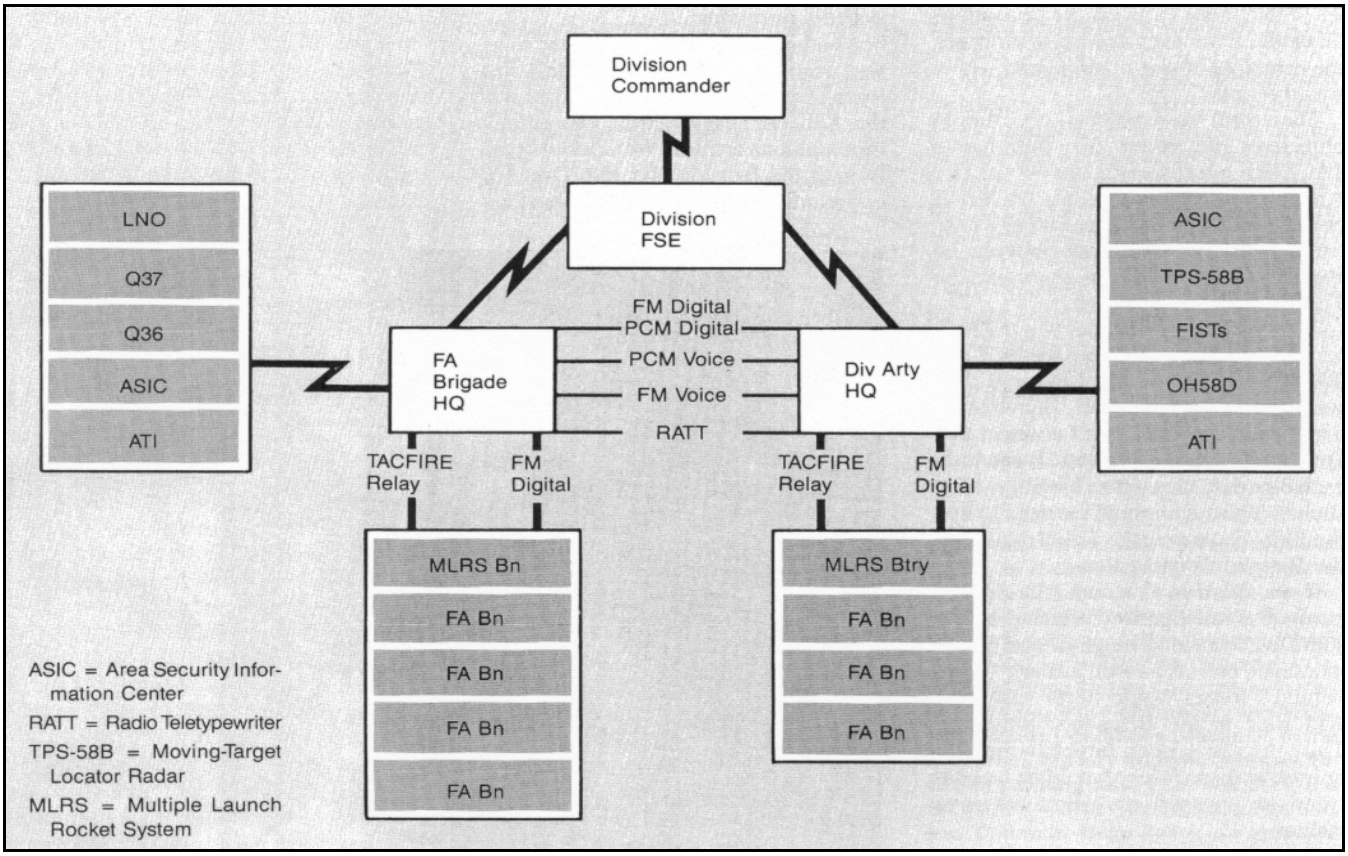
Second, the artillery target intelligence (ATI) files in the two Div Arty-level computers end up with different information. Because of the intelligence "inputters" linked to each computer, most of the counterfire information ends up in the FA brigade computer and most maneuver-related information ends up in the Div Arty computer. But any unit in the Spider can access the information in either computer by using the TACFIRE auto-relay function.

ATI processing is essential for developing the enemy order of battle, specifically the regimental army groups (RAGs), divisional army groups (DAGs) and army artillery groups (AAGs). As ATI is analyzed and targets are developed outside the maximum range of the organic artillery systems forward, they're passed digitally to the corps arty targeteers for engagement by its deep-battle weapon systems, such as Lance.

The Spider allows for fire support command and control from the forward target acquisition assets through the FA battalions, through the Div Arty and FA brigade computers and into the Corps Arty shelter. Obviously, this door swings in both directions.

Because this heavy TACFIRE system has proven to be an effective battlefield multiplier for the maneuver commander, we felt it essential to achieve the same results using BCT and TACFIRE.

In Week One of Centurion Shield 90, the VII Corps area of operation (AO) for US forces was task organized with the 10th Mountain Division occupying the northern flank and the 1st Armored Division



The Two-Headed Spider. The 17th FA Brigade uses this automated systems design for force artillery command and control under the heavy TACFIRE concept.

occupying the center sector. The 10th Div Arty was the Force Field Artillery (FFA) Headquarters in their AO and the 17th FA Brigade was the FFA Headquarters in the 1st Armored Division sector.

This combat organization didn't support the Two-Headed Spider concept in the 10th Div Arty's operational zone. Therefore, we had to devise a way for the Div Arty's BCT to access the 17th FA Brigade's TACFIRE shelter, thus creating a modified Spider.

Once we bridged the two systems, the 10th Div Arty would be linked to the VII Corps Arty via the Brigade's computers. In that regard, we used the heavy TACFIRE model as our building block to achieve this objective.

War Preparations

Planning between the 10th Div Arty and the 1-36 FA began at the end of November 1989. We had one month to complete our plan. To make matters worse, we could only plan through a series of telephone calls via the transatlantic cable. If we ever needed to embrace the principle of war of simplicity—now was the time.

Therefore, we developed two simple objectives regarding the light-heavy TACFIRE interface: to connect the Div Arty BCT into the Battalion's TACFIRE computer using hard wire and to establish digital communications between the Battalion's TACFIRE computer and the 17th FA Brigade's shelter.

The first issue to address was the software compatibility between the BCT and TACFIRE. We had been assured they were generally compatible. But what we discovered was BCT can't connect to a Div Arty/brigade computer. It can only exchange data files with a battalion-level shelter. This highlighted the need to link the 10th Div Arty to the 17th Brigade via the Battalion's computer.

If we failed in this task, the critical battlefield intelligence collected by the 10th Division's long-range ground reconnaissance patrols as well as their "stay-behind" forces would never reach the ATI files in the Brigade's computer. Thus, lucrative deep targets being acquired by these forces wouldn't be analyzed or engaged in a time-sensitive fashion.

To ensure we didn't lose this human intelligence (HUMINT), we placed the Battalion's intelligence NCO in the 10th Div Arty tactical operations center (TOC) and a liaison team in the maneuver brigade's TOC. They would pass their information over FM voice into the Battalion TOC. It was then entered into the TACFIRE network via the TOC's variable format message entry device (VFMED).

As for the hardware question, there was one major obstacle. The TACFIRE computer uses the KG31 to secure its transmissions. The 10th Div Arty doesn't own KG31s. They would have to employ their KY57s to secure their BCT. But these two secure systems aren't compatible.

We decided to work around the problem by collocating the Div Arty and Battalion TOCs. We hard-wired the two systems and bypassed the problem. This worked very well.

If this problem had not arisen, we still would have collocated the TOCs because we couldn't test the equipment until we were in our initial battle position (IBP). Once in the IBP, we were only hours away from the start of the exercise (STARTEX). We simply wouldn't have the time necessary to work out any major systems problems.

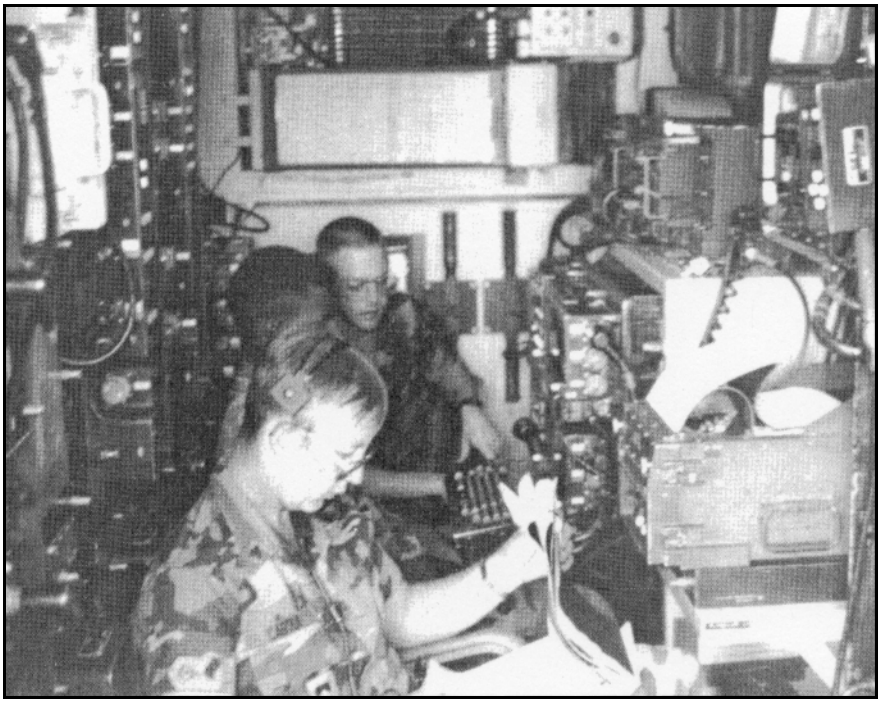
Another planning issue we had to assess accurately was the Battalion's ability to communicate over FM radios with the 17th FA Brigade over exceedingly mountainous terrain. We worked closely with the Brigade and 10th Div Arty communicators to achieve the best tactical profile possible, (We had a marvelous map exercise that highlighted the communications challenge.)

Our experiences attempting to digitally link FM transmissions using "retrans" were consistently unsuccessful. Therefore, we decided the most reliable means of communications, under the circumstances, would be through a dedicated pulse code modulation (PCM) circuit.

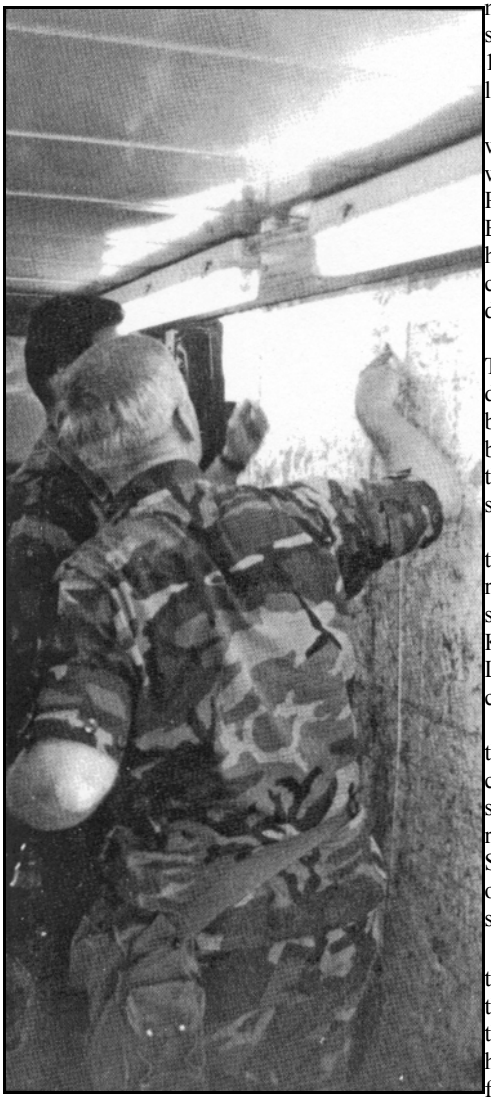
After designing our modified Spider, in theory, the BCT could successfully interface with the Battalion's TACFIRE computer via wire. Also, in theory, the Battalion's computer was digitally linked to the Brigade's shelter through a PCM circuit with FM as the backup system. The Brigade shelter theoretically was tied to both the 1st Armored Div Arty and VII Corps Arty shelters. If it worked, the entire US fire support network supporting the VII Corps battle could be decisively brought to bear at the critical time and place on the battlefield.

War Proper

As the Battalion moved out of the Kaserne and into its FAA, I kept thinking about one word: *rehearsal.* I believe it to be an operational requirement and a key to success. Yet, on the eve of a major exercise, we were preparing to execute a most formidable plan without the benefit of having first rehearsed it.



The 1-36 FA TACFIRE interfaces with the 10th Mountain LTACFIRE.



Joint planning between the operators of both light and heavy units is key.

The 1-36 FA and the 10th Div Arty didn't occupy the same FAA. But we were separated by only a few kilometers, which allowed face-to-face coordination. During the next 24 hours, we reviewed our plans in great detail.

This would have been the perfect time to try to hard-wire the BCT into our TACFIRE shelter. Unfortunately, all the necessary equipment had not yet arrived from the port of debarkation. We would have to wait until we collocated the TOCs in the IBP.

It was a long and difficult night road march into the IBP. We arrived just before dawn. The Div Arty TOC was already in position and had begun setting up. We had less than 24 hours to link the entire digital network from the BCT to the TACFIRE shelter through the PCM link and into the 17th FA Brigade's computer. But our light-heavy TACFIRE interface worked.

The only twist to the original plan was we were able to establish communications with the Brigade through FM radio. The PCM crew, which moved with the Battalion TOC, was inexperienced and hence very slow. Fortunately, our backup communications planning paid big dividends.

The next logical step was to separate the TOCs and establish a BCT-TACFIRE digital interface over an FM net. This had been discussed during the planning phase, but the possibility of acquiring a KG31 for the BCT was so remote that the idea simply faded from our memories.

Within the first few hours of the battle, the 10th Div Arty Commander quickly realized the potential of this fire support system. By the third day, he had acquired a KG31 for his BCT. With the support of the Litton representatives on-site, we connected the KG31 to the BCT.

The separation of our TOCs occurred on that day while we maintained digital communications over an FM radio net. We stayed tactically dispersed for the remainder of that first week of Centurion Shield 90. Our light-heavy TACFIRE objectives had been accomplished in spades.

We solved other problems discovered in the light-heavy TACFIRE link, mostly by the BCT operator's actions. For example, the Weapon Descriptor Files in LTACFIRE have maximum ranges of 24,200 meters for the M110A2 and M198 howitzers. The BCT would, therefore, not accept AFU;UPDATE messages with the howitzers' actual maximum range of 30,000 meters. The operator had to manually change the MAXRNG field on all AFU;UPDATE messages to conform with LTACFIRE's software.

The LTACFIRE BCT can be fielded either with a separate keyboard, which plugs into the terminal, or without a keyboard, in which case all data must be input by the touch screen on the terminal. Using the touch screen slows all operations greatly; we much preferred the separate keyboard.

The LTACFIRE can transmit up to 32,000 bits per second, a very fast transmission rate. Heavy TACFIRE has a maximum rate of 1,200 bits per second; therefore, light-heavy communications are much slower than light-light communications. When units become experienced with LTACFIRE, they may get used to a volume of traffic that can't be supported in links with heavy units.

We encountered several other problems in the system during the week. They covered a wide spectrum, including TACFIRE hardware and software interrupts, PCM downlink failures and BCT hardware and software anomalies. However, we successfully worked through these problems.

Conclusion

Simplicity—this last principle of war is the sum of all others. Clearly, our joint planning and implementing successes during this technological adventure were predicated on simplicity.

In the planning phase, we applied basic tenets. We adhered to the seven inherent FA responsibilities, conducted operations in accordance with standing operating procedures (SOPs), built redundancy in our communication systems, defined what information is passed digitally and what information is passed manually, and fought the battle as we have been trained to do. We had to modify procedures for the last tenet, which we'll write into our tactical SOPs.

In the execution phase, we followed two basic principles. First, if the digital communication links failed, we would have manual backup in place to continue the mission. Second, command emphasis and careful leader supervision were absolutely essential to make the light-heavy TACFIRE interface work.

The bottom line to this story—we made the light-heavy TACFIRE interface an effective combat multiplier for the VII Corps Commander during Week One of Centurion Shield 90.

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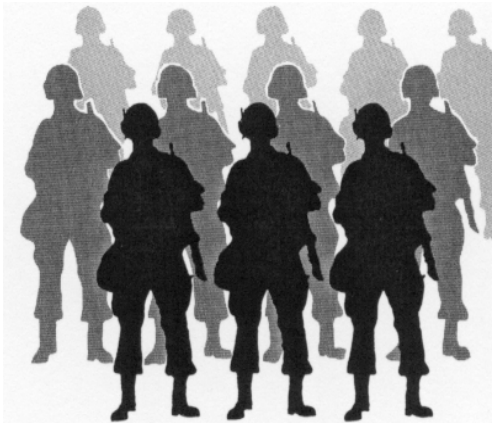
On Making Our Smaller Army a Better One



by General (Retired) Donn A. Starry

In the wake of Soviet initiatives in East Europe, there has been considerable commentary about a smaller, better US Army. What exactly does that mean? Better equipped or better organized? Better trained? Better led? Smaller by budget activated reductions or smaller because, somehow, we've learned how to do more with less?

> ***"... any [Army] organization should be considered nothing more than a transition between what was and what should come next."***

A lot of factors will impact on the quality of our Army as it grows smaller. But as the lesson repeated in four wars tells us, the key to building effective fighting teams is twofold. First, we must build the soldiers' confidence in their abilities to fight and win as teams. We accomplish this by training leaders to build those teams and by training soldiers together as units. Second, we must stabilize our teams—minimize the personnel turbulence to build and retain cohesive unit integrity.

Notions Examined

There are several other popular notions as to how the Army can be better as it becomes smaller, but most miss the mark. Let's explore some of those notions.

We have some of the best **equipment** in the world. It's true, however, that we don't have a well-thought-out scheme for ensuring a modernization rate—fielding new technology that's competitive with the rate established by the Soviets in recent years.

In battle, our equipment seems to perform as well as or better than that of others. But then wars aren't won by equipment, even though there's a persistent notion that our higher tech equipment will win them without soldiers' having to fight. Without some reform of the acquisition process—reform directed at improving the modernization rate—we're not likely to do much better than before.

We have fairly sound **organizational structures**, although some believe they're too large and the leader-to-led ratio is too lean to meet the demands of modern battle. However that may be, any organization should be considered nothing more than a transition between what was and what should come next. For as doctrine changes to accommodate the threat and technology, organizations should change to ensure the most effective combination of tactics and equipment in battle.

We train hard—at least we spend a sheik's ransom on **training**. The National Training Center (NTC) at Fort Irwin, California, may well be the best facility of its kind in the world. Yet units training there are continually bested by the opposing forces (OPFOR), and commanders complain that as soon as their units return to home station, they're so eaten up by personnel changes that they're no longer the well-trained outfits that marched off the desert at Fort Irwin. Further, they complain that those changes take place virtually overnight—or so it would seem.

We have an impressive and comprehensive education and training system for officers and NCOs; our **selection system** for command, promotion and schooling is thorough and fair. However, some folks still don't perform to expectations based on glowing reports in their files (the basis for their selection to their present appointments).

Let's face it: we're not all George S. Patton, Jrs. or Old Bills (Sergeant Lennon, the cavalry sergeant in the famous Remington print). In fact, we seem to

have far too many average or less than average performers among the leaders.

So what makes the **difference?** While volumes have been written about each of these notions, the distilled experience of my 40 years in uniform suggests that in the strange ways that battle turns out in the end, it really doesn't make much difference what equipment is in the gun parks or how the unit is organized. It's the leadership—the cohesion and stability of a unit that make the difference.

> ***"Battles more often than not are won by the courage of soldiers, the quality of their leadership and the excellence of their training."***

Others have come to the same conclusion. The Israeli Defense Force, after carefully examining the conduct and outcomes of armored unit battles in the Arab-Israeli wars, came to a similar conclusion.

Leadership and Training

Why are good units good and not-so-good ones the way they are? Some claim it's the unit commander—the individual leadership character of the boss. To some extent that may be the case. But a deeper look at the problem suggests strongly there's probably much more to it than that.

Battles more often than not are won by the courage of the soldiers, the quality of their leadership and the excellence of their training. Training as individuals is important, of course, but more important is unit training—"together training." Quality unit training sets the stage for the informal unit leaders to emerge.

Said another way, we have two kinds of leaders: formal appointed leaders and commanders and those informal ones that emerge in the units. The latter emerge when the "chemistry" of the people, training, courage, teamwork and even the enemy and the circumstances of the battle bring everything together at the right time and in the right way to win the battle.

The commanders or appointed leaders can't be everywhere on the battlefield; crises in battle have a troublesome way of appearing just exactly where the formal leaders are not. Therefore, the soldiers in the unit must be trained well enough to do things together right and until, hopefully, the appointed leaders can arrive to take charge.

History provides several important and relevant commentaries on soldiers becoming teams in units with the right chemistry.

After World War I, General Pershing's operations officer, Colonel George C. Marshall (destined for greater fame) wrote about the critical need to train units deploying to Europe well—well enough to go into battle with something more than a shoestring's chance of success. Army Chief of Staff Eisenhower testified to the same training need after World War II, as did one of his successors Army Chief of Staff Collins after the Korean War.

More definitively in his superb book *This Kind of War*, T. R. Fehrenbach observed that by the spring of 1951, US Army units in Korea had gotten about as good as they would ever be. He observed that less than a year after the War started, the units had peaked. Their capabilities were limited because of the combined negative effects of a one-year rotation policy, battle and non-battle casualties and other drains on unit strengths.

In writing about both World War II and Korea, the late great S.L.A. Marshall alleged that perhaps no more than a quarter of the riflemen in infantry units fired their weapons at the enemy during an action. Historians and others recently have attacked Marshall's indictment of the Army's individual and, most especially, unit effectiveness. They claim Marshall was reporting perceptions on his part—that there's little or no statistical reliability or disciplined data collection and analysis to back up his conclusions. However, many if not most who have fought would likely testify that Marshall was probably about right—certainly he was not nearly as wrong as his detractors would have us believe.

The Problem

Perhaps the best explanation of what Marshall and others observed was provided by one of the Army's finest battalion commanders of the Korean War, then Lieutenant Colonel Gordon Murch. He described the problem somewhat as follows.

In any rifle platoon on a given day in combat, there may be as many as 20 soldiers present for duty. Of that number, about four or five will act when something starts. What they do may not be as precisely prescribed by relevant manuals, but action is the order. As General Patton once noted, it's far better to do something *about right* now than wait to do something *precisely right* too late. So of the 20 who are present for duty, there are four or five doers.

Another six or eight will do nothing—go to the ground, not fire weapons and be passively protective of themselves, mesmerized by the action around them. They're the non-doers.

The remaining soldiers—seven, eight or nine will follow whatever they observe going on around them. So if one of this latter group is near one of the doers, he too will become a doer. If, on the other hand, he's near a non-doer, he too will become passive.

The problem: how do we identify the doers or create doers in training and place them so there's a high probability they'll influence more of the entire unit? In its largest context, the problem is well-illustrated by the summary chapter of the book *America's First Battles, 1776-1965* (Editors Heller and Stofft), which calls it "command control." It's cited as the most important contributor to the less than spectacular performance of our Army in the 10 first battles described in other chapters of the book.

Unfortunately, identifying doers in advance or training soldiers to be doers and placing them strategically in units falls afoul of two of the most pernicious problems of units in battle. First, we have no organized body of data to tell trainers or commanders how to identify doers, let alone how to train doers. It's perhaps the greatest single gap in our knowledge about unit effectiveness, leadership and command in battle, yet it's the one to

> ***"[We need to] identify the doers or create doers in training and place them so there's a high probability they'll influence more of the entire unit."***

which we give the least attention. Second, we have too much personnel turbulence from battle and non-battle casualties, which is loaded on top of turbulence created by the personnel rotation policy.

At the time, Marshall's conclusions about the non-firing infantry were considered to be an indictment of the effectiveness of individual training. Immediately, programs were undertaken to reinforce individual training, especially marksmanship training. The fact is that the Army really missed the point. Marshall may not have missed it, but he never articulated it as well as Fehrenbach did in *This Kind of War.* It was the effectiveness of the team that was under indictment, the problem described so eloquently by Murch.

Examples of Excellence

Three times in 40 years I served in *superb* units. All three were excellent because of the cohesion we built by demanding unit training and leadership that developed the soldiers' confidence in themselves, in their leaders and in each other. And all three units were able to stabilize their personnel, maintaining the team intact.

The 63d Tank Battalion. In the early 1950s, I was a platoon leader, company commander and battalion staff officer in a tank battalion in the 1st Infantry Division in Europe. The battalion was commanded for a time by Lieutenant Colonel Creighton W. Abrams, Jr. (who later achieved greater fame than he already had). The Korean War started; the Army mobilized. In Europe, we stabilized: no rotations or transfers out for more than a year.

After a time, it was quite apparent we had become very good at everything we did. Well-trained as a unit under a fierce taskmaster, we developed enormous confidence in each other. We had become a super unit. Lieutenant Colonel Abrams frequently commented on it when describing the difference between our battalion, the 63d, and his beloved 37th Tank Battalion of World War II fame. We had trained together so long and hard, knew and had such great confidence in each other that we all had become doers. Getting there was not an easy task, but once there, excellence in everything we did seemed easy.

The Bandits. In the 1960s, I was the Executive Officer and later Commander of the 1st Battalion, 32d Armor, the famous Bandits, then in the 3d Armored Division in Europe. That Battalion too had stabilized, in this case as the Berlin Wall went up. Rotations and transfers were suspended for more than a year as the US military partially mobilized to flesh out the force in Europe to counter the increased threat. In time, we were as good as the 63d Tank Battalion—for all the same reasons.

As I left the Bandits in 1964, the faces peering out of the turrets were the ones I'd known for nearly four years. I never had to look around to see where they were or what they were doing; we knew each other so well and had trained together so hard that there was never uncertainty. We were all doers.

The 11th Cav. The third super unit in my experience was the 11th Armored Cavalry Regiment, the famous Blackhorse, which I commanded in Vietnam and Cambodia in 1969 and 1970. Recollections of those other two great units—the 63rd and the Bandits—were in the back of my mind as I contemplated how best to implement what I knew made units good. And I had to do that in a theater that had a one-year rotation policy, which was aggravated by battle and non-battle casualties.

Armed with complaints from troop and squadron commanders that they were shorthanded on the line and knowing from the strength reports that the Regiment was actually overstrength, I went looking for the "missing" souls. More than 700 of them were in the base camp for one reason or another. Six hundred went back on line within the next few days.

Troop stand-downs in base camp areas were costing us another three cavalry troops a day. Having observed the debilitating effects of this practice on other units in Vietnam, we terminated the stand-down program. We all went on line for the duration: we put on steel helmets and flak jackets; dug in at night; and lived, smelled and communed with ourselves, the ground and the enemy, with a little time out for R&R midway.

Tough. No question. But it saved lives. With our unit at strength and fairly stable, we could build the kind of individual and team confidence that makes units great. Given the rotation system and casualties, we struggled to overcome the problem identified by Marshall and more clearly yet by Fehrenbach a decade or two earlier.

Personnel Turbulence

There has yet to appear in print a commentary on individual and unit performance

> ***"With our unit at strength and fairly stable, we could build the individual and team confidence that makes units great."***

> ***“ . . . if the unit turbulence rate exceeds about 20 percent [per quarter], no meaningful training can be expected. ”***

in the Vietnam War that parallels those described by Marshall and Fehrenbach for World War II and the Korean War. Can we presume the problem has been solved, based on our knowledge of the causes of and remedies for a lack of unit effectiveness? Not at all.

Several books have been written describing various aspects of unit performance in the Vietnam War; most are disparaging of leadership at one or more levels, singling out that as the cause of less than effective unit performance. Most of these accounts are dramatic exaggerations or personal ax-grinding.

The systemic flaw inhibiting unit effectiveness in Vietnam was the same one cited by Marshall and Fehrenbach: the lack of effective fighting teams. We had new faces on the line at a rate that militated strongly against the likelihood of excellence in individual or unit performance. We *had* deployed some well-trained units to Vietnam—as well-trained as individual and unit training in a non-combat environment could make them.

The Infusion Policy

But as entire divisions began arriving in Vietnam, it suddenly occurred to the personnel managers that in a year's time the system would redeploy those units virtually en masse. So the personnel managers began a program of "infusion." They shuffled people around to have a representative mix of rotation dates in every unit. The unit stayed and the people left, but not all at the same time.

From a personnel management perspective, this solution must have smacked of pure genius. But from a unit effectiveness perspective, it was quite another matter. Suddenly, we tossed out the effects of all the hard work, time and resources expended to bring those units to a satisfactory state of training to deploy and fight a war.

We trained our organizations as whole units to arrive combat-ready in the theater of operations and then treated them as replacement pools, scattering (infusing) individuals into them, all to satisfy the orderliness of the personnel management system. The one-year individual rotation system coupled with casualties and attrition simply cloned the effects identified in *This Kind of War.*

The Redeployment Plan

Then in early 1969, it was decided to redeploy US troops from Vietnam. Plans were drawn up in the Headquarters in Saigon in response to President Nixon's National Security Study Memorandum 36, which announced the policy of "Vietnamization." The first increment to redeploy would consist of 25,000 US troops.

Planning in Saigon was closely held; no more than half dozen people in the theater knew what was being planned. Once the number to be redeployed had been decided on, there came the question of which 25,000 would go home.

General Abrams, then commanding in Vietnam, sent word to Army Chief of Staff Westmoreland that a whole division should redeploy, naming the 9th Infantry Division in the Mekong Delta as the unit. The Division would redeploy and, at the appropriate time, march down the streets of Washington, Seattle or wherever, flags flying, bands playing, soldiers in battle dress heads up and proud—now coming home. Coming home would be soldiers who had served a month or two in Vietnam along with some who had served perhaps 11 months.

"Not fair," said the personnel managers—not fair to those left behind. So overriding General Abrams' wishes, it was decided the recent arrivals in the redeploying units would transfer to units remaining in Vietnam. The soldiers new to the theater would replace those who had fought for 10 or so months in another unit—one that would remain in the theater. No units intact would redeploy. The aircraft traffic simply would be increased to accommodate the surge in individual redeployments. Unit flags would be cased and brought out by "a few sergeants." It was a typical "management" solution. But it increased personnel turbulence in units remaining to fight the war.

At first, the effects of the turbulence from first redeployments weren't noticeable. With more than 500,000 soldiers in the country, the ripple caused by the redeployment of 25,000 was hard to detect. But as strengths declined further—the second increment of 150,000 soldiers redeployed in the fall of 1969—the turbulence in remaining units skyrocketed. Toward the end, lieutenants and sergeants stood in front of platoons and squads in which there were few, if any, familiar faces; they issued instructions about the combat operations of the day, hoping against hope that somehow it would all turn out right.

> ***“ The US Army's individual replacement system . . . is an anachronism. . . . We should adopt a unit replacement system, probably at the battalion level . . . ”***

> ***"The complexities of modern battle require us to improve leader-to-led ratios . . ."***

As serious an undertaking as battle is, it's too much to ask officers, sergeants or soldiers to go to battle under those circumstances—not fair to them, not fair to the Army, not fair to the country. In the end, that situation caused, in great measure, the so called leadership crisis cited in the more strident criticisms of the Army's performance in Vietnam.

So despite the lessons of three wars, the Army, had once again, drawn its trusty derringer and ventilated important parts of its corporate anatomy. And it was all in the name of the liturgy—the dicta of the individual replacement system so long imbedded in the "military policy of the United States."

The Turbulence Studies

In the late 1970s after the Vietnam War, the Army formally studied the effects of personnel turbulence on unit effectiveness. In the broadest context, the studies concluded that if the unit turbulence rate (new face in the job) exceeds about 20 percent per quarter, no meaningful training can be expected.

At the time, some MOS rotation policies alone ensured a turbulence rate of as much as 50 to 60 percent. The overall Army average was so close to the 20 percent threshold that at least half the force was certain to be unable to train to effectiveness at any given time. And as training goes, so goes combat.

As Commander of the Blackhorse in Vietnam, I tried to estimate for each battle how many participants had fought together before. Even with stringent measures designed to reduce turbulence, it was quite likely that on any given day as many as one or two in 10 had not fought together yesterday. It wasn't that it was their first fight; it was just that, for one reason or another, faces had changed.

Was the new face a known quantity? Or was there an edge of uncertainty that made the battle team just a fraction or so less effective? *Important* questions—soldiers' lives hang on the answers.

The Lesson Learned

We now have one of the important battle lessons of four wars before us. Same lesson. It invites the critical question: How many of the battle casualties of those four wars could have been avoided had we heeded the lessons of our battle experience? Put more simply: When will we learn! For if our most precious resource is our soldiers, how can we ignore the lessons of our battles and commit our soldiers to battle so callously? To keep history from repeating itself, we must implement several programs to live up to our responsibilities to soldiers.

First, while smaller may be better, it won't be because of smallness; it'll be because we have better trained units—regardless of their size. This suggests strongly that the US Army's individual replacement system, in place for three quarters of a century, is an anachronism. It's certainly an anachronism in modern battle but likely in all battle—modern or not.

Therefore we should adopt a unit replacement system, probably at the battalion level, on the model that served the Wehrmacht so well in World War II and is characteristic of most armies in the world. Some individual replacements may be necessary, but the baseline system must be replacement by unit.

The complexities of modern battle require us to improve leader-to-led ratios, especially in cavalry, tank, infantry, artillery and engineer units on the ground, and likely in air cavalry and other combat aviation units. This calls for smaller units with more leaders per soldiers.

But once again, a move toward smaller unit organizations serves no real purpose unless we can train units more effectively. This demands more stability (less turbulence) in soldier assignments and more effective unit training systems.

Leader training should clearly distinguish for the leader trainees the essential differences between the leadership they will provide and leadership provided by the doers in the unit. The latter is based on the trust and confidence soldiers have in themselves, in one another and in their unit.

For this to happen, we need to collect and digest the mountain of information available on the subject, then decide how best to integrate the distilled wisdom into leader training. In short, we need to understand better what Marshall and Fehrenbach were telling us long years ago and the striking lessons of the Army's *First Battles*.

One final admonition. Courage of soldiers, quality of individual and unit leadership and effectiveness of training, especially unit training—these, together with a little luck, always a little luck, win battles. Courage of soldiers is a given. It's there, we only have to find and bring it to bear.

But we have no right to demand that the courage of soldiers be required to make up for our inability to train them as individuals and teams and bring them together into effective fighting formations on the day of battle.

General (Retired) Donn A. Starry is the author of the book *Mounted Combat in Vietnam* and more than 50 articles and is an advisor to government and industry in several countries. He retired from business in 1990 as Executive Vice President and also Special Assistant to the Chief Executive Officer of two international corporations. In his last decade before retiring from the Army in 1983, General Starry commanded the US Army Readiness Command, headquartered at McDill AFB, Florida; US Army Training and Doctrine Command, headquartered at Fort Monroe, Virginia; V Corps, US Army Europe; and the US Army Armor Center and School, Fort Knox, Kentucky. He served two tours in Vietnam, the second tour as Commander of the 11th Armored Cavalry Regiment, leading it in the Cambodian invasion of May-June 1970. General Starry is the principal author of the Army's AirLand Battle Doctrine and of AirLand 2000, concepts for Army and Tactical Air Force doctrine, organization, equipment and training for the year 2000 and beyond.

Musicians of Mars

Synchronization for the Company/Team Commander

Summary of a Booklet from the Center for Army Lessons Learned

An orchestra conductor must synchronize all the instruments for the sounds to become a symphony. No matter how well each of the musicians can play, without synchronization, an orchestra produces a cacophony of sound instead of a symphony.

Before an orchestra creates a symphony, each of the musicians must learn, practice and rehearse their respective pieces. It's the conductor who brings all the musicians and instruments together to produce the symphony.

Commanders on today's and tomorrow's battlefields, like conductors of fine orchestras, must plan for, train, practice and rehearse to synchronize their "Musicians of Mars" to produce the symphony of war.

The following is a summary of the major points in the booklet "Musicians of Mars: A Story of synchronization for the Company/Team Commander" published by the Combined Arms Training Activity, Center for Army Lessons Learned, Fort Leavenworth, Kansas (90-4456-CATA-30M-6 Aug 90).

- Synchronization is the integration of all available assets at the right time and place on the battlefield. Synchronization doesn't necessarily occur just because each separate asset knows its job well.
- You must clearly understand, beyond doubt, the commander's intent. Don't let false pride cost soldiers lives! Briefback the order, concept and intent to the individual issuing the order. The briefback should occur immediately following the order.
- The company/team commander and platoon leaders must focus on the engagement area when organizing a defense. Positioning of weapons, obstacles and indirect fires must allow for the massing of fires on the enemy forces while they're in the engagement area.
- Changes in obstacle locations must be reported to everyone. Every obstacle must have someone assigned as a shooter...and not just the fire support team (FIST) or fire support officer (FSO). The shooter must know radio frequencies, target numbers and alternate commo means. Every obstacle must have someone assigned to see it and secure it from breaching/reduction by dismounted forces.
- Boresighting and prefire checks must be part of every unit's standing operating procedures (SOPs) and be enforced.
- Rehearsals and backbriefs are key to synchronization. They surface disconnects in the plan. Shortfalls noted in rehearsals must be fed back up the chain of command. There's no substitute for personal recon . . . walking the line. The map is often subtly, fatally wrong.
- Rehearse in day; rehearse at night; rehearse in mission-oriented protection posture level 4 (MOPP 4); rehearse with simulated jammed commo—rehearse, rehearse, rehearse. Rehearsals must include everyone and be to standard. If not, do it again.
- Junior leaders exercise initiative only if they have experience and have developed confidence by "doing." Commanders must underwrite subordinates' mistakes as the price of learning.
- You must establish a time line that includes all critical events. Stick to it religiously. Time management is essential to effective planning and preparation.
- Doing all oneself simply won't work. There may be short-term success, but in the long run, only disaster will result. Give subordinates responsibilities and train them to standard; give them authority and hold them accountable.
- You must confirm the intelligence preparation of the battlefield (IPB). The IPB paints a picture of the battlefield and what the force you'll face looks like. It confirms the enemy's intentions.
- Plan for contingencies. Have redundant systems in place and rehearse their use before the battle starts. If you aren't prepared, you're doomed to fail.

Critical Synchronization Tasks

Defense

- Prepare for combat.
- Reconnoiter a company battle position.
- Perform fire support planning.
- Maintain mobility/bypass an obstacle.
- Establish an obstacle.
- Occupy a battle position.
- Coordinate artillery fires.
- Construct survivability positions.
- Prepare a subsequent company/team battle position.
- Develop a company/team fire plan.
- Perform logistical planning.
- Organize a company/team engagement area.
- Execute a company defensive mission.
- Execute the fire plan.
- Defend against air attack (active).
- Displace to a subsequent battle position.
- Perform reserve/counterattack force activities.
- Reorganize.
- Provide medical evacuation of and treatment for casualties.

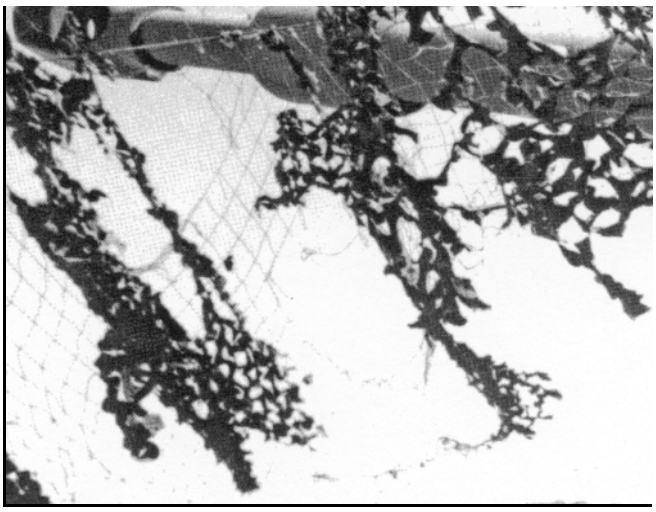
Offense

- Prepare for combat.
- Perform reconnaissance.
- Perform tactical movement.
- Perform hasty river/gap crossing.
- Perform passage of lines.
- Breach an obstacle.
- Perform assault and attack position activities.
- Perform an attack by fire.
- Assault an enemy position (mounted and dismounted).
- Employ indirect fire in the offense.
- Defend against air attack (active).
- Perform logistical planning.
- Consolidate and reorganize on the objective.
- Provide medical evacuation of and treatment for casualties.

1st Cav Div Arty

Reports from Operation Desert Shield

by Colonel James M. Gass



Colonel Gass, Commander of the 1st Cavalry Division Artillery, wrote this article in early December 1990. His Division Artillery has been deployed in Operation Desert Shield since late September.

During the 1st Cavalry Division's deployment and initial training period on Operation Desert Shield, we have developed, rediscovered and experimented with a number of different tactics, techniques and procedures. At this point, our analysis of the situation and the factors of mission, enemy, terrain, troops and time available (METT-T) lead us to believe that these adaptations will substantially improve our efficiency—and survivability—in the desert.

This article briefly discusses several such techniques as well as considerations for operating in the desert environment.

Maps. Units are operating in very open terrain with few discernible terrain features that can be identified on a map. The maps have large, open spaces with little relief. The actual terrain has significant features not depicted on the map. Much emphasis is placed on "dead reckoning" using compass, odometer and, when available, navigational aids such as the small, lightweight GPS receiver (SLGR) and the long-range aid to navigation (LORAN). Training is required on the use of latitude/longitude for navigation and fire-mission processing. Units also must be familiar with converting latitude and longitude to universal transverse mercator/military grid reference system (UTM/MGRS) and plotting latitude and longitude on military maps. When using UTM/MGRS, units must be able to use the complete 13-digit coordinates.

Given the severe shortage of maps, units must operate with a significantly reduced number of them. They must be able to operate using 1:250,000 scale maps as the standard due to the large distances they'll encounter. In the digital/tactical fire direction system (TACFIRE), long coordinates are the standard as division zones encompass two or three 100,000-meter grid squares.

Rates of Movement. Due to mobility constraints, TACFIRE shelters may not be able to keep up with units' rates of march. As a result, we're training to operate in "digital off" mode. This includes manual, tactical fire direction, fire planning and control of radars.

All movement is cross country. Except for the rare improved main supply routes (MSRs), which may support more than a corps, movement is at best on unimproved dirt roads. Field Artillery units must operate cross country, closely following their supported maneuver units.

In offensive operations, direct support battalions (and reinforcing units) must be included in the brigade task force formation immediately behind the lead task forces. Maneuver units are limiting their rates of movement to allow their supporting artillery to keep up rather than quickly outranging their fire support. The limiting factor, even for a force equipped with M1/M2 tanks, is the cross-country speed of a loaded M548 ammunition carrier (12 kilometers per hour) or M109 howitzer (20 kilometers per hour).

Consolidation—Moving, Resupplying, Massing. Given the reduced threat capability to acquire firing units, the increased threat from small, bypassed units and the overstressed ammunition/fuel resupply system, our batteries are operating as single units instead of platoons.

When batteries move, their formations take two basic forms:

(1) "Battery wedge" formations consist of an M577 command post carrier as the lead vehicle with platoons in echelon to either side. The second M577 and the battery trains follow in the center of the wedge.

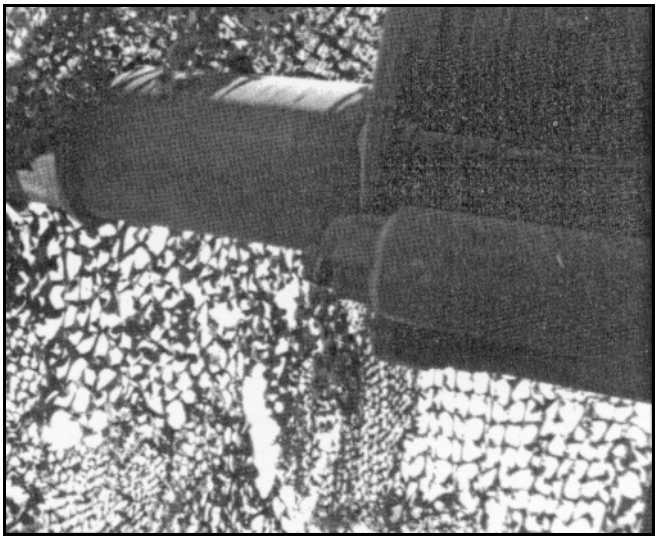
(2) Alternately, units move with platoon wedges "in column." Platoon wedges have an M577 as the lead vehicle and two sections to either side to form the wedge. Platoons of a battery are separated by 200 to 400 meters in column with the battery trains following the trailing wedge.

In a battalion move, the unit forms a "battalion diamond." Firing batteries lead in echelon to the flanks. The battalion headquarters and combat trains comprise the trailing point of the diamond.

These formations offer several advantages, given a somewhat reduced threat and the vast distances that units must move.

Control of units during movement is simplified. Moving over long distances with somewhat erratic map accuracy, the reduced number of moving elements and their proximity eliminates many of the problems of "lost" units.

The smaller battalion formation can be tucked tightly behind or in the middle of a brigade formation during movement. This can help the maneuver units gauge their movement rates and provide better security for all the battalion elements.



Sgt Raymond Roman

Logistics is simplified. With fewer elements to service, ammunition and fuel sections are more able to manage their assets. Operating as a single battery, firing units can also free additional personnel and vehicles (e.g., platoon leader and gunnery sergeant) to help with ammunition convoys. Battalion formations simplify recovery operations and simplify establishment of maintenance collection points.

Battery firing elements simplify massing fires. Given the hasty nature of occupations in an offensive or fluid situation, fewer elements have to be massed. In the wedge formations, tubes can be arranged to reduce the impact of muzzle velocity variations (MVVs). This allows the battery to shoot "base piece data" and achieve an effective sheaf without individual piece corrections or waiting to emplace wire communications and gun display units (GDUs). Fire commands are distributed using AN/PRC-127 hand-held radios.

Survey. With the enhanced survey capability provided by an additional survey device per battalion—one global positioning system (GPS)-8/9—for a total of two position and azimuth determining systems (PADS) and one GPS, each battery can provide almost immediate positional survey and rapidly emplace directional control. The nature of the terrain often allows line of sight between batteries to allow for common directional control. Emplacement times have been significantly reduced with first rounds downrange in 10 minutes (hasty occupation from the move, position and directional control—not a hipshoot).

RSOP. In the terrain here, reconnaissance, selection and occupation of position (RSOP) carries a different expectation. There are few if any "great" firing positions, but there are adequate positions everywhere. The number one priority for reconnaissance is the route. Because of the sand and wadis that don't appear on maps, finding a route that gets you to your next operating area is much more difficult and important than where the battery center will be.

Almost all occupations will be "hasty"—from the move. Rapid occupations and displacements are required to allow artillery units to keep up with a moving, fluid fight. Emphasis is on rapidly achieving the ability to fire and mass, then with minimum delay, resuming movement. Position improvement may be limited to establishing alternate aiming points and methods of lay and ammunition resupply.

MLRS. Our multiple launch rocket system (MLRS) batteries are experimenting with tighter platoon formations and, possibly, battery formations similar to the cannon battalions for movement. These formations allow us to maximize the capabilities of launchers to rapidly disperse, emplace and fire while providing enhanced protection from "leaking" or bypassed forces.

Logistics. Maintenance and resupply over extended lines of communications (LOCs) and in a fluid situation become much more difficult. Mobile operations extend Class III (petroleum, oil and lubricants) distribution to the limit. While ammunition requirements may be reduced during movement, resupply must be accomplished over extended distances and unsecure LOCs.

A significant portion of a unit's ammunition haul capacity is diverted to carry rations and water. Minimum requirements are for three days' rations and five days' water. In a firing battery, this may equate to all eight of the ammunition trailers or one heavy expanded-mobility tactical truck (HEMTT) per battery.

Recommendation. Battalions should operate under the control of a division artillery, to rehearse the dual command and control/logistical links. Stateside division artilleries should train in a National Training Center (NTC), Fort Irwin, California, environment to experience the requirements of integrating target acquisition radars, military intelligence sensor acquisitions, aviation units and reinforcing fires with a divisional scheme of maneuver.

Conclusion

These ideas are the preliminary results of our training and analysis. They're a compilation from many sources and units. As we prove and test these techniques, we'll continue to keep the Field Artillery community abreast of the results.

Redlegs of the 1st Battalion, 3d Field Artillery (First Gunners) and A Battery, 92d Field Artillery (Brave Cannons) of the 2d Armored Division, and the 1st Battalion, 82d Field Artillery (Dragons); 3d Battalion, 82d Field Artillery (Red Dragons); A Battery, 21st Field Artillery (Steel Rain); A Battery, 333d Field Artillery (Triple Threat) and Headquarters and Headquarters Battery of the 1st Cavalry Division Artillery (Red Team) send their greetings from Saudi Arabia.

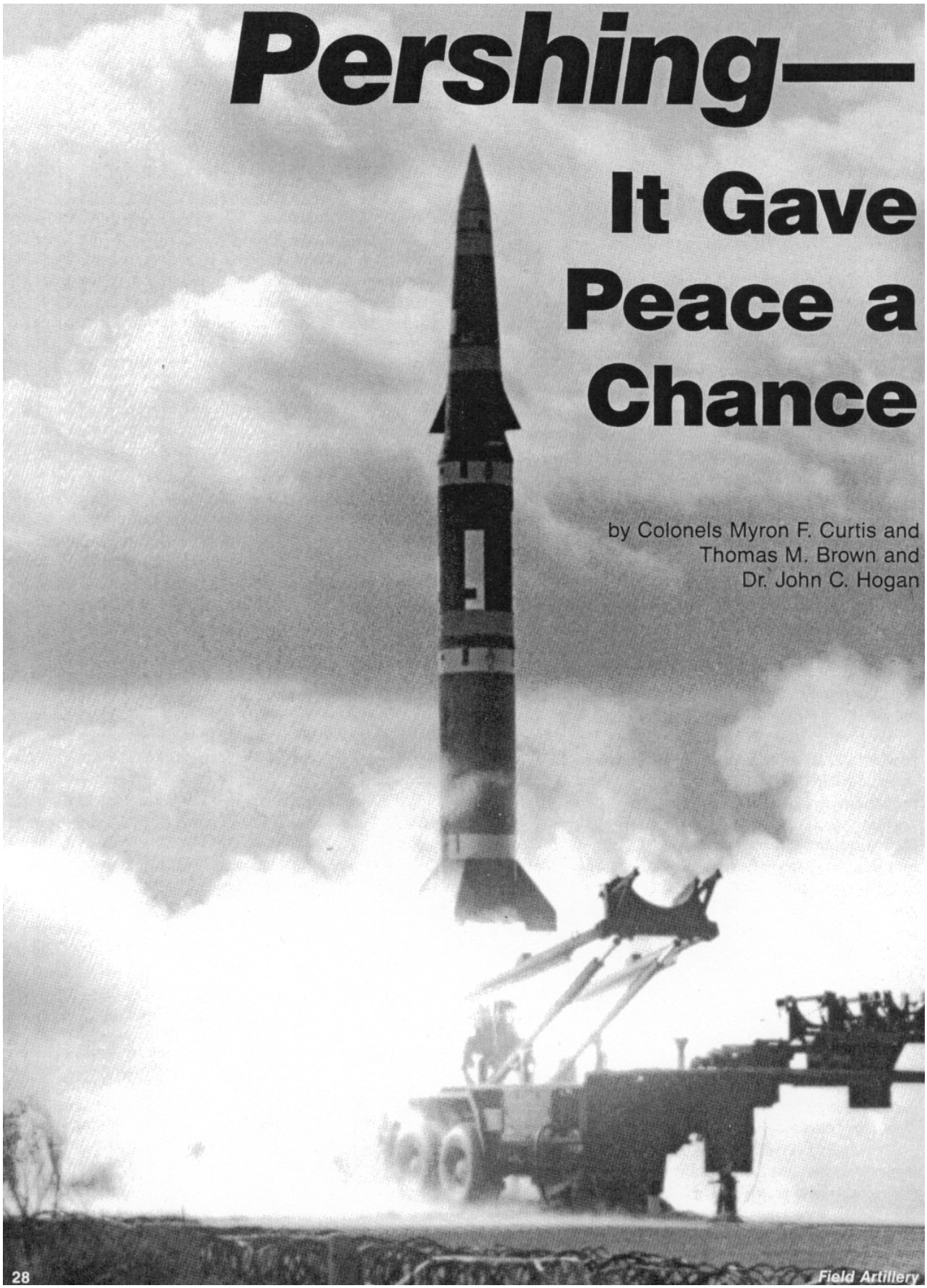
Red Team, First Team!

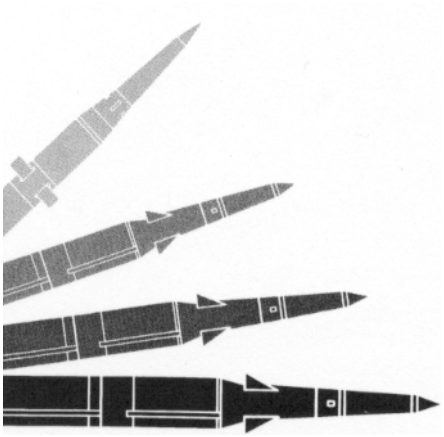
Colonel James M. Gass has commanded the 1st Cavalry Division Artillery (home station, Fort Hood, Texas) since June 1989. He also commanded the 2d Battalion, 41st Field Artillery, 3d Infantry Division in Germany, and B Battery, 2d Battalion, 2d Field Artillery, 214th Field Artillery Brigade, Fort Sill, Oklahoma. Colonel Gass had two tours in Vietnam, one as a helicopter pilot in the 25th Infantry Division (Light) and one in the Aerial Field Artillery Battery (Cobra gunships) in the 101st Airborne Division (Air Assault), the latter unit he helped to form. He's a graduate of the United States Army War College, Carlisle Barracks, Pennsylvania, and holds a master's degree from Oklahoma State University.

Pershing—

It Gave Peace a Chance

by Colonels Myron F. Curtis and
Thomas M. Brown and
Dr. John C. Hogan

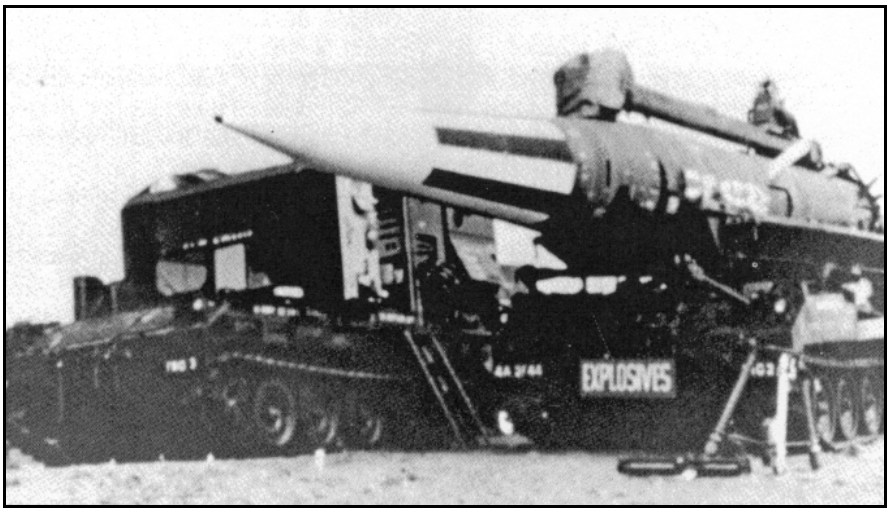




In 1991, the US and our Ally Germany will destroy the last of the Pershing II missiles in compliance with the 1987 Intermediate-Range Nuclear Forces (INF) Treaty. The Pershing's awesome lethality and remarkable precision drove the Soviets to the nuclear arms control negotiating table.

And though the Pershing's days are numbered, its successful development in a short time, unique tactical testing and the spin-offs of its technological advancements will impact developing land-mobile missile systems for years to come.

Until the last Pershing II is destroyed, the quality and professionalism of the soldiers who man the system will make it one to be reckoned with.



The early Pershing I missiles were built around the M-474, a fully tracked, modified M113 armored personnel carrier.

Pershing's History

At the end of World War II, war as it was fought for thousands of years was changed forever. With the dawning of the nuclear age, mass destruction was an instant possibility.

The ability of a country to build up large stockpiles of men and equipment to launch cross-border attacks was seriously jeopardized. With the advent of modern missile systems, the massing of troops and equipment was no longer practical.

By the mid-1950s, the US Army was equipped with such missiles, but they were liquid-fueled, large and cumbersome. But new technologies already were emerging that would make future systems better adapted to the battlefield environment.

In January 1958, the US Army was directed to proceed in the development of a solid-propellant ballistic missile to replace the liquid-fueled Redstone missile—the beginning of the Pershing program. Earlier missile systems largely had been developed in-house by the government. But this time, the Army teamed with a civilian contractor to take advantage of the expertise.

The Glen L. Martin Company (now Martin Marietta Missile Systems), Orlando, Florida, was selected as the prime contractor for the new Pershing system in March 1958. The goal of producing an accurate, cost-effective weapons system in a minimum amount of time was of paramount importance to the partners in the early development efforts.

One primary concept for the Pershing program was to minimize flight test failures on the premise that it was easier (and cheaper) to make repairs on the ground instead of "in the air." With this objective came thorough testing of the many parts before integrating them into a complete missile. This attention to detail enabled the first successful test firing of a Pershing missile on a ballistic trajectory on 25 February 1960, just short of two years after the initial contract was signed. **Pershing I.** In 1962, the first operational Pershing battalion was activated at Fort Sill, Oklahoma. Its mission: to organize and train and field test this new system. Since the nose of a Pershing warhead fits neatly inside an old fashioned pickle barrel, the goal of the new battalion was to put every test missile launched "into the pickle barrel"—a lofty goal.

The early Pershing (PI) system was built around the M-474, a fully tracked, modified M-113 armored personnel carrier. It was believed this system would be mobile enough for the Pershing to go any where the field Army deployed. The Pershing firing platoon included a warhead carrier, fire control computer, power station and tropospheric communications system mounted on an M-474.

The system could move overland or could be transported on helicopters or in cargo aircraft. The unique mix of mobility, long-range and warhead lethality gave the commander an unprecedented increase in firepower to focus on enemy forces to a depth of up to 700 kilometers (about 430 miles) in front of the forward line of own troops (FLOT).

The initial deployment of the US Pershing battalions to Europe was in 1964. Within months, the Secretary of Defense directed the Army upgrade the capabilities of the Pershing system to assume the mission of a theater quick reaction alert (QRA) force. The battalions

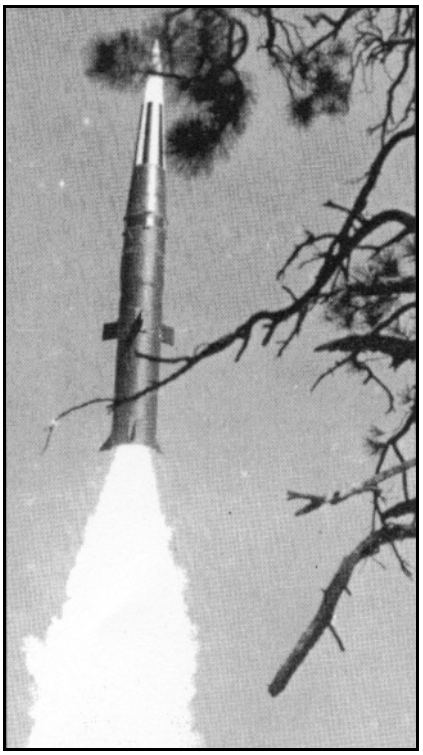
were to provide short-notice nuclear fire support on high-priority targets assigned by the Supreme Allied Commander in Europe (SACEUR). This was decisive in the development and fielding of the improved PIa system.

The PIa was the first of many upgrades to the Pershing system. Major modular improvements were made to the ground support equipment. Increasing the number of launchers from eight to 36 per battalion improved total firepower. These improvements significantly increased the maintainability, mobility and reaction time of the system.

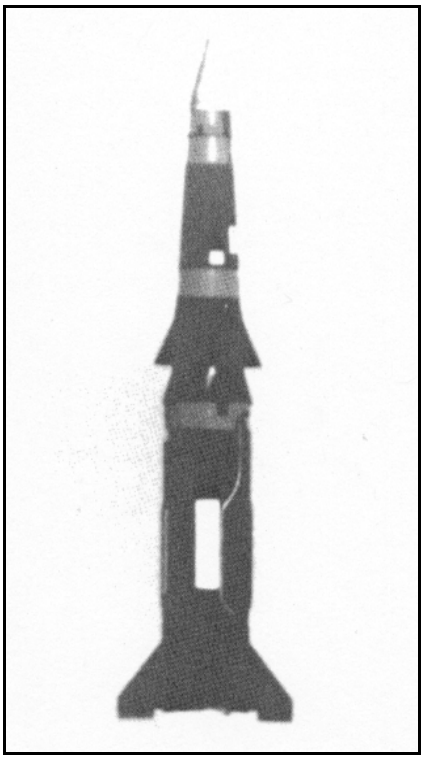
In 1964, West Germany agreed to buy the Pershing under the Military Assistance Sales Program. They bought enough PI hardware to equip two Pershing wings in the German Air Force. (A wing is comparable to a US battalion.) The German wings reached full readiness status in 1966. Through the years, the Germans have participated in all major modular improvements to the Pershing. In 1971, the German Air Force changed from the PI to the improved PIa system.

Both US and German units have participated in test firings assessing quality, reliability and safety since the beginning of the Pershing program. Both airlifted Pershings from the field to US test ranges at the Kennedy Space Center in Florida and the White Sands Missile Range in New Mexico.

Evolutionary improvements continued throughout the 1970s with the introduction of the automatic reference system (ARS) that automatically aligned the missile's on-board inertial reference system, eliminating the requirement for pre-surveyed missile firing sites. The sequential launch adapter (SLA) allowed countdown and launching of up to three missiles without moving the fire control computer, power station and cables. These improvements significantly reduced reaction time and increased the system's pre-launch survivability (PLS). **Pershing II.** In December 1979, the US made a major commitment to our NATO Allies in the Dual-Track Agreement in which they committed to improve the long-range theater nuclear force to counter the increased threat from the Soviet SS-20 missiles and Backfire bombers. This agreement called for modernizing the Pershing system and developing the US Air Force ground-launched cruise missiles (GLCMs) while continuing nuclear arms control and elimination initiatives. The Agreement brought about the Pershing II system.



An early Pershing I missile firing at the Kennedy Space Center in Florida.

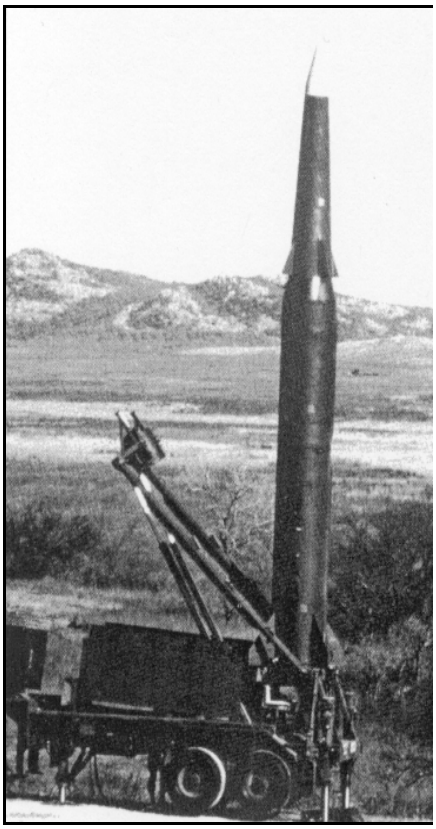


A Pershing Ib being launched. This missile was as accurate as the Pershing II.

In 1964, West Germany bought the Pershing missile system to deploy with US forces in Germany. The German Wings (comparable to US Pershing battalions) reached full readiness in 1966.

Improved missile motors and the change from an inertial guidance system to a highly accurate radar area correlation guidance system produced a missile system with considerable built-in flexibility and increased potential to fly a wide range of missions. With an increase in range from the PI's 740 kilometers to 1,800 kilometers, a 10-fold increase in accuracy and selective warhead yield and greatly reduced emplacement and displacement times, the Pershing II was a formidable threat to any potential enemy.

The fielding of the PII in Europe gave the commander, for the first time, the ability to rapidly strike deep into the enemy's rear operational area with enough destructive force to desynchronize the forward movement of the rear echelons. The PII's pinpoint accuracy could surgically destroy hardened point targets. Such devastatingly precise nuclear strikes would cause forward movement to grind to a halt with the PII destroying units and disrupting logistics and communications. These capabilities, coupled with



Captain Dave Drummond

A Pershing II at Fort Sill, Oklahoma. The missile's fielding gave the commander the ability to strike deep with enough destructive force to desynchronize the enemy's rear echelons.

the PII's ability to penetrate all known air defense systems, were instrumental in forcing the Soviets to the arms reduction negotiating table.

The future of the PII missile system is now measured in months. On 8 December 1987, President Reagan and General Secretary Gorbachev signed the historic INF Treaty that requires the total elimination of the Pershing II missile system be completed in 1991. However, the advanced missile system technologies, innovative management programs and integrated support systems developed for the Pershing will influence existing and future land-mobile missile systems well into the 21st century.

Innovative Technologies

Since the beginning of the Pershing program, modular flexibility was a design requirement for the system. Because of the ever-changing tactical and political demands on the field commander, the ability to tailor his response to a threat is critically important.

Some innovative technologies were tested using the Pershing system. Though not all of the hardware has been produced, enough analyses have been completed to assure the capabilities are available for other applications as the need arises.

Nuclear earth-penetrator warhead. This warhead penetrates deep into the earth before exploding and destroys the target with minimal collateral damage. It can neutralize point targets, such as airfields; dams; command, control and communications complexes; or hardened missile sites. Advanced testing of the earth-penetrator components has proven the technical viability and tactical value of this warhead.

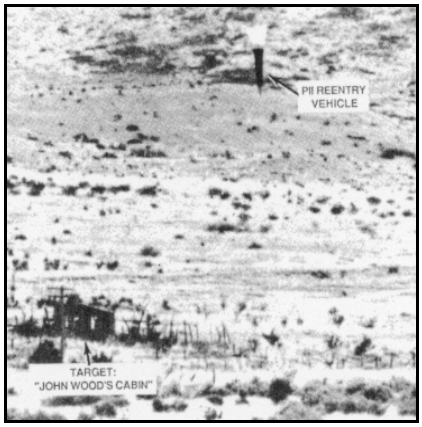
Single-Stage Missile. A variation of the PII missile that was tested extensively is the PIb, a single-stage missile designed to use the PII first-stage solid-propellant motor and the PII re-entry vehicle. This option can give us a missile with a range of 740 kilometers, (the same as the PIa) but with the highly accurate terminal guidance capabilities of the PII.

Another variant is the PIc, a single-stage, terminally guided missile that uses a modified PII second-stage, solid-propellant motor and the re-entry vehicle. The PIc has a maximum range of about 400 kilometers with the same accuracy as the PII.

Before implementation of the INF Treaty, the PIc variant was a candidate for replacing the aging Lance missile system. Though the PIc was never test fired, the concept of using missile components in a mix-and-match fashion to achieve specific battlefield capabilities is being considered for future systems.

Anti-Satellite Technology. Looking into the future even farther, the Army is evaluating the possibility of using the Pershing guidance technology in an anti-satellite role. As originally envisioned, a low-cost anti-satellite system could have been developed using the existing PII missile motor sections with modified guidance and warhead sections.

But under the provisions of the INF Treaty, all PII solid-propellant missile motor sections are being destroyed under the watchful eyes of Soviet INF Treaty inspection teams on-site. Still, using missiles not limited by the INF Treaty and the PII guidance technology can give the US a ground-based, quick reaction, anti-satellite missile system to destroy enemy satellites that are surveillance threats.



A Pershing II warhead landing with pinpoint accuracy.

Pershing Personnel

As important as the hardware is, the people are what made the Pershing the deterrent it has been during the years. Without the professionalism and dedication of people—from the deployed forces to the rear most supply clerk in the continental US (CONUS)—the Pershing II system wouldn't have been effective, regardless of its technological capabilities.

The 56th Field Artillery Command is the US forwardly deployed unit charged with manning and maintaining the PII missiles in the NATO area. Battalions are at Schwaebisch-Gmuend, Heilbronn-Neckarsulm and Neu Ulm, Germany. With a dual mission and dual chain-of-command, this highly complex organization stays constantly combat-ready with its remaining PII missile force standing alert at all times.

The mission of the 56th Field Artillery Command is to be prepared to execute its portion of the SACEUR Scheduled Plan in one of two forms. During peacetime, several firing batteries always are standing QRA, covering assigned targets in the Warsaw Pact and Western USSR. The other firing batteries rotate through a maneuver, maintenance and pre-alert cycle. During periods of increased tensions, all firing batteries deploy to widely dispersed field locations and assume an increased alert posture. The 56th Field Artillery Command will continue performing this vital deterrent mission until the last firing battery stands down in 1991 to destroy its equipment under the provisions of the INF Treaty.

Pershing II Redlegs demonstrate their system's combat readiness and remain on guard until end-of-mission.

One of the truly unique aspects of the Pershing program has been the close relationship of the 56th Field Artillery Command with the 3d Battalion (Pershing), 9th Field Artillery (3-9 FA) at Fort Sill, Oklahoma. The 3-9 FA was key to the unqualified success of the total Pershing program.

The Battalion's original four-fold mission was to (1) train personnel in the CONUS rotation base before being assigned to Pershing units in Europe, (2) support missile firings at both eastern and western test ranges, (3) verify changes to missile and ground support equipment in CONUS before implementing it system-wide and (4) validate new tactics and procedures before introducing them to the European theater.

The 3-9 FA truly has been a test-bed organization and a window to the future of the Pershing system. This ability to test equipment changes and operational concepts before making expensive changes in the whole system has proven its worth time and again and increased the operational effectiveness of the worldwide Pershing force.

Survivability—Key to the Future

Survivability is the key to the future of any land-mobile missile system. Without enhanced survivability, improving hardware, software and fielding new systems still could leave a missile system too vulnerable. Improved mobility, reduced tactical site signature and an increased ability to hide firing positions in silent postures until called to action are all significant factors in the survivability formula.

During the years, the Pershing community has taken the lead in testing new equipment and techniques. For example, instead of the usual 10-kilometer separation between firing units, the tactical commander might choose a significantly larger area to disperse his assets. This ability to exploit the technical capabilities of a system in a tactical environment will play an important part in the survivability of other weapon systems. The search for new and, perhaps, radically different operational concepts is a continuing effort.

Pershing Peacemaker

The life of the Pershing system is fixed in time by the INF Treaty. But the influence of the Pershing system and the exploitation of its advanced technologies will impact existing and developmental land-mobile missile systems well into the future.

The hard work, dedication and professionalism of the men and women of the Pershing battalions and wings coupled with the highly advanced technology of the Pershing II have combined to produce a highly lethal and precisely accurate missile system that brought the Soviets to nuclear arms elimination negotiations. And though we never had to fire a missile in anger, **Pershing truly gave peace a chance.**

Colonel Myron F. Curtis is the Training and Doctrine Command (TRADOC) Liaison Officer for all military activities and aerospace contractors in the Huntsville-Redstone Arsenal, Alabama area. He served as the TRADOC Systems Manager for Pershing II at the Field Artillery School, Fort Sill, Oklahoma, and for three years as Commander, 1st Battalion (Pershing), 41st Field Artillery (a PIa firing battalion), in West Germany in the 1980s. Colonel Curtis also commanded D Battery, 3d Battalion (Pershing), 84th Field Artillery (a PI battery) in Europe in the 1960s.

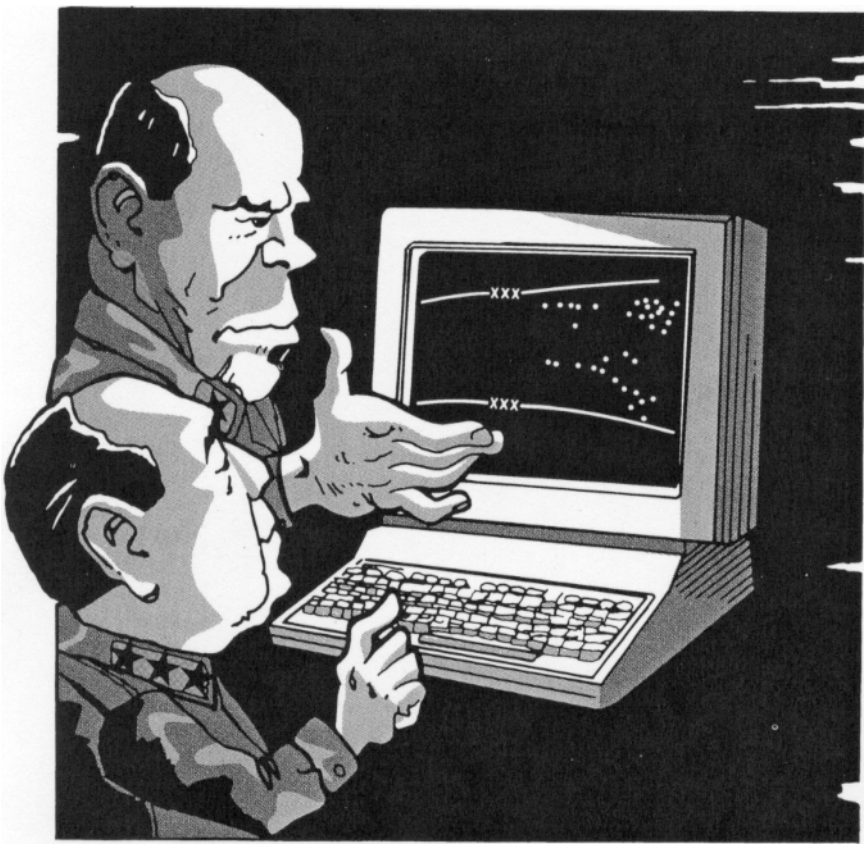
Colonel Thomas M. Brown is the Director of the Weapons Systems Management Directorate at the Missile Command (MICOM), Redstone Arsenal. He's responsible for six major system areas, including the Pershing and Lance missiles, and serves as Executive Agent for the INF Treaty Technical and Experimental Program. Before his current assignment, he was the Pershing Project Manager, also at Redstone Arsenal. Colonel Brown was Director, Business Management Office, Strategic Defense Command, Huntsville, Alabama, advising the Ballistic Missile Defense Project Manager and DA-chartered project managers, among others. He also served as Chief, Program Management Office, Ballistic Missile Systems Command, Huntsville.

Dr. John C. Hogan is Manager of Advanced Programs at Martin Marietta Missile Systems, Orlando, Florida. His responsibilities include missile concepts for nuclear and non-nuclear systems; survivability, chemical warhead and earth-penetrator technology; and applications of ballistic missiles to deep interdiction. Before the signing of the INF Treaty, Dr. Hogan worked primarily on Pershing II and pre-planned product improvements to the system, including as Lead Engineer for the Pershing II nuclear earth-penetrator and air-burst and surface-burst warheads.

Operation FireStrike

by Lieutenant Colonel C. William Rittenhouse, USAR

D-Day Minus 1, 1800 Hours. The pale light of cathode ray tubes illuminated the faces of two men staring intently at columns of blips on a large sensor scope. The blips were actually enemy vehicles moving toward the Corps area of operation. Right now, they were still more than 200 kilometers away, but the gap was steadily closing.



For the X Corps Commander and his Corps Artillery Commander, the accumulated fatigue of weeks of preparation was now giving way to the adrenalin high of imminent battle. During the last 96 hours, a large enemy force had been tracked at great distance as it moved forward and laterally. The Corps Commander had watched these developments while he carefully positioned his own units to defeat what he knew was an impending attack.

Within hours, the X Corps would unleash a devastating onslaught by fires. This attack would include the combined fires of Field Artillery, tactical air support and attack helicopters. The name for this type of attack is FireStrike.

The setting for this action is somewhere in the western desert of the United States in the year 1997. Elements of the US X Corps are conducting a large-scale command post and field training exercise (CPX/FTX) to test their ability to fight on a nonlinear battlefield. The exercise is driven by a state-of-the-art computer to evaluate maneuver, fires and logistics. The opposing force is made up of various Active and Reserve Component units. Both Blue and Red forces consist of samplings of combat, combat support and combat service support units. All command, control and communications facilities are in full operation.

The war-fighting doctrine applied in this scenario is still AirLand Battle, but it has been updated to meet the battlefield challenges of the late 1990s and beyond. This doctrine is being developed as the AirLand Battle-Future (ALB-F) Nonlinear Concept.

The purpose of this article is to describe, from the perspective of the corps artillery commander, the planning and execution considerations for the corps fires, particularly the FireStrike—a concept currently being developed. As technology improves our range, munitions lethality and ability to find the enemy, FireStrike will become a real war-fighting capability.

FireStrike and ALB-F

Before explaining what FireStrike is, it's necessary to see how it fits into the basic cycle of the ALB-F concept. (See Figure 1 on Page 34.)

Conditioning with fires (Phase 2 of ALB-F) is where one or more FireStrikes would occur. In addition to FireStrikes, the corps would execute long-range fires both forward and laterally. It

would conduct proactive counterfire—i.e., detect and attack the enemy's artillery functions, to include weapons, target acquisition, ammunition and command and control (C^2) and suppress enemy air defenses (SEAD). FireStrikes also would support the corps C^2 countermeasures campaign.

FireStrike is a carefully planned massing of fires against leading elements of an enemy force. It's directed against different target sets in the threat array. These include columns of enemy armored combat vehicles, accompanying artillery and combat support and combat service support assets.

The FireStrike concept adds a dimension to the relationship between maneuver and fires. FireStrikes have been described as being independent of maneuver. What this really means is these fires usually will occur before a scheme of maneuver is put into effect. Whereas a current maneuver plan specifically dictates fire support requirements, a FireStrike would establish the conditions for ultimate maneuver exploitation.

The immediate objectives of a FireStrike would be to destroy selected enemy elements. The overall objective would be to shape the enemy force for the final defeat by the maneuver forces.

A FireStrike is neither a preparation, program, series nor a time on target (TOT). It won't happen all at once but, perhaps, over a period of hours. Separate FireStrikes could be executed at intervals lasting several days, depending on the situation. In short, a FireStrike is a carefully conceived, detailed plan that links sensors with shooters to accomplish a mission with fires.

1. Detect and fix the enemy with sensors and reconnaissance assets.

2. Condition the enemy with long-range, precision fires.

3. Decisively defeat the enemy with maneuver forces.

4. Reconstitute and get ready to fight again.

Figure 1: The Cycle of the AirLand Battle-Future Concept

X Corps Preparations

D-Day, 0130 Hours. As the X Corps Arty Commander left the darkened mil van, his mind raced over the actions of the past few days.

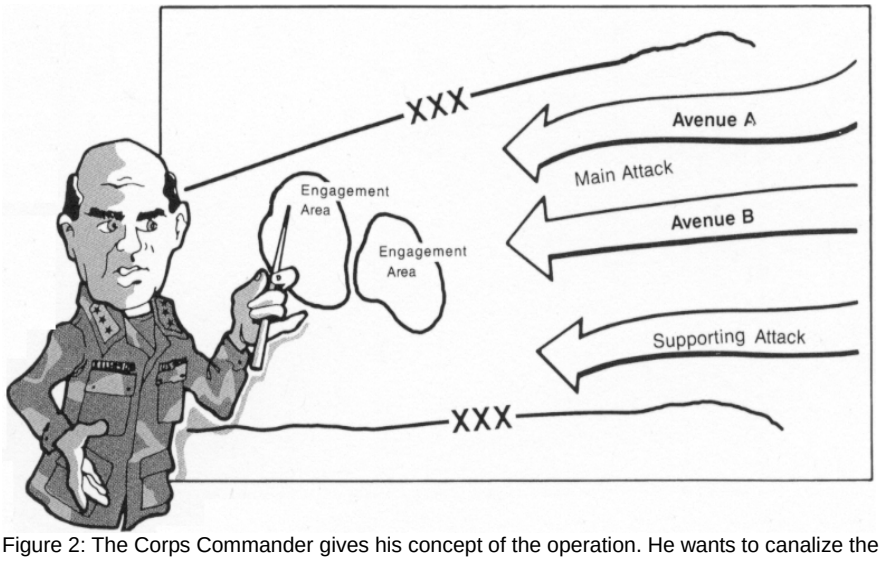


Figure 2: The Corps Commander gives his concept of the operation. He wants to canalize the enemy on Avenue A, concentrate fires on Avenue B and stop the enemy in his tracks in his supporting attack.

The events leading up to the FireStrikes had begun with intense detection or acquisition activities. Technological advances of recent years have allowed commanders to "see the battlefield" with an astonishing degree of resolution. Sensor systems such as the joint surveillance target attack radar system (JSTARS), the Guardrail common sensor (GRCS), unmanned aerial vehicles (UAVs) plus national intelligence means have given him a formidable detection capability. Along with long-range surveillance units, these systems allow a corps commander to know where major elements of the enemy are most of the time.

During the past 72 hours, a mosaic-like picture of the enemy's intentions had begun to appear. It seemed the Red Force would attack the X Corps in a two-pronged manner: a main attack in the north with two-plus divisions and a supporting attack in the south with at least one division. The enemy commander had at least one division in reserve.

The X Corps Blue Force would counter the offensive with three divisions, two heavy and one motorized. The Corps had two armored cavalry regiments (ACRs) and a Corps Artillery consisting of three Field Artillery (FA) brigades. Each brigade had three multiple launch rocket system (MLRS) battalions and two Paladin battalions. Each division artillery plus the ACR howitzer batteries had the Paladin. Additionally, the Corps aviation consisted of three aviation brigades. Tactical air support included an adequate number of battlefield air interdiction (BAI) sorties.

Corps Concept of Operations

In a hastily called staff meeting, the Corps Commander had explained his concept of the operation. Pointing to several engagement areas on the situation map, he had turned to the Chief of Staff and G3. (See Figure 2.)

"This is where I want to finish the enemy. If we work this right, we can spring a hammer and anvil trap on his main force. I expect to be able to decisively defeat him with our two northern divisions, and that includes his reserves."

The Corps Commander then had pointed on the map to the Corps reserves.

"We'll keep our reserves [motorized division] covering the southern approach. I'm concerned about the size of the enemy movement there, but I still think it'll be a supporting attack."

He had looked at his fire support coordinator (FSCOORD) and cautioned:

"The success of our ground maneuver depends on how well we can set up this force with fires. We've got to hit him in a totally coordinated effort using your artillery, the Air Force and our attack helicopters."

Motioning to the Corps Aviation Officer and the Air Liaison Officer (ALO), the Corps Commander had laid out his plan for fires.

"First, I want to blunt the nose of his main attack, but I don't want you to pour it on so the enemy is forced to change

directions. I want to draw him into our chosen engagement areas or kill zones where I'll commit our maneuver units. I want you to execute a FireStrike against this main attack, and it's got to be done with surgical precision.

"Now, we've got to take out as much of his artillery as quickly as possible. I don't have to tell you about his long-range shooters. He can see and hit us almost as well as we can him. Also, don't overlook his accompanying artillery.

"Remember, as he moves his main effort into attack formations, he'll have to use what we've identified as avenues of approach A and B. I want to canalize the enemy along Avenue A and concentrate our fires on Avenue B."

Shifting his attention to the south, the Corps Commander had continued, "The purpose of the FireStrike *here* is to stop this guy in his tracks. I don't want him to achieve his planned objectives, and most important, I don't want him to divert forces to the north.

"We'll plan an engagement area for our reserve division to attack the remnants of the enemy but only as a contingency. If I have to commit my reserves, I'd rather have them available against the main attack.

"Artillery and Aviation," the Corps Commander had turned to his two commanders, "you work that out with the Air Force. Our success will depend on a coordinated attack with fires—Field Artillery coordinated with Tac Air and both synchronized with our attack helicopters. Above all, don't allow any part of that southern force to break through."

Planning Fires

The Corps Artillery Commander had entered the main CP fire support element (FSE) and was informed that all Corps Artillery units were in position and ready for the attack. He then had contacted his G3 at the Corps Artillery main CP, a few kilometers to the north.

The report from the G3 had been encouraging. The distribution of critical munitions to their units was completed. The Army tactical missile system (Army TACMS) Blocks I and II munitions had been allocated to selected battalions in the 66th, 67th and 68th FA Brigades. But one of the brigades, the 68th in the south, had been weighted with Block II missiles. The smart, armor-killing Block II missiles would be critical in destroying the enemy's supporting attack and his reserves.

In addition, selected battalions had received the MLRS ground-launched Tacit Rainbow (GLTR) missiles. Tacit Rainbow is a missile that loiters over enemy territory and detects, homes in on and destroys enemy electronic emitters. The Corps Artillery Commander was relying on Tacit Rainbow for SEAD and to reduce the enemy's counterfire capabilities.

In addition to these weapons, the Corps Artillery had MLRS terminally guided warheads (TGWs) to hit moving armor and the sense and destroy armor (SADARM), the latter's being a misnomer as it's effective against semi-stationary targets such as self-propelled artillery. The Corps Artillery cannon units had other types of smart munitions: terminally guided projectiles (TGPs) for moving, hard targets and 155-mm SADARMs. The Corps Artillery was armed with a formidable array of weapons that could destroy point targets at intermediate ranges with cannons and MLRS rockets and at long ranges (100 kilometers or more) with Army TACMS and Tacit Rainbow.

The Corps Artillery Commander had expressed his concern about logistics. He knew his units were adequately armed to conduct the initial fires attack, to include the FireStrike. But he also knew his command was spread over a large area. It would be difficult for the Corps Support Command (COSCOM) to "push" the needed fuel, ammunition and other supplies.

Finally, looking at the situation map, he had noted the locations of the maneuver division artillery battalions. In this fight, he wouldn't use these units to conduct the FireStrikes or other Corps fires.

Rather, they would remain with their supported maneuver brigades—armed, fueled and waiting to be committed. They would be with the divisions several kilometers to the rear of the FA brigades. Of course, once the divisions were committed, elements of the Corps Artillery would on-order assume reinforcing and general support reinforcing missions.

A short time later, the Corps Artillery Commander had met with the Corps Aviation Officer and the ALO. The details of the plan had been carefully ironed out before being presented to the Corps Commander for final approval.

At 2130 hours D-Day-1, the Corps Artillery Commander had conferred with his brigade commanders on a secure net, covering last-minute details. He cautioned them on survivability. Already the ACR had reported small enemy ground probes threatening the widely dispersed cannon and MLRS units. The survivability of his artillery units was an even greater challenge on the nonlinear battlefield. During the initial detection and the fires phases of the battle, his units usually would be positioned forward of the maneuver divisions and, therefore, more vulnerable to enemy air, ground and artillery attacks.

The brigade commanders quickly had reviewed the plan for fires, especially the FireStrike. The Corps Artillery Commander had emphasized the Corps Commander's intent as he gave guidance.

"It's now a matter of watching and waiting. We know our detection and delivery priorities. The IPB [intelligence preparation of the battlefield] is in progress: named and targeted areas of interest have been established along mobility corridors in the avenues of approach. We've identified trigger events and engagements areas.

"An effective FireStrike depends on our ability to assess target damage. Timely BDA [battle damage assessment] will allow us to shift and mass fires.

"Remember, in terms of execution, your hands are on the trigger, either in your brigade TOCs [tactical operations centers] or at battalion, battery and so on. But I'll retain centralized control of all of the Corps fires. That includes long-range fires, counterfire, SEAD and the FireStrikes."

He then had concluded, "It's now a matter of execution. The only thing I can add is good luck and good shooting."

Execution of Long-Range Fires

D-Day, 0200 Hours. Hostilities began when the enemy crossed a designated phase line some 200 kilometers forward of the Corps' main CP. X Corps' initial response to this action involved an attack with a large number of BAI sorties. The Air Force quickly achieved air superiority.

D-Day, 0215 Hours. Before the Air Forces' A-16s arrived, selected MLRS units had begun launching Tacit Rainbow missiles against selected enemy air defense sites. These self-loitering missiles had homed in on predesignated radar frequencies along friendly routes of ingress and egress. One by one, enemy air defense

radars had been acquired and destroyed.

D-Day, 0530 Hours. BAI results were coming in. Several company-sized tank and infantry formations had been attacked in assembly areas. One battalion-sized element of tanks had been destroyed in the process of off-loading ammunition from truck transporters.

D-Day, 0600 Hours. By this time, the corps electronic warfare (EW) effort was operational.

D-Day, 0600 Hours. In the 67th FA Brigade's TOC, the acquisition effort had located several tactical ballistic missile (TBM) transporter erector launchers (TEL). The acquisition had involved a filtration and fusion process where potential targets are picked up by one type of sensor and then confirmed by a second means.

For example, an initial indication of a TEL is made by cueing the Guardrail. It picks up transmissions common to a TBM type of target. Guardrail is then down-linked to the Field Artillery by a commander's tactical terminal (CTT) found at the Corps Artillery TOC, FA brigade TOC and selected MLRS battalions. Further identification is made by a UAV that also is down-linked to the Field Artillery. This fusion process occurs in the automated intelligence system called the all-source analysis system (ASAS), which provides timely, target information to the FA deliver units.

Finally, targets had been attacked with the anti-personnel and anti-materiel submunitions from Army TACMS Block I missiles. The results of the attack were being evaluated.

D-Day, 0900 Hours. Sporadic fires had occurred for the last seven hours. They consisted of mostly BAI and a number of long-range missions with Army TACMS. Target sets included bridges, moving columns, logistical sites, assembly areas and C^2 facilities.

As JSTARS had scanned large areas of the battlefield, columns of blips had begun to appear. As predicted, a major enemy attack was in full progress. Leading elements had moved into attack formations.

D-Day, 0930 Hours. Suddenly the tempo quickened. The amount of information being processed through the ASAS and the advanced Field Artillery tactical data system (AFATDS) tripled in an hour.

From the vantage of the Corps tactical CP, the Corps Commander and

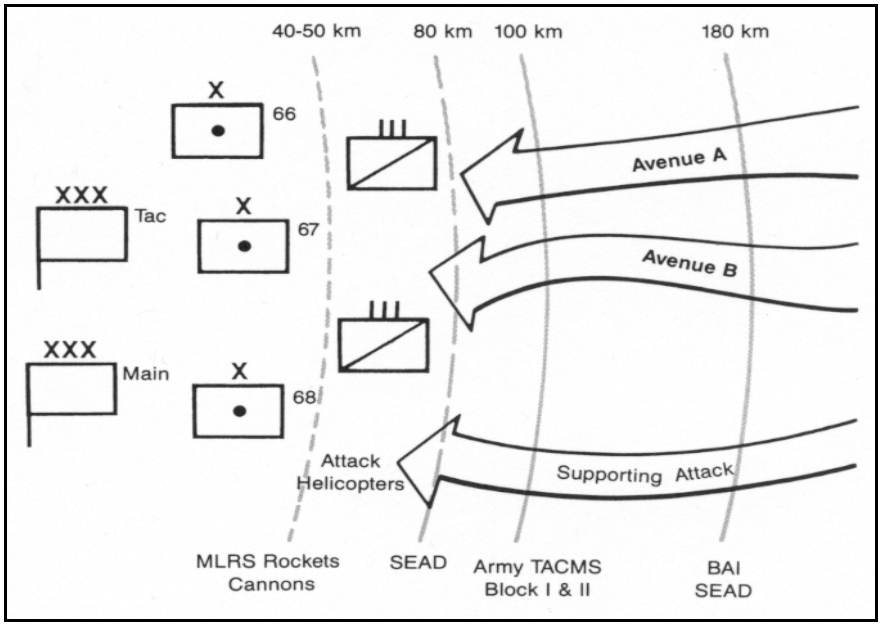


Figure 3: The Beginning of the Northern FireStrike. The long-range fires plan uses weapons according to their range. (For the Army TACMS, cannons, MLRS and SEAD missions, these are the approximate range limitations, though their ranges can exceed these distances.)

Corps Artillery Commander could see the main attack taking shape. The enemy attacked on the two suspected routes. The combined effects of JSTARS, Guardrail, UAVs and other acquisition assets revealed enemy forces stretching more than 100 kilometers. It was time for the northern FireStrike to begin.

Northern FireStrike

D-Day, 1000 Hours. The FireStrike plan involved using weapons systems according to their range and capabilities. (See Figure 3.) For example, enemy follow-on battalions and reserves were attacked through BAI at ranges beyond the limits of Army TACMS. Army TACMS was concentrated in ranges from around 80 kilometers out to approximately the range of the A-16s. At ranges from around 100 kilometers back to the 50- to 70-kilometer mark, the sky belonged to the Apache attack helicopters.

Air space management and deconfliction between Field Artillery and air attack means were achieved through on-order airspace coordination areas (ACAs). These areas went into effect from about 60 kilometers to more than 100 kilometers on an as-needed basis, usually for short periods of time. MLRS rockets and Paladin howitzers covered the intermediate ranges.

D-Day, 1100 Hours. The MLRS battalions of the 66th FA Brigade in the north were in an intense cycle of shooting and moving. The 67th FA Brigade was in the center and the 68th FA Brigade in the south. (See Figure 4.) Leading enemy combat elements traveling along Avenue A consisted of battalion-sized units engulfed in the 66th Brigade's hail of Army TACMS Block II smart, anti-armor submunitions. Smaller enemy units that had managed to slip through the storm of fire were being raked with fires from the attack helicopters and the ACR. Cavalry reports confirmed the forward momentum of the main attack was decreasing.

D-Day, 1120 Hours. The Corps Artillery Commander lifted the Army TACMS Block II fires against the leading units of the main attack. He instructed the 67th FA Brigade Commander to focus intense fires on enemy forces along Avenue B. The UAV down-links were showing more targets than he could destroy with his remaining Block II missiles. He informed the Corps Artillery Commander of the situation and requested coordination for additional attack helicopter fires. Mean-while,

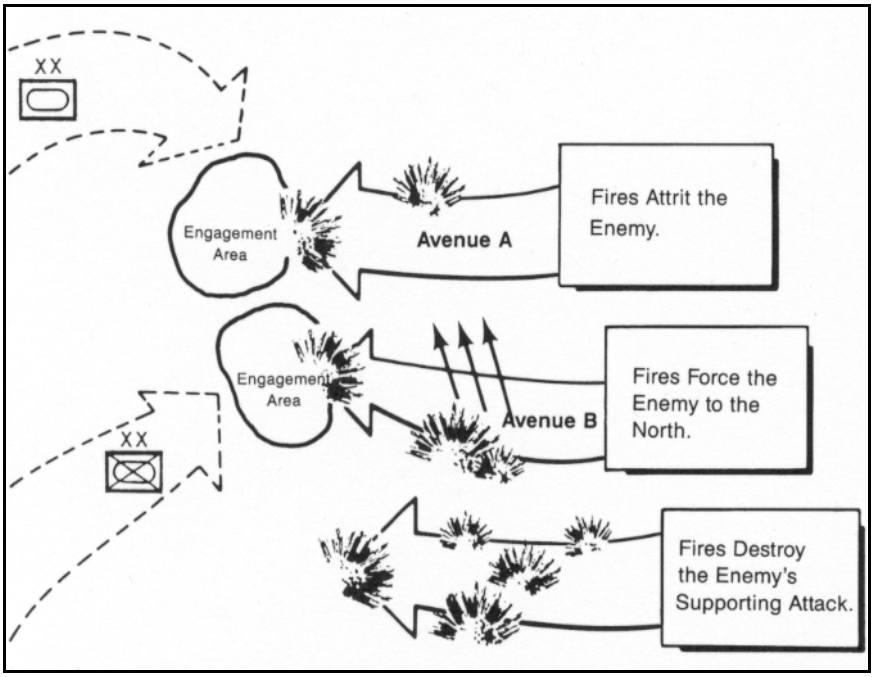


Figure 4: Southern FireStrike Simultaneous with the Northern FireSlrike. The overall objective is to condition the enemy with massive destructive long-range fires and force him to the place of our choosing for our maneuver forces to decisively defeat him.

he alerted two MLRS batteries and a cannon battery that were loaded with a preponderance of TGWs and TGPs.

The MLRS and cannon battery commanders reconnoitered positions forward into the area being screened by the ACR. Within minutes, these batteries were moving on an artillery raid to positions within range of Avenue B. They massed fires on moving targets with volumes of armor-killing TGWs and TGPs. These fires, plus the fires of the attack helicopters, left lines of burning hulls. At the same time, enemy commanders began shifting forces to Avenue A.

At a distance of some 20 kilometers to the rear of the Field Artillery, two divisions had begun moving forward in attack formations. Along with these elements were the close support battalions of the division artillery organizations. Both the division artillery commanders had been monitoring the FireStrikes and preparing to support the attacks of their respective units.

Southern FireStrike

D-Day, 1015 Hours. The 68th FA Brigade in the south rained massed fires on the enemy's supporting attack columns almost simultaneously with the northern FireStrike. Tac Air, Field Artillery and aviation literally stopped the supporting attack over a distance of 80 kilometers. Army TACMS Block II and MLRS TGWs struck formations of armored combat vehicles. Army TACMS Block I, SADARM and dual-purpose improved conventional munitions (DPICM) effectively destroyed accompanying artillery, C^2 nodes and other "soft," high-payoff targets. The intensity of these fires continued for about two more hours until the threat of enemy forces in the south was eliminated.

D-Day, 1230 Hours. The Corps Artillery Commander, operating from the FSE in the Corps Tac CP, was confident that both FireStrikes successfully had conditioned the enemy force. The Corps Commander now could commit his maneuver forces to decisively defeat the enemy.

The Corps Artillery Commander turned his attention to the problems of continuing ammunition resupply operations. Some had to perform reinforcing missions as the divisions were committed. When this occurred, selected Corps Artillery units would continue to deliver long-range fires.

Conclusion

Obviously, this scenario is an oversimplification of the "fog" of large-scale battles. But it illustrates the characteristics of the nonlinear battlefield and the impact those characteristics will have on the Field Artillery.

Emerging developments in the areas of weapons and munitions, target acquisition, support and sustainment and C^2 will give future commanders highly lethal means of destroying the enemy at great distances. Hi-tech sensors linked to long-range weapons firing precision, killing munitions can prevent an enemy from massing for an attack. We'll be able to force the enemy to mass at a place not of his choosing—a place where we can decisively defeat him with our maneuver forces.

In a FireStrike, our senior Field Artillery commanders have increased responsibilities. Corps artillery, Field Artillery brigade and division artillery commanders will be challenged in areas such as logistics for widely dispersed units, Field Artillery survivability under nonlinear conditions and terrain management. Our commanders must approach the nonlinear battlefield with a frame of mind similar to that of a maneuver commander. They must expand their thinking about maneuvering fires to destroy an enemy force.

Finally, Field Artillery commanders must be adept in the art of synchronizing combat power. This is the age-old artillery requirement to provide the right amount of fires on the right target at the right time. Fulfilling this requirement on the nonlinear battlefield is, in fact, the challenge of executing a successful FireStrike.

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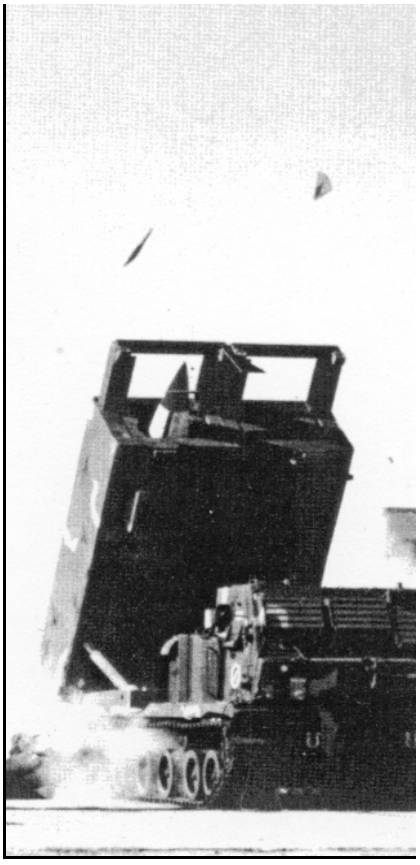
Army TACMS

by Major (Retired) Leighton L. Duitsman



September 1990 marked a significant milestone in the US Army's capability to attack targets deep in enemy territory with conventional organic assets. The event was the fielding of the first Army tactical missile system (Army TACMS)-capable multiple launch rocket system (MLRS) battalion in Europe.

The Army TACMS is replacing our conventional warhead Lance missiles and will greatly improve our employment flexibility at the corps level. It delivers a larger warhead at substantially longer ranges than the Lance missile with dramatically improved accuracies and vastly superior firing rates.

These capabilities were demonstrated during operational testing in the spring of 1990 at White Sands Missile Range, New Mexico. The operational test unit, 6th Battalion, 27th Field Artillery, III Corps Artillery, Fort Sill, Oklahoma, proved that one Army TACMS-equipped MLRS battery could deliver more firepower in a given period than the entire Lance force structure.

MLRS Family of Missiles

Army TACMS is the premiere system of a new family of long-range tactical missiles being developed for the Army. All members of this new missile family will be launched from the MLRS launcher, which is being modified to accommodate them.

The Army TACMS missile system currently being fielded is known as Block I. This missile will be employed against targets that are "soft sitters," (non-armored, stationary target sets of the type shown on the right side of Figure 1.)

The Army TACMS Block II missile will be a product improvement over Block I. It will be capable of engaging "hard," or armored, moving targets (shown on the left side of Figure 1) by employing a warhead carrying several smart submunitions. Once dispensed, these submunitions will be able to acquire, home onto and engage enemy armored combat vehicles at great ranges as they move toward friendly positions.

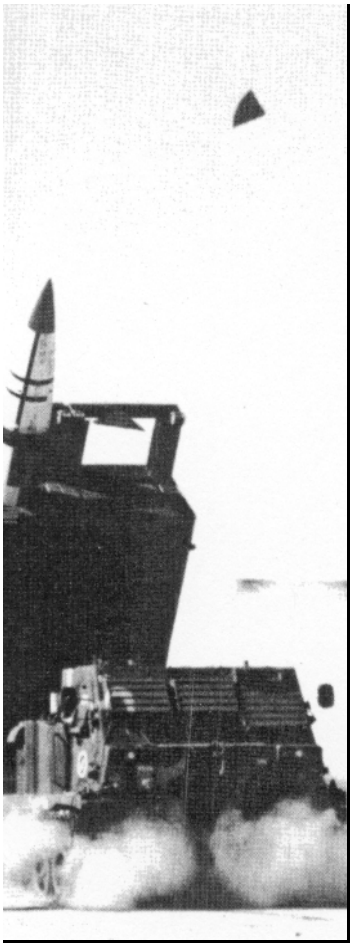
The third member of this family is known as ground-launched Tacit Rainbow (GLTR). This missile will be employed against enemy emitters such as radars. The GLTR will loiter in a specified target area of interest until it acquires its target and then attack it by homing onto the signal source.

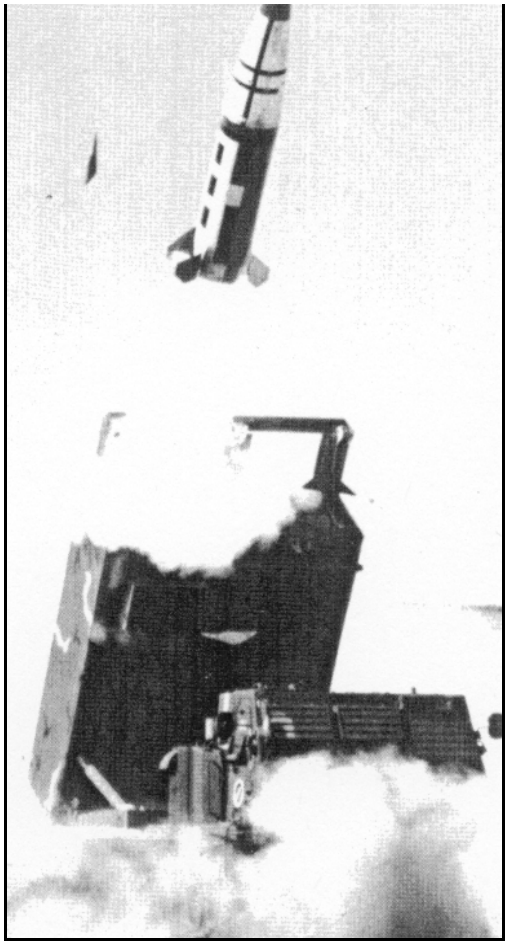
Operational Fires

The Army TACMS provides the corps with an organic capability to employ operational fires. Depending on the situation, the corps is the highest level at which tactical operations usually are conducted. Conversely, the corps is the lowest level at which the operational art is practiced—that is, setting the conditions for future tactical battles. The corps fights its subordinate divisions

	Hard (44%)	Soft (56%)
Moving 43%	Maneuver Regiments Maneuver Battalions Self-Propelled Artillery Battalions	
Sitting/Emitting 57%		Command Posts Air Defense Artillery Helicopter Bases (Forward Area Rearm and Refuel Points, or FARRPs) Logistics Installations Surface-to-Surface Missiles Towed Artillery and Multiple Rocket Launchers (MRL) Electronic Warfare (EW) Installations

Figure 1: Target Groupings. The Army TACMS Block I missile currently being fielded is effective against soft, stationary targets. With a product improvement, the Block II missiles will engage hard, moving targets.





and sets the conditions for combat at the tactical level of warfare. It's also the lowest echelon to execute the ground operations of campaigns.

Operational fires are employed to achieve corps operational objectives. These fires disrupt, delay, degrade or divert enemy capabilities to interfere with the corps' attaining its objectives. They provide the corps leverage to control the current battle as well as to set the stage for future battles.

Using both organic and supporting systems, the corps commander has a variety of means to acquire high-value targets whose destruction will yield a high operational payoff. The Army TACMS overcomes the range limitations of the Lance missile that previously could be overcome only by battlefield air interdiction (BAI). The advent of Army TACMS combined with current tactical air capabilities provides the commander a potent attack means to achieve such an operational payoff. At the same time, the Army TACMS provides timely fires in response to target acquisition. Fielding the Army TACMS potentially can free-up tactical air assets to fulfill other missions.

Army TACMS

This missile system provides a vastly improved organic fire support asset to the corps. The corps can now strike at longer range, either at depth or laterally. Army TACMS' accuracy permits precision interdiction of enemy elements throughout the missile's range band. This allows the commander to fill the gaps on a nonlinear, "porous" battlefield where distance doesn't permit the timely repositioning of either maneuver forces or shorter range fire support assets to counter enemy thrusts. The Army TACMS will force the enemy into a reactive mode, allowing our maneuver commanders to manage the close battle better.

The Army TACMS is an inertially guided semi-ballistic missile launched from an upgraded M270 MLRS launcher. It can alter its trajectory to comply with mission parameters.

Each MLRS launcher can carry two missiles. A missile is stored, transported and launched from a missile/launch pod assembly (M/LPA) that is of the same basic dimensions as a rocket "six-pack" launch pod container (LPC). Each M/LPA is similar to the LPC visually, which makes it difficult for the enemy to determine if a launcher, platoon, battery or battalion is primarily engaged in rocket or missile fires.

The missiles are stored and delivered as full-up certified rounds in a ready-to-fire configuration. Neither warhead mating nor missile checkout or receipt inspection is required upon delivery to the unit launcher. Both empty M/LPAs can be downloaded and new ones uploaded in the same time it takes to reload 12 MLRS rockets.

Each missile warhead contains about 950 M74 anti-personnel and anti-materiel submunitions, the same ones used in the non-nuclear Lance warhead. Their dispersion diameter on the ground varies, depending on the target type and dimension, target location accuracy and desired degree of damage.

Launcher

All launchers that have come off the production line since July 1989 can launch the full suite of the MLRS family of munitions (MFOM), to include Army TACMS missiles. In addition, a schedule is in place to retrofit existing launchers to transport and launch all MFOM munitions.

Each launcher can fire the two missiles within seconds of each other at the same target or at two different targets, independent of range. It can move onto the firing point, launch its missiles and depart in about the same time it takes for a rocket fire mission.

The current M270 Version 6 launchers have been modified to transport and deliver all MFOM munitions. The Army TACMS-capable launcher has been improved in several ways, only a few of which are mentioned. One of the more significant changes is an improved stabilization reference platform (ISRP) to provide more accurate directional control. An improved electronics unit (IEU) enables processing of the various munition sites. The addition of a program interface module (PIM) transfers important mission data between the launcher and missile. New ablative panels provide protective coating and increase the life of the launcher by substantially increasing the number of missiles that can be fired before the panels must be replaced.

Command and Control

The launcher gets its name (Version 6) from its fire control system (FCS) software used to employ the Army TACMS. Version 6 FCS is compatible with the tactical fire direction system's (TACFIRE's) Version 9 software, which is being delivered to units concurrently with the fielding of Army TACMS-capable MLRS units. Each MLRS battery will have four Version 9 fire direction systems (FDSs). Each firing platoon will have an FDS in lieu of the platoon leader's digital message device (PLDMD), thus providing more capability and flexibility for command and control of platoon-level operations.

Operational Employment

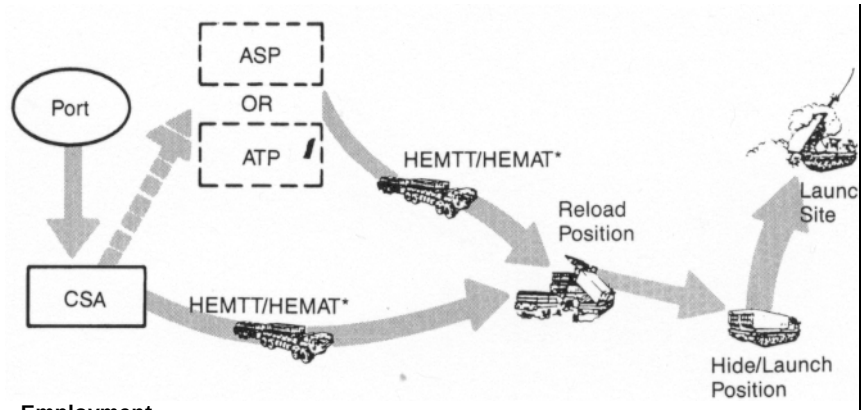
As can be seen in Figure 2, little difference exists in unit operations when employing Army TACMS or when firing standard rockets. The operational test unit amply demonstrated that the addition of this new MLRS long-range munition essentially equated to "business as usual."

But the addition of the new missile requires increased attention to ammunition resupply operations. The Army TACMS will be drawn from either the direct-support ammunition transfer point, ATP, (or ammunition supply point, ASP) or the corps support area (CSA) ammunition supply point, whichever is closest.

This increased ammunition distribution requirement can be simplified by judiciously assigning tactical missions and managing ammunition by battery or platoon. Those battalion launchers in general support of the corps usually will employ only long-range munitions (e.g., Army TACMS in the near term).

Units with reinforcing missions usually will employ the same munitions as the units being reinforced. For example, a corps MLRS battalion reinforcing a division artillery today would employ M77 rockets. In the future, they might be required to carry three different types of rockets. See Figure 3 for a notional breakout of munitions by unit mission.

Decisions as to the actual mix of munitions is left to the discretion of the commander, based on the tactical situation. However, units generally should be limited to no more than three munitions types during a given period.



Employment
- Corps MLRS Battalions
- Planned Packages of Fire
- Centralized Planning
- Centralized or Decentralized (Quick Fire) Execution of Fire Missions

Stowage
- Stored as Certified Round
- Same as MLRS Family of Munitions

Command and Control (C^2)
- Same as Deep Battle System of Systems
- Secure Voice and C^2

Training
- Loading Same as MLRS Family of Munitions
- Launch Sequence via Software; Transparent to Crew

*Heavy Expanded-Mobility Tactical Truck (HEMTT)/Ammunition Trailer (HEMAT)

Figure 2: Operational Plan for Employing Army TACMS Block I. The operational plan for the Army TACMS Block I is basically "business as usual" for an MLRS battalion. But the increased ammunition requirement (two missiles as opposed to 12 rockets per launcher) will require some attention to ammunition resupply operations.

Fire Support Planning

The *decide, detect* and *deliver* methodology is critical to the effective employment of Army TACMS and MFOM fires. Targeting for operational fires is characterized by planning from 72 to 96 hours before the operation. To be effective, the corps must use planned fires to the maximum extent possible to shape the future tactical scenario.

The intelligence preparation of the battlefield (IPB) is a repetitious process based on our knowledge of the enemy's doctrine, templates and norms and the terrain on which he is deployed. Added to this are inputs from various sensors and unit battle reports. Based on this fuzed intelligence, the commander and his staff can then project courses of action for future operations. For each alternative, the G2 determines the most probable enemy response. This, in turn, allows us to select those high-value targets whose attack is critical to the operation's success.

These are *relevant*, high-value targets. Some of these are relevant for relatively short periods of time, such as when suppressing enemy air defense sites along specified ingress and egress routes in support of tactical aircraft strikes. Others may always be relevant. An example would be an enemy's SA-12 missile, which can attack airborne target acquisition sensor platforms, missile systems and attack aircraft.

The task of matching the acquisition and attack assets in both time and space follows the determination of targets whose attack is critical to the success of the operation. For example, if the target is primarily an emitter, then a signal intelligence (SIGINT) sensor would be appropriate as an acquisition source; a side-looking airborne radar (SLAR) sensor would be good against moving targets, etc.

Obviously, the attack assets must both be capable of ranging the target and responsive if the target is of a fleeting nature. Lethality, measured in terms of both accuracy and payload, also must be considered. Other considerations include

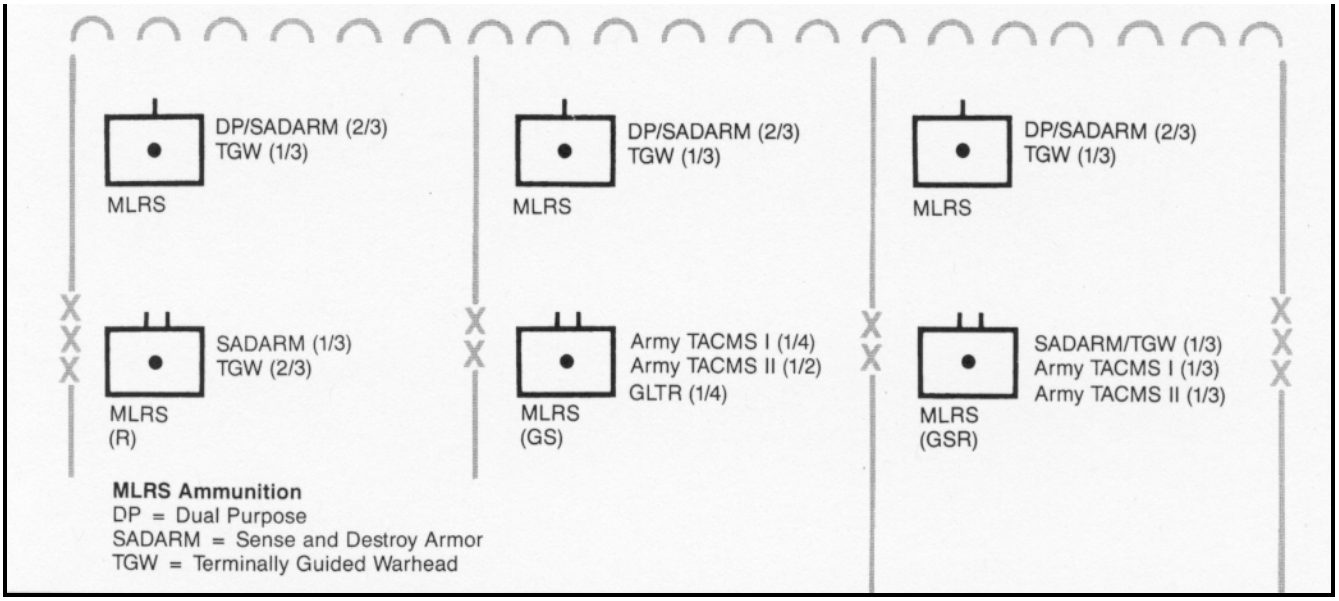


Figure 3: A Notational Plan for MLRS Ammunition Type and Mix by Unit and Mission. Depending on whether the unit's mission is reinforcing (R), general support (GS) or general support reinforcing (GSR), the MLRS platoons and batteries' launchers will carry different numbers and mixes of ammunition.

vulnerability of the attack assets to potential threat countermeasures (both lethal and non-lethal) as well as weather factors.

Next, taskings are issued to the sensor systems and warning orders and engagement time windows are disseminated to the selected delivery units. Finally, the decision is made as to whether the corps will retain centralized control of the engagement of targets acquired by those sensors or whether control will be relinquished to the delivery unit.

Decentralized control is appropriate if maximum responsiveness to on-call fires is sought. An example may be the case when a SIGINT sensor such as Guardrail/common sensor is tasked to acquire and comfirm the location of a relevant, high-value planned target. Quick fire channels are established between the sensor system (via the commander's tactical terminal) and delivery unit (the MLRS battalion fire direction center, or FDC) to expedite processing the fire mission.

These steps complete the battle management or the decide phase. Again, the process has deliberate, repetitive and centralized planning. The enemy battlefield function has been identified, and appropriate means have been put in place to eliminate its supporting target elements during specified periods.

In the detect phase, the target activity is confirmed. That trigger event, along with updated locations if necessary, is sent to the corps fire support element (FSE) when under centralized control. The corps FSE confirms that the target still meets the attack criteria before it's engaged.

When decentralized execution has been authorized, the mission is sent to the delivery unit via direct communications channels. The detect phase ends with the final tactical computation of the updated attack data, if needed.

The attack begins with the transmission of the request for fire to the delivery unit. Final technical computations are made, and ordnance is delivered. The results of the attack may not be reported in a manner artillerymen have traditionally used on the observation hill. The outcome of engagements at long range may be difficult to assess using the sensors that initially reported the trigger activity.

To illustrate this point, consider the engagement of enemy radars in the suppression of enemy air defense (SEAD) mission mentioned earlier. If acquired by SIGINT sensors, the only report might be that the radar emissions have stopped. We may not know if the equipment has been destroyed. What is known, however, is just as important. The radars' having been shut down for the specified period could have allowed penetrating attack aircraft to accomplish their mission, thus contributing to the overall success of the battle.

Precision Interdiction

The fielding of Army TACMS provides MLRS units a significant new capability that will greatly improve the commander's flexibility in employing long-range fires in support of combat operations. This new system will play a key role in delivering accurate payloads against critical, time-sensitive, long-range targets, both day and night, laterally or in depth and under all weather conditions. It provides the commander the responsiveness he needs to seize the initiative and ensure the successful outcome of the operation.

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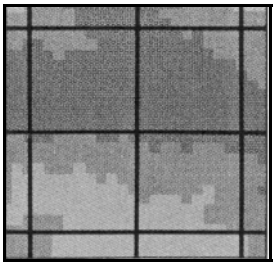


Simulation Series

BCTP Trains

Artillery Leaders in Command and Control

by Lieutenant Colonel (Retired) Thomas D. Morgan

Although the Warsaw Pact threat seems to have diminished, the Soviets have trained and equipped several Third World countries, and they pose a considerable threat. Such unfriendly countries as Iraq, North Korea, Libya, Cuba and North Vietnam train to fight using Soviet or Soviet-type equipment, tactics and doctrine. The Soviet thought process is there in Iraq and in other potential threats. In the Middle East, the conventional weapons approach NATO standards and are plentiful.

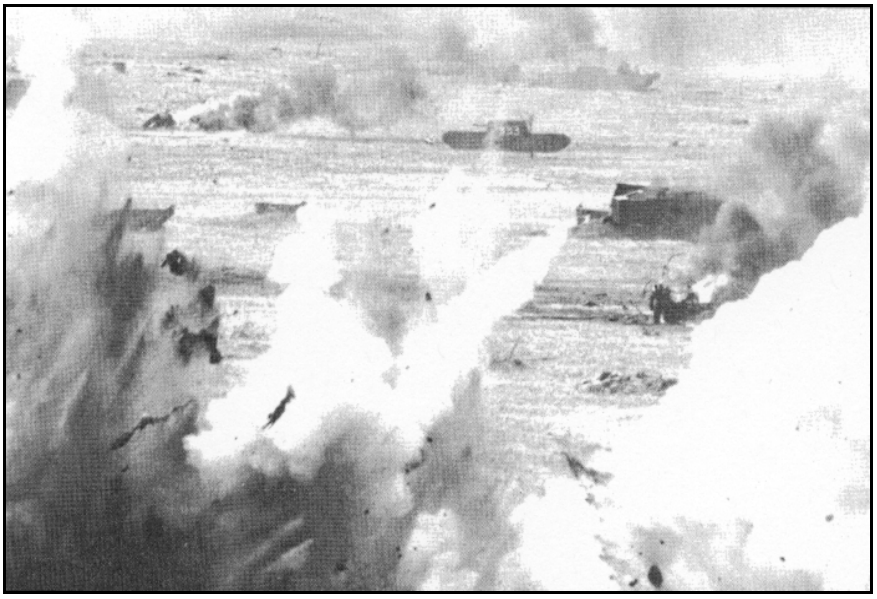
Experience gained from more than 20 Battle Command Training Program (BCTP) Warfighter Exercises in the Total Army—heavy and light—have shown that while the threat to the Free World may have shifted, realistic command and control training is even more important. Because of these factors, conventional fire support for a numerically smaller US Army is as important for the future as it has been in the past.

BCTP: CTC Writ Large

In a nutshell, BCTP is an extension of the highly successful Combat Training Center (CTC) concept, which provides the next best thing to actual combat for battalions and brigades. BCTP transfers the training of the CTCs to the division and corps levels.

BCTP is for the Total Army, all 28 divisions and five corps. A battle command rotation cycle for a division or corps consists of two phases: a tactical seminar with the division or corps commander, his staff and major subordinate commanders, usually at Fort Leavenworth, Kansas, and a Warfighter command post exercise (CPX), usually at an on-site training facility.

The BCTP Warfighter Exercise is a computer-driven CPX conducted under tactical conditions. The Exercise



Getting enough "steel on target" is important to really do damage to the OPFOR, whether it be in computer-driven or real battle. (I Corps Artillery capabilities exercise at Fort Lewis, Washington)

stresses the tactical, main and rear CPs as well as the combat support (CS) and combat service support (CSS) headquarters.

This is where the Field Artillery comes in. The actions of the artillery battalions organic to the division, plus those corps artillery assets under the operational control of (OPCON) or have missions for the division, are role-played in the artillery workstations of the on-site BCTP battle simulation center (BSC). Support roles (i.e., the close and long-range battles) of the Field Artillery are replicated in the BSC, using the corps battle simulation (CBS) software to drive a series of computers. (CBS was formerly called the joint exercise simulation system, or JESS.)

In the CBS workstations, large video displays provide controllers accurate unit-related data in real-time. CBS uses a combination of graphics and menu-driven commands. Tactical communications link the workstations to the field tactical operation centers (TOCs) and pass information as if from units fighting the battle to CPs controlling the action.

The division or corps being trained fights a realistic, thinking opponent in a 24-hour-a-day, real-time exercise. The opposing force (OPFOR) uses Soviet-style doctrine and tactics in simulated combat operations. BCTP's "world class" OPFOR has become well-known to division and corps commanders as the higher echelon of the threat that their battalion and brigade commanders encountered at the CTCs.

During the course of a Warfighter Exercise, several after action reviews (AARs) are conducted to provide feedback to the unit being trained. Data for the AARs comes from several sources: BCTP military observer-controllers (OCs) who continuously visit TOCs, senior observers (retired general officers expert in the type of warfare being fought in the BCTP scenario) and contract CBS workstation controllers and analysts who provide "game and ground truth" for the CPX. Thus, the AAR is the key component in the BCTP training and learning process.

In the course of more than three years of BCTP seminars and Warfighter Exercises, many observations have been made covering all the battlefield operating systems. The following fire support observations are a result of BCTP experiences. They should not be construed to reflect on the performance of any particular unit or as a how-to-beat-CBS standing operating procedure (SOP).

Counterfire

FM 6-20-30 Tactics, Techniques, and Procedures for Fire Support for Corps and Division states that "Counterfire is not a separate battle. It is inseparably tied to close and deep operations and is part of the overall combined-arms fight to achieve fire superiority." In Warfighter Exercises, counterfire is frequently left to the artillery to solve rather than making it a combined-arms effort.

At the start of a Warfighter, the scenario may dictate force ratios that have the Blue forces outnumbered and outgunned by the OPFOR. For the Blue to only target and attack OPFOR tubes and launchers in the counterfire battle can be counterproductive, even though the OPFOR can be successful by limiting its counterfire effort to Blue Field Artillery systems.

Two reasons account for this. First, the OPFOR potentially has more tubes and launchers. Therefore, the OPFOR can keep up a heavy volume of fire as compared to the Blue, even though the OPFOR has lost 10 to 30 percent of its delivery systems. The Blue, on the other hand, can't afford such a loss without seriously reducing its counterfire capabilities. Thus, it works as a regressive tax: the Field Artillery-rich OPFOR can afford to pay a price that will ruin the Blue forces.

Second, the OPFOR fires a much heavier volume of fire than the Blue does. The OPFOR will fire several hundred rounds (i.e., 120 rounds of 203-mm or 560 multiple launch rockets) to suppress a Blue battery or platoon. This has a devastating effect if the target location is accurate.

The Blue, however, usually fires much less. During one Warfighter, a Blue force fired about 50 rounds against each OPFOR firing unit targeted (usually a battalion) and mixed in about eight chemical rounds for harassment. Unfortunately, this didn't "slug" the OPFOR, only irritated him. It made him vengeful for a massive counterstrike.

The lesson learned here is to mass a considerable amount of fire support on an enemy fire unit once it's located because there may be only one chance to do so. You may have to exceed your controlled supply rates (CSRs), but if you don't attrit the enemy early on, you'll never catch up. The massing effect of Field Artillery and air-to-ground attacks (both Army attack helicopters and USAF tactical air) pays large dividends in CBS, just as it's expected to on a real battlefield.

Counterfire should be directed against the total OPFOR fire support system, not just tubes and launchers. This means going

after the OPFOR's ammunition and petroleum, oil and lubricants (POL) logistical system, which CBS replicates well. The OPFOR can neither move nor shoot without POL and ammo. The OPFOR ammunition and POL supply points are vulnerable and should be targeted for combined air and ground attacks to put enough "steel on target" to really do some damage. If units target the OPFOR supply points, the OPFOR moves them for survivability. On the move, they can't resupply units as well.

Units get good results in Warfighter Exercises when the division artillery (Div Arty) directs the counterfire battle with specific responsibilities shared with a Field Artillery brigade or separate fire support assets from corps. CBS is most effective when selected, long-range general support (GS) artillery is dedicated to the counterfire battle while direct support (DS) and reinforcing artillery take care of the close battle and interdiction roles.

Artillery task organizations or weapons and systems mixes for counterfire don't have to be "rigged" in CBS. The best results come when you use the standard command relationships and mission assignments. That makes it easier for artillerymen to understand the commander's intent. Too many times, the personnel in the workstations don't understand the orders they receive from the TOCs.

One thing that makes a difference is how the fire support assets are used once the task organization is announced. For example, a 105-mm DS battalion isn't a good choice for a counterfire mission when 155-mm, 203-mm and multiple launch rocket system (MLRS) fire units are available.

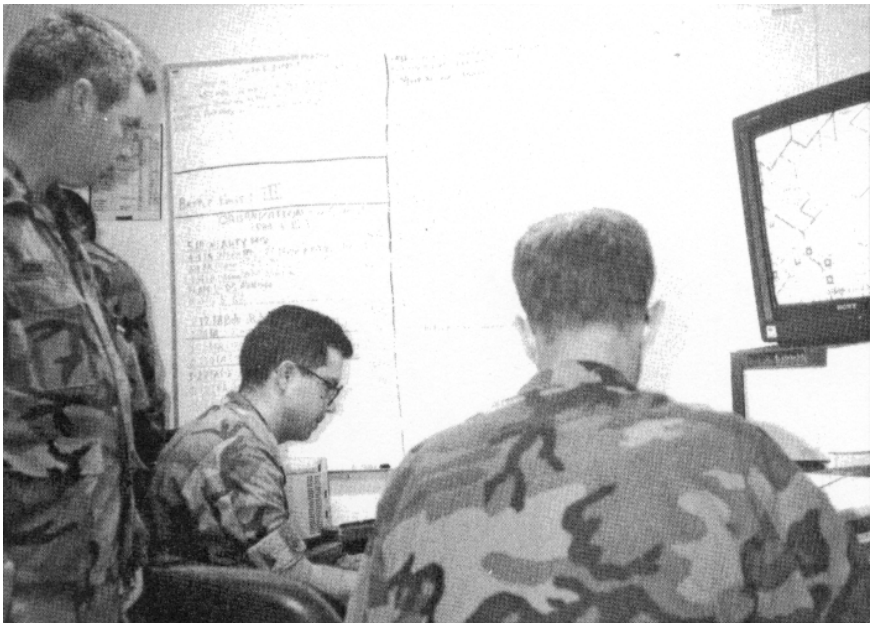
Massing Fires

Many units don't believe they can mass fires effectively in the simulation. But they can program CBS to fire several units at one time using a "Start Fire" field on the FIRE MISSION/FIRE TARGETS menu. Also, they can interrupt ongoing missions with priority fire missions and mass fires immediately on a different target.

What CBS lacks is a real-time assessment of the fire mission effects. The assessment is based on a first-in, first-out queuing sequence. In other words, CBS doesn't replicate the synergistic effects of surprise, massed fires and, thus, the instantaneous effect of the disruption of the unit's command and control (C^2) system.

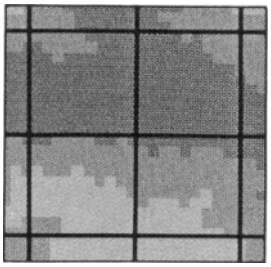
In CBS, however, a unit's posture stays the same throughout a long bombardment. That increases the casualties of enemy personnel who would have "gone to ground" in a real bombardment.

On the whole, good weapons effects are generated in CBS by massing fires if the target location is accurate. In the case of massing of fires, the anomalies of CBS tend to cancel each other out.



LTC(R) Thomas D. Morgan

This crowded workstation is typical of those in Warfighter Exercises. Frequently, the intensity and pace of action rivals that of the field TOCs.



Simulation Series

Thus, CBS can mass Field Artillery and time air strikes to complement those artillery concentrations, just as in real combat. But it requires careful, skillful coordination to make it all work.

High-Priority Targeting

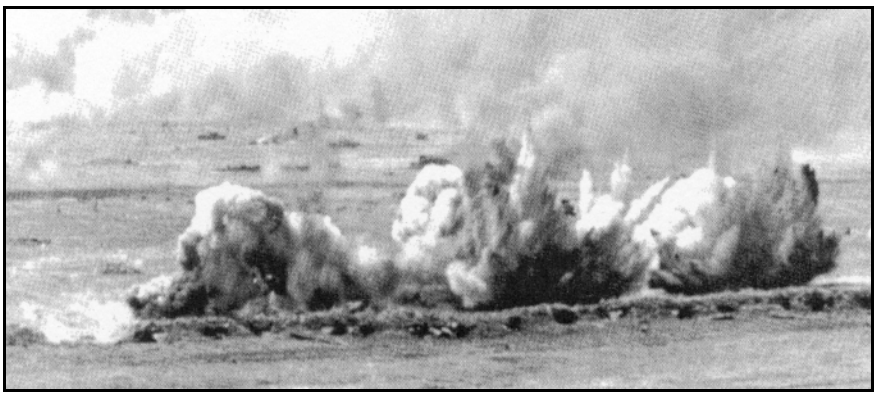
The targeting effort is critical to the success of any battle. Units frequently amass a long list of targets from their radars and other sources; however, the process is often slow and inaccurate. They frequently select inappropriate targets and methods of attack. What is lacking is an effective attack driven by a high-priority target list. The method of attack (i.e., how many fire units and how many rounds) often isn't communicated accurately to the CBS workstation.

You must keep high-priority target lists and the attack guidance matrix updated. Also, your targeting team must be focused. It must have target selection standards, evaluate targets for attack and determine target damage assessment (TDA) requirements. In addition, you must effectively command and control radars—essential to a good targeting effort.

The targeting effort is critical for all phases of the battle. Target value analysis (TVA) and target prioritization must be a continuous effort. It helps to have artillery targeting personnel in the division targeting cells, perhaps the Field Artillery intelligence officer (FAIO).

Personnel who know how to recognize and develop suitable artillery targets should be in charge of the targeting effort. *FM 6-20-10 Tactics, Techniques, and Procedures for the Targeting Process* charges the deputy fire support coordinator (FSCOORD) with this responsibility.

The tactical fire direction system (TACFIRE) and CBS aren't digitally compatible systems. Skilled artillerymen must "translate" the TACFIRE data before it's put in the CBS computer. Important



Field Artillery can mass fires in computerized war games and attain the same devastating effects of real combat. (I Corps Artillery capabilities exercise at Fort Lewis, Washington)

targets sometimes are lost or relegated to a low priority in the firing queue.

CBS can expedite fire missions, but it won't do it automatically. You must have a "man in the loop." The battery or battalion fire direction center (FDC), replicated by the CBS computer operator, must make it happen. Units that do best in Warfighters focus on selected high-payoff targets and don't piecemeal their efforts.

Post-strike TDA is essential for updating target lists and planning attacks. This TDA is available with the CBS, but you must get it using legitimate intelligence collection sources, such as post-strike reconnaissance and surveillance teams or assets.

Chemical Strikes

The Blue force chemical strikes against the OPFOR are rarely effective in Warfighters. The problem is twofold. First, the chemical rounds aren't released in time for the scheduled strike. Second, units don't fire enough rounds to have any appreciable effect on the OPFOR. Non-persistent gas doesn't last long enough to do any damage when you fire only a few shells.

Too often, units don't track chemical munitions distribution or understand the division fire support element (FSE) and logistical organizations well. As a result, chemical fire planning usually is untimely and burdensome because personnel don't understand the chemical release system.

The chemical fire plans often don't support the scheme of maneuver to produce a tactical advantage. Chemical strikes seem more a matter of revenge against the OPFOR for starting chemical warfare. The effect has been to harass and anger, but not deter the enemy.

Terrain Management

Units sometimes develop fire support plans with inadequate guidance from the maneuver commander. In the offensive, Field Artillery units fall behind and can't deliver effective deep attack and counterfire because they're out of range. They don't fire preparations because their artillery isn't in position.

Terrain management is a primary concern of the maneuver commander. The Field Artillery must fight for priority to move and shoot effectively. Several units simultaneously moving through the same area cause road congestion in CBS, just as in real life. In the defense, retrograde or withdrawal, the same congestion problems can occur—only this time artillery units can be overrun before getting to their new positions.

Fratricide

Fratricide is an ugly word to artillerymen. For those of us who have seen US soldiers killed by "friendly fire," it has left a bitter, lasting memory. Unfortunately, in danger-close firing situations, it's difficult to avoid some fratricide when employing the combined-arms team.

CBS can cause fratricide if the radius of fire (blast area of a specific artillery system) overlaps a friendly unit's radius (size of a unit in the defense) or its tactical deployment radius (size of a unit in the attack).

To allow for realistic training during Warfighter, maneuver units must understand that there may be some danger-close fratricide. But fire units must attack targets per doctrine or tactical SOP.

Fratricide occurs when fire support coordination measures aren't updated and fires across boundaries aren't cleared properly. Fratricide caused by CBS anomalies won't count against a unit, but failure to coordinate fires will result in friendly force deaths and be an item for discussion at the AAR.

Special Munitions

Too often, units don't integrate family of scatterable mines (FASCAM) and Copperhead into the scheme of maneuver. They're important force multipliers that are effective in CBS.

Units don't always use FASCAM to delay OPFOR follow-on elements coming into the main battle area. They often don't use Copperhead in engagement areas or "fire sacks." Neither FASCAM nor Copperhead rounds are fired in quantities up to their CSRs.

Ammunition Resupply

The Foreign Science and Technology Center at Charlottesville, Virginia, has estimated that a Soviet motorized or tank division (with usual augmentation) can haul 46,000 rounds of artillery. Soviet surrogates can approach that amount. That, coupled with the ammunition haul capabilities of Army and Front units supporting a main attack (i.e., 214,000 rounds), means the attacking force has about 260,000 rounds per day for a division and supporting artillery.

The OPFOR units in Warfighters have been known to fire that much ammunition. The Blue units rarely come close to that volume and usually only fire their CSRs with difficulty.

The current US ammunition distribution system can't begin to match the Soviet's. When our new maneuver-oriented ammunition distribution system (MOADS), using combat-configured loads (CCL) and the palletized loading systems (PLS), comes on line, the US Army ammunition resupply system will improve. But, it's still doubtful if we'll ever achieve parity with the Soviets in this area.

The lesson: we better learn how to target and destroy the OPFOR's large stocks of ammunition—and learn well.

Conclusion

There are many common threads of AirLand Battle doctrine that can enhance

chances for success. Effective counterfire, deep operations targeting, integration of fire support with maneuver and movement of artillery will pay dividends in CBS Warfighters, just as they will in real combat operations.

If we integrate Warfighter AAR observations into unit training—into a real battle if that time comes—units can feel confident of success. This confidence will be born of the lessons learned during a strenuous Warfighter training period whose goal was to accomplish the mission. Let's shoot and **make every round count** against the enemy.

Lieutenant Colonel (Retired) Thomas D. Morgan is a Controller-Trainer and Military Simulations Analyst for the Battle Command Training Program, Fort Leavenworth, Kansas. He was commissioned in the Field Artillery from the US Military Academy at West Point in 1958. Lieutenant Colonel Morgan served with Field Artillery units in the continental US, Germany and Vietnam and as a Gunnery Instructor at the Field Artillery School, Fort Sill, Oklahoma. He holds a master's of public administration from the University of Missouri and a master's in history from Pacific Lutheran University in California.

REDLEG NEWS

ITEMS OF GENERAL INTEREST

Junior Officers New Career Opportunity—Army Acquisition Corps

Junior officers can apply for the new Army Acquisition Corps (AAC), which offers single-track career progression with promotion potential to the highest ranks and technical training and graduate schooling.

As of July 1989, Secretary of Defense Dick Cheney required each of the services to establish a dedicated corps of military acquisition specialists. The goal of the AAC is to develop a pool of specialists to fill critical materiel acquisition management positions, with the specialists applying their knowledge of operational realities and technology.

The annual assessments from the Army totals 221 officers, 24 of whom will be Field Artillery officers. From captain through colonel, the AAC will have a target population of approximately 3,000 officers.

Career Progression

A DA board will review all Field Artillery officers who hold Functional Areas 51 (research, development and acquisition) and 52 (nuclear weapons) during their eighth year of service for entry into the AAC. Officers may apply for the AAC if they hold eligible functional areas, but the board will determine who enters the program, to include officers who haven't applied for the AAC. Once selected, officers receive a skill code of 4M (AAC candidate for certification), and their career files move from their branches to the Acquisition Branch at the Total Army Personnel Command (PERSCOM).

Any officer selected for the AAC who doesn't have an advanced degree will be scheduled for the Army's Advanced Civil Schooling Program for a master's degree in management, business, science or engineering. After civil schooling, the officer will attend a nine-week Materiel Acquisition Management Course at the Army Logistics Management College, Fort Lee, Virginia, en route to his first acquisition assignment.

At least 50 percent of AAC officers will be selected for the resident Command and General Staff College, Fort Leavenworth, Kansas, and programmed for acquisition-related operational assignments as majors—their last branch assignments. From this point, AAC officers serve exclusively in acquisition assignments after attending the Program Management Course (PMC) at the Defense Systems Management College, Fort Belvoir, Virginia.

Memorandums of instructions (MOIs) to lieutenant colonel and colonel promotion boards will ensure that selection rates for AAC officers are at or above the rate for the entire Army competitive category, AAC officers won't be eligible for battalion- or brigade-level commands.

As lieutenant colonels, members compete for 285 critical acquisition positions, including 88 product manager positions. As colonels, AAC officers compete for 139 critical positions, which include 79 project manager assignments. By law, all general officers assigned to procurement commands must meet the AAC certification standards, thus providing AAC officers potential for promotion to the highest general officer ranks.

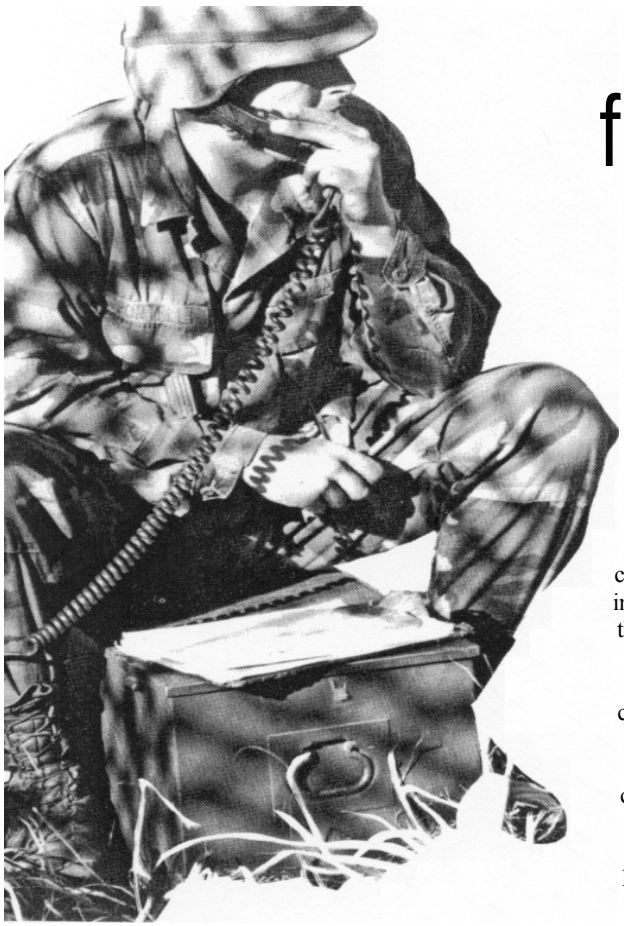
Start Now

It isn't too early for junior officers to begin thinking about an AAC career. Officers request their functional areas at approximately the fifth year of service; those Field Artillery officers wanting an AAC career must select Functional Areas 51 or 52. Twenty-one of the 24 Field Artillery officers selected for the AAC annually will hold Functional Area 51. Having the right functional area won't guarantee entry into the AAC, but it's a prerequisite to applying for and entering the AAC at the eighth year of service.

The Army is committed to establishing and maintaining a world-class acquisition corps. Through the AAC, officers have challenging and rewarding opportunities to provide the best soldiers in the world the best equipment in the world.

If Redleg officers have questions about the AAC or would like more information, they can call AUTOVON 284-9571/9572 or commercial (703) 274-9571/9572 or write me at Chief, Army Acquisition Proponency Office, Army Acquisition Executive Support Agency, Alexandria, Virginia 22333-0001.

LTC Daniel D. Ziomek, OD
C, AAC Proponency Office



Artillery Thirst for Voice and Digital Communications

by Lieutenant Colonel Mark A. Ison, AV

The architecture for both voice and digital communications of the Field Artillery is changing to take advantage of advanced technology and new communications equipment. The interconnection of the systems in this architecture allows the Field Artillery to provide critical fire support for the maneuver commander to meet the doctrinal tenets of AirLand Battle. Modification of this communications architecture is directly proportional to the combat effectiveness of the King of Battle. With one of the three primary parts of the architecture missing or inoperable, the Field Artillery may not be able to deliver timely fires for the maneuver forces.

Primarily, this architecture has three systems: the single-channel ground and airborne radio system (SINCGARS), mobile subscriber equipment (MSE) and the enhanced position location reporting system (EPLRS). Along with the fielding of this new equipment is the requirement for tactical units to operate these systems without dedicated signal soldiers; the systems are user-operated.

Overview

MSE is the Army's wide-area network communications system that spans the corps area; EPLRS is a division-area system dedicated to digital data; and SINCGARS is the combat-net radio for small-area communications in unit areas. (See Figure 1.) As you move toward the forward line of own troops (FLOT), SINCGARS becomes the primary communications system. Conversely, as you move through the battalion area to the corps rear area, MSE becomes the primary communications system. Under the user-owned, user-operated concept, you'll operate MSE- and SINCGARS-related equipment for the command and control (C^2) of unit combat operations.

EPLRS is a system that automatically serves as a pipeline for high-volume digital traffic (no voice capability) and provides position-location information. This device will be throughout the division area, usually at the battalion and higher command posts (CPs).

EPLRS doesn't operate in the traditional sense; that is, EPLRS isn't a tactical radio net where you "push-to talk, release-to-listen." With a community of users, all transmitting and receiving at the same time, EPLRS is a master

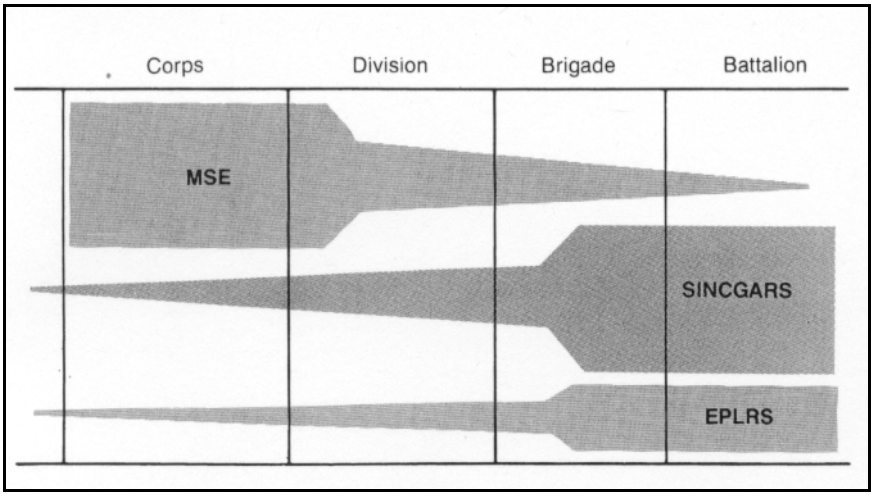


Figure 1: Shown above is the MSE, SINCGARS and EPLRS systems distribution in the corps area to support Field Artillery communications.

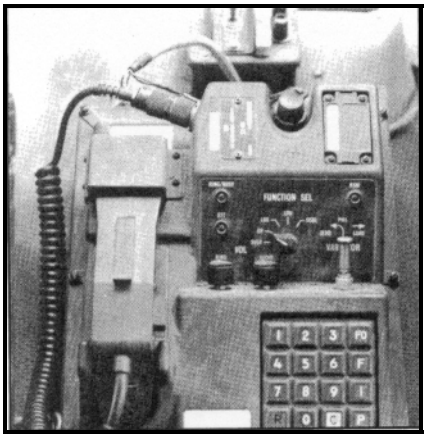
computer that automatically routes messages to the correct user.

MSE

Think of MSE as the "Ma Bell" of our large-area tactical communications network. It can transmit voice, data and facsimile (FAX) communications securely. It employs directional antennas for the multi-channel radios in the backbone system and has access switch networks and alternate call routing to prevent the enemy from using electronic warfare (EW) measures. MSE is simply a dial-up telephone system that enters the area network via radio or wire to interconnecting automatic switching units.

MSE will have minimal impact on the Field Artillery battery's current C^2 operations. The primary reason for this is the battery must use a wire interface device to access MSE.

On the other hand, the battalion will be able to enter the area network by means of a mobile unit, which provides access via a radio. The battalion staff will have access to the area system via the mobile subscriber radio telephone (MSRT) terminal in the vehicle supporting the commander, executive officer and operations and logistical officers. MSE, for the first time, allows the battalion commander and his staff entry into the area system from any position on the battlefield.



The digital subscriber voice terminal, part of the MSRT, gives the commander access to the area network (through MSE) from anywhere on the battlefield.

The battalion staff will have the communications tools necessary to better support the sustained tactical operations of the firing batteries with administrative and logistical requirements.

Emplacement and displacement of CPs are enhanced as access to the area system is continuous. This becomes critical because of the number of times a Field Artillery unit moves to survive and support the highly mobile maneuver force.

TACFIRE

MSE wasn't designed to provide the dedicated communications links required by the tactical fire direction system (TACFIRE) network. It'll play a greater role in technical and tactical fire direction as the advanced Field Artillery tactical data system (AFATDS) is fielded. An interface device is available to pass digital traffic from TACFIRE over the MSE network. MSE can support high-priority missions in the TACFIRE network, as deemed necessary by the commander. (See *Field Manual 24-1 Signal Support in the AirLand Battle* for a more thorough discussion of the signal architecture MSE provides the tactical commander.)

Total Fielding

The Army is now fielding this equipment under a total-fielding concept. This means both the Army's Active and Reserve Components will receive it simultaneously. The National Guard and the Army Reserves won't receive the older equipment from the active Army units. (See Figure 2 for the tentative MSE fielding schedule.)

MSE Fielding (Fiscal Years)	
III Corps	89
V Corps	90
VII Corps	91
XVIII Airborne Corps	92
I Corps	93

Figure 2: MSE will be fielded through FY 94.

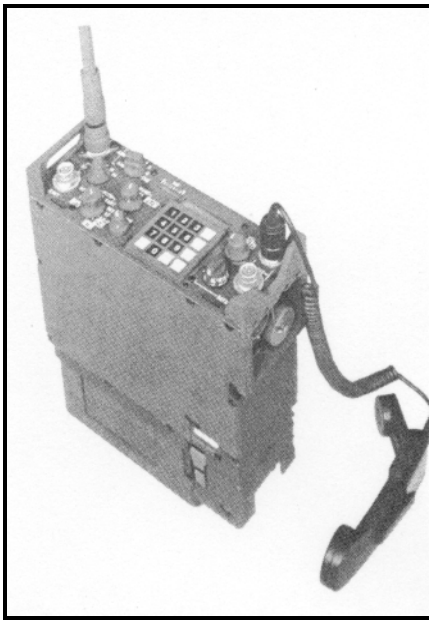
SINCGARS

This is the primary combat-net radio for the Army. Units from all branches will use it mainly for voice communications, although fire support units will use it to pass digital messages as well. Voice nets will meet the C^2, administrative, logistical and fire support coordination requirements. The digital capability will augment tactical and technical fire direction at the fire support team (FIST) and forward observer (FO) levels. It also allows us to communicate with automatic target handover systems (ATHS) on aircraft such as the OH58D (hand-off to AH64) and special operations helicopters and the Air Force close air support (CAS) aircraft.

SINCGARS uses frequency-hopping technology to defeat EW measures, changing its operating frequency more than 100 times a second. This system has several unique features and was designed with the user in mind—it's relatively simple to operate. (See Figure 3.)

- Whisper Mode
- Reduced Weight and Size
- Expanded Frequency Range (920 to 2,320 Channels)
- Digital Data Transmission from 75 Bits to 16 Kilobits, Facsimile and Teletype
- Electronic Counter-Countermeasures (ECCM) Plug-In Module (Frequency Hopping)
- Offset Tuning (+/-5 or +/-10 Kilohertz)
- Interoperability with Fielded Equipment
- 6 Single-Channel Presets Plus Manual and Cue
- 6 Frequency-Hopping Net Presets
- Scanning of Single-Channel Presets
- Built-In Performance Test

Figure 3: SINCGARS, the Army's primary combat-net radio, has several unique features and is relatively simple to operate.



Man-Pack SINCGARS

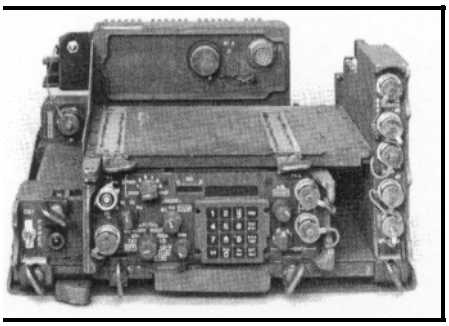
SINCGARS is known as a family of radios. This means the system uses a building block concept, starting with the basic manpack configuration and expanding to a vehicular dual long-range

(retransmit) configuration. The installation kits allow users to install SINCGARS quickly in the current radio mounting positions on vehicles.

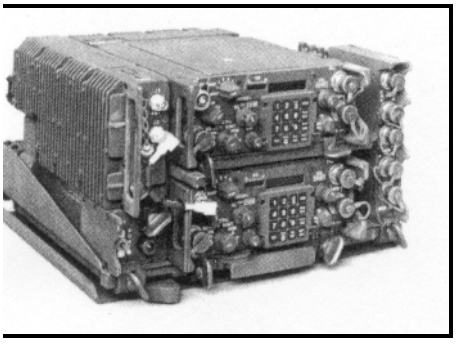
The original fielding plan for SINCGARS has been modified primarily because of budget constraints. What this means is a longer fielding time for the system. In spite of this, the 2d Infantry Division, South Korea, received them ahead of schedule by one year due to its critical mission requirements. There are plans to back-fill shortages of old-series radios in Forces Command (FORSCOM) units as SINCGARS fielding is completed. (See Figure 4 for the tentative SINCGARS fielding schedule.)

SINCGARS Fielding (Fiscal Years)	
Training and Doctrine Command	88
Korea	89
Hawaii	90
XVIII Airborne Corps	91
III Corps/I Corps	92
V Corps/VII Corps	93

Figure 4: SINCGARS will be fielded by FY 94.



The vehicular short-range SINCGARS replaces the AN/VRC-53/64 radio.



The vehicular long/short range SINCGARS replaces the AN/VRC-12/47 radio.

EPLRS

There are several communications reasons why fires could arrive late on target: the competition between voice and data transmissions, limited nets or radios, nonstandard net structures, etc. EPLRS is the third system in the fire support network that will help eliminate some of these problems, making it a critical one for the delivery of timely fires.

EPLRS is a Signal Corps system to distribute high volumes of data automatically, and unlike MSE and SINCGARS, it doesn't replace a current communications network. Because it uses volumes of data to execute fire missions, the Field Artillery will receive

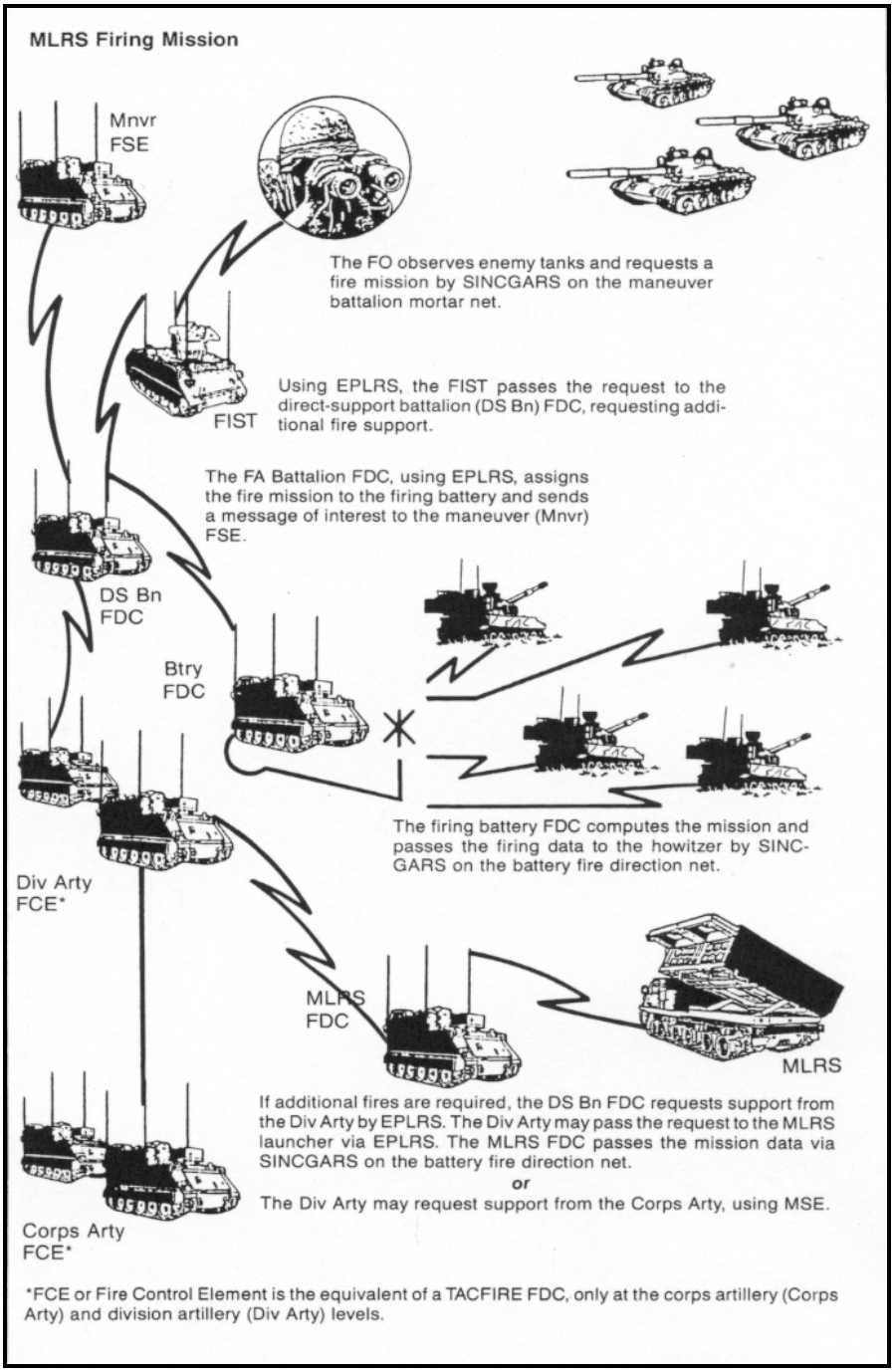


Figure 5: This Figure shows how a firing mission is processed through SINCGARS, EPLRS and MSE from the FO to the MLRS firing platform.

the greatest benefit from the data distribution capabilities of this system.

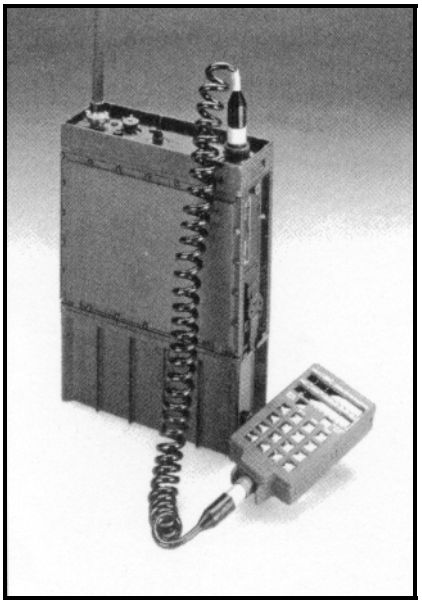
The original fielding plan has been put in jeopardy because of budgetary problems. If the fire support system is to process large volumes of high-speed data and use that data to deliver timely fires, EPLRS is simply a *must.*

Need-lines

Current plans call for using EPLRS to move data among tactical elements. To manage the movement of these data, need-lines must be established among artillery fire support elements (FSEs). For example, you establish a need-line between the maneuver battalion FSE and the direct-support artillery battalion's fire direction center (FDC).

After all required need-lines are identified, the Signal Corps develops a data distribution network to support the commander's concept of the operation. Each need-line is allotted time—called time slices. There are approximately 34,000 slices available every 64 seconds. The more critical the need-line, the more time slices it receives.

The unit signal officer ensures the servicing signal battalion has the need-line requirements necessary to establish the communications network. In the absence of the signal officer, the artillery operations officer must perform this function.



EPLRS

Once the need-line is established and time slices allocated, the EPLRS user device monitors all time slices allocated to it. It ignores time slices other than its own or, if required, retransmits them in their respective time slots to the interested user. In this way, information is routed over multiple paths, better ensuring successful transmission of critical data to the intended addressee.

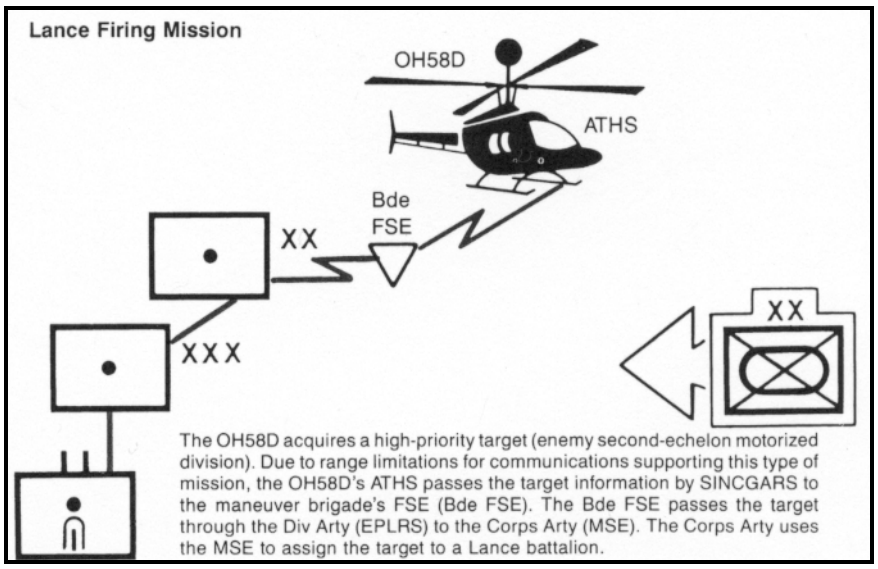


Figure 6: This Figure shows a simple firing mission processed using SINCGARS, EPLRS and MSE from the OH58D Field Artillery aerial observer who acquired the target to the Lance missle system.

Users

EPLRS devices will be at the battalion FDC, battery computer system (BCS), FIST, combat observation lasing team (COLT) and FSE. While the major target generators (FOs) won't have direct access to EPLRS, it connects the rest of the fire support system, automatically routing digital data for targeting.

Conclusion

Fielding of these advanced communications systems will allow us to properly distribute both voice C^2 and high-speed data transmissions to the right people to make vital decisions in combat. Figures 5 and 6 illustrate two simple fire support missions being processed over the three new communication systems. Figure 5 is a multiple launch rocket system (MLRS) firing mission with the target acquired by an FO, and Figure 6 is a Lance firing mission with the target acquired by a Field Artillery aerial observer in an OH58D helicopter and processed via the airborne version of SINCGARS.

The three systems are part of the Signal Corps' communications architecture that connects all branches of the Army but is essential for Redlegs. The three quench the thirst fire supporters have for communications to process and deliver timely fires to support maneuver units in combat—Field Artillery's charter.

If units have questions or need more information, call the the Communications/Electronics Department at the Field Artillery School, Fort Sill, Oklahoma, at AUTOVON 639-3115/2501 or commercial (405) 351-3115/2501.

Lieutenant Colonel Mark A. Ison, Aviation, is Deputy Director of the Communications/Electronics Department, Field Artillery School, Fort Sill, Oklahoma. He has commanded an Aviation Section, F Troop, 8th Cavalry (attack helicopters), Vietnam; B Battery, 1st Battalion, 18th Field Artillery, III Corps Artillery, Fort Sill; and an Aviation Section, 213th Aviation Company (CH47s), 19th Combat Aviation Battalion, South Korea. He also served as S3 for the 19th Combat Aviation Battalion and for the 210th Combat Aviation Battaion, 193d Infantry Brigade, Panama. Among other assignments, Lieutenant Colonel Ison was the Senior Staff Officer for Operations and US Army Contingent Commander, Multinational Force and Observers, Sinai, Egypt. He's a graduate of the Command and General Staff College, Fort Leavenworth, Kansas, and holds a master's degree from Oklahoma City University.

VIEW FROM THE BLOCKHOUSE

FROM THE SCHOOL

TOE Update

Changes Reflect Current Nuclear Operations

Because special weapons (SW) are battery (not platoon) operations, new tables of organization and equipment (TOEs) have been revised accordingly. (Past TOEs documented requirements in the firing battery/platoon paragraph.) The TOEs for nuclear-capable cannon systems document SW requirements in the battery headquarters in TOE paragraph 01 and modified TOE (MTOE) paragraph 201.

Now equipment associated with SW (trainers, prescribed nuclear load vehicles, etc.) moves to the battery headquarters. The greatest impact will be in platoon-based (3x6 and 3x8) 8-inch units, which lose one of their two M109 vans. There are no personnel changes: firing batteries/platoons still need the fully trained SW teams they now have.

FA Nuclear Warhead Dets to Transfer to Ordnance

By mid-1992, all Field Artillery nuclear warhead support detachments in NATO will be the responsibility of the Ordnance Corps. On 28 March 1990, the Chiefs of Field Artillery and Ordnance agreed that nuclear Field Artillery detachments should be transferred to Ordnance Corps control. The Field Artillery and Ordnance Schools are developing the concept and the TOEs. Implementation is planned for July 1992.

When the US first allocated nuclear weapons to NATO, our allies required training in all aspects of nuclear operations: nuclear fire planning, fire direction, SW operations and howitzer crew drills. The US Field Artillery had the mission to train our allies for two reasons: we had an established nuclear operations training base, and US Field Artillery would work with allied Field Artillery.

Over the years, the requirement to train our allies has significantly decreased; they now have their own training bases. Our training mission has become a logistical one with the exception of unlock and assembly/prefire operations, which Ordnance personnel can accomplish.

TOE Branch Address Change

The Documentation Branch has changed its name and office symbol. It's now the Documentation Branch, Systems Integration and Priorities Division, Directorate of Combat Developments, ATTN: ATSF-CSID, Field Artillery School, Fort Sill, Oklahoma 73503-5600.

Our location and phone numbers are unchanged: Room 218, Knox Hall, AUTOVON 639-2726/5879 or commercial (405) 351-2726/5879.

REDLEG REVIEWS

BOOK REVIEWS

Eyewitnesses at the Battle of Stones River

David R. Logsdon. Nashville, Tennessee: Kettle Mills Press, 1989. 82 pages. $6.95

The most important function of any history book is to illuminate the past. By examining previous events, the historian may better understand his own time and learn from the mistakes of others. This is especially true of military history. This book about soldiers in the Civil War by Mr. David Logsdon is a useful tool for such studies.

The author has presented little of his own analysis here. Instead, he has collected an extensive range of eyewitness commentaries and presents excerpts in a very entertaining fashion. Culled from diaries, letters and reports of participants, these brief vignettes describe the violent four-day Battle of Stones River near Murfreesboro, Tennessee. The vignettes help to give the reader a sense of the hardship, fear and anticipation experienced by the soldiers on both sides.

Oral history collections such as this have their limitations. It's almost impossible to place these recollections into historical context without some knowledge of the American Civil War. But this book isn't intended to provide detailed explanations of the War's causes, strategy or major campaigns. You must find that information elsewhere.

Instead, this book provides a brief look at the thoughts of the soldiers who fought the War. Although Logsdon mentions several leaders, this is a book about soldiers. It's their thoughts that stand out:

> ***"LT Hardin . . . was the last to leave the position. . . . As he was riding on after his guns, a cannon ball passed entirely through his body.... Some of the boys saw him fall and turned back to help him but got to him in time to see him open his eyes and close them forever, without a struggle or a gasp."***

Many readers will argue that modern technology has made lessons from the Civil War obsolete. There's no doubt that science has changed the manner in which wars are fought and will continue to do so. Nonetheless, history provides the most readily available examples of combat experience for leaders at all levels.

Obviously, there is no substitute for the real experience, but we all must use every possible resource to prepare ourselves for the challenges of combat. Books such as this one provide the raw material for this kind of study. It offers clear examples of how men react under the stress of combat. Logsdon's book is a brief but compelling look at the men who fought on both sides of our nation's greatest conflict.

MAJ Donald A. Carter, FA
Military History Instructor
Field Artillery School

Firepower in Limited War

Colonel (P) Robert H. Scales, Jr. Washington, D.C.: National Defense University Press, 1990. 290 pages. $9.00

Since the advent of nuclear weapons, the discussion of war has been divided into two major categories: World War III and everything else. Fortunately, the nuclear holocaust that almost certainly would come with the next general war never happened, and with the lessening in East-West tensions, it hopefully never will. Every war since 1945, then, falls under the second major category of limited war—armed conflicts with limited goals, neither fought with all the means available nor aimed at the absolute destruction of an enemy and his homeland.

The distinction between these two major categories of war is clear. Not so clear are the lines of distinction within the limited war group. These so-called small wars have been fought on a spectrum of varying intensity, running from Korea and Vietnam on the high end, to Northern Ireland and the West Bank on the low end. There are no "hard and fast" rules for these conflicts, no neat formulas. Each limited war is a unique case, and the utility and applications of firepower vary with the situation.

In ***Firepower in Limited War,*** Colonel Robert H. Scales, Jr., presents a penetrating analysis of the use (and misuse) of mortars, artillery, tactical air support, attack helicopters and naval gunfire in the small wars since 1945. By analyzing four of these conflicts—the British Falklands Campaign, Soviet intervention in Afghanistan and both the French and American phases of the war in Vietnam—he draws a set of general lessons for the application of military force in such situations.

The limited conflicts, he notes, generally have not been struggles to capture territory but wars of attrition aimed at forcing an enemy to give in by making the fight too costly. The objective, in other words, is to kill as many of the enemy as possible while conserving one's own forces.

Modern nations engaged in such conflicts have a tendency to rely very heavily on firepower to accomplish this—the "bullets not bodies" philosophy. But in virtually every case, modern nations engaged in post-1945 conflicts have overestimated the destructive power of their own forces, particularly the firepower component.

Naked firepower, even when applied at massive levels, is very inefficient at killing enemy troops. That lesson emerged as far back as the middle years of the First World War. Firepower is effective only when coupled and integrated with maneuver. Limited wars, in particular, require the timely and measured use of appropriate levels of force rather than the massive sledgehammer blows and rapid exploitations that would be the keys to winning a general war.

Colonel Scales' observations have some serious implications for the direction of our current tactical thinking. The need for firing close to one's own troops can be seen in every one of these small wars. Yet this is a skill rarely practiced or emphasized in peacetime. Quite the contrary, in recent years our doctrine and equipment designs have focused on shooting deep. But in limited wars, there are seldom any follow-on-forces to interdict or rear command posts to hit.

On the air power side, control of the air has been the single greatest tactical advantage of modern forces engaged in limited wars. But the true value of that control lies in aerial observation, close support of ground troops and the rapid air transportability of those troops. Mastery of the air space over the battlefield is rarely a major issue because it's frequently "a given" from the start. (The Falklands War was one case where it wasn't.) And experience in the largest of these limited wars has shown that guerrilla forces and fairly primitive Third World armies usually can sustain themselves in the field in the face of even the most sophisticated air interdiction campaigns.

The author concludes by calling for us to re-think our approach to limited wars, particularly when it comes to the organization, equipment and doctrine of the light divisions, which are supposed to be tailored for exactly those conflicts. Specifically, Colonel Scales sees the need for more integration of all fire support and maneuver assets, the decentralization of the control of firepower (both surface- and air-delivered) to the lowest levels of operational command and the creation of maneuver units of all arms at the lowest practical echelons, even as far down as battalion level.

If there is one thing wrong with this book, it's that there isn't enough of it. The author analyzes only four of the many post-1945 small wars, each of which involved a major power against a third-rank power. This selection is understandable enough, since the author's intention is to draw lessons for the US military. The analysis of additional wars undoubtedly would have made the volume too long without adding anything to the weight of the author's arguments. But . . . it would have been fascinating to read Colonel Scales' observations on the use of

firepower in wars between Third World countries (like Vietnam and Laos), or between second-rank powers acting as surrogates of major powers (like the Yom Kippur War).

Lucidly written, extensively documented and well reasoned, this book is a *must* for everyone concerned with employing both firepower and maneuver on the battlefield. It particularly should be read by those at the policy-making level who, more than anyone, must understand what firepower can and cannot do.

MAJ (P) David T. Zabecki, FA
S3, USAR Mil Intel Gp, Europe
Germany

The Forward Observer

Thanks for this crossword puzzle to Redlegs Major C.T. Botkin, USMC; Master Sergeant H.C. Cyphers, USA; and Corporal De La Vega, USMC of the Staff Planning School, Landing Force Training Command, Naval Amphibious Base, Coronado, San Diego, California.

ACROSS

1. Type of supporting fires used to aid maneuvering forces.
3. Spotted for last, corrected for first.
5. Mountainous terrain or fog may result in this type of fire.
8. It factors in with the FO's bag of tricks (abbreviation).
9. This tells the FO rounds are "on-the-way."
10. Height of burst spotting when half of the rounds are air and half are graze.
12. Element number three in call for fire; it's sent separately (two words).
18. In a "SIMO," the master station's command to measure azimuth to sun.
19. Massing technique—all rounds timed to land on target simultaneously (abbreviation).
20. System used to compute the gunnery solution at battery and platoon levels (abbreviation).
21. An artilleryman who performs best when elevated for maximum visibility (abbreviation).
22. The angular deviation between this and the target is measured in mils.
24. In a 3x6 FA unit, the BC's right-hand man (abbreviation).
25. Horizontal clockwise angle between grid and magnetic north commonly associated with the DC (abbreviation).
26. A relative, but effective, measure of cannon wear-check from your howitzer operator's TM (abbreviation).
27. Very shortly this ammo type will replace HE as the most common (abbreviation).
28. In terms of accuracy, the type of fire artillery delivers.
29. Active ingredient in most smoke rounds (abbreviation).
31. F in FASCAM.
32. Fires for the force as a whole; one of four standard tactical FA missions (abbreviation).
33. P in the DAP boresight technique.
35. Word (often repeated again and again) that preceeds the command in 18 Across.
36. M110's caliber, according to the metric system.

DOWN

1. Must be added to the angle of site because projos trajectories aren't rigid (combination form).
2. A spotting-round between observer and target.
4. One type of artillery classification by cannon type; the M107 was this.
6. Number of elements in the call for fire.
7. Correction used when an air burst is too high.
8. Place one can go locally on his own time to learn about his MOS/job (abbreviation).
11. FO controls delivery of each and every round in this mission (three words).
13. A standard tactical mission—one unit's fires added to that of another.
14. FO's home on the range (abbreviation).
15. Appropriate correction word for condition in 2 Down.
16. An artillery responsibility—fires delivered into the enemy's rear areas.
17. Condition that exists when firing within 600 meters of friendly forces (two words).
21. To measure the deflection to an aiming point without moving the tube.
22. Son-of-FADAC (abbreviation).
23. If it's this or less (in meters), it's a minor deviation correction.
30. Applied to deflection (especially in high-angle) to offset the projo's right-hand nature.
31. Horizontal clockwise angle from the line of fire to the OL (abbreviation).
32. A celestial body that may be used for hasty survey.
34. This fan's for observin', not for coolin' (abbreviation).

For the answers to this puzzle, see the April 1991 edition of ***Field Artillery.***