

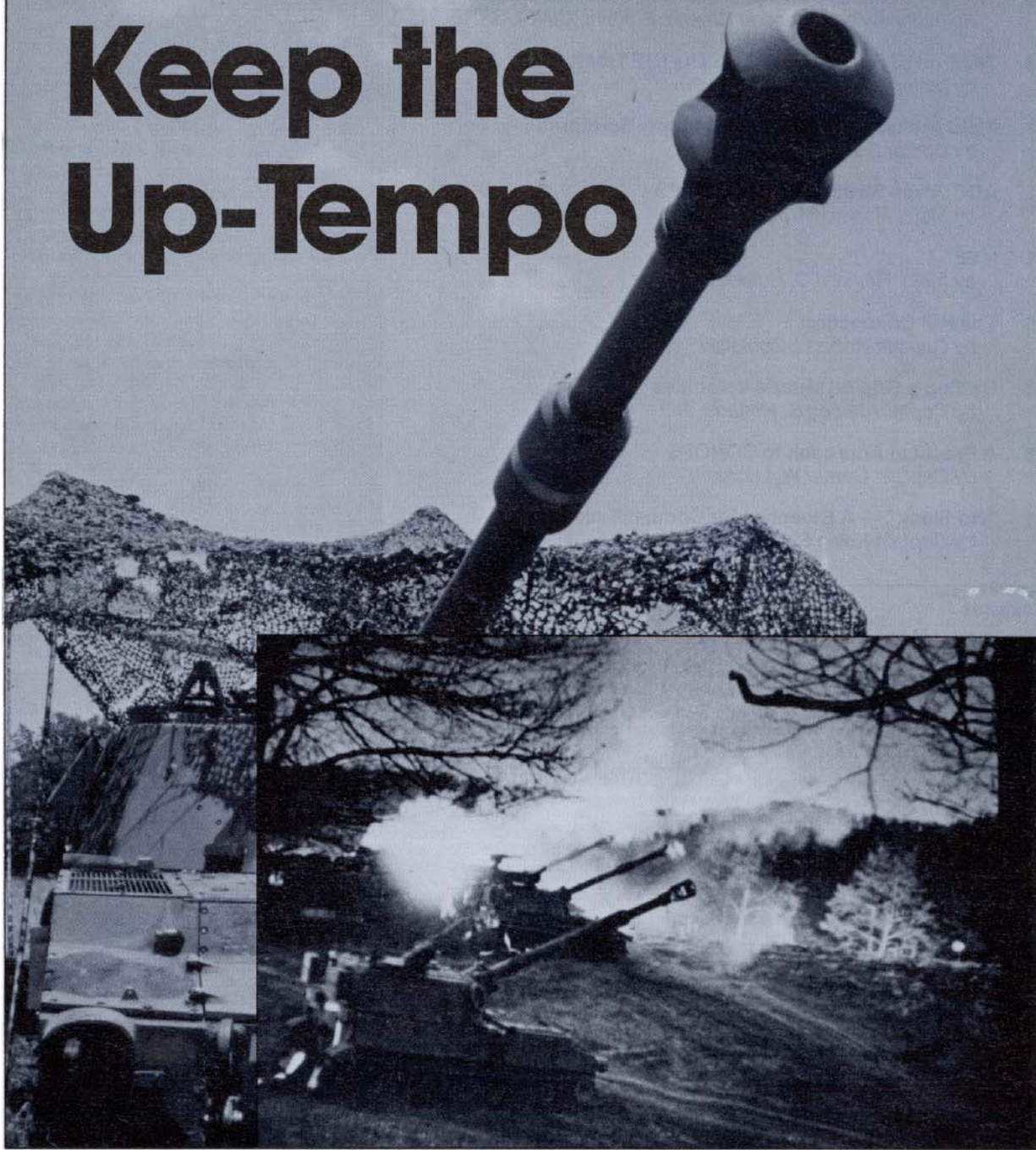


Field Artillery

A Professional Bulletin for Redlegs

October 1988

Keep the Up-Tempo





October 1988

Articles

- 10 The Key to Field Artillery—Focusing Combat Power**
An Interview with General Crosbie E. Saint, CINCUSAREUR
- 13 The End of the Pershing Era: The INF Treaty**
by Major Daniel L. Breitenbach
- 17 Field Artillery Ammunition Resupply Solutions**
by Doctor Robert A. Kromer
- 22 AOE Force Structure and CONOPS**
by Major Ronald M. Janowski
- 31 MSE**
by Major Richard C. Huber, SC
- 35 The HIP Connection**
by Captain Robert I. Zabielski
- 43 Getting a Grip on Muzzle Velocities**
by Captain James B. Rhoads, Jr.
- 46 A Practical Approach to CONOPS**
by Captain Gerald W. Lucas
- 51 "No Slack" — A Blueprint for Combat Excellence**
by Captain Kevin S. Donohue

Features

- | | |
|------------------------------------|--------------------------|
| 1 On the Move | 28 Redleg News |
| 2 Incoming | 39 Right by Piece |
| 25 View from the Blockhouse | |

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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 interdependence 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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Keeping Up With the Ivanovs

In a recent article in *Red Star Thrust* (published by FORSCOM), Lieutenant Colonel Norm Hoffman points to the Soviet view that the human dimension is the key to winning future wars. The specific quality he highlights is stress resistance. He says, "The Soviets believe the force that is able to endure the longest will be victorious."

Hoffman goes on to say that to increase soldier resistance to the effects of the unparalleled intensity of modern combat, Soviet military leaders have started a rigorous psychological training program founded on the principles of endurance, simplicity and repetition. They try to enhance soldier endurance by simulating stressful combat conditions in training. Applying the rule of simplicity means concentrating on simple tasks using simple equipment. The principle of repetition focuses on retaining critical combat skills, even after stress has degraded soldier performance.

So, we know the Soviets are looking closely at this human element to keep up the tempo of combat. We also know they plan to seize the initiative to increase the combat stress on their opponent. Finally, we are painfully aware the Soviets continue to pour a large share of their gross national product into maintaining a massive, well-equipped force.

The message is clear. We must train and equip our forces to meet the demands of continuous operations worldwide. "Keeping up with the Ivanovs" is not a bourgeois pastime. We hope this issue helps Field Artillerymen better meet the challenge.

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Field Artillery

On the Move

MAJOR GENERAL RAPHAEL J. HALLADA

Continuous Operations and the Human Dimension

The AirLand Battlefield holds many challenges. Before the fog of war enshrouds us, we must consider the conditions under which we expect to operate while we wage that war. The struggle will be intense, lethal and chaotic as each side attempts to maximize the capabilities of its own forces and doctrine.

At the commencement of hostilities, the Warsaw Pact will methodically replace and reinforce initially engaged units from follow-on echelons. By sustaining this momentum throughout the campaign, they hope to apply such pressure that they'll break our will to fight. Such tactics, when coupled with the development of sophisticated night vision devices, have dramatically increased the Threat's ability to conduct continuous operations.

The implications of such operations are especially pressing to Field Artillery. As the most lethal arm on the battlefield, we must develop our tactical doctrine to support continuous operations. Failure to do so would be tantamount to abandoning the maneuver forces on the battlefield.

As we apply emerging technologies to the art of warfare, we must not lose sight of the human dimensions. Prolonged exposure to combat reduces individual and unit effectiveness. A full-strength battery performing its mission in continuous operations—losing sleep, extending its physical activity and enduring combat stress—can be reduced to functioning at an unacceptable level. Typically, we think of losing combat strength in terms of soldiers' death or injury. But there's another, equally lethal factor—combat stress.

Studies at the Army Research Institute indicate we can expect one combat stress casualty for every four or five wounded in action. As wounded-in-action casualties increase, so do combat stress casualties. During the 1973 Yom Kippur War, the Israeli combat stress casualty to wounded-in-action ratio was 1:3. One battalion involved in the Israeli Lebanon operation of 1982

As the most lethal arm on the battlefield, we must develop our tactical doctrine to support continuous operations.

had 31 of 36 casualties caused by combat stress.

These figures suggest that stress doesn't respect rank. Those tasks most dependent upon reasoning will suffer first from the effects of sleep loss and fatigue. The cognitive tasks performed by battery leaders, fire direction personnel and fire support officers are the most susceptible to the stress of continuous operations. Gross mental errors by our leaders could cause dire consequences. As Redlegs, our goal, then, is to train ourselves and our soldiers to such a level of performance that we minimize errors and assure victory.

First, we must inspire a spirit that endures. The mere presence of respected leaders on the battlefield will do much to allay the fears and sense of isolation our soldiers most certainly will feel. The vast dispersion of firing sections across battery fronts and the use of cover will only add to our cannoners' sense of isolation. Artillerymen will see their comrades die; at the same time, most will never see the dynamic results of their efforts in battle. This could prompt a sense of inadequacy or self-doubt that only concerned leadership can overcome.

We also must keep our soldiers informed of the tactical situation and do everything we can to restore some semblance of normalcy to their lives. In practical terms, this means ensuring soldiers receive mail regularly, have hot meals on time and have time for personal hygiene.

Second, we must organize, plan and train for the rigors of continuous operations. We must anticipate the physical and mental demands, identify the mission-essential tasks and then train them to the point of overlearning—the point at which responses become almost

automatic and, therefore, resistant to stressful, fatiguing conditions.

It's also essential to cross-train all members of the battery to take over others' duties, to include command. This will add depth to our force and help organize our units to perform shift work. Such shift rotations will allow our soldiers time for rest and sleep, which they must have if we are to remain an effective fighting force.

The artillery usage projection for a 155-mm howitzer, based on Training and Doctrine Command-approved standards, is 500 rounds per day during surge operations in a European scenario. That equates to each crewman's handling more than five tons of ammunition per day, assuming a full crew of nine men. Our cannoners will be physically exhausted from ammunition handling alone.

The AirLand Battlefield promises an abundance of targets for the artillery. Constant fire missions, displacements and occupations will leave little time for our soldiers to rest. Furthermore, Army war-gaming studies conclude that no more than two howitzers from an eight-gun battery will be operational after 16 hours because of counterfire, if the battery moves only two or three times a day. The best defense against counterfire is to move often, with most firing units projected to move at least 10-12 times per day.

The challenge before us is great, but not insurmountable. Leadership, more than ever before, will be the cornerstone for success in such an environment. In this Year of Training, we must train innovatively to meet the demands of 24-hour-a-day operations. After all, the most precious resource we have is the soldier, and he's our charge.



Incoming

LETTERS TO THE EDITOR

Response to "Fire Support in Mobile Armored Warfare"

The authors of "Fire Support in Mobile Armored Warfare" [Lieutenant General Crosbie E. Saint (recently promoted to General), Colonel Tommy R. Franks and Major Alan B. Moon, June 1988] suggest that today's fire support coordinators (FSCOORDs) and artillery organizations must accomplish the traditional missions at a faster pace in a very fluid environment with a greater number of players and more complex systems.

The article raises many issues and suggests some changes to Field Artillery tactics. However, before adopting these suggestions, several doctrinal issues must be discussed and resolved.

The article begins advising "...focusing and economizing combat power at key points and times to seize the initiative...." A list of tasks the fire support system must accomplish to do so effectively then follows: "...shape, silence and selectively attack targets, ...plan, coordinate and integrate ...electronic warfare (EW), mortars, close air support (CAS) and Field Artillery with other battlefield operations ...[and] develop a fire support scheme of maneuver...." All emphasize the fundamentals of maximum, feasible centralized control in a fluid situation, as opposed to present doctrine that recommends decentralization in the offense. How does the Mobile Armored Corps propose to balance these two requirements? With "Storm Artillery," say the authors.

Storm Artillery sounds very much like a dedicated battery. Granted, dedicated batteries are employed in support of lead companies in special situations while Storm Artillery apparently moves with the lead battalions in all situations, but the results are the same. The FSCOORD sacrifices centralized control for responsive fires. This tactic raises several questions.

First, why is Storm Artillery necessary? The FSCOORD is placing lightly armored howitzers and canvas-backed M548s in the realm of the tank so they can quickly engage targets 3,000 to 4,000 meters out. Why not employ mortars in that role? The 4.2-inch mortar platoon has two fire direction centers (FDCs), six mortars, a guided,

anti-armor mortar projectile and a range of 6,840 meters. It moves into action quickly and has a high rate of fire. Using a portion of the direct support (DS) battalion as accompanying artillery—a concept we abandoned after World War II—may be justified, but only after making maximum use of the supported force's mortars.

Second, "shooting a lot of the correct type of rounds at a few targets..." consists, to a large extent, of massed fires. How does a DS battalion do this effectively when one-sixth to one-third of its firepower is never on a common grid? What happens when the brigade commander places two, or even three, task forces abreast? How can the DS battalion mass its fires?

The authors answer to the DS battalion's massing fires: by "piling on...By moving continually under an umbrella of reinforcing units,...the direct support unit keeps up...[and will] 'pile on' when required." How many reinforcing units? How do they keep pace with the maneuver formation if the Storm Artillery is continuously moving? If the bulk of non-DS Field Artillery is reinforcing, with what does the division FSCOORD influence the battle?

Pile on requires definition. It sounds like multiple-fire units not on a common grid shooting at the same target at roughly the same time. This is a second-best tactic for a Field Artillery establishment that has led the world in effective tactical fire direction.

Closely connected to the issue of massed fires is the issue of employing the tactical fire direction system (TACFIRE). While we should not

build tactics exclusively around hardware, we do need to consider its capabilities and limitations. Except for a passing reference to mutual support, TACFIRE is not mentioned in the article. How does the Mobile Armored Corps propose to employ TACFIRE? To say many challenges exist in this area understates the case.

Finally, the authors raise two non-Field Artillery fire support issues: attack helicopter integration and offensive EW coordination. Both systems belong to non-division artillery (Div Arty) elements, and both are generally under operational control (OPCON) of maneuver elements.

Employing attack helicopters against Threat field artillery as the authors suggest may be a novel idea, but we shouldn't adopt new tactics unless they have a marked advantage over the old. Attack helicopters kill tanks more easily than Field Artillery does and will probably do more lasting damage to Threat field artillery than cannon-delivered counterfire. But employing attack helicopters against Threat field artillery incurs both resource trade-offs and command and control ambiguities.

Employing attack helicopters requires suppression of enemy air defense (SEAD) fires. SEAD consumes fire support officer (FSO) time and ammunition resources. Cannon-delivered counterfire is far simpler because target development, ammunition and mission execution all remain within the Field Artillery community. In addition, even when SEAD is fired, cross-forward line of own troops (FLOT) operations are risky for attack helicopters. Synchronization may be a tenet of AirLand Battle, but simplicity is a principle of war. Thus, the question: under what mission, enemy, terrain, troops available



Cobra — Employing attack helicopters for counterfire requires SEAD fires and consumes the FSO's time and ammunition resources.

and time (METT-T) conditions has the Mobile Armored Corps found it advantageous to favor the risk incurred in cross-FLOT operations over the simplicity of cannon-delivered counterfire?

Also, how has the Mobile Armored Corps resolved the command and control issue of employing attack helicopters in a fire support role? The authors state the fire support scheme, not the division scheme of maneuver, includes the use of attack helicopters against Threat field artillery. Whether the Field Artillery community likes it or not, aviation considers itself a maneuver arm. An article in *Military Review* ["Attack Helicopter Operations in Air Land Battle: Close Operations," June 1988] co-authored by General Saint describes a helicopter attack against Threat artillery as an operation similar to a raid. What command relationship does the Mobile Armored Corps use? Is an attack helicopter battalion placed under operational control (OPCON) of the Div Arty and given a counterfire mission, or does the attack helicopter battalion operate as a maneuver element with Field Artillery in direct support of it? If the latter is chosen, where does that Field Artillery come from? How much

ammunition should be expended in SEAD programs? Is a DS mission appropriate, or is a non-standard mission required? The answers to these questions are required to "...focus fire support as a prism focuses the sun's rays."

The subject of synchronizing EW raises similar questions. If offensive EW is fire support, what role does the division FSCOORD play in allocating it? Again, command relationships can either help or impede synchronization.

The EW liaison officer (LNO) of an asset under OPCON of the maneuver brigade reports to the brigade S3. The EW LNO of an asset under OPCON of the Div Arty but supporting the maneuver brigade reports to the brigade FSO. Attaching offensive EW assets to the Div Arty would be consistent with the US Army's principle of unity of command, as opposed to the present practice favoring the British Army's principle of cooperation. Simplicity favors the former. What does the Mobile Armored Corps say?

The authors conclude with a call for "mental flexibility...[to]...take advantage of...mobility of fire." I am in favor of both mental and physical agility. But before we of the Field Artillery

community commit ourselves to dedicated batteries in a situation requiring frequent massed fires immediately responsive to brigade and division commanders, we must be sure we can cover all the bases. As FSCOORDs, we must establish or reaffirm, in conjunction with other branches and services, command and control procedures that facilitate massing all fire support means.

The authors described a battle the US Army may fight against to the Threat's operational maneuver group. They proposed possible Field Artillery tactics and identified many required fire support tasks. It's now up to the Field Artillery community to answer some hard questions so we can make the fire support system work to support the maneuver commander and, together, win that battle.

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Authors' Response to Major Capps

Major Capps' comments on our article "Fire Support in Mobile Armored Warfare" are on the mark. Several of his points are well made. The fire support business is a "thinking man's game" that needs smart, dedicated professionals who think, challenge new ideas and, at the same time, recognize the need to modernize archaic ways of doing business. Fire supporters on tomorrow's battlefield must accomplish fire support tasks faster, coordinate with more folks and employ more complex systems. Hence, we press for improved Field Artillery tactics and seek innovative thoughts. Old answers won't resolve new questions.

The concept of Mobile Armored Warfare decentralizes control within the brigade zone, but it does not imply the

dedication of batteries. Simply, "Storm Artillery" postures cannon to keep up with maneuver to provide responsive fires and accommodate the characteristics of the non-linear battlefield. Hip shoots, moving close behind lead task forces and direct fire are techniques to increase survivability, maintain attack momentum and destroy Threat forces.

There is a distinct difference between command and control of the *movement* of cannon and command and control of the *maneuver* of fires. Fires are planned and called for by FSOs and continue to be massed by battalions. So, movement of direct-support fire units is decentralized, but as direct support units move under the reinforcing umbrella, fires are still massed (focused) and

maneuvered. METT-T still rules.

Mobile Armored Warfare doesn't change the employment of TACFIRE which, for the immediate future, will continue to be our means of providing fire support. We just have to get faster and better at using TACFIRE capabilities. And, yes, attack helicopters are a maneuver arm, but attack helicopters can be employed in a fire support role. Even if attack helicopters are employed in a maneuver role, the fire support implications and fire support tasks to support them demand synchronization. This notion is discussed in *FC 6-20 Principles of Fire Support* (Coordinating Draft), which characterizes attack helicopters and electronic warfare capabilities as fire support ingredients.

It's up to all of us to hammer out the tough questions facing today's fire supporters. Hats-off to Steve Capps whose interest and work serve our Arm well.

Tommy R. Franks
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Major, FA
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Response to "The Flying Box': Supporting the Mobile Armored Corps"

I commend Captain Jorge M. Fernandez for his article, "The Flying Box': Supporting the Mobile Armored Corps," [June 1988]. His ideas and experiences on movement techniques and deploying for hipshoots are excellent. However, I disagree with his views on employing M110A2 howitzers immediately behind the attacking maneuver forces to provide quick, direct or indirect fire.

His opening paragraph discusses the possibility of using M110A2 howitzers to reduce bunkers, fortified buildings and other well-prepared strongpoints from distances of 2,000 meters, while mechanized infantry and armor forces maneuver to assault these positions from the flanks. Such an idea is tactically unsound—at least from the stance of conserving valued Field Artillery resources, to include M110A2 howitzers.

Tanks, improved tube-launched, optically tracked, wire-guided (TOW) missile vehicles (ITVs), Bradley fighting vehicles (BFVs) and attack helicopters are all faster, much more accurate direct-fire weapons than howitzers at ranges of 2,000 meters and beyond. Tanks are particularly well-suited for such fire-support missions, since they're heavily armored and can survive small-arms, mortar, heavy machine-gun and artillery fires and perhaps an antitank round. On the other hand, an M110A2 howitzer and its crew have little hope of surviving such attacks.

Modern M60A3 and M1 tanks have laser range finders that provide nearly instantaneous, precise ranges for ballistically solving gunnery problems. Howitzer crews determine their range to target using a map or the section chief's best guess. The direct-fire probability of hit for a tank round far exceeds the probability of hit for an 8-inch artillery projectile at a range of

Engaging Strongpoint Targets with M110A2 Howitzers Using Indirect Fire at 2,000 Meters

Charge	Muzzle Velocity	Elevation	Maximum Ordinate
1 GB	254 m/s	163 mils	82 m
2 GB	278 m/s	135 mils	68 m
3 GB	308 m/s	109 mils	55 m
4 GB	352 m/s	89 mils	46 m

2,000 meters. Admittedly, 200-pound, 8-inch high-explosive projectiles will devastate most targets, particularly when fuzed with concrete-piercing or delay fuzes. However, howitzer direct fire is slow compared to the speed and accuracy of tank fire.

Since most bunkers and fighting positions are likely to be camouflaged, they're going to be difficult to detect. The infantry, armor and attack helicopters' direct-fire weapons have significantly better optical and thermal-imaging systems, providing more accurate all-weather, day and night direct-fire aiming than any howitzer.

Tanks, ITVs, BFVs and attack helicopters all can engage such targets much more accurately and faster than howitzers can. Even using an engineer asset such as the combat engineer vehicle (CEV) with its 165-mm demolition cannon may be a better choice, if it can range the target. The CEV fires from a tank-like vehicle. Thus it has ample armor, enabling it "to take a pounding" howitzers can't hope to withstand.

The charges required to engage strongpoint targets using the M110A2 howitzer have flat trajectories that require flat terrain or terrain with high ground at exactly the correct point under the trajectory. Otherwise, the rounds will burst short of the target.

Engaging Strongpoint Targets with M110A2 Howitzers Using Direct Fire at 2,000 Meters

Charge	Elevation
7 WB	30 mils
9 WB	18 mils

Due to the relatively flat trajectories, soldiers must be careful of their minimum quadrant elevation, lest they have a premature burst from hitting a tree or ridge close to the guns. High-angle fire is not an option; the range is simply too short. The howitzer can't elevate high enough to bring the rounds in that close, regardless of charge. This flat terrain situation is precisely what will cause howitzers and their crews to be destroyed by rifle and machine gun fire or worse, by larger antitank guns or missiles. In the defense, strongpoints have the initial advantage of surprise, while the commanders have an excellent knowledge of the terrain they command. The strongpoints will be immobile, ideally suited for indirect-fire attack; and to keep them immobile, a healthy dose of FASCAM [family of scatterable mines] may help.

All soldiers, particularly leaders, must know and select the best available weapons for the task at hand. Soldiers must fight aggressively, always seeking the offensive. But they must do it with the intention of being able to win and fight again tomorrow. Placing

M110A2 howitzers on what amounts to the forward edge of the battle area (FEBA) and then attempting to engage enemy defensive strongpoints is not conducive to Field Artillery survivability. Such practices are tantamount to self-defeat.

My solution to Captain Fernandez' situation is to maintain a portion of indirect fire support in position, within range and ready to fire at all times. Even at the most extended ranges, a cannon in an established position with directional survey control, current meteorological data and accurate velocity errors may hit the same target more quickly and with greater accuracy than it can on any hipshoot mission.

The firing element in a deliberately occupied position will provide more accurate and timely fires for several reasons:

- The unit is oriented, laid and ready to fire.
- Working internal firing battery communications are installed.
- Ammunition is readily available for extended missions.
- Firing position selection is on our terms, not the enemy's.

Emplaced howitzers can respond more immediately with accurate fires than an artillery unit crossing the battlefield with its maneuver elements. When there is no other artillery to fire, a hipshoot is a tactic of last resort. Direct-support artillery units and those likely to have reinforcing missions must be able to hipshoot and perform direct-fire missions, but I wouldn't give those missions the highest training priority in any firing battery.

The M110A2 howitzer, although extremely accurate, is not the ideal howitzer to follow immediately behind the mechanized maneuver forces; the M109A3 would be the better choice. However light its armor, the M109A3 has turret armor for its crew where the M110A2 has none. Also, the M109A3 offers a variety of shell-fuze combinations, which the M110A2 simply doesn't provide. Bigger isn't always better; sometimes more ammunition variety is better.

Another fire-support means Captain Fernandez doesn't address is the

infantry's mortars. Mortars have a variety of shells, may be laid directly on a target, can fire comparatively high rates of fire, are lethal to exposed troops, can engage targets very quickly and, in mechanized infantry units, can deploy from armored personnel carriers. Mortars can support maneuver commanders quickly and effectively.

Maneuver forces also use overwatch and bounding overwatch techniques to provide direct-fire protection. Overwatching elements may provide substantial suppressive fires and can do much of what Captain Fernandez wants the unprotected M110A2 howitzer crews to do. Both the infantry and armor forces fire from armor-plated, highly maneuverable fighting vehicles. Tanks and infantry fighting vehicles don't have to disengage travel locks, move their cannon tubes back "into battery" after moving, or lower and dig in spades. Nor do they carry only a limited number of complete rounds of ammunition on board.

Maneuver commanders must use all of their weapons systems and reconnaissance units effectively. Scouts, cavalry, unmanned aerial vehicles and other intelligence preparation of the battlefield (IPB) resources enhance locating or predicting dangerous positions before the main body arrives. As a result, we may be able to reduce the need for some emergency fire missions.

We must advise maneuver unit commanders as to which fire support means will do the best job of eliminating enemy resistance. The maneuver commander's fire support coordinator (FSCOORD) is the man to advise him. I urge every soldier, particularly leaders, to know the strengths and limitations of all available weapons systems and to use these weapons effectively and efficiently.

Occasionally, we may need to use an M110A2 howitzer to render a strongpoint defenseless through direct fire, but we must do it under limited visibility conditions—at night, under smoke or from a well-concealed position. And if possible, we should mass fires by firing more than one howitzer at a time.

In most instances, howitzer direct

fire should be used as a last resort to defend the artillery battery. M110A2 howitzers are ill-suited for challenging modern and even not-so-modern direct-fire weapons systems.

General George S. Patton once said, "Accept the challenge, so that you will know the exhilaration of victory." I wish to add—Be alert and avoid placing your artillery where it may learn the agony of defeat.

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Author's Response

I agree wholeheartedly with Major Bralley's letter on the use of M110A2 howitzers for Storm Artillery. The 8-inch howitzer is better suited for general-support indirect fire because of its extended range and superior accuracy.

Granted, the M109 series howitzers are much better for Storm Artillery tactics. However, the M110A2 crews must train for direct-fire missions as described in my article. They must be prepared to carry out these tactics if called on to do so by the maneuver commander.

Using 8-inch howitzers to reduce reinforced positions has precedence in history. During the Lorraine Campaign in the fall of 1944, General George S. Patton's Third Army brought up 8-inch howitzers to directly fire on bunkers along the Siegfried Line and to help reduce the fortified defenses around the city of Metz.

The Mobile Armored Corps concept is offensive. Field Artillery, including M110A2 units, must be ready to carry out the direct-fire tactics to support it.

Jorge M. Fernandez
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Response to the Survivability Issue of *Field Artillery*

After reading the April issue of *Field Artillery* dealing with the Battle to Survive, I was surprised to find that the most vulnerable Field Artillery system, the M981 fire support team vehicle [FSV, formerly called FIST-V], was not mentioned at all.

To fully use the FSV, the company fire support officer might find himself in a position extremely vulnerable to enemy direct and indirect fire. To maintain the most important function of the FSV, establishing and maintaining the communications link between the maneuver commander and fire support assets, it must be on high ground or at least not masked by terrain. The OPFOR [opposing forces] artillery is sure to target the key terrain it's on, leaving the hammerhead and radio antennas of the FSV open to damage.

The FIST [fire support team] is also the very best source of firsthand battlefield intelligence for the Field Artillery battalion. By reporting what he sees, the forward observer can keep the Field Artillery direct support battalion S3 informed about enemy as well as friendly dispositions. To accomplish this mission, key terrain (again high ground) is necessary, making the FSV vulnerable to enemy fire.

We can use the lasing capability of the FSV properly only in a position that offers good visibility of an engagement area or kill zone. This position is sure to receive preparatory fires before any OPFOR advance.

The distinctive silhouette of the vehicle also is a problem. For units not equipped with the M901 improved-TOW [tube-launched, optically tracked, wire-guided missile] vehicle, the FSV becomes that troop or company's most easily identifiable vehicle, especially with its four radio antennas. The defensive capability of the FSV consists of an M60 machine gun, which is effective only against dismounted infantry.

The performance characteristics of the FSV also are not the best. At 27,900 pounds, the FSV is almost 3,000 pounds heavier than a regular M113A2 but has the same engine and horsepower, which makes disengaging from a threat difficult.

In conclusion, the company fire support officer must decide, with the guidance of his troop or company commander, how best to employ his vehicle, knowing its capabilities and especially its limitations. He also must consider that he must be in the best



possible position to influence the battle by seeing the battle without being seen. If that means being in a vulnerable position, then so be it; that's why FISTs are *forward* observers.

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The Key to Firefinder Survivability

Chief Warrant Officer [Thomas] Curran's article ("Increasing Survivability of Firefinder Radars," April 1988) is interesting and informative.

It's true there are two types of cueing: random and situational; however, we must remember that random cueing is the least desirable. Rather than decrease the possibility of Firefinder's being detected, random cueing actually could increase that possibility by cueing the radar when enemy activity is low. The radar could be radiating when the enemy is not firing. Random cueing is not tactically sound. It takes radiating control of this valuable asset away from the commander and places that control on a set, non-standard schedule. The enemy is not likely to shoot based on our computer-generated radiating schedule.

Mr. Curran states we should base this

type of cueing on intelligence estimates. We should base either type of cueing on intelligence estimates, commanders' target criteria and target-value analyses.

Currently, situational cueing is the most desirable. The commander controls the cueing and can maximize the use of critical friendly and priority zones. He has the flexibility (based on the tactical situation) to establish a quick-fire channel (if needed) and to exploit the full potential of Firefinder to support AirLand Battle.

It's impossible to set a definite time for when and how long to cue the radar or who should cue it. An experienced officer's best judgment, based on the tactical situation at that time, is the key to establishing when to cue Firefinder. An inexperienced officer might cue Firefinder because he hears one or two mortar rounds impacting close to his position. On the other hand, an

experienced officer might realize that one or two mortar rounds may only be harassment and interdiction fire used by the enemy to determine the effectiveness of our counterfire or pinpoint our radar. The commander can designate the fire support team, aerial observers, battalion tactical operations centers, brigade fire support officers (FSOs) or some other agency to cue Firefinder.

Mr. Curran suggests units should move the radar after two minutes of radiating and that it is imperative to keep the cumulative radiating time to less than two minutes. Any commander who employs Firefinder on that set amount of time effectively neutralizes his own radar capabilities by keeping the system on the move.

Just as a howitzer is, a radar on the move is useless to the maneuver commander. Both systems must be stationary and in range of their respective

targets to provide the required support. We shouldn't base the cumulative amount of radiating on a definitive time, but on the factors of mission, enemy, terrain, troops available and time (METT-T).

We shouldn't base radar survivability on the shoot and scoot tactics currently proposed by the artillery community. I agree, moving the radar is one method we can use to increase its survivability. Minimizing radiating time is another. But the real key to Firefinder survivability is to—

- Understand Firefinder capabilities and limitations and know how to use them to enhance your situation and worsen the enemy's.
- Know proper Firefinder employment procedures thoroughly.
- Understand that cueing is nothing

more than control of when and how Firefinder will radiate and who has been designated to cue the radar.

- Know your enemy and his capabilities and limitations as they pertain to the particular time and place where Firefinder is employed (i.e., good G2).

Firefinder can hurt the enemy and contribute positively to the outcome of any battle. Therefore, commanders and radar warrant officers concerned with supporting the maneuver commander and the counterfire battle must know Firefinder and the enemy it will be employed against.

Let's not set definitive times for radiating and movement. Don't let the enemy dictate to us; rather, let us dictate to him. Knowing these factors, then looking at worst-case and best-case situations, the commander can determine

the reasonable risks that he can take when employing Firefinder.

Gordon M. Baxendale
CW3(P), 211A
Target Acquisition Department
Field Artillery School

According to Colonel Harold L. Cooke, Director of the Target Acquisition Department at the Field Artillery School, the preferred method of cueing a Firefinder radar is situational. The cumulative radiation time of each system will be two to 15 minutes or more. Cumulative radiation before a Firefinder should move depends on the threat. This information will be included in the revision of FM 6-161 Field Artillery Radar Systems and become doctrine.

Editor

Response to "Light Fighter Battery Defense"

I know artillerymen wrote about the switched silhouettes [in the chart] on Page 11 of the April 1988 issue of *Field Artillery*. The towed artillery piece wasn't the same scale as the self-propelled howitzer, and scale is very important. However, of more concern to me as an ex-first sergeant (the man responsible for firing battery defense) was the article by Captain [Howard E.] Lee, "Light Fighter Battery Defense" [April 1988].

In a high- or mid-intensity conflict against heavy counterbattery, I would agree that dispersion would increase survivability. Five lightly armed enemy infantry could tie up a commander's dispersed sections and completely stop their ability to support the infantry. Captain Lee eliminated the reaction force and gave the area between sections to the enemy. (How many times have we had to send ammunition between sections in the same position area.) Try it with MILES [multiple integrated laser engagement system] equipment and one of the light-fighter infantry scout squads; the grunts will eat up a dispersed battery.

I prefer a tight, small fire base, where you can disperse the artillery rounds through fire direction center (FDC) computation. If you're going to stay in

place, dig in and fill sandbags. There's nothing like 10 feet of dirt to provide security. Put one third of your unit to sleep, interlock your battery defense with every friendly unit in the area and use a common-defense radio net with one commander.

I'd like to think the direct-support artillery unit in the light-fighter team would be in the forward battle area. If you're thinking rear battle area, you're too far back.

Captain Lee's final argument about the ease of initiating air assaults when elements are more dispersed is true. However, if friendly helicopters can get close to a firing section for pick up, so can enemy aircraft. Even worse, you could lose the helicopters and the howitzers by not being able to secure the pick-up zones with interlocking fire from the remainder of the battery.

My last point on dispersed defense, as he presented it, is where does the commander go when the "stuff hits the fan"? How many sections can he afford to lose before he moves the rest out?

Let's look at the conflicts of the past and see if the problem isn't more one of poor unity of command than of massed equipment and men. Combat gets lonely enough without spreading ourselves out

too far. Try it with MILES and a live-fire ARTEP [Army training and evaluation program] situation; there are some real problems in command and control with Captain Lee's ideas (e.g., which sections get the medics?).

We should put the howitzers around the battery operations center, ammunition sections and FDC. Put the machine guns and fighting positions around the entire area. Dig in, tie in with adjacent units and run patrols only if necessary. (Normally, you don't have the training or men to patrol well or often.) Be ready to move if counterfire strikes. Sound familiar? I spent a year in a mid-to low-intensity conflict area, and Fire Base Mary Ann would have been defeated much sooner if it had been five separate elements.

William E. Dungey
CSM, FA
4th Battalion, 58th Aviation

When we published our correction of the howitzer silhouette reversal in August, we also enlarged the M198 silhouette to the appropriate size. No slight intended.

Editor

Response to "Light Fighter Battery Defense"

FM 6-20-1 Field Artillery Cannon Battalion accurately states, "...artillery units that must fight off ground attacks are effectively suppressed"; therefore, units must eliminate the ground attack to provide effective maneuver support. Survivability planning starts with the knowledge that to complete our mission, we have to put our weapons into static firing positions. Whether these positions are 10 or 300 meters apart matters very little, except they must be defended.

The problem of whether or not an artillery unit can defend itself and continue its mission is relevant, but only as a matter of accepting risks. You can continue with fire support missions and defend yourself, but neither will be effective. Risk assessment is a command prerogative. All forces on the battlefield are obligated to protect themselves and to participate in defending higher, lower or adjacent units, regardless of their primary mission. Captain Lee advocates disregarding the "Basic Considerations for the Defense" (*FM 6-50 Field Artillery Cannon Battery*) [in his article "Light Fighter Battery Defense"] and needlessly risks unit destruction.

The hardened platoon concept in this article has great merit as a way to organize for the defense, but lacks methods "to conduct the defense using hardened platoons." Detailed defensive planning adhering to the basic considerations for the defense will eliminate the risks implied in the article (see STP-13B14-SMTG, Page 3-109). These risks are the result of an inherent dislike of "conventional battery defense methods" and the need to enhance air assault operations. A discussion of these risks is in order.

"The first step toward eliminating the manpower drain is to defend only those points where friendly forces actually occupy space on the ground."

The risk here should be obvious—terrain is not considered. Cover large open areas with fire, not soldiers. Occupy avenues of approach or decisive terrain within the perimeter with hardened platoons. If you separate your forces, the need to coordinate between elements of the defense increases. Failure to coordinate will cause units to hesitate. No battery can expect to man

completely an extended perimeter. However, everyone who occupies a position must know who is on his left and right and what his primary sector of fire is. Failing to know these dooms any defense.

"Leaders should plan to drop the concept of a reaction force and make each hard point responsible for its own defense." In this one statement, the unit commander subjects the hardened platoons to piecemeal destruction by inferior forces by having no reserve force. In placing two howitzers together for mutual support, the concept of mutual support past that level is then forgotten. The reaction force is any group of soldiers, taken from a less-affected area of the perimeter, that destroys or ejects a hostile threat.

If one platoon or area is attacked, a designated platoon can react with more firepower than a piecemeal reaction force can. The real strength of the hardened platoons is that they can react.

The designated reaction force platoon, in this case, is one howitzer section plus part of the other section. This leaves the other section (minus) to defend both howitzers or to move them to

Basic Considerations for the Defense

- Use of Terrain
- Defense in Depth
- Establishment and Maintenance of Security
- Dispersion
- Establishment of Priorities
- Defense in all Directions
- Mutual Support
- Control
- Flexibility

FM 6-50 Field Artillery Cannon Battery has an excellent discussion of each consideration.

alternate positions.

This reaction force would have an E6 commander with radio communications, an M60 team, two E5 team leaders, two grenadiers and two riflemen with light antitank weapons (LAWs) already assembled. All the commander would do is control the defense when the ground attack starts.

For example in Figure 1, the left platoon reports it's under a ground attack by a squad-sized combat patrol 600 meters north of target reference point (TRP) 0001. In this case, the left platoon

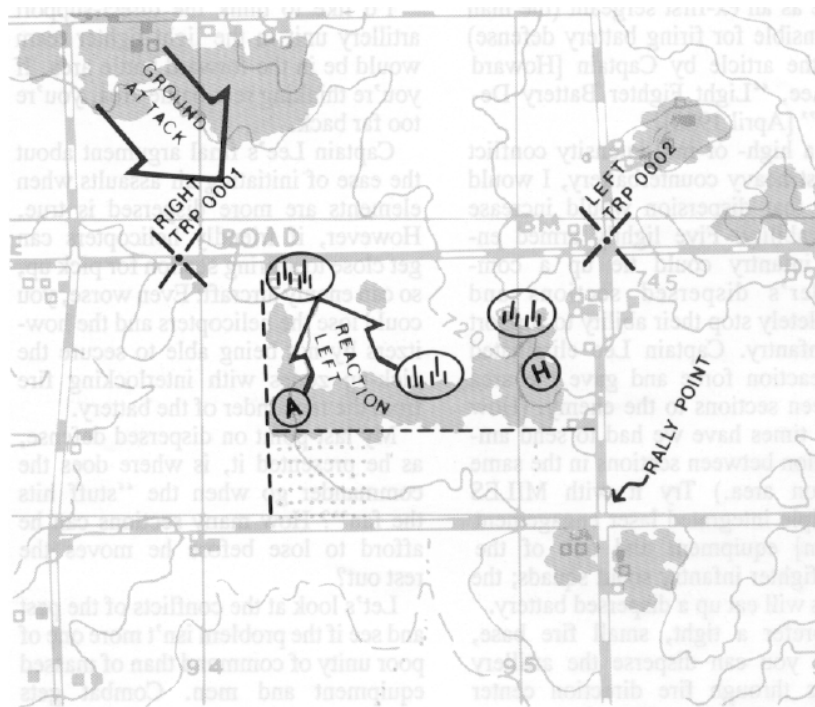


Figure 1: If one platoon or area is attacked, a designated reaction force platoon can react with more firepower than a piecemeal one.

has the immediate, mutual indirect fire support of another battery or the right platoon, which has the firing data for this preplanned target.

The effect of this mutual support with artillery fire to fix the ground attack is obvious. A battery officer must adjust the right platoon's artillery fire using 100/r. The reserve force can move to an attack position while the supporting fire fixes the enemy force. The fire mission alerted the battalion that the battery is under infantry attack and not ready to accept missions until the threat is eliminated. This quick reaction by the separate platoons can ensure their mutual defense.

"Unfortunately, the battery loses internal integrity with this configuration. The unit will not have interlocking fires between sections...."

The configuration loses integrity through the commander's failure to plan for interlocking and defensive fires required for his *battery defense!* Units can fill dead space between platoons in the same manner as in a conventional defense—with mines, supplementary M60 machine-gun fighting positions or other means. We must find, fix and destroy the threat outside the perimeter. The defense diagram (Figure 2) shows weaknesses the enemy could exploit and areas with deadspaces to cover. The diagram shows two large and some smaller deadspace areas in front of the position.

Units must plan and implement interlocking fields of fire meticulously. The diagram shows how to modify the initial defensive plan. The commander directs the unit to cover the deadspace in the front of the position by direct fire from howitzers one, three and six using muzzle-action, beehive projectiles. For the flank deadspace, he repositions the M60 assigned to the first howitzer section. For the deadspace behind the position, he directs the fourth section to prepare a supplementary machine-gun position. Until these two machine guns are sited, he directs command-activated claymore mines be emplaced.

"Counterbattery fires pose another danger to the unit..the unit must be prepared to lose two complete sections."

The risk of losing two howitzers instead of one means we failed to plan to limit that vulnerability (see *FM 5-103 Survivability*, Page 2-4, "Protection

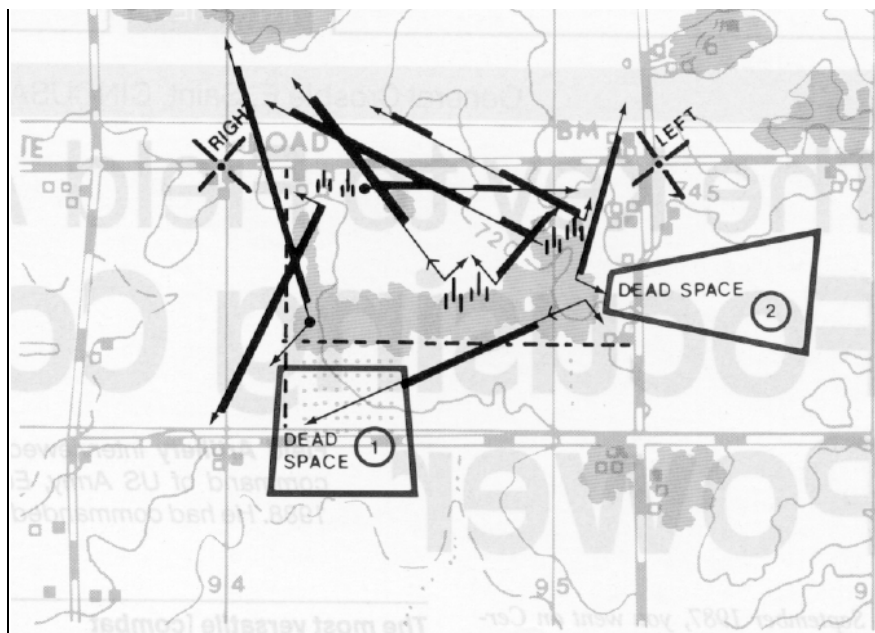


Figure 2: This defense diagram shows weaknesses the enemy could exploit and areas with deadspaces to cover. (Grazing fire isn't to scale; 600 meters is the maximum possible.)

Needs"). Mutually supporting sections can construct more protection than one section alone. Soldiers are protected first.

Howitzer ammunition is the most dangerous and the next most vulnerable common element to protect. The sections dig a common ammunition pit with overhead cover for joint use. Then, even if the platoon must displace hastily, ammunition survivability is possible. Next, a protective wall can separate and later surround the high-mobility, multi-purpose wheeled vehicles (HMMWVs).

The light howitzer's most vulnerable aspects are fire control and recoil systems. Soldiers must learn to remove the sights and go into a protected position quickly. By using a protective 10-foot-by-three-foot-by-three-foot wall between howitzers and by sand-bagging the recoil system, the hardened platoon can accept a near miss from medium artillery, losing one not both howitzers (*FM 5-103*, Page 4-44). The first option is always to let the platoon occupy terrain that affords some protection in an area it can improve cover rapidly.

A vulnerability not discussed in the article is vulnerability to an air attack by helicopter or high-performance aircraft. The signature of hardened, two-gun platoons is much less distinguishable (when not actually firing) than six howitzer-section positions

rounded out by support vehicles. The closeness of small arms gives a tight "cone of fire" for jet aircraft to fly through, times the number of platoons within range.

The Hind-D helicopter usually breaks left or right after a long-range attack. This tactic allows an unaffected howitzer platoon to easily control a direct-fire engagement. The howitzers could engage both sides of a Hind-D's line of attack simultaneously with direct fire (HE/VT at greater-than-minimum arming range). This platoon configuration allows for a simple counteraction to air attacks that may drive off an attacker, instead of letting the enemy make multiple, unchallenged air attacks.

How we defend calls for planning, first using the fundamentals of the defense and then accepting the risks if we disregard a consideration or expect to do two things at once. No organizational design can fit all circumstances, so we must realize all the risks and then take actions to limit them. Survivability is nothing more than limiting the risks you're willing to take.

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MAJ, FA
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38th Infantry Division

General Crosbie E. Saint, CINCUSAREUR

The Key to Field Artillery— Focusing Combat Power

Field Artillery interviewed General Saint shortly before he took command of US Army, Europe, and Seventh Army on 24 June 1988. He had commanded III Corps, Fort Hood, Texas, since 1985.

In September 1987, you went on Certain Strike REFORGER (return of forces to Germany), one of the largest exercises ever. What did you learn on REFORGER that will help you as Commander-in-Chief USAREUR (CINCUSAREUR)?

We learned a lot about tactics in a NATO environment and how to attack from the march. We learned that well-trained units can move very quickly.

The III Corps Artillery commander [Brigadier General David L. Cole] has come up with some interesting charts to focus combat power. You can look at them, in terms of organization and volume of fire, and tell who has the combat power to do what. The "who" changes with the situation.

I compare focusing combat power to operating a flashlight. You can turn on the flashlight, and it shines in a certain spot. Then you can move the flashlight around. You need the ability to move your combat power around the same way.

Usually, what happens is you [corps] say to one division, "I'll give you three extra battalions of artillery." Then the division says to the brigade, "Okay, I'll give you one of these three extra battalions." Then the brigade goes to the battalion and says, "You've got some more artillery." But nobody has figured out how to move it like a flashlight.

You've got to move that power so in the morning you support a river crossing, and then you take that "flashlight" and move it over to another division in the afternoon to conduct a breakthrough operation. Then you

The most versatile [combat power] is the artillery. If you can get it within range, it can do the job.

move it to another place to take out somebody's artillery because that night you're going to use helicopters.

From a corps' point of view, we need to move all of these assets around. Of course, the most versatile is the artillery. If you can get it within range, it can do the job.

Unfortunately, not enough artillerymen look at it that way. They stay within their doctrinal boundaries and produce measles sheets all over the place. That's why a battery shoots one round here and one round there. So another thing I learned is we need to shoot groups of fires and shoot corps and division TOTs [times on target]. They work well. But it's something you have to train to do.

The Army seems to have lost its expertise in some of these areas. In the past, we knew how to do these things, so we reinvented them for today's warfare.

We learned a lot about logistics—how to keep a heavy force supplied with fuel and food. Supply is always a major problem, unless you have your act together. That's why people don't move much—because it's very difficult. We relearned in some detail how to move a large unit.

If you're moving fast in a column—somewhat like a "pencil" going down the road—and you have only one-third of your battalions firing at a time, you're not using much ammunition.



But if you're on the defense and you've got the battalions spread out sideways with everybody shooting up a storm, you consume a lot of ammunition.

On the other hand, your fuel consumption is very high when you're on the move. Movement changes the whole logistics picture.

We need to change the whole system to "push" supplies instead of having somebody "pull" them. The higher headquarters usually knows what its subordinate units are going to consume before they do. It knows they're going to attack with one brigade up and two back waiting to attack the enemy's jugular at the right moment—or whatever. It knows what's in a brigade and that the brigade will travel, say, 50 miles.

So, why ask the platoon to tell the company to tell the battalion to tell the brigade to tell the division how much fuel the platoon will need? The guy at the top can figure it out on the back of an envelope. The only question is where does the unit want the fuel?

Another thing we figured out is how to dispense fuel very quickly. We can refuel a tank battalion in about 15 or 20 minutes. We sort of reinvented that, too.

However to a degree, we did invent the relationship between fire support and intelligence, which is rather key. How long does it take after you find out something about the enemy before fire support can act on the information? At what level is the collector and at what level is the firer? We created a corps-troops OPEL [operations cell] with six or seven people to answer those questions.

All the intelligence systems come in one van. It has a VFMED [variable format message entry device] and an artilleryman in it. It has the unit commander with the special mission for the corps troops—whether the mission needs helicopters, a cavalry regiment or nuclear fires. The OPEL gets the planners out of the mushy, big scheme of maneuver with their hands covering the map in a posture of coordinating to make something specific happen.

The OPEL has direct communications with the corps fire support cell where the air support operations center (ASOC) is—where we can use the firepower of our "Blue Brethren." [For more information about the OPEL, see "Synchronizing Deep-Attack Support: The Corps-Troops Operations Cell" by Colonel L.G. Nowak, *Military Review*, July 1988.]

At III Corps, you experimented with a permanent combined-arms task force at the battalion level. Would you explain that concept, and do you plan to implement it in USAREUR?

Tanks and infantry require teamwork in battle. That teamwork shouldn't be thrown together the night before. That hasn't changed much. But the pace of the battle has picked up. Therefore, the time and opportunity to get your act together before the event has decreased.

Whether you need "x" amount of

infantry and "y" amount of tanks depends on the situation. But the headquarters above the tanks and infantry needs to be configured so it can support either tanks or infantry with very little adjustment.

Our current TOEs [tables of organization and equipment] don't allow you to do that. I understand TRADOC [Training and Doctrine Command] has developed a new headquarters TOE of one of these combat battalions so you can easily put tanks or infantry together. The TOE configures them so they live, train and subsequently fight together with confidence. And the FIST [fire support team] is right there with them. They'll train on battle drills so they can act quickly. That was one of the great advantages of the Germans in World War II when they first started off in Belgium. They had honed their combined-arms drills to a razor's edge. And that's what I'm trying to create.

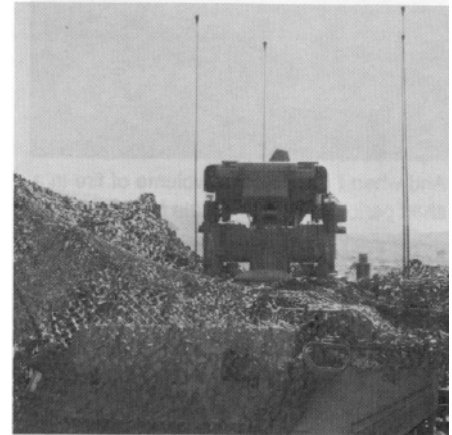
In USAREUR, I'm going to implement that concept where it's reasonable to do so. I have some facility problems in Europe, and I can't just move everybody around in a duffle-bag shuffle. But I'm going to push the concept because I think it gives added real combat power.

What should the Army be doing to enhance our ability to reinforce and sustain our troops in Europe?

From an artillery point of view, you've got to get on with improving fire support command and control—TACFIRE [tactical fire direction system]—so it can adjust more rapidly. To the uninitiated, it appears only the fire support officer who's working TACFIRE knows what's going on. Almost everybody is building a system to keep that from being a reality.

You've got to get on with the HIP [howitzer improvement program]. The HIP will give you command and control because each howitzer will have its own communications capability and be able to lay itself and fire directly from wherever it is. It will be able to do most of its own computations. From what I can determine, I'd say the HIP howitzer will make a great addition to USAREUR.

Field Artillery is going to have to come to grips with the whole arrangement of the MLRS [multiple launch rocket system], Army TACMS [Army



The battalion combined-arms task force easily can adjust the amount of its infantry and armor to handle the situation—and the FIST is right there with it.

tactical missile system], etc., very quickly. Right now, the artillery can't keep up with the maneuver force. The Bradleys and M1s drive out of range, and that's a significant problem.

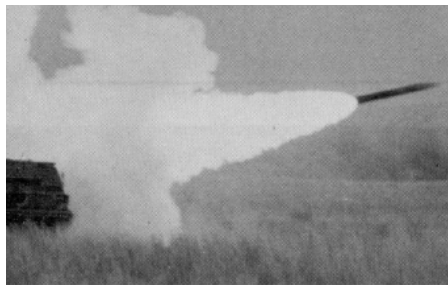
The artillery has figured the arrangement out. They've just got to make it happen. If you don't have fire support responsive to maneuver, the maneuver folks will run off and come up with something else. And that would be a great shame.

One of the highest priorities is getting some training device such as CATIES [combined arms training integration and evaluation system] to measure the effects of artillery. Now, the artillery neither gets credit for its devastation, nor has its "warts" exposed.

You may ask, "Why must we portray fire support to the soldier on the ground?" Simple, people aren't using the artillery or fire support as they ought to. Soldiers hide behind hills because it makes them feel safe from direct fire. They don't realize that somebody's shooting on top of them. And they don't realize the ferocity of it.

Maneuver battalions don't see the benefits of their own artillery, their own fire support. We build battalions based on what power they need to support them. If that power isn't operative, then the battalion loses every time.

We also have to figure out how to move information around, as opposed to just moving data. People think that moving numbers around solves the problem. Not true. I want to move information so the picture in my mind appears at some other place and somebody



And when I need a large volume of fire in a short period of time—give me MLRS.

else can put that same picture in his mind. Then we can act in concert. We both understand the "end state" desired or the scheme of maneuver. We've got to get on with that. But I can't find anybody who's talking anything but transcribing numbers.

We haven't figured out how to move overlays from one place to another—or at least we haven't put our money down to do it. An overlay is a picture, and an overlay represents at least 1,000 words. Our inability to reproduce and transmit overlays makes clear communications very difficult.

How will you use corps-level MLRS?

When running a special mission, it will operate under the command and control, to a degree, of the corps-troops OPCEL. We'll also use it to reinforce whatever the division's doing. It gives us volume of fire.

MLRS isn't just a counterfire weapon as some people think. We'll use it whenever we need something fast and a whole lot of it. But we can't shoot MLRS willy-nilly because we don't have enough trucks in the US Army to haul that much ammunition. So you save it in your pocket until you need it.

What role do you see for our light forces in USAREUR?

There's a lot of terrain that light infantrymen can fight extremely well in. If an urban area is critical to you, and you want to hold it, then that's what those guys are made to order for. But they aren't the answer to everything; you need a little bit of everything to do the job. My objective is to take advantage of the enemy's vulnerability and expand it or to create a vulnerability and then expand it. If I don't have light infantry, I'm vulnerable to the enemy in too many places.

I see a role for airborne troops in USAREUR, which surprises many people. For instance, on one occasion at Fort Hood, we brought in a battalion from Fort Bragg, airdropped it and established a FARRP [forward area rearm and refuel point]. We

brought the Air Force in with fuel, ran several missions with Apache helicopters and then withdrew the airborne battalion. All this happened between sundown and sunup. I can tell you, that should make the enemy very nervous.

What role do you see for the unmanned aerial vehicle (UAV) in Europe?

I'd say the UAV is indispensable and overdue. It allows me to see what's on the other side of the hill. There's no other way to see what's on the other side of the hill.

I don't need one that's gold-plated and does tricks. I'd be satisfied if it just flew in the daytime. But somebody keeps trying to invent a "super carrier," and I haven't seen it show up yet.

Recent reports in national magazines have talked about an improved tank that the Soviets could be fielding in significant numbers. If the tank were turretless and needed less armor, it could be a more difficult target for us to hit, and it might be faster and more mobile because of its lighter weight. If you faced that threat, what would you change in USAREUR equipment and tactics to meet it?

If I were going to shoot an enemy who's faster, I'd need a killing round—whether it's a rocket, chemical energy or kinetic energy—to travel so fast that when I saw the target, I wouldn't have to wait 15 seconds before the round hit. When I pulled the trigger, it would hit almost instantaneously. And if the round were very accurate, it would take care of an enemy who's small and fast. Because if I can see him, I can kill him. We also can develop weapons systems that will kill based on signatures: visual, audio, heat and shape signatures.

But the key to tactics is your vision of what the battlefield will look like. A pitched battle is going to look like what one historian in the Army told me, "...like an orphanage that's on fire in the middle of the wintertime while it's raining and dark." I mean it's just going to be a melee in the old sense of the term with everybody running around hacking and slashing everybody else.

The guy who can adapt to change the quickest is the one who's going to win—regardless. And that's true all the way down to the tank commander and company fire support officer.

If you're not technically and tactically

proficient, you'll never be able to see the big picture. When you're in the middle of this "hurrah," you have to pull the levers that will change your disorder into order and continue the enemy's disorder. It's an acquired skill, not something somebody just jumps up and pumps into your head. It's something you have to grow into.

Do you have a final message for Field Artillerymen worldwide?

The key to the Field Artilleryman's success in battle is his ability to focus combat power. Everyone looks to him to tie all things that are projectiles together and move ordnance to the target in a package. This includes artillery, air force, missiles, rockets, electronic warfare, et al. I don't think we're teaching Field Artillerymen to do this as well as they should in cooperation with maneuver. It isn't easy, but we're going to have to become specific rather than general in our instruction if we're to succeed. No one said it was easy.

I do see improvements. There are more people trying to figure out, for instance, how to shoot at moving targets with artillery. You need a moving target trainer on your ranges.

You need to figure out how you bring the artillery up with the attacking force so the battery is behind the lead task force. I need a high volume of fire within 15 seconds. As soon as somebody shoots at them, the artillery should stop and dump about a battery six 2,000 meters out front—then sort it out and adjust as they go.

I need responsive artillery that's very fast. And then when I need a large volume of fire in a short period of time, give me MLRS.

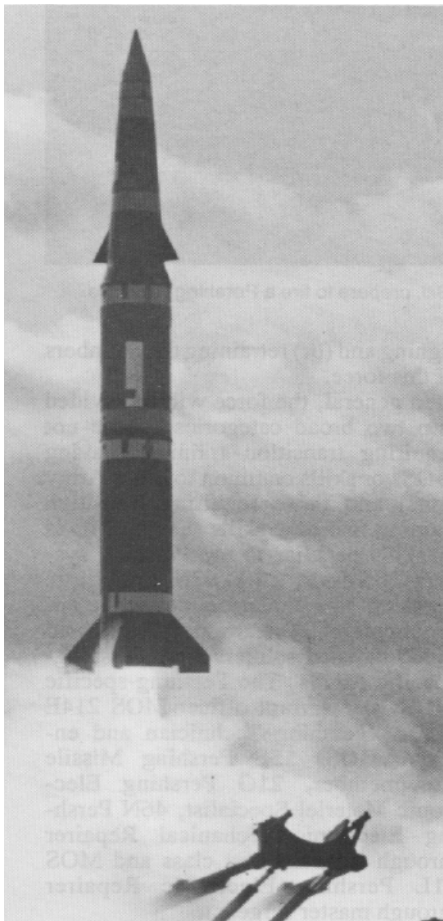


General Crosbie E. Saint took command of the US Army, Europe (USAREUR) and Seventh Army in June. He commanded III Corps and Fort Hood, Texas, and the 1st Armored Division, 11th Armored Cavalry Regiment and 7th Army Training Command, in USAREUR. During his two tours in Vietnam, General Saint commanded the 1st Squadron, 1st Cavalry Regiment, and served as G3 of the 23d Infantry Division. He also served as Deputy Commandant of the Command and General Staff College, Fort Leavenworth, Kansas.



The End of the Pershing Era: The INF Treaty

by Major Daniel L. Breitenbach



The enemy satellite rotating through space routinely recorded the results of another Pershing II firing. Once again, American technology and NATO solidarity had changed the balance in the Cold War. The system's technical accuracy and the political success in fielding Pershing II have forced Russian political strategists to review their options. The strategic game has taken another turn.

The Army first fielded the Pershing system in 1961. The initial system was a track-mounted version with a range of 400 miles. In 1968, this system was updated with the Pershing IA (PIA), which was, in turn, replaced by the Pershing II (PII). These systems had ranges of about 400 miles and 1,000 miles, respectively.

The PII fielding was initiated in spite of internal political discord among the NATO allies. This discord was caused by two separate issues. First, the fielding was linked from the start with the United States' proposal that PII not be fielded if the Soviets would deactivate their own version of the intermediate-range missile, the SS-20. NATO conservatives on both sides of the Atlantic interpreted this proposal as weakening the strategy of nuclear deterrence. Second, the proposed fielding of additional nuclear-capable systems in NATO resulted in a fairly strong popular resentment manifested in both political protests and voting records.

Soviet political strategists declined the United States' fielding offer and concentrated their efforts on financing activities that would increase NATO

dissention. Despite their efforts, the NATO leadership stood firm and fielded PII amid much political turmoil and in the face of daily demonstrations at the fielding sites.

Just before Christmas in 1987, a remarkable event occurred in Washington, D.C. The two super powers, the United States and the USSR, signed the Intermediate-Range Nuclear Forces (INF) Treaty. The December Summit between President Reagan and General Secretary Gorbachev produced the first agreement in the nuclear age eliminating a whole class of nuclear weapons systems. This political achievement far exceeds the strategic significance, in terms of the numbers of weapons eliminated, and sets the stage and standards for further nuclear weapons reductions.

In simple terms, the Treaty eliminates Pershing II and ground-launched cruise missiles (GLCM) in a tradeoff for the Soviet intermediate-range systems. The Treaty provides for a phased reduction for a period of three years from the date of implementation. Signing this agreement completed the first step in a US-NATO strategy designed to bring the Soviets to the negotiating

table on terms acceptable to the US and its allies. The Treaty is the first step back from the nuclear mutually assured-destruction strategy followed for the last several decades.

In spite of the political battles and the continuing controversy at home and in Europe, an elite group of soldiers who man and support the Army's Pershing missile system have remained combat ready. These are the soldiers of the 56th Field Artillery Command (FACOM) and its continental United States support base.

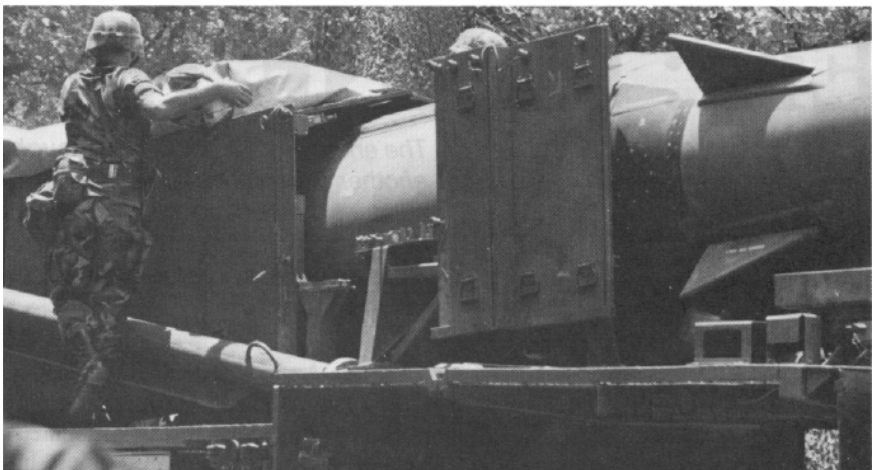
Like their Air Force counterparts who man the GLCM, these soldiers have played a major role in the INF strategy and have borne the brunt of implementing it. They have handled the demonstrations outside their front gates in Germany and fielded this system under adverse political conditions in a highly professional manner.

With the INF Treaty a reality, these soldiers now face a political contradiction. Having successfully fielded a highly technical, strategic system, they now must dismantle it—also in the name of strategy. Professionalism and patience have achieved our national strategic goal without combat, and throughout the ordeal, the Pershing force has exemplified the high standards of the Field Artillery.

The Pershing Force

The Pershing force has three forwardly deployed battalions and support units in the 56th FACOM, totaling approximately 6,000 men and women, as well as one battalion, school personnel and support troops at Fort Sill, Oklahoma, and Redstone Arsenal, Alabama. In addition, US Pershing soldiers serve with German Pershing units.

Because the Pershing missile system is being dismantled, more of the deterrence burden will shift to the conventional forces in NATO. A cooperative effort between the Army and US Army, Europe (USAREUR) staffs has resulted in a proposed "conventional force adjustment package." This package includes a Field Artillery brigade with a headquarters and headquarters battery, two 155-mm self-propelled howitzer battalions (3x8), four multiple launch rocket system (MLRS) battalions, conversion of the existing two 8-inch howitzer battalions to 3x8 and



Soldiers of the 3d Battalion, 9th Field Artillery, Fort Sill, prepare to fire a Pershing II missile.

appropriate combat service support units. The package also includes retention and conversion of the Pershing infantry battalion to a mechanized unit for use as an opposing force (OPFOR) at Hohenfelds Training Area and increases in tables of organization and equipment (TOEs) and tables of distribution and allowances (TDAs) for selected units in USAREUR to authorized levels.

The Pershing force is a highly specialized team with the Army's only strategic weapons system. Each member is critical to the team's success, whether the individual's military occupational specialty (MOS) is a primary missile skill or one of the many administrative, maintenance or logistical skills. While each skill is critical to combat readiness, phasing out the Pershing system will result in distinct personnel management actions in reassigning

and (or) retraining the members of this force.

In general, the force will be divided into two broad categories—those not requiring transition training (having MOSs or skills common to other Army units) and those requiring transition training into new skills (having MOSs or skills peculiar to the Pershing system). Some 220 officers have Pershing-specific specialties while approximately 94 warrant officers and 2,900 enlisted soldiers have Pershing-specific MOSs. The Pershing-specific MOSs are warrant officer MOS 214E (130A) Pershing Technician and enlisted MOSs 15E Pershing Missile Crewmember, 21G Pershing Electronic Materiel Specialist, 46N Pershing Electronic-Mechanical Repairer through sergeant first class and MOS 21L Pershing Electronic Repairer through master sergeant.

Field Artillery

Soviet INF Inspections

The INF Treaty eliminates US and Soviet nuclear-capable weapons having a range of more than 500 kilometers (300 miles), but no more than 5,500 kilometers (3,300 miles). The weapons systems affected are the US Pershing II, IA, IB and GLCM and the Soviet SS-20, SS-4, SS-5, SS-12, SS-23 and SSC-X-4.

Under the terms of the Treaty, the Soviets can inspect facilities in the US and five allied countries to determine compliance with the Treaty. The inspections continue for 13 years, starting 30 to 90 days after 1 June 1988 (the date the Treaty went into force). Initial inspections verify Treaty items at various facilities, including missiles, launchers and support equipment.

The continental US has five sites subject to Soviet inspections. Soviets can inspect Fort Sill, Oklahoma, and Redstone Arsenal, Alabama, which have training facilities; Pueblo Army Depot, Colorado, which repairs and stores the missiles; and Martin Marietta, Maryland, and Hercules Aerospace, Utah, which manufacture the missiles.



The Soviets SS-20, one of the longer-range missiles in the intermediate-range nuclear force, will be eliminated during the next three years under the INF Treaty. It has a range of 5,000 kilometers.

The four Pershing II battalions in the US Army are the 1st, 2d and 4th Battalions of the 9th Field Artillery, 56th Field Artillery Command, West Germany, and the 3d Battalion, 9th Field Artillery, 214th Field Artillery Brigade, Fort Sill.

Pershing Personnel Management

The most difficult part of the Treaty, from a personnel management perspective, is sustaining personnel readiness during the implementation period. This will require the Department of the Army (DA) to assign new soldiers to units at the same time many others are leaving. Career progression and overseas tour lengths are the primary reasons for this seemingly contradictory procedure.

All non-Pershing-specific officers, warrant officers, noncommissioned officers (NCOs) and soldiers will be eliminated from Pershing, based on the implementation time line, through normal reassignment, reenlistment and expiration of term of service (ETS). Personnel remaining on active duty can expect to use current skills in their new assignments, unless they reenlist for other options.

Because deactivation schedules may vary by unit and location, some soldiers may be eligible for early release,

curtailment of overseas tours or early reenlistment. Still others may be reassigned into new jobs at their current location or reassigned within their current theater of operation. In addition, personnel managers will attempt to fill units with soldiers whose dates of estimated return from overseas (DEROS) are compatible with the unit deactivation plan to minimize turbulence for the individual. Since these soldiers will perform similar duties, regardless of the unit they're assigned to, there's no impact on their career development as a result of the implementation of the INF Treaty.

Officers

Field Artillery officers assigned to Pershing are trained as Heavy Missile Officers (AOC 13C). But Pershing duty is just one of many assignments for a Field Artillery officer and is appropriate career development in troop or staff positions, branch qualifying the officer at the level of assignment. On reassignment, these officers will follow normal career development patterns,

based on the Officer Personnel Management System (OPMS) II and branch guidance. While no specific retraining or redesignation is required as a result of the elimination of the Pershing structure, Field Artillery officers may receive training and (or) skill designators necessary to assume their new duties.

Warrant Officers

Warrant officers holding MOS 214E (130A) will be trained in a new warrant officer skill and assigned to a unit in that MOS. Some warrant officers may be retained in the Pershing MOS to eliminate the equipment and help verify compliance with the Treaty. In addition, some warrant officers approaching retirement may elect to forego reclassification by submitting their retirement papers early. But they may not retire earlier than the required 20 years.

NCOs and Enlisted Soldiers

NCOs and soldiers in a Pershing-specific MOS will be trained in new skills with individual career potential. Again, the normal reassignment process will trigger retraining consideration. NCOs and soldiers also will have reenlistment and retention options. Like their counterparts in other MOSs, they'll have some early-out and consecutive-overseas-tour options. However, Pershing soldiers are different because the INF Treaty requirements have significant career development implications. Each one ultimately will have to be retrained into a new primary MOS (PMOS).

To ease the soldiers' career transitions, the retraining will be approached in a number of innovative ways. Accession of new soldiers will maximize the number of skill-level soldiers eligible for reenlistment at the time of unit deactivations. This will let the individual soldier select a new skill from all available training at the time of reenlistment. Mid-term and career soldiers are being interviewed individually by DA personnel managers to identify new career fields that offer advancement opportunities and maximize the individual's potential.

Some of these soldiers already have entered training, even though they'll serve another tour in Pershing. This pre-training is an example of personnel management actions to provide the

maximum career opportunities to soldiers and to ease their transition. Some NCOs approaching retirement may elect to forego reclassification by submitting their retirement papers early. But they may not retire earlier than the required 20 years.

The MLRS and 13B Cannon Crewmember specialties are the MOSs Pershing soldiers' skills most easily transfer to within the Field Artillery. The MLRS MOSs are 13M Crewmember, 13P Fire Direction Specialist and 27M Repairer. However, personnel managers will consider the soldiers' preferences and the needs of the MOS before reclassifying them into one of those MOSs.

The eventual elimination of Pershing MOSs reduces the number of Field Artillery specialties available to women soldiers. The MLRS and 13B MOSs are in direct-combat units; therefore, women soldiers are barred from those MOSs. They also are barred from working in units with fire support equipment that could be in close combat. At this time, the only Field Artillery MOSs available for women soldiers' reclassification are 13N Lance Missile Crewmember and 93F Meteorological Crewmember.

The reclassification program won't harm soldiers' chances for promotion. Eligible Pershing soldiers will be integrated into the promotion lists of their new MOSs for consideration.

Career transition is a significant event, and all soldiers in a Pershing-specific

MOS have individual counseling available through their career branches at DA, as well as from their unit personnel officers. The appropriate career branches at DA are maintaining individual counseling sheets on mid-term and career soldiers.

These counseling sheets were completed during DA visits to Pershing units conducted for the past eight months. Visits will continue throughout the implementation period of the INF Treaty, but soldiers may complete an interview sheet through their unit personnel officers or by telephoning their respective career branches. The interview format identifies the soldier's desires, individual qualifications and career performance trends, matching all against other Army skills for maximum performance and individual success.

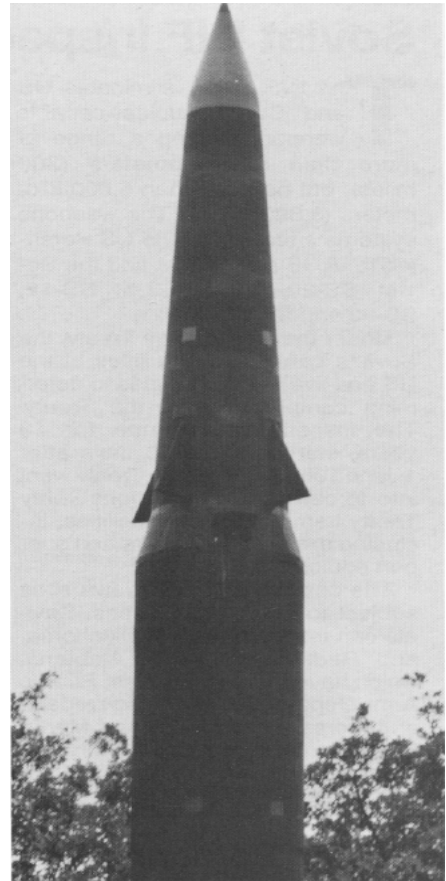
Details of the transition are spelled out in the *Total Army Personnel Agency's (TAPA's) Pershing Career Development, Retraining and Reclassification, and Sustainment Plan* that guides commanders and managers. Soldiers can get more information about the Plan through their post Adjutant General's office or their installation commander.

Conclusion


The INF Treaty follows a very specific, lengthy time line that allows both the United States and the Soviets to eliminate the missiles and to verify that each has done so. Consequently, the national interest dictates we adhere to the time line but sustain combat readiness in those units not yet deactivated.

Combat readiness in these units becomes the hedge against Treaty infractions and assures the Soviets stay on schedule. To sustain personnel readiness during this period, some Pershing soldiers will not be retrained for several years. Career development and progression opportunities based on individual performance and potential will be maintained for these soldiers throughout the implementation period.

INF is the end of an era for soldiers in Pershing II-specific skills, and they can be proud of the contributions they and their predecessors have made to NATO strategy. Anxiously looking forward to their next Army challenge, they'll continue to serve as outstanding representatives of our nation's finest throughout the INF Treaty



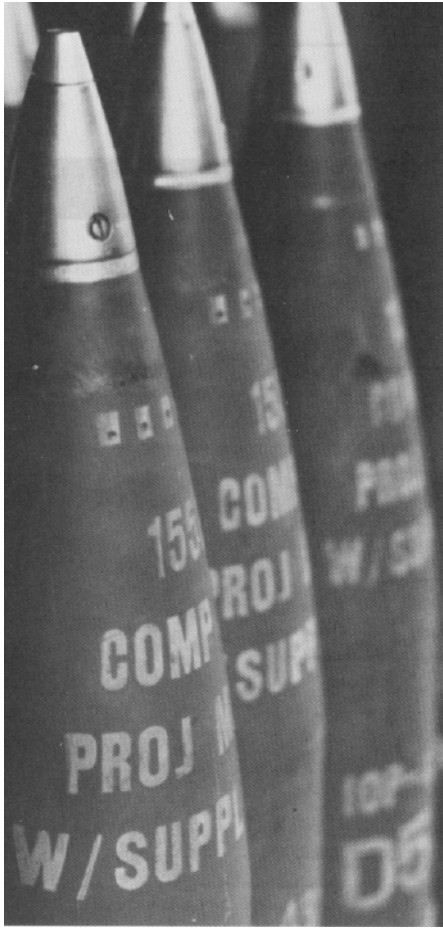
Signing the INF Treaty was the first step in a US-NATO strategy designed to bring the Soviets to the negotiating table on acceptable terms.

implementation and will go on to serve as leaders in other Army career skills. 

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PFC Jeffrey W. Whitaker of 3-9 Field Artillery (Pershing) will have to change his MOS during his career and could become an MLRS or Cannon Crewmember.



Field Artillery Ammunition Resupply Solutions

by Doctor Robert A. Kromer

Also shown are projections by the Field Artillery School indicating that in the future, the howitzer improvement program (HIP) howitzer and the advanced Field Artillery system-cannon (AFAS-C) will require even more ammunition, firing as many as 599 and 1,409 RTD, respectively.

Today's supply system is inadequate to support combat in Europe, and it will be even more so with the advent of new, more capable howitzer systems. How did this situation develop? A review of the current supply system will provide some information.

The Ammunition Resupply System

FM 9-6 *Ammunition Service in the Theater of Operations*, which details ammunition resupply within the corps, is being revised to depict a new system for ammunition distribution. This system, the maneuver-oriented ammunition distribution system (MOADS), pushes ammunition as far forward into the division as possible (see Figure 2).

For brigade operations under MOADS, the ATP supporting the maneuver

The timely flow of ammunition to the user—be it the individual soldier or a weapon system—is critical to the success of the battle. But the current ammunition resupply system can't supply the ammunition a committed division will need. Field experience and fire support models routinely show we'll need much more ammunition than the system can supply. This article suggests quick, inexpensive ways to make the resupply system more efficient. It concentrates on artillery-related solutions from the ammunition transfer point (ATP) forward to the battery rearm and refuel point.

Inadequate Resupply

In summary, the problem of insufficient ammunition for the howitzer is presented in Figure 1, showing current amounts of ammunition required per committed 155-mm howitzer in the early days of various combat operations. The second column shows the number of rounds per tube per day (RTD) the supported brigade's supply node (the ATP) is designed to supply.

Current Howitzer Ammunition Requirements ⁽¹⁾		Current ATP Sustained Output Capability ⁽²⁾	Future Howitzer Ammunition Requirements per Level of Combat ⁽³⁾	
Type of Operation (Heavy Commitment)	Rounds per Tube per Day (RTD)		HIP Howitzer	AFAS-C Howitzer
Covering Force	274	350 Short Tons (STs) of all Ammunition Types; or 114-152 Rounds per Tube per Day	Committed	
Defense of Position	207		201	473
Attack of Position	153		Surge	
			387	911
			Peak	
			599	1,409

(1) FM 101-10-1/2, Oct 87, Page 2-138.
 (2) FM 9-6 rates output for an ATP at 350 STs per day. US Army Field Artillery School (USAFAS) combat models show 60 to 80% of ATP ammo is for howitzers and project the percentage of each munition to be used. Taking the proportion of ammo used on a combat day and its weight (including packing materials), the supply system daily output of STs of artillery rounds was converted to single rounds.
 (3) USAFAS "Operational Mode Summary/Mission Profile for HIP," 23 Oct 86 and USAFAS "AFAS-C Use Study," 27 Jan 87.

Figure 1: Projected Howitzer Ammunition Use and Supply



brigade has soldiers and equipment to handle 350 short tons (STs) of ammunition per day. Figure 3 portrays operations in a brigade sector at a "committed" or average level of combat intensity.

While 350 STs is the normal output of the ATP, extraordinary circumstances may demand more. When the enemy employs its second-echelon divisions, the subordinate brigades of the US division facing the main attack are engaged at a higher or "surge" level of intensity. This division usually maintains the surge level for four to seven days and requires more ammunition than under normal conditions. Field tests have shown that we can increase the output of the ATP to about 530 STs per day for a few days (see Figure 4).

Even with the increased output during intense combat, the supply system won't be able to provide enough ammunition for the artillery force without redistributing some assets within the division. If the ammunition resupply system can't meet the projected requirements for divisional units in Europe, what changes to the system could

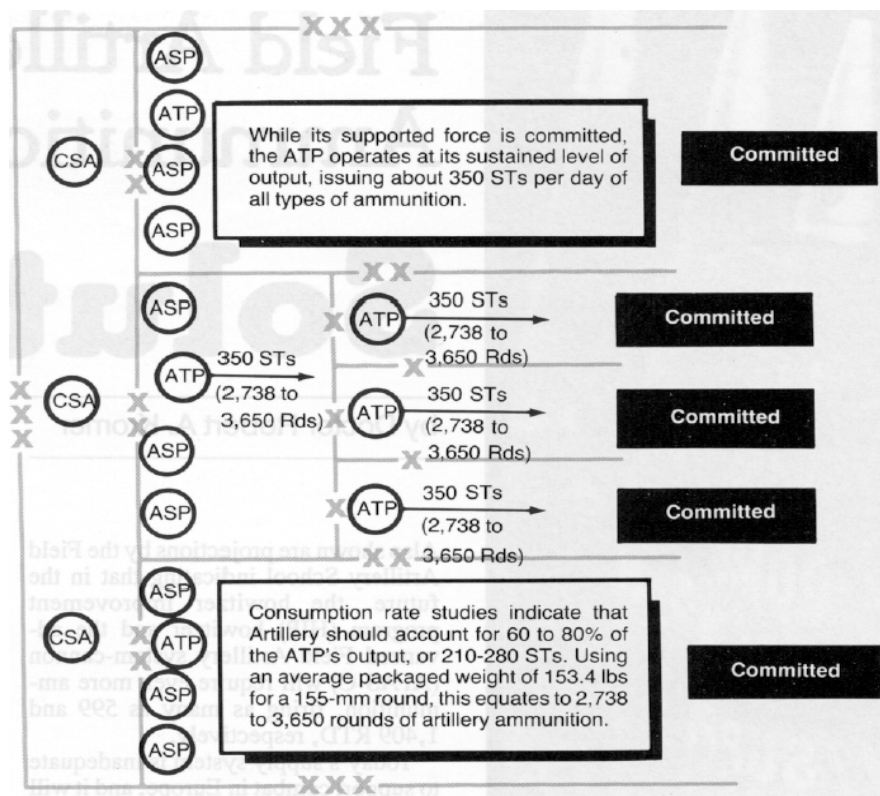


Figure 3: Ammunition Resupply to a Committed Brigade

reduce the shortfall? Any solutions must assume that no additional manpower and few additional dollars are available to resolve supply system problems. Rather, we must be more efficient with what we have.

Resupply Problems

The problems associated with resupplying ammunition fall in three broad categories: ammunition volume, ammunition type and command and control to support the ammunition resupply system. Clearly, these problem areas are interrelated.

The first major problem—volume or tonnage—concerns getting the requisite amount of ammunition to the howitzers for firing. The problem of ammunition type involves getting the correct type of ammunition to the howitzer: dual-purpose improved conventional munitions (DPICM), sense and destroy armor (SADARM), white-bag powder, etc. This problem has arisen largely because of the more than 20 projectile and propellant types for and the limited storage capacity of a howitzer.

Last, underpinning any logistics solution must be a command and control system that can accurately and rapidly forecast needed supplies, redirect incoming supplies to the priority consumer and flexibly reassign operational missions and priorities to subordinate

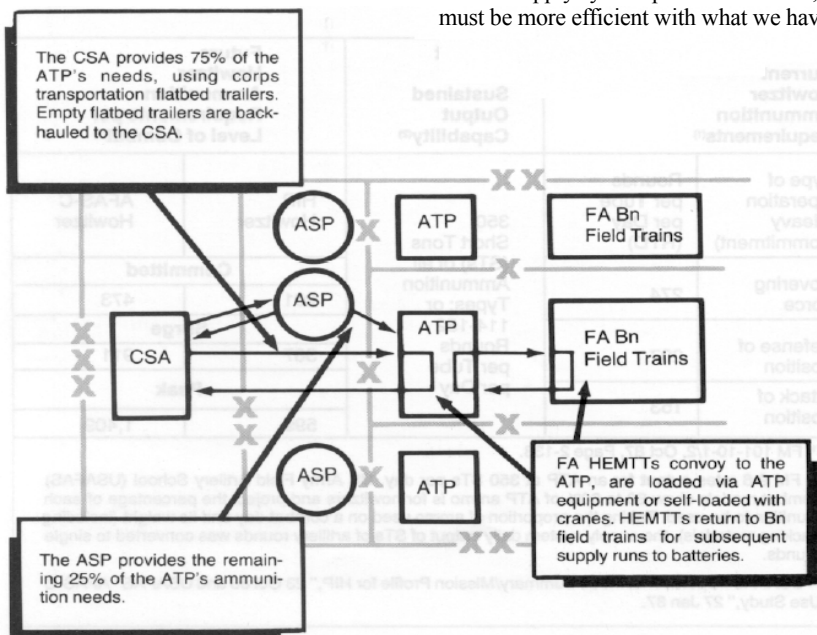
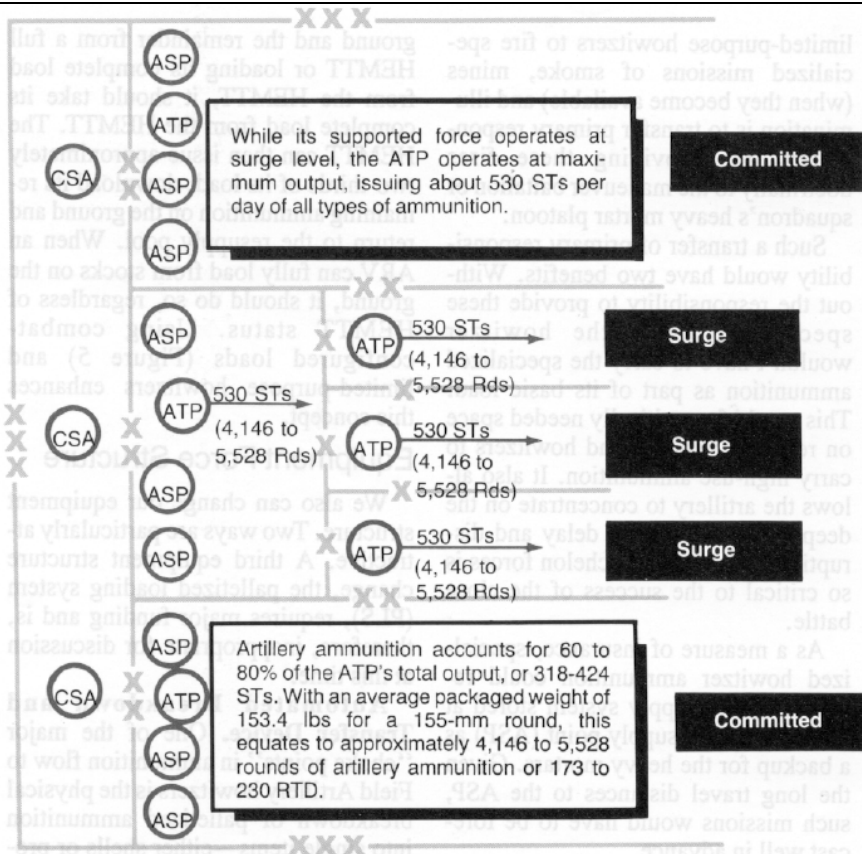


Figure 2: Ammunition resupply under MOADS pushes ammunition forward to the ATPs.



of maintaining this variety of specialized munitions is to forecast more accurately intended usage rates and to prepackage ammunition into packs the resupply system can process more efficiently. Figure 5 outlines four packs of ammunition (expected consumption by type as determined by Field Artillery School models) for more efficient resupply.

In this concept, the force artillery would forecast ammunition by package type. The desired ammunition mix would be configured for transport at the corps storage area (CSA). Upon arrival at the ATP, the load types would remain on the corps line-haul trailers, awaiting issue. By consolidating ammunition on trailers into discrete loads (packs), a unit would make only one stop within the ATP to load its ammunition, resulting in considerable time savings. After transporting the load to the rear and refuel point, the ammunition would be broken down into individual rounds and loaded on the ammunition resupply vehicle (ARV).

Limited-Purpose Howitzers. The problem of having a howitzer force with the correct munition to fire on each target type has generally required each howitzer to carry all or most types of ammunition. The carrying capacity of the howitzer section is limited (42

Figure 4: Ammunition Resupply During "Surge" Combat Periods

units as a result of the changing tactical and logistical situation. Thus, any revision to the ammunition resupply system also must address the ripple effects of such changes on the requirements of the command and control system.

Potential Solutions

Given the problem definition, we can modify the ammunition resupply system in several ways to improve throughput capacity. None of the modifications increases personnel levels. However, the solutions do call for changes in doctrine, procedures and techniques and equipment types and levels.

Doctrine, Procedures and Techniques

Combat-Configured Loads. A wide variety of special-purpose projectiles and propellants has been developed for the 155-mm howitzer. While these munitions provide the means to accomplish certain missions better, they pose significant problems. With the exception of DPICM, SADARM

and high explosive (HE) ammunition, artillery munitions used in Field Artillery School combat-simulation models are projected to be used infrequently. Consequently, inefficiencies result when the supply system has to transport, store and issue this ammunition.

One means of lessening the impact

Type Munition	Type & Number of Rounds Per Ammunition Pack			
	A Pack (Hi Vol)	B Pack (Mines)	C Pack (Smk & Cprhd)	D Pack (Illum & Cprhd)
HE	8			
DPICM	24		8	8
Base Bleed DPICM	8			
HE RAP		24	16	16
Copperhead			8	8
SADARM	8			
FASCAM-AP		8		
FASCAM-AT		16		
WP			8	8
HC Smoke			8	
Illum				8
TOTAL	48	48	48	48

Figure 5: Palletized Packs for Combat-Configured Loads



rounds on the howitzer plus 93 on the ARV for the HIP howitzer section). So requiring the howitzer to have many types of infrequently fired ammunition will limit the quantities of high-use munitions it can carry. The result is more frequent resupply of high-use munitions for each howitzer.

A solution to this problem is to designate and equip a portion of the howitzer force as limited-purpose howitzers. These howitzers would provide the majority of their fires with special-purpose ammunition. While most howitzers would have high-use munitions and provide fires against the majority of the targets, limited-purpose howitzers would primarily stock low-use munitions and would provide "specialized fires." Limited-purpose howitzers also would stock a small amount of high-use munitions to fire in the event there isn't a high-use howitzer available to attack a target.

Under this concept, battery operations would be revised to include one limited-purpose howitzer per platoon (a total of six in an artillery battalion). These howitzers and their ARVs would be loaded (using the ammunition packs described in Figure 5) with an ammunition mix consisting of a B Pack and a C or D Pack (C Pack during daylight and D pack at night). All other howitzers would have two A packs. Field experience or computer model runs, using variations of the number of howitzers and mix of loads, will reveal the optimum howitzer or load mix.

This concept has three operational benefits. It frees the majority of the howitzer force to stock only high-use munitions, thus using on-board storage space more efficiently and requiring resupply less frequently. It concentrates low-use munitions on some howitzers, ensuring enough of the correct type of ammunition is available for the individual missions. Last, it enables an ARV to reload completely with a single stop at the rear and refuel point, as opposed to stopping one place for high-use ammunition and a second for low-use. The potential time savings should be significant.

Responsibility for Specialized Missions. A variation of designating

limited-purpose howitzers to fire specialized missions of smoke, mines (when they become available) and illumination is to transfer primary responsibility for providing these fires doctrinally to the maneuver battalion or squadron's heavy mortar platoon.

Such a transfer of primary responsibility would have two benefits. Without the responsibility to provide these specialized fires, the howitzer wouldn't have to carry the specialized ammunition as part of its basic load. This would free critically needed space on resupply vehicles and howitzers to carry high-use ammunition. It also allows the artillery to concentrate on the deep battles where the delay and disruption of the second-echelon forces is so critical to the success of the close battle.

As a measure of insurance, specialized howitzer ammunition could remain in the resupply system stored at the ammunition supply point (ASP) as a backup for the heavy mortars. Given the long travel distances to the ASP, such missions would have to be forecast well in advance.

One can argue that transferring responsibility for firing specialized fires to the maneuver force does nothing for the supply system—it just diverts the problem from the Field Artillery to the maneuver force. In terms of pure tonnage, that's true. It does, however, ease the artillery's problem of having the right amount of the right kind of ammunition on the howitzer, a critical element of sustaining the force.

Reconfiguring Loads Within the Battalion. During field operations involving a number of artillery units, the heavy expanded mobility tactical truck (HEMTT) usually is allowed to remain with a partial load at the rear and refuel point until all its ammunition is unloaded. This loitering with a partial load results in our using HEMTTs inefficiently. If they could download their remaining ammunition on the ground, the HEMTTs could turn around for a resupply run sooner. With this procedural change, units would have to revise SOPs so any HEMTT that has transferred at least two-thirds of its ammunition to the ARVs downloads its remaining ammunition and returns to the vehicle pool used for resupply operations.

When an arriving ARV has a choice between loading a partial load from the

ground and the remainder from a full HEMTT or loading its complete load from the HEMTT, it should take its complete load from the HEMTT. The HEMTT can then issue approximately two-thirds of its load, download its remaining ammunition on the ground and return to the resupply pool. When an ARV can fully load from stocks on the ground, it should do so, regardless of HEMTT status. Using combat-configured loads (Figure 5) and limited-purpose howitzers enhances this concept.

Equipment Force Structure

We also can change our equipment structure. Two ways are particularly attractive. A third equipment structure change, the palletized loading system (PLS), requires major funding and is, therefore, inappropriate for discussion at this time.

Automated Breakdown and Transfer Device. One of the major "choke points" in ammunition flow to Field Artillery howitzers is the physical breakdown of palletized ammunition into single items—either shells or propellant canisters. Usually occurring at the rear and refuel point, this critical transformation of palletized ammunition configures the components to load into the ARV. The operation is time-consuming and extremely labor-intensive. A conservative estimate of the physical effort required to transfer ammunition manually from the ammunition vehicle to the ARV and from the ARV to the HIP and AFAS-C howitzer is shown in Figure 6.

Even at the sustained firing rates projected for the HIP and AFAS-C howitzers (201 and 473 RTD, respectively), it's doubtful that ammunition personnel can transload the several tons of ammunition for more than a short time. Breaking down and transferring ammunition to the ARV is difficult in favorable weather; it's slower, more difficult and dangerous during blackout conditions and inclement weather.

Under this concept, the Army would have to develop a mechanical device to reconfigure and load ammunition at the rear and refuel point. This would increase productivity, crew safety and manpower efficiency.

Ideally, the device would be able to handle both projectile and propellant pallets. But first priority should be to develop a device to handle projectile

Howitzer Type	Level of Combat Intensity	Expenditure Rates (RTD)	Total Weight of Rounds Handled by Crew (lbs)	Weight Handled per Man per Day (7-Man Crew)	Tons of Ammunition Handled per Day
HIP Howitzer	Committed	201	47,436	5,721	2.6
	Surge	387	91,332	10,148	5.1
	Peak	599	141,364	15,707	7.9
AFAS-C Howitzer	Committed	473	111,628	15,947	8.0
	Surge	911	214,996	30,714	15.4
	Peak	1,409	332,524	47,503	23.8

Notes:

- Calculations assume each crewman shares equally in ammunition resupply tasks and each item is handled twice—to load and unload it from the ARV.
- The round used is a complete DPICM, weighing 118 pounds.



without the long-haul turn-around to the ATP.

Strategy for Adoption

Clearly, some of the suggested changes will result in greater resupply efficiencies than others. Additionally, some changes make more sense operationally, and some changes are more likely to be implemented by the Army. To provide priority to the effort, the matrix in Figure 7 evaluates each of the changes in the context of its impact on the ammunition resupply system, its operational suitability and its probability of adoption by the Army. Based on this evaluation, each change has an implementation priority.

Summary

Our ammunition resupply system is inadequate to meet its mission and will be even more so with the advent of more capable howitzers. We must change the resupply system to accommodate this new equipment. This article suggests a few areas we can change to increase the productivity of the system without increasing personnel and at relatively modest costs. The problem is there; the challenge is to determine the solutions. If this article has stimulated some action in that direction, I am content.



Dr. Robert A. Kromer, a retired Field Artillery lieutenant colonel, is a systems analyst with a firm in Lawton, Oklahoma. He has managed projects concentrating on fire support operations, logistics and concepts analysis and problem definition. He recently completed an analysis of the Army's tactical ammunition resupply system, which culminated in modifications to the Army force structure to increase ammunition throughput. Dr. Kromer served the Army in Field Artillery units in the US, West Germany and Vietnam. His most recent artillery assignment was as the S3 of the 2d Infantry Division Artillery, South Korea.

Figure 6: Minimum Crew Effort Required for Manual Ammunition Resupply

Assessment Category Change	Impact On Ammo Thruput	Op Suitability	Probability of Adoption	Priority
Combat-Configured Loads	1	2	1	1
Automated Breakdown Device	2	1	3	2
Responsibility for Specialized Msns	3	1	4	3
Limited-Purpose Howitzers	6	2	2	4
Reconfigured Loads	5	4	3	5
Ammunition Trailers	4	4	5	6

Note: Changes are ranked relative to each other where 1 = highest.

Figure 7: Priority of Pursuit

pallets, since they are the heaviest and bulkiest.

We should be able to transport the automated breakdown and transfer device to the rearm and refuel point on a 1-1/2-ton ammunition trailer. A single crewman should be able to operate the device. It would have a mechanical arm to remove a pallet of ammunition from an ammunition vehicle (PLS truck, 5-ton truck or HEMTT) and place it within the automated breakdown and transfer device. The device would remove the bands, packing material and wooden bases from the pallet of ammunition. A conveyor belt would then transfer the shells to the "X-Y stacker" inside the ARV for storage.

While the artillery logistics community has discussed such a device periodically, its development is uncertain. It shouldn't be. This device makes sense in terms of efficiency and safety.

Field Artillery Battalion Ammunition Trailers. Another option to increase the efficiency of the Field Artillery battalion ammunition section would be to add ammunition trailers to provide additional hauling capacity between

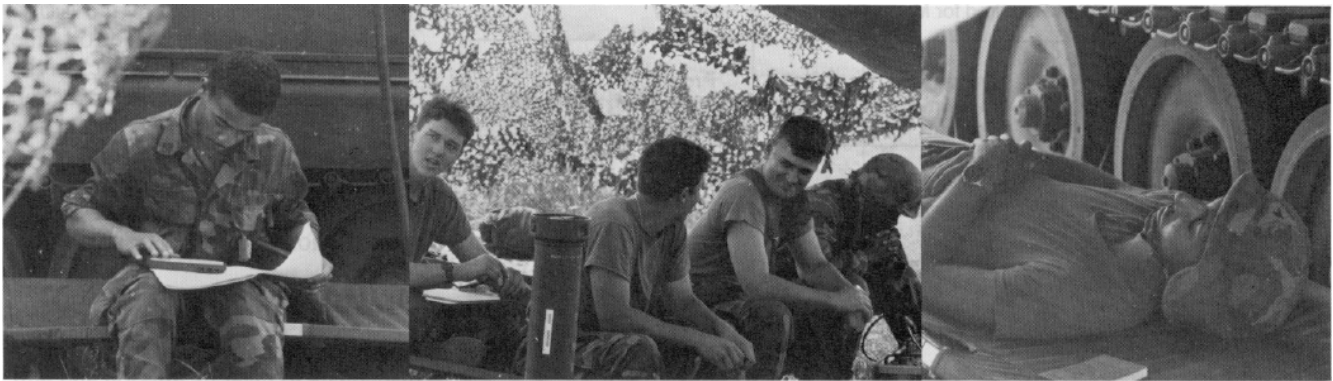
the ATP and the battalion combat trains. The trailers would increase the hauling capacity of the ammunition section without increasing its manpower requirement.

This change would add 10 heavy expanded mobility ammunition trailers (HEMATs) to the Field Artillery battalion (one trailer for each of the HEMTTs in the battalion ammunition section). Each of these trailers has a cargo capacity of five long tons or 11,000 pounds. Loading time for the HEMAT is approximately 10 minutes when loaded by forklift or 30 minutes when loaded by the HEMTT crane.

Arriving at the Field Artillery battalion combat trains area, the HEMAT would be decoupled from the prime mover HEMTT and remain in the area. (The low mobility of the HEMAT precludes it from being used at the rearm and refuel point.) Empty HEMTTs returning from the rearm and refuel point would be reloaded with ammunition from HEMATs, if available, at the battalion combat trains. The HEMTTs would then be ready for another resupply run to the rearm and refuel point

AOE

Force Structure and CONOPS



by Major Ronald M. Janowski

...a soldier's spirit is keenest in the morning; by noonday it has begun to flag; and in the evening, his mind is bent only on returning to camp.

Sun-Tzu, 500 B.C.

The ability of an army to fight has always been tempered by the question of time: when must we be ready, and how long must we sustain the fight.

Interest in continuous operations (CONOPS) has increased in recent discussions of the structure of Field Artillery. Often CONOPS has been defined in terms of a weapon system or individual soldiers of a battery operating 24-hours a day. This is clearly not a reasonable expectation. Neither personnel nor equipment can operate continuously for very long.

More accurately, CONOPS is the ability of Field Artillery to provide enough continuous and overlapping fires on the battlefield 24 hours a day to support maneuver forces. Overlapping fires are

when units provide mutual support; this allows some units to stand down elements for rest or maintenance. To support the division's primary maneuver element, the brigade, the artillery battalions must be capable of CONOPS.

With continuing resource constraints, force structure may be the most effective and relatively least expensive way to achieve CONOPS. For CONOPS, we need either more units or more personnel within units. Obviously, it's cheaper to add personnel to selected units than field new units. Our current force structure, the Army of Excellence (AOE), was not designed with strict considerations for CONOPS. However, AOE is flexible and can support artillery CONOPS.

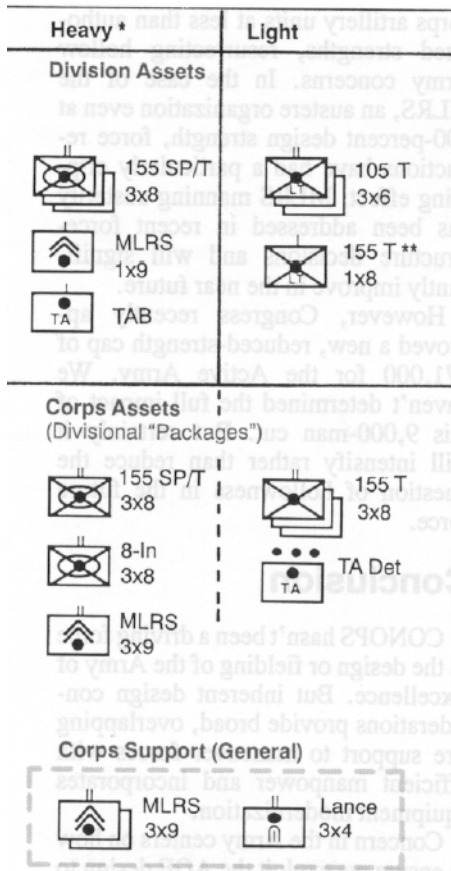
Army of Excellence Design

The Field Artillery of AOE is layered on the battlefield in divisional and corps assets. In broad terms, AOE classified divisions as heavy or light. Organic to each of these, the division artillery provides a portion of continuous fire

support to the maneuver brigades. Each maneuver brigade is habitually supported by a Field Artillery battalion in direct support (DS). In heavy divisions, these battalions are 155-mm systems, either self-propelled or towed depending on the configuration of the maneuver brigades (armor, mechanized or infantry). In light divisions (including the two "special" divisions, the 82d Airborne and the 101st Air Assault) the DS battalions have 105-mm cannon.

In addition, both heavy and light division artilleries have organic general support (GS) with either cannon or multiple launch rocket systems (MLRSs). The only exception to this is the two special divisions which, because of aircraft sortie caps, don't have the divisional GS battery typical of light divisions.

The corps artillery, though not organic to the divisions, habitually supports each division assigned to the corps. Depending on the corps' division types, "packages" of corps artillery assets are added to the total corps artillery. Thus, corps artillery assets are uniquely tailored for each corps, according to the divisions being supported.



* 2d ID & 9th MTZD differ slightly in Div Arty assets but have identical corps assets.

** 155 T battery was not designed into the 82d Abn and 101st AASlt Div Arty TOEs.

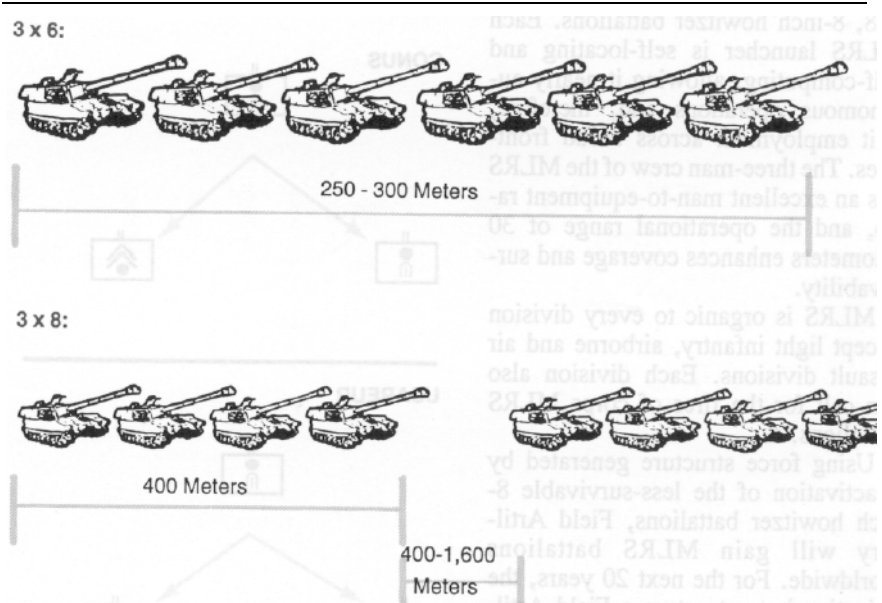
Army of Excellence Fire Support Structure

As with a division, the corps may retain GS artillery to provide the commander fire support to influence the battle.

Target acquisition Q-36 and Q-37 radars are organic to heavy divisions. These assets are split between division and corps for the light divisions. The Q-36 radars are organic to DS battalions in light divisions, while the Q-37 radars are attached habitually as corps assets. This arrangement takes light division aircraft sortie requirements into consideration.

AOE is the result of real-world resource constraints applied to Army-86 designs (Division 86, Light Division 86 and Corps 86). The Army-86 studies designed Field Artillery organizations to execute AirLand Battle doctrine and to be "robust" for sustainability. But at that time, designers weren't constrained by resource limitations.

AOE was developed because the



The 3x8 transition improves firepower, increases survivability and has better man-to-equipment ratios.

sum of the Army's required parts exceeded the resources available. A major design guideline was to eliminate force "hollowness." This was to be done by ensuring we could fill AOE designs with programmed personnel end strengths. Clearly, we "walk a fine line" between force hollowness and force ineffectiveness. AOE represents a force structured to perform AirLand Battle but reduced in personnel end strength.

Not surprisingly, AOE is reduced in overall capability from the Army-86 force. Wherever possible, the decrements were in support and service support areas of each organization. The Army accepted these reductions as design risks before implementing AOE, but CONOPS was more seriously impaired than most other functional areas.

AOE and CONOPS

Although AOE organizations can't meet all contingencies and are certainly less robust than Army-86 organizations, they are realistic in light of resource constraints. Even as a constrained reflection of Army-86, AOE still has several inherent CONOPS features.

3x8

The 3x8 transition, which up-guns each of the three batteries in 155-mm and 8-inch battalions to eight howitzers, doubles the number of firing

units. By operating the four-gun platoons as if they were distinct batteries and separating them by as much as 1,600 meters, the commander gains some important benefits. First, he increases the number of tubes by one-third. Second, by spreading a battery front across two grid-squares (standard map 1,000 by 1,000 meter grid-zones), he greatly enhances artillery survivability. Finally, he improves man-to-equipment ratios by incorporating equipment modernization. Each benefit provides a better concentration of fires, more reliable fire support and more efficient use of manpower to support maneuver.

The 3x8 transitions began in 1986. The Active Army should complete the transitions in 1992 and the Army Reserve in 1993 plus.

MLRS

The Field Artillery modernization master plan calls for increases in MLRS units. The plan is based on a trade-off of the less effective, more vulnerable 8-inch system.

By design, MLRS enhances the commander's CONOPS capabilities as discussed in 3x8 transitions. As a conventional force multiplier, MLRS is unequalled. A 12-rocket volley from a single launcher will deliver about 7,800 dual-purpose, improved conventional munition (DPICM) sub-munitions against a target. This is roughly equivalent to a volley from two

3x8, 8-inch howitzer battalions. Each MLRS launcher is self-locating and self-computing, allowing it nearly autonomous operations and, therefore, unit employment across broad frontages. The three-man crew of the MLRS has an excellent man-to-equipment ratio, and the operational range of 30 kilometers enhances coverage and survivability.

MLRS is organic to every division except light infantry, airborne and air assault divisions. Each division also can call for the fires of corps MLRS battalions.

Using force structure generated by deactivation of the less-survivable 8-inch howitzer battalions, Field Artillery will gain MLRS battalions worldwide. For the next 20 years, the objective is to structure a Field Artillery force that provides a single cannon caliber and a rocket-missile-cannon mix consisting of about 50 percent MLRS.

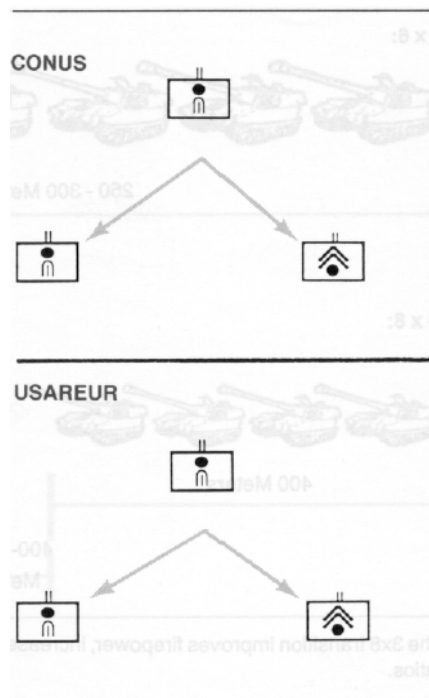
The transition is currently taking place in the Active Army and will continue into the next century for the Active Army, National Guard and Army Reserve.

Design Versus Constrained Reality

Currently, AOE de facto is a far cry from AOE by design. Complex management demands challenge a more rapid transition to AOE. In addition, the equipment and manpower to support the "affordable" AOE design continue to be affected during our annual budget process. As a result, AOE is subjected to additional constraints.

The equipment demand generated by each transition is more complicated than just inprocessing launch platforms to designated units. The systems primarily involved in the 3x8 transition—M109, M198 and M110 howitzers—essentially are complete. A broad-scope tube count performed in 1985 to support 3x8 verified we have enough tubes in the force for AOE. Therefore, we must rearrange systems already in the force on a large scale to accomplish 3x8. In many cases, this adjustment will cross active and reserve unit lines and even require some units to switch to entirely new howitzers. A number of units will deactivate.

The growth of MLRS is hamstrung by the opposite problem: not enough



8-Inch Battalion Conversion to MLRS

MLRS launchers in the system. At current production rates for the M270 MLRS armored vehicle multiple rocket launcher (AVMRL), we can't meet our objective force design. In light of current studies establishing requirements for even more AVMRLs, production of MLRS is too low.

Perhaps a greater challenge will be getting enough associated items of equipment. Relatively low-visibility but high-impact items such as radios, command tracks (M577) and battery computer systems (BCSs) are in short supply throughout the Army, so we'll need to do more than shift assets—they're simply not out there.

Transitions will continue beyond the 1990s with several reserve units maintaining "substitute" weapons until the design systems are available. National Guard divisions are maintaining 8-inch battalions—both "pure" and composite with 155-mm towed howitzers—in lieu of MLRS batteries. Also, several 8-inch battalions are delaying transition to MLRS until M270 launcher production can "catch up."

Even without equipment problems, AOE must work within end-strength-mandated personnel caps. Although AOE was designed to be manned at 100 percent strength under the old cap of the 780,000-man Active Army, unforeseen manning "gaps" have appeared as field units have moved toward AOE. As a result, we've had to man AOE corps

artillery units at less than authorized strengths, resurrecting hollow Army concerns. In the case of the MLRS, an austere organization even at 100-percent design strength, force reductions have had a particularly crippling effect. MLRS manning austerity has been addressed in recent force-structure decisions and will significantly improve in the near future.

However, Congress recently approved a new, reduced-strength cap of 771,000 for the Active Army. We haven't determined the full impact of this 9,000-man cut. But certainly it will intensify rather than reduce the question of hollowness in the future force.

Conclusion

CONOPS hasn't been a driving force in the design or fielding of the Army of Excellence. But inherent design considerations provide broad, overlapping fire support to maneuver forces with efficient manpower and incorporates equipment modernization.

Concern in the Army centers on how to ensure we exploit the AOE design to provide the highest degree of CONOPS possible. It's imperative we continue that concern.

The art of war teaches us to rely not on the likelihood of the enemy's not coming, but on our own readiness to receive him....

Sun-Tzu, 500 B.C.



Major Ronald M. Janowski is enroute to the 56th Field Artillery Command in West Germany. He served as a Force Structure Staff Officer in the Directorate of Combat Developments at the Field Artillery School, Fort Sill, Oklahoma, and attended the Force Development Officers Course, Fort Leavenworth, Kansas. Major Janowski is a graduate of the US Military Academy, West Point; the Materiel Acquisition Management Course, Fort Lee, Virginia; and the Command and General Staff College, Fort Leavenworth, Kansas. He commanded Headquarters and Headquarters Battery, 2d Battalion, 34th Field Artillery, Fort Lewis, Washington.

View from the Blockhouse

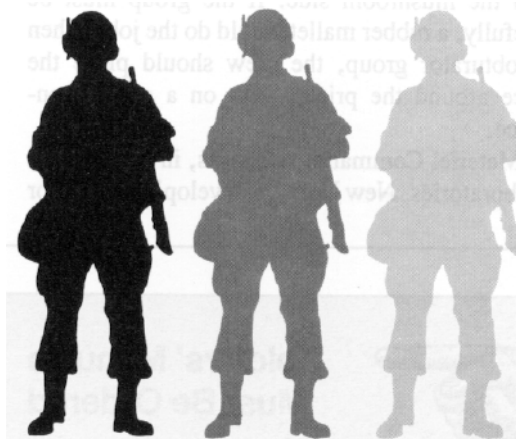
FROM THE SCHOOL

The TOE and The Personnel Cap

Department of the Army (DA) limits the number of personnel spaces allowed in tables of organization and equipment (TOEs). Known as a personnel cap, the number limits the force strength of the Army. The intent is to keep the size of the Army below 781,000 soldiers.

In some units, the personnel cap adversely affects their ability to conduct sustained operations. The TOE developer has had to delete personnel spaces from the TOE to meet the cap. Most often, these spaces come from combat service support (CSS) personnel. This results in a reduction in ammunition and fuel haul due to a lack of drivers. Mechanics and wiremen also are reduced. The TOE developer attempts to leave Field Artillery spaces intact, but he can't always do that. This hampers standardization efforts.

The TOE contains three levels of personnel. Before the personnel cap, Level 1 provided 100 percent of the personnel and equipment required to complete the unit mission on a sustained basis. At Levels 2 and 3, the unit's capabilities were reduced to 90 and 80 percent, respectively. The personnel cap has caused Level 1 strengths to drop below the minimum necessary for 100 percent capability. Many units



have modified TOEs funded at Level 2, further cutting into sustained operation capabilities.

There's no short-term solution. The long-term solution would be to increase the size of the Army, which isn't feasible in the foreseeable future.

If units have questions, call the Organization and Personnel Division, Directorate of Combat Developments, the Field Artillery School, AUTOVON 639-2726 or 3702 or commercial (405) 351-2726 or 3702.

TOE Items of interest

General Supply Technician. The general supply technician in the light infantry division artillery has been moved to the division support command (DISCOM). The Training and Doctrine Command Commander directed the consolidation of property books as in other divisions.

BUCS and the PADS Party. Message, DTG 101943Z Sep 85, DAMO-FDE, Subject: DA Letter Authority for Procurement of Additional Backup Computer System (BUCS) General, 7021-01-188-8050 provides authority for issuing one

BUCS per position and azimuth determining system (PADS) party.

Retention of the TI-59 Calculator. Message, DTG 012017Z Aug 85, DAMO-FDE, Subject: DA Letter Authority for Computer Set, Field Artillery General, 1220-01082-1646, CLIN C17797 and Computer Set, Field Artillery Missile 1220-01-082-1647, CLIN C18047 provides authority for retention of the TI-59. Units may consolidate and redistribute TI-59 calculators based on need. Repairs of the TI-59 will not be supported as it has long been out of production. Headquarters, US Army Armament, Munitions and Chemical Command validated this information in May 1988.

SAFETY in the 8-Inch Community: Obturator Spindle

Backing off the obturator spindle nut to allow the firing block mechanism to slide to the firing position on the M110A2 howitzer is not in accordance with the Operator's Manual procedures and is unsafe. The Operator's Manual specifically states the nut must be snug (hand tight). An improperly assembled obturator spindle group could lead to catastrophic failure of the primer, possibly causing personal injury and equipment damage. Rock Island Arsenal, Illinois, also notes from further inspection of continental United States (CONUS) and outside continental United States (OCONUS) units that the obturator spindle

nut is backed off anywhere from one-half to one and one-half turns from the snug position.

This improper adjustment made by the crew creates excess headspace between the base of the primer and the obturator spindle. The failure of the primer to seat properly in the primer vent creates unequal pressure in the vent and damages the primer. The reason a primer won't seat properly in the primer vent is burring and other damage to the tapered end of the obturator spindle. This damage to the spindle can't be corrected by the reamer in the crew's basic items of issue (BII).

Causes for this damage are merely speculative in nature. Some possibilities may be the obturator group was beaten out with a hammer or piece of steel instead of being removed by hand from the mushroom side. If the group must be removed forcefully, a rubber mallet would do the job. When cleaning the obturator group, the crew should place the spindle surface around the primer vent on a clean, non-abrasive surface.

The Army Materiel Command, Arkansas, in cooperation with Benet Laboratories, New York, is developing a tool for units to use to repair obturator spindles. Look for a *PS*

Magazine article to be published in the near future and a follow-on article in *Field Artillery* regarding preventive maintenance and corrective action to take with the obturator spindle. The key is for all leaders to know of this situation and train to prevent further damage to the obturator spindle and its components.

If units have questions, call the Cannon Division, Gunnery Department, the Field Artillery School, AUTOVON 639-6224 or 6379 or commercial (405) 351-6224 or 6379.



Soldiers' Manuals Must Be Ordered

If you aren't receiving the current soldier's manual (SM), check with your unit's publications account clerk. Beginning in FY 88, you no longer receive a copy of the SM automatically. Units must establish an account and order the SMs on DA Form 12-11D-R Subscription for Soldiers'

Training Publication (STP) (Enlisted) (LRA), Nov 86. If a unit hasn't established an account and ordered the manuals, soldiers won't have them to study for their skill qualification tests (SQTs). SMs are no longer on the push system; therefore, if a unit hasn't established an account, its automatic supply of SMs probably has been shut off.

For more information, write Commandant, US Army Field Artillery School, ATTN: ATSF-DTD, Fort Sill, OK 73503-5600 or call AUTOVON 639-5759 or 6105 or commercial (405) 351-5759.

Warrant Officer 132A (201A) MOS Update

The reclassification "clock" for Field Artillery warrant officers leaving MOS 132A (201A), Meteorology Technician, is ticking away. In October 1987, Field Artillery Branch, the Total Army Personnel Agency (TAPA), sent letters to each 132A outlining options available to them. Responses were returned in December 1987 and individual preferences presented to the Reclassification Board in February 1988. TAPA provided the Board's decisions in letters to each warrant officer in March and April 1988. Personnel requirements, reassignment policies and availability of training seats will determine the individual scheduling of reclassification

training and ensure the soldiers' complete transition before 1991.

The Headquarters, Department of the Army, disapproved a Field Artillery proposal to retain selected 132As in the inventory past 1991. However, three to six warrant officers who are retirement-eligible before September 1991 may be retained for meteorological data system (MDS) and light artillery meteorological system (LAMS) training requirements through September 1991. All other warrant officers who wish to remain on active duty can expect to begin the transition in the next two years—with the transition's being completed before 30 September 1991.

If warrant officers have questions, call TAPA, Warrant Officer Division, AUTOVON 221-5239 or 7839.

BATTLEKING

BK 12-87, M197 Direct-Fire Training Device. In the spring of 1981, the New Jersey Department of Defense, which heads their National Guard, solved its Field Artillery direct-fire training problems. Colonel (retired) Lawrence Bryant and Sergeant Major John Valentine took a direct-fire training device that tankers used in the 1950s and modified it for their special circumstances. They needed a cheap, reliable trainer they could use on limited firing ranges, such as those in heavily populated New Jersey.

Called an M-179, it has a .50-caliber machine gun strapped onto the howitzer tube. The machine gun then is bore-sighted with the tube. Tracer rounds are used in the belt, letting howitzers practice direct fire in places of limited range. Fortunately, .50-caliber rounds have about the same trajectory (out to 1,000 meters) as 105-mm, 155-mm and 8-inch howitzer rounds and cost a fraction of the amount.

Under the BATTLEKING project, which tests cost-effective ideas, the Directorate of Training and Doctrine, Field Artillery School, field-tested the M-179. Says First Lieutenant Stephen Eastland, 1st Battalion, 17th Field Artillery,

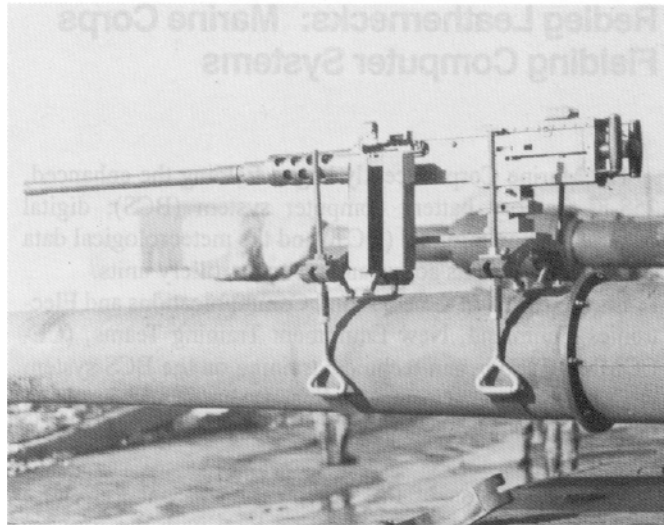
who was the officer in charge at the testing, "I doubted whether the gunner and the assistant gunner would be able to see the round hit the target. But after using it, I'm very impressed. The round is easy to follow, and the feedback to the gunner and assistant gunner is immediate. It beats all other training devices hands down."

Eastland said other direct-fire trainers lack in areas of range, manageability or reliability. None of these problems plagues the M-179.

Because of the \$266-per-round price tag, Training and Doctrine Command (TRADOC) authorizes only six howitzer rounds for direct-fire training. This limits training and blocks all cross-training. "With just six rounds, the gunner can train only in the gunner position and the assistant gunner can train only in that position. It allows no cross-training at all for the rest of the crew members," said Eastland.

With .50-caliber rounds costing about \$2.30 each, units can train whole sections for a fraction of the cost of just one howitzer round.

The M-179 direct-fire trainer device, NSN 6920-01-117-8693, can be fabricated at local training and audiovisual support centers (TASCs). For more information, see *DA*



Pam 310-12 Index and Description of Army Training Devices, Page 3-408 or contact the US Army Field Artillery Board, ATTN: ATZR-BDO (BATTLEKING), Fort Sill, Oklahoma 73503-6100, AUTOVON 639-3717 or 4075 or commercial (405) 351-3717 or 4075.

Airborne Field Artillery NCOs Needed

Field Artillery Branch, US Total Army Personnel Agency (USTAPA), is looking for NCOs in MOS 13B Field Artillery Cannon Crewman and MOS 13F Fire Support Specialists who are interested in Airborne training. With the conversion of the 1st Battalion, 39th Field Artillery, Fort Bragg, North Carolina, to airborne, the Career Management Field (CMF) 13 airborne surplus was depleted.

According to SFC David K. Nichols, Field Artillery Career Advisor (TAPA) for cannon MOSSs, the Army wants airborne-qualified soldiers to exceed authorizations by 150 percent to allow airborne NCO professional development assignments as drill sergeants, recruiters and service school instructors.

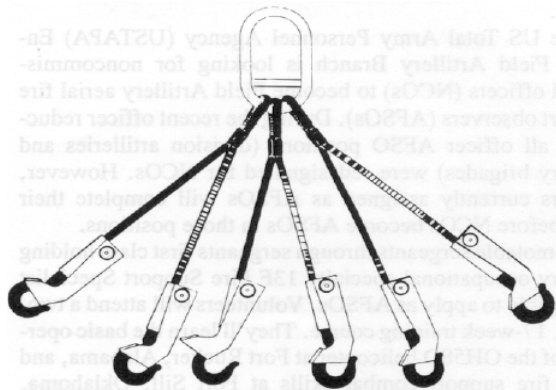
SFC Nichols is looking for overseas-based NCOs who want airborne training to reenlist under Option F-3 in AR 601-280 Total Army Retention Program, or, if not eligible to reenlist, to submit DA Form 4187 Request for Personnel Action asking for airborne training enroute from overseas. Procedure 3-19, DA Pam 600-8 Management and Administrative Procedures or Chapter 6, AR 614-200 Selection of Enlisted Soldiers for Training and Assignment contain detailed information on application procedures. Most CMF 13 Airborne soldiers will be assigned to the 82d Airborne Division, Fort Bragg after training.

Soldiers with questions about airborne training application procedures should contact SFC Nichols at AUTOVON 221-0304 or commercial (202) 325-0304.

Ammo Slings for HEMTT

Multiple-leg slings to hook up to the M977 heavy expanded mobility tactical truck (HEMTT) are now available through the Tank and Automotive Command (TACOM). The sling lifts palletized 155-mm and 203-mm projectiles. The M977s now being issued to units will have the slings.

Units can order the slings from TACOM, using NSN 3940-01-247-7400 with a basis of issue of two slings per truck. If units have questions, call the New Systems Division, Gunnery Department, Field Artillery School, AUTOVON 639-5523 or commercial (405) 351-5523.



Redleg Leathernecks: Marine Corps Fielding Computer Systems

The Marine Corps recently began fielding the enhanced, 258-K memory battery computer system (BCS), digital communication terminal (DCT) and the meteorological data system (MDS) to its active and reserve artillery units.

Instructors from the US Army Communications and Electronics Command, New Equipment Training Teams, (CE-COMMNETT) began technical training on the BCS system at Camp Lejeune, North Carolina, in June and completed training for all active units in August at Kaneohe Bay, Hawaii.

The introduction of this equipment will put the entire system on a digital communication loop with the forward observer's (FO) sending missions digitally to the BCS on a

DCT and the meteorological messages coming digitally to the BCS from the MDS. However, while units are trained during the next 12 months, the battalion FDC and the fire support coordination center (FSCC) at all levels will have no means of monitoring missions or communicating digitally with the batteries or the FOs. To overcome this, the Marine Corps has developed the Marine flexible fire support system (FIREFLEX). This will provide a limited automated capability in the battalion FDC and FSCC to monitor digital communication between the FO and the battery FDC.

The Marine Corps currently is considering two devices to fill this requirement: a modified fire support team (FIST) digital message device (DMD) and a battlefield computer terminal (BCT). The Corps will continue to evaluate these systems for another 12 months. A system then will be purchased and fielded in the Fleet Marine Force.

Redleg News

ITEMS OF GENERAL INTEREST

FA Not Promoting Enough NCOs

The decentralized noncommissioned officer (NCO) promotion system is how the Field Artillery "grows" its NCO corps. The US Total Army Personnel Agency (USTAPA) and Field Artillery Branch studies demonstrate that 30 to 35 percent of the E-4 population and 25 to 30 percent of the E-5 population must be on promotion lists if the artillery is to sustain itself without overreliance on reclassified NCOs.

In May, only 12 percent of MOS 13B10 Cannon Crew-members, 20 percent of MOS 13F10 Fire Support Specialists and 18 percent of MOS 82C10 Field Artillery Surveyors were on promotion lists to sergeant. While the conflict between quality and quantity continues, the

number of Field Artillerymen on promotion lists to sergeant and staff sergeant in many of our MOSs has dropped to the point that it limits our ability to grow our own NCOs. Should the trend continue, the Field Artillery will have to increase the number of soldiers entering our field at grades E-5 and E-6. With the corresponding drop in the experience level of our NCOs, there will be an increased training burden on units and an adverse impact on combat readiness.

Commanders and command sergeants major at all levels should periodically review the number of soldiers recommended for promotion before the Field Artillery loses its best potential NCOs because they aren't recommended for promotion.

*FA Enlisted Branch
USTAPA*

Aerial Fire Support Observers Needed

The US Total Army Personnel Agency (USTAPA) Enlisted Field Artillery Branch is looking for noncommissioned officers (NCOs) to become Field Artillery aerial fire support observers (AFSOs). During the recent officer reductions, all officer AFSO positions (division artilleries and artillery brigades) were redesignated for NCOs. However, officers currently assigned as AFSOs will complete their tours before NCOs become AFSOs in those positions.

Promotable sergeants through sergeants first class holding military occupational specialty 13F Fire Support Specialist are eligible to apply as AFSOs. Volunteers will attend a two-phase, 17-week training course. They'll learn the basic operation of the OH58D helicopter at Fort Rucker, Alabama, and aerial fire support combat skills at Fort Sill, Oklahoma. When they complete their training, NCOs will be assigned as



Field Artillery

AFSOs and will be eligible for air crewmember pay.

Each application must include the results of a Class II flight physical with a linear anthropometric exam and a cycloplegic refraction eye exam. An applicant also must have—

- Completed the Basic NCO Course in MOS 13F.
- A general test score of 105.
- A standard test score of 105.
- A Field Artillery score of 100.
- Three years' time in service left or must execute a statement of intent to reenlist or extend to meet the

Article 15s and Promotions

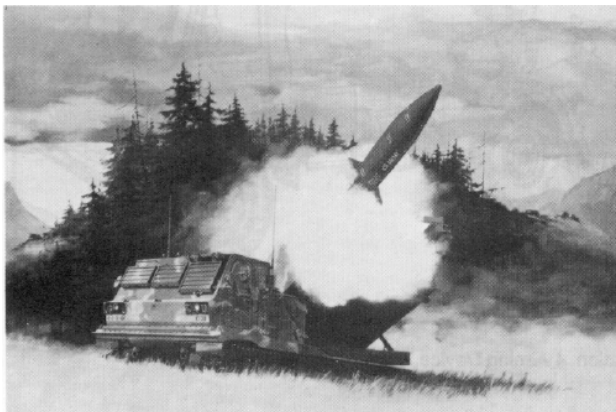
One of the clearest discriminators used by promotion boards is the presence of Article 15s in a noncommissioned officer's (NCO's) performance microfiche. Many NCOs haven't been selected for promotion to sergeant first class or master sergeant because of Article 15s that could have been removed from their performance microfiche and placed in their restricted microfiche.

Staff sergeants and above may request an Article 15 be transferred to the restricted file under AR 27-10 Military Justice, while sergeants and below request the transfer under AR 15-185 Boards, Commissions and Committees: The Army Board for Correction of Military Records. In

Army TACMS Fired Three Bull's Eyes

The Army tactical missile system (Army TACMS) fired bull's eyes in three tests at White Sands Missile Range, New Mexico. During tests 26 April, 8 June and 12 July 1988, Army TACMS' performance met all test objectives. In fact, test data results show significantly better performance in accuracy and reliability than initially predicted.

The long-range missile was launched successfully from a modified version of the multiple launch rocket system (MLRS) launcher and flew the planned trajectory, impacting in the target area several miles away. In addition to launcher and missile performance, test engineers acquired data to evaluate warhead delivery characteristics.



LTV Aerospace and Defense Company, the Army
October 1988

time-in-service requirement.

Eligible NCOs must submit their applications right away to meet initial training dates. They should direct any questions about this program to SFC David K. Nichols at TAPA, AUTOVON 221-0304 or commercial (202) 325-0304.

Soldiers can apply for AFSO training by submitting DA Form 4187 Request for Personnel Action through their personnel service centers to TAPA. Send applications to Commander, USTAPA, Attention: DAPC-EPK-F, 2461 Eisenhower Avenue, Alexandria, Virginia 22331-0460.

both instances, the Army Board for Correction of Military Records will review the case and make a decision.

Removing an Article 15 in no way guarantees selection for promotion, nor does it automatically cause reconsideration of prior non-selection. The key is to try to remove the Article 15 well before entering the zone of consideration for promotion.

An NCO with an Article 15 in his record should see his battalion personnel staff NCO or legal clerk for help in removing it from his official military personnel file viewed by promotion boards.

Robert L. Cooper
MSG(P), FA
FA Enlisted Branch
USTAPA

TACMS' prime contractor, conducted the firing with support from the Army Test and Evaluation Agency (ARMTE) and White Sands. LTV has planned seven other firings to make sure the engineering design meets Army requirements. Following that, the government will conduct its own test program.

The range of Army TACMS is classified, but it is well beyond the range of existing Field Artillery cannon, rockets and the Lance missile. The system will feature increased accuracy, leading to more reliable lethality. Each missile will be approximately 13 feet long and nearly two feet in diameter. The non-nuclear warhead initially will contain about 1,000 sub-munitions—each similar to a grenade—for attacking enemy troops, supplies and equipment. A planned follow-on warhead will feature precision-guided sub-munitions to attack armor.

Army TACMS missiles will be launched from a modified version of the MLRS launcher. By using the MLRS that's already deployed, the Army minimizes the impact of a new missile system on the current force structure.

Once fielded in the 1990s, Army TACMS will give corps commanders the ability selectively to attack enemy second-echelon forces deep beyond the front lines in support of the corps commander's deep-battle objectives. It also will raise the so-called "nuclear threshold," the point at which the military commander must resort to tactical nuclear weapons to stop the onrushing enemy.

M113 Unsafe for Amphibious Training

The US Army's M113 armored personnel carrier (APC) and its derivatives have been declared unsafe for peacetime amphibious training. The ban applies to most of the US



An M113 of the 1st Battalion, 46th Infantry Regiment (Mech), Swimming at Grafenwoehr, West Germany

Army's M113 force of nearly 26,000 vehicles, including the 13,000-strong troop carrier force. The M113 is one of the world's most prolific armored vehicles, with more than 75,000 in service with the armed forces of 41 countries.

A spokesman for the Tank Automotive Command (TACOM) said the swimming prohibition applies to "all of the M113 vehicles other than air defense type vehicles."

As the M113 has developed, its weight has increased from about 10,660 kilograms (kgs) with full combat load to 12,250 kgs in the later M113A3 types. With additional external armor, the M113A3's weight rises to 14,000 kgs. The M113A3 has been banned from swimming since it entered service in 1986.

While a review of the amphibious capability is now under way at the Army's Training and Doctrine Command at Fort Monroe, Virginia, the problem may be overcome best by simply eliminating the M113's need to be amphibious. "We're looking at ways to restore the swim capability," said a US Army public affairs spokesman at the Pentagon. "But first, we want to know: does it have to swim? What is the point in spending the money to make it swim again if we're not going to ask it to do that?"

*Courtesy of Jane's Defence Weekly,
12 March 1988, p. 435*

The Soviet BM-21V Grad-P

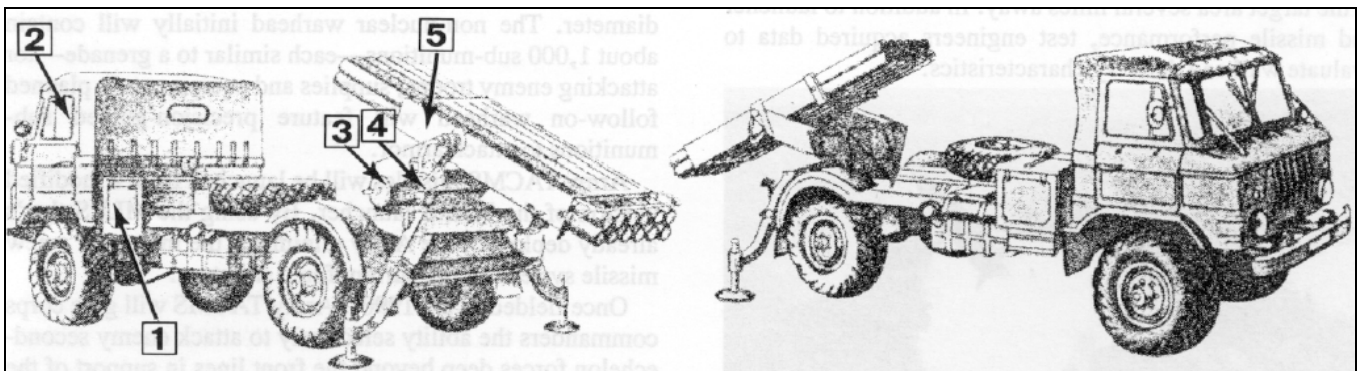
Details of the BM-21V Grad-P multiple rocket system, a lightweight version of the BM-21 Grad (Hail), are becoming available in the West now, although it has been in service for a number of years.

The BM-21 Grad-P (called M1975 in NATO) is the smallest member of the trio comprising the basic BM-21 (based on the Ural-375, 6x6, truck and fitted with 40 tubes for the long- or short-range rockets) and the modified version, the BM-21B (based on the ZiL-131 truck and

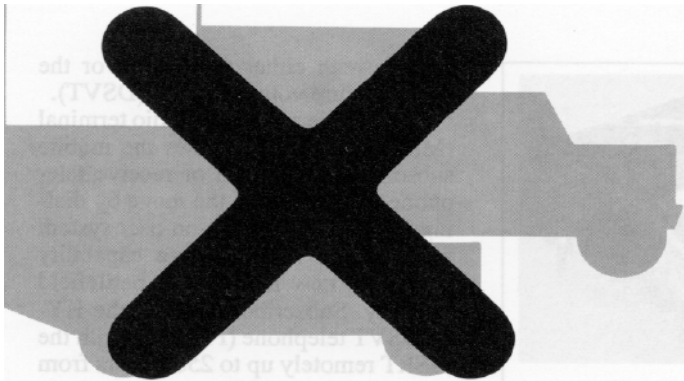
carrying 36 tubes, which are limited to the short-range rocket).

The BM-21V has only 12 tubes, but it can fire the long-range M-21-OF rocket. Its maximum range is 20.5 kilometers. It was developed especially for the composite artillery battalion in the air assault divisions. Each of these battalions has 12 D-30 (2A19 Sonyushka) 122-mm howitzers and six BM-21V multiple rocket launchers.

*Courtesy of Jane's Defence Weekly,
5 March 1988, p. 415*



The BM-21V Grad-P Multiple Rocket System: 1 Tool Stowage, 2 Cab, 3 Elevation, 4 Aiming Device, 5 Launcher Assembly



MSE

by Major Richard C. Huber, SC

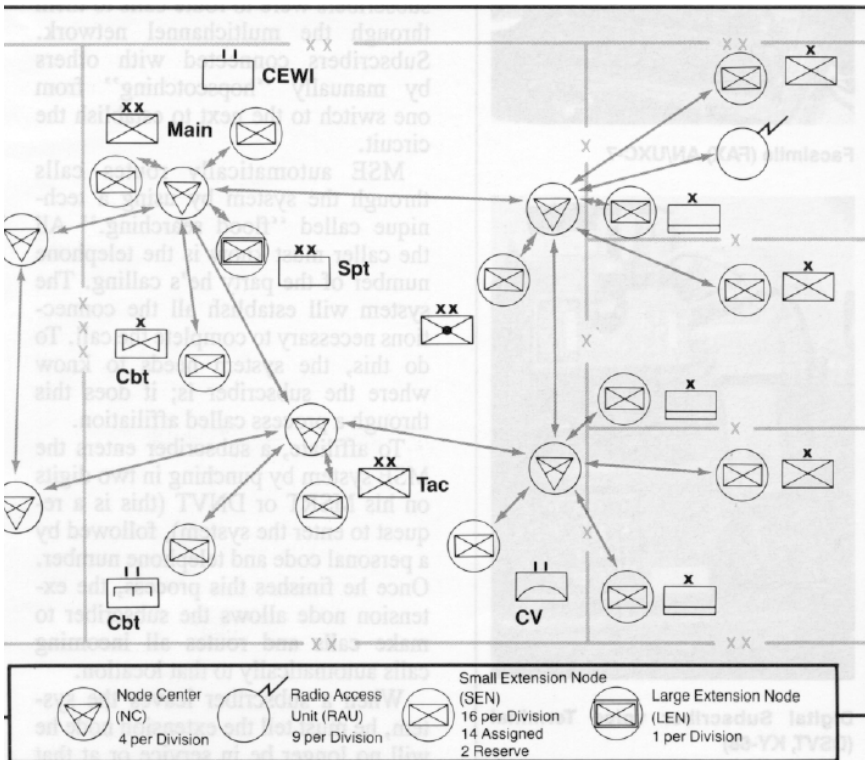
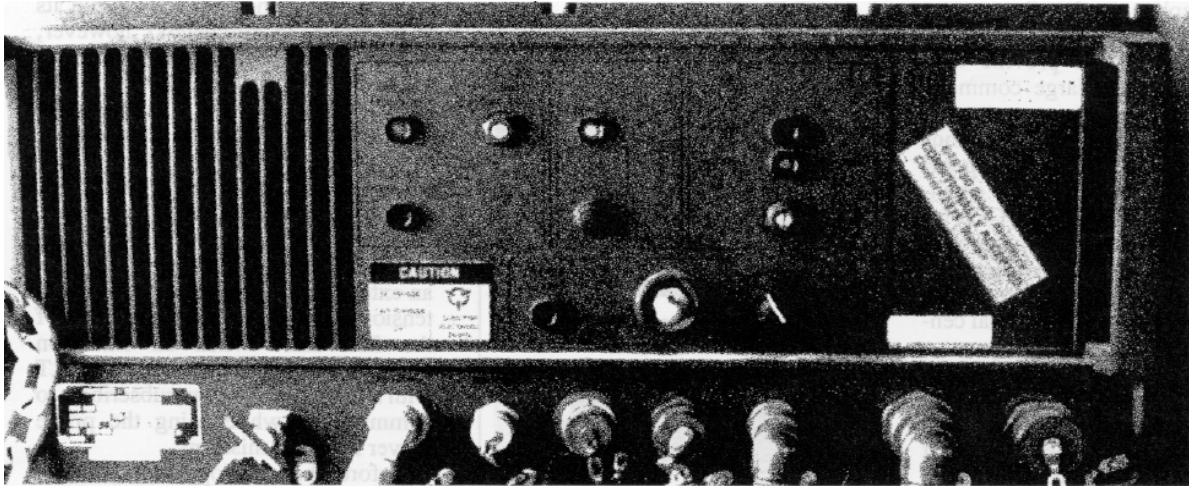


Figure 1: MSE Signal Support Distribution

The Army's transition from the current multichannel communications system to mobile subscriber equipment (MSE), which began in 1988, will have a significant impact on Field Artillery doctrine and procedures. Many commanders have begun to ask how to use MSE, how MSE will support the organizational command structure and procedures and what problems to expect when MSE is fielded. The 1st Cavalry Division Artillery, Fort Hood, Texas, found answers to these questions during its recent fielding and testing of MSE. To understand the answers, you first must know how MSE supports the commander in the field.

Area Coverage

The node centers (NC) shown in Figure 1 are the backbone of the MSE system. Each NC consists of a node center switch (NCS), one remote and one local radio access unit (RAU), a line-of-sight (LOS) terminal, a node management facility (NMF) and a node support vehicle (NSV). The node center switch provides network switching

to connect and route calls through the system. The radio access unit allows mobile subscribers (using cellular telephones) to place or receive calls while on the move or stationary within the corps area of operation. The line-of-sight terminals provide radio links between node centers, large extension nodes (LEN), small extension nodes (SEN) and radio access units.

Wire Subscriber Access

Static telephone subscribers enter the MSE network as wire subscribers. Large extension nodes provide wire subscribers access to large command posts (CPs) within the corps area, for example, corps support commands (COSCOMs) and division support commands (DISCOMs). Small extension nodes support the smaller CPs, for example, corps artilleries, division artilleries (Div Artys), Field Artillery brigades and maneuver brigades. Both nodes are similar to the area signal centers that support those CPs today.

Wire subscribers enter the MSE system by connecting their telephones to one of the nodes' local junction boxes, using WF-16/U wire. The location of the junction box and the assignment of binding posts usually will be prearranged in the unit's SOP.

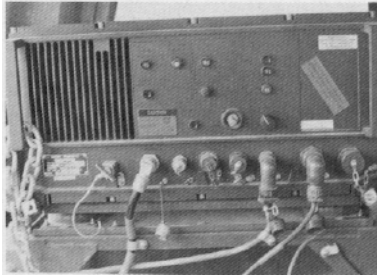
Subscriber Terminals

All MSE terminal equipment is owned, operated and installed by the user. The digital, non-secure voice terminal (DNVT) shown in Figure 2 is the primary subscriber terminal device used within the MSE system for telephone-wire access. The DNVT is a digital, four-wire, voice or data telephone. Currently, only the facsimile device will connect to the DNVT data port. However, other subscriber terminal devices will be compatible with the DNVT, for example, the single subscriber terminal (SST) and advanced field artillery tactical data system (AFATDS) when they're fielded. The DNVT is connected by wire to the nearest node center, large or small extension node.

The digital facsimile terminal (FAX) in Figure 2 is a simple, easily installed device that transmits quality, single-page graphics. It electronically transmits text and (or) graphics among subscribers in black and white or in eight shades of gray. The FAX will



Digital Non-Secure Voice Telephone (DNVT) TA-1035/U



Receiver-Transmitter RT 1539 (P)A(C)/G



Facsimile (FAX) AN/UXC-7



Digital Subscriber voice Terminal (DSVT, KY-68)

Figure 2: Mobile Subscriber Terminals

operate with either the DNVT or the digital secure voice terminal (DSVT).

The mobile subscriber radio terminal (MSRT), Figure 2, allows the mobile subscriber to transmit or receive telephone calls while on the move by dialing into the MSE common-user system via a secure radio link—a capability that gives new meaning to battlefield mobility. Subscribers can use the KY-68 DSVT telephone (Figure 2) with the MSRT remotely up to 250 meters from the radio. The MSRT can communicate directly with other MSRTs within its radio range (15 kilometers); however, linking with other MSRTs is not standard and is done only in exceptional circumstances. MSRTs usually link automatically through the nearest radio access unit to the entire MSE system.

Using the stand-alone field kit (SAFK), the MSRT can be removed from the vehicle. CPs and elements that are not within wire-line distance of an extension switch (large or small extension nodes) are the primary users of the field kits. When an extension switch isn't available, using an MSRT with a field kit will allow subscribers to communicate while using the prime mover for other missions.

Before the development of MSE, subscribers had to know where other subscribers were to route calls to them through the multichannel network. Subscribers connected with others by manually "hopscotching" from one switch to the next to establish the circuit.

MSE automatically routes calls through the system by using a technique called "flood searching." All the caller must know is the telephone number of the party he's calling. The system will establish all the connections necessary to complete the call. To do this, the system needs to know where the subscriber is; it does this through a process called affiliation.

To affiliate, a subscriber enters the MSE system by punching in two digits on his MSRT or DNVT (this is a request to enter the system), followed by a personal code and telephone number. Once he finishes this process, the extension node allows the subscriber to make calls and routes all incoming calls automatically to that location.

When a subscriber leaves the system, he must tell the extension node he will no longer be in service or at that location. This process is called disaffiliation; it works the same way as affiliation

but uses a different code. After arriving at a new location, the subscriber starts over by reaffiliating with the system.

Tactical Employment

Field Artillery organizations and their supporting signal elements must develop communications plans based on mission, enemy, troops, terrain and time available (METT-T). The plans will vary according to the type of traffic, density of subscribers, transmission times, type of mission, presence of electronic warfare and unit training.

Proximity to a radio access unit and small extension node governs which subscriber terminal units will use. For example, laying wire lines for DNVTs depends on the amount and condition of WF-16/U wire available, the terrain to be covered, the length of time the unit will occupy the position and the number of soldiers available to perform the required tasks.

The Div Arty tactical operations center (TOC) will be concerned with positioning and mounting MSE subscriber terminals. The subscriber terminal "laydowns" shown in Figures 3 and 4 portray how the 1st Cavalry Div Arty is planning to use its equipment. Because of the Div Arty's larger staff and planning and coordination requirements, more MSRTs and DNVTs have been allocated for its use than for Field Artillery battalions. Operational test results and communications requirements of users ultimately will determine the optimum allocation of devices and the preferred procedures for using the MSE system.

The impact of MSE will be the greatest at the battalion level (see Figure 5),



MSE enhances the rapid transmission of secure-voice digital traffic.

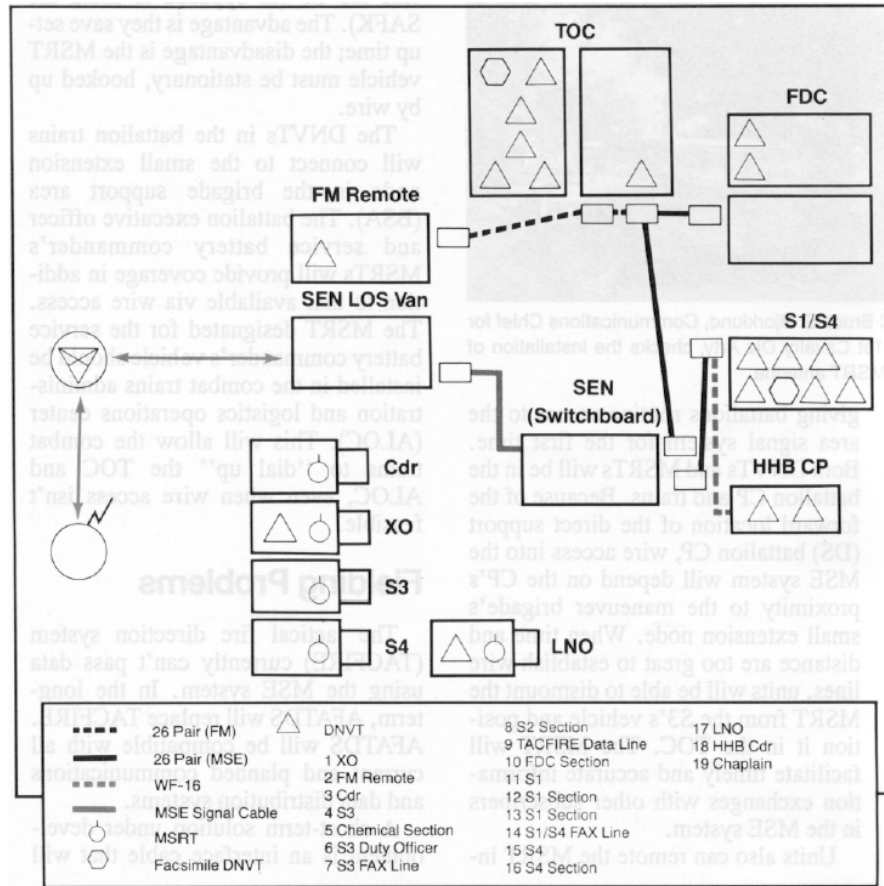


Figure 3: 1st Cavalry Division Artillery Command Post

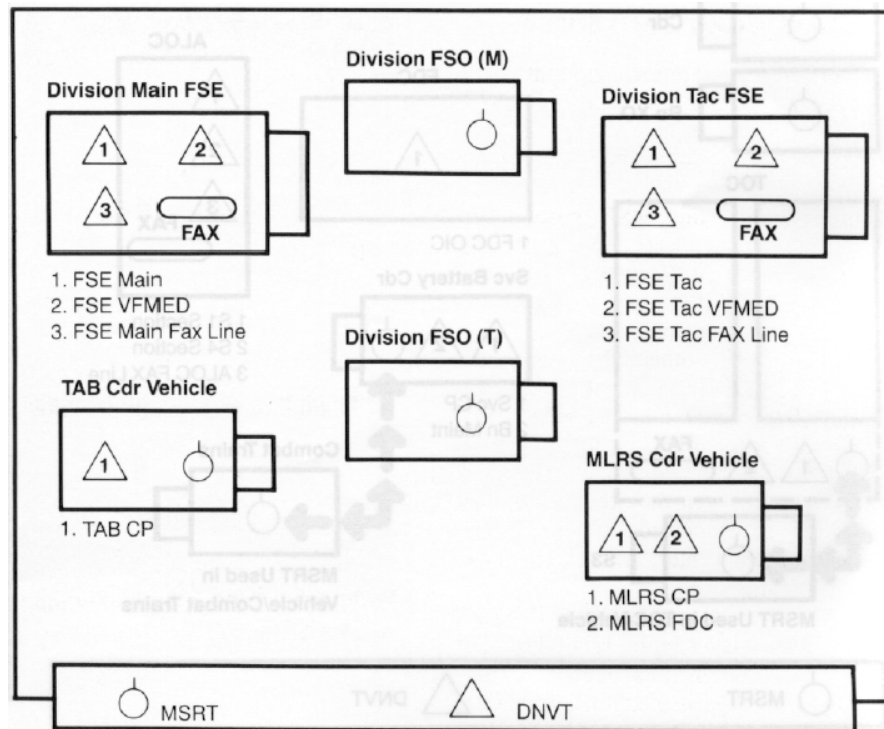


Figure 4: 1st Cavalry Division Artillery FSE, TAB and MLRS



SFC Bruce E. Bjorklund, Communications Chief for the 1st Cavalry Div Arty, checks the installation of the MSRT antenna.

giving battalions routine access to the area signal system for the first time. Both DNVTs and MSRTs will be in the battalion CP and trains. Because of the forward location of the direct support (DS) battalion CP, wire access into the MSE system will depend on the CP's proximity to the maneuver brigade's small extension node. When time and distance are too great to establish wire lines, units will be able to dismount the MSRT from the S3's vehicle and position it in the TOC. The MSRT will facilitate timely and accurate information exchanges with other subscribers in the MSE system.

Units also can remote the MSRT inside

the CP (as opposed to using the SAFK). The advantage is they save setup time; the disadvantage is the MSRT vehicle must be stationary, hooked up by wire.

The DNVTs in the battalion trains will connect to the small extension node in the brigade support area (BSA). The battalion executive officer and service battery commander's MSRTs will provide coverage in addition to that available via wire access. The MSRT designated for the service battery commander's vehicle should be installed in the combat trains administration and logistics operations center (ALOC). This will allow the combat trains to "dial up" the TOC and ALOC, even when wire access isn't feasible.

Fielding Problems

The tactical fire direction system (TACFIRE) currently can't pass data using the MSE system. In the long-term, AFATDS will replace TACFIRE. AFATDS will be compatible with all current and planned communications and data distribution systems.

A short-term solution under development is an interface cable that will

change TACFIRE's analog signal to an MSE digital signal; this cable will allow TACFIRE to use MSE for data distribution. Unit levels to receive the interface cable are the Corps and Div Artys' TOCs, main and tactical FSEs, the MLRS battalion or battery and also the Field Artillery brigade TOCs. Until the fielding of the cable in 1989, all TACFIRE transactions will have to be conducted by combat net radio (CNR).

MSE operates in the same frequency band as CNR, so there may be times when MSE and CNR will interfere with each other. Three ways to minimize this interference are frequency separation (special attention should be paid to Field Artillery CNR data nets), antenna separation at CPs (ensure at least 50 meters separate CNR and MSRT antennas) and time sharing (users operate only one radio at a time).

There is a potential problem with frequency interference between the single-channel ground and airborne radio system (SINCGARS) and MSRT. Units must use both radios carefully to prevent this interference.

Summary

MSE promises to be an invaluable tool for the Field Artillery. It will increase mobility, flexibility and survivability, thereby ensuring our ability to adhere to doctrine and procedures.

MSRTs will allow commanders, CPs and selected staff elements to maintain area communications while on the move, helping them to better influence the outcome of the battle.



Major Richard C. Huber, SC, recently assigned to the Regional Signal Group, Supreme Headquarters Allied Powers (SHAPE) in Belgium, was a Training and Doctrine Command Systems Manager for Fire Support Command, Control and Communications at the Field Artillery School at Fort Sill, Oklahoma. Major Huber has been involved in the analysis of communications requirements for battlefield automated systems as well as the development of procedures to improve communications support for the Field Artillery. He has a master's degree in information management from Oklahoma City University.

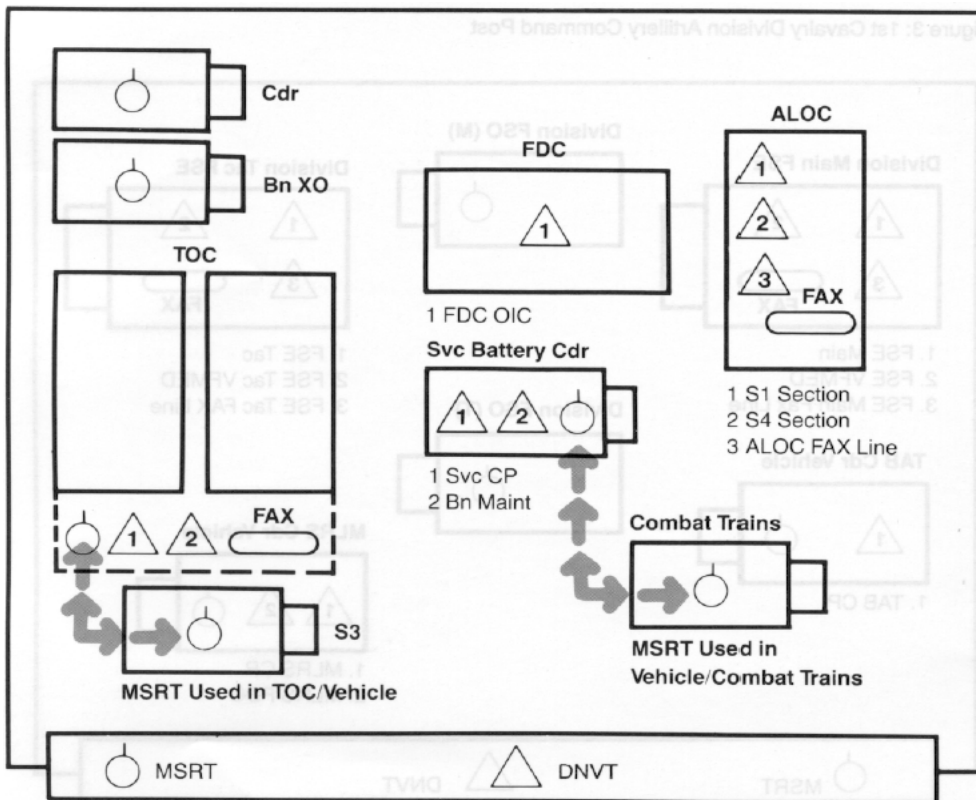
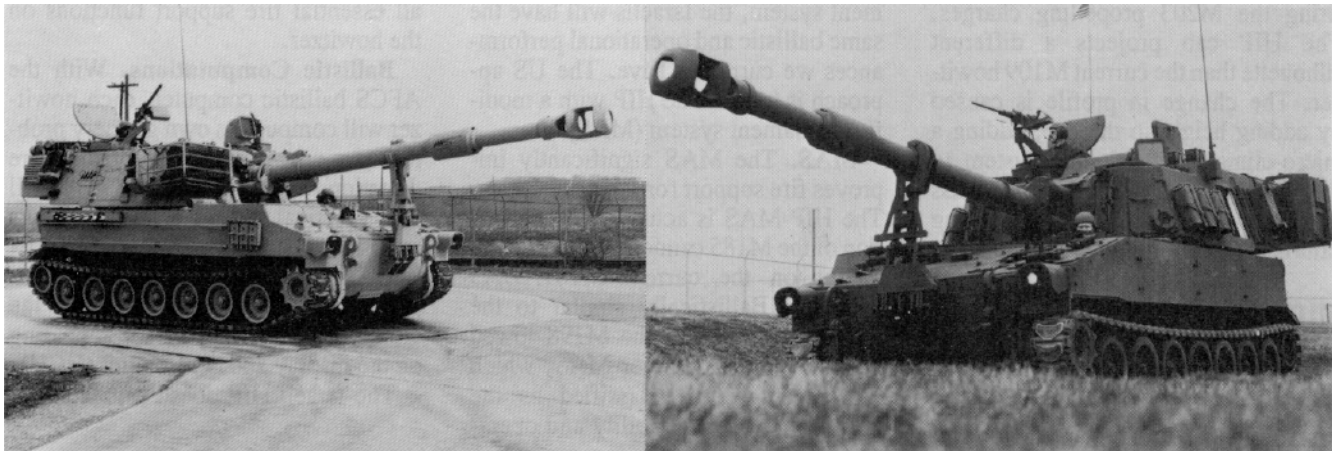


Figure 5: Field Artillery Battalion Laydown



The HIP Connection

by Captain Robert I. Zabielski

As we approach the decade of the 90s, the US Army continues modernization efforts to keep pace with the ever-improving Threat. The Field Artillery's self-propelled howitzer modernization program is a key part of the overall effort.

The M109, which is 25 years old this year, is the foundation of the Army's modernization of the medium, self-propelled artillery fleet. The howitzer improvement program (HIP) started in 1984. Key improvements to the current M109A2/A3 in survivability, responsiveness, reliability and range will help us provide better fire support for the ground-gaining arms.

The US and IDF

These much-needed improvements have their roots in an interesting co-development program. The HIP is a joint program of the US Army and the Israeli Defense Force (IDF). Not a newcomer to the IDF, the M109 is the backbone of Israel's 155-mm self-propelled howitzer fleet.

When the US Army adopted the M109A1, the Israelis purchased the export version, the M109A1B. As the Israelis also recognized the need to enhance their fire support, they opted to continue with the proven M109 series.

The HIP program became a marriage of US and Israeli modernization efforts to jointly develop the next generation of self-propelled howitzers: the US HIP M109A3E2 and the Israeli M109A1C. The US HIP is scheduled to be fielded late in 1990 with the Israeli HIP fielded soon after.

The US's original development strategy was to have the next generation howitzer evolve through a series of modifications to the HIP. Current strategy is to field an entirely new howitzer, the advanced Field Artillery system, cannon (AFAS-C), as the follow-on to the HIP.

The HIP is an M109A2/A3 with significant technical improvements. Starting with a completely new turret on a refurbished and improved M109A2/A3 chassis, the HIP features improvements in armament, fire control, automotive, vulnerability reduction, prognostics and diagnostics and suspension.

The decision to start with a new turret, rather than modify the old one, was based on a need to increase ballistic protection for the crew, provide structural modification for the state-of-the-art equipment and provide support for the added stress caused by



The Israeli M109A1C HIP Prototype, the "Sister" of the US M109A3E2 HIP, Also Under Development

firing the M203 propelling charges. The HIP cab projects a different silhouette than the current M109 howitzer. The change in profile is caused by adding height to the cab, adding a micro-climate conditioning system to the roof, extending the bustle across the rear width of the cab and adding external stowage baskets.

HIP Comparison

Though HIP addresses many common US and Israeli requirements, there are differences in the two vehicles to accommodate each country's distinctive operational requirements. Each country's approach represents a unique combination of user requirements and economic trade-offs.

Firepower

Differences in the US and IDF HIPs are immediately apparent in the armament improvements. In fielding its version of the HIP, the IDF will incorporate the standard 39-caliber M185 cannon and the M178 mount now on US and Israeli 155-mm self-propelled howitzers. With this armament system, the Israelis will have the same ballistic and operational

performances we currently have. The US approach is to field the HIP with a modified armament system (MAS).

MAS. The MAS significantly improves fire support for the early 1990s. The HIP MAS is actually a modification of the M185 cannon and M178 gun mount on the current M109A2/A3 howitzer. Ballistically similar to the cannon mounted on the M198 towed howitzer, the 39-caliber MAS, which was recently type classified as the M284, improves reliability and operational capabilities.

The M284 also fires all existing and developmental 155-mm munitions, excluding the MK2A4 primer (used only on the old M114 howitzer). This cannon's ability to handle the new family of propellants, especially the M203 series, increases range by 27 percent (out to 30 kilometers when firing rocket-assisted projectiles).

Fire Control

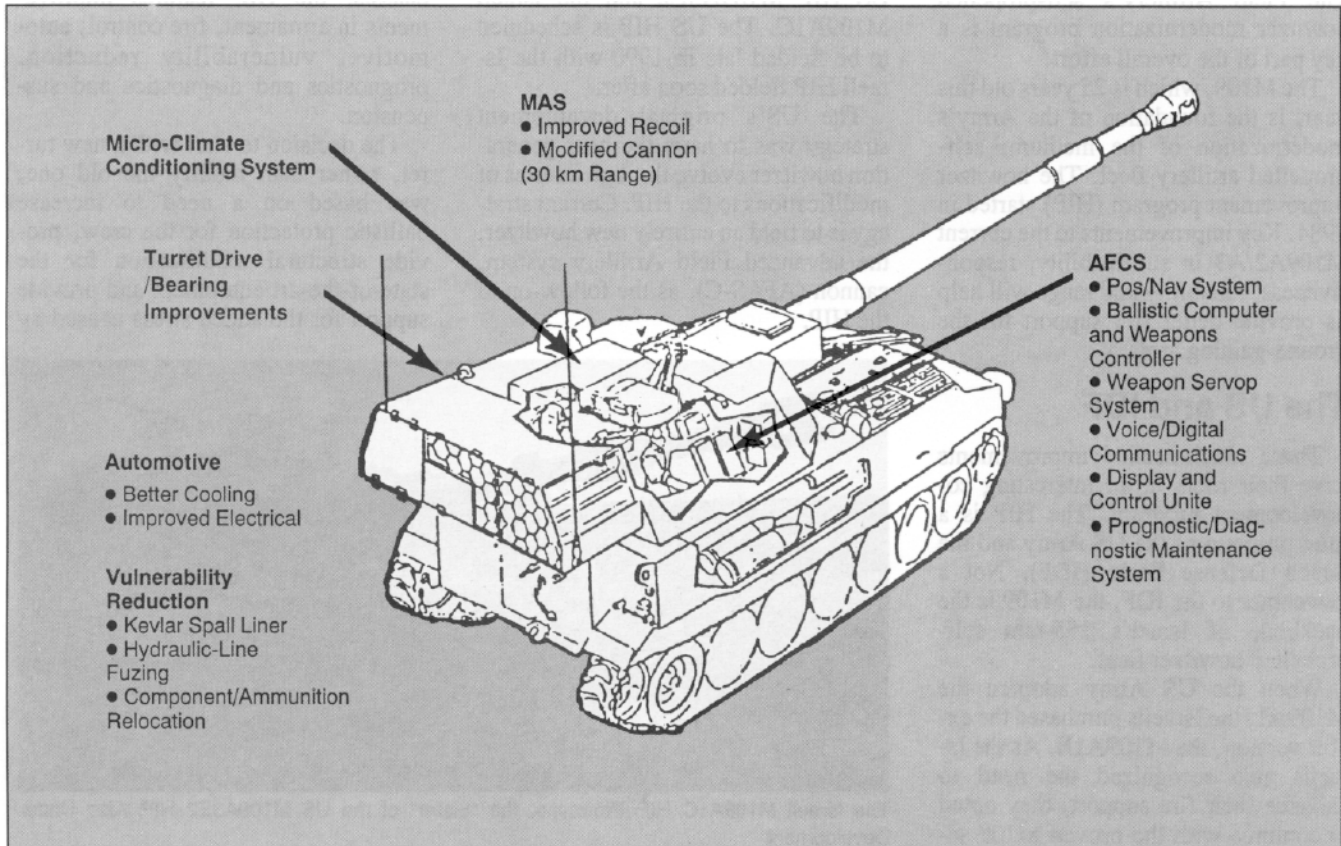
The HIP has a unique command, control and communications (C³) system. Its on-board automatic fire control system (AFCS) integrates and controls all essential fire support functions on the howitzer.

Ballistic Computations. With the AFCS ballistic computer, each howitzer will compute its own gunnery problems, as now done by the platoon fire direction center (FDC). The FDC will retain tactical control of the howitzers and the ability to compute fire missions, as necessary. All ballistic computations will be transparent to the crew with the firing data's appearing on the display and control unit (DCU).

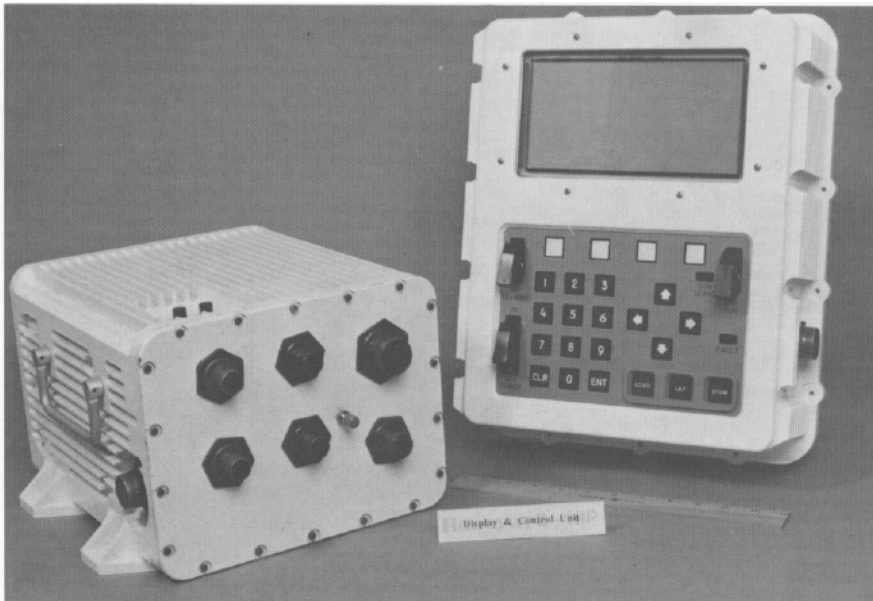
The Israeli HIP doesn't include on-board

HIP MAS: Improved Reliability and Operational Capabilities

- Improved muzzle break and bore evacuator.
- More chamber volume to accommodate new propellants with increased chamber pressures.
- Tube temperature sensor with temperature status (Hot, Warm or Cold) displayed on the fire control system's display unit.
- More robust breech with improved firing mechanism.
- Dual-tongue torque keys and two shallower grooves to increase the life of the cannon tube.



The US M109A3E2 is the first-generation HIP, which has significant technical improvements and allows for semi-autonomous operations.



All ballistic computations on the AFCS will be transparent, with the firing data's appearing on the DCU.

ballistic computation. The US HIP has one display unit while the Israeli version has a second one for the driver and (or) the gunner.

The AFCS is compatible with all external command and control and target acquisition nodes and equipment. Likewise, the Israelis' version is compatible with its tactical fire control and target acquisition means.

Weapons Servo System. The US and Israeli versions also part company in the method of laying the HIP onto the appropriate firing data. Once firing data has been received, the Israeli crew will manually traverse the turret and elevate the cannon. Unlike the Israeli version, the US AFCS has a weapon servo controller integrated with the ballistic computer (allowing the crew to automatically lay the howitzer by pushing a button).

Although the automatic process will be the primary mode of operation, the crew will be able to control indirect fire manually if AFCS malfunctions. The howitzer has the traditional optical and mechanical indirect fire support sighting equipment on board. Likewise, reciprocal laying with another HIP still will be possible.

Position and Navigation System (Pos/Nav). With the HIP's on-board Pos/Nav integrated with the AFCS, the HIP will be able to navigate freely with the crew's always knowing its location,

direction of travel and direction of and distance to destination. The US Pos/Nav system uses the modular azimuth and positioning system (MAPS) dynamic reference unit (DRU). The MAPS provides highly accurate position (easting, northing and altitude) and direction information. It requires only periodic updates, with or without survey control points, to establish and maintain the required Pos/Nav accuracy. A vehicle motion sensor (VMS) provides movement information through a modem to the MAPS. Free from much of the dependence on external survey, our fire support will be more responsive.

The Israelis have their own Pos/Nav system called the gun orientation and navigation system (GONS). The GONS functions similarly to MAPS.

Communications

For the first time, our self-propelled howitzer crews will have radio communications. The system is compatible with current radios and the new single-channel, ground and airborne radio system (SINGGARS) for digital and voice communications. A communications processor will allow the crew to concentrate on its primary fire-support tasks by automatically executing all communications-related functions.

Communications Processor. Like the ballistic computer, the communications

processor functions will be transparent to the crew but allow for the operator's interactive participation.

The Israeli version does the same for its battalion- and battery-level command and control system.

SINGGARS. The HIP employs the AN/VRC-89 SINGGARS radio as the primary means of digital and voice communications. As needed, it will have either one AN/VRC-89 radio (two transceivers) or two AN/VRC-64 radios. The Israeli HIP provides essentially the same capabilities with Israeli radios.

Command and Control. For maximum versatility, the AFCS system will be able to communicate with all command and control nodes with any combination of SINGGARS, AN/VRC-46 or AN/VRC-64 radios. Both the US and Israeli HIPs have the capability for wire communications.

Security. All digital data and voice communications will be secured with either the SINGGARS AN/VRC-89's internal encryption capability (when available) or with the KY57 COMSEC device when using the AN/VRC-64 radios and early SINGGARS. The Israeli version accommodates its own secure systems.

Intercom. The howitzer has a six-station crew intercom system (five internal and one external). All communications will be audible under any conditions, including when the crew wears mission-oriented protection posture (MOPP) IV nuclear, biological and chemical (NBC) gear.

Prognostics and Diagnostics

To reduce the troubleshooting and fault isolation time of the HIP's sophisticated electronic packages, the HIP will have prognostic and diagnostic capabilities. Each of the critical line replaceable units (LRU) has its own built-in test (BIT) capability. Built-in test equipment (BITE), called the prognostics-diagnostics interface unit (PDIU), will monitor critical hydraulic and electronic functions through a data bus and special on-board sensors. The BIT and BITE will allow the crew to isolate faults to the LRU and speed up the repair process. The use of plug-in test equipment (PITE) complements the HIP's BIT/BITE system.

The HIP's PITE system, the simplified test equipment-expandable

(STE-X), is a portable system with HIP-peculiar components for testing electronics, armament and automotive systems. It's operable by unit-level repairmen. The HIP STE-X includes the STE-ICE (internal combustion engine) test capability for automotive electronic systems. The Israeli version includes a BIT capability supplemented by a standard multimeter and STE-ICE for the automotive tests.

Training

The US HIP crewman will benefit from a triad of complementary systems anchored by the HIP's AFCS embedded training (ET). The HIP's menu-driven software will train at various skill levels, allowing the crew to learn or maintain its proficiency. The training software has tactical scenarios, including firing missions, movements and maintenance actions through mock failure generation.

Used in the institutional environment, the second part of the HIP-system training triad is the stand-alone institutional fire control system trainer (IFCST) for the classroom. The institutional maintenance trainer (IMT) completes the triad of HIP training systems. The Israelis don't have the institutional trainers and their embedded training uses a "help menu" instead of the US' scenario or tutorial approach.

Reliability

In addition to changes in the HIP's armament system to improve reliability, availability and maintainability (RAM), it also needed automotive and suspension improvements.

Automotive improvements are the same for both HIP versions and include a NATO slave-start receptacle, crossover tube protection, a desert cooling package, an improved air-cleaner blower motor relay, a starter protective circuit, protective covers for sensors and connectors, STE-ICE sensors, an external NATO power receptacle, subfloor drains, an improved electrical system with a 650-ampere alternator for the US version (350-ampere for the Israeli version) and improved wiring harnesses, a final-drive quick disconnect and a Halon fire suppression system in the engine compartment.

Improvements to the suspension system include longer, stronger torsion



The US HIP will operate semi-autonomously, reducing dependence on traditional command and control methods that help the enemy detect us.

bars and hydraulic bump stops and improved shock absorbers to compensate for the HIP's additional weight.

Survivability

In developing HIP, both countries tried to make their fire support systems more survivable. Differences in threats they faced and tactics they employ underscore each country's approach to improved survivability.

Different threats require different tactics. Israel faces a more moderate counterfire threat in the Middle East as compared to the more intense counterfire threat the US is likely to face in Europe. As such, the Israelis combine speed on the battlefield with more traditional platoon and battery formations to improve survivability. Our higher counterfire threat requires different tactics for improved survivability.

Our technical improvements will allow semi-autonomous operations and reduce dependence on the traditional methods of command and control that help the enemy detect and attack us.

With semi-autonomous operations, we'll be more dispersed. Our HIPs will operate in pairs in an area of up to one square kilometer. If the counterfire threat warrants it, each pair of howitzers can split up. By using "Shoot and Scoot" tactics, we'll be able to fire missions and displace in less time than it takes for the enemy to attack us.

When the enemy does attack us, the HIP has vulnerability-reducing features that make it more survivable and, thus, more available. The Israeli version doesn't include the same features. It reduces vulnerability by relocating components inside the cab.

Relocation and Segregation. If the US HIP should get hit by shell fragments or shaped-charge munitions, the relocation and segregation of critical components will improve our chances for survival dramatically. The HIP's new turret includes a full-width bustle where all propellants are stored. If a propellant fire should occur, the explosive energy will be isolated from the crew and other vulnerable on-board components.

The next generation howitzer, the AFAS-C, may include separate compartments for each propellant. With this modification, the propellants will be inside the full-width bustle, accessible to the crew. If a propellant fire occurs, the explosive energy will vent away from the crew and expell to the outside by means of exterior blow-off panels.

On the HIP, relocating components of the vulnerable hydraulic system minimizes the possibility of destructive hydraulic fires. The hydraulic reservoir and related components are isolated from the HIP crew in a separate compartment. The only part of the hydraulic

system exposed in the cab interior is the hydraulic lines.

Hydraulic-Line Fuzing. To minimize the effects of a fire fueled by ruptured hydraulic lines, the US HIP includes hydraulic line fuzing. The fuzes will sense ruptures in the line and automatically shut off the flow of hydraulic fluid in a fraction of a second. Thus, hydraulic fires will stop before they can develop into catastrophies.

Fire Suppression. An improved fire suppression system replaces carbon dioxide with Halon and improves distribution of the fire-fighting compound inside the cab. The system will do a better job of containing fires, thus enhancing the crew's chances to escape.

Spall Suppression. Kevlar panels mounted on the interior walls and ceiling of our cab will reduce significantly the spalling effect of fragments puncturing the HIP's exterior aluminum armor. Kevlar is the same material used as the exterior skin on the Pershing II missile's rocket motors.

Additional Exterior Armor. To complement the US HIP's aluminum armor, we're adding special armor to vulnerable exterior areas on the sides and top of the turret and driver's hatch.

NBC Protection. The US HIP's collective NBC protection system, the micro-climate conditioning system (MCS),

will protect the crew from any NBC attacks, thus permitting the crew to operate in air-conditioned comfort, even when wearing MOPP IV protective clothing. From its ballistic enclosure mounted on top of the turret, the MCS will filter out NBC contaminants and provide clean, conditioned air to individual crew stations inside the cab.

Each crewman will be tethered by air hose to an outlet in his work area, which won't hinder his movement within the cab. The air hose will deliver the filtered, conditioned air to each crewman's ventilated facepiece and cooling vest.

In lieu of the US's MCS, the Israeli HIP provides NBC protection with current individual crew protective equipment integrated into a gas-particulate filter unit.

Night Vision. The US HIP driver has a night-vision device that will enhance operations during periods of reduced visibility.

Improved Storage. Extra storage includes external baskets and roof-top storage for vehicle and crew equipment. The HIP's roomier cab has more interior storage, helping the crew's access to equipment without degrading the work space. The Israeli HIP stores 53 complete rounds while the US version stores 39 complete rounds (37 conventional rounds

plus two Copperhead rounds). The Israeli version accommodates an auxiliary power unit in the full-width bustle.

Conclusion

The cooperative effort between the US and Israel signals the start of a new era in more responsive, lethal fire support for the ground-gaining arms. With the advent of the Intermediate Nuclear Force Treaty, we need the improved war-fighting capability the HIP can provide. Our soldiers deserve it.



Captain Robert I. Zabielski is assigned to the Training and Doctrine Command System Manager's office for Cannon Systems (TSM Cannon) at the Directorate of Combat Developments, Field Artillery School, Fort Sill, Oklahoma. Previous duties include coordinating and executing the School's transition to the Pershing II missile system and commanding a battery and serving as S1 with the 552d US Army Artillery Group in West Germany. Captain Zabielski is a graduate of the Command and General Staff College, Fort Leavenworth, Kansas, and holds a master's of business administration from Oklahoma City University.

Right by Piece

NOTES FROM UNITS



Airborne Redlegs

From the pack 75-mm howitzer of World War II to the M102, 105-mm howitzer of Vietnam, the airborne community has had an indirect-fire weapon to support maneuver. On 17 August 1987, a new era in airborne fire support began at Fort Bragg, North Carolina. Soldiers accustomed to seeing the 105-mm howitzer descending by parachute experienced a new sight. The M198, 155-mm towed howitzers and 5-ton trucks became part of the airborne artillery inventory.

The 1st Battalion, 39th Field Artillery (1-39 FA), became the first and only 155-mm battalion to go on airborne status in the free world. In the late 1970s, the Army's airborne test board determined the M114A2 howitzer and M813, 5-ton truck could withstand the impact of parachute delivery. Emphasis later switched from the M114A2 with the introduction of the M198. The additional weight of the M198 wasn't a



Top and Middle: Soldiers of the 1-39 Field Artillery Regiment de-rig and set up a 155-mm howitzer dropped from a C130. Bottom: The Redlegs have an 18-minute standard from the last man on the ground to the first round down range.

large factor in the testing. The Board came up with the proper rigging procedures and cargo parachute requirements, and after numerous successful test drops, the Air Force certified the howitzer for parachute delivery from either C-130 or C-141 aircraft.

The 1-39 FA has been part of the XVIII Airborne Corps Artillery since 1967. It provided general support to the 82d Airborne Division Artillery (Div Arty). The thrust of the preparation for the transition came from within the Battalion, the 18th Field Artillery Brigade and Fort Sill. Members of the Field Artillery Center came to Fort Bragg to write a separate table of organization and equipment (TOE) for the Battalion. The uniqueness of a 155-mm airborne battalion required a separate TOE. Vehicles and equipment associated with a towed 155-mm battalion had to be air-droppable.

The number of airborne-qualified personnel presented another transition problem. There were enough qualified soldiers in the senior noncommissioned officer and officer ranks but few in the lower ranks. In January 1987, the Battalion recruited soldiers from the Field Artillery Training Center at Fort Sill. Soldiers who volunteered for airborne school could come to the battalion. We recruited 120 cannoners, seven surveyors and 14 fire direction center (FDC) soldiers. Key leaders received permissive jump status from the XVIII Airborne Corps Commander.

Training on rigging the howitzer and truck continued into the summer. A two-gun package consisting of two howitzers, two prime movers and an FDC deployed in a corps emergency deployment readiness exercise (EDRE) to Fort Stewart, Georgia. The remainder of B Battery joined this two-gun package, linking up by air and ground convoy from Fort Bragg.

On 17 August 1987, the Battalion formally became airborne. Lieutenant Colonel William A. McNutt had assumed command a month earlier. We now had to train as an artillery unit in airborne operations. Soldiers had to be reminded that airborne is only a means of deployment. Once the parachutes hit the ground, the artillery mission begins. Since we had no Army training and evaluation program (ARTEP) standard for our unique operations, the Battalion adopted an 18-minute limit from the time the last man hit the ground until the first round went down range.

The M198 and the entire family of 155-mm ammunition added a new dimension to forced-entry fire support planning and coordination. Since the 82d Div Arty has 105-mm howitzers, planners had to come up with the proper mix of 155-mm ammunition to supplement and complement the 82d Div Arty's guns. The major advantage the 155-mm has over the 105-mm is its extended range and the variety of ordnance it can fire, to include Copperhead, family of scatterable mines (FASCAM) and dual-purpose improved conventional munitions (DPICM). If the 82d has to deploy, the additional firepower of the 155-mm can support the Airborne Division until additional forces from the XVIII Airborne Corps can be brought into the battle. We continue training for the employment of two-gun packages, battery-size elements and battalion-level airborne insertions.

In December, the Battalion became a part of the Army's regimental system. The 39th Regiment is unique because it consists of the *only* airborne 155-mm howitzer battalion. The challenge of the maroon beret and the tradition of the Redleg will ensure the 1st Battalion, 39th Field Artillery Regiment (Airborne), shoots, moves and communicates in its airborne mission.

Samuel S. Wood, Jr.
MAJ, FA
Executive Officer
1st Battalion, 39th Field Artillery

OH58D: The New Eye on the Battlefield

Tension mounts in the brigade tactical operations center (TOC) as the message comes through. Threat reconnaissance units are quickly approaching your defensive boundaries. The exact location of these units is unknown. Fast, accurate intelligence reports are now critical to the unit's survival. You can get these reports in several ways. However, time constraints greatly limit your options. One new option is getting the information from the aerial fire support officer (AFSO) in his OH58D helicopter. This new system gives you fast, accurate information for fire support.

The AFSO and His OH58D

Each heavy division has six AFSOs and OH58Ds. The AFSOs are artillery lieutenants who have 17 weeks of specialized flight and observer training after completing the Field Artillery Officer Basic Course. This combination of Field Artillery and Aviation training helps the AFSO become proficient in fire support planning and coordination.

The AFSO has several systems at his disposal. These systems include the mast-mounted sight (MMS) to locate, track and laser designate targets for both day and night operations. A laser rangefinder and designator further increases MMS capabilities by giving an eight-digit grid coordinate and the altitude within seconds. The airborne target handover system (ATHS) sends artillery missions, intelligence reports, spot reports and battle-damage assessments digitally to the tactical fire direction system (TACFIRE), the battery computer system (BCS) and other aircraft. The OH58D's total communication system includes five radios, allowing the AFSO to communicate with Air Force, Navy, and other Army aircraft. Also, a high-frequency (HF) radio provides a long-range capability. Finally, the navigation system continually updates the aircraft's position. This helps the AFSO keep the maneuver commander informed of targets or enemy activities on the battlefield.

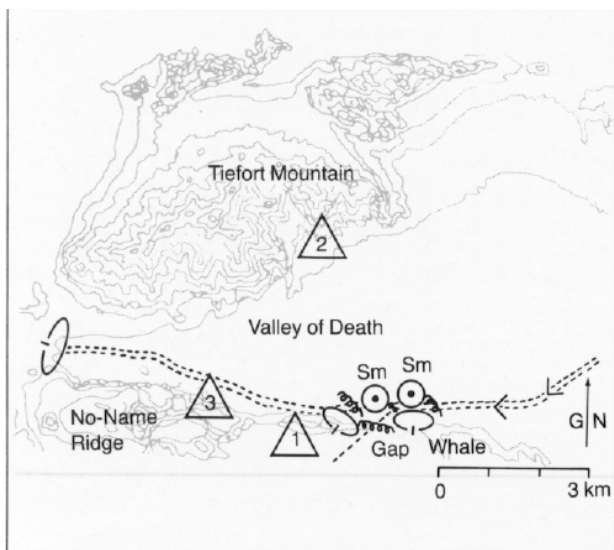


OH58D Employment Scenario

The 2d Brigade sets up a deliberate defense, preparing for a threat offensive. One task force is in the Valley of Death (see the map). The brigade commander has decided to employ his OH58D in this sector. Two mechanized infantry teams are east and west of Whale Gap, respectively. One armor team is on the southern edge of Tiefert Mountain while the other armor team is across the western end of the Valley of Death. The task force is organized as follows: two mechanized infantry teams, two armor teams and one engineer company. The brigade has the following fire support assets available: one 155-mm self-propelled battalion (direct support), two AFSOs with OH58Ds and one combat observation lasing team (COLT).

Maintain Surveillance

The 2d Brigade receives orders to defend in sector. The brigade commander decides to send one of the OH58Ds,



which are under operational control (OPCON) of the Brigade, to the task-force front to provide early warning. The OH58Ds rotate to provide continuous observation. The first OH58D is at Position 1 in the vicinity of Furlong Ridge. From there, the AFSSO determines the direction of the enemy's approach. This information helps the commander position his forces. Using the MMS and the ATHS, the AFSSO sends faster, more accurate intelligence reports than was possible with previous systems.

Emplace Minefields and Cover Obstacles

The commander's intent is to channel the enemy into the Valley of Death and destroy him. He plans to do this by using obstacles. The engineer company places wire obstacles at the entrance to Whale Gap. While the wires will slow the enemy, more obstacles, such as minefields, are needed. AFSSO 1 remains at Position 1 and is directed to emplace two family of scatterable mines (FASCAM) minefields.

The laser gives the AFSSO an eight-digit grid coordinate for each corner of both minefields. The AFSSO transmits the fire missions to TACFIRE, and the minefields are emplaced. As first-echelon enemy forces approach, the lead vehicles begin having casualties from the mines and the covering fires of the mechanized teams at Whale Gap. Enemy forces are attrited and begin altering their route of march toward the Valley of Death.

Destroy Prominent Targets with All Means of Fire Support

As the battle continues, enemy forces begin to scatter in confusion. AFSSO 2 is now at Position 2. He spots a suspected command vehicle and lases it to get an accurate grid location. He then recalls a preplanned Copperhead mission on the ATHS and transmits the mission to TACFIRE. After sending the mission, AFSSO 2 designates the vehicle. The Copperhead round impacts, destroying the vehicle and adding to the enemy's confusion.

Enemy forces now begin to mass as the rear elements begin closing in. AFSSO 1, now at Position 3, quickly begins directing a close air support (CAS) mission in coordination with the ground forward air controller (FAC). Using the laser, AFSSO 1 directs laser-guided munitions onto the enemy, inflicting major casualties.

Help Survey for Other Fire Support Elements

AFSSO 1 moves to the rear to refuel. While at the refueling point, he receives a "frag" order (FRAGO). A battery needs survey support as soon as possible. Ground survey units are available, but they can't reach the firing point fast enough. AFSSO 1 completes refueling and heads to the firing point. Using the navigation system, he gives the artillery battery an eight-digit grid coordinate as a survey point. The battery is soon laid and ready to fire.

Support for Rear Area Operations

AFSSO 1 moves forward to replace AFSSO 2, who must refuel. AFSSO 2 completes refueling and receives a FRAGO while enroute back to the forward edge of the battle area (FEBA). Intelligence reports show that the task force in the rear area has suffered an enemy air assault. It needs fire support immediately. AFSSO 2 flies to the area and confirms the intelligence reports. He then calls in mortar fire through the ATHS to the mortar ballistic computer (MBC). The mortar fires suppress and confuse enemy forces until friendly reinforcements arrive. AFSSO 2 then returns to the FEBA and continues calling in effective fires on enemy forces.

Conclusion

Granted, this scenario presents only a broad view of OH58D capabilities. It shows how we can use the system to maintain surveillance, emplace obstacles, destroy prominent targets, help in survey and rapidly support rear area operations. How the commander employs the system in these and other missions is at his discretion. If used correctly, the OH58D is an asset to all fire support and maneuver elements. Commanders should understand the capabilities of and use this combat multiplier in future operations.

2LT Adam P. Oaks
2LT Kenneth D. Seiffert, Jr.
1LT B. Shawn Vishneski
AFSSOs, 24th Infantry Division

The Total Army Personnel Center (TAPA) is recruiting promotable sergeants through sergeants first class to replace officers in AFSSO positions. See the article "Aerial Fire Support Observers Needed" on Page 28.

Editor



Getting a Grip on Muzzle Velocities

by Captain James B. Rhoads, Jr.

Muzzle velocity is one of the most influential factors affecting the accuracy of cannon firing, yet it's one of the most misunderstood. With the advent of the battery computer system (BCS) and the back-up computer system (BUCS), we no longer have to manage muzzle velocities manually.

Many remember grouping howitzers in a battalion according to shooting strength, based on battalion comparative velocity errors (comp VEs). We got these battalion and battery comp VEs by calibrating with the fall-of-shot method, M36 chronograph or the M90 velocimeter. This was a critical event. Not only were the VEs critical for grouping howitzers within the battalion, but the battalion fire direction center (FDC) needed them to transfer a graphic firing table (GFT) setting from a registering battery to the non-registering batteries.

Without valid VEs, we could not effectively mass the battalion. This still holds with BCS and BUCS. The primary difference is with maintaining battalion comp VEs because of the individual-piece-to-individual-aimpoint solution with computed trajectories for each piece.

Currently, batteries use the M90, and the battalion FDO usually doesn't monitor it. This causes a potential lack of muzzle-velocity consciousness throughout the battalion. The Gunnery Department of the Field Artillery School teaches a four-hour block of instruction on muzzle-velocity management to all Officer Basic and Advanced Course students. I can't overemphasize the importance of this instruction.

Officers and noncommissioned officers (NCOs) responsible for delivering fires must thoroughly understand muzzle



velocities and the influence they have on the way a battery does business. Ammunition management, fire command standards, terrain-gun-position corrections and special corrections, and the application of registration corrections all hinge on good calibration procedures and the correct application of muzzle velocities.

Calibration

Maintaining a good log of muzzle velocities can be a real challenge. Some believe we should use the M90 every time we fire. Although ideal, this is not feasible at times due to M90 failure, the type of mission's not facilitating calibration or the lack of personnel to oversee and coordinate calibration in a tactical situation.

There's an answer to this predicament. It's acceptable to infer calibrated muzzle velocities from one lot to another. Inferring requires a good calibration for all guns in the battery with one base lot. Once this base calibration is complete, you keep the M90 on one gun that serves as a "base piece." This base piece calibrates lots of propellants used in the battery that are different from the base lot. You measure the difference in shooting strength between the two lots for the base piece during calibration. This difference becomes a constant that's applied to the rest of the guns in the battery to determine an inferred muzzle velocity for each gun for the new lot.

This procedure isolates the difference in propellant efficiency between two lots and applies that difference across the board. Since you already established the comparative shooting strength between guns in the calibration of the base lot, all that's left to isolate is the lot-to-lot difference in propellant efficiency, which is represented in the difference constant.

You must consider several factors when deciding to use inferred data as opposed to calibrating data for each lot. If your battery fires a large number of rounds during training, you must consider the expected loss in muzzle velocity for a given number of equivalent full charge (EFC) rounds fired. The reliability of inferred data is inversely proportional to the number of EFC rounds fired. This is more true in the 155-mm and 8-inch cannon than in 105-mm cannon. Expected loss in muzzle velocity per EFC round fired is

Calibrating Lots of Propellants By Using a Base Piece

Gun 3 is the "base piece" for M3A1 calibration purposes.

Lot G (RAD-1-345), Charge 4 Calibration by Gun in Meters per Seconds:

<u>Gun 1</u>	<u>Gun 2</u>	<u>Gun 3</u>	<u>Gun 4</u>	<u>Gun 5</u>	<u>Gun 6</u>
317.5	317.8	316.4	318.0	315.4	317.0
		<u>317.0</u>			
		<u>+.6</u>			

Lot G (MEP-2-319), Charge 4 Muzzle Velocity (Difference Constant)

The difference constant is applied to the remainder of the guns with the result's being an inferred muzzle velocity for the new lot.

317.5	317.8	318.0	315.4	317.0
<u>+.6</u>	<u>+.6</u>	<u>+.6</u>	<u>+.6</u>	<u>+.6</u>
318.1	318.4	318.6	316.0	317.6

By using this procedure, we can determine an inferred muzzle velocity for each gun for a new propellant lot.



Soldiers record muzzle velocity data from an M90 velocimeter.

less in 105-mm cannon, so the inferred data will break down less rapidly. Regular pullover gauge readings and good EFC round counts on DA Form 2408-4 Weapons Record Data will indicate when you should recalibrate.

Ammunition Management

Once you've established a good record of muzzle velocity for your howitzers, it's critical you manage ammunition properly. The battery executive officer or platoon leader and the ammunition NCO must be sensitive to the lots of ammunition delivered to the gun sections. When sections receive ammunition lots, they should check, record and report them to the battery or platoon fire direction officer (FDO). The FDO will check the record

of muzzle velocities to see if the unit has calibrated data for those lots. If calibration data exists, he should check the date of the data. If the calibration data is still reliable, he should establish a lot designator and include it in the fire command standards. The correct muzzle-velocity data will then be key stroked into the BCS and BUCS data base. If no data exists on the received lots, use the M90, at least on the base piece, so you can infer new data.

It's imperative section chiefs properly segregate the propellants by lot designator so a mission won't be fired with mixed lots. This would be particularly counterproductive with a registration or any type of danger-close or precision fires.

You also must consider the means by which BCS and BUCS apply muzzle velocities to computed firing data to be

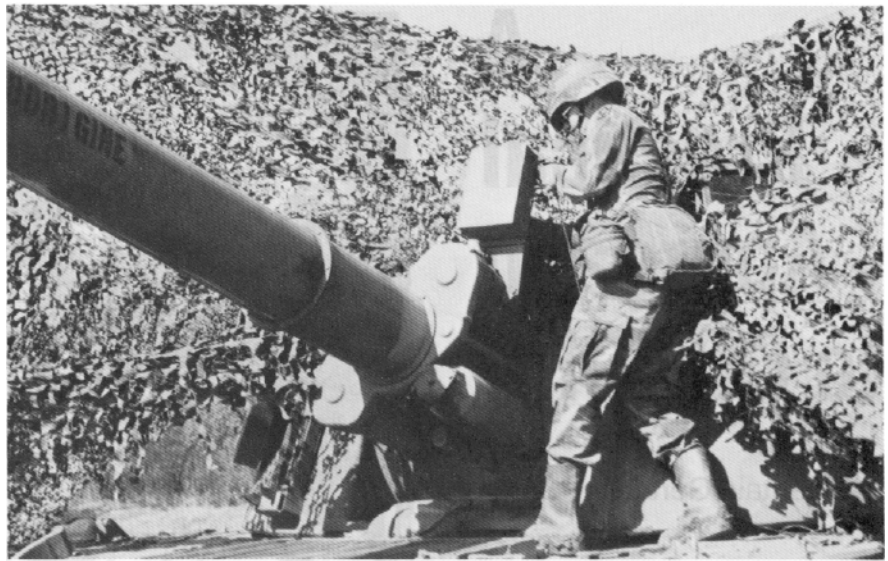


Section chiefs must separate propellants by lot designator so crews won't fire a mission with mixed lots.

most accurate in muzzle velocities and effective in managing ammunition. In the BCS;MVV file, muzzle velocity variations (MVV) from the tabular firing table (TFT) are stored by propellant model and projectile combination for each gun. In the AFU; BAMOUP ammunition file, propellants are stored by lot designation and propellant model. The BCS can't assign more than one MVV per propellant model at one time. This requires the FDO to monitor closely which MVV is on file during fire mission processing.

If a gun is using lot G, M3A1 propellant during a fire mission, the FDO must ensure the correct MVV is in the BCS;MVV file at that time. For instance, if lot G (M3A1) is flagged for a mission and the MVV currently on file is that of lot F (M3A1), the computer won't apply the correct MVV to the firing data. The BUCS computer applies muzzle velocity data the same way BCS does; therefore, the same considerations pertain to BUCS operations.

The ammunition break down in a battery is very important when considering how BCS and BUCS apply muzzle velocity data. You have a couple of alternatives if you receive multiple lots of propellant in your battery. Depending



A soldier mounts the antenna unit of an M90 velocimeter on an M109 howitzer.

on how much of each lot is on hand, you can give each gun some of each lot. If you do this, lot segregation in each section is critical. The FDO will establish a fire command standard lot, and he'll specify any time a lot other than the standard is to be shot.

You also can break down the ammunition by giving one gun one lot only. In this case, it's important to ensure the BCS;MVV file for each gun is established using the calibrated data for the lot issued to that gun. Guns 1, 2 and 3 could be issued manufacturer's lot RAD-1-345 (M3A1), and guns 4, 5, and 6 could be issued manufacturer's lot MEP-2-319 (M3A1). These two manufacturer's lots can be given one battery lot designator of "G" because manufacturer's lots aren't intermixed among the guns. By specifying one lot in the fire mission, you'll apply the appropriate individual MVVs.

Terrain-Gun-Position Corrections and Special Corrections

The BCS and BUCS allow us the luxury of having the effect of terrain-gun-position corrections (TGPCs) and special corrections on each mission by having aimpoints for individual pieces. However, if gun-display-unit (GDU) communications are not feasible and time is not available to send individual-piece firing data by voice, you can compute TGPC and special corrections by BCS or BUCS. You then send them to the guns as corrections for the gunner's aide of the panoramic telescope

and the correction counter of the range quadrant. (See *Field Artillery Journal*, May-June 87, View from the Blockhouse, "Mastering BUCS.") This provides adequate sheafing with one set of firing data sent to all guns.

Without good muzzle-velocity data, this technique is ineffective. You account for the piece displacement within the battery, but not the individual shooting strength of each weapon.

Conclusion

It's imperative every member of the team be conscious of muzzle velocities and how they impact on battery business. We should assign responsibility for accomplishing specific tasks to specific individuals. The commander must know about muzzle velocities and how to manage them. Key individuals in the battery should meet after calibration to discuss muzzle-velocity related issues. If we ignore muzzle velocities because they're too difficult to manage or if we misunderstand and apply them improperly, we can't safely and efficiently support our maneuver forces.



Captain James B. Rhoads, Jr., commands A Battery, 2d Battalion, 34th Field Artillery, III Corps Artillery, Fort Sill, Oklahoma. He served as a Gunnery Instructor at the Field Artillery School, Fort Sill, and as a fire support team chief, reconnaissance and survey officer, battalion fire support officer and battery and battalion fire direction officer with the 25th Infantry Division in Hawaii.

A Practical Approach to CONOPS

by Captain Gerald W. Lucas

"Smith! Smith! What're you doing sleeping? Don't you realize this is an important training exercise, and it'll be over in just 20 more hours?!"

How many times have we given this warning to our soldiers? We know our battalion has an Army training and evaluation program (ARTEP) every 18 months and that for three or four days, we conduct fire missions and reconnoiter, select and occupy positions. There is significant evidence, however, that we are giving little, if any, consideration during these exercises to the intense problems we'll face sustaining continuous operations (CONOPS) in combat. We must build continuous operations practices into our exercises, regardless of their lengths.

The wars of the future will be characterized by continuous operations that will require units to operate 24 hours a day for several days or weeks. Continuous operations in combat will test the endurance of both man and machine.

We've seen the Arab-Israeli conflicts last for only days or weeks but result in the loss of thousands of lives and tons of equipment. Regardless of the duration, campaigns will be characterized by periods of intense, continuous operations.

Soviet Offensive Doctrine

Soviet offensive operations must maintain a rate of advance of 60 to 100



kilometers per day in a nuclear environment and 30 to 60 kilometers per day in a nonnuclear environment. The principal method by which the Soviets hope to achieve these goals is by using echelons at the front—army, division and regiment. Using these echelons provides continuous pressure on the defending force, ultimately destroying its will to fight.

Analyses shows that within 96 hours of contact, a US task force will see the opposing echelons replaced twice. We can expect a Soviet division to survive 24 to 48 hours and regiments 12 to 24 hours. They will consider units engaged for that length of time expended and subsequently will replace them. This isn't Soviet doctrine for continuous operations per se. But Soviet doctrine dictates that commanders do what's necessary to achieve their goals.

Soviet as well as US forces no longer must depend on mortars and artillery to illuminate the battlefield. The proliferation of night-vision devices allows units to remain in contact, regardless of the weather or time of day.

So what does this mean to the Field Artilleryman? It means that we, as members of the combined-arms team, must be prepared to provide fire support 24 hours a day for our committed units.

This article focuses on problems associated with continuous operations: training, sleep deprivation and combat readiness. It also discusses methods we can use to minimize the problems' impact.

CONOPS Problems

We train continuously in combat scenarios for relatively short periods of time. Therefore, we aren't prepared completely for the impact of sleep deprivation and exhaustion on performance and combat readiness.

Training

Suppose an ARTEP took eight days. Would we run our soldiers and equipment into the ground? Regrettably, we might be inclined to do that. Units take a four-day ARTEP where soldiers and their leaders "gut it out" for 72 to 96 hours. There is often more incentive to stay awake when ENDEX (end of exercise) is the "light at the end of the tunnel." At ENDEX, you simply go to the motor pool, down-load, account for sensitive items and go home. We lull ourselves into believing that a successful ARTEP implies that we're prepared for the rigors of war and that we're prepared to execute our combat mission.

Sleep Deprivation

Sleep deprivation and exhaustion are perhaps the greatest challenges soldiers face, especially those soldiers involved in continuous operations. As exhaustion increases, the possibility of mistakes also increases. We usually make mistakes while performing tasks that require a great amount of mental clarity. The average soldier can perform tasks that require conscious effort for a period of 18 hours before his accuracy is degraded. A study conducted for the Vice Chief of Staff of the Army (VCSA) indicates that we can expect a 25 percent decline in performance for each 24 hours of continuous operation.

Performance mistakes aren't conscious but rather mistakes of forgetfulness. For example, a gunner may forget to level his sight, a platoon leader may forget to verify survey or a battery computer system (BCS) operator may enter the wrong platoon location. Any of these errors could result in friendly soldiers' dying.

Leaders should look for indicators of sleep deprivation. Soldiers show signs of performance degradation when they—

- Aren't able to concentrate on one task.
- Lose short term memory.
- Respond slowly to commands.
- Have difficulty understanding orders.
- Have frequent mood changes such as euphoria, depression and anger.

The effects of sleep deprivation vary from soldier to soldier. Factors influencing the effects are age, physical condition, training, individual sleep requirements, morale and the amount of sleep lost.

The gradual loss of sleep over a period of several days is cumulative. Following a week of intense fighting on the Golan Heights, an Israeli battalion commander fell asleep and burned his leg severely on his vehicle's exhaust. Shortly afterward, his deputy commander accidentally shot himself in the hand with a submachine gun and had to be evacuated.

The closest environment to continuous operations that US soldiers have experienced recently is the National Training Center (NTC) at Fort Irwin, California. NTC experiences have



Sleep loss causes leaders to make decisions that cause injuries or cost lives, if not entire units.

shown that sleep loss causes leaders at all levels to make mistakes. They make decisions that cause them to lose their own lives or their entire units.

Combat Readiness

Soldiers aren't the only victims of continuous operations. Another related area that will suffer greatly during continuous operations is combat readiness. The nonstop use of equipment will

result in accelerated wear and cause components to fail prematurely. The activity and sheer exhaustion of the crew will lead to poor preventive maintenance or maybe none at all. Maintenance may become reactive, with emphasis only on repairing, not preventing equipment failures. Acceptance of a reactive maintenance system will lead to an increase in preventable, noncombat equipment losses.

Battery CONOPS Training: "How To" in a Light Infantry Division

Artillery must provide continuous fire support under the tenets of AirLand Battle. Nowhere is this need more evident than in the light infantry divisions. Occupying defensive hide positions during daylight and conducting maneuvers at night are standard for light infantry units. Therefore, many of the artillery units of the 5th Battalion, 15th Field Artillery, 7th Infantry Division (Light) at Fort Ord, California, emphasize continuous operations during every training exercise.

In training, we encounter three main obstacles to conducting continuous operations. The first and greatest problem is providing enough rest for howitzer crews and fire direction center (FDC) and other section soldiers.

The problem of crew rest is compounded by a second obstacle, also of the utmost importance. A light division can expect to operate in low- to mid-intensity environments where the opposing force is likely to be composed largely of guerrilla elements. Therefore, the importance of independent and effective perimeter defense is increased. The third obstacle involves manning the weapon systems. Most of our units aren't full strength. Any attempt to provide crew members rest further reduces the number of personnel to man the weapon systems and provide security.

Cold Platoon

One way to preserve soldier power is to employ the cold platoon concept. A platoon within the battery is designated "cold" to rest. The cold platoon then has time to pull crew maintenance on the howitzer and prime mover and continue to harden the position.

Depending on the tactical scenario, one-third of the battery's firepower rests while the other two-thirds supports the maneuver elements. Mission, enemy, terrain, troops available and time (METT-T) determine whether or not the cold platoon concept is a viable option. A battery may never have the luxury of designating one of its platoons cold, but it's a possibility worth considering

and batteries should train for it in peacetime.

Flexible Defense

While the firing battery is accomplishing its fire support mission and using sleep plans, it also must defend itself against possible ground attack. The battery commander must analyze his battery defensive plan in terms of METT-T, remembering the principles of economy of force and security.

He can use the flexible defense to overcome this second obstacle ("Defending the Battery—Another Way" by Sergeant Ward Wright, *Field Artillery*, March-April 1987). The flexible defense, using listening posts and observation points and hardened positions, creates a strong-point defense along possible enemy avenues of approach. This allows the commander to defend the battery using a minimal number of soldiers.

Standardized Sections

The problem of manning the weapon systems is alleviated by the solutions already mentioned. Also, the standardization of all sections and their layouts will reduce the stress of crews' operating under mental and physical fatigue. The ability of a section member to find easily any equipment necessary to accomplish his mission will greatly help a section rotate for sleep.

Sleep Plans

One technique we use to ensure crews get enough rest is strictly enforcing sleep plans. A sleep plan is a method of managing personnel to ensure they receive enough rest. Sleep plans must be decentralized down to the section-chief level. The section chief knows best how much rest his soldiers need to accomplish their mission. Requiring section chiefs to articulate and justify their sleep plans ensures they are well thought out.

Junior Leadership Training and Cross-Training

An enforced, workable sleep plan also inherently entails extensive junior

leadership training and maximum cross-training. For example, every gunner should be able to do the job of his chief so the chief can get the rest he needs. We don't allow one man to become indispensable. Therefore, it's critical that battery key leaders also follow a sleep plan. Possible cross-training matches are to team the battery commander with the first sergeant, the executive officer (XO) with the fire direction officer (FDO) and the chief of firing battery with the gunnery sergeant.

Each team is responsible for supervising a specific portion of the battery. The battery commander and the first sergeant concentrate mainly on maintaining and checking the perimeter and headquarters platoon. The XO and the FDO take turns supervising the FDC and provide tactical fire control. The chief of firing battery and gunnery sergeant walk the "line of metal," providing their expertise where needed. Each team determines who sleeps when and for how long.

Conclusion

The ability to fight sustained campaigns is vital to achieving victory on the battlefield. While all units should train to conduct continuous operations, units of the light divisions, particularly, must prepare for 24-hour-a-day operations.

Making any of our suggestions work depends on training in a realistic, fast-paced scenario that challenges the unit. Requiring the unit to shoot, move and communicate during demanding five-to-seven day exercises that mentally and physically tax soldiers will allow key leaders to test their unit's ability to successfully conduct continuous operations.

CPT Gregory K. Herring
Commander, C Battery
CPT Drew A. Turinski
Battalion FDO

1LT Gregory P. Fenton
XO, C Battery
5th Battalion, 15th Field Artillery
7th Infantry Division (Light)



We must conduct training that safely replicates combat conditions and practices continuous operations techniques.

CONOPS Solutions

There are no easy solutions to continuous operation problems—each unit will face varying demands in combat.



Unit effectiveness declines if soldiers get less than four to five hours of sleep for each 24 hours of continuous operations.

But we can prepare to complete our missions over long periods of constant combat by training more realistically, by being aware of the negative impact of sleep deprivation on performance and combat readiness and by practicing ways to counteract that negative impact.

Training

Continuous operations could cause us to fail in combat or, even if we win, lose many lives and a lot of equipment. However, these don't have to become reality. The most important mission we have in peacetime is to prepare for war. One way we can prepare is by training realistically. We must conduct training with events that safely replicate combat conditions. Realism, in the sense we must operate tactically for periods in excess of 96 hours, will allow us to practice continuous operations effectively. Ideally, we would have combat exercises that exceed 96 hours. But during shorter training exercises, we can practice methods that will help sustain continuous operations in combat.

Sleep Deprivation and Combat Readiness

Although the next armed conflict will be intense and of relatively short duration, the effects of sleep deprivation

will take their toll. The VCSA study concludes that soldiers should have a minimum of four to five hours of continuous sleep for each 24-hour period of continuous operations. Sleep periods of less than four to five hours will degrade individual and unit effectiveness. A sleep schedule of four to five hours can maintain unit effectiveness for five to six days.

An alternative to continuous sleep is "cat napping." We all have caught ourselves dozing off for brief periods of time. We can cat nap for a short period of time to achieve a temporary improvement in performance. However, cat napping is not a long-term substitute for continuous sleep.

All leaders must try to provide soldiers the opportunity to sleep. If and when an individual or unit becomes ineffective due to sleep deprivation, leaders must consider a period of recovery as the gradual loss of sleep over a period of days is cumulative.

Sleep Loss Versus Sleep or Rest*

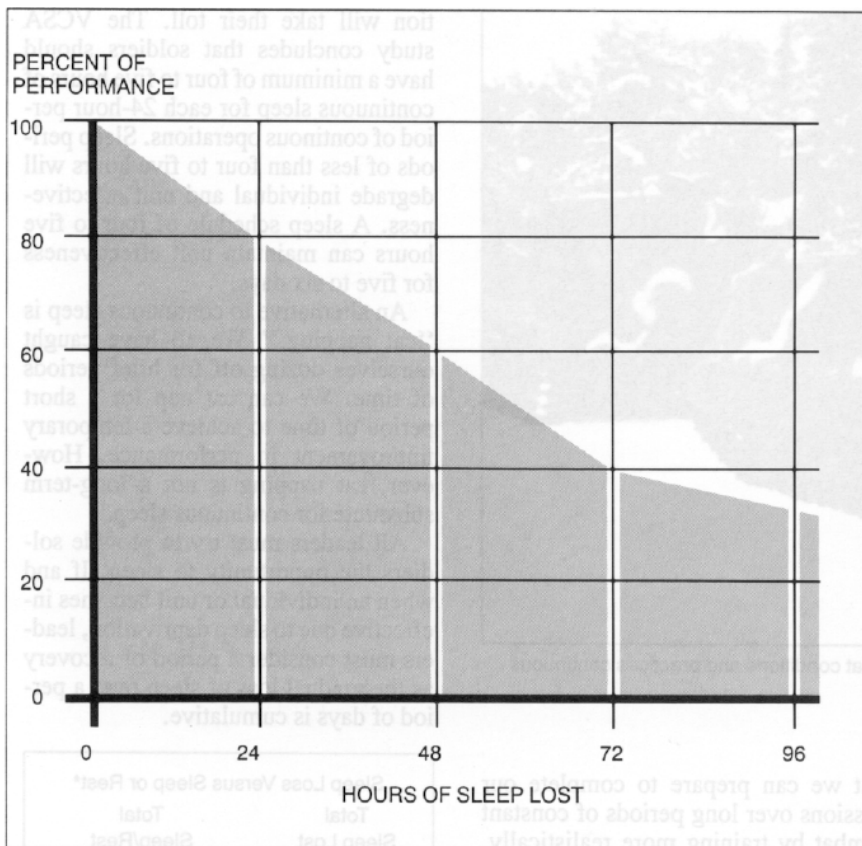
Total Sleep Lost (Hours)	Total Sleep/Rest Required (Hours)
36-48	24
72-96	72

*Data from Army Research Institute studies.

The hours of sleep or rest required to make up for the hours of sleep lost are approximate and vary from soldier to soldier.

The counterfire threat and tactical situation will require a firing unit to make several tactical and survivability moves daily. We know soldiers require a minimum of four to five hours of continuous sleep each day. The number of moves required will make continuous sleep virtually impossible. If a firing unit (platoon) has been operating continuously for four to five days with little sleep or has been operating for one and one-half to two days with no sleep, it will be ineffective.

We have used one method successfully to combat exhaustion and stress since World War I. Although we didn't prescribe the practice in doctrine or provide for it in tables of organization and equipment (TOEs), commanders recognized the need to provide an area for units to rest and relax. Assets were taken "out of hide" to man these centers, which were within earshot of the guns.



Sleep Loss Versus Performance Loss

Although setting aside an area for rest is difficult, it does deserve consideration. We currently are considering four ways to provide this area, based on mission, enemy, terrain, time and troops available (METT-T).

Crew Rotation. This is the most desirable option since each section maintains its ability to shoot. If the requirement for firing or moving is light, each howitzer platoon and fire direction center (FDC) section can establish and maintain its crew sleep schedule. This scheduling should start automatically without platoon headquarters' direction.

Warm Platoon. During extended, intense periods, a platoon can stand-down while maintaining radio watches in the FDC and each howitzer. Fire missions wouldn't be directed to the platoon unless absolutely necessary.

Cold Section. This option is less desirable since a section wouldn't have to maintain a firing capability. This option is flexible because it leaves the section in place or moves it outside the platoon area. If the FDC is rotated, the other platoon FDC would have to provide

tactical fire direction for both platoons.

Cold Platoon. Similar to the cold section only for platoons, this option is the least desirable. It removes an entire platoon from action. When designating rest cycles by cold section or platoon, we may have to move cold units to a central location, preferably the battery support area.

Replenishment. The preferred method to replenish a battalion is by firing platoon, while it's on the move. We can adapt "hot refueling" to provide ammunition, food and maintenance support also. We should give priority to refueling and rearming on arrival. Vehicles then would disperse for survivability. While stopped, the crew would perform preventive maintenance and report deficiencies to the maintenance contact team assigned to the battery. During this time, crew members would rotate for meals, collect their mail, take showers and complete other personnel actions. The key to this operation is coordination and planning with responsibility belonging to the battalion executive officer and S4. (An illustration of this method of

replenishment is in Chapter 13 of *FM 6-50 The Field Artillery Cannon Battery*.)

Conclusion

The offensive doctrine of both the US and our potential foes and the advancement of technology have made continuous operations inevitable. These operations will press the endurance of soldiers and equipment to the limit. With combat comes the constant struggle between providing for the needs of the soldier and maintaining operations to complete the mission. We must be extremely cautious when making decisions to resolve this struggle. We must operate to complete the mission, but at the same time, assembling the right unit at the right place at the right time to do the job is impossible if units are ineffective.

When considering solutions to continuous operation problems, increasing crew size would appear to be the simplest. However, with an austere budget and the cap on Army end strength, it's not a realistic solution.

Preparing for continuous operations is a matter of attitude. We must practice continuous operation methods during training, regardless of the length of the exercise. Leaders must ensure subordinates establish and enforce sleep discipline. If the situation doesn't allow for sleep schedules, then leaders must realize they'll need alternate methods to allow units time to recover. We must prepare for continuous operations so we aren't defeated by our own hands.



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"No Slack"

—A Blueprint for Combat Excellence

by Captain Kevin S. Donohue

During battery command, I applied a leadership model, which may be useful to others. We can look at command through a simple model, one I call the "No Slack" Leadership Model. It's so simple, in fact, you probably already know a critical part of it—the four "Cs": courage, candor, commitment and competence.

My model requires assumptions. The first assumption is that the four Cs are primarily individual characteristics. When using these terms, I'm referring to a person's qualities, not a unit's or group's. This is an important distinction because this article also discusses group characteristics.

The second and most critical assumption is that these four traits are not genetically predetermined. The kernels of each of the desired traits are in our soldiers, and we must develop these traits to realize each soldier's potential.

The No Slack Model

The model must have an output and an input. What is the output of a combat-arms unit? *Combat Excellence*—it's our purpose for existing. Note I said "combat excellence," not "combat readiness." Most units will meet some statistical criteria for combat readiness, but the combat-excellent unit is one in which members display the discipline, skill and motivation to *win* in combat—not just survive.

What is the input to a combat-arms unit? What can we inject into a unit to achieve an output of combat excellence? I found the most succinct answer to this question, surprisingly enough, in an old issue of *PS Magazine*.

We face a dilemma that armies have always faced in a democratic society. The values necessary to defend that society are often at odds with the values of the society itself. To be an effective servant of the people, the Army must concentrate not on the values of our liberal society, but on the hard values of the battlefield. These values are simple: live or die, win or lose.

General "Dutch" Kerwin
Retirement Address, 1978

In leafing through issues trying to find component listings to barber kits and safety warnings about "deuce-and-a-half" spare tires, I found a cartoon about a Roman Legionnaire whose unit was garrisoned in Gaul. He wrote home about his new commander, who had come in and turned the unit upside down in his commitment to high standards. When one of the leaders tried to explain away his unit's lax attitude by saying that the Romans were at peace and had no real enemy, the Captain exploded. "No enemy!" he declared, "You have just met the enemy—and he is me!" The commander went on to say, "With no foe to challenge your fitness to fight, then I must take his place....When you can meet my standards, you win! We all win! If you can't hack it in peace, what chance do you have in war?" The story ends with the Legionnaire's describing how handily the unit defeated an overwhelming horde of marauding Visigoths.

There are many different ways of saying the same thing, but a Ranger class motto says it well: "Pressure makes Diamonds." And that's the input into the system: *challenge*.

Challenge can be almost anything mental or physical, as long as it forces

the soldier to step out onto new ground and tap his energy or ability right at its limit. A challenged soldier is going to develop and appreciate his own capabilities faster and to a greater degree than an unchallenged soldier. Each time he does this, he pushes the envelope of his *confidence* out a little more—he'll be prouder, more sure of himself and more satisfied with his duties and the Army in general.

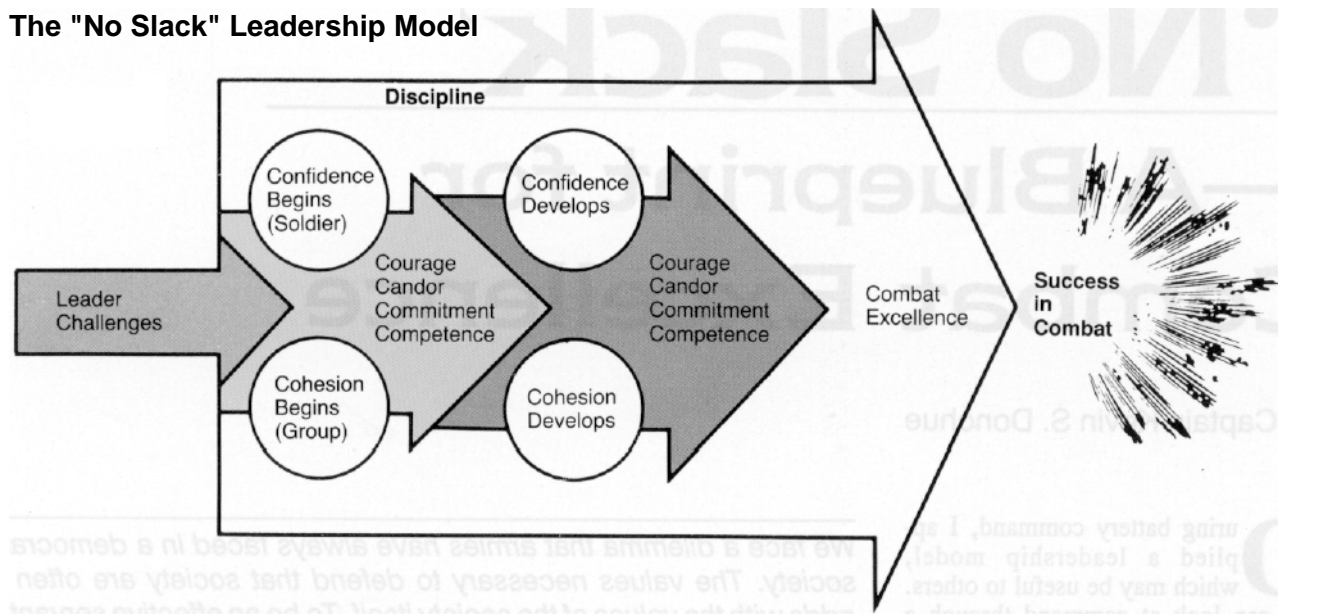
Challenge a group of soldiers and in meeting that challenge, something subtle and wonderful will begin to grow. It's cooperation, trust, teamwork and spirit all rolled into one word—*cohesion*.

The pieces of the model fit together well. *Challenges develop confidence (soldier) and cohesion (group). And cohesion and confidence breed courage, candor, commitment and competence.* As these four individual traits flourish, they'll begin feeding back into the model, helping to build more confidence and cohesion. *Courageous, candid, committed and competent soldiers will make their unit combat excellent.*

Confidence

Consider yourself a living example of how challenge can build confidence.

The "No Slack" Leadership Model



The leader sets the standards that challenge soldiers and begins to develop their confidence and the unit's cohesion. Confidence and cohesion, in turn, develop the soldiers' courage, candor, commitment and competence, which further develops confidence and cohesion. Ultimately, the unit develops combat excellence—the ability to accomplish its mission under the most adverse combat conditions.

What happens when a person, situation or environment challenges your limits? You react the best you can. For most of us, challenges force us to work harder and maybe do something we didn't know we were capable of doing. But after it's over, isn't there a sense of accomplishment and satisfaction? You improve, realizing more of your potential, and the next time, you're ready for an even tougher challenge.

As leaders, we have to take advantage of this phenomenon. If we take the path of least resistance and let ourselves and our soldiers fall into a sleepy routine of meeting a minimum standard day after day, our soldiers' confidence won't grow.

Note that there are some pitfalls to beware of when setting standards. First, each person has different capabilities, and it's the easy way out to manage one standard geared toward the least capable soldier and apply it to all. Such a standard fails to challenge most of your soldiers. Swing the pendulum too far the other way and you increase the probability of a soldier's failing. Failure diminishes confidence—unless you deal with that failure in a constructive manner.

One solution to striking that seemingly "no win" balance is to emphasize improvement over accomplishment, when possible. As long as everyone is performing better, confidence will come. Establish high standards and challenge

soldiers to meet those standards. Most of your men can meet them and will be better for it. Watch the stragglers—are they just marking time or are you seeing improvement?

Confidence builds *competence*. A self-confident soldier is going to be more capable of performing his duties in a stressful environment—in combat. A confident soldier is going to display more *courage*.

As Colonel J. I. Gurfein, commander of the 23d Infantry in the Korean War, noted "...Heroism is knowing what to do in an emergency...A frightened pilot thinks a submariner is brave, a submariner gasps at the bravery of a paratrooper and a paratrooper looks with awe at an astronaut in space. Yet each one is doing well what he is trained to do."

Cohesion

Why worry about cohesion? According to *DA Pam 350-2 Developing and Maintaining Unit Cohesion*, data from the North African Campaign indicates that combat stress (neuropsychiatric) casualties had a devastating effect on less-cohesive units, and the percentage of combat-stress to wounded-in-action casualties was 40 to 45 percent. In more-cohesive units that experienced heavier fighting (the 82d Airborne and 101st Air Assault Divisions), this figure averaged below four percent.

More recent data from the 1973 Yon Kipper War indicate that combat stress casualty rates were profoundly higher in hastily formed tank crews than in other crews engaged in the same battle. In other words, the more cohesive the unit is, the better prepared its members are to withstand the shock of combat. According to Colonel D.M. (Mike) Malone, challenge builds cohesion:

High stress and heavy pressure applied to the whole team will build teamwork. That's a fact. The trick is to do it the right way. Events, exercises and activities that are extreme challenges—which demand a hard core, all-out effort by a team and by each team member—will build teamwork. Add danger, and the teamwork gets even stronger. The high stress of battle puts teams together so well—sometimes in just a few hours—that they continue to have annual "get-togethers" for years after the war is over. In training, get as close to the battlefield as you can... Then start listening for the bragging and war stories—about "Us." It'll work. Guaranteed.

Cohesion enhances the soldier's *commitment* to his unit. His confidence in himself, his buddies and his leaders will increase. His competence and

courage will increase because he has endured hardship as a member of a team and will have a true concern for his fellow soldiers.

Discipline—The Catalyst

Discipline is the soul of an army. General George Washington spoke those words in 1759 while he addressed his captains before a campaign in the French and Indian War. Just because discipline isn't one of the Cs in the challenge model, don't think it has been forgotten or superseded. In fact without it, the whole model is worthless. Discipline is the cement that binds the system together; it must permeate the soldier's every action and thought.

Discipline increases the efficiency of everything a unit does. A truly well-disciplined unit can receive and accomplish a mission without hesitation. It means everyone does what he is supposed to the way he's supposed to without constant supervision.

The most important step in creating discipline is to *demonstrate* discipline through your own moral courage and conviction. I can't overemphasize the importance of setting the example for strong personal values.

Setting that personal example is necessary but far from enough. You also must set performance standards and then achieve them. Your soldiers must be confident that if you set out to accomplish a mission—whether it's repositioning the battery, cleaning all the rifles in the arms room or having award recommendations submitted 30 days before permanent changes of station—you're going to accomplish that mission.

One way of setting the example and instilling discipline is to make physical training (PT) tough. Your example and PT standards set the tone for each soldier's day. Don't ever do PT halfway. It will be blindingly obvious what you are "made of" and what inner strength you have. PT is training that soldiers feel at the "gut level." Believe me, soldiers watch you very carefully during PT.

No Slack

Shortly after I took command, I adopted the motto "No Slack." Some accused me of setting a "zero defects" atmosphere with that slogan. Not at all! I was simply expressing my commitment to completing each mission, without

excuses and regardless of adversities.

An error may occur in training, but the commander must not consider the training complete until his soldiers correct the error and complete the training satisfactorily. Such a standard should be inherent in all training. It means that training must be standard-oriented, not time-oriented. Don't leave the field until you're doing the things you set out to do correctly! Enforcing standards is discipline. You must recognize that discipline doesn't just mean giving out Article 15s.

Besides combat readiness and discipline, there's another term that seems to have lost its true meaning—welfare of the troops. This term is meant to remind us of the importance of time off for the soldier, functional latrines, good food in the mess hall, etc. These are important considerations, but the term "welfare" has become too restrictive. Field Marshal Erwin Rommel, one of the greatest generals in the history of warfare, once said, "The best form of welfare for the troops is good training."

Other Challenging Techniques

There are many ways to challenge your soldiers, building the confidence and cohesion that lead to battlefield victory. Some of the other challenges I presented to the battery included—

- Climbing the highest mountain in the area. Anyone not present for duty that day went on the "make-up" climb three days later.
- Having a 15-mile forced road march as a battery. We marched to the nine-mile point, where we spent one hour reconnoitering our tactical assembly area. Then we returned to camp as individual sections competing to beat each other back.
- Running a 10-kilometer race as a battery during organization-day activities. Afterward, all participants received a T-shirt commemorating the event. I saw soldiers wear those shirts often.
- Training in an intensive, 24-hour exercise in 20 to 30 degree weather during which the battery trained and deployed as two light infantry platoons armed with multiple integrated laser engagement system (MILES) gear. The severe personal privations and difficulty the platoons experienced while maneuvering at night in the snow in the mountains

against a well-trained opposing force was the most extreme challenge most of the soldiers had experienced since joining the Army.

Some may criticize these challenging activities as spending too much time on "infantry" or "ranger" training. My objective was to challenge the battery, to build that cohesion and confidence and then watch courage, candor, commitment and competence grow. After each of these tough events, the soldiers displayed a fierce pride in their accomplishments. The change in attitude was frequently most visible in my quiet or "unmotivated" soldiers. The benefits we derived from those infantry exercises made us sharper artillerymen—more disciplined, motivated, cohesive, confident and combat excellent.

Wrapping Up

Command isn't hard if you, as a leader, show the moral courage to do what you know will best enhance the combat excellence of your unit. You have to believe in yourself—know you can lead your unit effectively. Don't accept excuses. Don't settle for second best. And don't *ever* let your popularity with your soldiers be a factor in your decisions. The American soldier is pretty smart; deep inside, he wants a strong, fair, competent leader—one who gives him No Slack.



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