Field Artillery

A Professional Bulletin for Redlegs

August 1991

Sands of Time

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FEATURE ARTICLES: Fire Support and Combined-Arms Operations

ARTICLES

DEPARTMENTS

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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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A very special **thank you** to Bob Coleman, Directorate of Training and Doctrine, Field Artillery School, for sharing his time and artistic talents to produce this issue. **A job well done Bob!**

—Editor

By Order of the Secretary of the Army:

GORDON R. SULLIVAN
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The Adjutant General

Fred F. Marty
Major General, United States Army
Field Artillery School Commandant

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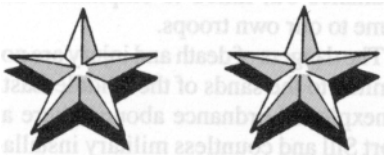


Staying on Target

Our community has been led by an outstanding Chief of Field Artillery these past four years. With General Raphael Hallada's departure, I accept the position with enthusiasm and look forward to the challenge of leading the Field Artillery into the future.

The Field Artillery is definitely on the right path. Desert Storm strengthened our credibility with maneuver commanders. Our cannons and rocket launchers performed flawlessly, and our leaders and soldiers demonstrated extraordinary skill.

As the Army transitions to a contingency force, we must review Desert Storm lessons learned for application to the future. The insights gleaned from these experiences will allow us to reinforce our successes and correct our fire support deficiencies.

Doctrine. Our war-fighting thrust is on track—our principles are sound. During Desert Storm, we successfully validated our fire support tactics, techniques and procedures (TTPs).

But the war revealed a need to emphasize joint procedures and prepare ourselves to transition to AirLand Operations doctrine with its increased demand for operational fires.

Training. Operation Desert Storm definitely validated the principles contained in *FMs 25-100/101 Training the Force.* Our next enemy, however, may not give us several months to get ready. Therefore, we must double our training efforts to be ready for the next conflict.

We will have to continue emphasizing the philosophy of tough, realistic training. Drills and rehearsals must become commonplace. The Combat Training Centers (CTCs) must continue to be maximized. Training at the three CTCs has proven time and again essential to our combat readiness.

As the Army reduces its size, we will have to adapt our training for constrained resources. That demands we introduce practical simulations, simulators and crew trainers to ensure all Redlegs are prepared for the modern battlefield.

Force Modernization. The Artillery for the 21st century must be deployable, lethal, versatile and expansible.

We must deploy weapon systems able to keep up with supported forces. During the next decade, the M119 will include a suite of more lethal munitions for light forces. The Paladin, with its improved responsiveness and survivability, will help our heavy forces fight and win in mid- to high-intensity conflicts.

Weapon systems for the 21st century must have increased range, accuracy and a burst rate of fire. A lightweight, towed 155-mm howitzer will be fielded for light forces and the advanced Field Artillery system-cannon (AFAS-C) for heavy forces. These weapons will give the Artillery both the punch and responsiveness needed to influence the future battlefield.

Desert Storm emphasized that smart munitions (fire and forget) will be an integral part of our future inventory. We will field state-of-the-art munitions for the multiple launch rocket system (MLRS), Army tactical missile system (Army TACMS) and cannons to give us the ability to strike deep and kill both moving and stationary point targets. At the same time, we are developing improved propellants and more versatile fuzes to increase the efficiency of our modern howitzers.

Without the ability to "see" the enemy, we can't maximize our weapons advances. Along with other improvements, we must enhance our target acquisition capabilities. The joint surveillance target attack radar system (JSTARS) and Firefinder radar Block II will significantly improve our ability to detect targets and deliver fires more rapidly.

The demands for responsiveness and our ability to support AirLand Operations dictate a need for improved command and control (C^2). The objective is to equip the Total Force with the advanced FA tactical data system (AFATDS). In the interim, we will continue to field a standard configuration C^2 package of laptop computer units (LCUs), battery computer terminals (BCTs) and forward entry devices (FEDs). This configuration will allow us to bridge to the objective design more quickly.

Finally, the artillery force structure must adapt to provide fire support for the Army's four corps and 20 divisions. Without the required force structure, the Field Artillery won't be able to respond to AirLand Operations' increased reliance on fires.

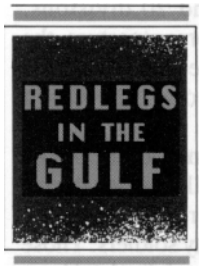
Leader Development. As the Army draws down, the FA will adjust to the requirements of a smaller force. We must continue to assess quality soldiers. Those with demonstrated potential to lead have to be retained in our future NCO and officer corps. Leader development programs and FA School programs of instruction (POIs) continually must be refined and coordinated with field commanders to ensure the technical and tactical competence our profession demands.

Conclusion. The decade of the 90s offers plenty of fire support challenges. I look forward to meeting these challenges and continuing to maintain our reputation as the "King of Battle." It won't be an easy task, and we will have to work together. I welcome your input and recommendations. *Field Artillery—On Target!*

Major General Fred F. Marty is the new Chief of Field Artillery, Commanding General of the US Army Field Artillery School and Center and Fort Sill, Oklahoma. He has commanded Field Artillery units at every echelon from battery through corps artillery, principally in support of cavalry and armored forces. His Field Artillery commands include two batteries of the 6th Battalion, 77th Field Artillery; the 1st Battalion, 16th Field Artillery; the 41st Field Artillery Brigade; the 30th Field Artillery Regiment; and the V Corps Artillery. He also has served as Assistant Commandant of the Field Artillery School, as Assistant Division Commander of the 1st Cavalry Division, and as Commander, US Army Community and Family Support Center.

Desert Storm Safety

As a participant in Desert Storm, I am happy to report we in the Field Artillery community took time for safety. Not one incident of fratricide, in the air or on the ground, was attributable to Field Artillery fires!

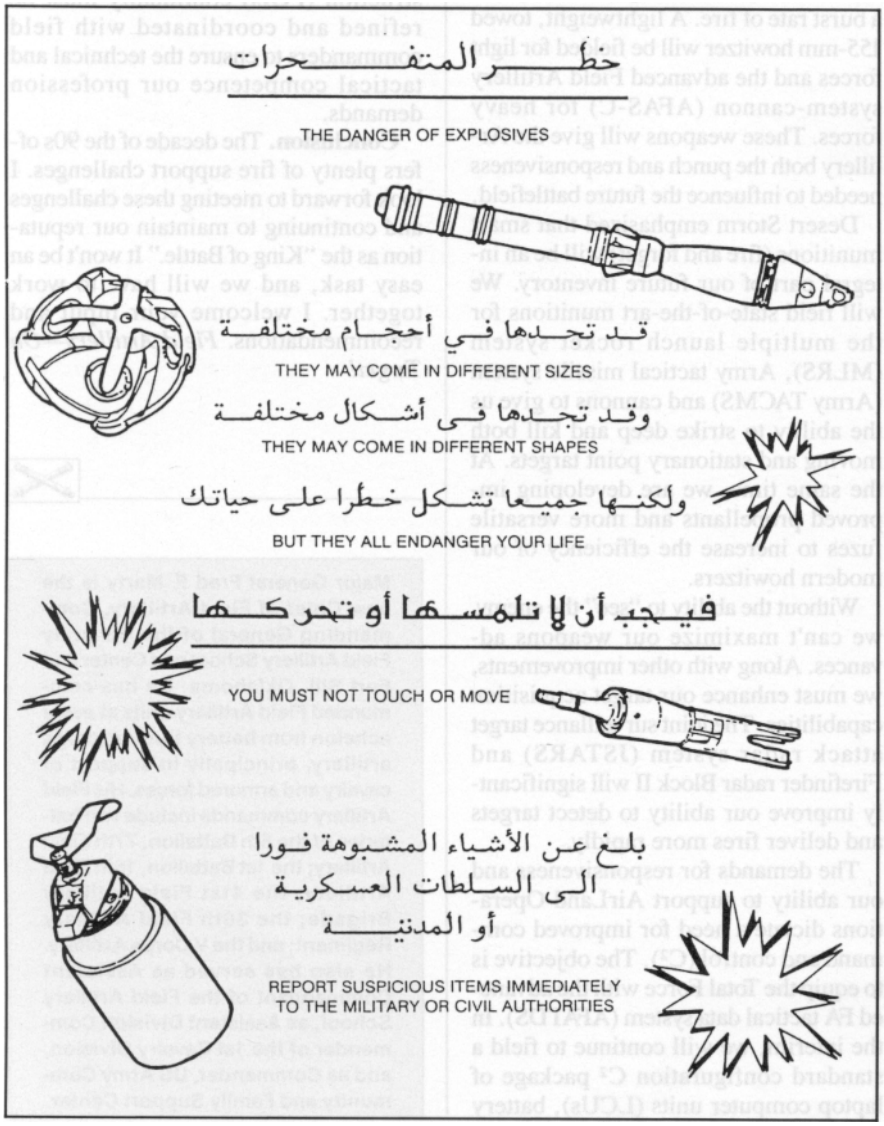


Yet we must not rest upon our laurels. Although the number of casualties were extremely light, far too many deaths and injuries occurred due to carelessness. Before the start of the ground war, 38 Army personnel were lost in accidents. In the days that followed the end of hostilities, I saw the growing number of deaths and injuries reported in theater. These were accidents that clearly should have *never* happened. Most were due to individual carelessness, and some were due to outright stupidity.

As Americans, we tend to enjoy collecting things. We are enthralled by the unusual and seek thrills and novelties. Souvenir hunting on the battlefield often met with tragic consequences, as the casualty reports indicated. We went to great effort to warn the Kuwaiti people (see leaflet) of the dangers of unexploded ordnance but failed to emphasize the same to our own troops.

The dangers of death and injury are not limited to the sands of the Middle East. Unexploded ordnance abounds here at Fort Sill and countless military installations throughout the world. We must take time to remind our soldiers and family members of the potential dangers. Let's take a lesson from our hard-won victory in the desert and apply it to the future. Safety is everyone's responsibility, from general down to private. Let's try and make the motto from Army Central Command (ARCENT) headquarters a reality: "Not one more life!"

CPT Patrick A. Calhoun, FA
A/1-30 FA
Fort Sill, OK



Top-Down Fire Planning—Bottom-Up Refinement

I am writing this letter to generate discussion on the "top-down fire planning—bottom-up refinement" technique.

The primary reference for fire supporters of heavy brigades and below is *FM 6-20-40 [Tactics, Techniques and Procedures for Fire Support for Brigade Operations (Heavy)]*. I believe this is generally an excellent field manual and certainly a vast improvement over the manual it replaced. However, I believe it is flawed in its approach to the top-down, bottom-up process in that it expects too much input by company team FISTs [fire support teams].

The current doctrine calls for the brigade and task force (TF) fire support officers (FSOs) to develop a fire plan and let the company FSOs "modify [the targets] as necessary and add any other targets according to the maneuver commander's priorities. Modifications and additions are submitted through the battalion to the brigade FSO for inclusion in the final brigade target list and fire plan." This sounds good but doesn't work (given the prep time available for most missions) and isn't very feasible.

To put this in perspective, the offense fire planning example given in FM 6-20-40 shows the TF has 13 targets in its zone (planned by the brigade and TF FSO). Eleven hours prior to a 0600-hour line of departure, the TF order is briefed and three of the company FSOs submit a total of 12 additional targets for inclusion in the brigade fire support plan. This approach to fire planning guarantees late rehearsals, incomplete dissemination to firing platoons and, most importantly, dilutes the synchronization of fire support with maneuver.

Preferably in this example of fire planning in the offense, refinement to the target list would come from reconnaissance efforts, the TF S2's updated situational template and changes to the TF scheme of maneuver. Company FSOs would submit changes to the target list by exception.

FM 6-20-40's example for defensive operations is similarly flawed. The TF FSO in the example tells the company FSOs to—

1. Plan smoke to separate enemy elements as they encounter our obstacles.

2. Plan fire to support the counterattack.

3. Plan fires on the flanks (on dismounted infantry avenues of approach).

I believe all this should be accomplished at the battalion level, and the company FIST should be responsible for refining targets based on the actual position of the obstacles, platoons and points.

The [Center for Army Lessons Learned (CALL), Fort Leavenworth, Kansas] pamphlet titled "Fire Support Lessons Learned," dated May 1990, states a lesson is "FOs and FSOs at lower levels verify and refine the plan, their assigned targets and positioning to ensure they can execute fires needed to support the commander's intent."

The best summation of a company FSO's responsibilities in this process is in *FM 6-20-1 [FA Cannon Battalion]*. It states:

. . .additional targets are added if necessary, but the company fire support teams are primarily responsible for executing the brigade/task force fire plan. These shooters stand on the ground with the company commanders, identify trigger points and synchronize the battle. The primary concern of the company FSO is planning priority targets and FPFs [final protective fires] and validating target locations. They ensure that the company has primary and backup observers . . . able to observe the trigger points of their targets.

This paragraph succinctly states the company FSO is primarily not a fire planner, but a trigger puller who executes the TF fire plan in accordance with the commander's intent and devotes his efforts to ensuring the success of that plan.

For all of the above to work, the brigade and TF FSOs must develop a valid fire plan. The only way to do this is that the decision-making process (DMP) as outlined on Page 2-4 of FM 6-20-40 and the troop-leading procedures (TLP) as outlined on Pages 2-14 to 2-22 of *FM 71-2 [The Tank and Mechanized Infantry Battalion Task Force]* must be followed by the battle staff at the TF and brigade main command posts. CALL is publishing a newsletter titled "Battalion and Brigade Battle Staff, Volume 1" that deals with how to apply DMP/TLP with limited or moderate time available. I recommend FSOs get a copy and apply its lessons when it comes time to write orders. [CALL reports the newsletter will be available, tenatively, in late 1991.]

The brigade TF FSO must focus on several critical areas during the decisionmaking process. When the commander issues his initial planning guidance to the staff, the FSO should start formulating the concept for fire support, building on it throughout the DMP. Once a course of action is developed, war-gaming that course of action is where the FSO should be "putting targets to acetate." The FSO continues to refine how to achieve the maneuver commander's intent, ensures all assets and munitions are used and verifies the desired attack and engagement criteria—in short, addresses all fire support responsibilities.

Good war gaming results in a fire support plan synchronized with the other battlefield operating systems and the scheme of maneuver and executable by company FSOs. A poor fire plan that leaves the FIST scratching their heads in wonder can almost always be attributed to a failure of the battle staff to follow the DMP/TLP.

I recommend that future revisions of FM 6-20-40 continue to emphasize this point and quit relying on company FSOs to build a synchronized brigade fire support plan.

CPT Boyd D. Gaines, FA
Ops Gp, CMTC
Hohenfels, Germany

Will the Build-Down Allow Risk-Taking?

I must confess my disgust with the use of the oxymoron, "Build-Down." This misnomer puts Orwellian Newspeak to shame. Such terminology insults the intelligence and puts a euphemistic spin on a force reduction that will cut away muscle, not fat, in both the Army and the federal civil service. Someone should recall we'll be cutting away about one-third of the force in the next two years—a force that either won or supported winning the Persian Gulf War. Every Army should have such "deadbeats"!

We should be more sensitive with our use of terms. But what's the point of breast-beating when budget constraints will force us to make the personnel cuts, regardless?

The point is simple. Commanders and their subordinates must be vigilant lest we return to a "zero defects" mentality. That is, commanders are going to have to make room for risk-takers, and risk-takers must continue to take risks.

On the command side, that means not using the evaluation report or the performance appraisal as a counseling tool. Leaders who are genuinely concerned about the professional development of their subordinates will regularly correct unsatisfactory performance with on-the-spot counseling. A soldier or civilian who receives anything less than full credit for improved performance and potential at report time will be left by the wayside by a promotion and selection system focused somewhat myopically on the reduction.

And in those cases where a risk-taker has made a serious error, his commander

must root out his motives to determine if the mistake sprang from a larger value system. In other words, was the subordinate thinking more about doing what he thought was the right thing rather than focusing on understanding the commander's intent—should the subordinate be allowed to fail? This analysis involves considerable soul-searching in some cases. But it's worth the commander's effort if we are to keep from losing the "doers" in our midst. The cautious and conservative make fewer mistakes for which to be held accountable.

Subordinates, on the other hand, must resist the temptation to focus on their careers at the expense of readiness. Yet there will be an inclination toward self-preservation as the Army "builds" down. When you look to your left then right, knowing it may be you who's leaving and not one of two others you're looking at, caution is suddenly terribly appealing.

Try to be prudent, but please don't be railroaded when it comes to your convictions and the good of the Army. Keep the lines of communication open with your boss. Make your professional development a constant, daily obsession. Pay particular attention to values and ethics that have made this Army great throughout its history. And if you should face a situation where being true to yourself may mean sacrificing your career, dare to do so.

As personnel managers and promotion boards wrestle with their convictions while trying to preserve a ready force, remember each of us has a sacred obligation to share the responsibility to preserve that force day by day. There is neither room for careerists nor for commanders who let their egos or prejudices cloud their evaluation of subordinates. The choices of each of us who remains in the Army will grow only more difficult. And there must be ample room for those who'll get it done and dare to make it better.

MAJ Charles W. Pope, Jr., FA
Public Affairs Office
Fort Sill, OK

History Contest: Results and More

This year's history contest targeted the theme "Fire Support in Combined-Arms Operations." Congrats to the winners, and a special thanks to our distinguished panel of judges.

If you didn't enter an article in this contest, don't despair—next year's contest is yours for the writing. And if you have other good ideas, send them to us. Our 1992 themes are listed on this page. We aren't theme-bound, however, so don't let our themes drive your submission.

Hope you enjoy this history edition. Let us know how we can meet your needs.

Contest Winners	
First Place:	"Operation Cobra Fire Support Equation: Organization + Flexibility = Victory" by Captain Gregory J. Celestan
Second Place:	"Nikolai Voronov and the Defense of Moscow: An Artillery Epoch" by Captain Stephen L. Curtis
Third Place:	"The Soviet Operational Maneuver Group: Fire Support Lessons for AirLand Battle-Future" by Major Joseph P. Nizolak, Jr.
Honorable Mention	"Placing Steel on Target: The Birth of the Fire Support System" by Major Donald A. Carter

Field Artillery 1992 Themes

Month	Theme		Copy Deadline
Feb 92	Targeting (Battalion through Theater)		7 Oct 91
Apr	FA Readiness in Contingency Operations		2 Dec 91
Jun	FA Logistics		3 Feb 92
Aug	History Contest*	Contest:	3 Feb 92
		Other:	6 Apr 92
Oct	Train to Fight**		1 Jun 92
Dec	Red Book: Annual Report		3 Aug 92

**See the History Writing Contest rules on Page 5.*
***This theme will address training at CTCs, simulators and other devices for training under constrained resources and general training strategies (from platoon- through brigade-levels).*

1992 History Writing Contest

The United States Field Artillery Association is sponsoring its seventh annual History Writing Contest with the winners' articles to be published in the August 1992 edition of *Field Artillery.* To compete, submit an original, unpublished manuscript on **any** historical perspective of Field Artillery by 3 February.

The Association will award $300 for the First Place article, $150 for Second Place and $50 for Third. Selected Honorable Mention articles also may appear in the August *Field Artillery.*

Civilians of any nationality or military of all branches and services, including Allies, are eligible to compete. You don't have to be a member of the Association. Your submission should include your (1) double-spaced manuscript of no more than 2,500 words, (2) biography and (3) graphics (black and white or color photographs, slides, charts, graphs, etc.) to support your article. Be sure to include footnotes in and a bibliography with your manuscript.

The article should include specific lessons or concepts that apply to today's innovative Redlegs—it should not just record history or document the details of an operation. Authors may draw from any historical period they choose.

A panel of three expert historians will judge the manuscripts, which will be sent to them without the authors' names. The panel will determine the winners based on the following criteria:

- Writing clarity (40%).
- Usefulness to Today's Redlegs (30%).
- Historical Accuracy (20%).
- Originality (10%).

By 3 February 1992, send the manuscript to the United States Field Artillery Association, ATTN: History Contest, P.O. Box 33027, Fort Sill, Oklahoma 73503-0027. For more information, call the Editor or Managing Editor of *Field Artillery* at AUTOVON 639-5121/6806 or commercial (405) 351-5121/6806.

Judges of the 1991 History Contest

The US Field Artillery Association thanks the judges of this year's submissions:

• **Lieutenant General (Retired) Willard W. Scott** was born in Fort Monroe, Virginia on 18 February 1926. He was graduated from the United States Military Academy in 1948 and commissioned a Second Lieutenant in the Field Artillery. He holds a Master of Science degree in Mechanical Engineering from the University of Southern California and an Honorary Doctor's degree from St. Thomas Aquinas College.

General Scott became the 52d Superintendent of the United States Military Academy in July 1981 and held that position longer than any other Superintendent in the past 50 years; he retired from West Point and the Army in August 1986.

General Scott came to the Superintendency from commanding the V US Corps in Europe. He also has been Assistant Deputy Chief of Staff for Operations and Plans at Department of the Army; Commanding General, 25th Infantry Division, Hawaii; Commanding General, Army Readiness Region VI, Fort Knox, Kentucky; Deputy Chief of Staff for Plans, United States Pacific Command; Commanding General, United States Military Assistance Command Vietnam, Special Troops; and Commanding Officer, 23d Artillery Group, US Army Vietnam.

Since retiring from the Army, General Scott is an Adjunct Staff Member with the Institute for Defense Analyses in the Washington, D.C. area. He is also the Executive Director of the Association of Military Colleges and Schools.

• **Colonel Kenneth E. Hamburger** was born in Oklahoma and attended Oklahoma State University where he received the Bachelor of Architecture degree in 1964. A Distinguished Military Graduate, he received a commission in the Field Artillery. He holds masters and doctoral degrees in history from Duke University and has served on the faculty of the History Department at West Point for the past 10 years.

He joined the First Cavalry Division as an Assault Helicopter Platoon Leader in Vietnam in 1967. Returning to Vietnam in 1971, he participated in the invasion of Laos as an Aviation Battalion Operations Officer and commanded a reconnaissance airplane company at Chu Lai.

In Europe, he served as a Field Artillery battalion operations officer (S3) and executive officer in the 8th Mechanized Infantry Division and commanded the Attack Helicopter Troop of the 11th Armored Cavalry Regiment. During 1980-1981, he commanded the 1st Battalion, 15th Field Artillery of the 2d Infantry Division in Korea.

In 1984, Colonel Hamburger was appointed as a Permanent Associate Professor at West Point. He has taught courses on the Korean and Vietnam Wars, Grand Strategy, Generalship and Leadership. He has written and spoken to international audiences on combat leadership, US coast defenses and the Vietnam War.

• **Colonel (Retired) Richard H.** Sinnreich enlisted in the Army in 1960 and was commissioned a Second Lieutenant of Field Artillery upon graduation from the United States Military Academy in 1965. Following troop duty, including battery command in the Republic of Vietnam, he obtained a master's degree in National Security Affairs from the Ohio State University and returned to the Military Academy as an instructor and later Assistant Professor of National Security Studies. His service on the West Point faculty included internships on both the Joint and National Security Council staffs.

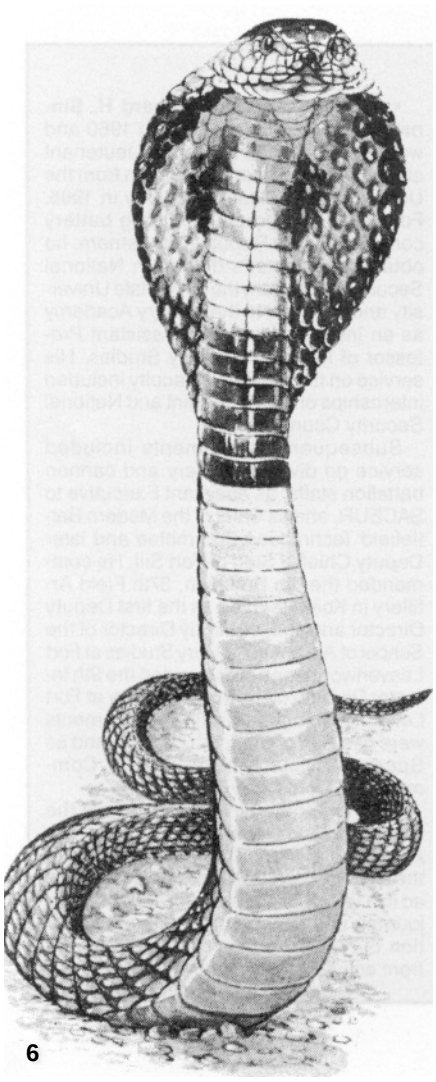
Subsequent assignments included service on division artillery and cannon battalion staffs, as Assistant Executive to SACEUR, and as Chief of the Modern Battlefield Techniques Committee and later Deputy Chief of Staff of Fort Sill. He commanded the 6th Battalion, 37th Field Artillery in Korea, served as the first Deputy Director and subsequently Director of the School of Advanced Military Studies at Fort Leavenworth, and commanded the 9th Infantry Division (Motorized) Artillery at Fort Lewis, Washington. His final assignments were as Chief of Staff, 9th Division and as Special Assistant to the Deputy Commander, I Corps and Fort Lewis.

Colonel Sinnreich is a graduate of the Command and General Staff College, the Advanced Military Studies Program and the National War College. He has published in a variety of professional and scholarly journals and was co-author of the 1986 edition of *FM 100-5 Operations.* He retired from active service in June 1990.

First Place

Operation Cobra Fire Support Equation: Organization + Flexibility = Victory

by Captain Gregory J. Celestan



. . . it was destined to become known as the Normandy Breakout—the most decisive battle of our war in Western Europe.

General Omar N. Bradley
Commander, American Forces
Normandy, June 1944

Operation Cobra, the code name for the Allied breakout from the Normandy beachhead, was designed to shatter the German defenses in the Normandy area and allow the Allied forces to leave the Cotentin Peninsula (see Figure 1). One of the greatest concentrations of firepower in the European Theater of Operations during World War II was employed during Cobra. Six American divisions were concentrated over a narrow front, providing overwhelming firepower to break the defenders. More than 20 battalions of divisional and corps artilleries were under the control of a single corps headquarters for Operation Cobra.

The coordination among army, corps and division fire support officers (FSOs) was critical in employing artillery during the operation. Until Operation Cobra, this number of Field Artillery (FA) units had never been organized and controlled under one field headquarters. The successful employment of 20 battalions of artillery, in conjunction with a massive air preparation, was critical to the success of the initial breakthrough.

Operation Cobra was necessary because the Allied forces had failed to expand the beachhead and reach their planned objectives after the initial Normandy landings on 6 June 1944. The German forces, commanded by General-feldmarschall Guenther von Kluge, were determined to prevent the Allied forces from expanding out of the Cotentin peninsula.

By D+30 hours, the Allied forces were bogged down in a battle of attrition in hedgerows with little forward progress. The commander of the American forces, General Omar Bradley, was concerned the situation would deteriorate into the trench-style warfare of World War I, so he conceived Operation Cobra to break out of the hedgerows and through the German defenses. Bradley was successful, to a large measure, because of his artillery organization and flexible employment.

FA Organization

Operation Cobra called for extensive fire support for six divisions arrayed in depth over a narrow front. The plan called for the First Army to act as the controlling headquarters for the heavy artillery units (240-mm howitzers and 8-inch howitzers and guns). VII Corps controlled the medium units (155-mm howitzers and guns), and the rest of the artillery (105-mm howitzers) fell under divisional control.

Heavy artillery assets were stripped from adjacent corps in the First Army area and placed under the control of a single command for this operation. Twenty-one heavy artillery battalions were concentrated to provide overwhelming fire support for the ground forces.

One must look at the changes made before the Normandy landings to fully understand the organization of the artillery units under the First Army. After World War I, France and Germany had

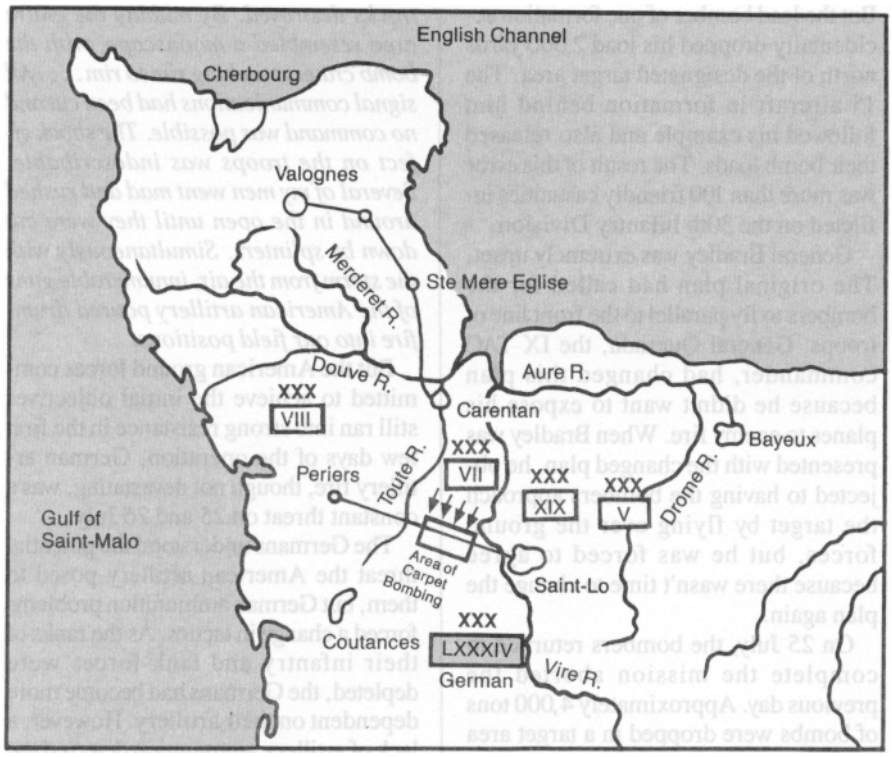


Figure 1: Operation Cobra—the Normandy Breakout, 24-27 July 1944.

changed their artillery organizations, based on their experiences during the war. The US Army studied and adopted some of the changes.

During the 1930s, the US Army tried to standardize the artillery formations throughout the service. Battalions consisted of two to three batteries; regiments, two three-battery battalions or three two-battery battalions; and brigades consisted of two or more regiments. Groupments, which were temporary tactical units, were formed when necessary. They had several units from battery to regimental levels under one command for fixed period.

The division and corps artilleries were fixed organizations. The division artillery usually was composed of two regiments of artillery. The corps artillery had one brigade with one regiment of howitzers per division. Under this structure, the corps didn't have its own artillery headquarters and headquarters battery (HHB).

Then from 1941 to 1943, the Army redesigned the FA structure and adopted a flexible brigade-group structure in lieu of the old fixed brigade for the corps artillery. Each corps also was authorized its own HHB. The implementation of the flexible brigade-group system ended the regimental system.

The major advantage this organization provided was flexibility. Under the new structure, the corps artillery commander could task organize the assets needed to accomplish the mission.

Command and Control

The sheer numbers of artillery allocated for the Cobra assault added a burden to the VII Corps Artillery's command and control structure. But the flexible corps structure allowed the corps planners to alleviate some of the command and control problems.

For the operation, VII Corps was allotted a major portion of First Army's artillery. Before H-Hour, First Army gave VII Corps nine of its 21 heavy artillery battalions, five of its 19 mediums and all of its seven non-divisional light artillery units. VII Corps Artillery controlled 258 pieces for Operation Cobra (including only non-divisional artillery pieces). VII Corps attached the light artillery battalions down to the divisions.

Most Field Artillerymen at the time had little training in controlling artillery on such a scale. After the war, Brigadier General Charles E. Hart, a First Army artillery officer, commented in his article "Artillery with an American Army in Europe," *Military Review*, September, 1945:

Whereas all seasoned officers were familiar with the general organization and employment of the division (including the divisional artillery) prior to the advent of large-scale operations, most officers, artillerymen as well as others, had only very hazy ideas as regards the organization and employment of the mass of non-divisional artillery required either by a corps or by an army.

Compounding the command and control problems, new tactical elements were formed before the operation. Two combat commands (A and B) were formed out of the 3d Armored Division to help in the exploitation phase of the operation. Fire support for these elements had to be flexible and mobile to provide continuous support.

The artillery battalions assigned the direct support (DS) mission for each combat command stayed in the column of that tactical formation. The two artillery battalions assigned to support the combat commands were placed in a groupment under the command of the DS battalion commander. In addition, a 155-mm howitzer battalion was added during the operation to serve as a general support (GS) battalion for the groupment. The groupment commander then acted as the fire support coordinator (FSCOORD) for the combat command. This formation proved to be very successful during the operation.

Air Power and Problems

One area of concern for the Cobra planners was the coordination between the Air Corps and ground forces. The major stumbling block for the ground forces was the lack of communication between the pilots and ground elements.

General Elwood A. Quesada, the IX Tactical Air Command (TAC) commander, was instrumental in solving the problems experienced during operations before Cobra. He had his reconnaissance pilots attend courses in artillery fire adjustment to help the artillery spotter planes. To prevent mishaps between friendly forces, he had the same radio (VHF) installed in the tanks that were used in the planes. Using the same radios vastly improved the communications and, therefore, effectiveness of air cover for the ground forces.

In Operation Cobra, General Bradley risked the majority of his forces by massing them on a narrow front. Bradley understood that this risk was necessary to

penetrate the enemy's defenses. But he planned to use heavy bombers for a firepower preparation of "carpet bombing" to destroy the enemy's capabilities.

The focus of the operation was General J. Lawton Collin's VII Corps. VII Corps initiated the operation by breaching the enemy's defenses along the St. Lo-Periers highway immediately following the preparation. Once the defensive lines were breached, General Collins started the exploitation phase by pushing his motorized infantry and armored units through the gap.

Heavy bombers and artillery conducted the preparatory fire mission. Bradley had decided to use bombers because he felt the level of destruction he wanted was far beyond the capabilities of the artillery available to the First Army (Martin Blumenson, *Breakout and Pursuit*; Washington, D.C., 1961.)

The German forces facing Collins' VII Corps belonged to Army Group B and numbered about 30,000 men. One of the major subordinate units of Army Group B was the LXXXIV Corps commanded by Generalleutnant Dietrich von Choltitz. The LXXXIV Corps had tactical responsibility for the terrain that elements of VII Corps were preparing to seize.

By 24 July, most of the units under the LXXXIV Corps' control were badly battered. These units had been in continual combat since 6 June and had received few replacements. Some of the units such as the Panzer Lehr Division, 17th SS Panzer Grenadier Division and 77th Division, contained mostly remnants and augmentees.

The Panzer Lehr Division, which was seriously reduced in strength, received the greatest portion of the carpet bombing at the onset of Operation Cobra. At full strength, this division would have had approximately 15,000 men, but on 24 July it had approximately 7,000 soldiers combat effective.

Operation Cobra began tragically on 24 July 1944. British Air Chief Marshall Leigh-Mallory, overall commander of the air forces, decided on the morning of 24 July that the weather would preclude the bombers from visually acquiring the target area and advised General Bradley to postpone Cobra. The decision to postpone the operation was made too late, however, to recall all of the bombers.

Most returned to their bases in England without releasing their loads. But the lead bomber of one formation accidentally dropped his load 2,000 yards north of the designated target area. The 15 aircraft in formation behind him followed his example and also released their bomb loads. The result of this error was more than 100 friendly casualties inflicted on the 30th Infantry Division.

General Bradley was extremely upset. The original plan had called for the bombers to fly parallel to the front line of troops. General Quesada, the IX TAC commander, had changed this plan because he didn't want to expose his planes to enemy fire. When Bradley was presented with the changed plan, he objected to having the bombers approach the target by flying over the ground forces, but he was forced to agree because there wasn't time to change the plan again.

On 25 July, the bombers returned to complete the mission aborted the previous day. Approximately 4,000 tons of bombs were dropped in a target area only eight square miles.

Again, tragedy followed errors on the part of the bombardiers. Smoke from the lead bombing runs obscured the landmarks and target area from the follow-on waves of bombers. Several formations repeated the errors made the previous day and dropped their loads on the American lines.

More than 500 casualties were caused by this error, including Lieutenant General Lesley J. McNair, Commanding General of the Army Ground Forces. Command and control was disrupted temporarily by bombs falling short. The fire direction center (FDC) of the 957th FA Battalion was destroyed, and the communication wire between the 9th Infantry Division Artillery command post and its firing battalions was cut as a result of the errant bombs.

After these two incidents, General Eisenhower resolved never to use heavy bombers in a tactical role again (Blumenson).

Despite the friendly casualties, the effect of the preparatory fires on enemy forces along the front was devastating. As stated in John Keegan's Six Armies in Normandy (New York, 1982), General Bayerlein, commander of the Panzer Lehr Division, described the initial bombing:

. . .Back and forth the bomb carpets were laid, artillery positions were wiped out, tanks overturned and buried, infantry positions flattened and all roads and tracks destroyed. By midday the entire area resembled a moonscape, with the bomb craters touching rim to rim. . . . All signal communications had been cut and no command was possible. The shock effect on the troops was indescribable. Several of my men went mad and rushed around in the open until they were cut down by splinters. Simultaneously with the storm from the air, innumerable guns of the American artillery poured drumfire into our field positions.

But the American ground forces committed to achieve the initial objectives still ran into strong resistance in the first few days of the operation. German artillery fire, though not devastating, was a constant threat on 25 and 26 July.

The Germans understood the potential threat the American artillery posed to them, but German ammunition problems forced a change in tactics. As the ranks of their infantry and tank forces were depleted, the Germans had become more dependent on their artillery. However, a lack of artillery ammunition deterred the Germans from having effective counterbattery fire during Operation Cobra. They were forced to neglect counterbattery missions in favor of using their meager resources to fire DS missions for their ground troops.

General Collins was faced with a difficult decision on the evening of 25 July. His infantrymen had made limited gains but still hadn't reached their objectives. He decided to commit part of his heavy (armor and mechanized infantry) forces on 26 July to widen the breach in the German lines. On the morning of 26 July, General Collins committed his main attack force (1st Infantry Division, Combat Command B-3d Armored Division and 2d Infantry Division). Due to the success of this force against disorganized resistance, General Collins committed his last exploiting force (the remainder of the 3d Armored Division) on the morning of 27 July.

German forces were unable to stop the armored and infantry columns, and their defensive positions disintegrated. German command and control was lost, and all the Germans could do was fight in isolated pockets (US Military Academy's *The Second World War: Europe and the Mediterranean*, 1982).

FA Organizational Advantages

The key to the American successes throughout the campaign was our ability

to effectively mass firepower at several critical points along the German defensive positions. The organization of the VII Corps Artillery during Operation Cobra was a major factor in this capability.

The problem of coordinating the various artillery battalions attached to VII Corps for Operation Cobra was solved by consolidating them under one headquarters. The 32d FA Brigade, usually an army-level asset, was attached to VII Corps to control all the heavy artillery during the operation. The 240-mm howitzer and 8-inch units in the First Army area were stripped from their units and attached to the 32d FA Brigade.

The fire support plan was designed so the 32d FA Brigade would control the heavy artillery and corps static artillery to free VII Corps Artillery from the burden of controlling an excessive number of units. This concept was explained in the Army's field manuals and professional journals before the Normandy landings but hadn't been tested on a large scale.

There were several advantages to placing similar artillery systems under one headquarters. Ammunition resupply and logistics planning was greatly simplified by consolidating heavy artillery under the control of the 32d Brigade. In addition, the personnel who had the most knowledge about employing heavy artillery were assembled under one command. Most important, unity of command enabled the brigade commander to concentrate long-range fires when needed by the corps commander.

This arrangement proved to be highly effective during the later stage of Cobra when VII Corps units rapidly moved across the French countryside. It also gave the First Army commander the freedom to provide fire support over a wide zone while still maintaining the ability to mass his resources when the situation arose.

Counterbattery fire was one of the primary missions of the VII Corps Artillery at the start of Cobra. On 24 and 25 July, counterbattery missions were fired against 69 enemy anti-aircraft positions. The success of these missions was evident to the pilots; only the first four waves of bombers received any enemy anti-aircraft fire. The entire counterbattery fire plan for Operation Cobra was controlled by VII Corps Artillery.

In addition, the main artillery preparation for Cobra was coordinated through First Army Headquarters to the artillery of four of its five corps: V, VII, VIII and XIX Corps (see Figure 2).

FA Flexibility

The effective coordination and employment of the First Army's fire support assets can be attributed to the organization of the artillery units before the battle: the consolidation of heavy artillery under the control of the 32d FA Brigade attached to VII Corps. This eliminated several echelons of command and provided a central planning headquarters for the corps and army commanders.

The smooth execution of the preparatory fires resulted in widespread confusion among the German defenders. Very little coordination was possible among the scattered German units after the preparatory fires destroyed their communication lines. This prevented the Germans from launching any coordinated counterattacks against the American forces.

The fire support plan for the operation was very successful because of its flexibility in the organization and mission assignment of the FA units. The ability to mass artillery at any point on the battlefield was a major advantage the Americans had over the Germans.

By organizing all heavy artillery units under a single brigade headquarters, General Bradley was able to effectively control and mass his firepower at the beginning of the breakthrough. This organization was critical when he needed to mass fires in support of an engagement or reinforce the fires of other VII Corps artillery assets. The clear lines of command among the artillery commands, from battalion to army, eliminated wasted time and streamlined coordination.

In reference to his relationship with VII Corps Artillery, Colonel Frederic J. Brown, the commander of the 3d Armored Division Artillery during Operation Cobra, said the following in his article "The Story of the 3d Armored Division Artillery" (*Field Artillery Journal*, September, 1946):

In every operation, the corps artillery support was superb. Anything asked was given, regardless of whether it was fire support, attached battalions or corps artillery in direct support. The type and quantity of artillery support was tailored to the need, if it was available in the VII Corps or First Army. Hence the problems of division artillery organization for combat were those of balancing requirements and available road space, but not availability.

Corps	Commanders (Major Generals)
V Corps	L. T. Gerow
2d Division	W. M. Robertson
5th Division	S. L. Irwin
35th Division	P. W. Baade
VII Corps	J. L. Collins
2d Armored Division	E. H. Brooks
3d Armored Division	L. H. Watson
1st Division	C. R. Huebner
4th Division	R. O. Barton
9th Division	M. S. Eddy
VIII Corps	T. H. Middleton
4th Armored Division	J. Wood
6th Armored Division	R. W. Grow
8th Division	D. A. Stroh
79th Division	L. T. Wyche
XV Corps	W. H. Haislip
5th Armored Division	L. E. Oliver
83d Division	R. C. Macon
90th Division	R. S. McLain
XIX Corps	C. H. Corlett
28th Division	L. D. Brown
29th Division	C. H. Gerherdt
30th Division	L. S. Hobbs

Figure 2: First Army's Order of Battle, 24 July 1944. Lieutenant General Omar N. Bradley commanded First Army. The main artillery preparation for Operation Cobra was coordinated through First Army Headquarters to the artillery of four of its five corps: V, VII, VIII and XIX.

Using established doctrine, the First Army and VII Corps planners organized an artillery force able to provide devastating fire support when needed.

Captain Gregory J. Celestan won First Place in the US Field Artillery Association's 1991 History Writing Contest with this article. He's currently a student at the Defense Language Institute, Monterey, California, studying Russian. He served as Battalion S2 and commanded C and Headquarters Batteries in the 4th Battalion, 7th Field Artillery, 42d Field Artillery Brigade, Germany. Also in the 42d Brigade, he was the Battalion Ammunition Officer and a battery executive officer in the 2d Battalion, 92d Field Artillery. Captain Celestan is a graduate of the Field Artillery Officer Basic Course, Fort Sill, Oklahoma, and the US Marine Corps Amphibious Warfare School, Quantico, Virginia.

Nikolai Voronov and the Defense of Moscow: An Artillery Epoch

1991 HISTORY WRITING CONTEST

Second Place

by Captain Stephen L. Curtis

In the final analysis and once the force is engaged, superior combat power derives from the courage and competence of soldiers, the excellence of their training, the capability of their equipment, the soundness of their combined arms doctrine and, above all, the quality of their leadership.

FM 100-5 Operations, 1986

A handful of beaten and outnumbered Russian artillery regiments fighting a dire last-stand at Moscow in November 1941 stopped one of the greatest forces in history by using lessons forged from their previous defeats. One man, Russia's top artilleryman at the time, was the impetus behind many of the reforms that helped make victory possible. This battle was a turning point in both the development of the Russian artillery and the war as a whole and was the culmination of a chain of events stretching back to 1939.

The roots of the Russian failure up to the Battle of Moscow had their origins in the late 1930s. The development of the Russian artillery during this period left it without the organization and doctrine needed to capitalize on the lethality of its tube numbers. From its success at Khalkhin Gol in 1939 until the Germans tried to invade Moscow, the artillery suffered from misguided lessons that left it unprepared for this new age of mobile combat. Marshal Nikolai Voronov, appointed to head the artillery in the summer of 1941, began a new phase of development, attempting to resurrect his broken artillery just months before the Battle of Moscow.

Using the elements of combat power (maneuver, firepower, protection and leadership) as an analysis framework, this article discusses how the Russian artillery first set itself up for disaster, was nearly destroyed and then rose from defeat under Voronov's leadership to achieve, possibly, the greatest Russian victory of World War II.

Prelude to Disaster

The Russian High Command had been setting itself up for failure since 1939. Until that time, it had been rebuilding its artillery, virtually destroyed in World War I.

The artillery had its first test in 1939 at Khalkhin Gol against the Japanese (28 May to 31 August) and achieved a spectacular

victory. After initial setbacks, the artillery, tanks, infantry and aircraft attacked with synchronized precision.

Conducting deep penetrations, bypassing strongpoints and coordinating the attacks with devastating artillery preparations had been the keys to victory. Nikolai Voronov participated in engineering this success. However, the events after Khalkhin Gol caused the Russian leaders to forget these lessons and, in fact, reverse many of them.

Immediately after Khalkhin Gol, the Germans invaded Poland (1 September 1939). The speed of their attack shocked the Russians who carefully observed that the foundation of the Blitzkrieg's combat power was the dive bomber and tank. The Germans used their aircraft as "flying cannons," and the speed of their tank and motorized divisions, theoretically, negated the need for devastating artillery preparations. Practically the only fire support available to the German maneuver forces was the light gun and trench mortar. Against the Poles in 1939 the Germans could get away with this tactic.

In distilling the lessons of the Blitzkrieg, many in the Russian High Command opined that the days of massive artillery barrages were over. The High Command questioned the preeminence of the artillery in the Russian battle formation and wanted to give many of its functions to airplanes and tanks. Fortunately, events in Finland later in 1939 dispelled many of these views.

The Russians initiated their attack on Finland on 30 November 1939. Within a month, the Finns, with an army half the size of the Russian's, defeated them.

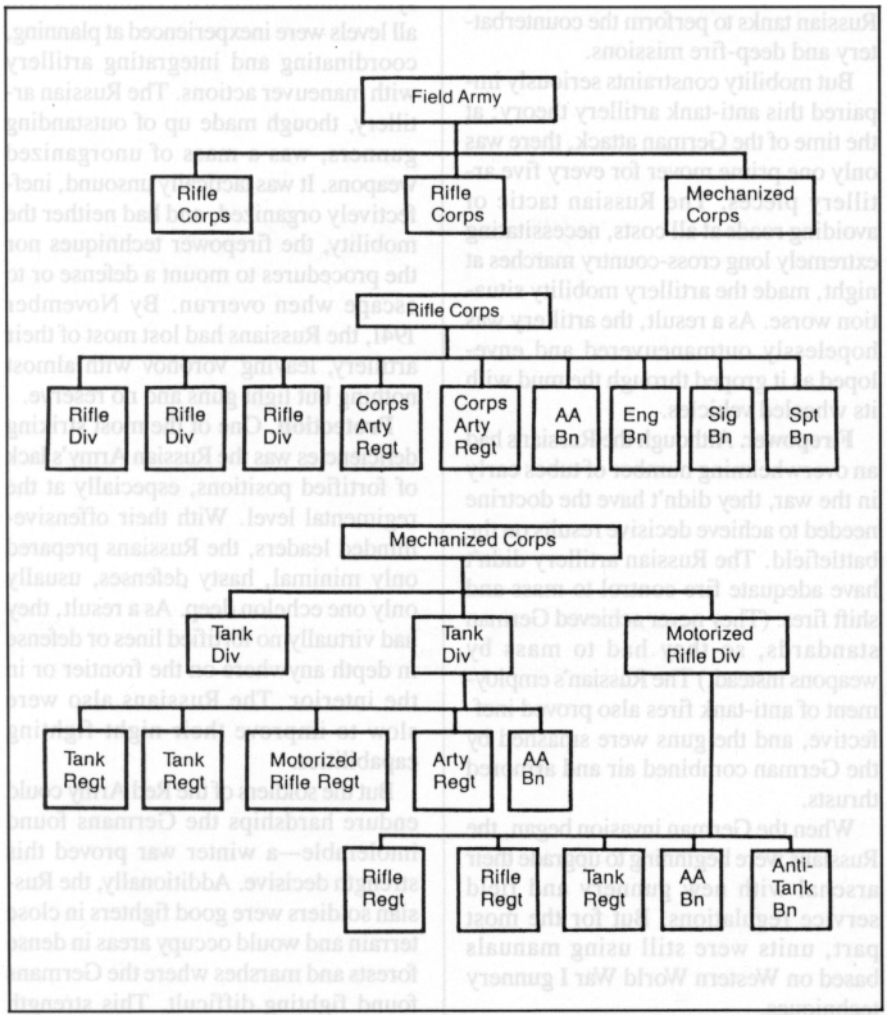


Figure 1: The Reorganization of the Russian Army, Starting in December 1940. The artillery was reorganized into close support, long-range counterbattery and heavy artillery units. Only six months later, the Germans attacked on 22 June 1941, resulting in the Russians' being caught unprepared. (Note: "AA" stands for anti-aircraft.)

After a renewed Russian assault, the Finns finally capitulated in the spring of 1940. But it took 21 Russian artillery regiments and five super-heavy artillery batteries firing in support of 22 divisions and five tank brigades to defeat the Finns.

Nikolai Voronov had been instrumental in the victory. He had disagreed with the operation commander, General Kirill A. Merretskov, who believed a quick victory was possible. Voronov's misgivings had been justified.

Large groupings of Russian soldiers (known as mottis) were cut off and annihilated. Artillery batteries were employed in the open, uncamouflaged, with black powder and residue illuminating their positions in the snow. Campfires lit the night.

On a higher scale, inter-arm cooperation was virtually absent, and coordinated efforts were few. Leaders lacked imagination and initiative at junior levels and control at the senior levels.

Battlefield reconnaissance wasn't performed, and logistics planning was poor. Weapons performed erratically in the intense cold, leading to ineffective fires. In spite of these shortcomings, the artillery prevailed.

The Russian artillery was successful against static positions and strongpoints because it had time for methodical preparations. And because the Russians greatly outnumbered the Finns, the success of the artillery (and the force as a whole) didn't depend on inter-arm cooperation. This only reinforced the High Command's myopia concerning the artillery's limitations and needs when employed in mobile warfare. Hence, the fundamentals of combined-arms operations, especially depth, were "relegated to oblivion" (Brian Moynahan, *Claws of the Bear: The History of the Red Army from the Revolution to the Present*; Boston: Houghton Mifflin Company, 1989, Page 87). In addition, the position of Head of the Artillery was abolished, passing its function to subordinate staff agencies in the General Staff and Artillery Directorate (Chris Bellamy, *Red God of War: Soviet Artillery and Rocket Forces*; New York: Brassey's Defense Publishers, 1986, Page 47).

After much vacillating, the Russian High Command decided in December 1940 to reorganize the army with field armies consisting of two rifle corps and a mechanized corps (see Figure 1). A 1940 redraft of the 1936 regulations detailed

the use of artillery in both offensive and defensive combined-arms operations. The artillery was reorganized into close support, long-range counterbattery and heavy artillery units. The Russians were only six months into the reorganization when the Germans attacked on 22 June 1941 and were caught ill-equipped and only half-trained.

Voronov Takes Over

The great and signal strength of the Soviet High Command was that it was able to produce that minimum of high-caliber commanders capable of steering the Red Army out of total disaster. Voronov's artillery reforms . . . were hints of this.

John Erickson
The Soviet High Command, 1962

Despite the advances in Soviet operational art, the artillery had incorporated few of the doctrinal reforms or received few of the equipment improvements needed to combat the Blitzkrieg. Voronov knew the artillery would be the cornerstone of the Russian version of the Blitzkrieg. He had learned this at Khalkhin Gol, against the Finns and in other experiences. Yet his ideas went unheeded by many Russian leaders in their headlong drive to emulate the German war machine's use of dive bombers and tanks in the Blitzkrieg. Fortunately, Voronov's appointment in June 1941 as Marshal of the Artillery began the reemergence of the artillery in the Russian combat formations.

Performance of the Red Artillery, June to October 1941

Voronov inherited an artillery waiting for disaster. The Red Army had a massive amount of artillery—67,000 guns, howitzers and heavy mortars against 7,000 German artillery and mortar pieces. The Germans, however, turned this Russian arsenal into a mass of twisted, useless scrap iron. It took Voronov six months to be able to concentrate overwhelming fire against the Germans, and by the time he could, he had a fraction of the artillery available to him in June 1941.

Using the framework of the US Army's concept of combat power and its elements of maneuver, firepower, protection, leadership, one can see why the Russian artillery initially suffered defeat. Voronov clearly had to improve his combat power at the tactical level before strategic victories were possible.

Maneuver. The Russian artillery had made poor decisions concerning its needs on a mobile, armor-heavy battlefield. For example, mechanized artillery hadn't been produced on a large scale until the war began in 1941. This was in spite of the fact the Russians had the technology and capabilities to build these machines as early as 1935. But the Red Army leaders believed tanks could accomplish the functions of mechanized artillery: provide deep fires against rear areas and command and control centers.

When the mechanized artillery was produced, it was put under the command of the armor (against Voronov's objections) because no maintenance capability existed for it in the artillery. The addition of the anti-tank artillery was supposed to stop enemy tank formations, allowing Russian tanks to perform the counterbattery and deep-fire missions.

But mobility constraints seriously impaired this anti-tank artillery theory; at the time of the German attack, there was only one prime mover for every five artillery pieces. The Russian tactic of avoiding roads at all costs, necessitating extremely long cross-country marches at night, made the artillery mobility situation worse. As a result, the artillery was hopelessly outmaneuvered and enveloped as it groped through the mud with its wheeled vehicles.

Firepower. Although the Russians had an overwhelming number of tubes early in the war, they didn't have the doctrine needed to achieve decisive results on the battlefield. The Russian artillery didn't have adequate fire control to mass and shift fires. (They never achieved German standards, so they had to mass by weapons instead.) The Russian's employment of anti-tank fires also proved ineffective, and the guns were smashed by the German combined air and armored thrusts.

When the German invasion began, the Russians were beginning to upgrade their arsenal with new gunnery and field service regulations. But for the most part, units were still using manuals based on Western World War I gunnery techniques.

In many of the first battles of the war, the Russians attacked in a sector frontally with an equal distribution of forces and fires across the sector. This was the configuration of most of the artillery facing the Germans before the invasion. Coupled with neglecting reconnaissance, this configuration prevented the Russians from massing fires on the Germans while the enemy was still in his assault positions.

Massing fires didn't occur above regiment because there wasn't an effort above that level. Unity of command was missing in battles characterized by confusion at all levels.

Guns were either placed too far forward in the attack, resulting in their annihilation by German direct-fire weapons, or too far back in the defense, preventing them from engaging the enemy to the depth of his formations. As most of the Russian artillery was arrayed in single echelons over a wide area, it couldn't provide reinforcing fire support to all fronts.

The maneuver and artillery failed to synchronize. Maneuver commanders at all levels were inexperienced at planning, coordinating and integrating artillery with maneuver actions. The Russian artillery, though made up of outstanding gunners, was a mass of unorganized weapons. It was tactically unsound, ineffectively organized, and had neither the mobility, the firepower techniques nor the procedures to mount a defense or to escape when overrun. By November 1941, the Russians had lost most of their artillery, leaving Voronov with almost nothing but light guns and no reserve.

Protection. One of the most striking deficiencies was the Russian Army's lack of fortified positions, especially at the regimental level. With their offensive-minded leaders, the Russians prepared only minimal, hasty defenses, usually only one echelon deep. As a result, they had virtually no fortified lines or defense in depth anywhere on the frontier or in the interior. The Russians also were slow to improve their night-fighting capabilities.

But the soldiers of the Red Army could endure hardships the Germans found intolerable—a winter war proved this strength decisive. Additionally, the Russian soldiers were good fighters in close terrain and would occupy areas in dense forests and marshes where the Germans found fighting difficult. This strength also would have a decisive effect at Moscow.

Leadership. Perhaps the most tragic flaw the Russian artillery had before the Battle of Moscow was poor leadership.

Both Russians and Germans agree the Russian Army leaders at all levels were unimaginative, lacked initiative, avoided responsibility and generally lacked tactical expertise.

There were many reasons for these weaknesses. The purge of 1938, which cost the Red Army up to 60 percent of its most competent officers, and a fear of reprisals for defeats conditioned the Russian leaders' responses. This stifling environment cost the Russians thousands of soldiers as they and their leaders fought in useless frontal assaults for "every inch of ground" (B. H. Liddell Hart, Editor, *The Red Army*; New York: Harcourt Brace and Company, 1956, Page 141).

Russian operations were characterized by a lack of unity of effort, an inability to anticipate events on the battlefield and an unwillingness to seize the initiative. From the corps level down, leaders failed to develop and carry out bold plans, capitalize on enemy weaknesses or react effectively to battlefield events.

Last, the Russian Army was only partially trained at the outset of war, and most of its personnel were lost in the first weeks of fighting. Subsequently, the artillery was mostly peasants and other civilians recruited from outlying farms and communities. These civilians were difficult to train in fire control, inter-arm cooperation and the operation of complicated artillery systems. At the lower levels where the officer and NCO corps suffered the most attrition, this lack of training presented an even greater leadership challenge.

This was the artillery Marshal Voronov inherited, and he immediately set about correcting its shortcomings. The fate of the artillery as well as the army hung in the balance.

Voronov's Reforms

All in all, one must conclude that the swift and drastic reorganization of the artillery . . . helped save the Red Army from annihilation and to prepare the way for eventual success.

Harold J. Gordon
"Artillery," in Hart's *Red Army*

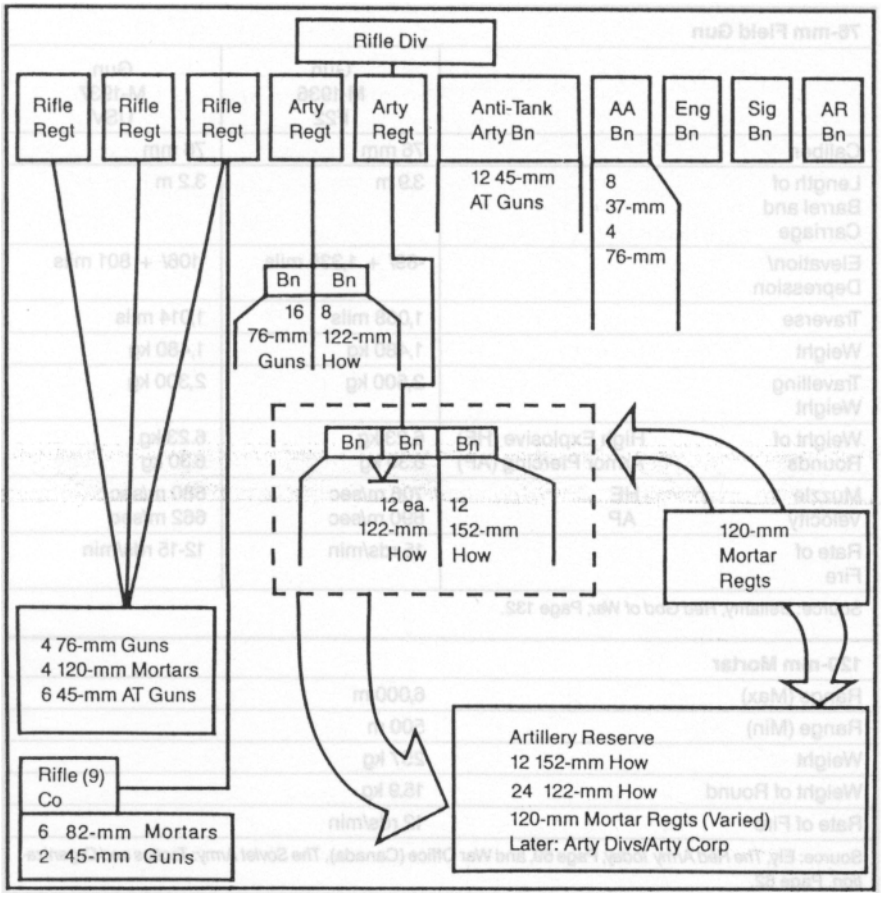


Figure 2: Vornov's Reorganization of the Russian Artillery in 1941 before the Battle of Moscow. To improve his firepower effectiveness, Voronov cut the maneuver divisions' direct support weapons almost in half to form the High Command's artillery reserves.

Voronov's first mission was to stop the German tanks and instill confidence in his artillery. His second was to save his artillery as a fighting force (he could rebuild it later). His reforms were imaginative and immediate; they demanded both mental and physical endurance.

Maneuver. Marshal Voronov believed that to win, he had to restore the artillery's ability to maneuver on the battlefield. Lack of mobility had helped cause the artillery to fail its missions of providing preparation fires for the maneuver forces, accompanying the maneuver to provide support or attacking the enemy with deep fires. It also had rendered the artillery unable to escape its destruction.

By the Battle of Moscow, Voronov had improved the artillery's mobility. For example, 120-mm mortars, which in many cases were the only direct support left to maneuver regiments, were mounted on wheeled carriages for mobility. Additionally, they were dispersed and employed as regiments (groups of 24) to deliver massed fires and engage the enemy at maximum ranges.

Extensive fortifications had been built around Moscow. The key was to force the German tanks off the road where the artillery could canalize and kill them.

The artillery moved only at night and maneuvered into the most difficult terrain where the enemy found travel slow and difficult. Voronov's artillery was mobile enough to deploy after each round fired—no longer would guns fire until overrun. When there was no motor transport for a piece, the crew manhandled it into position.

Firepower. Marshal Voronov's greatest improvement was in the effective use of firepower. Because most of his heavy artillery was either lost or evacuated to preclude its destruction, Voronov basically had no tactical or strategic reserves. He, therefore, immediately cut the direct support weapons in each maneuver division almost in half (from 280 pieces to 182). These pieces formed the artillery reserve of the High Command (see Figure 2). This resulted in the loss of one artillery regiment per division. But most maneuver units didn't miss the loss of their direct support artillery because they had never employed it effectively anyway.

Voronov also ordered the increased production of 120-mm heavy mortars

(see Figure 3). They were easier and quicker to produce and required less men and fewer gunnery skills to operate than artillery. When employed en masse, mortars could be as effective as artillery. The mortar would prove an ideal weapon for an artillery fighting for its life and with guns manned by half-trained peasants.

The mortar and the 76-mm gun were the most effective artillery weapons at the Battle of Moscow (see Figure 4).

Next Voronov increased the effectiveness of his artillery against tanks. The annihilation of most of his anti-tank weapons and the near destruction of the Russian tank corps made the choice obvious: use artillery in the direct-fire mode.

Voronov had seen direct-fire artillery used effectively several times. While in Spain as an advisor during the Spanish Civil War, he had learned the Russian field guns, with their low silhouette and high muzzle velocity, were ideally suited for direct fire. In addition, direct-fire artillery had stopped Japanese tanks at Khalkhin Gol in July 1939. The Russians also had employed direct fire successfully against the Germans at the Dneiper River. Even the cadets of the Podgorodnye Artillery School had used direct fire effectively at Dniepropetrovsk, although it was at an ideal range and against largely stationary targets. Last, direct fire was employed at Smolensk in desperation at ranges of 900 meters and without armor-piecing shells. Though of minimal tactical effect, it had a shocking psychological impact on the Germans.

The guns available for Voronov to use for direct fire were mostly light 76-mm field guns. What previously had been desperate acts became doctrine. Guns were ordered to fire at ranges not to exceed 600 meters. Only high-velocity guns of 100-mm calibers or more could engage the enemy at 1,000 meters. Direct fire was easier to teach, simpler to execute, saved time and ammunition and solved the problem of shortages in communications and optical equipment (most of the guns were fired with open sights).

Protection. But this new method of firing demanded greater protection for the crews if they were to survive. Voronov's emplacement of artillery maximized surprise. The guns moved into position at night and dug in with extensive camouflage. The gun crews also dug alternate, supplementary and dummy positions.

Extensive battlefield reconnaissance was ordered. This allowed German crew-served weapons and other dangerous targets to be hit with indirect fire at the start of the attack. Under this barrage, the anti-tank guns fired one or two rounds at close range and then moved to a prepared alternate position. These methods contributed to the protection and survival of the crews in what might be considered suicidal techniques.

Soon the Russians camouflaged their positions so well the Germans didn't detect them until they fired. And the artillery

Portrait of Voronov: Note the crossed cannons on the epaulets.

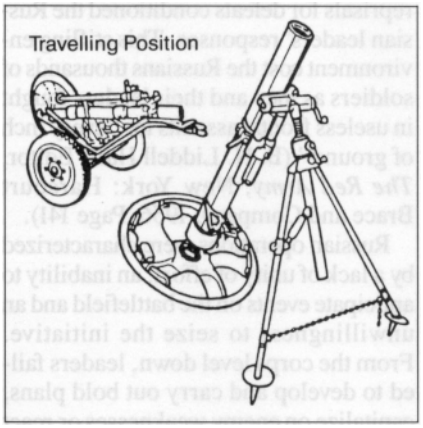


Figure 3: 120-mm Mortar Used by the Soviets during the Battle of Moscow.

76-mm Field Gun			
		Gun M-1936 F22	Gun M-1937 USV
Caliber		76 mm	76 mm
Length of Barrel and Carriage		3.9 m	3.2 m
Elevation/ Depression		-89/ + 1,335 mils	-106/ + 801 mils
Traverse		1,068 mils	1,014 mils
Weight		1,480 kg	1,480 kg
Travelling Weight		2,500 kg	2,300 kg
Weight of Rounds	High Explosive (HE)	6.23 kg	6.23 kg
	Armor Piercing (AP)	6.30 kg	6.30 kg
Muzzle Velocity	HE	706 m/sec	680 m/sec
	AP	690 m/sec	662 m/sec
Rate of Fire		15 rds/min	12-15 rds/min

Source: Bellamy, *Red God of War,* Page 132.

120-mm Mortar	
Range (Max)	6,000 m
Range (Min)	500 m
Weight	257 kg
Weight of Round	15.9 kg
Rate of Fire	12 rds/min

Source: Ely, *The Red Army Today,* Page 69, and War Office (Canada), *The Soviet Army: Tactics and Organization,* Page 62.

Figure 4: Characteristics of 76-mm Light Gun and 120-mm Mortar. By the Battle of Moscow in November 1941, these two Russian artillery pieces were the most effective weapons left in Voronov's artillery force.

pieces moved to their alternate positions before the Germans could react.

Leadership. Voronov and the other marshals could do little in such a short time to correct the Russian Army's leadership deficiencies. However, some reforms were instituted to enhance the Army's morale and competence. Authority to confer some awards was delegated to subordinate tactical commanders. Special schooling was established to commission soldiers with proven battlefield performance. Accelerated promotions were instituted based on performance in battle. Tactically, extensive battlefield reconnaissance and fire planning became the rule; direct and indirect fires were planned to complement each other.

The creation of the artillery reserve allowed time for training, as new personnel could train when their units were not employed. Training methods were improvised during this period that included synchronizing fire and maneuver and simplifying the rules for employing artillery. Counterbattery and direct fire techniques also were improved, especially against moving targets. These ideas later were incorporated in the new gunnery regulations published in January 1942.

Not all Voronov's improvements were in effect by the Battle of Moscow, November 1941. However, almost all affected that battle. The Russian artillery, for the first time, exhibited power equivalent to its numbers, however few they were at that point. Victory was not ensured.

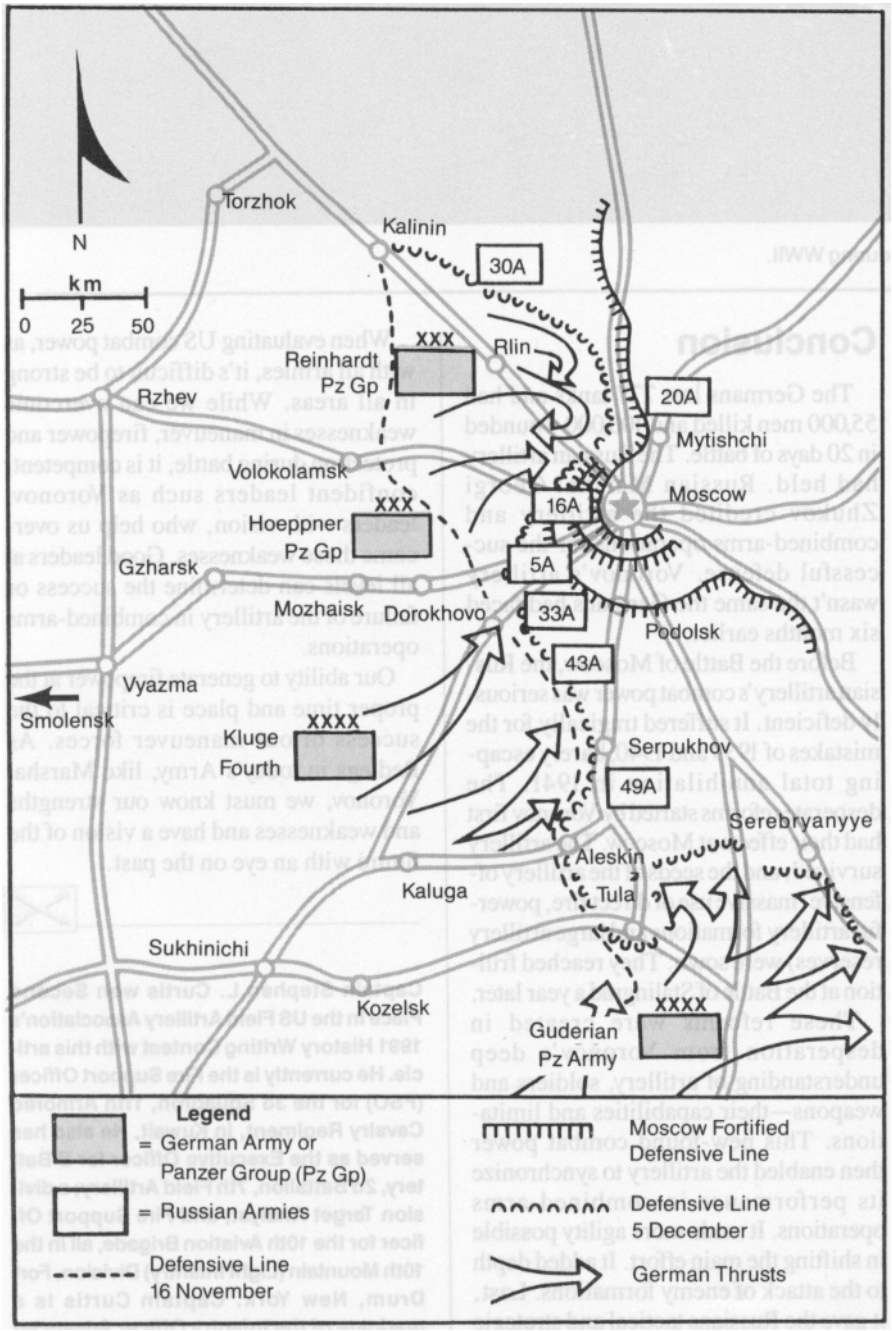


Figure 5: Final German Assault on Moscow, 16 November to 5 December 1941.

Battle for Moscow, November to December 1941

Voronov, who endured the first six months of his tenure watching the Germans dismantle his artillery, had frantically prepared for the final test. What was left of his artillery stood at the gates of Moscow facing the Blitzkrieg for what might have been the last time. This was the situation on 16 November 1941 when German Field Marshal Feodor von Bock's Central Army Group started its final drive on Moscow (see Figure 5).

The Germans attempted a double envelopment with Generals Georg-Hans Reinhardt and Erich Hoeppner attacking from the north with 12 divisions. General Heinz Guderian attacked from the south with seven divisions. General Gunther von Kluge came from the west with the Fourth Army (36 divisions).

The German attack consisted of about 1,800 tanks supported by 3,000 artillery pieces and 1,500 planes. But as the Germans got closer to the city, they ran into the Russians' line of defense: a "brick wall."

Russian General Zhukov's main defensive line consisted of the 16th Army in the northwest, the 5th and 33d Armies in the center and the 43d and 49th Armies holding the southern sector. This outer defensive line was supported by 800 tanks and 1,428 artillery positions and had 100 miles of anti-tank ditches and 75 miles of concertina wire.

Voronov supported this force with a reserve of 160 guns formed into 10 batteries. These batteries were positioned by Stalin himself, who called them "regiments" to enhance their importance.

The fighting became intense as the Germans, forced off the roads, took heavy casualties. Their preparatory fires

Soviet soldiers wrestle with a 76.2-mm field gun during WWII.

had little effect. While their tanks were grinding to a halt, the Russians hit their rear columns with aircraft and indirect fires. German attempts to bypass strongpoints were futile as they encountered defensive positions in depth. General Kluge's Fourth Army coming from the west was stopped on 22 November in what degenerated into a frontal attack against prepared positions. Field Marshal von Bock then took personal command of the battle, vigorously driving all the forces he had forward into the grinder.

Russian General Rokossovski's 16th Army in the northwest, which had sectors facing 300 and 400 German tanks with only 56 and 150 tanks respectively, was forced to retire behind its artillery positions to regroup. The last artillery unit remaining in that sector checked a German breakthrough with fires on 25 November.

German General Guderian's Panzer Army with 12 divisions stopped in the south at Tula and assumed the defensive on 30 November. However, on 1 December, the Germans broke through the Russian's 5th and 33d Armies' sector in the center. Only the fire of the Russian 32d Infantry Division Artillery and minefields stopped the German tanks.

The last German attack was repulsed by General Golubev's 43d Army in the south on 4 December. The next day von Bock halted the attack.

Conclusion

The Germans lost 777 tanks and had 55,000 men killed and 100,000 wounded in 20 days of battle. The Russian artillery had held. Russian Marshal Georgi Zhukov credited the artillery and combined-arms operations for the successful defense. Voronov's artillery wasn't the same the Germans had faced six months earlier.

Before the Battle of Moscow, the Russian artillery's combat power was seriously deficient. It suffered tragically for the mistakes of 1939 and 1940, barely escaping total annihilation in 1941. The desperate reforms started by Voronov first had their effects at Moscow. The artillery survived, and the seeds of the artillery offensive (massive use of direct fire, powerful artillery formations and large artillery reserves) were sown. They reached fruition at the Battle of Stalingrad a year later.

These reforms were created in desperation from Voronov's deep understanding of artillery, soldiers and weapons—their capabilities and limitations. This new-found combat power then enabled the artillery to synchronize its performance in combined-arms operations. It made more agility possible in shifting the main effort. It added depth to the attack of enemy formations. Last, it gave the Russians tactical and strategic initiative. The era of great German victories was over.

When evaluating US combat power, as with all armies, it's difficult to be strong in all areas. While we can overcome weaknesses in maneuver, firepower and protection during battle, it is competent, confident leaders such as Voronov, leaders with vision, who help us overcome those weaknesses. Good leaders at all levels can determine the success or failure of the artillery in combined-arms operations.

Our ability to generate firepower at the proper time and place is critical to the success of our maneuver forces. As Redlegs in today's Army, like Marshal Voronov, we must know our strengths and weaknesses and have a vision of the future with an eye on the past.

Captain Stephen L. Curtis won Second Place in the US Field Artillery Association's 1991 History Writing Contest with this article. He currently is the Fire Support Officer (FSO) for the 3d Squadron, 11th Armored Cavalry Regiment, in Kuwait. He also has served as the Executive Officer for B Battery, 2d Battalion, 7th Field Artillery; a division Target Analyst; and Fire Support Officer for the 10th Aviation Brigade, all in the 10th Mountain (Light Infantry) Division, Fort Drum, New York. Captain Curtis is a graduate of the Infantry Officer Advanced Course and Airborne and Ranger Schools, all at Fort Benning, Georgia.

FA Fast-Track Program

"Fire mission, platoon adjust, number three . . . one round, shell HE [high explosive], charge four, fuze quick . . . deflection 3024, quadrant 247 . . . two rounds, in effect."

The howitzer section jumps into action. Soldiers prepare the ammunition, cut the charge and a private first class (PFC) sets the initial deflection on the pantel.

That's right—a PFC gunner! It's a practice not usually found in modification table of organization and equipment (MTOE) units, but it is standard in the Field Artillery Training Center (FATC) at Fort Sill, Oklahoma, in the Fast-Track Program.

Early in each 13B Cannoneer's one-station-unit-training (OSUT) cycle, drill sergeants identify potential fast-track soldiers. Candidates for fast-track status include soldiers with junior reserve officers' training corps (JROTC) experience, one or more years of college and a higher than average general test (GT) score and those who display confidence, leadership and the ability to learn and retain skills quickly. As each 13-week cycle progresses, drill sergeants continue to identify the best soldiers to train as "Fast Trackers" (consistently, two soldiers per howitzer section).

The ultimate goal of the FATC is to train 100 percent of 13B-OSUT trainees to standard on as many selected Skill Level 2 tasks as possible. Fast-track training requires 23 hours of Skill Level 2 training in addition to the Skill Level 1 training. The 13B-OSUT trainee receives hands-on training on each Skill Levels 1 and 2 task until graduation. The Skill Level 2 tasks include: lay howitzer for initial deflection of fire, refer the piece, align the collimator, set deflection and lay for deflection using reciprocal lay, boresight using a distant aiming point and boresight using the test target.

Once the soldiers receive initial instruction, each task is reinforced through hands-on crew drill and dry- and live-fire exercises. Soldiers rotate through each cannon crewmember duty position; additionally, the fast-track soldier rotates through the duties of the gunner.

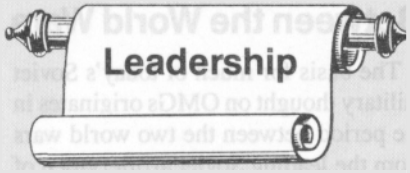
All 13B training is hands-on in a realistic environment. During live-fire, the young gunners are evaluated and checked for safety by the howitzer section chief or instructor, but each fast-tracker performs the gunner's duties.

The FATC training is more efficient with the fast track program. Each trainee crew is complete with a trainee gunner. This allows the instructor time to train and evaluate the entire section rather than spending his time as the gunner.

All Field Artillery units benefit from the fast-track program as they receive the graduates for gunners. Battery commanders and first sergeants can identify a fast-track soldier by looking in the soldier's military personnel records jacket (MPRJ) for an official FATC fast-track graduation certificate or the soldier's individual training record (ITR) that indicates what training the soldier has received. One FA brigade reported that approximately 50 percent of its gunners were fast-track graduates and were assigned as gunners within their first six months on station.

FATC graduated some soldiers who were immediately assigned to deploying units during Operation Desert Storm, leaving little time for additional MOS training for the new soldiers. Units need to be aware and take advantage of cannoneers who're Fast-Track graduates.

CPT Bryan D. Colbert, FA
S3, Training
FATC, Fort Sill, OK



Words of advice for the new battery commander, officers and non-commissioned officers (NCOs). This note was written by my father, a retired Field Artillery officer, prior to my taking command of A Battery, 1-22 Field Artillery. From the old colonel to the young captain:

Be fair, firm and aware. Keep your battalion/company advised of your actions and any problems you see that could impact the battalion and its reputation.

Don't make excuses, and always listen to the battalion commander's words and ideas. Stand up for what you believe is right—if you're right you cannot be wrong—but when the decision is made, it then becomes your decision.

Don't talk behind the battalion commander's back. Good or bad, he is the boss, and he is the man you work for.

Keep his staff informed and be cooperative. Think about how you might be able to improve on the routine, and if you think you can, let him know about it. The battalion S3 usually runs the day-to-day activities, so stay tuned in with him. Never, never try to get away with something that is wrong.

Be supportive of your NCOs. Listen to them, but also never let them run you. Watch your officers. Make them perform. Everyone needs specifics and an understanding of what you expect from them.

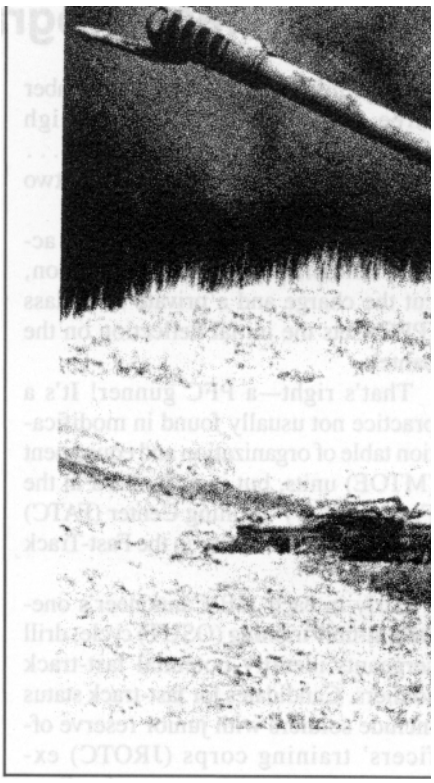
Above all, keep the rounds in the playing field. You and you alone hold responsibility for safety in your unit. Make sure your guys know what they are doing.

Finally, don't forget anything. Remember this thought: every officer should carry a notebook, have a watch and carry a tennis racket. This will ensure you don't forget, you're always on time and stay in good physical condition.

I felt that the words of advice that my father passed on to me should be shared with the Field Artillery community. They apply in peace as well as in war.

MAJ Jeff Landau
SGL, FSCAOD

The Soviet OMG:
Fire Support Lessons for AirLand Battle-Future



Third Place

by Major Joseph P. Nizolak, Jr.

At the time Major Nizolak wrote this article, the emerging doctrine was called AirLand Battle-Future (ALB-F). Recently it was designated AirLand Operations.

The Soviet operational maneuver group, or OMG, is the epitome of Soviet operational maneuver. A formation of division, corps or, possibly, army size, it's designed to carry the battle to the enemy's rear. An OMG sustains itself with what it can carry and by "living off the land." A commander facing a Soviet Army or Front could expect the Soviet commander to unleash one or more OMGs early in the battle. The OMG tries to disrupt the enemy's rear area and lines of communication and facilitate a rapid victory for the Soviet higher force.

OMG operations also serve as a good model for fire support on a fluid battlefield. The Soviet artillery firepower in an OMG is a mobile base of fire for the force. Following standard Soviet doctrine, this base of fire creates opportunities for the maneuver forces and, because of its mobility, reduces the time the enemy has to prepare defenses. Artillery units in the OMG provide continuous fire support to rapidly maneuvering forces while regularly displacing to keep up with the battle.

This article traces the historical development of the OMG and its fire support, starting with World War I. Then it shows how the current OMG can be a model for US artillerymen to develop fire support doctrine for the maneuver stage of ALB-F.

With developments in Eastern Europe, it's easy to believe the study of fire support in the Soviet OMG is no longer applicable; this belief is faulty. Many potential adversaries use Soviet equipment and follow Soviet doctrine.

Our current emphasis is on heavy-light operations. During World War II, the Soviets conducted OMG operations with a considerable amount of towed artillery, making the OMG concept applicable to light artillery. For these reasons and others, the study of the OMG is more timely than ever.

Development of the OMG

In response to their civil war, the Russians left the First World War on 5 December 1917, shortly after the Battle of Cambrai. Because of the initial success of the British tank units against units of the German Second Army, the Battle of Cambrai returned mobility to the battlefield and marked the beginning of modern combined-arms warfare.

As soon as internal stability was restored, Soviet military leaders began to study battlefield mobility, having seen its impact at the Battle of Cambrai. With this study began the development of the Soviet operational maneuver doctrine that led to the OMG.

Between the World Wars

The basis for much of today's Soviet military thought on OMGs originates in the period between the two world wars from the leading Soviet artillerymen of that time. Most of these officers attended the first All-Union Artillery Conference convened by the Red Army in 1924. The conference contributed to the development of Soviet Operational Art found in the Frunze reforms (1924-25) that established the first Soviet combined-arms concepts (Christopher Bellamy, *Red God of War*, London: Brussey's Defence Publishers, 1986, Page 45). Attendees left the conference thinking about artillery as an arm of maneuver, using it to clear the way for the ground-gaining arms.

Soon after the All-Union Artillery Conference, General Golovin, formerly

of the Imperial Artillery, published a widely read article that set the stage for Soviet fire support and operational maneuver doctrine (*Red God of War*, Page 42). He explained that in a war of maneuver, artillery is critical to both preserving a force's freedom of maneuver and denying the same to the enemy. This originated the Soviet doctrine that, above all, maneuver means maneuver of fire.

Vladimir Triandafillov (a founding father of Soviet military art and thought) completed the initial theoretical foundation for fire support of the OMG in his work "[The] Character of the Operations of Modern Armies (1929)." Using his World War I experiences, Triandafillov stated the need for artillery to accompany the advancing troops through the enemy defense, "not just with fire but also with wheels," (*Red God of War*, Pages 46-47). While J.F.C. Fuller, British military theorist, and G. Douhet, Italian military theorist, were downplaying the role of artillery, the Soviets maintained it as a key system. (J.F.C. Fuller, *On Future Warfare*, London: Sifton Praed and Co., Ltd, 1928; G. Douhet, *The Command of the Air*, New York: Coward-McCann, 1942.)

Fuller maintained that future armies should consist solely of armored forces, and Douhet contended that wars could be fought and won totally with airpower.

By the early 1930s, the Soviets had firmed up the concepts of operational maneuver and deep operations and fire support for both. They formalized these concepts in their field regulations and then tested them in field exercises. Offensive operational maneuver of artillery, infantry and armor became the bedrock of Soviet military art.

Unfortunately, the Soviets lost most of their military leaders who had theoretical and field experience in Stalin's military purges (1937-1941). The loss of many of their leading military theorists inhibited further development of the operational maneuver doctrine. It also caused the Soviets to enter the Great Patriotic War without the expertise to execute their new doctrine.

The Great Patriotic War

From their forced entry into the Great Patriotic War until the counteroffensives of November 1942, the Soviets watched the Germans execute operational maneuver. During this time, the Soviets struggled to relearn their doctrine. As in the initial theoretical formulation, Soviet fire support led the way.

Stalin's directive "On the Artillery Offensive" (10 January 1942) stated that artillery and mortars must clear the path for the infantry and tanks (*Red God of War*, Pages 49-50). This re-established the Soviet artillery procedures that would provide fire support for OMG operations.

Although German offensive operations were actually operational envelopments and not Soviet OMG operations, they set the wheels in motion that soon yielded the basis for the Soviet OMG. The first Soviet prototype OMG appeared on the second day of the Bobruisk Operation (23-28 June 1944), part of Operation Bagration. A Soviet tank-heavy, division-sized cavalry mechanized group (CMG) pushed through a gap in the line of contact and headed for Bobruisk. In the lead was a large, mobile fire support element that, in accordance with current OMG doctrine, remained silent during the breakthrough (*Red God of War*, Pages 61-62). Once through, the artillery blasted holes through any resistance encountered by the CMG. The Bobruisk Operation set the precedent for future Soviet operations.

Throughout the rest of the war, the Soviets employed these armor-heavy mobile groups that provided combined-arms mobility and firepower. The Soviet fire support doctrine called for all targets in an operational area to be hit simultaneously. This required close coordination between the OMG's fire support assets and those behind friendly lines that provided support during the breakthrough. Fire and maneuver in depth became the conceptual basis for the current OMG and its fire support (J.B.A. Bailey, *Field Artillery and Firepower*, New York: The Military Press, 1989, Page 295).

The Cold War Period

During the Cold War, Soviet strategy fluctuated between a reliance on either conventional or nuclear forces. One aspect remained clear: the Soviets were oriented on the offense. The OMG combines the evolution of their military theory and experience since World War I with their offensive orientation. The OMG allowed them to move from

nuclear reliance to a mobility reliance designed to collapse NATO's will to fight and restrict NATO's use of tactical nuclear weapons (C.J. Dick, "Soviet Operational Maneuver Groups: A Closer Look," *International Defense Review*, 16 June 1983, Page 771).

Current doctrine describes several missions that Soviet commanders can give OMGs (Dick, Page 773). Commanders can use the OMG to exploit deep into the enemy rear area units. A typical OMG mission may be to destroy, through violent meeting engagements, enemy reserves moving up to the front. OMGs may be tasked to establish blocking positions on the enemy's withdrawal routes or to conduct parallel pursuit of withdrawing enemy forces. The commander also may give the OMG the mission of seizing unoccupied enemy defensive lines.

Fire support plays a critical role in each of these missions, a role made more demanding by the speed, mobility and limited resources of OMG operations. To conserve artillery ammunition, OMGs rely on Army or Front assets to provide fire support until the OMG moves out of range (see Figure 1). To provide responsive fire support on the move, the OMG artillery units use the concept of the "fire strike." Fire strikes are short (three to five-minute duration), intense (30 rounds fired per tube), battalion massed fires designed to produce maximum effects on target with minimum expenditure of time and ammunition. Together, these techniques help the OMG artillery commander accomplish the many challenges of providing effective fire support for the OMG.

An obvious reason to study the Soviet OMG and its fire support is to know the tactics of a potential enemy who follows Soviet doctrine. The better you understand his tactics, the easier it will be to defeat him. There is, however, a more important reason: the applicability of the OMG model to fire support for ALB-F.

AirLand Battle-Future

ALB-F projects Army doctrine to meet the challenges of the year 2004 and beyond. It's evolutionary in nature and based on projections of future battlefield capabilities (Warfighting Seminar XI slides, Training and Doctrine Command Commanders' Briefing, 24 January 1990, Combined Arms Center, Fort Leavenworth, Kansas, and Lieutenant Colonel C. William Rittenhouse, "Fire Support on the Nonlinear Battlefield," *Field Artillery*, October 1990, Pages 36-39).

We can envision ALB-F in four stages as illustrated in Figure 2. Stage One is the detection and verification phase. During this phase, sophisticated satellite, airborne and ground sensors detect an enemy force massing for what appears to be an attack. The sensors transmit this information to allied command and control elements that alert their forces about the possible attack.

After detection, ground and air reconnaissance forces in concert with electronic sensors verify the enemy attack. The reconnaissance forces gather intelligence about the enemy disposition and composition, and all reconnaissance systems begin locating high-payoff targets for allied fire support.

Stage Two is an attack by deep fires (Rittenhouse, "Operation FireStrike," *Field Artillery*, February 1991, Pages 33-37). Orchestrated at the corps artillery level, allied long-range fires engage enemy forces with massive FireStrikes.

FireStrikes are planned, massed fires targeted against the enemy's leading elements. The corps artillery fire support

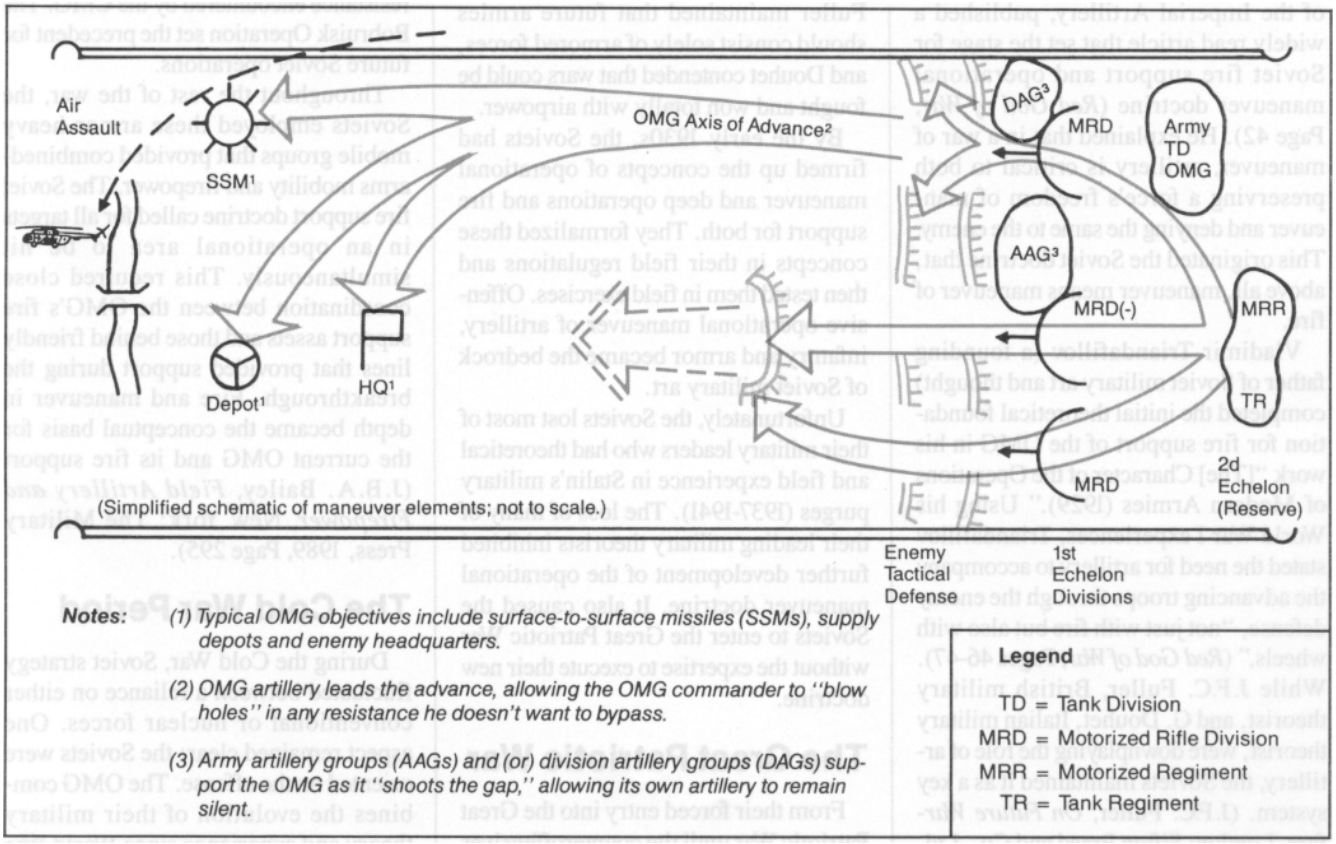


Figure 1: Typical Employment of an OMG by a Soviet Army.

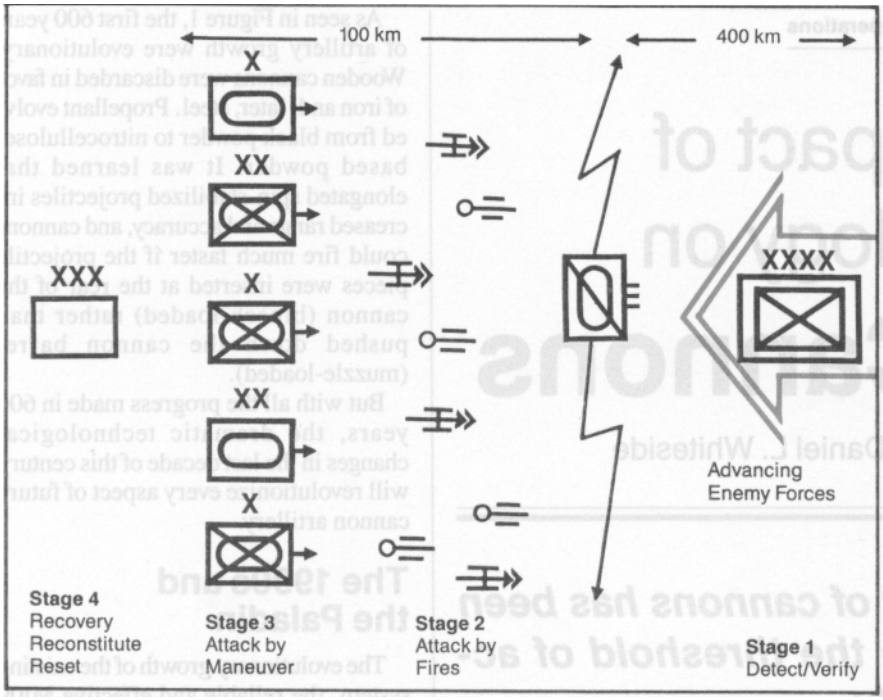


Figure 2: ALB-F as a Four-Stage Operation.

coordinator (FSCOORD) employs sophisticated electronic and visual detection systems to accurately locate the targets. The systems then direct fires from corps assets, such as battlefield air interdiction (BAI) aircraft, long-range artillery, rockets and missiles and attack helicopters. These assets engage the enemy with accurate, devastating fires using "smart" (fire-and-forget) munitions. The objective of Stage Two is to shape the enemy force and achieve favorable conditions for the maneuver force to defeat the enemy. (Note that the FireStrike concept of ALB-F is different than the Soviet fire strikes described earlier. The Soviet fire strike is short and intense to help the OMG secure specific objectives in the enemy's rear area.)

Stage Three is an attack with maneuver forces to exploit the effects of the FireStrikes. During Stage Three, the allied ground forces maneuver against the enemy flanks and engage him in close combat. Any reinforcing corps artillery fire support assets forward during Stage Two link up with the maneuver forces' direct support (DS) artillery. Close combat occurs in the so-called "battle zone," analogous to the main battle area of AirLand Battle. Stage Three continues until the allied forces defeat the enemy.

Stage Four consists of all actions to recover, reconstitute and reset for another attack. This stage begins once the enemy is defeated and the allied forces disengage from the enemy. Stage Four ends when allied forces are ready to meet another attack.

It's during Stage Three, the maneuver stage, that we can draw the closest to OMG operations. Acting like OMGs, battalion, brigade and division-sized units engage enemy forces on the move or secure objectives deep in enemy areas. Operations will be fast, deep, nonlinear and likely will consist of heavy and light forces. Our maneuver units will require continuous fire support during these operations. Like the artillery units in the OMG, our artillery units will operate on the move with limited support and long lines of communication.

There are several techniques the Soviet OMG employs which we could study and, most importantly, practice. The first technique is using stationery corps artillery assets to provide fire support for the maneuvering forces as they advance to their objectives. At a designated time or place, the maneuver forces' DS and reinforcing (R) artillery would take over the mission. This offers several advantages, such as conserving the moving artillery units' ammunition, allowing those units time to occupy good positions, and potentially, deceiving the enemy as to the true size of the maneuvering force. While coordination for this technique would be a challenge and require practice, we have a model in the Soviet system.

We're well on the way toward incorporating another Soviet technique due to current and future advances in our howitzer systems. This technique is employing mobile, fast, responsive artillery to support rapidly maneuvering forces. The M109A6 Paladin and the future advanced Field Artillery system-cannon (AFAS-C) are delivery systems that offer the means to keep pace with maneuvering forces. OMG artillery doctrine provides models we can modify to exploit our technological advantages and provide accurate, responsive fires on the move.

Quick fire plans based on responsive real-time intelligence will be the key to success for fire support during Stage Three. Our FSCOORDs and fire support officers (FSOs) must develop procedures to quickly identify high-payoff targets, accurately locate them and plan massed fires on them. The process the Soviets use to plan and execute their fire strikes may be useful for our tactics, techniques and procedures (TTPs).

We could design fire support procedures "from scratch" for ALB-F or adapt the OMG fire support model, modifying it to fit our needs. The choice seems clear. The Soviets exercised this combined-arms concept in their Great Patriotic War and have trained accordingly since that time. Their experiences are well worth our study and judicious application.

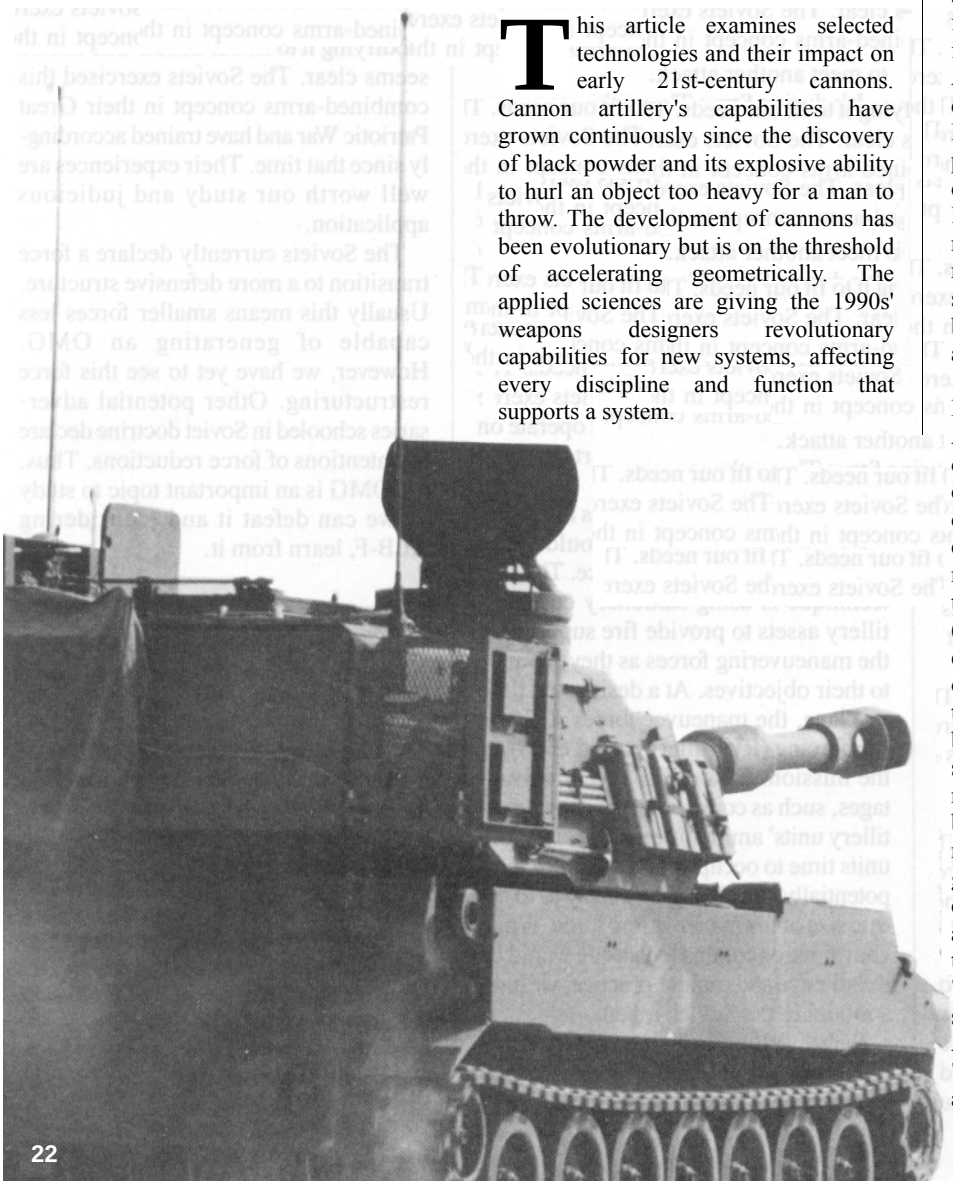
The Soviets currently declare a force transition to a more defensive structure. Usually this means smaller forces less capable of generating an OMG. However, we have yet to see this force restructuring. Other potential adversaries schooled in Soviet doctrine declare no intentions of force reductions. Thus, the OMG is an important topic to study so we can defeat it and, considering ALB-F, learn from it.

Major Joseph P. Nizolak, Jr., won Third Place in the US Field Artillery Association's 1991 History Writing Contest with this article. He's currently the Division Assistant Fire Support Coordinator (AFSCOORD) for the 25th Infantry Division (Light), Schofield Barracks, Hawaii. He commanded A Battery, 1st Battalion, 10th Field Artillery and A Battery (Target Acquisition), 25th Field Artillery, and served as the S3 of the 1st Battalion, 76th Field Artillery, all in the 3d Infantry Division (Mechanized), Germany. He holds a master's degree in computer science from the Naval Postgraduate School, Monterey, California, and a Master of Military Art and Science from the Command and General Staff College, Fort Leavenworth, Kansas.

The Impact of Technology on Future Cannons

by Colonel (Retired) Daniel L. Whiteside

"The development of cannons has been evolutionary but is on the threshold of accelerating geometrically."



This article examines selected technologies and their impact on early 21st-century cannons. Cannon artillery's capabilities have grown continuously since the discovery of black powder and its explosive ability to hurl an object too heavy for a man to throw. The development of cannons has been evolutionary but is on the threshold of accelerating geometrically. The applied sciences are giving the 1990s' weapons designers revolutionary capabilities for new systems, affecting every discipline and function that supports a system.

As seen in Figure 1, the first 600 years of artillery growth were evolutionary. Wooden cannons were discarded in favor of iron and, later, steel. Propellant evolved from black powder to nitrocellulose-based powder. It was learned that elongated spin-stabilized projectiles increased range and accuracy, and cannons could fire much faster if the projectile pieces were inserted at the rear of the cannon (breech-loaded) rather than pushed down the cannon barrel (muzzle-loaded).

But with all the progress made in 600 years, the dramatic technological changes in the last decade of this century will revolutionize every aspect of future cannon artillery.

The 1990s and the Paladin

The evolutionary growth of the existing system, the reliable and effective M109 family of self-propelled 155-mm cannons first fielded in the 1960s, will give the Army its first measure of revolutionary capabilities. In February 1990, the Department of Defense authorized initial production of the M109A6 Paladin cannon system. The Paladin satisfies longstanding demands for more responsive fires, increased range, greater reliability and better survivability for the system and its crew. Paladin is the bridging system to 21st-century cannon artillery.

With its Armored Systems Modernization (ASM) Program, the Army is looking toward the first decade of the 21st century. The ASM program is comprised of a family of vehicles that can accomplish the full range of combat, combat support and service support missions. The ASM program, headed by the Tank and Automotive Command (TACOM) in Warren, Michigan, is examining commonality and modularity of vehicles Army-wide. In commonality, the components of Army vehicles would be common (i.e., transmissions, electrical systems, or even snaps and cables). In modularity, the vehicles' chassis would be "adjustable," depending on the mission. For example, the next generation howitzer would be able to add chassis modules to change from light artillery to heavy and, conversely, take the modules off, as necessary, for a "heavy" mission. Through a multi-year series of technology demonstrations, the Army is identifying and pursuing "leap-ahead" technologies for a family of armored systems.

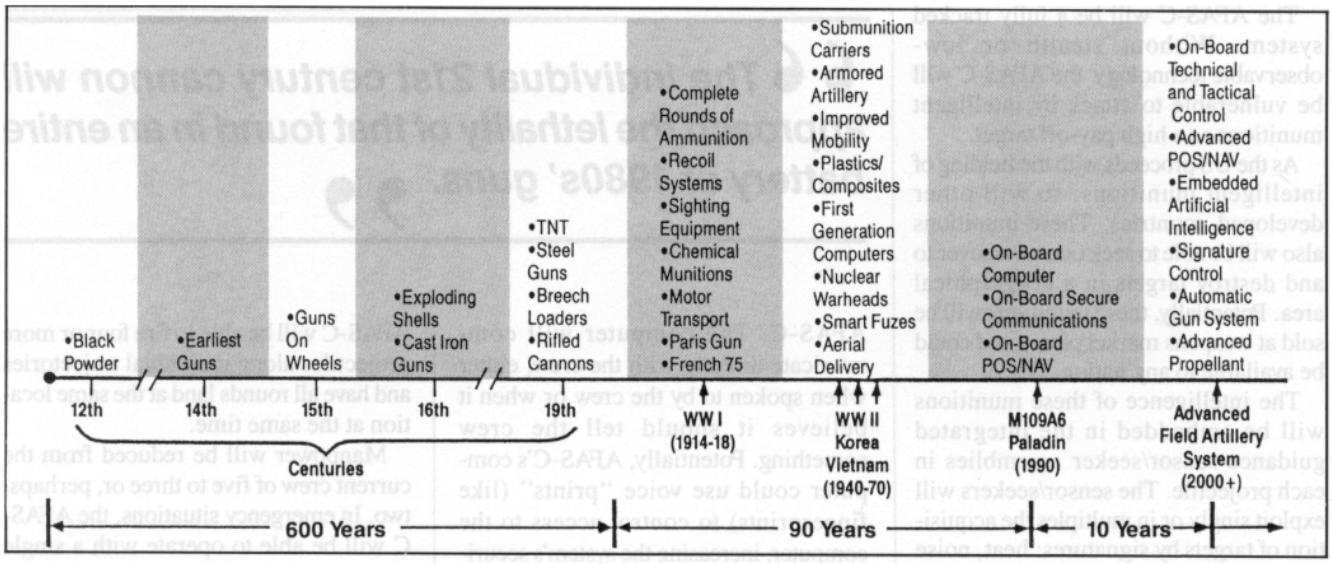


Figure 1: As this figure shows, the first 600 years of artillery growth were evolutionary. But the applied sciences are giving 1990s weapons designers the potential for revolutionary advancements, geometric in comparison.

The next-generation cannon system in the ASM family is the Advanced Field Artillery System (AFAS-C). Numerous technologies from a variety of applied sciences will contribute to the AFAS-C.

But as these disparate technologies coalesce, the Paladin's operation will radically alter the use of tactical cannon artillery. While the Army and this country's scientific communities proceed with AFAS-C development, the Paladin will be both a fielded capability and a laboratory for learning. When fielded, the Paladin will yield new concepts and doctrine that will be the necessary precursor for the AFAS-C.

With the Paladin, the doctrinal notion of grouping guns into a battery will be all but eliminated. The Paladin has a degree of artificial intelligence never experienced in the Field Artillery. Its automatic fire control system will know where the howitzer is located and what direction its gun points. It'll have an on-board computer system embedded in its turret to compute data for its cannon and any other Paladin that needs firing data.

Gone will be the survey instrument needed to lay the gun and provide directional control. Gone will be the requirement for a fire direction center (FDC) to compute firing data. A platoon operation center (POC) will pick up responsibility for the Paladin's tactical employment and terrain and ammunition management. The Paladin will be able to move, receive a request to fire at a target, pull into an unprepared firing location, compute firing data, orient its gun, fire and depart—all with no crewman leaving the vehicle. Using night-vision devices, the crew will be as effective at night as in the day.

With Paladin, the guns will no longer have to be grouped. Each gun will be able to establish its individual gun-to-target direction and range. From individual gun locations, a unit's guns could have their fires hit a target at the same time, then displace immediately. Consider the challenge this presents to an enemy counterbattery effort.

Early 21st Century and the AFAS-C

The Army of the early 21st century must be able to operate at the low-, mid-and high-intensity levels; it'll be at the higher levels of warfare that the AFAS-C will be employed. The increased lethality of new weapons, coupled with significantly improved capabilities in reconnaissance, surveillance, target acquisition and battle management, will force the enemy to remain dispersed until needed and then to mass for short periods of time. Linear alignments on the battlefield will give way to the nonlinear mixing of units.

Target Acquisition

Commanders will be able to "see" the battlefield to an unprecedented degree. Tactical warning time will all but eliminate one key ingredient of battlefield success: surprise. Sensors capable of providing accurate targets will be able to see to distances in excess of 100 kilometers, and targets will be tracked as they move to the main battle area. Targets will be classified (determined if a vehicle is a truck or a tank) and located with accuracies that will offer pinpoint targeting opportunities. A multitude of sensors will be available to the ground commander, including acoustic, movement-sensitive, seismic, heat or infrared (IR), shape or imaging and magnetic. Suffice it to say that the enemy won't be able to do much without being detected.

Twenty-First century sensors will provide nearly real-time acquisition and processing to move the data to a Field Artillery system. Connectivity between sensor and cannon will be direct. When a ground commander states his fire support requirements and the associated targets are determined, sensor-to-shooter linkages will yield rapid battle-management processing. In many situations, the longest period in the attack process will be the time the projectile takes to travel from the cannon to its target.

Stealth technology, resident today in aircraft, will move to ground systems to improve their survivability. The exploitation of this technology is essential to offset the threat's advances in target acquisition and more sophisticated, "intelligent" munitions.

The AFAS-C will be a fully tracked system. Without stealth or low-observable technology, the AFAS-C will be vulnerable to attack by intelligent munitions as a high pay-off target.

As the US proceeds with the fielding of intelligent munitions, so will other developed countries. These munitions also will be able to seek out, maneuver to and destroy targets in a geographical area. Potentially, these munitions will be sold at weapons market places and could be available to any nation.

The intelligence of these munitions will be embedded in the integrated guidance-sensor/seeker assemblies in each projectile. The sensor/seekers will exploit singly or in multiples the acquisition of targets by signatures: heat, noise from engines or firing, acoustic, seismic, shape or imaging (emissions).

Signature *control*, not just reduction, will be designed into the AFAS-C. Technology will provide the ability for the cannon to alter the way it "looks" (signature) to an enemy sensor/seeker. It'll be able to "alter" its sounds; skin materials that absorb, reflect or alter radar emissions (imaging); or its heat dissipation or projection. Active sensor countermeasures, such as jammers, will be standard on-board equipment. False signature generators will be standard equipment.

High-Speed Processing

The speed with which a very large amount of data will be processed will significantly increase. Processors that accept and respond to large amounts of information will be so compact they'll fit into the nose of cannon projectiles.

On board the AFAS-C will be an advanced computer system with a brain-like capability. This computer will be linked externally to supporting computer systems that'll provide volumes of information on subjects ranging from detailed friendly and enemy dispositions to weather and road conditions and to administration and supplies.

The AFAS-C on-board computer will receive input from several sensors to provide real-time status on critical situations. Sensors will provide early warning information ranging from atmospheric conditions (chemical agents) to enemy activities in the AFAS-C area.

Large amounts of information will be resident in the AFAS-C computer and flow to all parties that need the information, both internal and external to the AFAS-C. The computer will communicate directly with the crew, either when spoken to by the crew or when it believes it should tell the crew something. Potentially, AFAS-C's computer could use voice "prints" (like fingerprints) to control access to the computer, increasing the system's security. The computer also will advise the crew on topics such as recommending future locations and routes or maintenance services or actions necessary if a system fails or is about to fail.

The computer will provide other unique assistance. The crew can be physically connected with sensors so the computer can monitor their vital signs. For an ill or wounded crewman whose symptoms are given to the computer, it can recommend first aid while, concurrently, informing appropriate operational and medical agencies.

Mechanization

The weight of the average 155-mm projectile is approximately 100 pounds. The technologies linked to robotics will provide a cannon system that has its ammunition-handling functions performed by machine. Rates of fire will go from the current four to six rounds per minute to 12 or more per minute.

The individual 21st century cannon will approach the lethality of that found in an entire battery of 1980's guns. Surprise artillery fire falling on an enemy gives the most damaging results. A single AFAS-C will be able to fire four or more projectiles along individual trajectories and have all rounds land at the same location at the same time.

Manpower will be reduced from the current crew of five to three or, perhaps, two. In emergency situations, the AFAS-C will be able to operate with a single crewman or, if placed in a fully automatic stationary mode, without any crewmen.

Projectile Propellant

In the first decade of the next century, powder propellant will be replaced with a technologically superior substance. The substance may be a form of liquid propellant or a hybrid of electro-thermal plasma and liquid propellant. Significant among the improvements brought with this new propelling substance will be the energy it will impart to the projectile. Using that energy, the AFAS-C will achieve ranges approaching 50 kilometers.

The most significant characteristic of this new propellant will be its infinite zoning capabilities. Today, powder bags are prepared for each charge. Infinite zoning will use only the exact amount of propellant needed to propel the projectile the gun-to-target range along a specified trajectory.

Employment

The decentralization of the battery formation, having begun with the the Paladin, will be complete with the fielding of AFAS-C. The next-generation

“ The individual 21st century cannon will approach the lethality of that found in an entire battery of 1980s' guns. ”

“ Consider the implications of an attacking enemy force's being 'in combat' 100 miles before he can fire his tank at our tank. ”

cannon will be able to be employed as a single gun. With the 1993 fielding of the advanced Field Artillery tactical data system (AFATDS) located in the POC, the guns will be linked directly to the headquarters or element that tactically controls the battlefield. This may be the battalion operations element for a battalion in direct support to a maneuver tank or infantry brigade but will probably be the Field Artillery element collocated with the maneuver task force or brigade.

Multiple layers of processing will be eliminated. A streamlined flow of tactical fire control data (what, when and how much to shoot) from the supported unit directly to the guns will be the norm.

Similar linkages will be in effect for sensor systems, be they Army, Navy or Air Force—ground-based, aerial or space-based (see Figure 2). In a decide-detect-deliver scheme, sensors will be tasked to find specified targets for the AFAS-C.

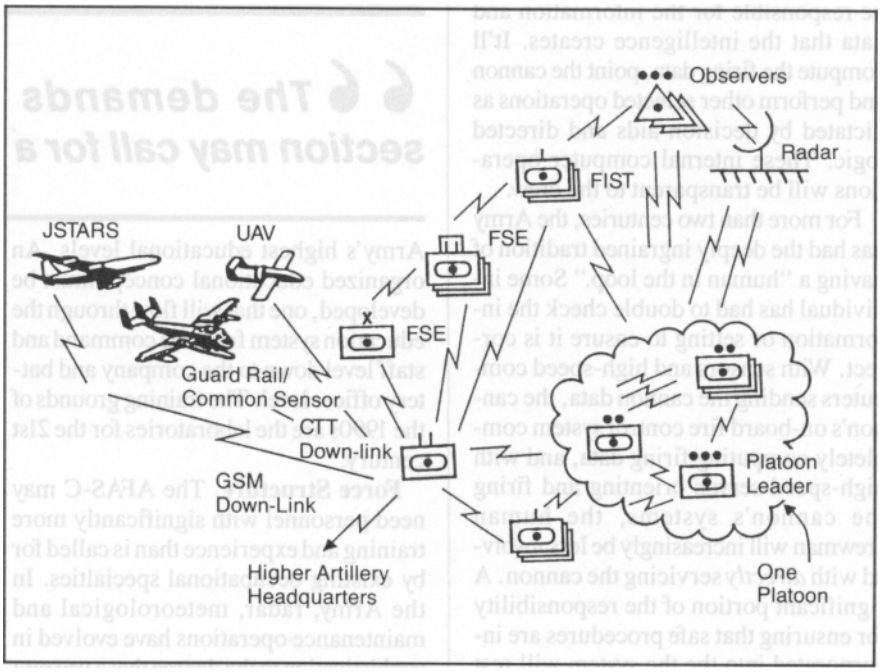


Figure 2: The Advanced Field Artillery System's Operational Environment. Ground-based, aerial or space-based sensor systems of all services will be tasked to find targets for the AFAS-C.

Challenges

The more significant challenges for the Army derived from the fielding of the AFAS-C will be in doctrine, training and, to a lesser extent, force structure.

Doctrine. The study of what might impact on the future Army is essential in the 1990s. Bridging systems such as the M109A6 cannon system are tools for our experimentation—to gain information and data that can grow into knowledge.

Already several trends can be identified that will have impact on doctrine:

- The emerging dominance of fires.
- The significance of logistical operations.
- The renewed importance of deception.
- The changing role of the unit commander.

Throughout the history of the Army, the Field Artillery's highest priority mission has been to support the ground-gaining arms, the infantry and armored forces. As an Army, we've measured tactical success by our ability to close with and destroy or capture an enemy and occupy his territory.

But targeting in the next 10 years will be over the horizon with tactical targets located out to 200 kilometers or more. These capabilities, coupled with the Field Artillery's increased range and accuracy, will significantly alter our measure of tactical success. Consider the implications of an attacking enemy force's being "in combat" 100 miles before he can fire his tank at our tank.

Massing forces will be a very high-risk operation with surprise difficult to achieve. Defensive operations may be the most powerful tactically; they would force the enemy to mount an offensive, allowing us to attack him with our fires. We'd then use ground-gaining forces for "mopping up" and moving forward to gain key terrain available because of the results of our fires on the enemy.

Logistical operations for the Field Artillery will be a significant challenge, not just for the AFAS-C platoon or battery but for the entire system that supports the Field Artillery. During peak demands in a mid- to high-intensity battle, a single AFAS-C will be able to fire 35 tons of main-gun ammunition in 24 hours. An eight-gun AFAS-C battery could need approximately 300 tons of ammunition per day—a true logistical challenge.

The role of the Field Artillery battery commander in the early 21st century will be considerably different from that of today. Rarely will the battery's guns be positioned in a battery formation.

With decentralization and the associated autonomous employment of the AFAS-C, the NCOs' and junior officers' responsibilities will significantly increase. Face-to-face supervision will give way to indirect supervision. And it'll be accomplished in routine operations by the review of information, data and status reports.

Traditionally, the unit commander and his immediate chain of command were responsible for accurately firing the cannons. The unit officers and NCOs were directly involved in creating firing data and supervising its execution. A revolutionary change is underway to alter this shared responsibility.

With the fielding of the M109A6, the Field Artillery will have intelligence embedded in a machine. A machine will

"An AFAS-C eight-gun battery could need approximately 300 tons of ammunition per day—a true logistical challenge."

be responsible for the information and data that the intelligence creates. It'll compute the firing data, point the cannon and perform other selected operations as dictated by decision aids and directed logic. These internal computer operations will be transparent to the crew.

For more than two centuries, the Army has had the deeply ingrained tradition of having a "human in the loop." Some individual has had to double check the information or setting to ensure it is correct. With sensors and high-speed computers sending the cannon data, the cannon's on-board fire control system completely computing firing data, and with high-speed servos orienting and firing the cannon's systems, the human crewman will increasingly be less involved with *directly* servicing the cannon. A significant portion of the responsibility for ensuring that safe procedures are incorporated into the the system will rest with those who specify the requirements of and test the new system.

Education and Training. The AFAS-C gun section chief will experience a major training challenge. To a significant degree, he'll be an independent agent on the battlefield. He'll have to oversee his crew and a highly complex array of systems, calling for significant changes in his training.

But the Army's most significant challenge is an educational one. Study is needed throughout the 1990s to assess the technological and doctrinal impacts. The evolutionary approach of altering the Army's intellectual framework may not satisfy the rapid and significant demands brought on by leap-ahead technologies.

This task is worthy of research at the Army's highest educational levels. An organized educational concept must be developed, one that will flow through the education system from the command and staff level down to the company and battery officer level. The training grounds of the 1990s are the laboratories for the 21st century.

"The demands on a AFAS-C chief of section may call for a warrant officer."

Force Structure. The AFAS-C may need personnel with significantly more training and experience than is called for by existing occupational specialties. In the Army, radar, meteorological and maintenance operations have evolved in sophistication to the degree that a warrant officer is required to perform them. Similarly, helicopter in-flight operations require the skills required of a warrant officer. The demands on an AFAS-C chief of section may well call for a warrant officer.

Conclusion

Although I only discussed cannon artillery in this article, the technological impact on other systems, such as tanks, antitank weapons and helicopters, will be similar to those impacting cannons.

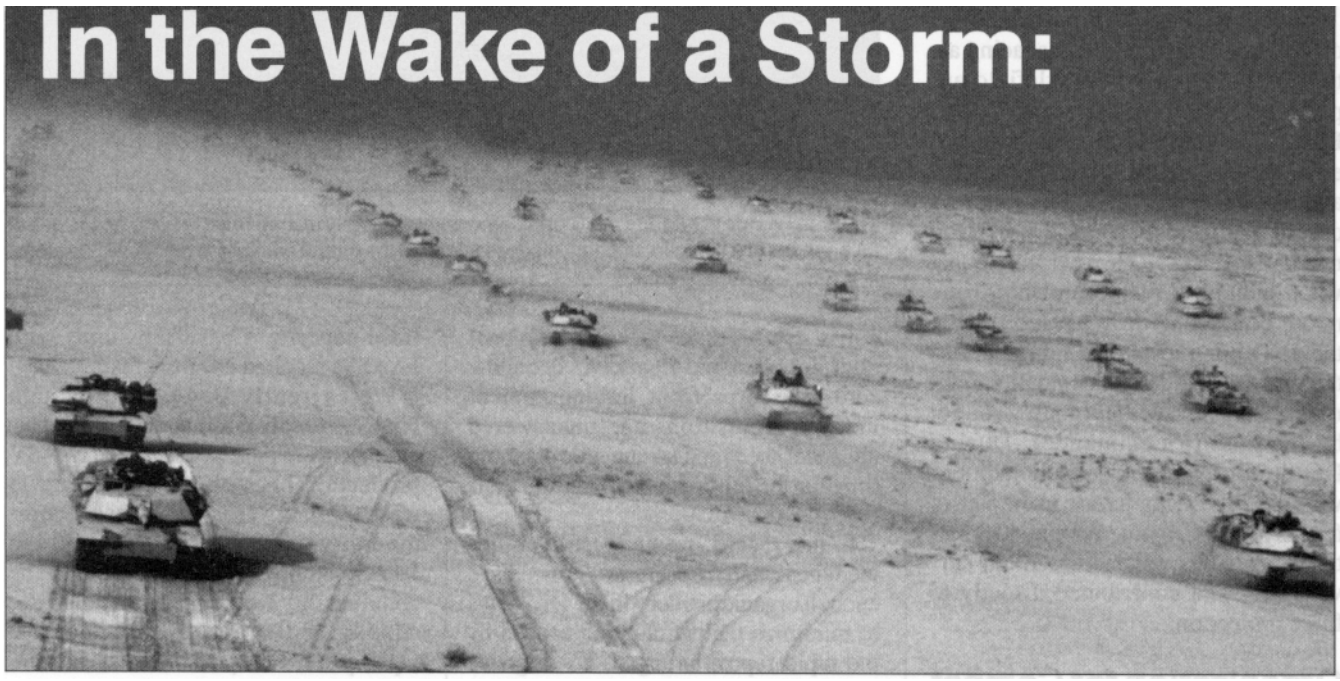
The Army must internalize what the Field Artillery experiences with its bridging systems, such as the Paladin. The Army can manage change by carefully orchestrating changes in its materiel, doctrine, training, force structure and development.

But all parts of the orchestrated change must evolve at the same rate as the fastest changing variable. Technology will be the fastest changing variable, making materiel the pacing item of the Army's change process.

Technology will continue to accelerate and bring advanced capabilities to the Field Artillery. Tying together and harmonizing all aspects of change management is the challenge of the Field Artillery's leadership.

Colonel (Retired) Daniel L. Whiteside supervises operational analysis and MANPRINT groups in an engineering department of a national combat systems development corporation. Before his retirement in 1989 after more than 28 years of service, he was the Course Director of the Theater Warfare block of instruction for the US Army War College, Carlisle Barracks, Pennsylvania; he also taught engineering subjects at the US Military Academy at West Point. Colonel Whiteside served as the Training and Doctrine Command's System Manager (TSM) for Deep Battle at Fort Leavenworth, Kansas. During his military career, he served at every level of command through corps, including his last Field Artillery assignment as Commander of the XVIII Airborne Corps Artillery, Fort Bragg, North Carolina.

"It even has a hole for the batteries."



Improving the FA After Operation Desert Storm

by Lieutenant Colonel L. Scott Lingamfelter

Operation Desert Storm was a watershed event for the Army and the Field Artillery (FA). The Army can point to several success stories, including the performance of the Abrams tank, Bradley fighting vehicle, multiple launch rocket system (MLRS), Army tactical missile system (Army TACMS), Patriot missile and the new series of wheeled vehicles, to name a few.

From an FA perspective, Operation Desert Storm clearly demonstrated that firepower delivered by both air and FA is key to success on the modern battlefield. To understand its impact, one need only have seen the results of eight consecutive days of artillery raids and the largest artillery preparation since World War II. That huge prep was fired by our 1st Infantry Division Artillery (Div Arty) and supporting artillery, the 42d, 75th and 142d FA Brigades, and the 1st Armoured Div Arty (United Kingdom). In the wake of these devastating fires, Iraqi defenses were dramatically reduced, allowing the "Big Red One" (1st Infantry Division out of Fort Riley, Kansas) to rapidly breach Iraqi heavily fortified positions while sustaining no friendly casualties.

On 28 February and several days before, the FA again proved it was the "King of Battle" as it crushed the Iraqi will to stand and fight. One Iraqi prisoner pleaded as he was passed to the division's rear lines, "No more Boom-Boom, no more Boom-Boom."

Yet in the flush of this success, we must acknowledge that we have weaknesses in FA operations, equipment and training. While all the lessons of Desert Storm must not be applied too widely, the issues discussed in this article have general application.

Platoon versus Battery Operations

Command, control and communications are at the heart of FA operations. In recent years, we've embraced the platoon concept in cannon artillery. The reasons for this were well-intended. Chief among them were the ability to engage multiple targets and, simultaneously, enhance survivability.

In our desire to attack multiple targets quickly, we lost sight of the fact that mass fires are the key to effective fire support, not the number of targets serviced. During the last few years, we've gravitated toward the suppressive attack of targets using platoon fires. However, the best effects, as supported by both our experience and joint munitions effectiveness manuals (JMEMs), are gained by massing fires (not less than a battery) on targets in serial fashion.

Additionally, platoon operations complicate an already brittle command and control environment. Indeed, desert warfare demands we do all we can to simplify every aspect of command and control while retaining speed and flexibility. In a highly mobile environment, particularly with bypassed enemy units, tight command and control is a survival imperative.

Our experience in Desert Storm was that movement by battery works best. This tactic was far more efficient than the echelonment of platoons and didn't reduce our flexibility to mass fires or attack targets quickly.

Additionally, we must disabuse ourselves of the notion that spacing artillery throughout the battlefield appreciably enhances our survivability. First, the battlefield is inherently crowded. Enemy indirect fires meant for another unit could well fall on your unit despite efforts to disperse. Second, too much dispersal can have a deadly effect when individual platoons or howitzers make contact with bypassed enemy tanks. Third, unexploded submunitions that litter the battlefield mandate careful route reconnaissance and convoy control by the battery commander. During Desert Storm, unexploded submunitions were often the major hazard in the path of friendly forces. Again, movement by battery during this war increased our survivability and contributed directly to force protection.

Organization for Combat

We must acknowledge once and for all that the best way to ensure adequate fire support on the modern battlefield is to have lots of it. For too long we have attempted to stretch what little assets we do have too thinly. We have prided ourselves in our ability to move artillery quickly about the battle command training program (BCTP) battlefield with little regard for the realities of movement; we have seemingly shunned any notion that even the artillery must pause now and then to refit, refuel and rearm.

Desert Storm demonstrated clearly that we must re-evaluate the use of FA brigades in a "plug-in, unplug" mode to augment the fires of committed maneuver divisions. Units used in this manner were stretched to their logistical and operational limits. If the objective is to augment the fires of the Div Arty, then let us do so by assigning more organic artillery to the Div Arty and support it by adding an artillery forward support battalion (FSB) to the division support command (DISCOM).

To be sure, there's a role for the FA brigade in weighting the corps' main effort. As such, some FA brigades should stay with the corps. However, if we added an MLRS battalion and two general support (GS) battalions to each Div Arty, the divisions would have enough assets to support most missions, other than one of a corps' main effort.

Currently, Div Artys depend on the corps artillery to provide the needed fire support assets. But in the process, the

The 75th FA Bde in Iraq. Desert Storm demonstrated clearly that we must reevaluate the use of FA brigades in a "plug-in, unplug" mode to augment the fires of committed maneuver divisions.

corps' FA brigades tasked to support divisions often find themselves bounding across the corps' front, leaving a trail of unfilled requisitions and unanswered logistical needs and having little planning time for the Div Artys to integrate their fires.

In this regard, we must learn an immediate lesson from Desert Storm: have enough organic artillery in the Div Artys to minimize the degradation caused by the rapid repositioning of FA brigades across a large, real battlefield—not one so easily controlled by a computer "mouse." Although it's clear we'll have to stand down artillery battalions in the near future, we mustn't simply eliminate—we must reorganize.

FA Equipment Improvements

The time has arrived to improve FA equipment. Desert Storm validated the expected good performance of the M109A2 howitzer, MLRS, Army TACMS, Q36 and Q37 Firefinder radars and OH58D helicopter. Nevertheless, there are shortcomings in our equipment that warrant correction now.

M109 Howitzer. We need a howitzer capable of keeping up with the Abrams-Bradley team we support. Our current howitzer must have a reliable digital radio that can receive data from a fire direction center (FDC), where we check for gross errors. Our howitzer needs a well-built, albeit, cost-effective global positioning system (GPS). Additionally, we need an integrated and hardened chronograph on each howitzer, one capable of feeding updated velocity errors to the FDC.

In the process, we must avoid being infatuated with "widgetry." We must note the obvious strengths of the M109A6 Paladin and field a less sophisticated version in the interim.

FA Ammunition Support Vehicle (FAASV). The M548 ammunition carrier was a failure. It was difficult to maintain and could only carry 50 percent of its rated capacity. Conversely, units with FAASVs all cited its strengths.

We currently don't have enough FAASVs for all 155-mm and 8-inch battalions. It's critical we restart the FAASV production lines—we can ill afford to wait another year. The chassis commonality between the M109 and the FAASV alone justifies the decision. The commonality would make maintenance simpler and more efficient and save repair parts, money and mechanics training time.

Fire Support Vehicle (FIST-V). We can't provide fire support if we can't keep up with the maneuver forces we support. The current FIST-V is too slow and requires too much time to operate its observation system.

We could quickly develop an FIST-V by modifying Bradley fighting vehicles. The FIST-V's hammerhead ground/vehicular laser locator designator (G/VLLD) could either be fixed on the Bradley or quickly mounted, even on the move. We should take immediate steps to take advantage of Bradleys' coming available from inactivating units and modify them to serve as FIST-Vs.

Command and Control Vehicles. We must replace the M577. It's slow and poorly configured. We must push to get an improved command and control vehicle, either on the FAASV or Bradley chassis.

The best alternative may be a vehicle similar in shape to the MLRS. We also should get such a vehicle to replace the 5-ton expandable vans used by the Div Arty and FA brigade tactical operations centers (TOCs).

Block II Radar. The Q36 and Q37 performed well; however, most units using these radars felt the Q37 was more reliable. While it did have some maintenance problems, it provided more accurate sensings. Clearly Block II radar is needed because of its improved reliability and mobility. We should field it without further delay.

Radios. Our 1950's technology VCR-12 radios worked but were difficult

to maintain and lacked range. The vinson hardware, however, worked well. We need the single-channel ground and airborne radio system (SINCGARS) now for its approved electronic counter-countermeasures (ECCM) and exceptional reliability. Both the Marine Corps and the 1st Cavalry Division were quite satisfied with SINCGARS during desert operations.

Mobile Subscriber Equipment (MSE). The divisional multichannel system with its associated AN/TTC-41s can't support fast-moving combat operations. We need MSE now to significantly improve our ability to communicate both by voice and digitally. However, the Signal Corps must address concerns about the number of radio access units (RAUs) required to support offensive operations.

Tactical Satellite (TACSAT). The Div Arty must be able to communicate with the corps artillery and FA brigades over great distances. This access must be reliable and rapid. TACSAT offers such a capability for artillery leaders trying to coordinate the employment of corps artillery units and synchronize current and future operations. TACSAT works and is available—we should buy it.

FA New Equipment Requirements

There are several modification table of organization and equipment (MTOE) shortcomings we also should address urgently. Here are a few.

Unmanned Aerial Vehicle (UAV). The British used a very reliable and relatively inexpensive UAV during Desert Storm. It provided good targeting information, reconnaissance data and battle damage assessments (BDAs) and did so in near real-time. We need a cost-effective UAV capability in our target acquisition battery (TAB) similar to that used by the British. That British system works and isn't loaded with excessive, high-cost gadgetry.

Armored Combat Earthmover (ACE). During the Gulf War, we were in a constant tug-of-war for limited engineer assets. To survive enemy fires, we must be able to protect ourselves by digging in or berming. We need an organic engineer vehicle in each firing element to provide this capability. The ACE works and is in production, requiring no research and development (R&D). Let's buy it for the artillery.

There's a plethora of good equipment ideas as a result of this war. However, if we aren't careful, we could choke on them. As such, we must move quickly and dramatically to fix those things we can fix with little effort and cost before they're "studied to death."

FA Training

Desert Storm was a tribute to the excellent training of our artillerymen. Yet we'd be remiss if we didn't note some key aspects of training that have made and, with more emphasis, can make it even better.

Survival Training. Despite our emphasis on common task testing (CTT) in recent years, our soldiers required additional training to ensure they were prepared to do those essential tasks. After our equipment departed for the theater, we doubled our CTT effort, to include emphasizing constructing fighting positions and other survival techniques.

As a result, our soldiers were prepared when we arrived in Saudi Arabia. We had very little difficulty getting soldiers to dig-in to standard, and all, to a person, reacted quickly and correctly to the potential chemical threat during Scud missile attacks at the port of Damman. The lesson is clear: don't wait until you've arrived in theater to thoroughly train on individual skills.

Section Tests. An artillery unit is only as good as its weakest section, howitzer, FDC, fire support team (FIST), mess or supply. Our NCOs conducted section tests in our units before deploying. Without a doubt, our operations benefitted from this effort.

The imperative is clear: section tests administered and evaluated by NCOs are the best way to train both the sections and NCOs. If you're looking for a trained and ready NCO corps, you need to allow NCOs to train soldiers and hold the NCOs firmly responsible for the results. During Desert Storm, our units performed well because our sections performed to standard—our NCOs had made sure of that.

Gunnery. All the fire plans in the world mean little or nothing if units can't execute them. We put major emphasis on gunnery before we left Fort Riley. We conducted gunnery evaluations both for cannon and MLRS units before deploying, plus we arranged for manual gunnery refresher training for our FDCs. After arriving in Saudi Arabia, we took advantage of the VII Corps "Jayhawk" range to limber up our sections in the tactical assembly area (TAA). After we moved forward to the forward assembly area (FAA), we continued our gunnery training.

Before attacking in the breaching operation, the Div Arty and its reinforcing FA brigades conducted artillery raids for eight days. While our primary goal was to destroy known enemy targets, we also used these raids to further refine and practice our gunnery and maneuver skills.

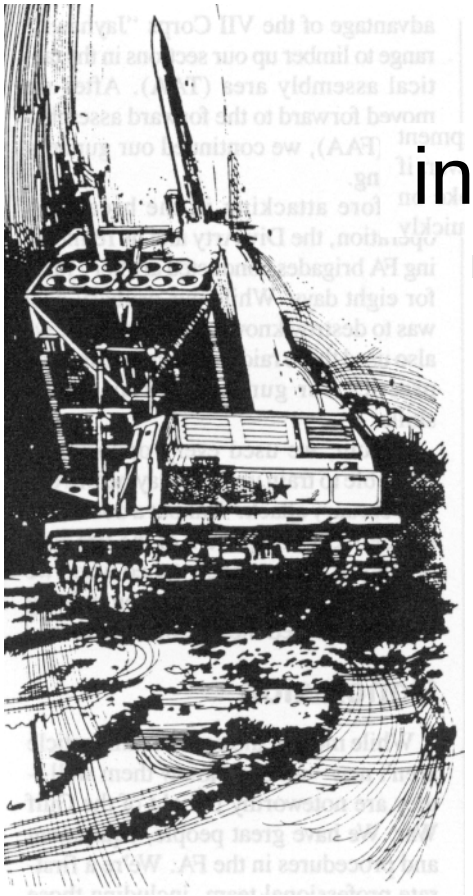
In sum, we used every opportunity available to train until the day before our 24 February attack. Without a doubt, the fire delivery component of the fire support equation was finely tuned when we attacked because we focused on training until we crossed the line of departure.

Conclusion

While most of the points in this article aren't new—all of us know them well—they are noteworthy in light of the Gulf War. We have great people, equipment and procedures in the FA. We're a first-rate professional team, including those who participated in Desert Storm and those who supported from a distance. Together, we must maintain our training edge.

But we must honestly acknowledge we have work to do and move immediately to do it. If we fail to act as we reconfigure the Army, we'll have wasted the most important opportunity afforded us since World War II.

Lieutenant Colonel L. Scott Lingamfelter is the Executive Officer of the 1st Infantry Division Artillery, Fort Riley, Kansas, and fought with the "Big Red One" during Operation Desert Storm. Before his current assignment, he was the 1st Infantry Division Artillery S3. Lieutenant Colonel Lingamfelter has served as a battery commander in the 2d Battalion, 92d Field Artillery, Executive Officer of the 1st Battalion, 76th Field Artillery, and Assistant S3 of the 3d Infantry Division Artillery and Chief of the Fire Support Element of the 3d Infantry Division, Germany. He's a graduate of the Armed Forces Staff College, Norfolk, Virginia, and holds a Master of Arts in Comparative Governments of the Middle East from the University of Virginia. In 1973, he graduated from the Virginia Military Institute with a Bachelor of Arts in History.



MLRS
in Operation Desert Storm

by Major Mark S. Jensen

This article is a melding of three articles by Major Jensen on the multiple launch rocket system (MLRS) operations of the 1st Battalion, 27th Field Artillery (1-27 FA), 42d FA Brigade, in Operation Desert Storm.

Operation Desert Storm marked MLRS' trial by combat. The MLRS batteries and battalions from the Active and Reserve Components, adding their fires to those of cannon artillery, engaged and destroyed a wide variety of targets in support of diverse offensive operations.

One such unit, 1-27 FA, deployed from Babenhausen, Germany, to Saudi Arabia in support of Operation Desert Shield on 17 December 1990. The battalion fired in support of the 1st Cavalry, 1st Infantry and 3d Armored Divisions. This article recounts some of the battalion's experiences and cites a few of the many lessons learned.

MLRS Raids

The first rockets fired in anger on 13 February were part of a three-battery MLRS raid conducted under the control of the 1st Cav Division Artillery (Div Arty). The mission required a daylight road march by batteries and passage-of-lines to an assembly area forward of the main defensive line, movement to forward firing positions and delivery of fires against high-payoff targets. Then the battalion had a rearward passage-of-lines and a night road march to battery positions.

February 3 was the date ordered for the raid. Three firing batteries—A-21 FA (1st Cav MLRS battery, also called Rocket Battery) along with B and C/1-27 FA—conducted forward passage-of-lines and occupied Assembly Area Red. A raid command post (CP) was established with the battery fire direction centers (FDCs) and two high-mobility multipurpose wheeled vehicles (HMMWVs). Two hours later after final brief backs and pre-combat checks, launchers moved out for the update area.

C/1-27 and A-21 were designated as shooters to engage high-payoff targets (HPTs). These included D-30 artillery battalions and M1946 batteries, brigade CPs and maneuver force positions. Targets were input manually in the battery FDC. Most were irregularly shaped and required "hand jamming" at the battery fire direction system (FDS). Launcher section chiefs carried hard copies of the targets on 3x5 cards.

B/1-27's mission was counterfire. If Iraqi artillery fired, a Div Arty Q-37 radar passed target grids by voice to the raid CP. Battery B would engage each of the first three targets located with 36 rockets and exit the position. If no counterfire was required, the battery was to engage additional HPTs. Here's what the raid was like.

Raid I

Looking back to the south, the advance party saw the haze part as the vanguard of the battalion, moving in desert wedge formation, crested the horizon. Launchers moved easily at 25 miles per hour over the rutted terrain. M577s managed to keep pace, with an effort, while the occupants of the HMMWVs held on for dear life and cursed the tankers whose tracks had destroyed the smooth desert surface.

The first battery to arrive in the assembly area moved into position, and using north as 12:00, occupied an arc stretching from 10:00 to 2:00. The FDCs moved to the center of the position. As ramps dropped, the crew scrambled to erect the OE-254 antennas that allowed them to communicate over the distance to the firing points. The other two batteries, arriving at 10-minute intervals, duplicated the drill, circling the wagons in the same fashion as their cavalry forebears of 100 years ago. Operations tracks grouped together forming a "T" with the battalion commander's and S3's HMMWVs backing up to the base.

Platoon leaders and sergeants moved quickly to launchers, supervising prefire checks and going over, for the hundredth time, the details of the operation. Battery commanders' (BCs') vehicles pulled to the center, the BCs gathering around the hood of the "Old Man's" vehicle. A quick check yielded good news: none of the launchers had broken down on the march. Good natured bantering broke out among the BCs, the volume of the laughter giving a hint of the adrenalin flowing.

This was the first mission—long

awaited. It marked the first time MLRS would be fired in anger—the first movement into harm's way.

"Okay fellas—cut the BS. We've got a lot to do before moving out. We'll have time to screw around after this is done," said the battalion commander.

"We've got two things to accomplish here today. Our mission is to destroy the high-payoff targets the Div Arty [1st Cav] has given us. We're part of the deception plan that will show the other side our main effort will come along the Wadi A1 Batin. Our guys will get their first taste of action, and the rest of the Army will see what the system is capable of for the first time. This is important. Don't screw it up." Removing his helmet and placing it on his HMMWV's hood, the battalion commander ordered the S3 to review the operation.

"Sir, the plan is unchanged. We'll do this just like we rehearsed it. The Div Arty says the HPTs they got from Corps [VII Corps] are solid. We're going to engage a couple of artillery battalions and at least two brigade CPs. The Div Arty's controlling headquarters and handles the interface with VII Corps. We control all MLRS fires and report to them.

"The armored cavalry screens have already moved forward and secured the area around the firing positions. Our passage forward of the brigade positions went smoothly. The brigade S3 was just in here—he tasked one of his mine plows to plow a road for us to use on the way out. We have a good link up with them here, and they'll provide guides out of position tonight to avoid our straying through the task force positions to our rear. Coordination with the Cav FSO [fire support officer] was done yesterday. Nobody wants any surprises on this one.

"Battery advance parties move out at 1630 to set up the update areas. At 1700 and 1705, A-21 and C/1-27 move to the update area. The two Bradleys [fighting vehicles] accompany you. You guys are the shooters. Make sure you have a good Met [meteorology data] and that all your launchers have hard copy of the targets with them. The Div Arty says no changes to targets will be made after you move downrange. Distance to the update area is about 13 kilometers—should take 25 minutes to close.

"Make sure you have a good spread at the update points. If a launcher goes down there, leave it behind and pick it up on the way back. If there's any slack in the schedule, leave the launcher behind at the update area. Report your arrival at the update area and SP [start point] to the firing positions. It'll take you 15 minutes to cover the six kilometers to the firing positions. We want you in position 15 minutes before time to fire. Report your arrival in firing positions. At H-minus 10 minutes, we'll give you the command to lay LLMs [launcher loader modules]. Report laid and ready.

"When you get the command to fire, get your rockets off, stow the LLMs and move off the point ASAP. Cymbelline radars have been active, and we don't know their reaction time. They may have planned targets in the area and rounds sitting 'on the trays.' We don't want to be the victims of a lucky shot. Remember, the Marines lost folks to counterfire a couple of days ago.

27th FA Regimental Crest

"Bravo, you're the counterfire battery. You SP five minutes after Charlie and move to your firing position. Make sure you have solid communications with us. The Div Arty Q-37 will start to radiate at H-plus five minutes. If the Iraqis respond, the Div Arty will get a location and pass it to us on the Div Arty command net. We'll pass it to you. You put 36 rockets on top of the grid—It's overkill, but what the hell. After firing three missions, you get out of there. If the Iraqis are asleep at the switch and doesn't reply, you engage your HPTs at H-plus 25 minutes and exit the firing positions.

"Account for all your launchers and personnel at your rally point and move back along the same route. Confirm your status at the update area and report passing through there. If something breaks down between the firing position and the update area, you're responsible for getting it back with your own assets. Make sure you've double-checked your tow bars and cables and have what you need. We have the M88 and M578 here to recover anything beyond your capabilities.

"If there are casualties, your combat lifesavers must stabilize them during the trip back here. The PA [physician's assistant] and the ambulance will take them from you here and complete evacuation to treatment facilities, if necessary. Sir, that's about it," the S3 concluded.

"Any questions of the S3?" asked the battalion commander. "If not, here are some things to remember. Your guys are going to be pumped up with adrenalin like nothing they've ever experienced. You have to maintain control out there. The march back to the assembly area here is going to be a dangerous time. Make sure you're on top of the formation. When you get back here, take a couple of minutes to cool your folks down before starting the road march back to your battery positions.

"You've rehearsed this and know what to do. Good luck. Go back-brief your leaders one last time and report when you're 100 percent ready to go. S3, what's the status of the Met?"

The next hour passed slowly. Digital communications were checked and rechecked. At the launchers, chiefs looked over gunners' shoulders as the targets were input and initial computations performed. Solutions were achieved on all targets. Tracks were inspected . . . flak vests adjusted . . . and crews started the "grab assing" and "BS'ing" that accompanies the excitement of "doing it for real" the first time.

At 1700, A-21 moved out to the northeast. Battery C, 1-27 FA, followed and the shooters were on the way. Battery C reported A-21 had come too far west and would have to cross its front to get to the update position. Battery C halts to let them pass.

At the battalion CP, the commanding officer reached for a fresh dip as the clock moved ahead.

Battery B started on time and the last of the launchers disappeared over the horizon in the fading light.

Tension increased as batteries reported arrival at the update area. Watches were checked repeatedly.

"How many launchers are updated? Any problems? Have they moved out yet?

Div Arty wants to know now!" Reports came over the battalion command net and were immediately passed to Div Arty.

At the CP, all personnel assumed the same position: ears glued to speakers or handsets, left hands in front of faces to see the watch dial. They waited anxiously for the commanders' reports.

"Sir, Rocket Battery reports arrival at the firing position."

"C Battery is at the RP [rally point].

"B Battery is closed."

"S3, confirm H-Hour."

"No change, Sir—1815."

"Time now?"

"1805, Sir. H-minus 10 minutes."

"Lay LLMs." BCs "Rogered" the command to lay LLMs. Silence on the nets.

"What's the status?"

"No report yet."

Then the radio came to life—"Rocket reports six laid; the others are moving."

"Charlies has eight laid, no report on the other one. The BC's checking it out now."

"We're running out of time."

More silence on the net.

"Rocket has all LLMs laid."

"C Battery is laid and ready."

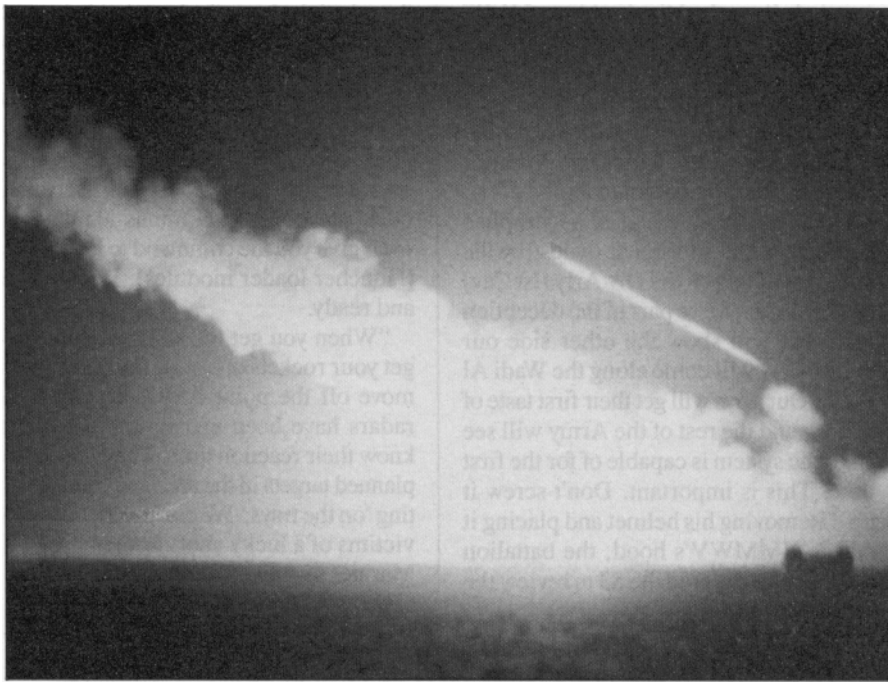
"About time—tell them to fire."

The command was passed to the FDCs for relay to the launchers. Seconds later a flash. The first launcher fired, and then the width of the horizon was lit as 19 launchers brightened the night. Blazing rocket motors marked the ascending trajectory with a trail of smoke that was lit and relit by succeeding rockets.

The assembly area was in complete silence as the first rockets were fired. Then whoops of elation erupted as the second volleys thundered into the darkness. Cameras flashed to cries of "Get some!" "Kick ass!" and "Look at those mothers!" A roar washed over the position. As the firing drew to a close, observers saw the copper-colored flash of the warhead event as the electronic fuzes functioned and thousands of bomblets were released on to the targets below.

Then the wait. Were the Iraqis on the ball? Were their radars up? Would they answer back? These guys were supposed to be good!

All the nets were silent as the LLMs were stowed. Then Rocket and C Batteries sent initial status reports. One launcher in Rocket had fired once and then shut down—couldn't be stowed.



The first MLRS launcher fired, and then the width of the horizon lit as 19 launchers brightened the sky.

"Drive it out of there now. Clear the firing point ASAP."

Battery C seemed okay.

"Q-37 is radiating. Nothing observed—yet."

"Roger. Pass the word to Battery B. Be ready."

Battery C was at the rally point. It was H-plus 15 minutes and still no counterfire.

"You got any targets for me yet?"

"Relax Bravo, you'll be the first guys we call."

"Roger."

H-plus 25 minutes. "Sir, it looks like they're not going to fire back."

"Tell Bravo to fire his targets."

Seconds later, the sky again was lit as another 100 rockets thundered down range. There were more whoops and hollers as the soldiers in the CP cheered the show.

"Bravo reports all fired. Can't stow one of his launchers."

"Put the jury struts in and tell them to move."

"He's doing it now."

Battery C almost drove past the assembly area in the dark.

"Can you see the red flashing light?"

Battery C moved into position at last with everything okay. The BC quickly reported to the commander and got permission to return to his original battery position.

The glow of blackout markers receded as the battery moved off, following a Cav Bradley acting as a guide.

A-21 returned to the firing area. Twenty minutes later, B Battery pulled in. A quick look at the B Battery LLM and the determination was made to move it back to the battery before attempting repairs. Then the Bradley guide vehicle returned.

The units moved to the SP at the same time, and for a couple of moments, it looks as if they might intermingle. The BCs acted quickly to get the situation unsnarled, and the convoys moved off in the dark.

Veterans at last. For the first combat MLRS raid, a more dramatic sight would be hard to imagine. Darkness accentuated the system's capability to deliver massive fires. First, the flash of 18 launchers firing simultaneously lit the width of the horizon, followed by the glow of hundreds of rocket motors climbing into the sky. In the distance, a bright copper-colored flash marked warheads opening to dispense thousands of bomblets. Seconds later, the first storm of what Iraqi prisoners called "Steel Rain" broke over the targets.

A total of 24 targets were engaged at ranges between 21 and 30 kilometers. The first ripple engaged 15 targets with 181 rockets; the second fired 106 rockets at nine targets. Total firing time was less than five minutes, delivering the

equivalent of 71 volleys from a 24-gun cannon battalion.

Witnesses to the firing—from the Bradley drivers in the screen to the general officers of the 1st Cav Division and VII Corps Artillery—were amazed by the volume and violence of the fires loosed that night. There was no doubt in anyone's mind (especially the Iraqis in the impact area) that the latest addition to the Field Artillery was "up to the task."

Raid II

Three days later, the battalion again joined the 1st Cav in a much larger operation. The deception plan called for a large feint operation to deceive the Iraqis into thinking that the main US effort was directed along the Wadi Al Batin. Four cannon battalions of the Div Arty and 42d FA Brigade, one MLRS battalion and the Div Arty MLRS battery massed their fires to destroy HPTs and suppress or destroy enemy air defense systems.

Shortly before 0100 on 16 February, the night again was shattered as Redlegs unleashed the fury of their cannons and rockets on all Iraqi targets in range. Of particular concern to our battalion was an SA-9 radar battery located by a joint surveillance and target attack radar system (JSTARS) only hours before the raid. Twelve rockets on the target put the radar "out like a light."

After several minutes of intense fire, the roar of artillery yielded to the growl of Apache gun ships moving across the border. A scan of the horizon with night-vision goggles showed numerous secondary explosions and fires reflecting off the clouds, testimony to the destructive power of the combined-arms team. We began the road march home exceptionally confident of our weapons system and training.

The Prep

The next day, we marched 40 miles west to the 1st Infantry Division area to prepare for the deliberate attack against the Iraqi defenses. The 1st Division had an aggressive raid schedule, and the battalion also participated in raids under the control of the 42d and 75th FA Brigades.

Operations Plan (OPLAN) "Scorpion Danger" called for a two-and-one-half-hour prep to be fired, starting at H-2:30 on the day of the attack scheduled for Ground Day+1.

On 24 February (G-Day), the division started moving forward. Lead elements encountered light resistance, and the decision was made to attack a day early, starting with the prep. The battalion had been told to prepare for a one-hour prep. As firing batteries pulled into position at 1100, new instructions came down. H-Hour was moved up, and the prep was shortened to one-half hour; new targets were coming in from the 75th FA Brigade.

"Murphy's Law" went into effect as the jump tactical operations center (TOC) lost digital communications with the 75th FA and one of the firing batteries. The 75th passed the targets by voice, and after a quick plot to verify range, the targets were assigned by voice to firing batteries. All launchers were ready to fire at 1330. H-Hour was rescheduled, and at 1430, the battalion added its fires to those of the other battalions and separate batteries supporting the breach.

The MLRS' ability to throw a boxcar load of ammunition 30 kilometers over the horizon in less than a minute make it an ideal weapon to deliver prep fires. In addition, the system's multiple aim-point capability gives it great flexibility in engaging targets.

Student Body Left

After firing in the prep for the 1st Infantry Division attack, the battalion slid to the west and linked up with the 3d Armored Division as it began the "Student Body Left" around the Iraqi lines. Moving in battalion formation, the launchers easily kept pace. But the heavy expanded-mobility tactical trucks (HEMTTs) pulling combat-loaded heavy expanded-mobility ammunition trailers (HEMATs) carrying 4 pods per trailer experienced extreme difficulty in traversing the soft sand, and five drive shafts snapped in a matter of hours.

As the division turned east on 26 February, the batteries dispersed across the two-brigade front, navigating by global positioning system (GPS) and keeping the direct support (DS) and reinforcing (R) battalions in sight. Late in the afternoon, a call from the 2-3 FA (Gunners), the DS battalion for the 1st Brigade of the 3d Armored Division, notified us the brigade was in contact, and the DS battalions were occupying firing positions.

Moving out of the desert wedge formation, the MLRS batteries halted and prepared to deliver fire. Located just behind the DS and R battalions, the MLRS firing positions were about four to seven kilometers from the line of contact. The first missions were received at 1800 from the 42d FA Brigade. The initial missions were transmitted from the brigade digitally, but communications problems required switching to voice.

The 1-27 FA answered calls for fire throughout the night, engaging 15 targets with 172 rockets. Early the next morning, the division exploited the previous evening's success and began pursuing the shattered Iraqi forces; the battalion fired an additional 44 rockets.

On several occasions, firing elements were laid and ready to fire on Iraqi targets, only to have the mission ended because of problems coordinating airspace with the Air Force. Unique to this operation was the use of the fire support coordination line (FSCL) as a *restrictive* fire control measure, which was particularly vexing. Placing the FSCL close to the forward-line-of-own troops (FLOT) necessitated clearing all fires with the Air Force. The time consumed in this process severely impeded the battalion's ability to respond.

In one instance, the battalion was passed 10 targets while moving and told to fire when within range. Closing into position, 1-27 FA reported ready to fire with eight of the 10 targets in range and received instructions to stand by for airspace coordination. After waiting more than an hour, clearance was granted to fire on only two of the targets.

Suspension of combat on the morning of 28 February found the battalion in eastern Iraq, ready to cross into Kuwait.

In the coming days, 1-27 FA had the chance to sort out experiences and analyze the way the system had been employed.

Lessons Learned

The 1-27 FA learned a lot. The most comforting lesson was the confirmation of the effectiveness of training. The battalion executed a number of different missions, but not one was a surprise in terms of preparation. The battalion's Army training and evaluation programs (ARTEPs) administered in Europe were excellent preparation for combat. The desert terrain required some modifications to the standing operating procedures (SOPs), but these were minor.

- MLRS movement formations were tight. The battalion operated across much smaller frontages than those in *FM 6-60 MLRS Operations.* Batteries marched in desert wedge formations and split off platoons to firing areas. They didn't use hide positions as the terrain had little relief and no areas for concealment. A battery frontage rarely exceeded three kilometers.

Launcher movement after firing was less than specified in FM 6-60. This was a function of the crowded battlefield and a lack of an effective counterfire threat from the Iraqis.

Tight formations were particularly helpful on raids where they allowed commanders to see each self-propelled launcher loader (SPLL) in operation, greatly facilitating control. This level of control sometimes aggravated platoon leaders and section chiefs trained in accordance with FM 6-60, but control is the name of the game.

- The MLRS system needs more range. It needs to reach 45 to 50 kilometers to engage the long-range cannon and rocket systems now on the battlefield. A trade-off of weapons payload for increased propellant or a larger rocket is necessary to guarantee success in the counterfire fight.
- Coordinating fires is tough. Long delays required to clear fires negatively affected the system's effectiveness. The battalion and the rest of the FA need to clarify just what targets MLRS will fire on and where and cut the time necessary to coordinate fires.
- Information flow breaks down in fast-moving situations. Deep targets are no longer deep by the time they make their way through the system. In these situations, it's prudent to assign MLRS the tactical mission of GS/R with "a string on" ammunition consumption to protect the force artillery commander's interests. This shortens the targeting information chain and increases responsiveness. A tie-in with the DS units is extremely beneficial in terms of getting tactical information relevant to the artillery.
- MLRS *can shoot.* Three soldiers can deliver an incredible volume of fire at extreme range. The ability to engage large, irregularly shaped targets enhances the system's effectiveness.

- MLRS can move. Launchers have no trouble keeping up with the supported maneuver force and can "ride to the sound of the guns" with ease. The same can't be said of the battalion's command and control vehicles and ammunition transports, particularly if they are pulling combat-loaded HEMAT trailers. In fast-moving situations, the launchers may have to pull the HEMATs or they'll have to be left behind in a battalion ammunition handling area where the HEMTTs return to reload.
- MLRS usually can communicate. All units must be able to direct fires using voice and digital communications. The 1-27's most successful technique was to use digital communications for fire planning and switch to voice once the fight was joined. But shooting using voice communications is fraught with perils as it strips out some of the redundant checks that ensure firing safety.

Until commanders have a user-friendly digital device capable of accessing all data bases and files, they'll rightfully insist on commanding and directing fires by voice. Whenever possible, the battalion used digital communications to direct a battery's fires because it made the task of tracking fire mission status easier.

- MLRS is a maintenance-intensive system. It's absolutely critical that repair facilities and replacement assemblies be close by and plentiful. Commanders must make supporting MLRS and transporting its critical assemblies a priority if they want fires available when needed most. The optimum solution for Desert Storm was to use UH-1 helicopters to transport line replacement units and other critical electronics spares to repair locations.

The area support concept as applied during Desert Storm, wasn't up to the challenge of providing critical assemblies in a timely manner. Cannibalization and extreme "hustle" on the part of the battalion logistics and maintenance personnel kept the system operational.

In Operation Desert Storm, MLRS proved to be a worthy addition to the Redleg team. Delivering large volumes of fire to extreme ranges, MLRS gave the ground-gaining arms a renewed appreciation of the fire support system. The 1-27 FA helped prove the artillery can devastate a defending force before maneuver forces close to direct-fire range, saving lives and speeding the accomplishment of the mission.

Major Mark S. Jensen was commissioned in Field Artillery from the United States Military Academy in 1975 and is currently the Battalion Operations Officer for the 1st Battalion, 27th Field Artillery (MLRS). His battalion participated in Operation Desert Shield/Storm as part of the 42d Field Artillery Brigade, VII Corps Artillery. His previous assignments include Forward Observer, Battery Executive Officer and Battalion Fire Support Officer with 2d Battalion, 78th Field Artillery, 1st Armored Division; Commander of Headquarters and A Batteries, 2d Battalion, 320th Field Artillery, 101st Airborne Division (Air Assault); Battalion Operations Officer for 4th Battalion, 77th Field Artillery; Commander of Headquarters Battery, 41st Field Artillery Brigade.

M198 Battery Occupation During an Overland Attack

by Captain Karl T. Stebbins and First Lieutenant Scott F. Snair

In August 1990, B Battery, 5th Battalion, 8th Field Artillery (5-8 FA), 18th FA Brigade left Fort Bragg, North Carolina for Saudi Arabia. As Operation Desert Shield marched closer to Desert Storm, two burning questions haunted us: "Would we be chasing behind allied tanks into Iraq? If so, exactly how were we going to do it?"

Our concerns were justified. As an M198 (155-mm) towed howitzer battery, getting stuck in the soft sands south of Kuwait started out as the norm rather than the exception. Experience with the sand and the cowboy-like realization that the faster we rode, the less likely we were to get stuck, made it easier to tow a 15,000-pound gun with a 28,000-pound truck (combat-loaded). But still, trucks got stuck.

And perhaps of most important concern were the presuppositions under which we had trained. All of our training exercises and evaluations had involved defensive scenarios. Many aspects of that training—from setting up nets and digging in to drawing up perimeter defensive sketches and range cards—contributed to the mind-set that, as a light, rapid deployment unit, our real-life mission inevitably would be defending a piece of land.

What was the *real*-life mission we were handed? To chase behind allied tanks into Iraq—of course.

The Mission

Our brigade supported the French 6th Light Armored Division and had the mission of destroying the remaining elements of the Iraqi 45th Infantry Division and securing the town of As Salman, Iraq—70 miles from the line of departure (LD)—and its airfield. As part of the feinting last-minute shift of allied forces to the west, our overland attack launched the ground war and defined the western flank.

While following the French AMX-30 tanks on the attack, the three battalions in our brigade "leapfrogged," with the in-place firing battalion prepping the enemy and providing covering fire. Leapfrogging meant each battalion moved north as a single convoy, 30 clicks at a time, into non-reconnoitered, non-surveyed land.

Rather than standardizing the method the battalions used to occupy, the brigade allowed each battalion to devise its own methods for fulfilling this unique mission. In turn, our battalion offered flexibility to each battery. As long as we met the requirements for rapid occupations and delivery of fires, and as long as the battalion fire direction center (FDC) wasn't hampered by our innovations, we could try anything.

Due to a few favorable conditions, creating an effective method for occupying while "on the go" was easier than it might have been. First, the Iraqi terrain along our route of attack was hard and rocky. The possibility of getting stuck was nullified—to everyone's relief.

Second, the allies had complete control of the skies. This would enable us to use an improved roadway—Main Supply Route (MSR) Texas—during the attack. Therefore, keeping up with the tanks wouldn't be as much of a challenge.

Third, because we always would be occupying behind the tanks in secured territory, the advance parties could spend less time "sweeping" a position for mines and enemy. Finally, the French division commander changed the plan from a 12-hour blitz to a 48-hour overland attack, easing our responsibilities in the operation.

With gun chiefs, FDC personnel, gunnery sergeants, platoon sergeants and platoon leaders all offering suggestions, we came up with a creative way of occupying. After a few dry runs and some fine tuning, we could lay the battery and be fully ready to fire in about the same time it took for a deliberate occupation, complete with an advance party preparation.

Our method offered more than the practiced emergency occupation or "hip-shoot." First, it used all assets available to the battery—advance parties, all key leadership and survey personnel. Second, it allowed the battery more than adequate dispersion. And finally, it provided the guns with three possible methods for receiving data: gun display unit (GDU), voice over PRC-126 radio and voice over wire.

Occupation Procedures

The battery moved north on MSR Texas in the order of march listed in Figure 1. As the battalion convoy moved north, the battalion S3 sent the battery commander (BC) a grid square to occupy and the azimuth of fire. The BC then turned off the improved road onto the desert terrain with the battery following.

Order of March
1. Commander
2. First Platoon Advance Party
3. Stinger Team
4. Survey Team
5. First Platoon Leader
6. First Platoon: Guns 1 through 4
7. First Platoon FDC
8. Second Platoon Leader
9. Second Platoon Advance Party
10. Second Platoon: Guns 5 through 8
11. Second Platoon FDC
12. Eight HEMTTs with Ammunition
13. Communications Team
14. Maintenance Team
15. First Sergeant

Figure 1. During Desert Storm, B/5-8 FA moved in this order of march. Advance party trucks were dispersed to take advantage of the .50 caliber machinegun protection. A .50 caliber was mounted on the maintenance truck.

As the BC approached an area that seemed suitable for occupation (relatively flat and free from large slabs of rock), he called a code word over the radio to the first platoon leader, who then relayed the code word and azimuth of fire over his PRC-126 radio. (Each gun and gunnery sergeant had a PRC-126 set on the battery internal frequency.)

At this signal, the convoy stopped. Both platoon leaders, both advance parties and the primary FDC broke from the convoy and came forward. The BC stopped and aligned his vehicle on the azimuth of fire. His vehicle represented battery center, thus orienting the advance parties.

The survey team stopped next to the BC's vehicle and gave him a 10-digit grid coordinate to the center of battery. The BC then called the grid and the azimuth of fire out to the FDC. The FDC entered the data into the battery computer system (BCS) and moved 100 meters behind the center of battery. At that point, the FDC was able to produce linear-sheaf firing data. (The Stinger team set up near the primary FDC.)

By this time the advance parties were well into preparing their positions. Each platoon's advance party moved 100 meters from the battery center and dropped off one soldier with one end of communications wire, and the soldier staked down the wire. The advance party vehicle drove off, unreeling the DR-8 line until a cloth marker tied to the wire indicated 150 meters. The soldiers in the back of the truck called for the driver to stop, and a second soldier dismounted with the unreeled DR-8 and the tagged line. The process continued until all advance party men were emplaced in "lazy W" shaped gun position design with a TA-312 telephone at each gun position (see Figure 2). The entire process took about a minute.

With the DR-8 unreeling, the gunnery sergeant continued toward the front right flank of the platoon. Dismounting, he set up the aiming circle, leveled the bubbles and called over the PRC-126 for his platoon to come forward. By this time, all gun guide stakes had been set up by the advance party.

The BC used his small lightweight global positioning system receiver (SLGR), a "Slugger," the Army's handy new satellite survey system device, to obtain a 10-digit grid coordinate for each of first platoon's gun positions. The second platoon leader used the battery's other SLGR to do the same for his platoon. Both sets of grid coordinates were sent back to the primary FDC, which entered the coordinates directly into the battery computer system's BCS;PIECES file. Before the guns were laid or the gunnery sergeants obtained deflections and subtense readings, the FDC could compute separate firing data for each howitzer.

The survey team set up an orienting station (OS) to the east of each platoon's lay circle to check magnetic direction and, if time permitted before the first fire mission, to check piece dispersion using referred deflections and subtense. The second OS also served as a safety circle. The survey team rechecked the center of battery grid coordinate.

The guns were laid using PRC-126 radios. First platoon switched to an alternative frequency after the gunnery sergeant called in to keep from interfering with second platoon's laying its guns. The advance party wire was used as a secondary means of laying, and then immediately after the pieces were laid, it became the gun display unit (GDU) line. After the guns were in order, a second wire was run for secondary voice. As soon as the platoon was laid, first platoon

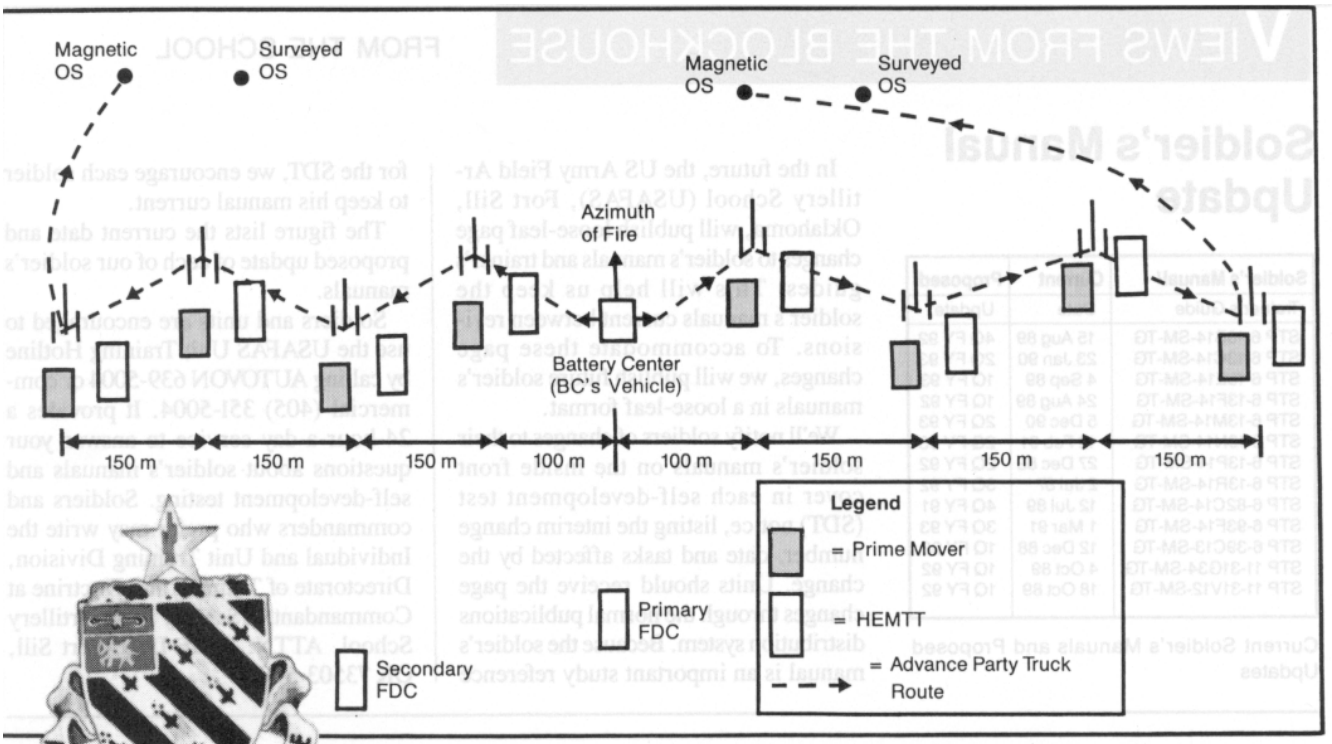


Figure 2: M198 Battery Occupation during an Overland Attack. Using this plan and following the article's procedures, B Battery could lay the guns and be fully ready to fire in about the time it takes for a deliberate occupation, including advance party preparations

switched the PRC-126 frequency back to the battery internal net, providing immediate voice communication with the FDC.

Thus, the FDC could send mission data by voice even before the guns were laid and by GDU even before they were in order. The secondary voice line was a backup in case PRC-126s malfunctioned or the enemy jammed them.

Each of the eight heavy expanded-mobility tactical trucks (HEMTTs) carried rounds, charges and fuzes and was assigned a gun section. The HEMTTs were arranged in the convoy accordingly. When the guns were laid, the first platoon leader signalled the HEMTTs to come forward. Each driver pulled in next to his assigned section, backing in from behind the gun line in case a fire mission was underway.

After reporting the battery in place and ready to fire, the FDC updated its backup computer system (BUCS) and firing chart. Each platoon leader also maintained an updated BUCS and firing chart. The FDC checked SLGR gun positions with those generated by the BCS using deflections from the guns to the surveyed OSs and the subtense distances. It provided all information to the secondary FDC.

The rest of the occupation procedures merely improved the basic position. (To ensure a 6400-mil capability and because of the short time spent in each firing position, we didn't use camouflage nets.) The battery tested GDUs, performed safety checks on the gun line and ensured it could defend the position.

Because the gun trucks and HEMTTs were lined up in the convoy "heads" with Gun One leading, pulling off the right side of the road (as opposed to the left) was ideal. But, the situation didn't allow us to always choose the right side or predict which side we would occupy next. One of the occupations was off the left side of the road, which meant Gun Eight had to travel the longest distance around the other guns. Although obviously a longer occupation, it was otherwise smooth.

Taking the SLGR shortcut for determining piece dispersion substantially cut the time it took the FDC to compute eight different sets of firing data. Verifying the gun grid coordinates with deflections and subtense distances, we found the SLGR data was never more than a few meters different. The device proved to be extremely accurate and useful.

Initially using the PRC-126 radios as the primary means of laying and as the primary voice communication with the FDC had been a cause for concern. Laying the battery over TA-321 telephones always had been the battery's preferred method and previous experiments with the older PRC-68 radios had produced mixed results. But we found the PRC-126 very clear and reliable. Furthermore, the PRC-126 batteries (we had plenty) were more dependable than PRC-68 batteries.

Given a unique situation, we believe B Battery's method of occupying during an overland attack was fast, reliable and lent itself to producing accurate fire. Firing battalion massing missions, 5-8 FA neutralized seven confirmed targets during the march to As Salman, Iraq.

Captain Karl T. Stebbins commands B Battery, 5th Battalion, 8th Field Artillery, 18th Field Artillery Brigade, Fort Bragg, North Carolina. He also served as a battery executive officer and fire support officer (FSO) for 2d Battalion, 78th Field Artillery, Germany.

First Lieutenant Scott F. Snair is Leader of First Platoon, B Battery, 5th Battalion, 8th Field Artillery. He also was the Platoon's Fire Direction Officer (FDO). Lieutenant Snair served as an enlisted Fire Direction Specialist for the 1st Cavalry Division, Fort Hood, Texas, before receiving his commission.

Soldier's Manual Update

Soldier's Manual/ Trainer's Guide	Current Date	Proposed Update
STP 6-13B14-SM-TG	15 Aug 89	4Q FY 92
STP 6-13C14-SM-TG	23 Jan 90	2Q FY 93
STP 6-13E14-SM-TG	4 Sep 89	1Q FY 93
STP 6-13F14-SM-TG	24 Aug 89	1Q FY 92
STP 6-13M14-SM-TG	5 Dec 90	2Q FY 93
STP 6-13N14-SM-TG	12 Feb 91	2Q FY 93
STP 6-13P14-SM-TG	27 Dec 88	2Q FY 92
STP 6-13R14-SM-TG	2 Jul 87	3Q FY 92
STP 6-82C14-SM-TG	12 Jul 89	4Q FY 91
STP 6-93F14-SM-TG	1 Mar 91	3Q FY 93
STP 6-39C13-SM-TG	12 Dec 88	1Q FY 93
STP 11-31G34-SM-TG	4 Oct 89	1Q FY 92
STP 11-31V12-SM-TG	18 Oct 89	1Q FY 92

Current Soldier's Manuals and Proposed Updates

In the future, the US Army Field Artillery School (USAFAS), Fort Sill, Oklahoma, will publish loose-leaf page changes to soldier's manuals and trainer's guides. This will help us keep the soldier's manuals current between revisions. To accommodate these page changes, we will publish future soldier's manuals in a loose-leaf format.

We'll notify soldiers of changes to their soldier's manuals on the inside front cover in each self-development test (SDT) notice, listing the interim change number, date and tasks affected by the change. Units should receive the page changes through the normal publications distribution system. Because the soldier's manual is an important study reference for the SDT, we encourage each soldier to keep his manual current.

The figure lists the current date and proposed update of each of our soldier's manuals.

Soldiers and units are encouraged to use the USAFAS Unit Training Hotline by calling AUTOVON 639-5004 or commercial (405) 351-5004. It provides a 24-hour-a-day service to answer your questions about soldier's manuals and self-development testing. Soldiers and commanders who prefer may write the Individual and Unit Training Division, Directorate of Training and Doctrine at Commandant, US Army Field Artillery School, ATTN: ATSF-DTS, Fort Sill, OK 73503-5600.

BCS Communications Cables for Version 9

During fielding of Version 9 software for the tactical fire direction system (TACFIRE), new equipment training (NET) teams noted several units didn't have all their authorized communications cables. The battery computer system (BCS) can't process secure digital communication to different secure devices over one cable.

When originally fielded, the Computer Group, Gun Directional, OL-200/GYK-29(V), came with only one W7/W10 communications cable, NSN 5995-01-119-9277. The unit of issue for the BCS is two communications cables. There are enough cables in the system for units to order the second cable.

With the advent of Version 9 software for TACFIRE, the BCS can communicate digitally through KG-31 and KY-57 secure devices. To take full advantage of this capability, units with the BCS must ensure they acquire the second cable. The battalion TACFIRE prescribed load list (PLL) should include an extra cable as well.

If units have questions about BCS, call the New Systems Division, Gunnery Department, Field Artillery School, Fort Sill, Oklahoma, at AUTOVON 639-3901/6988 or commercial (405) 351-3901/6988.

Version 9 BCS-MDS Communications Interface

The Fire Support and Combined Arms Operations Department (FSCAOD), Field Artillery School, Fort Sill, Oklahoma, received a report from Southwest Asia that the battery computer system (BCS) couldn't communicate with the meteorological data system (MDS) using Version 9 software. Units tried using both FM and wire line communications as well as a number of different pieces of equipment.

To test the communications interface and keep the variables to a minimum, we used wire as the link between the BCS and MDS. We initialized the MDS and the BCS (Version 9.12K) in accordance with the procedures found in the technical manuals. The MDS was set up in the BCS subscriber table following the procedures found in *TM 11-7440-283-12-1-1-1 Operator's Manual: Cannon Battery Computer System*, Pages 4-57 to 4-62. It's important to enter the MDS as device type "W" in Version 9. Device types are listed on Page 4-60 of the TM. Additionally, we used KG-31s and set up the subscriber table to reflect that. The entry of "G" was made in the communications security device (CD) field of the BCS' SYS;COMM format to indicate a KG-31 was being used on the net.

We established voice communications before trying digital communication. On the first few attempts, messages were transmitted and received between the two devices in a garbled or incomplete manner. We visually inspected all equipment to check for loose cables or wires and reviewed the software entries to ensure we made the proper entries. We then changed the preamble setting at the BCS and the corresponding keytime setting at the MDS from 1.4 to 0.7. Subsequent transmissions were successful between the two devices.

Changing the keytime/preamble settings is a logical step in communications troubleshooting. In this case, because we were using wire, a lower keytime/preamble setting is preferred. When using

radio, a higher keytime/preamble setting generally is used to key the radio properly before message transmission. Communications troubleshooting procedures are found in *FC 6-1-3 Battalion Tactical Fire Direction System (TACFIRE) Operating Procedures* and also in most unit TACFIRE standing operating procedures (SOPs).

We repeated the process without using the KG-31s and achieved the same results. We then re-initialized the BCS using software Version 9.12J to see if there was a possible problem between the two versions of software. Again, we achieved the same results. The procedures we followed, both initialization and communication troubleshooting, are standard procedures.

If units have questions about the BCS-MDS interface with Version 9 software, call the Fire Support Automation Branch, Command and Control Division, FSCAOD, at AUTOVON 639-3811/6385 or commercial (405) 351-3811/6385.

MTP Update

The US Army Field Artillery School (USAFAS), Fort Sill, Oklahoma, receives many requests for mission training plans (MTPs). We'd like to fill these requests, but with limited sources, we can't satisfy the demand.

Soldiers can requisition MTPs from the US Army AG Publications Center (USAAGPC). All current MTPs, as listed in the table, can be ordered on DA Form 4569. To automatically receive revisions to MTPs, submit DA Form 12-99R. To complete this form, you must have the number and title of the MTP, publication date and form and block numbers listed in the table. All current Field Artillery MTPs are listed in the table. Mail the completed DA Form 12-99R to Commanding Officer, USA AG Publications Center, 2800 Eastern Boulevard, Baltimore, Maryland 21220-5000. The AUTOVON number is 221-6232, and commercial is (703) 325-6232.

You can receive a printout of your account by requesting it from Commanding Officer, US Army Publications and Print Command, ATTN: ASQZ-NV (Mr. Johnson), 2461 Eisenhower Avenue, Alexandria, Virginia 22331-0302. The AUTOVON numbers are 584-3375/2533/2272, and commercial is (301) 671-3375.

For other information, call the Individual and Unit Training Division of Directorate of Training and Doctrine, USAFAS at AUTOVON 639-5004 (the 24-hour ARTEP Hotline) or 6255 or commercial (405) 351-5004 or 6255.

MTPs	Title and Date	Form Number	Block Number
ARTEP 6-037-30-MTP	Cannon Firing Battery 155-mm, Self-Propelled (3x6) (28 Mar 89)	12-12	149
ARTEP 6-115-MTP	FA Cannon Battalion Headquarters, and Headquarters Battery; Headquarters, Headquarters and Service Battery; or Service Battery (23 Nov 90)	12-12	945/904/155/156/851/151
ARTEP 6-115-20-MTP	FA Cannon Battalion Fire Support (24 Jan 90)	12-12	149/31
ARTEP 6-127-30-MTP	Cannon Firing Battery 105-mm, Towed (24 Jan 90)	12-12	149
ARTEP 6-367-20-MTP	FA Cannon Battery Firing Platoon 155-mm, Self-Propelled and Towed (20 Dec 90)	12-12	149/932
ARTEP 6-367-30-MTP	FA Cannon Battery (3x8) Battery Administration and Logistics (20 Nov 90)	12-12	149/991
ARTEP 6-397-30-MTP	Cannon Firing Battery (3x4), (3x6) 8-Inch, Self-Propelled. (20 Nov 90)		
ARTEP 6-398-30-MTP	FA MLRS Battery (8 Jul 89)	12-11	773
ARTEP 6-447-20-MTP	FA Cannon Firing Battery Firing Platoon, 8-Inch Self-Propelled (20 Dec 90)	12-12	149/993
ARTEP 6-525-MTP	FA MLRS Battalion (11 Jan 90)	12-11	4317

Future ARTEPs		Publication Date
ARTEP 6-100-30-MTP	HHB Corps Arty, Div Arty and FA Bde	Dec 93
ARTEP 6-100-31-MTP	Corps Arty, Div Arty and Bde Command Group and Staff	Dec 93
ARTEP 6-167-30	Cannon Battery, 155-mm, Towed (3x6)	Oct 91
ARTEP 6-303-30	Division Target Acquisition Battery	Oct 91

NOTE: There will be no revised versions of ARTEPs 6-500 (Warhead Detachment) or 6-595, 6-597-20 or 6-597-30 (Lance Battalion, Platoon and Battery, respectively).

Information Required to Request MTPs from USAAGPC. (This information is in *DA Pam 25-30 Consolidated Index of Army Publications and Blank Forms.*)

Gearing Up to Train Paladin

Imagine yourself a section chief in a self-propelled howitzer, where you are given a digital display of your current and next locations. . .a howitzer that, with the push of a few buttons, automatically positions the tube to the desired deflection and quadrant, prepared to fire. . .one that computes your own fire mission data and has on-board radios that give you both voice and digital communications with your platoon operations center (POC). Does this sound futuristic? Well, it is. . .and it isn't. In fact, the future is now, and the howitzer is the Paladin.

Fielding the M109A6 Paladin tentatively in June 1993 will significantly change the way we train enlisted and officer personnel who use the system. The fielding schedule currently is being revised because of the Army's "building down" process.

Evolving doctrine will place more responsibility on Redlegs, starting with the howitzer section chief and going through the battalion chain of command. No longer will howitzers be tied together by wire; they'll operate in pairs providing mutual defensive support. Increased coordination for land, survey, reconnaissance and logistics will be required to exploit Paladin's capabilities. Both the trainer and trained will face the challenge of employing Paladin to live up to its potential.

How do we propose to train this new technological breakthrough? This training will be accomplished in three phases: new equipment training (NET), institutional training and unit and collective training.

Paladin, our M109A6 howitzer, is a revolutionary cannon system for the 90s and beyond.

New Equipment Training (NET)

Two NET teams (NETT) will field the Paladin howitzer to *selected* units. One team will train continental US (CONUS) units, the other will train outside CONUS (OCONUS) units. Each NETT will be led by a lieutenant colonel and will have a total of six officers, one civilian and 45 enlisted personnel.

Battalion training will consist of a week during which only maintenance personnel at the battery, battalion and direct support (DS) and general support (GS) levels will be trained. This ensures the unit can repair its own howitzers should maintenance problems occur in the subsequent weeks of operator training.

Maintenance training will focus on improvements to the Paladin, such as the hydraulic line segregation, upgraded electrical system and the prognostic/diagnostic interface unit (PDIU) and built-in-test (BIT), which enable rapid troubleshooting and fault isolation of system components.

This maintenance week will be followed by three weeks of crew training for both the howitzer section and the POC. The section chief, gunner and ammunition team chief will learn to operate the automatic fire control system (AFCS), which is the on-board fire control and brains of the Paladin. Training these key individuals will ensure each section can maintain continuous operations in the field. The remainder of each section will learn about the howitzer improvements and how to operate efficiently as a crew.

The NETT will present doctrine and tactics training (DTT) to the firing battery leadership and commanders and their staffs from battalion through division levels. The training will focus on employment considerations, technical characteristics and the increased logistical requirements of the Paladin. The Field Artillery School team will develop a DTT package to be left with the unit after NET. This will enable the unit to train personnel arriving after NET who haven't been trained in the institution.

Institutional Training

The Paladin Commander's Course is currently under development. It'll have three tracks as well as common-core subjects: E5/E6, E7 and company grade officers and field-grade officers. The E5/E6 track will focus on operation of the AFCS and the many technical improvements to the Paladin. The E7 and company-grade officer track will focus on the system's capabilities, crew-member duties and the survey, logistical and maintenance requirements of the Paladin. The field-grade officer track will focus on the employment considerations and logistical and maintenance requirements of the Paladin. Though not finalized at this time, the length of each track will vary with the longest track (E5/E6) projected for three weeks. The course will begin in October 1993.

Active Component Officer Training. Field Artillery officer basic course (FAOBC) and advanced course (FAOAC) students going to Paladin units will attend the Paladin Commander's Course as a follow-on to FAOBC and FAOAC. Field Artillery precommand course (FAPCC) students going to Paladin units will attend the Paladin Commander's Course as an elective to FAPCC. FAOBC, FAOAC and FAPCC students not going to Paladin units will still get a doctrinal overview of the Paladin in their respective courses.

Active Component Enlisted Training. Skill Level (SL) 1 MOS 13B Cannon Crewmember soldiers will be taught how to operate the remote travel lock, which allows the driver to engage or disengage the howitzer tube without exiting the driver's compartment; the driver's night-vision device, which gives the howitzer improved night maneuverability; the final drive quick disconnect, which allows the section to rapidly prepare the howitzer for towing; and how to do the preventive maintenance checks and services (PMCS). Paladin training will be incorporated into one station unit training (OSUT) in October 1993.

The SL 2 through 4 13B soldiers identified for Paladin units will attend the Paladin Commander's Course TDY en route to their new units. Additionally, eight hours will be added to the advanced NCO course (ANCOC) in October 1993 to cover Paladin requirements. In

October 1994, a Paladin track will be added to the basic NCO course (BNCOC) in those locations servicing Paladin units.

The *MOS 13C Tactical Fire Direction System (TACFIRE) Operations Specialist* soldiers will be taught the TACFIRE software differences dealing with Paladin units, if the soldier is pinpointed to a Paladin unit. Otherwise, they'll be taught these differences in the unit.

The *MOS 13E Cannon Fire Direction Specialist* soldiers (SL 3) will get additional training on Paladin tactics, database management and howitzer positioning requirements.

The *MOS 45D Self-Propelled Field Artillery Turret Mechanic* SL 1 soldiers will receive two weeks of integrated M109A2/A3 howitzer and Paladin training. They'll learn how to troubleshoot and perform maintenance on the turret, fire control (to include pull and replace AFCS components) and other subsystems on both howitzers.

The Communications and Electronics Department of the Field Artillery School will provide 48 hours of communications training to MOS 13B soldiers, SL 2 and 3. The SL 4 soldiers of MOS 13B, SL 3 of MOS 13E and officers in Area of Concentration (AOC) 13A/E through grade O-5 also will receive communications instruction, primarily geared toward single-channel ground and airborne radio system (SINCGARS) operations.

Reserve Component (RC) Officer Training. FAOBC students will attend the Paladin Commander's Course as a follow-on to FAOBC. FAOAC RC school students will receive four hours of instruction on the Paladin.

Reserve Component Enlisted Training. In March 1995, a Paladin track will be added to RC-configured courses to cover those round-out units receiving the Paladin.

Unit/Collective Training

Individual training will be supported by the Paladin's embedded training capability, training manuals, soldier's manuals (SMs), and self-development tests (SDTs), formerly called skill qualification tests (SQTs). The embedded training function of the AFCS allows the section chief to train himself and his crew on three scenarios provided by the computer: Move Heavy, Shoot Heavy and Balanced. This capability will sharpen skills, even in garrison.

Collective training can be conducted at section, platoon, battery or battalion levels. The Paladin Army training and evaluation program (ARTEP) mission training plan (MTP) will specify the collective standards for a Paladin battery and battalion. The Paladin ARTEP MTP is currently in coordinating draft while the Paladin is in operational testing through November 1992. Using the results of the test, the ARTEP MTP will be updated and published in final draft before the first unit is equipped (FUE), which is scheduled for June 1993. The ARTEP MTP is one of several documents sent to receiving units *before* the NETT arrives. This will allow them to familiarize themselves with the Paladin to ease the impact of NET.

Doctrinal employment of the Paladin is significantly different from current procedures. The howitzers are no longer tied by wire, so dispersion is greater. They operate in pairs to provide mutual defensive support. The Paladin moves more frequently for survivability; this requires increased coordination and repetitious training for rearming and refueling, selecting and occupying positions, setting up communications security, cover and concealment, and interfacing the Paladin's AFCS with the battery computer system (BCS) of the platoon operations center. To avoid exposing itself to counterfire, the unit must work more closely with supported maneuver forces to coordinate position areas and fires. Extensive field training is required to fine tune procedures and fully exploit Paladin's capabilities.

Conclusion

Paladin is a unique and revolutionary cannon system for the 90s and beyond. Technology is giving us the opportunity to strengthen our position on the battlefield as the "King of Battle." But it'll be up to commanders at all levels to transition soldiers to the Paladin, making them the ultimate weapons on the battlefield—the well-trained Redleg.

If units have questions about Paladin training, call the New Systems Division, Directorate of Training and Doctrine, Field Artillery School, Fort Sill, Oklahoma, at AUTOVON 639-5714/3878 or commercial (405) 351-5714/3878.

Blast Exposure Limits for the M119 and M198

New blast overpressure research on the M119 and M198 howitzers is bringing good news. The new data shows crewmen are less susceptible to blast than previously thought. Operator manuals will change to increase the number of rounds a soldier can safely fire in a 24-hour period.

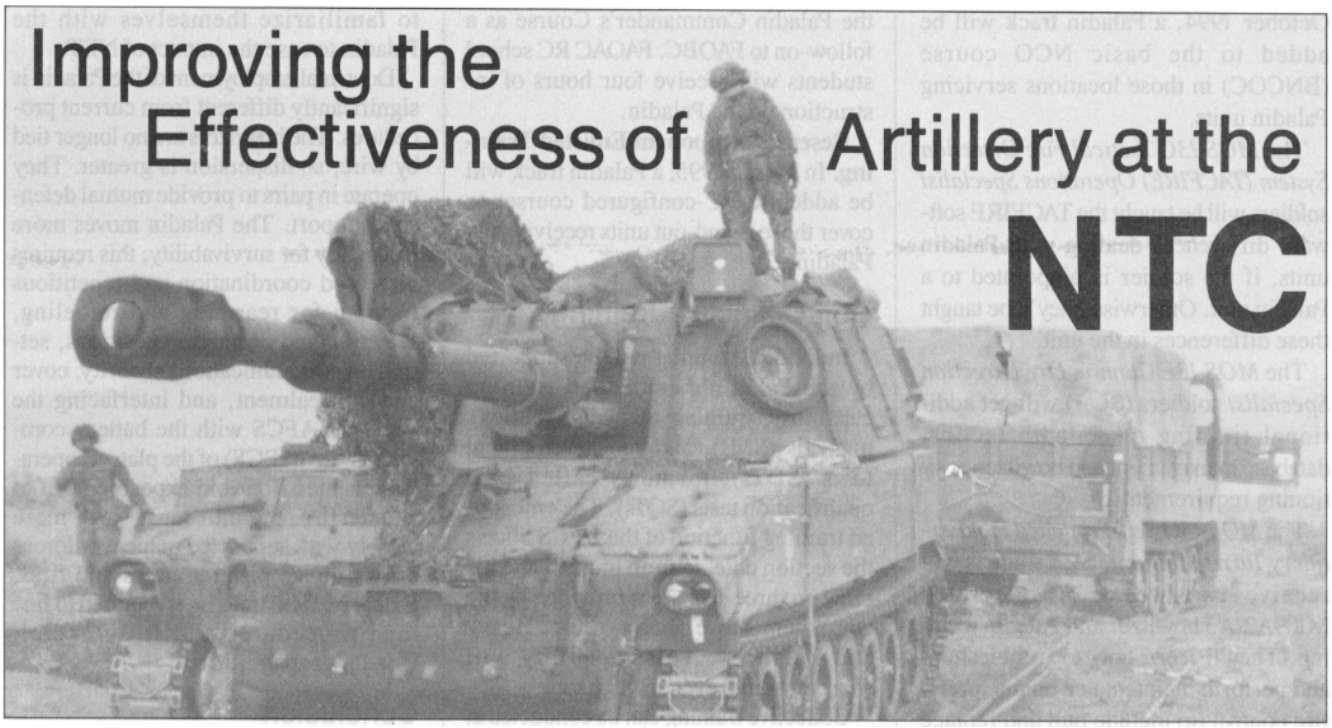
Extensive study with volunteers during the last three years shows soldiers can safely withstand much higher levels of blast with none of the effects previously feared. Additionally, medical interviews with M119 crewmen who reported minor overpressure related problems have shown the problems could be attributed to a number of other factors such as stress, dehydration or improper use of hearing protection.

The M119 and M198 are the best towed artillery pieces in the world. They are modern, battle-tested weapons that give our light forces much needed range and lethality. This increased capability causes more noise and blast than some older weapon systems, and initial testing resulted in special measures to protect the crew.

The cumbersome "point" system in the operators' manuals has plagued leaders since the weapons came into service. This will be modified. For example, the limits on M119 top charge will go from five rounds to 390 rounds in a 24-hour period. Restrictions on lower charges limits decrease even more. These new limits pose no health risk and will virtually eliminate the time-consuming problem of monitoring point limits in the field.

Units with questions should contact the Training and Doctrine Command System Manager (TSM) Cannon (ATSFCN), Directorate of Combat Developments, Field Artillery School, at AUTOVON 639-3716/3803 or commercial (405) 351-3716/3803.

Improving the Effectiveness of Artillery at the NTC



by Colonel Bruce B.G. Clarke, AR

Many senior Army leaders are bemoaning the lack of effectiveness of the artillery at the National Training Center (NTC), Fort Irwin, California. Many very intelligent people are trying to find a purely technical solution to what isn't a technical problem. The problem is maneuver commanders' impatience coupled with an incomplete integration of artillery into maneuver plans at every level.

Maneuver Commanders' Responsibilities

At the brigade level, it's critical the brigade commander—

●Position his artillery to support his scheme of maneuver. There's a tendency at the NTC (for a fully modern force) to outrun its artillery. This must be prevented.

●Provide a clear explanation of his vision—how he sees the battle unfolding.

●Designate his critical targets as part of the top-down fire planning effort; a sequence of fires may be useful.

●Position the brigade combat observation lasing team (COLT) to observe critical targets.

●Tightly control the number of targets allowed.

At the battalion level, it's critical the battalion commander—

●Understand the brigade commander's vision of the battle.

●Refine the brigade target list (location and description).

●Designate his critical targets and assign primary and secondary responsibilities for executing those targets (assigned to company commanders).

At the company level, it's critical the company commander—

●Understand how his mission fits into the higher commander(s') vision of the battle.

●Assign primary and alternate responsibilities for executing targets.

●Plan the maneuver of his fire support team (FIST) as he does a platoon, so the FIST can provide fire support in a timely and accurate manner.

●Be patient in execution, i.e., wait for the artillery to influence the battle. (When the artillery rounds impact, so should longer range direct fires.)

During a 30-minute battle, the direct support (DS) artillery battalion can fire only four or five battalion three-round fire missions, for a total of 72 rounds per mission. The minimum number of rounds to have an effect on a mechanized force of tanks and BMPs (Soviet-made tracked, infantry combat vehicles), for example, is 48; however, 72 rounds are more effective. The brigade and battalion commanders thus need to ensure those four or five missions are executed when and where they want them.

In this regard, a sequence of fires that integrates the fires of the artillery battalion with the maneuver of the supported forces is a key ingredient to success. Such a time-phased plan will ensure the artillery tubes are positioned and available for those four or five critical missions.

It also allows the maneuver battalion commander to position and plan fires for his mortar platoon to complement or reinforce the other fires. During other periods (other than the intense 30-minute battle), the indirect fires would be planned on anticipated targets and then shifted, based on the situation. The intelligence preparation of the battlefield (IPB) is critical in the development of such a sequence as trigger points must be determined and included in the plan to ensure the fires arrive on target in a timely manner. Figure 1 illustrates a scenario for such a sequence of fires.

Given the enemy disposition in Figure 1 and a mission to seize an objective in the vicinity of the limit-of-advance (LOA), the brigade commander issues his intent. He wants to rapidly attack and destroy enemy elements in the security zone to protect friendly lines of communication and continue the attack to seize the objective, emphasizing speed and massing combat power on an enemy flank to destroy the enemy in detail. The brigade commander assigns the mission of seizing the objective to the task force (TF).

The TF commander and his fire support officer (FSO) are given a top-down target list and fire support execution matrix. The fire support execution matrix contains those targets the brigade commander considers crucial to the battle and tells the TF commander to assign observers to execute the targets. As he develops his plan, the TF commander includes the brigade-directed targets, assigns execution responsibilities and sequences artillery fires with his mortar fires, direct fires and maneuver.

In this situation, the TF commander plans an on-call artillery mission on the enemy platoon in the security zone. This mission starts the sequence of fires shown in Figure 2.

If the mission of the platoon in the security zone was on a planned target location, the time from the call-for-fire to rounds complete can be five minutes for three battalion volleys (72 rounds). If the planned location is inaccurate, the fire mission will take eight to 10 minutes to complete. Winning the reconnaissance battle and developing accurate locations for targets in the sequence of fires can save three to five minutes per artillery fire mission. In a 30-minute battle, that can mean the difference between three and five battalion fire missions.

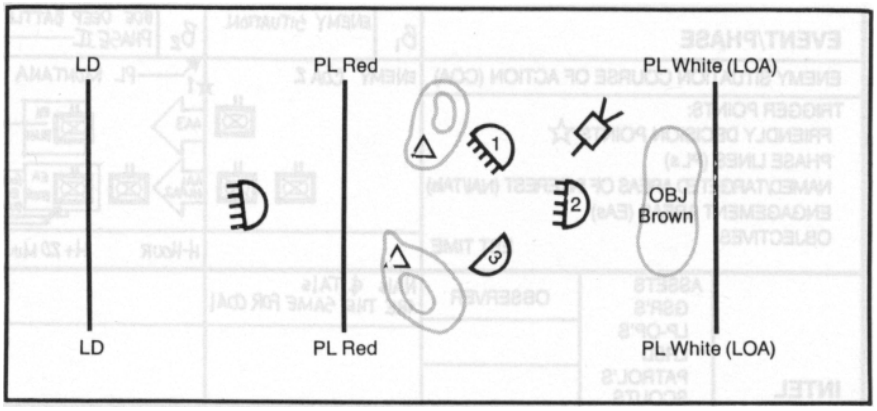


Figure 1: Typical Motorized Rifle Company Defense. A platoon-sized element is in the security zone between the line-of-departure (LD) and the Phase Line (PL) Red. The main defense has three motorized platoons and an anti-tank (AT) platoon defending the rear slope of a pass between PL Red and PL White with observation posts on the forward slope.

	Indirect Fires	Sequence of Fires	LD Time
Time	**Target**	**Observer/Executor**	**Firing System**
H+5 Min	Platoon Security Zone	Tm_____	FA
H+13	OP	Tm_____	FA
H+13	OP	Tm_____	Mortars
H+21	Platoon Pos. 1	Tm_____	FA
H+21	Platoon Pos. 2	Tm_____	Mortars 50% HE 50% Smk
H+23	Platoon Pos. 3	Tm_____	Mortars 50% HE 50% Smk
H+29	Platoon Pos. 2	Tm_____	FA
H+29	AT Pos.	Tm_____	Mortars

Figure 2: Sequence of Fires. This table shows the on-call artillery missions the TF commander planned on the enemy platoon in the security zone (see Figure 1). In the operation synchronization matrix, the movement of artillery is keyed to each phase of the battle (Figure 3). To satisfy the commander's intent, enough howitzers must be in position and ready to fire during the crucial stage(s) of the battle.

In the planned sequence of fires, the TF commander has decided to penetrate the enemy's defense on its right flank by integrating direct and indirect artillery fire on the right flank platoon. At the same time, his mortars will fire on the other two platoons to fix them and isolate the right platoon.

The TF commander's sequence of fires includes specific targets the brigade commander considers critical (or refined adjustments of the brigade targets) and targets he and his company commanders develop to support their scheme of maneuver.

In units where the artillery fire is effective, company commanders position their FISTs on the battlefield to call for fires that support their schemes of maneuver—not just have the FISTs follow them around the battlefield. This includes positioning them to execute the battalion or brigade commander's assigned targets.

Successful company commanders plan to maneuver their FISTs in the same manner they plan to maneuver their platoons.

Synchronization of Fire Support and Maneuver

The 2d Brigade (Dagger Brigade), 1st Infantry Division (Mechanized), Fort Riley, Kansas, tied all of this together by developing a synchronization matrix that integrates fire support with maneuver. The development of the brigade synchronization matrix and its supporting sequence of fires, maneuver plan, etc., allows for synchronization to occur down to the platoon level. When such synchronization happens, mass is achieved and victory is assured.

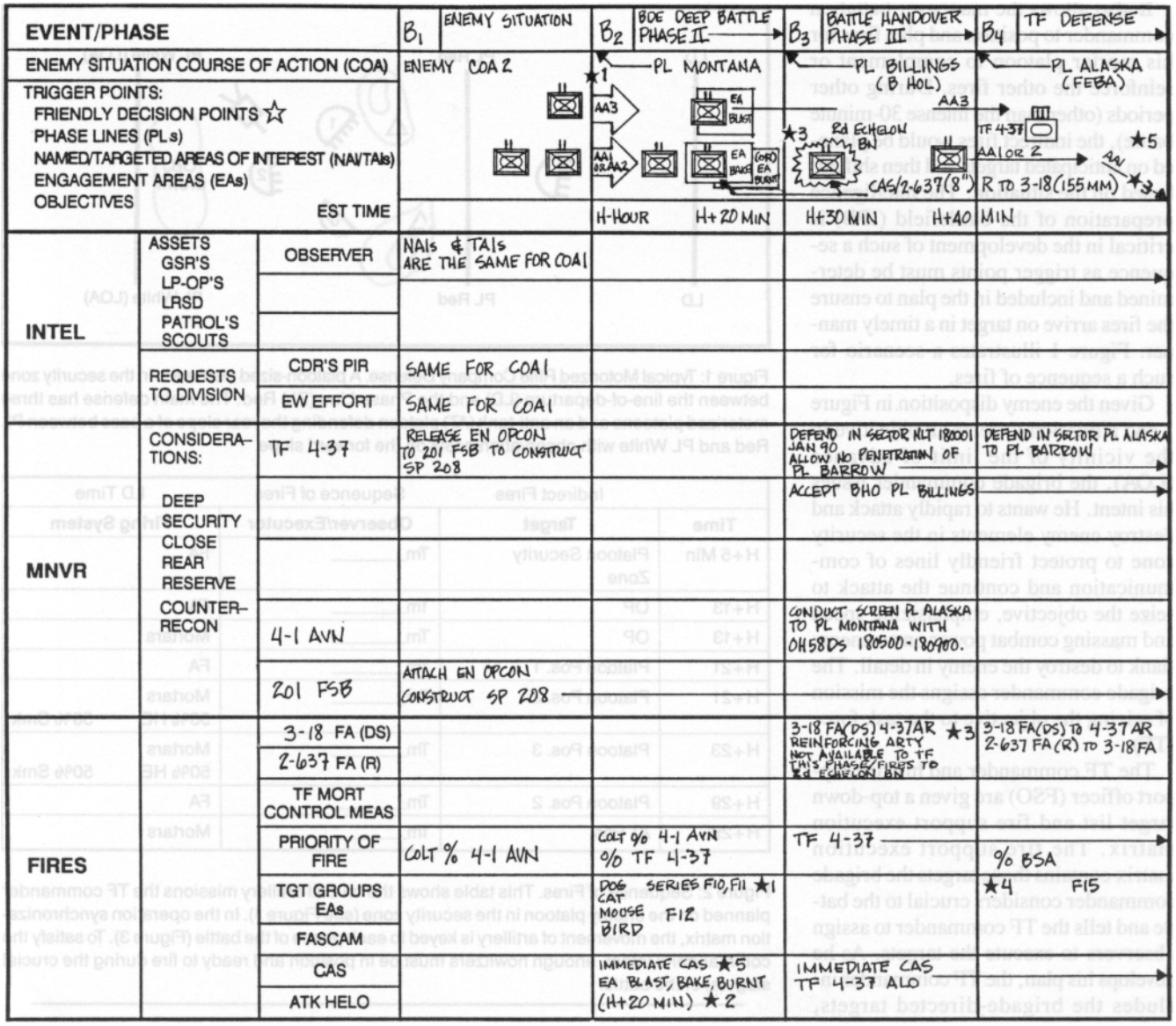


Figure 3: Part of the Dagger Brigade Operation Synchronization Matrix. This matrix integrates fire support with maneuver during a brigade deep attack of a MRR on one or two avenues of approach. The COLTs were responsible for the deep fires and the TF for priority of fires forward of the FEBA. (The decision points for the latter are shown in Figure 4.) The actual three and one-half by four foot matrix includes sections for air defense, command and control, combat service support and other areas. The matrix, which was developed by the 2d Brigade, is available from the Army Training Support Center (FR-89-740-1) or the Government Printing Office (1989-657-889).

Legend

AA = Assembly Area
R = Reinforcing
GSRs = Ground Surveillance Radars
LP/OPs = Listening/Observation Posts
LRSD = Long-Range Surveillance Detachment
Cdr's PIR = Commander's Priority Intelligence Requirements
EW = Electronic Warfare
EN = Engineer (Unit)
FSB = Fire Support Base
OPCON = Under the Operational Control of
SP = Strongpoint
BHO = Battle Hand Off
DS = Direct Support
o/o = On Order (Fires)
BSA = Brigade Support Area
FASCAM = Family of Scatterable Mines
CAS = Close Air Support
ALO = Air Liaison Officer

An example of such a brigade-level synchronization plan is shown in Figures 3 and 4. Figure 3 shows the brigade deep attack of a motorized rifle regiment (MRR) on one or two avenues of approach. Deep fires were the responsibility of the brigade COLTs. Forward of the forward-edge-of-the-battle-area (FEBA) there was a battle hand-off line where the TF assumed priority of fires with specified targets to execute in its engagement area. This process for the artillery is shown in Figure 4.

In many cases, synchronization has been planned and artillery targets are

Brigade Fire Support Execution Matrix

1. Commander's Intent for Fire Support:
   a. Fire FASCAM in Valley of Death (4000) vicinity, and back that up with a series to stop thrust there.
   b. Plan series in southern corridor both north and south of hill 700 to attrit enemy in deep battle.
   c. BHO to TF 4-37 at PL Billings. Mass both battalions PL Billings— PL Alaska.
   d. COLT, OH58Ds deep to fight deep battle.

2. Fire Support Execution Matrix:

Decision Points					
	Phase I	Phase II	Phase III		Phase IV
		PL Montana	PL Billings	PL Alaska	PL Barrow
	Occupation/Sec	Bde Deep Battle	Battle Hand-over	TF Defense	Rear Battle
TF 4-37			BB0017 BB0018 BB0016	B1B B2B	
4-1 Avn	OH58D Acquisitions				
COLTS		Dog F10 Cat F11, Bird Mouse F12			
Bde		Immediate CAS in EA Blast, Burnt, Bake, in (EN) w/COLT			
FPF Pri Tgts	COLT 3-Pri Tgts	COLT 3-Pri Tgts	TF 4-37 3-Pri Tgts 1-FPF	TF 4-37 2-Pri Tgts 2-FPF	BSA 2- Pri Tgts
Priority of Fires	COLT 0/0 4-1 Avn	COLT 0/0 4-1 Avn 0/0 TF 4-37	TF 4-37	TF 4-37 0/0 BSA	BSA
FSCOORD Measures		CFL- PL Billings	CFL- PL Billings 0/0 PL Alaska	CFL- PL Alaska 0/0 PL Barrow	CFL- PL Barrow
BSA					

3. Coordinating Instructions:
   a. Bde CFL PL Billings
   b. Target allocation: Bde - 35, TF 4-37 - 15, BSA - 10
   c. COLT positioned vicinity of 332983 under Bde control to observe Bicycle Lake Pass.
   d. Trigger for F10, F11, F12 is vicinity of 357011.

Legend
FPF = Final Protective Fires
Pri Tgts = Priority Targets
CFL = Coordinated Fire Line

Figure 4: Dagger Brigade Fire Support Execution Matrix. Based on the Brigade Operation Synchronization Matrix (Figure 3), this matrix shows the decision points for the TF's priority of fires forward of the FEBA.

developed, but mass isn't achieved. This is usually because either discipline has broken down or maneuver commanders lose patience. Discipline breaks down when we let targets be fired upon that aren't the ones *critical* to the commander's intent. The fire direction officer (FDO) and artillery battalion S3 are key in helping the FSOs and the fire support coordinator (FSCOORD) maintain such discipline.

Patience isn't practiced when the maneuver commander isn't willing to wait the five to seven minutes it takes to get artillery fires on the target and goes charging unsupported into a "kill sack."

In either case, mass isn't achieved and victory escapes our grasp.

Synchronizing fires and maneuver in our plans and then ensuring we have the patience and discipline to execute our plans is the key to effective artillery fire at the NTC and, ultimately, combat.

The burden for such an effort rests on the maneuver commander. He sets the intent and battlefield framework and provides the priorities. He's an integral part of the artillery's effectiveness.

Colonel Bruce B. G. Clarke, Armor, is Director of US National Security studies at the War College, Carlisle Barracks, Pennsylvania. Until recently, he commanded the 2d Brigade, 1st Infantry Division (Mechanized), Fort Riley, Kansas, where his unit developed the Brigade Operation Synchronization Matrix and the accompanying Fire Support Execution Matrix. Colonel Clarke also commanded the 2d Squadron, 11th Armored Cavalry Regiment, and A Troop, 3d Squadron, 8th Cavalry Regiment, 8th Infantry Division (Mechanized), both in Germany. He served as a District Advisor for the Republic of Vietnam Army and a Political-Military Analyst in the Arms Control and Disarmament Agency, Washington, D.C.