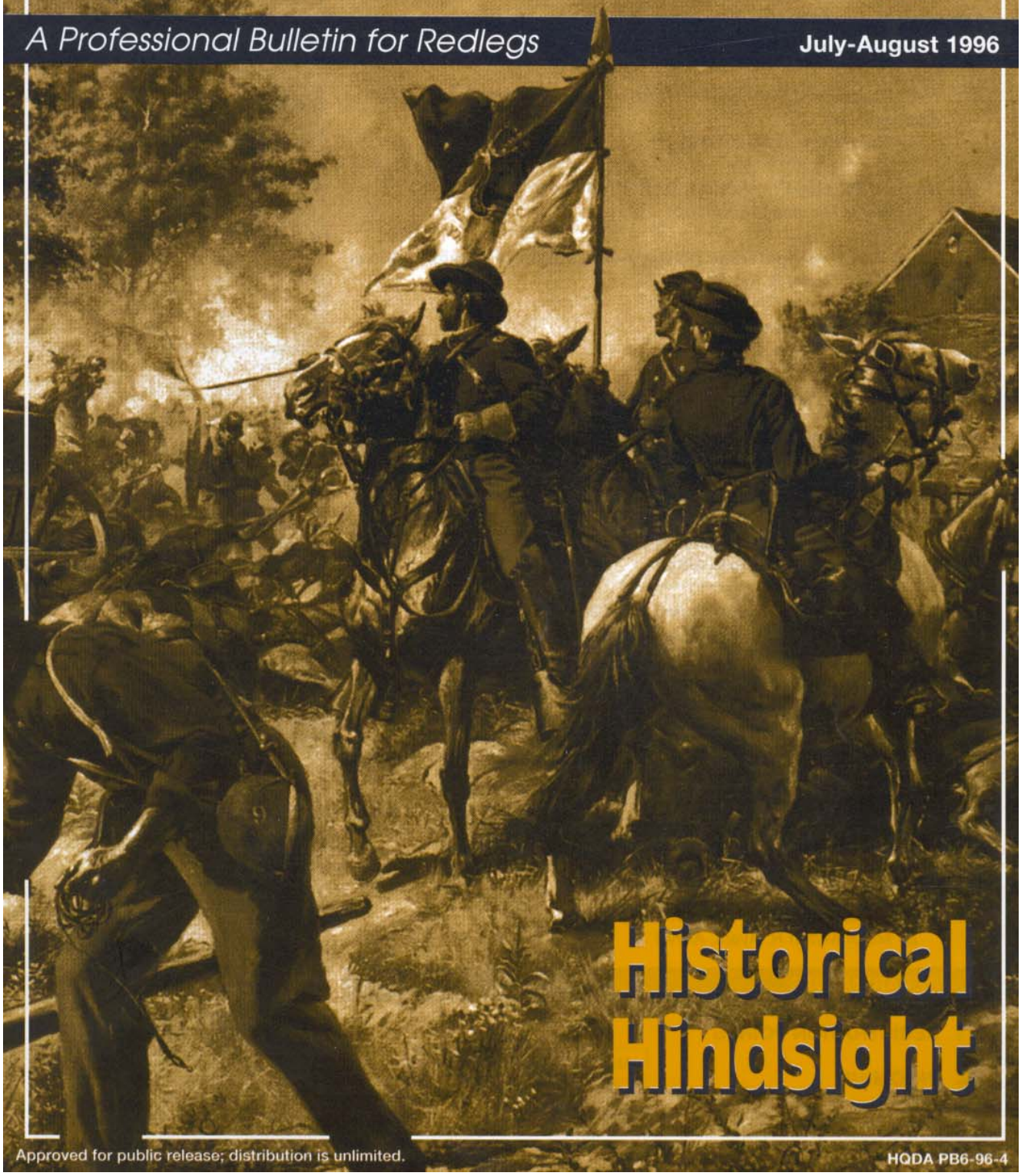
Field Artillery

A Professional Bulletin for Redlegs

July-August 1996



Historical Hindsight

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ARTICLES—History

ARTICLES

DEPARTMENTS

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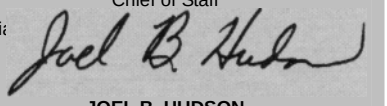

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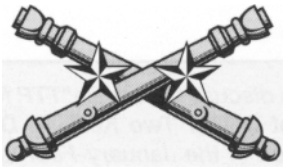
The Changing Face of Ground Warfare—

Fires *First*



We're entering the third great age of artillery, an age that will change the face of ground warfare. Intelligence, Signal and Field Artillery will form a triad to do more with fires than ever before. This triad will precisely locate the enemy, communicate his exact whereabouts over great distances and deliver long-range, precision fires to reduce him for exploitation by maneuver forces. In the first two ages of artillery, fires had a significant effect on the synchronization of ground warfare—as will the third age.

First Age: Fire and Maneuver. The first great age of artillery began at the start of the 19th century. Advances in technology resulted in light, mobile and powerful Field Artillery pieces, allowing commanders to synchronize direct fire with devastating results. During the Civil War, however, the introduction of rifled muskets gave infantry soldiers the ability to engage artillerymen at long range with accurate fire. The Napoleonic style of fire and maneuver—assaults with artillery and infantry—would no longer suffice.

Second Age: Quick-Firing Artillery and Synchronization. The turn of the 20th century marked the beginning of the second great age of artillery. Quick-firing artillery, defined as breach-loading guns with recoil systems firing smokeless powder and exploding munitions, promised to provide effective close support using indirect fire. Development of the fire direction center (FDC), graphic firing tables (GFT), portable radios and improved coordination of the target acquisition systems made massed indirect fire a reality. These helped synchronize indirect fires in combined arms warfare.

The Age of Fires First. The third age is upon us. During this age, the Fires First concept will redefine how artillery is employed. Fires First will use firepower to overwhelm the enemy and set the conditions for maneuver force exploitation. The triad of MI, Signal and FA will allow our ground commanders to attack the enemy by indirect firepower throughout the operational depths of the battlefield.

Finding the enemy precisely. The MI's all-sources analysis system (ASAS) greatly enhances our ability to locate the enemy on the battlefield. Superior knowledge is a key ingredient for success in combat. ASAS helps give us this knowledge by collecting data both horizontally and vertically from all resources, consolidating the information into a single data base, correlating the data and then graphically displaying the enemy position on the battlefield. Today's long-range acquisition systems—unmanned aerial vehicles (UAVs), Longbow, Kiowa Warrior, joint surveillance and target attack radar system (JSTARS), etc.—combined with second-generation day/night imaging capabilities will allow us to see a real-time picture of the battlefield imagery and targeting data.

ASAS offers the fire supporter a special feature. The commander can program high-value or high-payoff targets in the ASAS system. When these targets are detected, ASAS automatically generates a message directly to the fire supporter via the advanced Field Artillery tactical data system (AFATDS).

In addition to these assets, upgraded systems like the Q37P3I Firefinder radar will acquire artillery targets out to 60 kilometers and theater ballistic missiles out to 300 kilometers. The Q37P3I will interface with systems, such as the UAVs, JSTARS and AFATDS, to integrate Firefinder into targeting, including targeting for theater missile defense (TMD).

Communicating the enemy's exact whereabouts over great distances. Our current communications systems limit our ability to exchange digital and voice traffic at operational depths. In the near future, the Signal Corps will field an improved communications architecture that will tie together current and future radio systems. The enhanced position location reporting system (EPLRS), the Army's data network system for the digitized battlefield, will provide a key communications link needed for the Fires First concept. When we link EPLRS to the single-channel ground and airborne radio system (SINCGARS), the single-channel tactical satellite (TACSAT) and mobile subscriber equipment (MSE) and add the capabilities of the future digital radio (FDR), the architecture will provide both the range and digital capacity for Fires First execution.

Delivering precision fires. Our capability to deliver precise munitions over extended ranges determines the ultimate success of Fires First. Our developmental munitions will provide greater effects on targets than ever realized.

For example, the multiple-launch rocket system (MLRS) will be upgraded in the year 2000 to increase responsiveness, survivability and maintainability. New rockets under development or planned include extended range, extended range with guidance and the MLRS smart tactical rocket (MSTAR). The army tactical missile system (ATACMS) Block IA, with a range of 300 kilometers, will be fielded in 1998. Block II with BAT, which is a brilliant anti-armor submunition, will allow us to delay, disrupt or destroy moving armored forces at operational depths, starting in 2001. Block IIA with P3I BAT submunitions will be able to attack moving or stationary, hard or soft targets out to 300 kilometers in 2004.

The counterfire battle is critical, one we must continue to win. The Army's first smart munition, sense and destroy armor (SADARM), has top-attack, fire-and-for-get submunitions and is fired by 155-mm systems primarily against enemy artillery. With a range of 22.5 kilometers fired from Paladin and 28.2 kilometers fired from Crusader, SADARM's accuracy, effectiveness and penetration through armor will cause devastating effects to threat artillery. It also can be used against targets in close support, attack at depth and suppression of enemy air defenses (SEAD).

The Fires First concept is a logical next step in ground warfare. It facilitates the best possible outcome of warfare: rapid, decisive victory with minimum risk to friendly forces.

Responses to "TTP for Winning the Counterfire Fight"

Editor's Note: *The following two letters discuss the article "TTP for Winning the Counterfire Fight" by Chief Warrant Officer Two Keith A. Derrick and Captain Davis L. Butler, which appeared in the January-February edition. The first letter is written by a 131A Targeting Technician at the Field Artillery School who disagrees with several points in the article. The letter to the editor in the May-June edition about the article by Chief Warrant Officer Two Don F. Cooper of the National Training Center, Fort Irwin, California, also objected to the use of the radar section targeting technician in the direct support (DS) FA battalion tactical operations center (TOC) during mission execution. The final letter is one of the author's comments after having read the two letters from the targeting technicians.*

The Radar Technician and His Role

The article "TTP for Winning the Counterfire Fight" was an excellent example of the considerations for employing a AN/TPQ-36 Firefinder radar on the battlefield along with a description of the role of the targeting technician assigned to the radar. The article also went a long way in explaining the proper planning for zones, zone management and how to cue the radar. However, there are several subjects within the article that need correcting.

The first point for correction is the terminology referred to as "radar technician" (RT). In accordance with the new description for the 131A MOS [military occupational specialty] in *FM 6-121 Tactics, Techniques and Procedures for Field Artillery Target Acquisition* (Second Draft), there is no longer a "radar technician." The warrant officer assigned to a radar section is a "targeting technician."

The second point is the reference to the new modified table of organization and equipment (MTOE). There is a targeting technician assigned to the DS battalion, and by doctrine, his place is in the brigade FSE [fire support element]. However, there is not a void in the DS battalion TOC because the targeting technician assigned with the radar assists the DS TOC on matters concerning radar employment and targeting during the planning process (per FM 6-121).

The third point is that it is not the responsibility of the targeting technician to write the radar deployment order (RDO) or the target acquisition portion of the Field Artillery support plan. However the targeting technician with the radar is a valuable asset in advising and being an active participant with the Field Artillery battalion staff in planning the Field Artillery's mission.

Fourth point for discussion is the reference to radar cueing agents. The article was correct in pointing out the importance of authorized agents to cue the radar. However, the examples of who on the battlefield make the best agents was incorrect. It must be remembered that responsiveness is the key to success in cueing a radar. Agents authorized to cue the radar should be those who have the best view of what is happening out front on the battlefield. Examples may be company FSOs [fire support officers], OH58Ds, COLTs [combat observation lasing teams] or scouts.

The final point for discussion is where the targeting technician assigned to the radar should be on the battlefield. As discussed in FM 6-121, the targeting technician should be an active member of the DS battalion staff during planning. However, once the mission goes into execution, his presence is required with the radar section to ensure mission accomplishment. He still can be the manager and provide analysis, as pointed out in the article, from his position at the radar.

It is not my intent to suggest the article has little or no value to the field. In fact, the article points out essential points in making radar a successful combat multiplier and how to use the skills that the targeting technician can provide.

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TA Division
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DS Battalion TOC Needs Full-Time Radar Expert

I recently co-authored the article "TTP for Winning the Counterfire Fight." I wrote the article because of a lack of information and doctrine dealing with the counterfire fight. The article describes the TTPs my battalion used to plan and fight a counterfire fight. We developed those TTPs during our NTC train-up and refined the TTPs after our rotation. But I failed to fully address one issue in the article: the need for a targeting officer in the DS battalion TOC.

I was an FA battalion S2 for more than two years and participated in two NTC rotations, two NTC train-ups, countless field training exercises (FTXs) and many Janus exercises planning and executing the counterfire fight for my maneuver brigade. During my tenure, I realized the need for a radar expert in the FA TOCs.

The modified table of organization and equipment (MTOE) states the targeting officer is a radar technician. The mission training plan (MTP) recommends sending that targeting officer to the brigade FSE. Therefore, a void exists in the FA TOC.

Doctrine states the the FA battalion S2 plans and executes the counterfire fight. However, these S2s lack the training and experience to properly plan and fight one of the most critical fights for maneuver to win the close battle. The targeting officer at the brigade level

spends all his time planning and fighting battles with the brigade FSO—he doesn't have time to plan and fight an effective counterfire fight. Therefore, the DS battalion S2 must plan and execute the counterfire fight in conjunction with the battalion S3.

To help the FA battalion S2, we used the radar technician from the radar section to plan the counterfire fight, write the RDO and fight the counterfire fight from the FA TOC. We developed this TTP because of my lack of knowledge of the radar and the experience of our radar technician. We naturally came to this solution, based on the required knowledge and experience.

Unfortunately, the target acquisition community did not come to the same conclusion. Some still believe that the FA S2 should plan and execute the counterfire fight.

In many cases, the battalion S2 is a first lieutenant who is not an officer advanced course graduate. Advanced course students receive about six hours of instruction on the radar. In addition, these students receive about eight hours on the IPB [intelligence preparation of the battlefield] process. The advanced course does *not* prepare an FA officer to be a S2—much less to plan and execute a counterfire fight.

FA battalion S2s are expected to conduct the IPB, plan the counterfire fight and track the battle across the brigade's sector. Unfortunately, FA battalion S2 sections have significantly fewer personnel than a brigade S2 section.

Radar technicians or targeting officers spend all their careers dealing with the radar, receiving a great deal of tactical and technical training. By assigning a second targeting officer to a DS battalion, there would no longer be the problems of inexperience with or lack of knowledge about radars to hinder winning the critical counterfire fight. If the DS battalion receives a reinforcing battalion and the counterfire fight is handed off to that battalion, the second targeting officer can move to the reinforcing TOC and fight the counterfire battle from the reinforcing TOC.

I recommend a plan for the developmental progression of the radar technician or the targeting officer. I suggest the targeting officer start his career at the Q-36 as the radar technician. There he will learn the capabilities and limitations of the radar. He also will learn how to plan and fight the counterfire fight by attending the orders process at the TOC. Next, the radar technician should become a targeting officer in the DS FA battalion TOC. After serving a tour there, he advances to serve as the targeting officer in the brigade FSE. Finally, the targeting officer should be assigned to a Q-37 to start the process over again, except at the division and corps levels.

In conclusion, I believe that assigning a second targeting officer to a DS FA battalion will greatly enhance the warfighting capabilities of the battalion. This solution has already been proven effective. Where? The division artillery counterfire cell is augmented with personnel from the target acquisition battery to fight the counterfire battle. Are DS FA battalions that different from the division artillery? Not really. Both need additional personnel to effectively conduct the counterfire fight.

Some believe the counterfire fight is the division artillery's responsibility. If so, then why are DS battalions trained to fight the counterfire battle at the NTC?

CPT Davis L. Butler, FA
Former S2, 2-82 FA
1st Cavalry Div, Fort Hood, TX

Editor's Note: *The following two letters were written by the Field Artillery School's Chief of Doctrine Division, Warfighting Integration and Development Division, in response to articles written by Air Force authors that appeared in the "Air Fires" May-June edition.*

Response to "Air Power's Battlespace"

I read Air Force Lieutenant Colonel [Ricky R.] Ales' article "Air Power's Battlespace" with great interest and familiarity. I have had the pleasure of working with Rick on several joint and multi-service doctrine and tactics, techniques and procedures (TTP) projects. Although we frequently disagree on the issues, he's a consummate military professional only concerned with serving his country to the best of his ability. His article discusses Air Force doctrinal principles, the basis for all Air Force positions in procurement, operations and doctrine.

I believe every artilleryman should be aware of the views and beliefs that Lieutenant Colonel Ales presents in his article. I do not maintain that artillerymen should agree with and (or) accept these positions. In many cases, I disagree with Air Force ideology and with the way the Air Force influences joint doctrine.

By reading this article, other military professional publications and Air Force doctrine (*AFM 1-1, Basic Aerospace Doctrine, Volumes I and II* are suggested), artillerymen can begin to understand Air Force positions. Although Lieutenant Colonel Ales' article only discusses the basis for broad doctrinal principles, in the past, the Department of the Air Force has—

- Implied the superiority of the joint force air component commander (JFACC) over the other component commanders.
- Made the statements during Desert Storm that air power alone would win the war.
- Attempted to change the fire support coordinating line (FSCL) from a permissive fire support coordination measure (FSCM) into a boundary.
- Attempted to limit the depth of the joint force land component commander's (JFLCC's) area of operation.
- Stressed the importance of air interdiction (AI) and down-played close air support (CAS) as a mission for the Air Force.
- Tried to gain control over all interdiction operations and assets—including the Army tactical missile system (ATACMS) and Army attack helicopters.

These Air Force actions don't come from a desire to reduce other services' importance or capabilities but instead from fundamental beliefs in the capabilities and best application of air power. The Air Force has a totally different viewpoint of war. As a Naval officer once told a young Marine captain, "Close combat for a Marine is at the end of your bayonet, for the Navy it's 50 miles." The Air Force sees war from an entirely different perspective—one only needs to discuss targeting and targets to have this point driven home.

The Air Force targets are the enemy's capabilities (e.g., oil production, manufacturing and infrastructure, such as

rail/highway network and power grids), whose attack will change his motivation. In these targets are aim points like bridges, well heads and certain buildings. Weaponeers decide which munitions to use, the attack angles and impact points. The Army targets enemy soldiers, their vehicles and the forces that sustain them. Our purpose is to wound, kill or capture the enemy and occupy or control terrain.

We must understand both Air Force processes and fundamental beliefs to better work with them. This is true in both the operational theater and in the joint doctrine arena. For many artillerymen, Lieutenant Colonel Ales' article will be their first exposure to Air Force ideology. I couldn't think of a better place to start.

Vincent R. Bielinski
Chief, Doctrine Division
FA School, Fort Sill, OK

Response to "Today's Air Tasking Process"

Lieutenant Colonel [H. Alleyne] Carter's article [May-June] is a succinct and definitive explanation of the air tasking order (ATO) process. The ATO is not well understood by most in the Army today. We are familiar with the Army decision-making process and preparation of an operations order (OPORD) at each level. The ATO is similar to an Army corps or echelon-above-corps headquarter's constructing an OPORD that addresses objectives, weapons, coordination and possibly tactics for each company of the corps.

After reading the article, I feel there are some important points that must be made. First, each unit must forecast its requirement for air support and request it early. If you don't plan and request air early, it will not be available. The use of all the air support will be decided about 30 hours prior to the ATO going into effect. If we think we'll need close air support (CAS) or have nominations for air interdiction (AI), they must be submitted early. There are no excess aircraft waiting to be used. Army planners at the upper echelons (division and corps) must include air support in their long-range planning. This allows battalions and brigades to do realistic planning for CAS.

Second, the joint integrated prioritized target list (JIPTL) is misnamed. In actuality, it should be called the joint integrated prioritized *air* target list because it contains only those targets that will be attacked by air assets. On that list, you won't find targets the Army will attack for the Navy or Marines or any target to be attacked by surface-to-surface or some air-to-surface (e.g., attack helicopters) weapon systems—unless, of course, it's an Army tactical missile system (ATACMS) mission included for airspace deconfliction purposes.

Vincent R. Bielinski
Chief, Doctrine Division
FA School, Fort Sill, OK

Response to Review of Steel Wind

As a retired "cannon cocker," I frequently drop in at the Base Library at MacDill Air Force Base here in Tampa where I make it a point to look at the latest edition of *Field Artillery*. In scanning the September-October 1995 magazine, I came across Lieutenant Colonel [Russell E.] Quirici's review of the book *Steel Wind*: *Colonel Georg Bruchmueller and the Birth of Modern Artillery* by Colonel David T. Zabecki [USAR Field Artilleryman]. I read it with great interest.

I read the book several months ago, shortly after its publication. I was moved to write a review myself, but soon realized that after 30 years of retirement and, as a practical matter, having had no direct contact with the Field Artillery for 40 years, I had no frame of reference concerning contemporary artillery developments. I, therefore, scrapped the idea. I'm glad I did, for Lieutenant Colonel Quirici's review was both excellent and interesting.

My main purpose in writing this letter is to acquaint you with the following historical note and let you know that the book dispelled a myth that had existed in my mind for 53 years. When I went through officer candidate school and the Field Artillery Basic Course in 1942, I came away with the distinct impression that the US Army had a decided qualitative superiority over German Field Artillery. First, our development of the graphical firing table [GFT] led to the establishment of the battalion fire direction center [FDC], permitted the forward observer [FO] to use the FO method of reporting sensings rather than calculating and sending fire commands and facilitated the massing of battalion fire after the adjustment of one gun. But just as important, through our use of technical target acquisition methods such as sound and flash ranging, the conduct of artillery surveys to locate gun positions and stake out orienting lines and the employment of meteorological data to apply corrections to firing data, we could conduct highly accurate unobserved fire.

Imagine my surprise when I read in the book that the Germans had developed these techniques during World War I. True, as the book points out, they had virtually abandoned these techniques between the wars, allowing us to gain the advantage. But it was quite a surprise to learn they had developed them first.

Another interesting historical note. Despite the fact that the FO method of conducting fire proved to be more efficient than the previously employed battery commander's method (the observer carried firing tables, had to keep factors such as c, D and r/R in his head and sent back fire commands), many battalion commanders disliked the technique. For example, my battalion commander, a former horse cavalryman who transferred to the Field Artillery and had minimum knowledge of Field Artillery gunnery techniques, directed that the FO method would be employed only under extreme conditions. Otherwise, "my officers will fire like real artillerymen, by God!" Needless to say, when the going got hot, that directive was forgotten.

LTC(R) Bernard L. Tauber, FA
Tampa, FL

Reflagging: 2d Armored Division Becomes the 4th Infantry Division (Mechanized)

Military history, traditions, lineage and the future were on display 15 December 1995 as the Army said goodbye to the 2d Armored Division. In a ceremony held at Fort Hood, Texas, the colors of the 2d Armored Division were cased and the colors of the 4th Infantry Division (Mechanized) were unfurled over Texas soil for the first time. Soldiers marched in as members of the "Hell on Wheels" division and marched out as "Ironhorse" soldiers.

The ceremony at Fort Hood was attended by an array of general officers, state and local politicians as well as veterans from both divisions. More than 2,500 soldiers and guests filled the field and stands. Many of the 2d Armored Division landmarks, such as the water tower and entrance signs, were converted to reflect the 4th Infantry Division before the ceremony.

Both divisions have rich and honored histories with many battle streamers and citations for combat actions around the world. The 2d Armored Division activated in 1940. At that time, the division was formed at Fort Benning, Georgia, then the home of the Infantry School and the 4th Infantry Division. The 2d Division earned its nickname Hell on Wheels before entry into World War II under the command of Brigadier General George S. Patton, Jr.

Major General Robert S. Coffey, commander of the 4th Infantry Division, recounted the conflicts that both divisions participated in together: "From North Africa, across the beaches at Normandy, Operations Torch, Overlord, Cobra. Such epic battles as Utah Beach, the Bulge, the Heartegen Forest and Achen.

"The 4th Division was the first American unit to enter the city of Paris, signifying the Allied victories in liberating France. The 2d Armored Division was the first American unit to enter Berlin, signifying the Allied victory in Europe," Coffey continued.

The redesignated 4th Infantry Division will have two maneuver brigades at Fort Hood as well as the division artillery, aviation brigade, engineer brigade, division support command and separate battalions. The 3d Brigade Combat Team will remain at Fort Carson, Colorado, as well as an artillery battalion, engineer battalion, forward support battalion and other brigade support units.

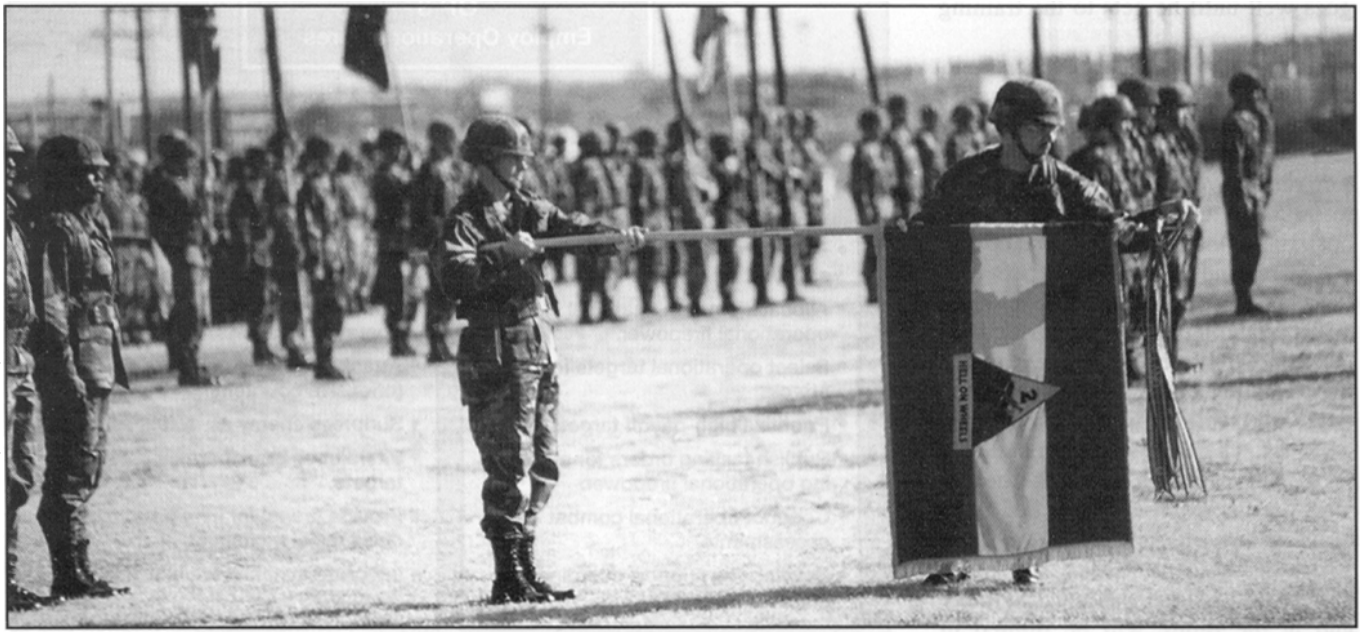
As the 4th Infantry Division colors were uncased and placed in the color guard, veterans who served with the division in World War II or Vietnam were present to assist the division Command Sergeant Major Wayne L. Sills in attaching the 21 battle streamers to the division flag.

After the division flag was posted, a new flag never flown before came onto the parade field. The light blue flag with red and dark blue arrows and the words "Force XXI" was passed from Lieutenant General Thomas A. Schwartz, III Corps Commander, to Major General Coffey, signifying the designation of the the 4th Infantry Division as the Army's Experimental Force, or EXFOR. The EXFOR will lead the Army into the 21st century.

During the next year, the EXFOR will test and evaluate many Division XXI objectives, cluminating in a Task Force XXI rotation at the National Training Center, Fort Irwin, California, in February 1997. The Division XXI evaluation is scheduled for November 1997.

Regarding the division reflagging, Major General Coffey said. "Our colors may have changed, but two things remain consistent—these soldiers are still members of America's Army, the best fighting force in the world today....These soldiers...America's sons and daughters, will lead us into the future."

MAJ Mark R. Newell
Public Affairs Officer
4th IN Div, Fort Hood, TX



SSG Richard Puckett, 13th PAD, 4th ID

Colonel Lawrence R. Adair, 4th Infantry Division (Mechanized) Artillery commander, holds the 2d Armored Division Artillery guidon as his Command Sergeant Major Harold E. Lewis furls it for casing during the reflagging ceremony on 15 December 1995.

The Div Arty's Role in the Division as an ARFOR

(or Why Captains Need to Understand the Operational Art)

by Lieutenant Colonel Dennis M. Murphy and Major Robert G. Bledsoe, USAF

You're a captain fresh out of the advanced course. You've done all of the things necessary to prepare you for the ultimate challenge in your career—battery command. Upon arriving at your new duty station, you report to the division artillery (Div Arty) S1. You sent an introductory letter to the Div Arty commander—but just to make sure, you emphasize to the S1 you want to command. A knowing smile follows: "Captain, the wait for command is at least one year. We've assigned you to the division FSE [fire support element] as a planner."

Ugh! Your trudge across post to meet the deputy fire support coordinator (DFSCOORD) allows you time for an attitude adjustment. Looking on the bright side, in the FSE, you'll have more exposure to the Div Arty commander than most of your peers—if you do your job well, you can get that battery command in a year.

Your in-brief with the DFSCOORD goes well until he gets to the training calendar.

"Captain, the next major event is Rolling Thunder. The division will act as the ARFOR [Army forces] headquarters for a JTF [joint task force]. This is a mission we rarely have the opportunity to train for. Our headquarters will be operating at the operational level of war.

"We're conducting OPD [officer professional development] and developing SOPs [standing operating procedures] to prepare for the exercise. I need you to be intimately familiar with the procedures we'll follow prior to execution."

Uh, oh. The advanced course didn't prepare you for this, and it has been a long time since you've cracked open Sun Tzu and Clausewitz.

An unlikely scenario? Not at all. More and more missions encountered today and in the future will be limited in nature but have strategic and operational significance. The 10th Mountain Division's role in Somalia is one example.

So how familiar are you with the operational art of war? What's different about fighting the Div Arty as part of an ARFOR versus a division? What's the doctrine? Do tactics, techniques and procedures (TTPs) exist?

Operational Operating Systems

One of the major differences in your role in the FSE supporting an ARFOR is the tasks you must perform, as described in the Universal Joint Task List.[1] While you still have tactical requirements, your focus must shift to the operational level, both in your own mission and dealings with the JTF. The six operational-level operating systems are movement and maneuver, protection, command and control, intelligence, support and firepower. No longer are you dealing with fire support, per se. Your overarching task is to "employ operational firepower," which includes conducting joint force targeting and attacking operational targets (see Figure 1).

These sub-tasks go well beyond your previous scope of responsibility and expertise. They encompass air tasking orders (ATOs), combat assessment, non-lethal attack, offensive counterair and interdiction, to name but a few.[2] So, do you have to develop expertise in all these areas or should you augment your FSE with experts? The answer—both. Let's look at an example that may shed some light on your new responsibilities and the expertise required to deal with them.

The ARFOR mission in Rolling Thunder is a peace enforcement mission that may require providing humanitarian assistance to belligerent forces. This supports an operational center of gravity aimed at ensuring a perception of fairness among the belligerents. The ARFOR is responsible for ensuring assistance convoys are escorted and protected and distributing food when it arrives.

Minimal FSE requirements, right? Think again. One of your most important sub-tasks is to "conduct non-lethal attack on operational targets." Your responsibility is to do what you do best—conduct the deep "fight."

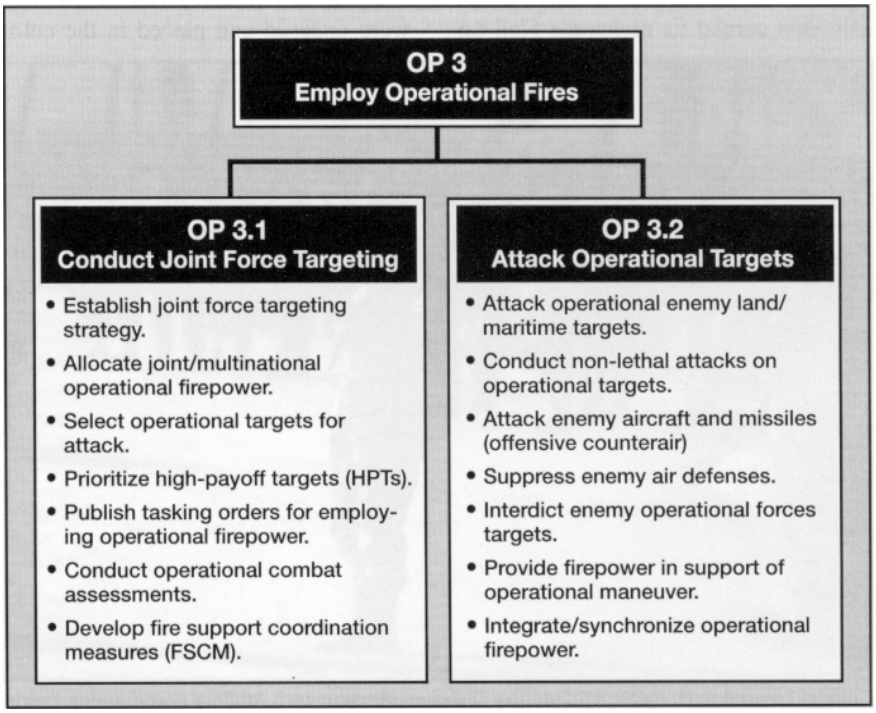


Figure 1: Operational Level of War Firepower Tasks

Div Artys are proficient at conducting deep operations and shaping the battlefield with lethal fires and electronic warfare (EW). Our combat training centers (CTCs) have ensured that. But are you prepared to "strike" a target with psychological operations (PSYOP), with civil affairs (CA)? How about integrate public affairs (PA) into your operations? If you receive human intelligence (HUMINT) that belligerent artillery batteries will attack the convoy, are you prepared to respond, given the restrictive rules of engagement (ROE)?

Non-Lethal Firepower

You've probably never thought of integrating information warfare as non-lethal fires under the lead of the FSCOORD and his FSE. Consider this: does PSYOP have a target or target audience? CA or PA? If so, perhaps the targeting process—*decide, detect, deliver, assess*—is the best methodology for the integration effort. The FSCOORD has the experience and rank to pull this shaping effort together. He has a staff that's trained in the methodology and an established battle rhythm the division understands. He does need help, however, in both subject matter experts and liaisons.

An ARFOR should be augmented by a dedicated command and control warfare (C^2W) cell. This staff section contains experts in PSYOP, physical destruction, EW, deception and operations security (OPSEC). PSYOP, physical destruction and EW represent the major targeting functions of C^2W, and the C^2W officer, doctrinally, brings these functions to the targeting meeting for integration.[3] Additionally, the C^2W cell habitually coordinates with CA and PA[4]; their inclusion in the cell makes sense and has proven effective in training and information operations war games.[5] For a notional C^2W cell, see Figure 2.

Consider our example. G3 Plans, as always, takes the lead in war-gaming courses of action (COAs) for the operation. Representatives of all the operational operating systems are present to integrate and synchronize their actions for success. You represent the firepower operating system.

Firepower, as expected, will provide an initial prep or "deep strike" (in this case, information warfare) to shape the battlespace. Additionally, the firepower operating system will play an integral role in attacking belligerent artillery, if it fires on the convoy.

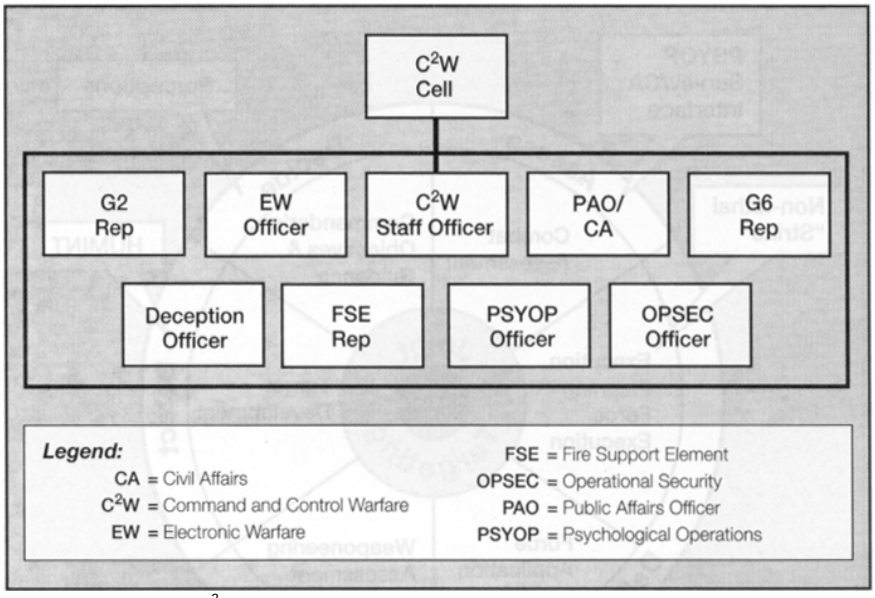


Figure 2: A Notional C^2W Cell. This cell works for the G3 and provides input to the targeting cell.

You take the results of the G3 war game for the selected COA back to the FSE to further integrate and synchronize the activities of the assets you control. The firepower synch produces a "deep strike" where PSYOP informs the local populace of the relief effort. PSYOP personnel may do this by airdropped leaflets, loudspeaker or even handbills. Having the PSYOP expert at your synch drill ensures you'll use the most efficient means available.

Also as part of the "deep strike," CA will inform local officials, establish the distribution sites for food and ensure equitable distribution among the populace. PA will ensure the widest possible coverage of the event, thereby providing truthful public information that portrays the effort as being fair to all.

In this phase, PSYOP has the additional mission of informing belligerent artillery batteries of knowledge of their intent and the consequences if they attack. This effort is backed up by a show-of-force that could include fighter flyovers and an AC-130 combat air patrol (CAP), given the enemy has a limited air defense capability.

If this initial "deep strike" is effective and if you have properly shaped the battlespace, the close fight (counterfire against belligerent artillery) may never be joined. Naturally, you prepare for the close fight by positioning radars, establishing priority targets and arranging for attack helicopter escorts, as necessary. Still, the importance of the initial shaping effort with non-lethal fires cannot be overemphasized.

This mission and the assets described to support it fit the Army's targeting methodology. The "perception of fairness" is the operational center of gravity and so certainly will be established as a high-payoff target (HPT) during initial crisis planning. This is the *decide* phase.

Detect relies heavily on HUMINT when focusing on non-traditional HPTs, such as perceptions. Perhaps Special Operations Forces (SOF) integrated in the community or among the belligerent forces will hear of the planned artillery strike and report it. CA may hear of it in its dealings in civil-military commissions. While it may sound strange to think of these examples as sensor-shooter links, that's exactly what they are.

The example speaks in detail of the *delivery* phase of the non-lethal fires assets.

Assess is a difficult yet critical part of this mission. How do you determine if perceptions of the people have been changed by the delivery of aid? You may have to have PSYOP personnel survey the people as to their feelings once the aid begins to flow. CA also could receive feedback in its dealings with local officials. Having these functions fully integrated into the targeting process under the lead of the FSCOORD ensures these assessments will get back to the right place for consideration and "restrike," as necessary. For an example of the joint targeting process with notations of non-lethal fires to shape conditions (perceptions) on the battlefield, see Figure 3 on Page 8.

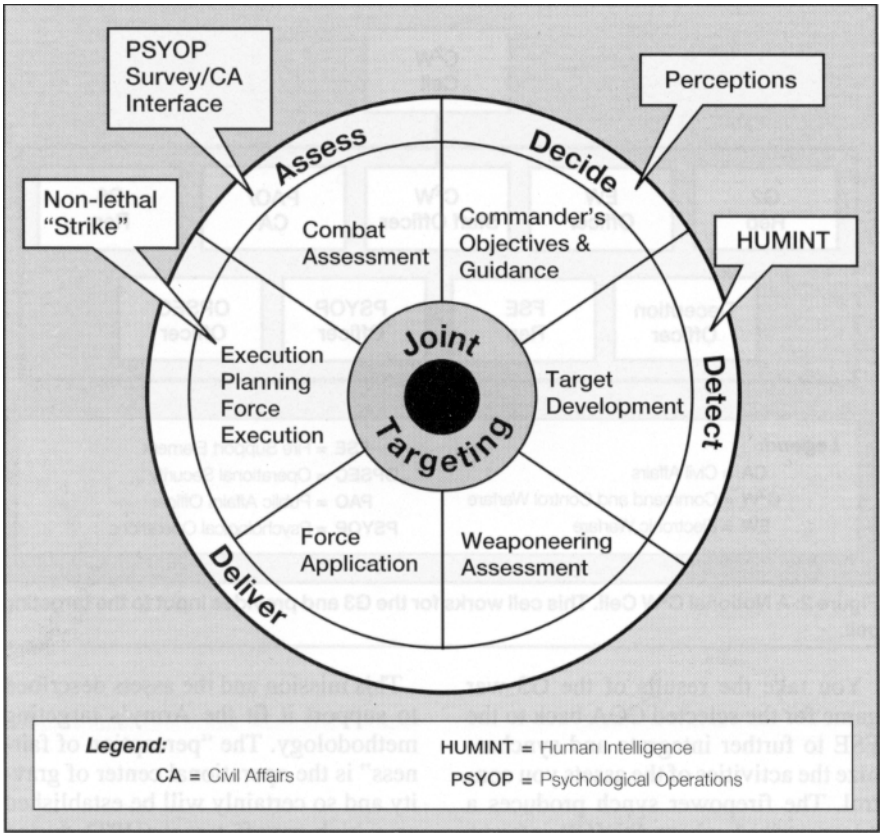


Figure 3: Joint Targeting Process with Notations for Non-Lethal Fires

It is apparent that for this process to succeed, the addition of the C^2W cell is critical. But what other expertise or interfaces must occur beyond those usually found in the FSE?

Army-Air Force Interface

The request for a fighter fly-over is no different than before. You submit a preplanned air request to corps. If you need to send an immediate close air support (CAS) request to support a convoy, your air liaison officer (ALO) uses his air channels to the corps' air support operations center (ASOC) to secure that support. Right?

Wrong! Don't forget—you're the ARFOR. There's no corps, no ASOC. The next level of command is the JTF. The joint force commander (JFC) may have selected a joint force air component commander (JFACC) to control the JFC's air power. If so, you need to coordinate with that headquarters, something a division normally does not do. Again, augmentation may be your best answer.

The battlefield coordination detachment (BCD)—previously called an element (BCE)—can provide the liaison essential to the air-ground operations effort from the ARFOR headquarters to the JFACC. Normally the BCD works in the JFACC's headquarters at echelons-above-corps in the air operations center (AOC). The BCD analyzes the land battle for the JFACC and serves as an interface between components to exchange intelligence and operational data as well as support requirements.

Because the division may not be comfortable with how a BCD operates in an AOC or understand what information exchange should take place between the respective operations centers, the division should request BCD augmentation to their headquarters. The BCD cell can help the division commander and his staff pose the right questions and formulate their air support needs for forwarding to the JFACC. The size of the cell is mission-dependent, but you don't want to request such a large cell that it inhibits BCD operations in the JFACC's AOC.

Another area the division may consider requesting augmentation for is the division ALO and his tactical air control party (TACP). Most likely, the TACP isn't manned, equipped or trained to coordinate for air support of an ARFOR. The ALO can augment his staff with equipment and trained personnel identified through mission analysis to provide the ARFOR the support it needs—air interdiction and CAS development, intelligence, joint suppression of enemy air defenses (J-SEAD), logistical support and airlift expertise.

You should be able to access the Air Force's contingency theater automated planning system (CTAPS) through your ALO. CTAPS automates the AOC and ASOC battle staff planning and management functions. Access to the system will tie you and your ALO directly to the JFACC and BCD, allowing for better mission support.

CTAPS provides information on a multitude of related areas, including the details for ATO planning, generation and dissemination; the airspace control order (ACO); and information on targeting data, aircraft times, air defense status and E-Mail listings, to name a few. Without this information, it is difficult for your ALO to support the ARFOR headquarters. As a result, depending on the number of systems and trained operators available, the division headquarters/ARFOR should have a CTAPS terminal for immediate access to the information.

Doctrine for Division as an ARFOR

At a minimum, current doctrine provides a start point for the study of the division as an ARFOR. Even if the ARFOR mission doesn't rate inclusion in your mission-essential task list (METL), you should have the right doctrinal manuals available in the FSE.

Although the new *FM 71-100 Division Operations* touches on the requirements for the ARFOR, it is cursory at best. The bottom line is that the footlocker full of manuals you normally take to the field probably won't give you much insight into the joint world, so you'll need to research and gather appropriate materials.

One of the best Army manuals is *FM 100-7 Decisive Force: The Army in Theater Operations*. It has a chapter that is essentially a primer on the operational operating systems and an expanded discussion of the firepower operating system. The *Universal Joint Task List, Version 2.1* (*Chairman of the Joint Chief of Staff Manual 3500.04*) lists and describes all fires tasks at the tactical, operational and strategic levels. It is a

must for any Div Arty that anticipates a mission to support its division acting as an ARFOR.

Ten long years after the passage of the Department of Defense (DoD) Reorganization Act dictating the armed services develop joint doctrine and train together, joint doctrine and warfighting are here and here to stay. J*oint Pub 3-09 Doctrine for Joint Fire Support* is in final draft. *Joint Pub 3-13.1, Joint Doctrine for Command and Control Warfare* is an excellent reference for integrating non-lethal fires. *Joint Pub 3-56.1 Command and Control for Joint Air Operations* discusses the role of the JFACC, joint ATO, BCD and joint targeting cycle. All joint publications are now in the Joint Electronic Library (JEL), which is on a CD-ROM. (The JEL CD-ROM is available through normal channels to get publications.)

Most often, our divisions will be called upon to operate as an ARFOR in a time of crisis—the worst possible time to start determining staff organization and responsibilities. The information age guarantees that even our most junior soldiers will perform acts that may have operational or even strategic significance. Our junior leaders must be prepared for these missions—must understand the operational art of war and their role in potential missions.

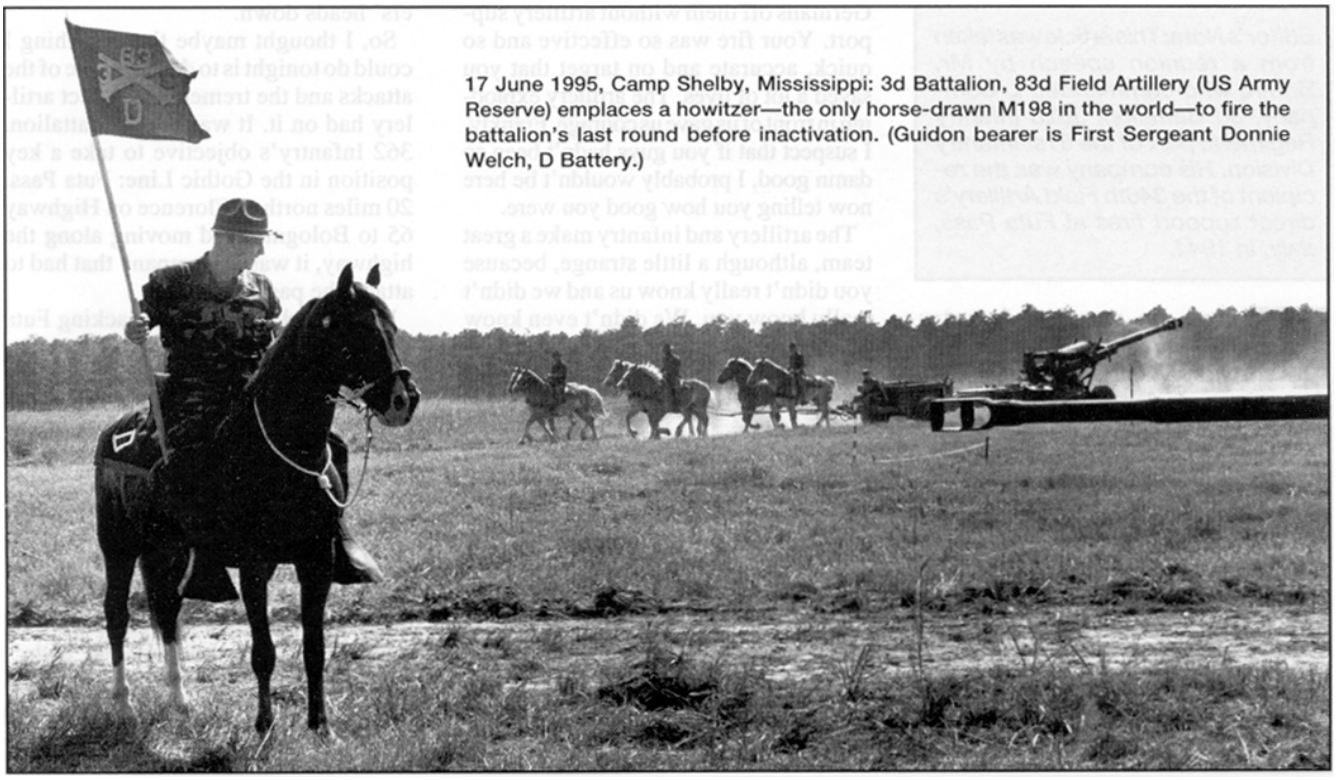
With the proliferation of operations other than war, we must recognize the importance of non-lethal fires as well as the vertical and horizontal operational links required for success in employing them. Waiting until tomorrow could be too late.

Lieutenant Colonel Dennis M. Murphy is the Senior Firepower Observer/Trainer on the Battle Command Training Program's (BCTP's) Operations Group Delta, Fort Leavenworth, Kansas; Operations Group Delta observes and trains Army commanders and staffs at the operational level of war, typically at the joint task force (JTF) or the army force (ARFOR) headquarters. He commanded the 4th Battalion, 29th Field Artillery in the 1st Armored Division, Germany, the division in which he also was the Deputy Fire Support Coordinator (DFSCOORD). Lieutenant Colonel Murphy served in the 101st Airborne Division (Air Assault), Fort Campbell, Kentucky, as a Battalion Executive Officer and S3 and Brigade Fire Support Officer. He holds a Master of Science in Mechanical Engineering from Pennsylvania State University and is a selectee for senior service college.

Major Robert G. Bledsoe, US Air Force, is the Chief Observer/Trainer of Joint Air Component Operations at BCTP's Operations Group Delta, Fort Leavenworth. He is a senior pilot with more than 2,700 hours of flying time. He was an Instructor Pilot, Flight Commander and Assistant Operations Officer flying F-15Cs out of Elmendorf AFB, Alaska; and F-117 Instructor Pilot and Flight Examiner for four years in the 4450 Tactical Group based in Nellis AFB, Nevada, participating in both Operations Just Cause and Desert Shield. Major Bledsoe also served for three years in the 149th Tactical Fighter Squadron, Air National Guard in Richmond, Virginia, flying A-7s. He is a graduate of the US Army Command and General Staff College at Fort Leavenworth and holds a Master of Science in Administration from Central Michigan University.

Notes:

1. *Universal Joint Task List, Chairman of the Joint Chiefs of Staff Manual 3500.04* Version
2. 1 (Washington, DC, 15 May 1995).
2. Ibid., 2-83 to 2-88.
3. Joint *Publication 3-13.1, Joint Doctrine for Command and Control Warfare* (Washington, DC, February, 1996), II-9.
4. Ibid., IV-6.
5. A Training and Doctrine Command (TRADOC)-directed information operations war game was conducted from 14 to 21 November 1995 at Fort Huachuca, Arizona. Results showed the need for integrating CA and PA into the C^2W cell.



17 June 1995, Camp Shelby, Mississippi: 3d Battalion, 83d Field Artillery (US Army Reserve) emplaces a howitzer—the only horse-drawn M198 in the world—to fire the battalion's last round before inactivation. (Guidon bearer is First Sergeant Donnie Welch, D Battery.)

Highway 65 South of Futa Pass

WWII:
Fires At Futa Pass

by Fred W. Booth

Editor's Note: *This article was taken from a reunion speech by Mr. Booth, who commanded L Company, 3d Battalion, 362d Infantry Regiment, part of the 91st Infantry Division. His company was the recipient of the 346th Field Artillery's direct support fires at Futa Pass, Italy, in 1944.*

There's no way the Infantry could do anything without the Artillery. As I think back on those times, facing the great 50-mile deep mountain mass of the central Apennines, invariably one of the most important things that comes to mind is the tremendous effect the artillery had. Day after day, night after night, mountain after mountain, you artillerymen made it possible for us to attack.

Many of you have been to Italy and have seen those mountains—it was almost impossible to go up them, many went straight up. There's no way we could have gotten to the top of first one and then another mountain or driven the Germans off them without artillery support. Your fire was so effective and so quick, accurate and on target that you saved a lot of lives. The artillery exploding in front of us gave us courage. Frankly, I suspect that if you guys hadn't been so damn good, I probably wouldn't be here now telling you how good you were.

The artillery and infantry make a great team, although a little strange, because you didn't really know us and we didn't really know you. We didn't even know where you guys were; you just fired for us. The key was the forward observer who brought the infantry and the artillery together.

Early in the campaign, when we first jumped off in Italy in June of '44, the artillery observer used to be right up with the company commander; that was the case for the first three or four weeks of our attacks. But it didn't work out very well because when we got pinned down, our observer was pinned down. And many times we couldn't see much right up front in the attack. It made more sense for the artillery observer to move farther to the rear where he had a better view of the situation. As a company commander, I always had radio contact with my artillery observer.

Later, it was interesting to talk with some of you Redlegs to find out you were back there loading those cannons and firing those shells but never saw them land, never saw what great effect those shells had on the course of the battles. Well let me tell you, those shells killed many Germans and kept the others' heads down.

So, I thought maybe the best thing I could do tonight is to describe one of the attacks and the tremendous effect artillery had on it. It was the 3d Battalion, 362 Infantry's objective to take a key position in the Gothic Line: Futa Pass, 20 miles north of Florence on Highway 65 to Bologna. And moving along the highway, it was L Company that had to attack the pass head on.

We moved to the east, attacking Futa Pass to the northwest. The reason for this approach was the concrete fortifications the German had constructed faced south on Highway 65. They had even dug in the turret of a tank with its gun pointing down Highway 65.

We knew we were going to have to break the Gothic Line that day, and we knew it was going to be a tough day. But that day got tougher sooner than we thought. As we started up the hill, we hit a series of fortified bunkers we hadn't realized were there. We were into the middle of them before we were aware they were there, and the Germans pinned us down.

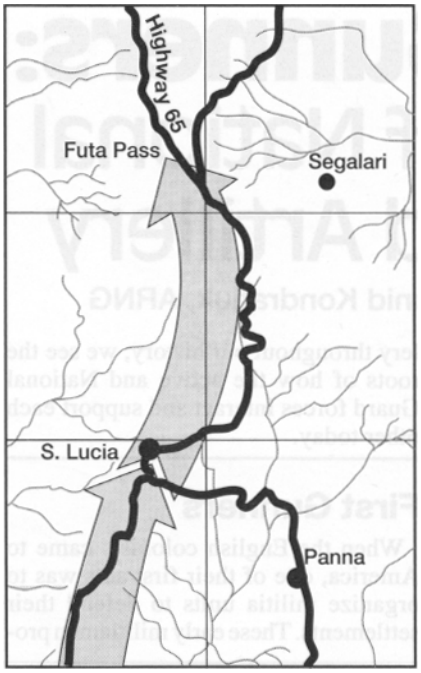
We had to use the rifle company's old fire-and-movement technique where a couple of guys covered the bunker and a couple of others take it and so forth, bunker by bunker. We were good at this by this time; all our companies had been in combat a long time. We had very good non-coms and officers and we knew how to fire and move. But still, it took us about two hours, two hours we hadn't expected to spend moving through those first German fortifications.

And then we came upon a hill, the last hill in Futa Pass. The damn thing was like a ski slope—it went straight up. There was no cover on that hill. We couldn't go around to the left because the highway and concrete bunkers were there. We couldn't go to the right because the terrain was rough, more sheer.

God knows I didn't want to send my company straight up that hill against a dug-in enemy, but all we could do was go up that slope. So I contacted the forward observer who was in a position to see where we were and where we needed to go.

About this time, the Germans started firing 120-mm mortar rounds behind us, trying to zero in on us; those mortars are so huge they sound like freight cars coming down on you. I knew damn well we had to get out of there quickly. Through my glasses I could see the top of the "ski slope." Germans were all over the place. They were in cement fortifications two-thirds of the way up the hill and at the top.

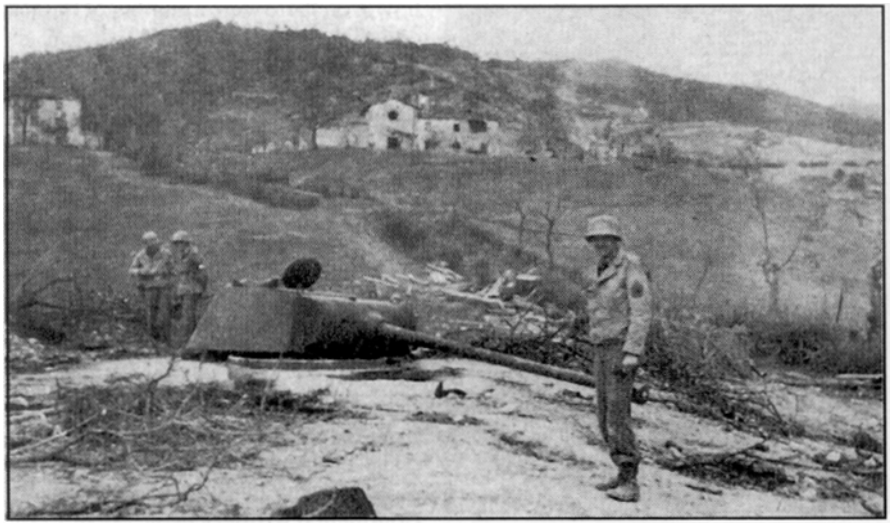
So, I asked the FO, "How soon can you get artillery on that hill?" His answer: "Oh, in about two minutes." It took us that long to get ready to move.



The 362d Infantry moves north to Futa Pass along Highway 65 toward Bologna.

The artillery fire started about halfway up the hill. It was *incredible;* the whole place exploded with artillery. It looked like you shot all the artillery in the Mediterranean Theater on that hill.

I had two platoons up front and two behind in reserve. We moved out and hugged our artillery fire as close as we could. As we moved up, the artillery fires moved up—a wall of fire in front of us to the top of the hill. We got to the top, the artillery lifted and there was chaos everywhere. Dead and wounded Germans were all over; two bunkers loaded with soldiers had taken direct hits.


One of the Tiger tank turrets guarding Futa Pass blasted from its concrete emplacement by artillery.

So, I guess what I'm telling you is we never would have made it to the top of that hill without that tremendous artillery support. And, when we did reach the top, we had some tough fire fights, but we cleared the area.

Futa Pass was a classic example of the infantry and artillery working together. The artillery made it possible for us to break through Futa Pass, a strongpoint of the Gothic Line. With careful training, the technique applies today, especially when things start to get hot in peace keeping or peace enforcement operations. The capabilities of the future Crusader to fire four rounds for simultaneous impact, a one-howitzer time-on-target (TOT), will allow our forces to mass more rounds faster using fewer weapons systems. But the Artillery must never forget how to support the Infantry up close and personal with a rolling barrage of fires the Infantry wants to hug until they "reach the top." It increased our courage to know that time and again the artillery would be there when we needed it.

After taking Futa Pass, I remember standing on Highway 65 late in the day at the top of the hill, which was literally in the middle of pass. We had had a terrible day—a lot of casualties. We killed a lot of Germans and had taken many prisoners. Wearily, I radioed battalion that we had cleared the pass. Did the major say "Thank you" or "Congratulations"? No, he said, "Be sure and send some people back down along Highway 65 to clear out those concrete bunkers." Then he said, "As soon as it gets dark, I'll send up orders for the next day's attack." And so he did.

Fred W. Booth of Minneapolis, Minnesota, is President of the 91st Infantry Division Association. During World War II in Italy, he commanded L Company, 3d Battalion, 362d Infantry Regiment, 91st Infantry Division. The 346th Field Artillery provided direct support to the 362d Infantry. Mr. Booth was the banquet guest speaker 10 September 1995 in Seattle, Washington, at the 346th Field Artillery's 50th Anniversary Reunion, to the day, of the battalion's disembarking in Boston Harbor from Italy. Mr. Booth left the Army as a Captain in 1946. In his post-war career, he worked in public relations, retiring as Senior Vice President and Creative Director for Colle and McVoy Advertising Agency of Minneapolis.

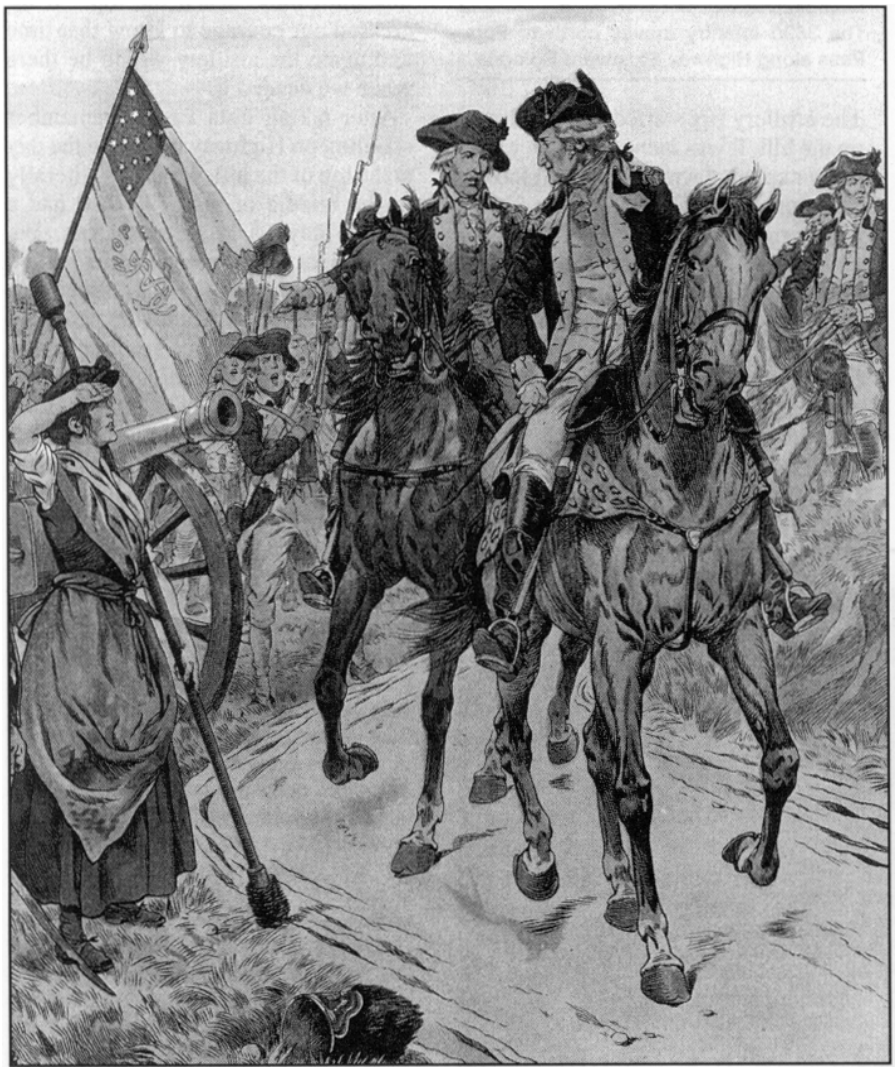
Citizen-Gunners:
A History of National Guard Field Artillery

by Lieutenant Colonel Leonid Kondratiuk, ARNG

Since the early 1600s—for more than 368 years—the Army National Guard (ARNG) has provided Field Artillery in both colonial and American wars. Guard artillery traditionally has been the largest percent of the Army's Field Artillery force during peacetime and has been the largest source for personnel and units at the beginning of most of our nation's wars. As we look at America's Total Field Artillery throughout our history, we see the roots of how the active and National Guard forces interact and support each other today.

First Gunners

When the English colonists came to America, one of their first acts was to organize militia units to defend their settlements. These early militiamen provided their own weapons and equipment. Along with armor, matchlocks, swords and pikes, the colonists also brought artillery from England. The militia of the Massachusetts Bay colony brought heavier guns, including at least one 18-pounder.



For her heroic role "womaning" the guns at the Battle of Monmouth in 1778, Molly Hays McCauly ("Molly Pitcher") received a warrant as an NCO from General George Washington.

In 1628, Samuel Sharpe was appointed Master Gunner of the Massachusetts militia. He and his successors were responsible for all artillery matters. In 1636, the colony's infantry companies were organized into three regiments. Two years later, the Ancient and Honorable Artillery Company was created as a volunteer militia unit with the mission of training its members in the military arts, including gunnery.

During the mid-17th century, other colonies began organizing volunteer militia artillery companies. Composed of volunteers (as opposed to common militiamen obligated by law to serve), militia artillerymen wore uniforms and served in at least partially equipped units that drilled on a regular basis. These first American artillery units were in towns and cities such as Boston; New York; Philadelphia; Newport, Rhode Island; and Charleston, South Carolina.

Volunteer companies usually were issued cannon, powder and provided a storage shed either by the colony or the town. Their uniforms usually were blue, similar to those worn by England's Royal Artillery. Militia artillerymen worked as mechanics, artisans and shipwrights during the week; trades technical in nature were necessary for the repair of artillery. On the eve of the American Revolution, militia artillery consisted of a few old and pitted guns; however, there were a number of trained colonial artillerymen.

When the Revolution began in April 1775, the Massachusetts Committee of Public Safety had already planned to organize a regiment of artillery. On 10 May 1775, it issued the orders and appointed Colonel Richard Gridley as commander. The regiment was mustered between May and June 1775 with the cadre coming from the Boston and Rhode Island militia artillery companies and entered Federal service as the Continental Artillery Regiment. This first regular regiment of artillery came from the militia.

The Philadelphia Artillery Company probably provided personnel for the 4th Continental Artillery in the fall of 1775. This early interchange of artillerists from the militia to the regulars and, later, regulars

to the militia set a pattern that continues today.

During the Revolution, militia batteries came on active duty for specific campaigns and served alongside the Continentals. The Artillery Battalion of Charleston, organized in 1756, took part in the battle for Charleston. Batteries of the Philadelphia Artillery Battalion fought in New Jersey at Trenton, Princeton, Brandywine and Germantown. The Beaufort (South Carolina) Independent Artillery was at Charleston and Savannah. All three of these units still serve in today's National Guard.

The most famous American artillery officer of the Revolution was Henry Knox, the second Chief of Artillery. Knox began his military career in the Boston Train of Artillery, Massachusetts militia. The unit consisted of only three guns but received its training from Royal Artillery officers stationed in Boston in the years before the Revolution.

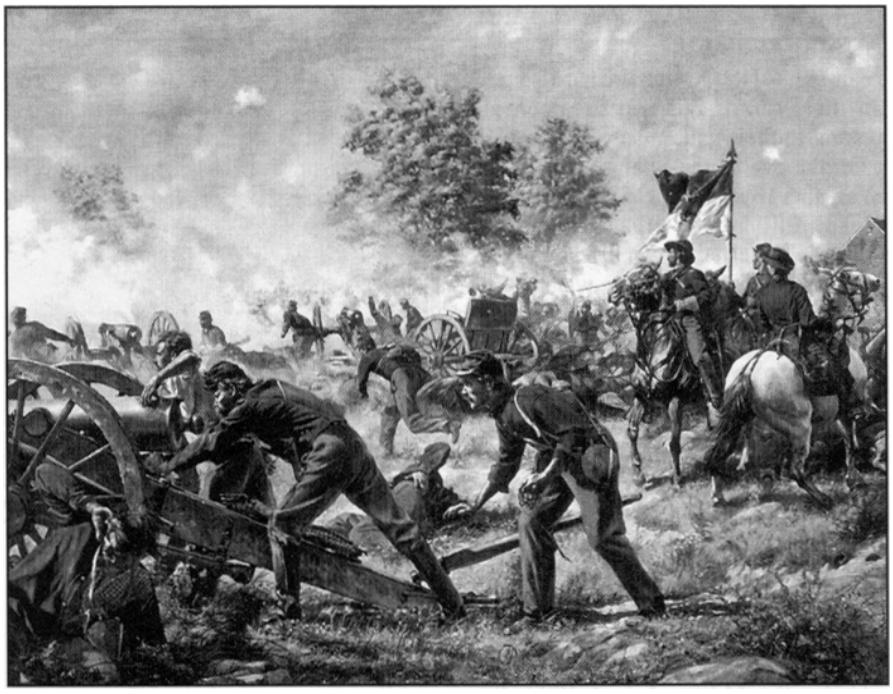
The Founding Fathers decided that the nation's defense establishment would consist of a small regular army and a large militia. During wartime, the militia was to provide the bulk of the units. From 1775 to 1940, the militia/National Guard was the largest component of the Army, and militia/Guard artillery units provided the largest number of units and personnel at the beginning of nearly every war.

Under the Militia Act of 1792, states were required to organize one battery of artillery for each infantry division. This first Federal requirement for militia artillery also stipulated that the battery would consist of one captain, two lieutenants, four sergeants, four corporals, six gunners, six bombardiers, a drummer and a fifer.

Artillery units were made up of uniformed volunteers. Guns were either issued by the War Department or the state. Some wealthier units bought their own cannons. Militia artillerymen served without pay, bought their own uniforms and contributed to the unit fund used to buy equipment. These batteries were concentrated in the cities that had both the wealthy citizens and mechanics necessary to support the unit and maintain the guns.

1800's Artillery

The period between the War of 1812 and the Civil War was, literally, the most colorful period in the Guard's history.



"Retreat by Recoil" Painting by Don Troiani, Historical Art Prints, Southbury, CT

The 9th Battery, 1st Massachusetts Light Artillery at Gettysburg on 2 July 1863.

Volunteer militia units organized all over the country. Each took great pride in its drill, and each wore its own full-dress uniform. Units attended summer camps, provided salute batteries for ceremonies and parades and, as necessary, put down insurrections and riots.

Units were known by distinctive designations. A volunteer could join the Richmond Howitzers, the Philadelphia City Grays, the Washington Artillery or the California Flying Artillery. While light infantry units competed with one another in drill competitions, artillery units showed off their gunnery skills. In 1843, the Alabama State Artillery of Mobile and the Native American Artillery of New Orleans fired their six cannons at 10-foot targets 480 yards away. The Alabama gunners won with 32 hits.

As the nation headed toward the Civil War, artillery training became more serious. With the outbreak of war in April 1861, virtually the entire Northern-organized militia entered Federal service for 90 days, the maximum under the Militia Act. Likewise, Southern militia units became the foundation for the Confederate Army.

Northern militia batteries served their 90 days, returned home and reorganized as batteries of three-year volunteer artillery. The Boston Light Artillery (today the 101st FA) returned home and provided the cadre for five batteries of the Massachusetts Light Artillery. The Providence Marine Corps of Artillery (today the 103d FA) served as the regimental depot and cadre for the 1st Rhode Island Light Artillery. The 1st Light Artillery Regiment, Ohio militia (today the 134th FA), entered Federal service as a volunteer regiment in April 1861 and mustered out four years later. The Artillery Corps Washington Grays of Philadelphia furnished 181 commissioned officers; many served in Pennsylvania's volunteer batteries.

The Northern states organized 222 separate batteries and 41 regiments of artillery. While most did not have a previous militia connection, state adjutants general raised all these units under the militia laws of the state and mustered them into Federal service.

In the South, prewar militia batteries were recruited to war strength and entered Confederate service as separate batteries. The Washington Artillery of New Orleans (today the 141st FA) expanded to a battalion and was one of the Army of Northern Virginia's best artillery units. The Washington Artillery of Charleston reorganized as horse artillery and served in Major General J.E.B. Stuart's cavalry division. The German Artillery, also of Charleston, served in Hood's Division. The Virginia batteries (today the 111th FA) entered service for the duration in the Army of Northern Virginia as did the Chatham Artillery of Savannah (today Headquarters and Headquarters Battery, 1st Battalion, 118th Field Artillery). These units and others fought in the major battles of the Civil War; the colors of the 15 senior

regiments of the National Guard's Field Artillery carry Civil War streamers attesting to their gallant service.

On the eve of the Spanish-American War, there were some 5,000 National Guard artillerymen organized into 33 separate batteries, seven battalions and two regiments. During the war, nearly all these units entered Federal service. While no batteries served in Cuba, three batteries from the California and Utah National Guard deployed to the Philippines where they saw extensive service in the Philippine Insurrection. Three Pennsylvania batteries served in the campaign for Puerto Rico.

National Archives

A battery of National Guard artillery on a road march along the Mexican border, 1916.

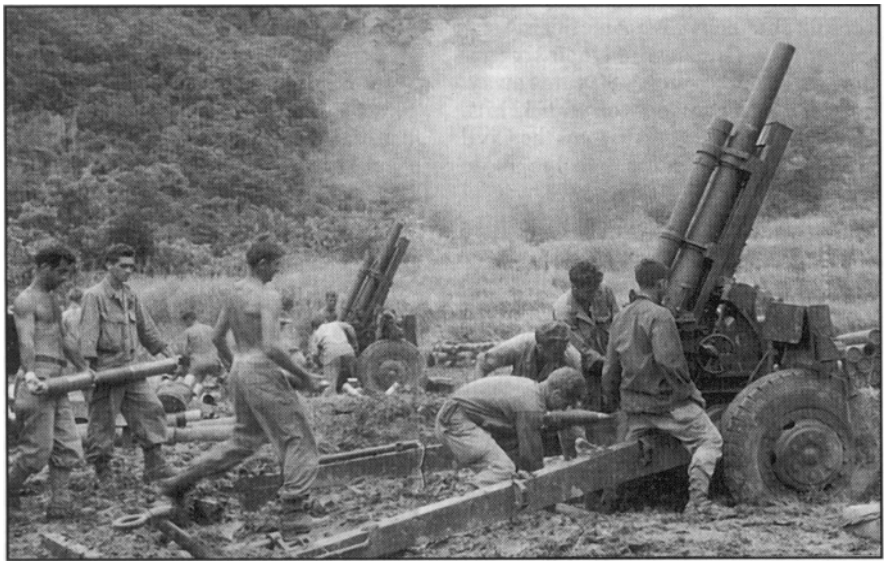
Guard Artillery in the World Wars

Under the Militia Act of 1903, the National Guard became the Army's primary reserve. This act and succeeding acts revitalized and modernized the National Guard. For the first time, the War Department directed the Guard's peacetime force structure. At the same time, more modern artillery, such as the Model 1905 3-inch gun, entered the Guard's inventory. The National Defense Act of 1916 authorized full-time stable sergeants, artillery mechanics and the issue of Army horses.

All 108 batteries with nearly 10,000 officers and enlisted men were mobilized in June 1916 for duty on the Mexican border. While they did not see action, they trained hard before being released in late 1916 and early 1917.

The National Guard reentered Federal service in the spring of 1917 when the US declared war on Germany. The artillery force expanded to 50 regiments assigned to 17 National Guard infantry divisions. Guard artillery units were redesignated as well; the 1st Massachusetts Artillery became the 101st US Field Artillery Regiment while the 1st Rhode Island became the 103d US Field Artillery Regiment.

Although a large force, the Guard's Field Artillery was untrained and poorly equipped due to rapid expansion. Officers and enlisted men underwent extensive training, both in the US and France. Once in France, Guard artillery saw plenty of action. Guard gunners not only supported their own divisions, but also frequently supported other US units as well as French units. Guard artillery made up 40 percent of the artillery assigned to the American Expeditionary Force.



A battery of 105-mm howitzers from Illinois' 122d FA Battalion, 33d Infantry Division fire at Japanese forces in the Philippines, June 1945.

After World War I, the Army reorganized under the National Defense Act. The National Guard retained its position as the largest component while Guard Field Artillery assumed its traditional role as the largest source of units in wartime. The Guard fielded 78 regiments assigned to six separate Field Artillery brigades, 18 divisional brigades and General Headquarters Reserves. The regular force was reduced to fewer than 20 partially organized FA regiments.

During the Depression, Guard training and readiness was low due to lack of funding and weapons and equipment grew increasingly obsolescent. One bright spot was the National Guard Bureau's plan to replace horses with trucks. By 1940, only one horse artillery regiment was left in the Guard.

The annual training for 1940 was increased to three weeks instead of the normal two weeks. National Guard units had been ordered to prepare for the war mobilization that began in September 1940. Some 50,000 Guard artillerymen made arrangements for their families as they left their jobs and reported for active duty.

The Guard's 78 artillery regiments greatly increased the Army's Field Artillery force. New guns and equipment began to arrive as units began to build from 50 percent strength (their limit in peacetime) to 100 percent war strength. With the reorganization of Field Artillery regiments to separate battalions, the National Guard provided 156 battalions, 35 group headquarters and headquarters batteries (HHBs) and 10 corps artillery HHBs.

In World War II, Guard artillerymen were the first to deploy to the Pacific Theater; the 2d Battalion, 131st Field Artillery of Texas took part in defensive operations in Java in March 1942. The 147th Field Artillery of South Dakota was on its way to the Philippines when it was diverted to Australia on 23 December 1942, becoming the first US Army unit to arrive there. The 32d Division Artillery of Wisconsin went into action in December 1942 in New Guinea. Guard artillery fought in every campaign from the Aleutian Islands, Guadalcanal, the Philippines, Okinawa and on countless other islands.

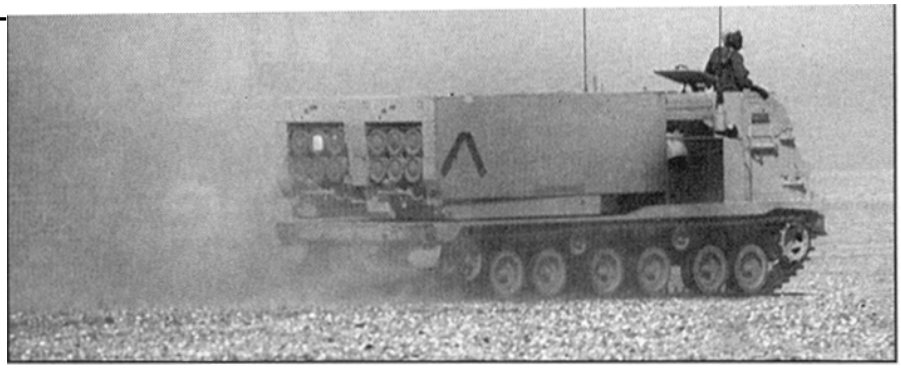
On the other side of the world, the 175th Field Artillery Battalion of Minnesota supported the 34th Infantry Division elements in Algeria in November 1942. The 111th Field Artillery Battalion of Virginia, part of the 29th Infantry Division, lost most of its guns in rough waters off of Omaha Beach on D-Day, so their artillerymen fought as riflemen. As the war in Europe spread to Italy, France, Belgium and Germany, Guard Field Artillery units were in support.

After World War II, the Guard continued to maintain the largest Field Artillery organization of the three components. It had 180 battalions, 15 group HHBs and five corps HHBs. This was the largest Field Artillery force in the Guard's history.

Guard Artillery in Southeast Asia and Beyond

With the outbreak of the Korean War in 1950, 64 Guard FA battalions were mobilized; 20 saw action in Korea. Thousands of other Guardsmen were sent to active Army battalions as replacements. Guard artillery battalions saw a great deal of action in support of both Army and Marine divisions; several were awarded Presidential Unit Citations for gallantry in action.

The 1960s was one of turbulence not only for the active Army and the National Guard, but for the country as well. During the Berlin Crisis of 1961, 17 Army National Guard Field Artillery battalions were ordered into active Federal service. In 1968, five battalions were called up for Vietnam, including the 2d Battalion, 138th Artillery of Kentucky and the 3d Battalion, 197th Artillery



Oklahoma's 1st Battalion, 158th FA (MLRS) deployed to the Gulf and took part in Operation Desert Storm.

Beginning in 1998, 14 National Guard battalions will be issued the M109A6 Paladin.

of New Hampshire that took part in operations. Many of the personnel of other National Guard battalions went to Vietnam as replacements. Other battalions served in Federal and state status in the streets of the nation's cities, attempting to keep the peace.

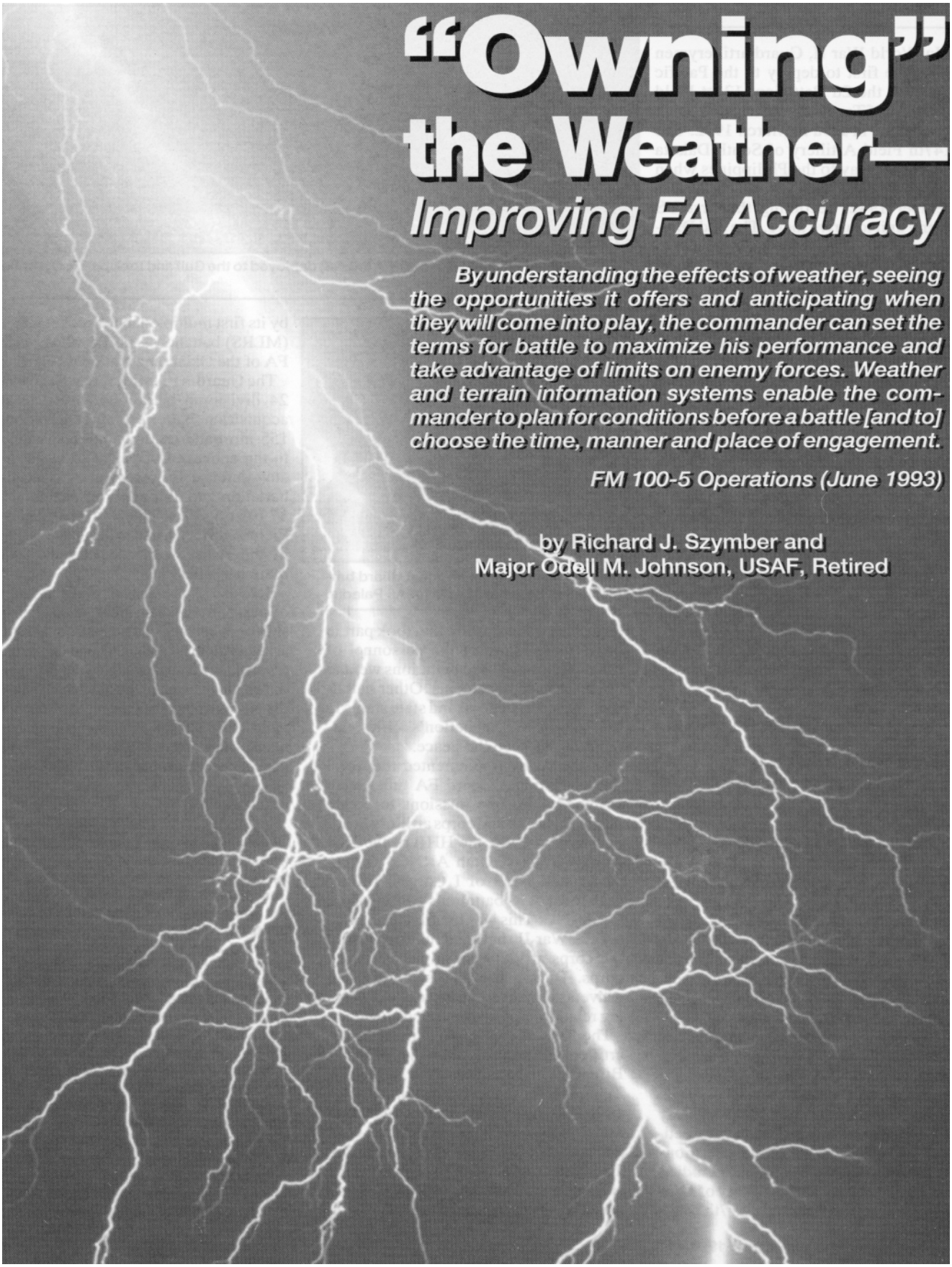
As the Army implemented the Total Force, National Guard FA units were assigned Capstone missions to active Army divisions and corps artillery headquarters. In 1984, the HHB of the XIII Corps Artillery, Utah ARNG, was redesignated HHB of I Corps Artillery with most of its battalions coming from the ARNG. This was the first time since World War II that the Guard provided the corps artillery for an active Army corps. During the 1980s, Guard and active artillerymen developed closer working relationships as they trained together.

The Total Force proved itself in the artillery community when the 196th FA Brigade with battalions from Kentucky, Tennessee and West Virginia and the 142d FA Brigade of Arkansas and Oklahoma mobilized, deployed to the Gulf and took part in Operation Desert Storm. The entire National Guard is proud of the artillery's performance in Desert Storm and takes special pride in the role played by its first multiple-launch rocket system (MLRS) battalion—1st Battalion, 158th FA of the Oklahoma National Guard.

The Guard's FA structure will grow to 24 divisional battalions, seven target acquisition batteries, eight divisional 155-mm batteries, 14 battalions assigned to the enhanced brigades and two theater defense brigades, one round-out battalion and 49 battalions assigned to 17 FA brigades. The National Guard's Field Artillery force will be the largest in the Army with 65 percent of the branch's units.

Because of the historical interchange of personnel and training, the relationship between active and National Guard artillerymen is close and one of mutual respect. With such a high percentage of the artillery force in the National Guard, the pieces of the Total Force artillery will meld their efforts as circumstances demand. It has been that way since 1775. We expect it to go on for another 200 years.

Lieutenant Colonel Leonid Kondratiuk, Army National Guard, is Chief of the Historical Services Division of the National Guard Bureau in Washington, DC. He also has served as a Historian in the US Army Center of Military History in Washington, DC, and as a History Instructor on the faculty of the US Army War College at Carlisle Barracks, Pennsylvania. He has been on active duty as a historian since 1980. In other assignments, he served as a Forward Observer, Battery Executive Officer and Battalion Ammunition Officer in the 26th Infantry Division Artillery, Massachusetts and Connecticut Army National Guard, before transferring to Armor. This article is taken from the National Guard Bureau brochure "The Tradition Continues: A History of National Guard Field Artillery" published in March 1996; copies are available by calling DSN 761-0717 or commercial (703) 681-0717.



"Owning" the Weather—
Improving FA Accuracy

By understanding the effects of weather, seeing the opportunities it offers and anticipating when they will come into play, the commander can set the terms for battle to maximize his performance and take advantage of limits on enemy forces. Weather and terrain information systems enable the commander to plan for conditions before a battle [and to] choose the time, manner and place of engagement.

FM 100-5 Operations (June 1993)

by Richard J. Szymber and
Major Odell M. Johnson, USAF, Retired

"Owning the weather" will give the Force XXI war-fighter the information he needs to employ smart weapons and munitions for maximum all-weather lethality. That involves exploiting and improving the weather-related technological advantages of our combat systems over hostile systems, making weather a force multiplier.

A major frustration for Redlegs often has been the ever-changing wind and other atmospheric factors that decrease artillery accuracy. By the year 2000, artillerymen will be much less concerned with unexpected meteorological (Met) effects, thanks to payoffs from the mobile profiler system (MPS) and the complementary computer-assisted artillery meteorology (CAAM) software package under development by the Army Research Lab's (ARL's) Battlefield Environment Directorate at White Sands Missile Range, New Mexico.

Improving Accuracy

The objective of MPS is to provide timely and accurate Met data for cannon round and rocket/missile ballistic corrections to help project lethality forward. The system will provide low-level wind data and information about visibility restraints (precipitation type and rate, sky cover, cloud-base height and fog) out to 500 kilometers for selecting the optimal munition and determining the aiming point for a target area. It will include a suite of sensors and software that will be fully operational in 2005 to support the developmental Crusader.

Marksmen down through the ages have known they must account for "windage." Wind, particularly at the projectile apogee, is the major Met factor affecting artillery accuracy. However, today's artillerymen know they need more information about the atmosphere than just windage to accurately fire their projectiles. Temperature, pressure and humidity also affect the round's ability to hit the target. To adjust the direction of fire so a round will hit its target, Redlegs need vertical profiles of Met data to the round's apogee.

The range of artillery fires has steadily increased during the last 50 years, with Crusader's unassisted range planned for 40 kilometers. In addition, the Army is developing weapons that will be able to attack targets hundreds of kilometers into the enemy's territory. As the range of artillery weapons increases, so do the atmospheric effects on their projectiles. With longer range weapons coming into the inventory, the need for accurate, time-ly data is even more critical.

An analysis of the factors known to affect artillery accuracy has shown that Met conditions contribute the most to miss distances and that frequently updating Met data used in aiming, especially wind, significantly improves accuracy and effectiveness. As much as 50 percent of the artillery miss distance is due to inaccuracies in Met data.

MPS will gather the required Met data, and CAAM will process those data and disseminate information about weather effects to the user.

Processing and Disseminating Met Data

There is no single system envisioned that will be able to provide the artillery all the target area Met data it needs. A suite of sensors and associated software will accomplish this mission—sensors that provide a variety of data in different resolutions at various locations and times. This requirement drives the need for CAAM, a software package that can integrate Met data from a wide variety of sensors to build a "best-Met picture" of the atmospheric conditions at the projectile's apogee, generate products that describe these conditions in artillery formats and disseminate this information to the relevant fire supporters. CAAM will optimize available Met data for employing artillery fires.

Existing methods for disseminating this information to fire supporters are largely inadequate. Current practices assume that the atmospheric conditions are homogeneous in time and space. Thus, Met information is disseminated across the battlefield as a single message for the entire area of operations and is assumed to be valid until replaced with a newer message. CAAM will give us the means to display and transmit that information to the various users via existing and near-term command, control and communications (C^3) networks.

CAAM will provide data management functions as well. For example, based on a trend analysis of the sensor data in the data base, CAAM will recommend a slower balloon release rate when the atmosphere is relatively stable and a more frequent rate when the weather is changing rapidly. (MPS will completely remove the balloon from the battlefield after the turn of the century, making this capability unnecessary.) CAAM also will disseminate new Met messages only as necessary. It will compare newly generated Met messages with the last message and recommend dissemination of a new message only when a specified level of artillery accuracy is threatened. This technique will help conserve our communications resources. CAAM software is being inserted into the current Met measuring set (MMS) AN/TMQ-41 as a technology improvement. Fielding of the time-space-weighted model (TSWM) version of CAAM, called CAAM I, will begin in mid-1997.

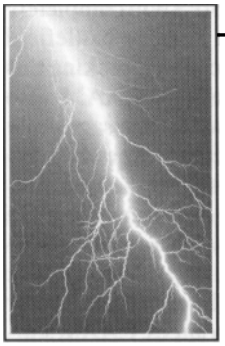
The next version of CAAM—CAAM II—is a battlescale forecast model that not only will give the user Met information on the projectile's apogee, but also on the target area. CAAM II will integrate Met sensors data and generate area-of-interest Met messages that closely represent the conditions in the target area at the time of firing.

The information will include profiles of the upper air via MMS, Met satellites, dropsondes and, eventually, unmanned aerial vehicles (UAVs). The information also will include automated surface data from a network of surface sensors. The target area profiles will provide winds and temperature, height of cloud bases, precipitation type and rate and refractive index. Pending funding, CAAM II could be fielded in 1999.

Met-Artillery Studies

The Field Artillery prefers predicted fire using Met and muzzle velocity corrections over registration or transfer adjusted fire—the element of surprise makes the fires more effective. The Met improvements being developed would enable predicted fire.

The Army Materiel Systems Analysis Activity (AMSAA) at Aberdeen Proving Ground, Maryland, evaluated the Met improvements in its study "155-mm Howitzer Accuracy and Effectiveness Analysis" (DN-G-32, Reichelderfer and Barker, December 1993). The results showed the value of proposed Met solutions to generate predicted fire vice adjusted fire. The study examined MPS' measurement of Met data accurate enough for artillery and CAAM I yielding the equivalent accuracy by managing the radiosonde-balloon release schedule on the battlefield.



Current techniques employ predicted fire with Met data approximately two hours old and collected 20 kilometers from the application location. The current practice of correcting artillery fire for a Met effect introduces two errors; one is due to the data time staleness (the Met team is dedicated to specific users) and the other is due to space displacement (the Met team is not collocated with the weapon system, and balloon-borne sensors drift). These errors induce slight inaccuracies at short ranges and major, unacceptable inaccuracies at long ranges.

CAAM I pools all artillery Met messages and manages the data via modeling algorithms to produce Met messages tailored for specific users; it provides 30-minute-old Met data collected no more than 10 kilometers from the location of application.

Based on the AMSAA study, Figure 1 shows the results of a 155-mm howitzer firing the M483A1 dual-purpose improved conventional munition (DPICM) 15 kilometers and firing the M864 extended-range DPICM 35 kilometers comparing current Met techniques versus CAAM I. The study assumed the location error was zero circular error probable (CEP), the target size was 25 square meters, the bomblet lethal area was 15 square meters, the weather was average mid-latitude continental and the terrain was moderate (hilly).

Compared to current practices, CAAM I results in significantly fewer rounds required to suppress or kill a target at both shorter and longer ranges. But the longer the range, the more dramatic the reduction in the number of rounds required. For example, the number of rounds required to suppress a target (defined as a fractional damage of 0.1) at a range of 35 kilometers was reduced by 50 percent. There was a 75 percent reduction in the number of rounds required to kill a target (a fractional damage of more than 0.3) at 35 kilometers.

Firing Range	Suppress (FD = 0.1*)	Kill (FD > 0.3*)
15 km	20%	58%
35 km	50%	75%

*Fractional Damage (FD) defined as 0.1 for Suppress and more than 0.3 for Kill.

Figure 1: This chart shows the percent of the reduction in the number of 155-mm howitzer rounds required to suppress or kill a target by using computer-assisted artillery meteorological (CAAM) versus current Met practices. (The percents are based on the 1993 Army Materiel Systems Analysis Activity Study DN-G-32.)

Range & Munition	Dollars Saved
M483A1 at 15 km	6.4 K*
M864 at 35 km	273.4 K*
SADARM at 23 km	66.0 K**

*Value based on the AMSAA Study (DN-G-32, 1993).

**Value based on Martin Marietta Study (1993).

Legend:

M483A1 = Dual-Purpose Improved Conventional Munition (DPICM)
M864 = DPICM-Extended Range
SADARM = Sense and Destroy Armor

Figure 2: The chart shows the savings (cost per kill) gained when we "Own the Weather," reducing the number of 155-mm howitzer rounds required per kill.

Figure 2 converts the reduction in the number of rounds to kill a target into savings in thousands of dollars per target. One can see that, using CAAM I, the Army could save as much as $273,400 in extended-range DPICM rounds. The 1993 "DMSP Tactical Enhancement Analysis/Army" conducted by Martin Marietta-Astro Space determined the cost saving per kill for the sense and destroy armor (SADARM) smart munition fired at a range of 23 kilometers. The SADARM savings result from improved knowledge of the target area weather derived from a 40 percent increase in the accuracy of the artillery Met data (i.e., profiles of wind velocity and temperature).

MPS and CAAM I completed an advanced technical demonstration at Fort Sill in September 1994. AMSAA-simulated results reveal significant improvements to the accuracy and effectiveness of current and future weapon systems.

As the Army moves into the 21st century with an ever-diminishing base of resources, we must find ways to achieve our missions more efficiently and effectively, including taking advantage of battlefield weather information never before available. For the artilleryman, owning the weather means having accurate, timely Met data all the time so he can hit his target first time, every time.

The words spoken by former Chief of Staff of the Army General Gordon R. Sullivan in 1993 say it best: "...as we leap technologically into the 21st century, we will be able to see the enemy—day or night, in any weather—and go after him relentlessly. The technology is there, waiting for us to pull it all together. Own the night. Own the weather. Three minutes from sensor-to-shooter. Smart weapons, smart munitions. *Decisive victory!*"

Richard J. Szymber is a Meteorologist with the Battlefield Environment Directorate of the US Army Research Laboratory (ARL) at Fort Huachuca, Arizona. He holds a bachelor's degree in geography from Arizona State University and a master's degree in atmospheric sciences from the University of Arizona. Mr. Szymber was permanently assigned to Fort Huachuca in June 1995 to serve as ARL's Owning the Weather Liaison Officer to the Army's Intelligence Center and help integrate the concepts into Army operations and programs. In addition to developing "Owning the Weather" concepts and programs, he is involved in research in satellite meteorology.

Major Odell M. Johnson, US Air Force, Retired, is a Meteorologist with ARL's Battlefield Environment Directorate assigned as an Own the Weather Liaison Officer to the Depth and Simultaneous Attack Battle Lab at Fort Sill, Oklahoma. In his previous assignment, he was a Meteorologist with the Directorate at the White Sands Missile Range in New Mexico. He has served as a Meteorologist with the Battlefield Environment Directorate since 1985 and with the Air Force Weather Service for 28 years, retiring from the latter in 1980. He holds a Bachelor of Science and Master of Science in Meteorology from Texas A&M University and a Bachelor of Science in Mathematics/Computer Science from Boise State University in Idaho.

The authors wish to acknowledge the contributions to this article of Charlie S. Taylor, Chief of the Meteorological Branch of the Target Acquisition Division, Directorate of Combat Developments, Field Artillery School, Fort Sill.

1996 History Writing Contest Winners

First Place—"Artillery Raids: Vietnam, Desert Storm and Future Applications" by Major Kevin J. Dougherty, Infantry

Second Place—"For Valor: L Battery at Nery" by Major Thomas G. Bradbeer

Third Place—"Napoleonic Artillery—Paradigm of Jominian Mass" by Major Daniel S. Roper

Judges of the 1996 History Writing Contest

Colonel Colby M. Broadwater III is Director of the Fire Support and Combined Arms Operations Department of the US Army Field Artillery School at Fort Sill, Oklahoma. He holds a Bachelor of Arts in History from the Citadel and a Master of Arts in International Relations from Salve Regina University, Newport, Rode Island. Among other assignments, Colonel Broadwater commanded the 1st Cavalry Division Artillery at Fort Hood, Texas, and 5th Battalion, 1st Field Artillery, 5th Infantry Division (Mechanized) at Fort Polk, Louisiana.

Lieutenant Colonel James J. Carafano is a Historian at the Center for Military History and a Doctoral Candidate in History at Georgetown University, both in Washington, DC. He holds a Master of Arts in History from Georgetown University and taught History at the US Military Academy at West Point. Among his other assignments, he commanded a battery in III Corps Artillery at Fort Sill and served as S3 of a battalion in the 3d Infantry Division (Mechanized) Artillery, Germany.

Lieutenant Colonel Leonid Kondratiuk, Army National Guard (ARNG), is Chief of Historical Services at the National Guard Bureau in Washington, DC, and has been on active duty as a Historian since 1980. He holds a Master of Arts in History from Kansas State University in Manhattan where he taught History. Lieutenant Colonel Kondratiuk also taught History at the US Army War College, Carlisle Barracks, Pennsylvania. Among other duties, he was a Forward Observer and Battery Executive Officer with the 26th Infantry Division Artillery, ARNG, before transferring to Armor.

Field Artillery Themes for 1997

Month	Theme	Copy Deadline
Jan-Feb	Target Acquisition	16 Sep 96
Mar-Apr	Precision Technology	18 Nov
May-Jun	Forward Observation	21 Jan 97
Jul-Aug	Training	3 Feb (Contest) 17 Mar (Other)
Sep-Oct	Force Projection	19 May
Nov-Dec	Red Book: Annual Report	14 Jul

1997 History Writing Contest

The United States Field Artillery Association is sponsoring its twelfth annual History Writing Contest with the winners' articles to be published in *Field Artillery*. To compete, submit an original, unpublished manuscript on any historical perspective of Field Artillery or fire support 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 *Field Artillery*.

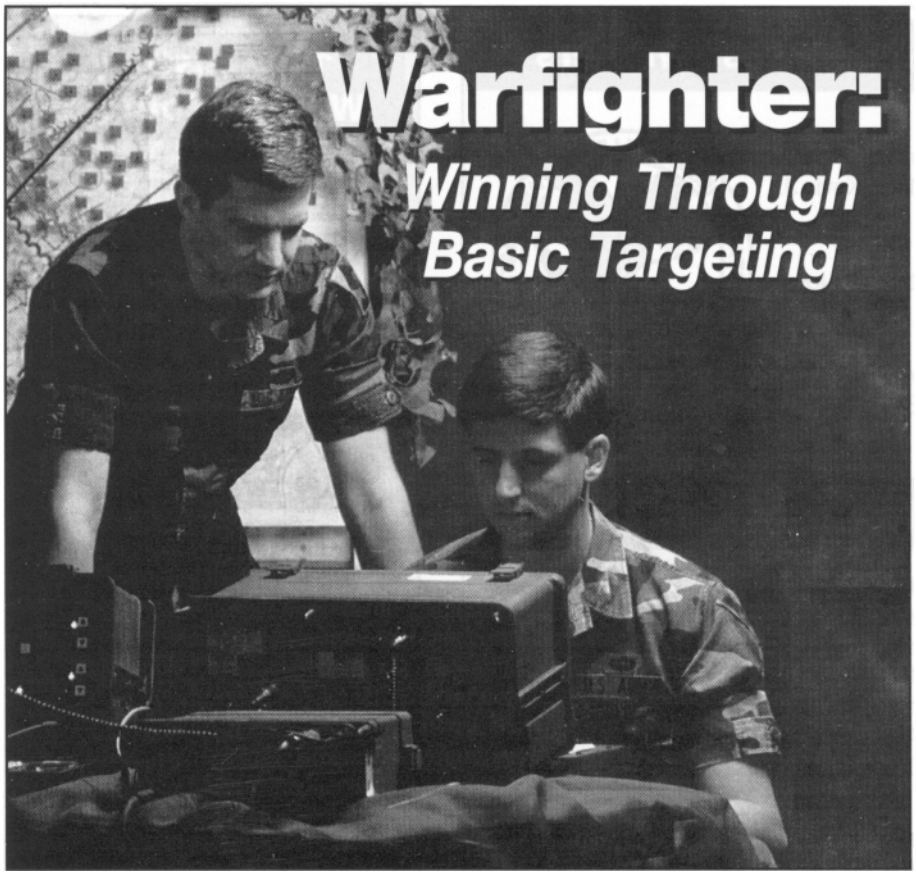
Civilians of any nationality or military of all branches and services, including allies, are eligible to compete. You don't have to be a member of the Association. Your submission should include (1) a doublespaced, typed manuscript of no more than 3,000 words with footnotes, (2) bibliography, (3) your biography and (4) graphics (black and white or color photographs, slides, charts, graphs, etc.) to support your article.

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 historians will judge the manuscripts 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 1997, 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 DSN 639-5121/6806 or commercial (405) 442-5121/6806.



by Major Milton R. Ayala, ARNG

The division main fire support element (FSE) must fully comprehend and adhere to the targeting methodology for the division to beat the opposing force (OPFOR). We, in the 35th Infantry Division (Mechanized), Kansas Army National Guard (ARNG), learned this fact in our past Warfighter Exercise—as others before us have learned. Adhering to the targeting methodology found in *FM 6-20-10 Tactics, Techniques and Procedures for the Targeting Process* greatly affected the outcome of our maneuver battle.

In the heat of battle, the target analyst and (or) the assistant fire support coordinator (AFSCOORD) must remember all the steps in the targeting methodology. However, stress, exhaustion, the chaos of battle and different levels of expertise have an impact on the FSE staff's ability to instantaneously recall all the principles and nuances of the targeting process. Not knowing or following the targeting process, can result in fires not being where they need to be to support friendly forces (such as when our forces are breaching defensive zones or belts), fire plans being canceled during critical maneuver events and ineffective counterfire.

A simple targeting flow chart (as shown in the figure) can be posted in the FSE as a reminder of the D^3A targeting process—*decide, detect, deliver* and *assess*. The flow chart summarizes the continuous targeting process, but a complete explanation of the targeting methodology is in FM 6-20-10.

As you can see, the *decide, detect, deliver* and *assess* phases are not "cleanly" separate phases. For example, you not only *assess* battle damage cycling back into the *decide* phase, but you also *assess* the validity of plans (rehearse and adjust them) prior to executing them in the *detect* or *deliver* phases.

Developing and Rehearsing the Plan. The key players that integrate the process at the division level are the G2, G3 and FSCOORD. These individuals are responsible for the command estimate and the targeting processes. The command estimate process involves the intelligence preparation of the battlefield (IPB), the target value analysis that results in high-value targets (HVTs), the commander's intent, the commander's guidance, mission analysis and war gaming. (For a good discussion of the command estimate process, see *ST 101-5 Command and Staff Decision Process.)*

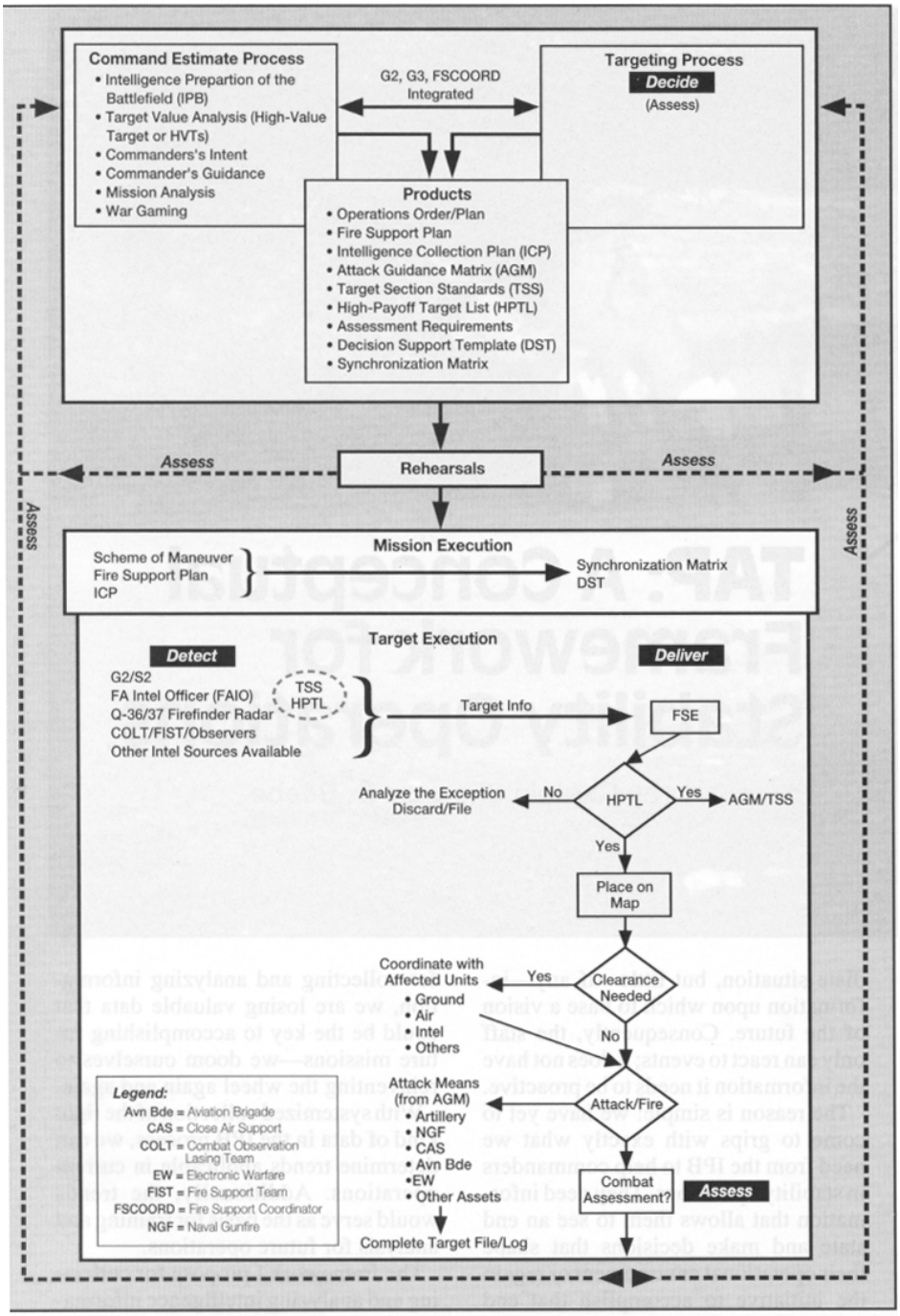
From the targeting process, the G2, G3 and FSCOORD *decide* on the focus and intelligence collection priorities and the best means to attack the targets. The assessment culminates in the creation of products briefed to the maneuver commander: the high-payoff target list (HPTL), intelligence collection plan (ICP), target selection standards (TSS) and attack guidance matrix (AGM).

Once the commander approves the products, the operations order (OPORD) is produced, including annexes. Other products generated from the approved products are the fire support plan, assessment requirements, decision support template (DST) and synchronization matrix. Then the battle operating system (BOS) players rehearse and assess the products developed during the command estimate and targeting processes. Once rehearsals validate the products, battle captains and fire supporters can focus on executing the mission.

Executing the Mission. Mission execution starts with all players' being thoroughly familiar with the scheme of maneuver, fire support plan and the ICP. This allows them to transition smoothly from executing the ICP (based on the TSS and HPTL) in the *detect* phase into executing the synchronization matrix and DST in the *deliver* phase. Effective mission execution depends on the accuracy and relevance of the products developed during the command estimate and *decide* phase, products that have been thoroughly validated and rehearsed. The means to attack the target and any assess requirements already have been determined.

The flow chart in the figure is especially useful to the FSE in the *deliver* phase of targeting. As the chart shows, the targeting process for the FSE starts with the detection assets' nominating targets. The TSS and HPTL provide an umbrella for the *detect* resources on the type of target information given to the FSE. Personnel in the FSE quickly analyze the target by scanning the HPTL and AGM and, simultaneously, conducting a map spot. From the map spot, they can determine if the target falls in the close or deep battle, what area of operation it effects and whether or not Field Artillery can range it. Next, the FSE coordinates clearance to fire, as needed.

As specified by the AGM, the division artillery either attacks the target or forwards it to other fire support means. Once the target is fired (lethal or nonlethal), an effort is made to assess the



Flow Chart for Division Targeting. This chart was designed by the author and Chief Warrant Officer Three David M. Gilley of the Targeting Branch, FA School; the information in the chart was taken from *FM 6-20-10 Tactics, Techniques and Procedures for the Targeting Process*.

damage to the target. Combat assessment helps the division decide whether or not to attack the target again or update the AGM. More importantly, combat assessment validates the integrative efforts of the G2, G3 and FSCOORD in the command estimate and targeting process, the cycling of a continuous effort.

Planning Fire Support. Before the FSE can successfully grapple with the targeting methodology, the staff must pay special attention to fire support. Our Warfighter Exercise, like others, revealed that fire supporters are not paying enough attention to the basic principles of fire support planning, preparation and execution.

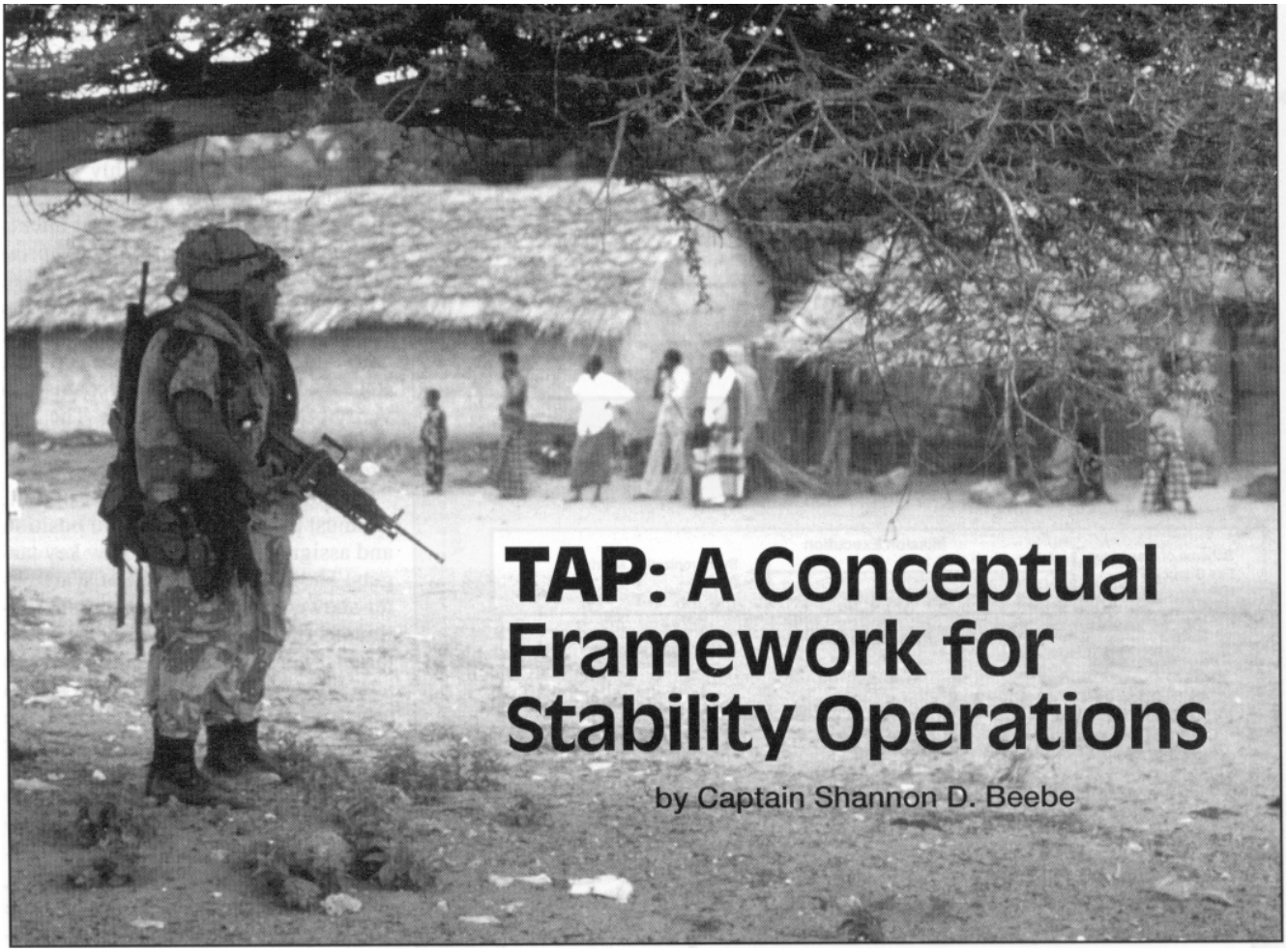
For example, one principle is that fire support plans must support the maneuver commander's intent. Fire supporters need to develop contingency fire plans that take into account enemy counterattacks; withdrawals, both friendly and enemy; and protecting the force (suppression of enemy air defenses, counterfire, screening, blocking, etc.). The FSE must be thoroughly familiar with the commander's intent to ensure the fire support plan meets that intent.

In the preparation phase, another principle holds true: rehearsals are crucial. The rehearsal gives insights into the fire support plan and execution matrix and validates the attack guidance criteria. Rehearsals also serve as a mechanism to verify preplanned target grids. The lack of routine rehearsals explains why many fire support plans are ineffective.

Last, to execute effective fire support, we must purge old targets and position and assign assets to shoot new key targets. The fast-moving pace of Warfighter showed we failed to maintain continuous fires on key targets because the targets were beyond the range of the attack systems listed on the AGM. In other words, in the frenzy of battle, the assigned shooters were out of range or involved in other battles.

Fire supporters must be thoroughly indoctrinated in targeting methodology and faithfully employ the basic techniques of fire support. Gamesmanship, short cuts and sloppiness only give the advantage to the OPFOR. With experience, established procedures and the flow chart to facilitate targeting, the FSE can help the division beat the OPFOR.

Major Milton R. Ayala, Kansas Army National Guard (ARNG), is the Assistant Fire Support Coordinator (AFSCOORD) in the 35th Infantry Division (Mechanized) Fire Support Element (FSE). In the 42d Infantry Division (Mechanized) Artillery, New York ARNG, he also was the AFSCOORD, a battalion S3 and commander of two batteries. Previously, he was a Field Artillery Controller in the US Army Reserve and served as Assistant S3 of the 5th Brigade, 75th Exercise Division at Fort Leavenworth, Kansas. He is Chief of Social Work Services at the Veterans Administration Medical Center in Poplar Bluff, Missouri. Major Ayala is a graduate of the Command and General Staff College and Tactical Commander's Development Course, both at Fort Leavenworth, Kansas, and holds a Master of Science in Social Work from Columbia University, New York, and Master of Art in History from the University of Minnesota.



TAP: A Conceptual Framework for Stability Operations

by Captain Shannon D. Beebe

During the last four years, our Army has made significant progress in planning and executing peacekeeping, peace enforcing and peace monitoring missions, collectively known as stability operations. Missions once thought to be the sole purview of special operation commands are now performed by standard, conventional forces with a high degree of success.

We've quickly updated our doctrine and tactics, techniques and procedures (TTP) to guide these operations. However, in our haste to create TTP for stability operations, we have sometimes forced "old wine into a new bottle"—that is to say, we have simply inserted stability operations terminology into conventional battlefield theory, overlooking the need for new concepts.

This is particularly true of a critical link within the staff's decision-making process: the intelligence preparation of the battlefield (IPB). The IPB in stability operations gives the commander excellent information about the immediate situation, but little—if any—information upon which to base a vision of the future. Consequently, the staff only can react to events; it does not have the information it needs to be proactive.

The reason is simple: we have yet to come to grips with exactly what we need from the IPB to help commanders in stability operations. They need information that allows them to see an end state and make decisions that shape their operational environment or regain the initiative to accomplish that end state. With that information they can provide guidance to their staffs.

In our haste to integrate intelligence in the stability operations decision-making process, we have failed to define a framework of analysis—the framework for accurately assessing this new, volatile operational environment to gain the information we need for vision and to be proactive.

Every stability operation is different—and those differences can be vast. But, by the same token, stability operations have similarities. Without a framework for collecting and analyzing information, we are losing valuable data that could be the key to accomplishing future missions—we doom ourselves to reinventing the wheel again and again.

With systemized collection of the right kind of data in the IPB process, we can determine trends applicable in current operations. Additionally, the trends would serve as the basis for training and analysis for future operations.

The framework I propose for collecting and analyzing intelligence information in stability operations is the Triad Analysis Process (TAP). It is a "formula" used in developing most theoretical strategic studies: the analysis of event-action-outcome. With enough data, one can see the probability of the outcome of an action after an event—begin to predict, to some degree, what one should do under certain kinds of circumstances. The process allows for a more holistic approach to developing doctrine in low-intensity conflict with stability operations a fluid step along the spectrum of conflict. In stability

operations, TAP is a tool for gathering information to use in conjunction with the IPB. Although the IPB process provides good information, it is inadequate in stability operations.

IPB Shortcomings. In all operations along the conflict continuum, success is the product of a commander's and his staff's shaping the battlefield as he desires and using initiative and vision to engage the enemy when and where he chooses. The linchpin of this success—as it has been since the days of Sun Tzu—is a thorough understanding of the enemy and the way he fights.

In the IPB process, we develop the doctrinal, then situational and, finally, event templates. We accomplish this by understanding the enemy's doctrine in detail and by believing the events of each engagement will be logical—will fit into a continuum of logical actions by the opposing forces. These are the keys to the IPB process and, ultimately, the basis for decisions affecting the outcome of the battle. However, in stability operations, based on the information developed in the IPB, the commander will have, at best, a myopic vision of the future and his staff is forced to react with little or no time to plan.

Although we have tried to amend our standard IPB process to include areas such as personality profiles and nongovernmental organizations (NGOs), we are still struggling with exactly how to formulate IPB in operations where there is no doctrine and no "enemy," just multiple factions with varying levels of cooperation. As a result, we have yet to realize the conceptual framework to get the information we need. The greatest problems with our conventional IPB model are its low ability for predicting long-term events and our inability to transfer the information collected to future stability operations.

According to *FM 100-23 Peace Operations*, the "principal difference between [IPB] for conventional battlefield situations and peace operations is the focus and degree of detail required to support the commander's decision-making process." This is accounted for, according to FM 100-23, by expanding the normal area of interest, a more detailed analysis of the terrain and infrastructure, closer analysis of the local area and threat evaluation. This then allows the staff to determine threat courses of action (COAs) and war game. Attention is given to how these actions will affect peace in the immediate and short-term—which is to say, intelligence for decisions is based on the belligerents' next move, after which the IPB cycle begins again.

This means the predictive value of the IPB hinges on the opposing factions' next step and offers no long-term benefits to help the commander shape the operational environment. The reason: the conventional battlefield IPB is, by its nature, reactionary. In stability operations, it is not only important to see the opposing parties' next step, but also see each step thereafter.

Stability Operations. In stability operations, our ultimate goal is peace. Peace is a political goal that may only be accomplished through sustained, relative stability over a period of time. The longer there is stability in an area, the greater the chance of peace.

The military's mission is to create and maintain stability. We can accomplish the mission in two ways. The first is to force stability. When a military presence is brought in that is overwhelmingly more powerful than the other factions, the factions may consciously decide not to engage in hostilities—stability ensues.

This is possible only as long as the factions abide by the rules or only one faction breaks them. With all factions abiding by the rules, one can easily see how the area becomes stable. Even with one faction violating the rules, it's relatively easy to force violators to stop engaging in hostilities. In this example, the IPB process gives the appearance of functioning well.

However, if multiple warring factions begin to violate the rules—regardless of how powerful the military—it becomes very dangerous and very difficult to decide who has done what. Our IPB process is then stretched beyond its abilities because the process doesn't give the commander the information he needs to predict mid- to long-term events.

When faction violations escalate, suddenly the military force is tied to a black-hole quagmire with no way to accomplish the mission. This "no way out" concern drove our debates over becoming involved in Bosnia—especially after having experienced "no way out" in Somalia. The "overwhelming force" method of maintaining stability used independently is viable, but it can turn deadly quickly.

The second way of creating and maintaining stability is through the use of negotiations and building cooperative alliances with military force as a last resort. This negotiation method calls for the commander to have a strong predictive model to help him shape the operational environment and give him an eye to long-term events, faction by faction. The commander must be able to see how these events will affect the balance of peace on future events, so he and his staff can continually take steps toward stability. This allows him to see that what appears to be a successful step today could result in the disintegration of stability tomorrow.

This "carrot-and-stick" negotiation is the preferred method of maintaining stability as it gives the commander more response options. But this approach also can be dangerous in the absence of a predictive model.

In Bosnia, the Implementation Force (IFOR) is using a combination of the two methods. An overwhelming military presence is combined with a series of joint military commissions (JMCs) at the various levels to negotiate with the

Maj David R. Gaumer USAFAS

A howitzer occupies a position among bombed out buildings in a presence mission in Bosnia.

former warring factions and implement the Dayton Peace Accord, enforcing stability in Bosnia-Herzegovina. Although he doesn't discuss JMC operations, Lieutenant Colonel Peter S. Corpac in his article "Evolving Tactics, Techniques and Doctrine for Fire Support in Peace Enforcement Operations" in this edition does discuss the "presence mission."

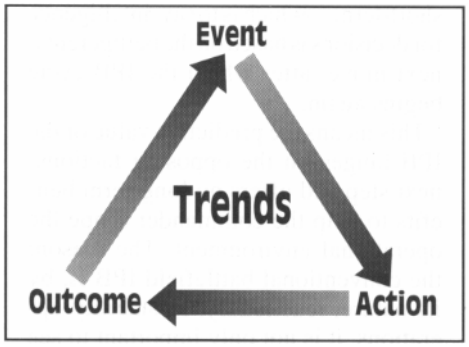
Historic data plays a vital role in the ability of the event-action-outcome model to have predictive value for the commander. This, then, gives rise to another question: What is the value of historic data when every event in every stability operation is different? This question has been our worst misconception, our greatest stumbling block to developing an analysis framework.

Because our military is relatively new at stability operations and few of our leaders are trained in this arena, we have looked to other nations for a model to follow. The recognized leaders in this area are Canada and Finland, which have served extensively in peacekeeping operations around the world. However, both countries maintain that every peace/stability operation is a separate entity with *no* overlap. As a result, we have not fully investigated the common trends we could capture, record and use to develop a predictive model with applicability reaching further than a single operation.

It's a vicious circle. Without capturing the data to analyze for trends that can predict cause and effect, we must cling to an IPB process that forces the staff to react to events, allowing us only moderate success. The predictive model must be general enough for operations in different theaters, yet focused enough to give commanders the intelligence they need to make decisions with a high degree of certainty.

The Triad Model. TAP is designed to describe and predict events in theaters of operations where the military missions range from peacekeeping to the last steps of peace enforcing before open, sustained, armed conflict. This model applies to a continuum of relative, sustained stability on one end to open, sustained hostilities on the other.

The model makes two important assumptions. First, the governments, factions and leaders we will face will act rationally—at least from their point of view. The second assumption is that all stability operations will occur in developing nations.



The first assumption helps us capture trends and develop COAs. A rational actor may be defined as some individual, government or organization that has an espoused or ordered agenda he/it strives to achieve—however irrational it may appear to us, he/it is consistent in the approach. For example, the extremist group Hezbollah suicide bombings in the Middle East to destroy peace negotiations in the region may appear to some to be counterproductive for its own good. But the agenda of the Hezbollahs is to destroy Israel and bring about an Islamic state, regardless of whether or not they can live in peace.

By way of another example, Saddam Hussein of Iraq was an *ir*rational actor during the Gulf War. No one has been able to conclude that Saddam Hussein had an agenda he attempted to follow. His actions were not due to a different mind-set or culture; they were purely irrational. TAP can't be used for operations in which the threat leader is irrational.

In the second assumption—that stability operations occur in Third World countries—we can draw on a body of strategic studies describing how these countries view their security internally and in relation to other nations. As a result, we see the commonalities of international security in all developing nations. For example, all Third World countries in strife have leaders who are trying to legitimize their regimes—each trying to be recognized as the people's leader. A faction leader's attempt to gain legitimacy is one commonality in stability operations and can take many forms: securing water or electricity for his people, protecting his people from looting, allowing them to have a voice as an ethnic group, etc.

The Analysis Process. TAP is the analysis of event-action-outcome. In generic terms, for every event occurring between Actor A and Actor B, there is response in the form of some type of action. As a result of this action—say, by Actor B—an outcome is produced, which then gives rise to another event. This cycle is continually exercised until a solution is reached between the two parties.

An *event* is defined as any perceived or real occurrence by a party that, ultimately, will invoke a response by an opposing party that will either advance or deteriorate relations between them. In stability operations, events may be classified as either a good will or adverse event. The good will event is some occurrence that adds to the stability of the situation. An adverse event is some occurrence that threatens or reduces stability. On one end of the spectrum, a good will event may be the opening of dialogue between opposing factions to exchange prisoner and free hostages. On the opposite end, adverse events may be the breaking of treaties to increased, open violence between factions.

These events dictate the posture of military forces trying to create and maintain stability. An operational environment that sees more good will events than adverse events will naturally be more peacekeeping than peace enforcing—and vice versa. This is a cyclic and dependent process.

The second stage in the Triad process is *action*, the response to an event. It is here the military commander attempts to influence the situation and affect the cycle. After the event has occurred, the staff develops and war games COAs. At this point, the benefits of the Triad process are most obvious. But the action taken must be within the context of the second assumption: stability operations will occur in developing countries.

Developed nations with legitimate governmental systems define security in terms of gross national product (GNP), national values and resources. Any threats to these will create rapid responses and may be resolved through dialogue centering around these issues. This is not true in developing nations. The national security of Third World nations revolves around entirely different factors. The security of developing nations is defined in terms of *perceived power, personalities of the leadership* and *regional themes*, the latter varying from region to region. Many commanders fail to recognize these Third World definitions of security and see the faction leaders as simple thugs.

Perceived power also may be stated as the level of legitimacy of the current government. The more legitimate the government,

the more willing its population is to follow its guidance and the less likely it is to have an extra organizational faction with enough legitimacy to undermine the established government. Thus, when negotiating with a legitimate government and its officials, military commanders may assume the agreements reached will apply to its citizens. It is to the commander's benefit to seek out legitimate government officials and operate through them.

Personality of the leader in Third World nations is also a vital factor. In governments with little legitimacy, the rule of the land is dictated by the leader. This was true in Somalia.

By understanding the personality profiles of the leaders, military commanders may be able to influence events through interpersonal relationships. This may sound foreign to some, but Lieutenant Colonel Corpac's article discusses the positive impact of the rapport established with artillerymen of the various factions in Bosnia-Herzegovina: "On more than one occasion, this working relationship helped to defuse a potentially explosive situation."

Finally, military commanders and staffs must understand *regional themes*. Each region or area, maybe even each village, has a different concern that, if satisfied, will add to the stability of the region. These concerns may be as simple as adequate food, water and medical supplies or may be as complex as a village of one faction having control of a power plant that supplies a village of another faction.

In conventional battlefield terminology, these regional themes are analogous to an enemy commander's "defeat mechanism." *FM 100-23 Peace Operations* calls this the "center of gravity" for each region. An example of this can be seen today in Bosnia. Even though "ethnic cleansing" is a real issue in some areas, it is not the prevailing regional theme of every village. A staff that does not understand this will be ineffectual in responding to events and determining future COAs.

By continuously recording the event-action-outcome cycle using commonalities, trends will begin to develop in a process similar to the IPB doctrinal and situational templating. Once commanders and staffs understand the factors and trends, they may influence their operational environment. Their goals shift from trying to predict events as independent acts to determining commonalities. If a commander is able to predict outcomes based on commonalities, he can be more assured of achieving stability. With TAP, war gaming and the IPB process will, in the long term, be more effective.

Conclusion. The success or failure of this process will determine where the operational environment resettles along the conflict continuum—toward stability or open hostilities. Using TAP in conjunction with the IPB process will increase the validity of our intelligence estimates. Once we determine commonalities and trends, we can train for stability operations, more accurately reflecting the challenges of realistic environments.

TAP is not the solution; it only the beginning. We have many questions yet to answer in the process. As we adopt TAP or some similarly capable analysis framework, we must continue to improve the concept.

Stability operations, a new era, requires new concepts. TAP is just that.

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Lockheed Martin Candidate Lightweight 155-mm Howitzer

This system is one of several in the Army and Marine Corps "shoot-off" test and evaluations ongoing from April through November at Yuma Proving Ground, New Mexico, and Camp Pendleton, California. The howitzer selected will replace M198s in the Army and Marine inventories, in both the Active and Reserve Components.

The selected howitzer will weight a maximum of 9,000 pounds. It must be air transportable and droppable from Air Force aircraft and able to be lifted by CH-47 helicopter and the Marine's developmental MV22 Ospree. The howitzer's threshold range must be 30 kilometers with an objective range of 40 kilometers, and it must fire five to eight rounds per minute for two minutes. The prime mover will be Army and Marine medium trucks.

Artillery Raids:

Vietnam, Desert Storm and Future Applications

by Major Kevin J. Dougherty, IN

Throughout the Vietnam War, the 1st Cavalry Division employed "artillery raids" to take advantage of the increased mobility offered by the helicopter. Lieutenant General John Tolson, who commanded the division from 1 April 1967 to 15 July 1968, described the tactic as follows: "...an artillery battery would move deep into suspected enemy territory, rapidly fire a prepared concentration on targets that had been developed by intelligence, and then pull out before the enemy could react."[1]

Shelby Stanton, author of a detailed history of the 1st Cav in Vietnam, elaborates that "Artillery raids were conducted if worthwhile NVA/VC [North Vietnam Army/Viet Cong] targets were reported beyond the range of normally positioned division artillery. Air-mobile infantry secured a forward location, and CH47 Chinooks brought in an artillery battery to the new landing zone. Observers in scout helicopters spotted targets for the artillery raiding battery. Lucrative sightings could be engaged also by the infantry as the howitzers switched to a fire support role. The artillery raid was brief, usually completed within six hours, and offered division artillery an ability to react rapidly to targets of opportunity."[2]

From Lieutenant General Tolson's and Stanton's reports emerged five essential elements that set the conditions for artillery raid success: mobility, intelligence, security, observation and speed. The five elements identified during the Vietnam War held true for Operation Desert Storm in the Gulf and will remain true for the future, allowing commanders to capitalize on the versatile applications of artillery raids.

The Vietnam War

Information about a specific artillery raid in Vietnam is hard to come by, perhaps because their frequency caused them to draw little special attention. Lieutenant Colonel Lloyd Picou, who reported on the subject for *Military Review* in October 1967, states that "at least two or more [artillery raids] were mounted each week."[3] In fact, the raids were so common they were given a code name—in the 1st Cav Division,

A CH-47A of the 1st Cavalry Division (Airmobile) lowers a 105-mm howitzer and ammunition during an artillery raid in Vietnam, 1966.

"Operation Steel Horse."[4] Thus the student of the artillery raid is best served by viewing the technique in the historical context of the entire Vietnam War rather than in the details of a specific operation.

• *Mobility*. The enemy in Vietnam soon learned to move his camps and training areas and reroute his lines of communication to put them out of the range of the 1st Cav's base camp artillery. However, as stated by Lieutenant Colonel Picou, the introduction of the helicopter to the artillery raid equation changed all that. The mobility of the helicopter made the artillery "capable of rapid movement to hit the enemy in his 'safe havens.'"[5] Lieutenant Colonel Picou concluded that "artillery can now conduct its own offensive operations, not with the objective of seizing a piece of terrain, but with the traditional objective of destruction, neutralization, harassment and interdiction."[6] In short, the mobility of the artillery raid made it such that the enemy, "no matter where they were or where they went...could not get out from under the guns."[7]

The 1st Cav artillery took its own measures to enhance its mobility. Each artillery battalion maintained one battery on 30-minute alert to conduct a raid. The alert batteries were stripped down to the bare essentials. To reduce the number of aircraft required, usually only four of the battery's six guns were employed.[8]

• *Intelligence*. The second element required to set the conditions for success in an artillery raid is target intelligence. Lieutenant Colonel Picou goes as far as to say that "target intelligence was the most important factor in triggering a Steel Horse."[9] This intelligence was gained by the division cavalry reconnaissance squadron, aerial observation, photographs, electronic surveillance, local US advisors and Special Forces teams.[10]

An analysis of these sources indicates that the usual targets for artillery raids were well beyond the areas of operation of 1st Cav dismounted patrols. The purpose of the raids was to take the artillery to an enemy who had consciously tried to avoid it. Such a purpose presents a challenge to the S2 to stretch his analysis beyond conventional boundaries.

• *Security*. Because in an artillery raid, the artillery deploys forward of friendly positions, the third element, security, is critical. Much of what the 1st Cavalry learned in this area was the result of Operation Masher/White Horse that was

Marine gunners fire their M198 howitzer at Iraqis during Desert Storm. The M198 was used in the night artillery raids.

conducted from 25 January to 6 March 1966. During this operation, the 1st Cav artillery became very adept at moving by helicopter; it conducted 57 battery displacements by air in just 41 days.[11] As a result of this campaign, it became an accepted technique in the division to use hilltops as artillery positions, largely because they were easy to defend.[12] The other key part of security was to have the artillery air assault preceded by the landing of an infantry security force.[13]

• *Observation*. As in all indirect fire operations, observation is a major element for success. However, the distances involved in an artillery raid made observed fires difficult. Usually, the 1st Cav used aerial observers, ideally from its aerial artillery battalion. A fringe benefit of this technique was that if any enemy troops were flushed from cover by the raid, the aerial artillery could attack them with rockets.[14]

The 1st Cavalry's effectiveness diminished, however, whenever the division relied on firepower alone. Stanton notes that "The enemy suffered little sustained damage from artillery and air power unless infantry followed up to actually seize the ground and complete his destruction"[15] This absence of infantry involvement also may have contributed to Lieutenant Colonel Picou's conclusion that after an artillery raid, "damage assessment was always a weak spot."[16]

The artillery raid must be part of a combined arms package. Unfortunately, too often it was employed in isolation, a decision that failed to maximize what Stanton calls the 1st Cav's "triad of powerful weapons systems—helicoptered infantry, armed aircraft and mobile artillery."[17]

• *Speed*. Lieutenant Colonel Picou writes that "Speed was essential as surprise was the most important element contributing to a successful operation."[18] Lieutenant General Tolson recalled that "some of these raids were conceived, planned and executed in less than three hours."[19]

One technique the 1st Cav used to facilitate speed was to compute firing data in advance whenever possible. The 1st Cav instituted a program of surveying key positions throughout its zone of operations. Lieutenant Colonel Picou states that "If the position to be occupied was near a traveled road, chances were that a survey control point was nearby."[20]

Operation Desert Storm

Operation Desert Storm showed that the artillery raid was still a valid concept. The 5th Battalion, 10th Marines and the 5th Battalion, 11th Marines conducted four such missions, beginning on 23 January 1991. During these operations, the Marines updated the lessons learned by the 1st Cav in Vietnam.

Whereas the 1st Cav in Vietnam conducted its raids with the primary purpose of destroying the enemy, the Marine raids were used as part of the deception plan. Lieutenant General (Retired) Bernard Trainor explains that it was the Marines' "job to occupy the Iraqis along the Kuwaiti border so they would be unaware that the bulk of the allied forces were poised well to the west." Lieutenant General Trainor continues to say that the Marine commander's plan was to "deceive the Iraqis by conducting artillery raids at arbitrary points along the battlefront to confuse the Iraqis as to where he was going to attack."[21]

Lieutenant Colonel James Sachtleben, commander of the 5th Battalion, 11th Marines, adds that "the raid force appeared in the middle of the night and fired from positions the enemy had every right to believe were unoccupied. This had to shake his confidence in his intelligence capabilities."[22]

• *Mobility*. Along with this variation in purpose, the artillery raids in Operation

Desert Storm relied on a different source of mobility than the 1st Cav in Vietnam. Lieutenant Colonel Andrew Mazzara, who commanded the 5th Battalion, 10th Marines, felt that "on the battlefield itself, helicopter transport of artillery weapons is an anachronism that was well suited to moving small, short-range rocket systems in Korea, but is not even considered in this arena. Even in low-intensity conflict, moving artillery by helicopter is an unlikely scenario."[23] For this reason, artillery raids during Desert Storm were conducted as ground movements.

Mazzara sees this as a good reason "to revisit the future utility of our self-propelled weapons."[24] In addition to self-propelled M109A3 155-mm and M110A2 8-inch howitzers, the ground movement included high-mobility multipurpose wheeled vehicles (HMMWVs) and light armored vehicles (LAVs). With such a convoy, certain measures were necessary to ensure mobility. For example, in order to reduce the chance of a breakdown, heavy equipment transporters (HETs) were used to move the tracked vehicles from initial battalion positions to final assembly areas.[25] Additionally, the Marines formed mobile logistical support packages.[26] They carefully calculated movement rates to ensure proper synchronization.[27]

• *Intelligence*. Like the 1st Cav in Vietnam, the Marines in Desert Storm placed a high value on intelligence. The Marines used aerial, thermal and satellite imagery sources and found that late-hour photographs forced targets "to stick out of the desert like sore thumbs and indicated personnel activity."[28]

Unlike the 1st Cav, the Marines had to be seriously concerned about counter-battery fires. The Marines spent a great deal of energy during the intelligence preparation of the battlefield (IPB) process determining how long it would take the enemy to counterattack. This war gaming dictated how long the Marines could remain at a raid site.[29]

The Marines became so confident in their estimates that, on one raid, a firing unit deliberately remained in place long enough to draw counterfire. The Marines were willing to take this risk because they felt their rocket-assisted projectile rounds gave them stand-off protection against the Iraqis, and F/A-18s were standing by to destroy any enemy that would take the bait. According to Lieutenant Colonel Sachtleben, "the plan worked beautifully."[30]

• *Security*. For artillery raids in Desert Storm, security was even more pronounced than it was in Vietnam. In the 5th Battalion, 11th Marines' raids, the security force was built around a company of light armored infantry. Lieutenant Colonel Sachtleben reports that "The night vision and superb weapons capabilities of the LAV were invaluable. They spotted enemy movement and provided covering fires as the battery withdrew after the first raid."[31] He adds that "another layer of security" was provided by air support in the form of EA-6B Prowler aircraft to jam Iraqi ground surveillance radars and F/A-18s, AV-8Bs and A-6Es to strike enemy targets.[32]

The LAV provided Marines security for artillery raids in Desert Storm.

• *Observation*. Technological advancements made observation easier for the artillery raiders in Desert Storm than for those in Vietnam. The LAVs could transport sophisticated electronics and communications equipment that otherwise would have been too heavy to carry over long distances.

First Lieutenant Anthony Winicki reports in his article "The Marine Combined Arms Raid" for the *Marine Corps Gazette* that, because of this capability, "FAC [forward air controller] teams could carry a MULE [modular universal laser equipment] target designator within eyesight of the enemy, and FOs [forward observers] could tap the communications equipment found on LAV command and control vehicles."[33] Remotely piloted vehicles (RPVs) both confirmed enemy targets and assessed the battle damage that routinely alluded the 1st Cav in Vietnam.[34] Artillery raids in Desert Storm were truly combined arms affairs.

• *Speed*. As in Vietnam, speed was critical for the Desert Storm artillery raiders. However, in Desert Storm, the raiders had much more time to plan their missions, normally three days.[35] The Marines made excellent use of this and other time to conduct rehearsals. Lieutenant Colonel Sachtleben reports that his Battery S could perform a night occupation "in less than half the Marine Corps

The 5th Battalion, 11th Marines used the M110 203-mm howitzer on some of its artillery raids.

combat readiness evaluation (MCCRE) time standard for daylight occupation."[36]

Like their 1st Cav predecessors, the Marines carried only essential items to enhance speed.[37] They also positioned their howitzers "in very close proximity to each other, expediting the laying process."[38]

Whereas the 1st Cav had to be content with survey control points, the Marines were assisted by a piece of technology unavailable during Vietnam—the Rockwell global positioning system (GPS). Using the 10-meter circular error probable (CEP) of the GPS and the celestial method of lay, the Marines were able to establish directional control of a battery in less than one minute.[39]

Raids Today and Tomorrow

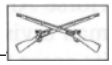
The artillery raid has proven itself to be a valuable combat multiplier both in Vietnam and Desert Storm. But is it applicable for today and tomorrow's artillerymen? Certainly Lieutenant Colonel Mazzara raises a valid concern about air assaulting howitzers on a battlefield in which the enemy has even rudimentary air defense capabilities.

However, First Lieutenant Jason Bohm in his 1993 article "Heliborne Mortar Raid—A Feasible Option" for the *Marine Corps Gazette* is much more optimistic. He sees the heliborne mortar raid as feasible in "low-intensity conflict over rugged terrain."[40] Bohm goes on to explain his concept that's much akin to the artillery raid. Thus, even if Lieutenant Colonel Mazarra is correct in limiting future artillery raids to the ground, perhaps mortar raids can pick up the task via the air.

Certainly one likely scenario for either an artillery or a mortar raid is the "flying checkpoint" technique used by Lieutenant Colonel John Abizaid, commander of the 3d Battalion, 325th Airborne Battalion Combat Team from April to July 1991 during Operation Provide Comfort. The flying checkpoint was "a mobile combined arms force which would move forward to key intersections in areas where armed Iraqi or guerrilla fighters were known to operate and would set up a hasty roadblock in order to disrupt unauthorized or unwanted military activity."[41] One of the components Lieutenant Colonel Abizaid cites in his task organization is "mobile mortar support."[42] Based on the mission, enemy, terrain, troops and time available (METT-T), this could just as easily be artillery support.

One of the virtues of the flying checkpoint technique was that its flexibility allowed the battalion to control a very large sector, a requirement that is becoming increasingly common in operations other than war.[43] This is consistent with lessons learned from Vietnam. Lieutenant Colonel Picou noted that it was the far-flung Special Forces camps, isolated outposts just like the flying checkpoints, that benefitted most from the 1st Cav's artillery raids.[44]

Thus, the indirect fire raid is, as First Lieutenant Bohm calls it, "a feasible option—one more alternative in the battalion commander's 'bag of tricks.'"[45] The artillery raid can be used as an offensive weapon as the 1st Cav used it, as part of a deception plan as the Marines in Desert Storm used it, or as a means of gaining flexibility in a large sector as in the flying checkpoint example. It is this versatility that makes the artillery raid a useful tool, and as long as planners remember to establish the five elements to set the conditions for the raids' success, assuredly we'll find future METT-T situations that can benefit from this technique.



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For Valor:

L Battery at Nery

by Major Thomas G. Bradbeer

One of the most heroic actions fought by the British Expeditionary Force (BEF) in 1914 occurred when a single battery of Royal Horse Artillery held off an entire German division for several hours, giving its corps time to withdraw.[1] During the retreat from Mons to the Marne River on 1 September 1914 at Nery, a village near Compiegne, France, L Battery of the BEF's 1st Cavalry Brigade held off the German 4th Cavalry Division so III Corps could withdraw.

FM 100-5 Operations states that the most essential dynamic of combat power is competent and confident officer and NCO leadership.[2] It further states that leaders inspire soldiers with the will to win. They provide purpose, direction and motivation in combat. During operations they know where to be to make decisions or to influence the action by their personal presence.[3] L Battery's leadership did all those things, allowing the unit to overcome seemingly impossible odds.

The Battle of Nery

The British and French armies (a total of 17 divisions) were retreating toward the Marne under strong pressure from 28 German divisions executing the von Schiefflen Plan. The plan, originally devised in 1905 but repeatedly modified before implementation, concentrated the majority of the German forces on the right wing of an intended giant wheel maneuver. The right wing was to sweep through Belgium and northern France and then continue to transverse in a vast are to the left and east. With the extreme right passing south of Paris, it would press the French back where they would be hammered in the rear on the anvil formed by the fortresses along the Swiss frontiers.

The French defeat at Charleroi on 21-22 August nullified the limited British success at Mons on the 23d. Fortunately for the Allies, the Germans did not take advantage of their success, and the Allies were able to withdraw.[4]

On 1 September 1914, the BEF's 1st Cavalry Brigade was covering the retreat of III Corps. Its organic artillery was L Battery, Royal Horse Artillery. L Battery had a complement of six officers and 164 others and was equipped with six horse-drawn 13-pounder guns. Its primary munition was the 12 and a half-pound shrapnel shell. Each round contained 263 pellets with a charge that forced the pellets forward when the round burst.[5] Each gun was manned by 11 men but could be operated by four in an emergency.

The battery was well trained and had seen almost continuous action since arriving in France two weeks before. During the retreat to Mons, L Battery had provided counterbattery fire on four German batteries, allowing the 1st Cavalry Brigade to withdraw with minimal losses.

L Battery arrived in the village of Nery, 50 miles northeast of Paris, on the night of 31 August. The battery commander, Major Sclater-Booth, had been briefed by the brigade commander to move at 0430 hours, but a dense mist covered the ground so the move was postponed one hour. Sclater-Booth ordered his men to use the time to feed and water the horses already hooked up to the guns and ammunition limbers. As the mist began to clear, the men were able to see the terrain around them for the first time.

A deep ravine lay to the east of the village, and beyond it, high ground dominated the area.[6]

Major Sclater-Booth was called to the brigade headquarters at 0500. He left his officers in a nearby field and returned to the center of the village. He had just arrived when a report was received that German cavalry in large numbers had been encountered on the high ground east of the village. Before orders could be issued, the entire village came under heavy artillery and machinegun fire.

The lead elements of the German 4th Cavalry Division had moved to within two kilometers of Nery undetected. Its attached artillery (three batteries of four guns each) had gone into action immediately and commenced to lay down a heavy barrage of shrapnel on the unsuspecting British brigade.[7]

L Battery had been caught in the open, lined up and ready to move—a near perfect target for the German artillerymen. Four of the German guns concentrated on L Battery while the remaining eight engaged the other units of the 1st Cavalry Brigade positioned around Nery. While the German artillery rained havoc on the village, eight regiments of German cavalry dismounted and added their machinegun and rifle fire.

L Battery's area was covered with dead and wounded horses and gunners who had been hit before they knew what had happened. Overturned ammunition limbers and horses struggling to free themselves from their guns created more chaos. The situation was grim. It was at this moment that the leadership of L Battery "influenced the action by their personal presence," as stated in FM 100-5.[8]

The brigade commander had decided to hold and fight until reinforcements could arrive. Major Sclater-Booth made his way back to his battery under intense fire. On the way, he was able to locate the German artillery from the repeated gun flashes through the mist. He was shocked to see the guns were on the high ground less than 800 yards from his own battery. Before he could relay the locations of the German guns, he was wounded by a shell and knocked unconscious.[9] Eventually, he managed to make it safely back to his battery.

With the battery commander wounded, Captain Edward K. Bradbury, the battery captain (executive officer), took charge. As he broke from cover, he was heard to yell, "Whose for the guns?"[10]

With three lieutenants and the surviving gunners, he made his way under fire to where the 13-pounders stood. Three pieces had been damaged beyond use. The remaining three were unlimbered and turned to face the threat to the east. Captain Bradbury and Sergeant Nelson and two gunners crewed one gun. Lieutenants Campbell and Mundy with two gunners crewed the second while Lieutenant Giffard, battery Sergeant Major G.T. Dorrell and two gunners manned the third.[11] The British half-battery opened fire on the German positions and rapidly forced the German cavalry to halt the advance. After three volleys, however, two of the British guns were knocked out of action by the concentrated German fire.

Part of a Royal Horse Artillery battery in position in late 1914.

The Germans also were firing shrapnel, and the effects were devastating. Lieutenant Giffard was wounded four times while carrying ammunition to his gun.[12] He continued relaying ammunition until the limber to his gun was empty and he was overcome by wounds. Within 10 minutes, only one gun remained in action. The other two were surrounded by dead or wounded artillerymen.

With only one British gun firing on them, the Germans massed their fires on it. Captain Bradbury and five others manned the remaining gun. Captain Bradbury acted as layer while Sergeant Nelson served as range-setter. Sergeant Major Dorrell loaded the gun while Gunner Derbyshire and Driver Osborne passed ammunition from limber to gun.

Lieutenant Mundy acted as the observer. "Five minutes left," he called. "Add 25." And then, as one German gun went silent, "Ten minutes more right; drop 25."[13] Mundy observed and directed the fire until three of the German guns were knocked out of action. Then he, too, was seriously wounded.[14]

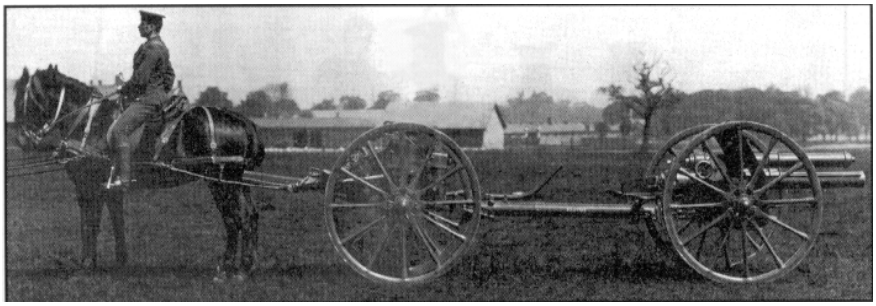
For more than an hour, the lone 13-pounder continued to fire. The German fire pounded the British gun crew, and with each incoming round, there seemed to be one less L Battery gunner alive. But slowly the odds against the battery were being reduced by the British crew's accurate fire. They kept up a steady rate of fire with shrapnel, mauling the German gun crews.

Realizing they were almost out of ammunition, Captain Bradbury made his way back to the limber to get more and in the process was mortally wounded with both legs blown off.[15] Now only Sergeant Major Dorrell and Sergeant Nelson, both wounded, were left to crew the gun. They fired their last rounds, and the gun fell silent. Their ammunition gone, the two surviving gunners were convinced the Germans would attack and overrun their position. L Battery's valiant fight to stop the German advance was over.[16]

But L Battery had not used up all its luck. There was a loud cheer from the other units in the 1st Cavalry Brigade who had taken refuge in a sunken road during the Germans' artillery barrage. The cheer was a salute to the valiant gunners of L Battery, but it also signaled the arrival of badly needed reinforcements. The 1st Battalion of the Middlesex Regiment and the 1st Scottish Rifles had arrived at the critical moment and with them I Battery, Royal Horse Artillery.[17]

The infantry battalions laid down heavy machinegun and rifle fire on the German positions. I Battery went into action, and its intense fire forced the Germans to fall back. The retreat turned into a rout when the British cavalry arrived to support the attacking infantry.

The Germans suffered nearly 800 casualties, many of whom were caused by



A British 13-pounder horse artillery gun together with its ammunition limber.

the accurate fires of L Battery. From the three enemy batteries, 15 German artillerymen lay dead around their guns and 25 were captured. Eight of the 12 guns were captured.[18]

From the time of its fight at Nery, the German 4th Cavalry Division ceased to be a cohesive fighting force. It took three days to reassemble the division, and even then, the division was not fit for duty.[19]

L Battery's casualties were heavy. Forty-five of the battery's 170 men were killed or wounded. Four of the six officers had been killed; the remaining two were wounded. For their courage and leadership, Captain Bradbury, Sergeant Major Dorrell and Sergeant Nelson received Britain's highest military award for gallantry—the Victoria Cross. The Distinguished Conduct Medal was awarded to Darbyshire and Osborne.[20]

The battery's superb leadership under fire, especially when caught by surprise, not only kept the battery functioning, but also inspired an epic defensive stand for nearly three hours. Captain Bradbury and his officers and NCOs didn't know it, but their actions had far-reaching effects on the war's first campaign. L Battery had been the decisive factor in stopping the advance of the German 4th Cavalry Division. The outcome of the action at Nery was one of several events that culminated with the Battle of the Marne and failure of the Schiefflen Plan.

The German 4th Cavalry Division was the eyes and ears of the Von Kluck's First Army. If L Battery's accurate fire had not destroyed the 4th Division, the division undoubtedly would have learned that the French had assembled a new army, the Sixth, on the left of the BEF, which posed a major threat to the Germans' flank.[21] Without this intelligence, Von Kluck continued to move First Army to the east. The result was the war's first major battle, the Battle of the Marne, which forced the Germans to withdraw beyond the River Aisne. This defeat ultimately led to the now infamous era of trench warfare that characterized the First World War.

Leaders as Combat Multipliers

There were many reasons why L Battery performed so well at Nery. As an integral unit of the BEF, it was composed of professional soldiers, all of whom were experienced, highly trained volunteers. Many had seen service in Africa or India. Assessing the European armies in 1914, the respected military writer and strategist, Sir Basil Liddell-Hart called the BEF "the most highly trained striking force of any country— a rapier among scythes."[22] The British Official History of the Great War stated it was "the best trained, best organized and best equipped British Army that ever went to war."[23] Officers and NCOs such as Bradbury and Dorrell were trained and competent and had the respect and trust of the soldiers they served with.

Strong leaders and trained, dedicated soldiers are great combat multipliers. At Nery, the moral qualities of soldiers and leaders—sense of duty, courage, loyalty and discipline—combined with stamina and skillprovided the decisive edge.

Superior combat power derives from the courage and competence of soldiers, the excellence of their training, the capability of their equipment, and above all, the quality of their leadership.[24] L Battery had all of these elements, and when tested on the field of battle, it fought with distinction as it was trained and, above all, led to do.

Today's Field Artillery leaders should remember the courage and leadership displayed by L Battery at Nery more than 80 years ago. No matter what the Army's or artillery's mission in war or peace, effective military leadership will be the key to success.

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24. FM 100-5, 2-12.

Cushing of Gettysburg: The Story of a Union Artillery Commander

Kent Masterson Brown. Lexington, Kentucky: The University Press, 1993. 330 pages. $32.00

Cushing's Career. Brown's book is the first complete record of Cushing's short but remarkable military career. Alonzo Herford Cushing was one of the great battery commanders of the Civil War. He graduated from West Point in 1861—a classmate of George Armstrong Custer. Immediately after graduation, Cushing was assigned to Battery A, 4th US Artillery. He served with that unit for the remainder of his life and saw action in some of the most significant battles of the Civil War, including the First Battle of Manassas, Fair Oaks, Second Battle of Manassas, Antietam and Fredericksburg. In February 1863, Cushing assumed command of Battery A and led the unit at Chancellorsville and Gettysburg. He received brevet promotions for his actions at Fredericksburg, Chancellorsville and Gettysburg.

The story of Cushing at Gettysburg did not make its way into Michael Shaara's highly regarded historical novel *The Killer Angels* or into the epic film "Gettysburg," as based on the book of the same name. Cushing and his battery, nonetheless, were at the very center of the action on Cemetery Ridge on 3 July 1863.

Cushing's battery was positioned in the Union line just to the north of the "Copse of Trees." His six three-inch ordnance rifles were less than 10 meters away from "The Angle" in the low stone fence that fronted the Federal troops.

Before the charge of Pickett's and Pettigrew's divisions, the Confederate artillery shelled the Union lines for almost three hours. During the preparation, Cushing's battery engaged in counterfire but took heavy casualties in the process. Cushing was severely wounded in the right shoulder and groin and had lost four of his six guns by the time the shelling had lifted. Refusing to leave his command or receive medical attention, Cushing continued to fight his battery.

When the Confederate artillery fire ceased, the Union troops knew the ground attack would follow shortly. Cushing moved his two remaining guns forward to the edge of the stone wall and prepared to face the Southern onslaught. He ordered all his battery's canister rounds consolidated at the two surviving pieces. He also ordered his cannoneers to arm themselves with trail spikes in anticipation of hand-to-hand combat with the Confederate infantry.

When the attack came, Cushing's guns started firing spherical case and solid shot until the Confederates were within canister range. With the leading Southern troops within 50 meters of his position, he started firing double canister.

A short time later, Cushing was hit in the face by a bullet and died at his Number 4 gun. Although he had been in severe pain and bleeding profusely, Cushing had remained in command for more than one-and-a-half hours after first being hit. He was only 22 when he died.

Immediately after Cushing fell, the Confederate charge broke into the Union positions and reached its high-water mark. A counterattack by the 72d Pennsylvania Infantry broke the momentum, and the attack stalled and ultimately failed. Confederate brigade commander, Brigadier General Lewis Armistead died just to the left of Battery A's Number 4 gun, only a few meters from where Cushing fell. After the battle, more than 600 Confederate dead were counted directly in front of Battery A's position.

Cushing's story is also the story of his German-born First Sergeant, Frederick Fuger. When Cushing died, Fuger assumed command of what was left of the battery. He started firing triple canister at point-blank range until Pickett's troops overran the sole surviving gun.

Fuger later received a battlefield commission and the Medal of Honor for his actions that day. He retired from the Army in 1903 as an artillery colonel. Fuger's son, Albert, also became a Field Artillery officer and commanded an FA brigade in France during World War I.

The Constants of Land Warfare. This book shows that although the technology and tactics of the Civil War are far removed from the world of today's Field Artilleryman, certain aspects of land warfare have remained constant. Then as now, Field Artillery leaders were responsible for shooting, moving and communicating—in all sorts of weather, over all kinds of terrain. Battery commanders of that era still had to worry about ammunition supply and rates of fire.

The human dimension of war has not changed all that much either. Any Redleg leader today instantly will recognize his 19th century counterpart's challenges in training, motivating and feeding troops in every imaginable condition. The core principles of military leadership have not changed at all.

Thorough Research. *Cushing of Gettysburg* is a meticulously researched book, based heavily on contemporary letters, journals and other manuscript material. The early chapters of the book sometimes have a tendency to get bogged down in the minute details of Cushing's ancestry and family history. On the other hand, Brown provides good descriptions of the key battles, including an especially gripping narrative of Gettysburg on 3 July.

A Final Tribute. Most soldiers who fell at Gettysburg were buried there. Cushing's body was guarded by the loyal First Sergeant Fuger and the cannoneers of Battery A until Cushing's brother could arrive to claim it. Brevet Lieutenant Colonel Alonzo Cushing was buried in the cemetery at West Point, appropriately enough, next to another hero of Gettysburg, Major General John Buford. General Buford was the Union cavalry commander who skillfully delayed the superior Confederate advance on 1 July 1863 and shaped the battlefield for the subsequent Union victory.

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Photo by 55th Signal Company (Combat Camera)

Evolving Tactics, Techniques and Doctrine for Fire Support in

Peace Enforcement Operations

by Lieutenant Colonel Peter S. Corpac

30 December 1995, Bosnia-Herzegovina—"Ready Six, this is Blackhawk Six. There has been a mine strike, at least one casualty; more information to follow." Simultaneously, an AH-64 pilot reported his helicopter was being painted by an SA-6 radar and Redlegs were detecting multiple mortar acquisitions—fire missions were sent to the guns.

Although to date we have not fired a "shot in anger," that was our welcome to Bosnia. Fire support for Operation Joint Endeavor requires maneuver and artillery commanders use fire support and firing units in dramatically different ways than in conventional missions. The goal in Bosnia-Herzegovina is to compel the former warring factions to comply with the Dayton Peace Accord—if possible, without resorting to combat. In this environment, the artillery battalion is a maneuver force as surely as an armor or infantry battalion.

The ability to provide quick and accurate fires remains the most important aspect of the fire support mission in Bosnia; however, the direct support (DS) FA battalions of the 1st Armored Division (part of Task Force Eagle), also must execute non-standard missions. These FA battalions must operate divisional style counterfire headquarters, serve as a power projection force and execute presence missions—all of which are extremely important to the success of Task Force Eagle's peace enforcement mission in Bosnia.

The FA's mission in Bosnia-Herzegovina is to provide fire support for peace enforcement operations to implement the military provisions of the Dayton Peace Accord and to ensure force protection. This is a very broad fire support mission. Foremost in this mission is protection of the force. That means we first establish a counterfire system that acquires and tracks all potential targets and indirect fire systems that threaten the NATO implementation force (IFOR) and take actions to dissuade the former warring factions from using artillery and mortars.

Then, if a decision is made to fire, we must attack the target with the right weapons

system. The weapon could be tanks or Bradleys, attack helicopters in close air support (CAS) as well as mortars or artillery. The first choice always will be to attack the target with precision fires with observer eyes-on-target whenever possible.

The brigade fights its artillery battalions like one of its maneuver task forces. The DS FA battalion's primary mission is fire support—but moving, positioning and employing artillery is integrated into and synchronized with the brigade peace enforcement operations.

For example, a firing platoon was positioned recently in the strategic town of Bok. It was in that town to provide an IFOR presence and show commitment at a critical time. The position was far from ideal for firing, but it had the intended effect and freed maneuver platoons to man checkpoints and clear the zone of separation (ZOS).

If we have to fire, the effects of our fires will be felt around the world, so accountability is crucial. There's no doubt that CNN would assess the battle damage for the world. Therefore, the system is in place to document the fire mission process—from target acquisition through mission approval to execution. We have to be prepared to show beyond a doubt that the target was legitimate, the fires were accurate and we made every effort to minimize collateral damage.

Organization for Combat. The mission and terrain in Bosnia-Herzegovina dictate that the DS artillery battalions in Task Force Eagle be organized differently than a conventional battalion. (The task force is comprised of the US 1st Armored Division with two of its brigades, a Russian brigade and a multinational Nordic-Polish brigade and is commanded by the 1st Armored Division's Commanding General.)

The DS FA battalions in Task Force Eagle have many of the assets of a conventional division artillery. Each battalion has a target acquisition battery with three Q-36 and two Q-37 radars, a multiple-launch rocket system (MLRS) platoon and a meteorological section attached to it. Firing platoons are prepared to be cross-attached to their sister battalion if the situation warrants it.

Mortars are an important fire support asset in peace enforcement operations. The artillery commander recommends positioning of the task force's mortars so their coverage and effects are integrated into the brigade's indirect fire coverage.

Counterfire Operations. The DS artillery battalion, with its attached TA battery, is responsible for counterfire operations in the brigade. To accommodate this and other requirements, tactical operations center (TOC) operations are unique. The TOC fights the close fire support battle, conducts counterfire operations and handles verification duties. We found that, at the DS battalion level, there isn't a lot of in-depth knowledge on counterfire operations or an understanding of the internal workings of radars and how they acquire targets.

Force protection is the radars' mission. They are positioned and oriented to detect indirect fires that threaten the IFOR, civilian population centers and ongoing operations. High-value targets are identified and possible firing positions for the weapons systems available to each side are plotted. The radars are oriented on those possible positions. A radar's difficulty in tracking rounds fired away from it complicates coverage. Many times, we must use two radars looking from different directions to cover an area.

The Q-36 and Q-37 radars are great. But while they even pick up AK-47s being fired into the air, this makes a terrible New Year's Eve as just about every native in the country fires his weapon into the air to celebrate. Our radars picked up hundreds of acquisitions, each deemed celebratory fire. But this capability allows us to detect fires originating from the ZOS, a treaty violation, and to vector maneuver forces to halt the activity. With the first target acquisition in Bosnia, our training and procedures paid off. We did *not* put 72 high-explosive (HE) rounds on some guy celebrating his birthday.

When a radar acquisition is received in the TOC, it's analyzed to ensure the target is legitimate. The S2's map is checked to see if there are weapons or suitable firing positions in the area from which the "fire" could come. Weapons characteristics must make sense—mortars in the area shooting 40 kilometers or an artillery round traveling one kilometer is not believable, indicating the acquisition is caused by something else.

Once we confirm the target is legitimate, we must have permission to fire. The decision maker must have the impact location, shooter location and details about the effects the fires would have. The probability of civilian deaths and collateral damage are always factors in receiving permission to strike a target. "Striking" a target can mean anything from maneuvering a Bradley platoon into position as a presence for deterrence, firing HE high in the air as a show-of-force or destroying the target with a Copperhead round.

Power Projection. The mission is to compel compliance with the Dayton Accord and facilitate peace in the region; attacking and destroying the three factions' units and equipment won't necessarily accomplish this mission. While we must remain prepared to shoot on a moment's notice, the best way to accomplish the mission might be to demonstrate our capabilities for accurate, deadly indirect fires to the factions. We must be seen as a tough, disciplined and professional force capable of detecting and destroying threats with little or no collateral damage.

Most of our training in stability operations emphasized fixed firing positions in base camps with little or no interaction with the faction military or civilian population. But employing artillery in this manner did not support the Task Force Eagle's commander's intent. The artillery had to be aggressive and seize the initiative—show the factions just how good we can be if we need to be. So we sought out the professional artillerymen of each faction and demonstrated the indirect fire capabilities of the American Army.

The senior artillery leader of each faction was invited to a separate demonstration. Each was shown a firing platoon occupation and spent time on the howitzers. The fire support team (FIST) and fire direction center (FDC) demonstrated the fire mission crew drill, emphasizing the speed of digital communications and the computer capabilities. We discussed the radars' capabilities and then complained of the problem of acquiring AK-47 weapons firing in the air—this helped confirm in their minds the effectiveness of the radars.

The final event was watching the speed of a digital fire mission from acquisition to firing the howitzer. The full MLRS platoon then occupied a nearby position and, in minutes, were ready to provide devastating reinforcing fires.

These unclassified presentations were a tremendous success. Every faction officer was absolutely amazed at the speed at which we can process missions, the variety and lethality of our munitions, the effectiveness of our armor protection and most important, our ability to

acquire targets. Ironically, some of the faction leaders offered to buy our equipment.

The demonstrations provided a side benefit. It established a professional relationship between us and the artillerymen of each faction. We got to know them—discussed fire support tactics and techniques used by the different factions in the war. On more then one occasion, this working relationship helped to defuse a potentially explosive situation.

There's a kinship among artillerymen around the world. It is amazing how we all seem to gravitate toward the aiming circle and talk of celebrating Saint Barbara's Day.

Presence Missions. Strength and power are respected in Bosnia-Herzegovina—looks count. Our mission analysis quickly showed that there were not enough maneuver forces for the tasks. We concluded that moving and positioning artillery would convey our intentions, determination and professionalism—much the same as having an American carrier group patrol just off shore. Moving the guns within the brigade, emplacing them and pointing the tubes at a faction's verification site or positions sends a powerful message to the citizens and soldiers of all sides. The guns demonstrate IFOR's commitment to the peace process and serve as its instrument to deal with those who seek to disrupt that process.

There is a tremendous psychological impact when four huge cannons and ten armored vehicles go thundering through small villages. *Everyone* knows when the cannons or MLRS are moving and where they are positioned.

The *Ready First* Brigade Combat Team (1st BCT of the 1st Armored

The FA "Presence" Mission

Of all the non-traditional artillery missions encountered since crossing the Sava River in Operation Joint Endeavor, the presence mission has been the biggest leadership challenge. The mission for a 155-mm M109 howitzer platoon is to move out of the safety of the established base camp, position itself within the zone of separation (ZOS) and project an Implementation Force (IFOR) presence. The platoon must be prepared to fire in support of friendly forces and provide adequate force protection for three or more days. Implied is the need to move through an unstable area, coordinate with maneuver forces in the area and establish contact with the local population. Although new, the presence mission is becoming the backbone of FA peace enforcement operations.

The need to maintain an IFOR presence within the ZOS was identified early during planning. There are not enough Bradley and Abrams platoons to meet all of the commitments. Moving howitzer platoons out of base camps and into forward positions conveys our commitment to enforcing the Dayton Peace Accord. Thus, artillery platoons became diplomats of sorts, dealing directly with the people effected by the accord.

The positions are usually along or in the ZOS, the strip of land that separates the Croats, Serbs and Muslims. The fighting has stopped, but many towns have been divided or cut off by the zone from the faction they hold allegiance to. Pre-war feelings and new frustrations are alive in the ZOS, making it a potentially dangerous area.

Position Selection and Preparation. Platoon position selection is more important here than on any other missions. Although a remote, secluded area might do well in a high-intensity theater, it does not meet the requirements here. The area should be open enough to showcase the platoon's firepower and capabilities. This provides good fields of observation for perimeter security. The position also should be near a highly trafficable road the brigade has cleared for movement, a road oversized logistics vehicles can use. Recently, we cut the logistic convoy travel by getting support from the closest maneuver base camp.

To find a good position, we start with the populated towns and work our way out. Talking to the Bosnians, using a translator or speaking German, gives us a good "feel" for the town and how they'll accept our presence. Reactions have varied from welcoming us into their homes, to keeping a safe distance, to standing their ground and challenging our resolve. The Dayton Accord grants us freedom of movement, and in some cases, local civilians and military units must be reminded of that and shown that an IFOR unit will not back down. Usually people are very cooperative.

Our chief concern is to find an area that isn't mined. local Bosnians are familiar with this requirement and have helped us select safe positions. In one case, a Serbian military commander walked in front of me into a field to demonstrate its safety.

The battery commander and platoon leaders conduct the initial route and position reconnaissance using an M992 combat ammunition transport vehicle (CATV). This serves many purposes. It provides a secure convoy, gives the platoon leaders a chance to see the area and tests for suitable roads and positions for tracked vehicles. Coordination with the task force is critical to verify cleared routes, the current situation, maneuver positions and future operations. We make a point of coordinating with adjacent units for protection with a combined quick reaction force or tie into their fire support plan.

Route selection is important. We use the platoon's movement into the position as part of the show of presence. A route must take the platoon throughout an occupied town or region to give the inhabitants a full show of the platoon's combat power.

The advance party consists of the battery commander, platoon advance party, a survey position and azimuth determining system (PADS) team and a CATV. Once at the site, the CATV positions itself to cover the advance party and orients toward the release point for the platoon. With the CATV in place, the gunnery sergeant is free to conduct advance party operations and have the PADS team establish a survey control point. The advance party also can use the CATV as a rally point to meet the oncoming platoon.

Division) is responsible for more than 3,800 square kilometers and 115 kilometers of the ZOS. This vast area cannot be covered by fires from base camps.

Therefore, at all times, at least one howitzer platoon is deployed in a forward position. The platoon moves to provide coverage throughout the sector and reinforce key areas at critical times. Mortars provide close-in fires for base camps and are positioned with distant checkpoints for fires beyond artillery coverage.

In employing the artillery battalion, one must strike a delicate balance between providing conventional fire support coverage and an imposing presence.

Fire Support Operations. Fire support operations has gotten a lot tougher. Every task force, company, platoon, checkpoint, patrol and logistics convoy must know the fire support plan and be prepared to call-for-fire. We no longer have the luxury of only the company FIST planning and executing fires. Artillery maneuver and fire support execution is decentralized. Every track commander at a checkpoint must have a sector sketch and map with targets plotted and know how to call-for-fire.

The observation plan, already a critical part of any fire support plan, is even more important in stability operations. Task force fire support elements (FSEs) track the locations of each trained observer team and lasing system. Whenever possible, we want a trained observer team with a ground/vehicular laser locator designator (G/VLLD) positioned to observe potential targets. This has brought back the old forward observer (FO) teams for patrols. Experienced observers, usually a company FIST, deploys with each task force quick reaction force. Precision strikes are always

Photo by 55th Signal Company (Combat Camera)

The howitzer's position must be open enough to showcase its firepower and capabilities.

Road March. The platoon must pay considerable attention to the main body's road march. Most of the roads cleared for traffic in Bosnia are narrow; in some cases, they don't support two-way movement. Much of the road system has been damaged during the war, yet to be repaired. The roads that are usable are filled with sharp and blind curves. The road conditions combined with the influx of refugees returning home can impede movement or cause a vehicle to go off the road.

The first sergeant plays a valuable role during self-recovery operations. In the event a vehicle breaks down, the first sergeant and recovery and maintenance assets stay with the vehicle— self recovery here in the former Yugoslavia can be a daily occurrence. The inadequate roads notwithstanding, the "thawing" climate in the spring and soft ground can leave a vehicle stuck in place.

Occupation. The platoon occupation should be well planned, well rehearsed and well executed. As always, we have one chance to make a first impression, to demonstrate our capabilities. During occupation procedures, the commander and first sergeant must be prepared to react to any group of spectators that shows up. Most are amazed at the organized effort a well trained platoon can exert during occupation. However with many tracked vehicles moving at once with civilian spectators in the area, there is a real potential for an accident, so safety is paramount.

Once the platoon is in position, we go and meet our neighbors. We find a church, school or store that looks to be the center of activity and strike up conversations with the townspeople. Anything said there is likely to spread throughout the town. With the aid of the translator, we quickly convey our intentions to the people.

We like to field questions from the inhabitants. This helps put everyone at ease about our mission. It also helps to generate conversations that inevitably lead to some useful information about the area. There is always concern about rogue elements, terrorists, undetected mines and snipers. Generally, the artillery platoon is the only IFOR element in the area for any period of time.

The most critical factor of the presence mission is the protection of the platoon. Although the majority of the people have accepted the IFOR presence and acted very professionally, the platoon could have to deal with multiple threats. We have encountered rogue elements, terrorists, undetected mines and independently operating snipers since we arrived. For each position, we prepare and continuously improve a strong perimeter defense.

In the presence mission, battery leaders face unique challenges. The threat of unexploded land mines and sniper attacks overshadow reconnaissance, movement and occupation. Our platoon-based operations must strike a delicate balance between force protection and force projection yet promote interaction with the local population to gather intelligence, calm fears and open the channels for commerce and facilities for soldiers.

CPT William M. Lockard, FA
Cdr, A/2-3 FA, 1st AR Div
TF Eagle, Bosnia-Herzegovina

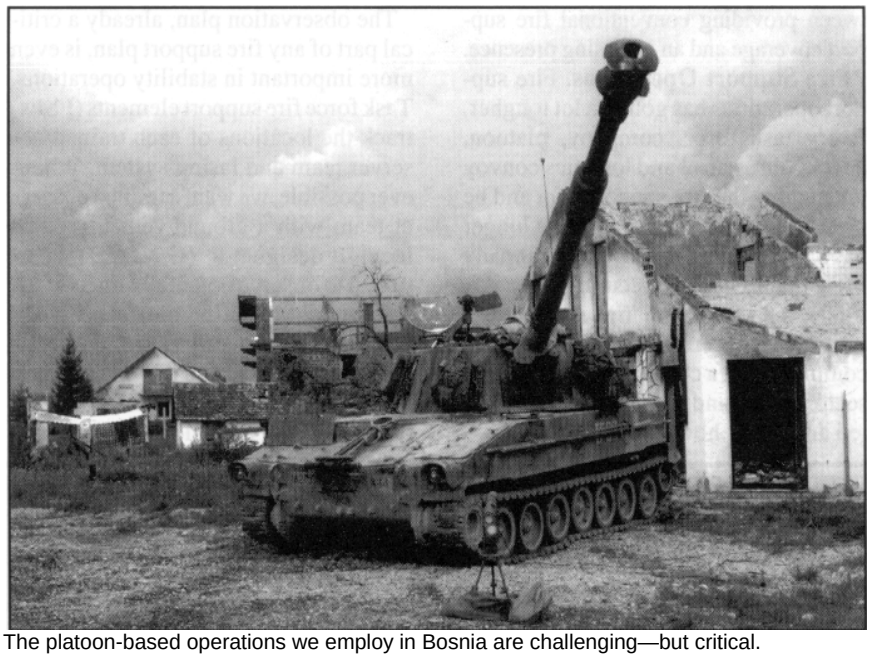


Photo by 55th Signal Company (Combat Camera)

The platoon-based operations we employ in Bosnia are challenging—but critical.

the first choice. Lasing systems, to include FIST, combat observation lasing teams (COLTs) and OH-58D and AH-64 helicopters, identify targets for potential indirect or direct fire systems.

The possibility of having to execute fires in this decentralized manner drives a continuous maneuver training program. Platoon leaders, platoon sergeants, track commanders and even logistics convoy leaders are taught call-for-fire procedures, the use of the target overlay and clearance-of-fire procedures.

Fire support targets are planned for execution by each base camp, checkpoint, observation post and patrol. These targets are resourced with observers, and the plans are rehearsed. Targets also are planned on known positions and along critical routes. Main supply route (MSR) targets are primarily for convoy commanders to shift fire onto until help arrives.

But fire support planning and execution is not necessarily designed to kill targets. We may want to defuse a situation by sending a message, short of lethal fires. Maneuver commanders can fire illumination or smoke rounds on a target. An HE fire mission, offset 500 meters from the target and 500 meters in the air, is also a possibility.

The platoon-based operations we employ in peace enforcement operations are critical but can be challenging. We put tremendous responsibility on the platoon leadership, who must execute all artillery tasks and often has responsibility for a radar collocated with the platoon. The platoon must establish its own perimeter for defense and coordinate with the local population and nearby friendly maneuver forces. Just as the DS battalion operates as a "mini-division artillery," the platoons often operate as "mini-batteries."

Logistics for platoon-based operations are tough. We provide maintenance support to the platoon, part from the battalion and part by splitting the battery maintenance section. The platoon maintenance slice is part of the platoon's logistics package, which also includes food, water and fuel to live for four days without resupply.

The battalion's controlling the six or eight platoons is no problem. Our operations work well in a 3x8 battalion; a 3x6 organization would make it almost impossible to cover the platoons' critical areas and command, control and support the platoons.

Staying Focused. Each unit in Bosnia-Herzegovina has the challenge of keeping its warfighting skills razor sharp while executing the peace enforcement mission. We have to keep the leaders and soldiers focused on knowing how to execute precise, rapid fires while not firing a shot.

The artillery battalions have used the Bosnia deployment as a unique training opportunity. We occupy every conceivable position. Platoons have conducted urban occupations in deserted and destroyed villages (there are lots of these). They have occupied positions in thriving communities, wooded areas, open fields—even have conducted hipshoots on roads. Every imaginable type of ammunition is on the guns.

Platoons move out on presence missions about every two weeks. Once in position, the guns go through every target in the fire plan to ensure they can use secondary aiming references and that there are no site-to-crest problems. 6400-mil, high-angle fire missions are the standard.

Leaders go through the planning process for each mission. They prepare fragmentary orders (FRAGOs) and FA support plans for operations. They also conduct rehearsals, especially fire support rehearsals.

Evaluations and competitions provide an added incentive for soldiers. The Gunner's test, Senior Radar Operator exam and other evaluation means help keep individuals focused. Section evals for howitzers, self-propelled launcher-loaders (SPLLs), FDCs and FIST teams as well as platoon competition, enable us to maintain trained units and recognize excellence.

The batteries develop and brief their quarterly training—yes, QTBs in Bosnia. Section chiefs brief the battalion commander on how they will prepare their soldiers for individual and section evaluations.

These initiatives are designed to combat complacency, to keep "soldiers' heads in the game." They also allow us to perfect our individual and collective skills as well as develop leaders.

We hope our presence in Bosnia-Herzegovina will enable the factions to reach a lasting peace. But whatever the outcome, this will not be the last peace enforcement mission for the US Army. We all must be prepared to execute that mission.

Lieutenant Colonel Peter S. Corpac commands Task Force 2-3 Field Artillery, part of the US 1st Armored Division's Task Force Eagle in Bosnia-Herzegovina. Prior to taking command of the task force, he served on the joint staff of the Pacific Command in Hawaii. Among other assignments, he was Executive Officer for the 4th Battalion, 5th Field Artillery, 1st Infantry Division (Mechanized), Fort Riley, Kansas; Fire Support Officer for the 2d Brigade, also in the 1st Infantry Division; and Commander of A Battery, 1st Battalion, 79th Field Artillery, part of the 7th Infantry Division (Light), Fort Ord, California, for two years. He is a graduate of the College of Naval Command and Staff at the Naval War College, Newport, Rhode Island, and holds an MBA from the University of San Francisco.

Firefinder Position Analysis System

by Lee R. Moyer and
Chief Warrant Officer Five Joseph A. Stephens

The Firefinder position analysis system/advanced development model (FFPAS/ADM) is new computer software that facilitates siting and setting up Q-37 and Q-36 Firefinder radars and improves their effectiveness. When properly sited, these radars can detect projectiles up to 50 kilometers and determine the location of the enemy weapon with great accuracy. Although the software is a prototype, it leverages technology used by the Federal Aviation Administration (FAA) in its radar software, allowing FFPAS/ADM to be rapidly developed for Firefinder and employed in both Korea and Bosnia.

A key element in employing Firefinder is to ensure adequate visibility of the radar's target (i.e., the enemy projectile). The Firefinder must observe a significant portion of the threat projectile's upward trajectory and determine the weapon's aim point. The radar beams also must be positioned above the intervening terrain to maximize elevation coverage and minimize ground clutter returns.

The manual Firefinder siting techniques currently used are time-consuming, decreasing the radar's effectiveness on a modern, high-tempo battlefield. Time limits may not allow radar personnel to evaluate alternative sites to select the best radar position—much less optimize the coverage provided by a network of Firefinders. FFPAS/ADM is a computer tool that reduces the time required to conduct detailed Firefinder site analysis.

In 1995, the Experiments and Demonstration Branch of the Depth and Simultaneous Attack Battle Lab at Fort Sill, Oklahoma, became aware of siting problems with the Q-37 in Korea. Personnel from the Field Artillery School at Fort Sill and the Night Vision & Electronic Sensors Directorate (NVESD), part of the Radar Division of the Communications and Electronics Command, Fort Monmouth, New Jersey, went to Korea to address the problem.

About this time, Technology Service Corporation, Trumbull, Connecticut, contacted NVESD to explore the Army's using software under development for the FAA's radars since 1990. The Korean problem was posed as a test case for the system. Within a month, the company had developed a FFPAS prototype that evaluated alternative Firefinder sites in Korea, and a contract was issued under the direction of the Program Manager of Firefinder at Fort Monmouth.

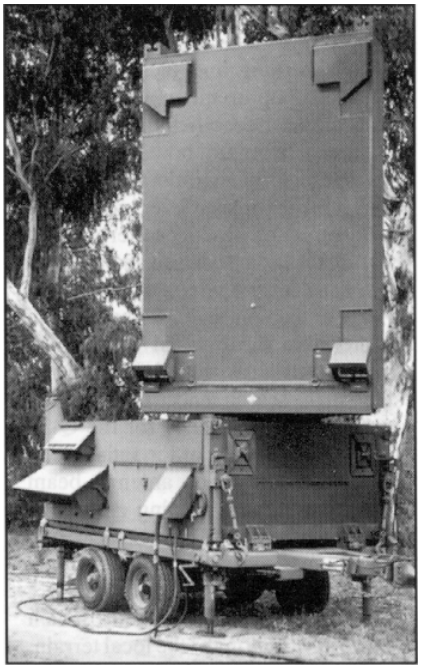
The first FFPAS/ADM system was delivered to the Field Artillery School for use in the 131A Targeting Technician Warrant Officer Basic and Advanced Courses in March 1995. The second system was fielded at Camp Stanley, South Korea, in April 1996; and the third to US forces in Bosnia in May. The initial FFPAS/ADM version models only the Q-37 radar; an enhancement to the system will allow it to model the Q-36 with delivery scheduled for July.

Firefinder Radar Siting Procedures

Firefinder personnel refer to the elevation profile of the local terrain as the *screening crest* and to the electronically controlled elevation angle versus azimuth scan angle dynamics of the radar beam as the *search fence*. Firefinder siting and preliminary determination of the screening crest currently are performed manually by using topographic maps and reconnoitering the forward area.

Once the radar is sited, an *aiming circle* is employed to determine the actual screening crest during the daylight hours. The Q-36 has an automatic terrain following (ATF) mode for use at night. During the time that the ATF mode is active, which may last for ten minutes, Firefinder is vulnerable to electronic detection and counter-radiation weapons.

The FFPAS/ADM helps radar siting by determining the coverage at a particular location, based on the optimal mechanical



antenna tilt angle and search fence, and by assessing Firefinder's ability to locate enemy weapons firing from specific locations. The FFPAS/ADM software can calculate in minutes data that used to take hours—even days—manually. The analysis capabilities of the software allow several sites to be evaluated in the same area and the radar coverage for each site to be determined rapidly and accurately.

FFPAS/ADM Overview

The FFPAS/ADM is a unique tool in that it considers the line-of-sight (LOS) visibility of the projectile, the radar's detection capability against the particular target and the strength of the clutter return when the radar operator performs a siting or analyzes an operational problem.

The characteristics of the terrain are taken from digital topographic data bases from the United States Geological Survey (USGS) or the Defense Mapping Agency (DMA) on CD-ROMs. A single CD-ROM typically contains 2 to 3 million square kilometers of Level 1 digital terrain elevation data (DTED), which has a resolution of 90 meters horizontally and one meter vertically. If available, the digital feature analysis data (DFAD) data bases and information such as road locations also can be used in FFPAS/ADM calculations.

Site Analysis. A Firefinder site is evaluated by first specifying the position of the radar on the "Terrain Plot" screen of the software—a topographical

map of the radar's area. The user positions the radar by specifying its easting, northing and local reference datum on a pop-up menu. On a second menu, the user specifies the antenna's mechanical azimuth boresite, its left and right sector scan limits and its minimum and maximum coverage ranges. The information produces a terrain plot showing the radar location and the coverage zone for the selected site.

The user then clicks on a menu button to determine the optimal mechanical elevation tilt angle for the sector and establish the search fence. The software generates a search fence for the Q-37 that keeps the center of the radar beam 28 mils (roughly one antenna beam width) above the screening crest. The user can override the FFPAS/ADM and specify a mechanical tilt angle and (or) flat mask.

The terrain plot is color-coded to match the height variations of the local terrain. By clicking on a particular point, the user can find out the easting, northing and altitude of that point. The user also can magnify a region of the plot by placing a rectangular "zoom box" around it. He can produce four additional plots to evaluate radar siting, any or all of which can be active simultaneously.

The "Screen Angle Plot" shown in Figure 1 is a 6400-mil terrain profile. As a function of range, the screening crest can be obtained directly from this plot; the range is shown color-coded from two to 20 kilometers in two-kilometer increments. Again, by clicking on a point, the exact range to that point is provided. The rectangular box on this plot denotes the left and right azimuth scan limits (edges of sector) and the lower and upper elevation scan limits (minimum and maximum beam elevation) and the optimal (i.e., 28 mil) search fence. For the Q-37, the radar coverage in the search mode (i.e., the antenna beam width) extends nominally plus or minus 21 mils in azimuth and plus or minus 15 mils in elevation around the search fence line.

The "Elevation Plot" shown in Figure 2 tells the amount of unobscured electronic elevation scan coverage available as a function of range and azimuth angle. On this plot, the search volume is color-coded from no coverage to 105 mils of coverage in 35-mil increments. Note that the black area designating no coverage in Figure 2 corresponds to the terrain peak that protrudes above the horizontal maximum beam elevation in Figure 1. If the radar were turned to point in the direction of the black wedge, radar personnel would have to increase the mechanical tilt angle to view projectiles beyond a range of nominally three kilometers.

The software also provides a "Visibility Plot," showing, among other areas, line-of-sight (LOS) visibility from the radar. The areas are color-coded to show the minimum visible height above the local terrain required for a projectile to become visible to the radar. This plot also identifies the susceptibility of the radar to low-altitude threats and quantifies the LOS visibility of the radar signal to enemy systems.

Figure 3 is a "Clutter Plot." This shows where radar returns from stationary objects

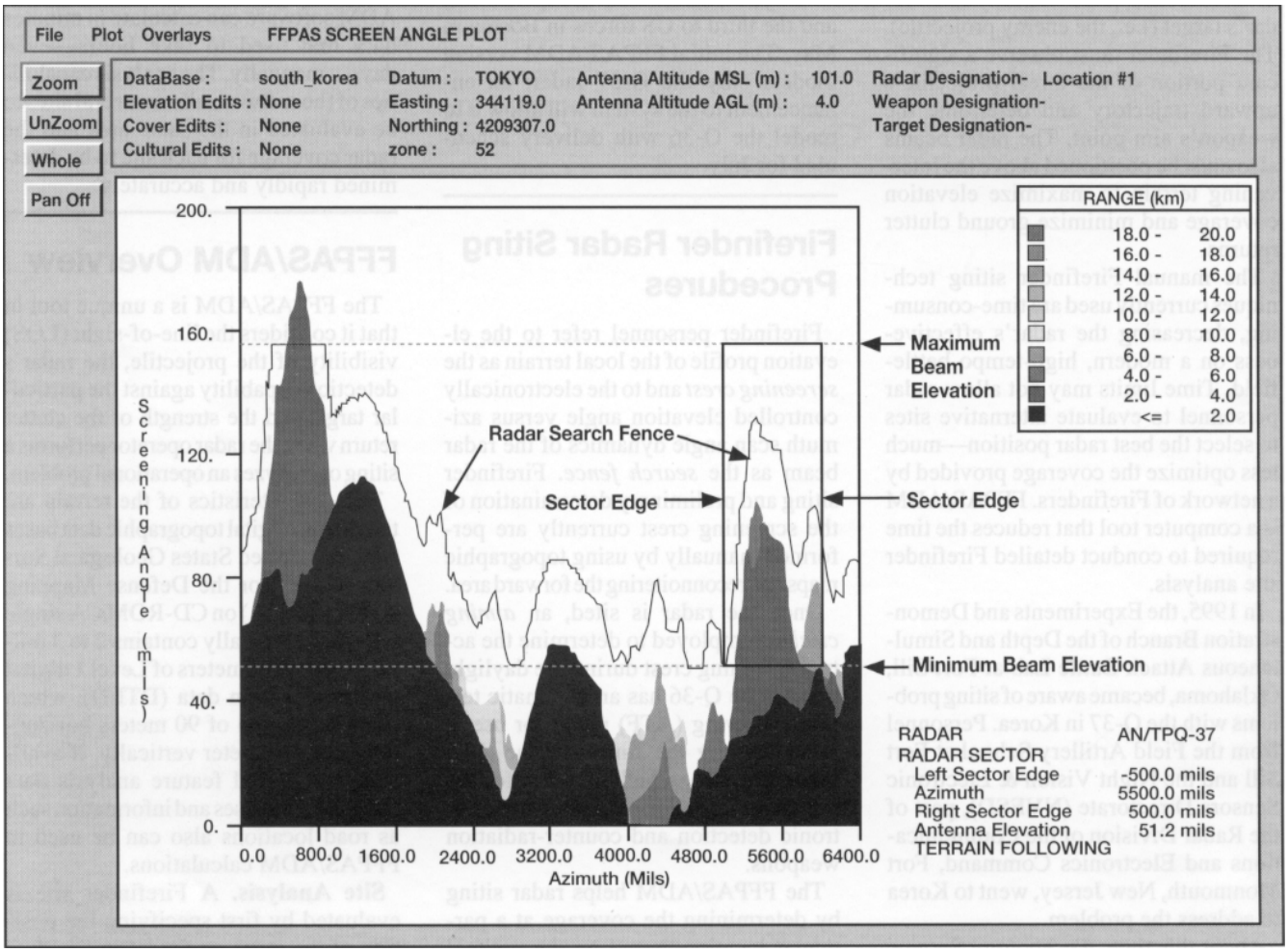


Figure 1: Screen Angle Plot

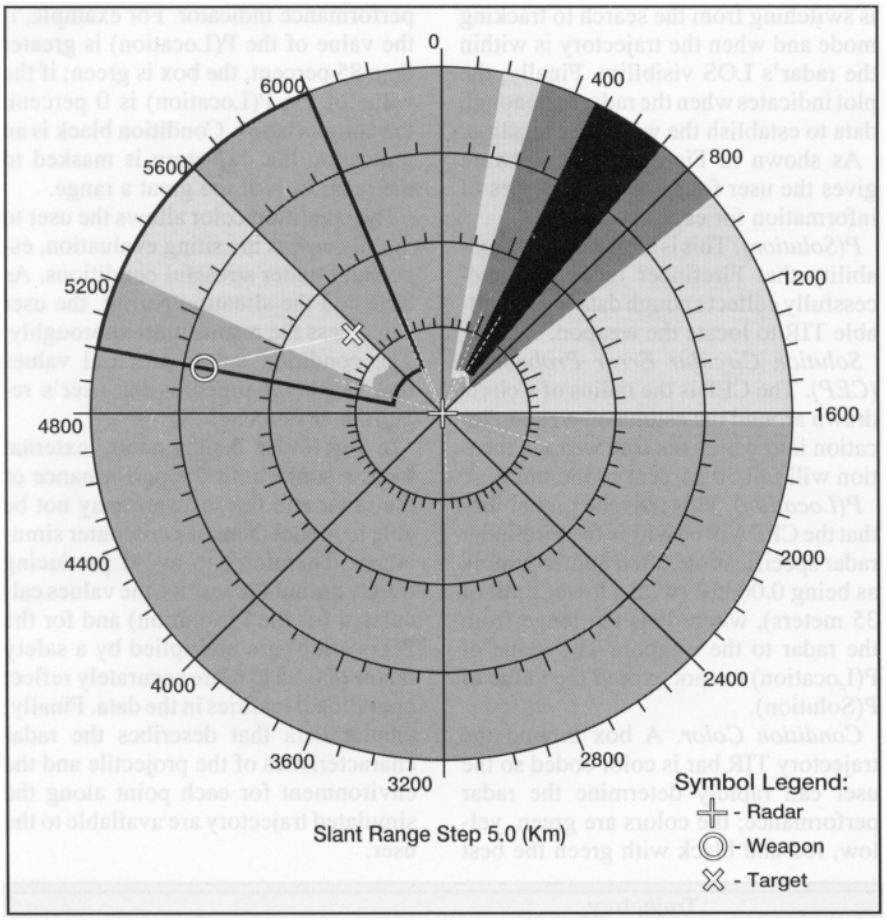


Figure 2: Elevation Plot

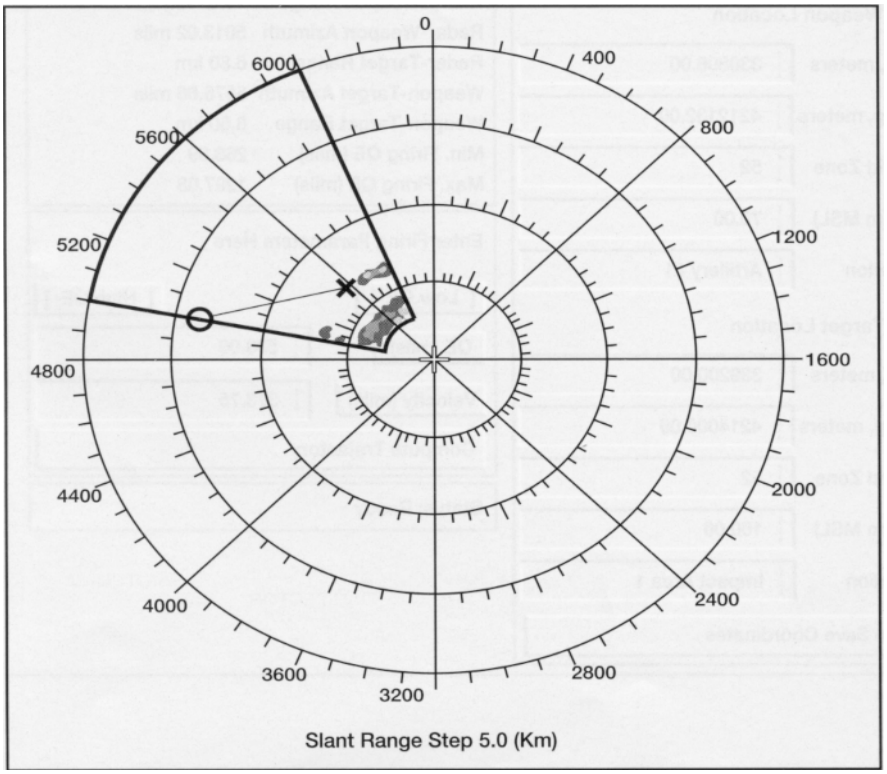


Figure 3: Clutter Plot

(i.e., the visible clutter identified in the "Visibility Plot") can degrade Firefinder's performance. The clutter plot is color-coded by clutter-to-noise ratio from zero to more than 80 decibels in increments of 10 decibels.

For all plots in a Cartesian coordinate format (all except the "Screen Angle Plot"), it's possible to tie points. By clicking on a particular point on any plot, a colored x will be printed at the same location on all active plots on the computer screen. Tying plots can be employed, for instance, to determine the cause of a masking condition or very strong clutter.

Weapon Location Analysis. The primary purpose of the Firefinder radar is to rapidly and accurately determine the location of hostile weapons so counterfire can be effective. FFPAS/ADM allows the user to analyze the radar's performance against a probable enemy weapon location and aim point.

The user can assess the radar's siting and set-up, based on battlefield intelligence in a variety of scenarios. First, he specifies the type, location and aim point of the weapon and the quadrant elevation (QE) and muzzle velocity for the shot, and then he estimates the ability of the Firefinder radar to determine the location of the weapon.

To perform this analysis, the user enters the information into the pop-up menu shown in Figure 4 on Page 42. As shown, the software models several generic weapon types; a specific weapon easily can be included. The software informs the user if the shot parameters input are beyond the capabilities of the weapon.

For achievable shots, all relevant data (e.g., the distance from the weapon to the impact point, the range from the radar to both the weapon and the impact point, etc.) is displayed in the menu. The system automatically computes the minimum QE values, which considers both the kinematics and the terrain profile, yet allows the user to change the muzzle velocity or QE value to analyze other firing conditions. At the push of a button, the user can get the maximum QE.

The weapon's model parameters in the software include the allowable range of values for the muzzle velocity, atmospheric drag coefficients and radar cross sectional area (RCS) of the projectile as a function of its aspect angle. This ensures the projectile's trajectory is modeled correctly and the radar signal strength is determined accurately.

Once a shot has been specified, it can be overlaid onto all plots. Figure 5 is the magnified "Screen Angle Plot" in Figure 1 onto which the projectile's trajectory has been overlaid. The triangles at the lower left with the points up denote the shot has occurred and is ascending; however, the trajectory is masked by terrain (a mountain). On the "other side of the mountain," the triangles with the points down indicate where the trajectory is masked by the terrain during the projectile's descent. The middle portion of the trajectory is where the projectile is visible to the radar.

FFPAS/ADM also provides a "Target-to-Interference Ratio (TIR) Plot." The TIR is the ratio of the signal received from the projectile to the sum of the clutter return and the thermal noise level in the radar. The computer screen shows a color-coded trajectory bar for each shot, indicating if the radar has enough signal strength to detect the projectile during the search mode and then in the target tracking mode. The color black, indicates there's no signal return—in the Korean scenario for this article, probably the result of terrain blockage. Black also indicates the radar is switching from the search to tracking mode and when the trajectory is within the radar's LOS visibility. Finally, the plot indicates when the radar has enough data to establish the weapon's location.

As shown in Figure 5, the software gives the user four important pieces of information for each shot:

P(Solution): This is the percent of probability that Firefinder radar will successfully collect enough data with a suitable TIR to locate the weapon.

Solution Circular Error Probability (CEP). The CEP is the radius of a circle drawn around the estimated weapon location into which the true weapon location will fall 50 percent of the time.

P(Location). This tells the probability that the CEP will be within the Firefinder radar specification, often quoted simply as being 0.0035R (with a lower limit of 35 meters), where R is the range from the radar to the weapon. The value of P(Location) cannot exceed the value of P(Solution).

Condition Color. A box around the trajectory TIR bar is color coded so the user can rapidly determine the radar performance; the colors are green, yellow, red and black with green the best performance indicator. For example, if the value of the P(Location) is greater than 85 percent, the box is green; if the value of the P(Location) is 0 percent, the color is black. Condition black is an indication the trajectory is masked to the radar or is at too great a range.

The condition color allows the user to rapidly assess the siting evaluation, especially under stressful conditions. As time and the situation permit, the user can assess the results more thoroughly. The condition colors are trial values that can be changed as the user's requirements dictate.

In Firefinder deployments, external factors could limit the performance of the radar and the software may not be able to model them in a computer simulation. Therefore, to avoid producing overly optimistic results, the values calculated for the P(Solution) and for the P(Location) are multiplied by a safety factor of 0.95 to more accurately reflect operational realities in the data. Finally, tabular data that describes the radar characteristics of the projectile and the environment for each point along the simulated trajectory are available to the user.

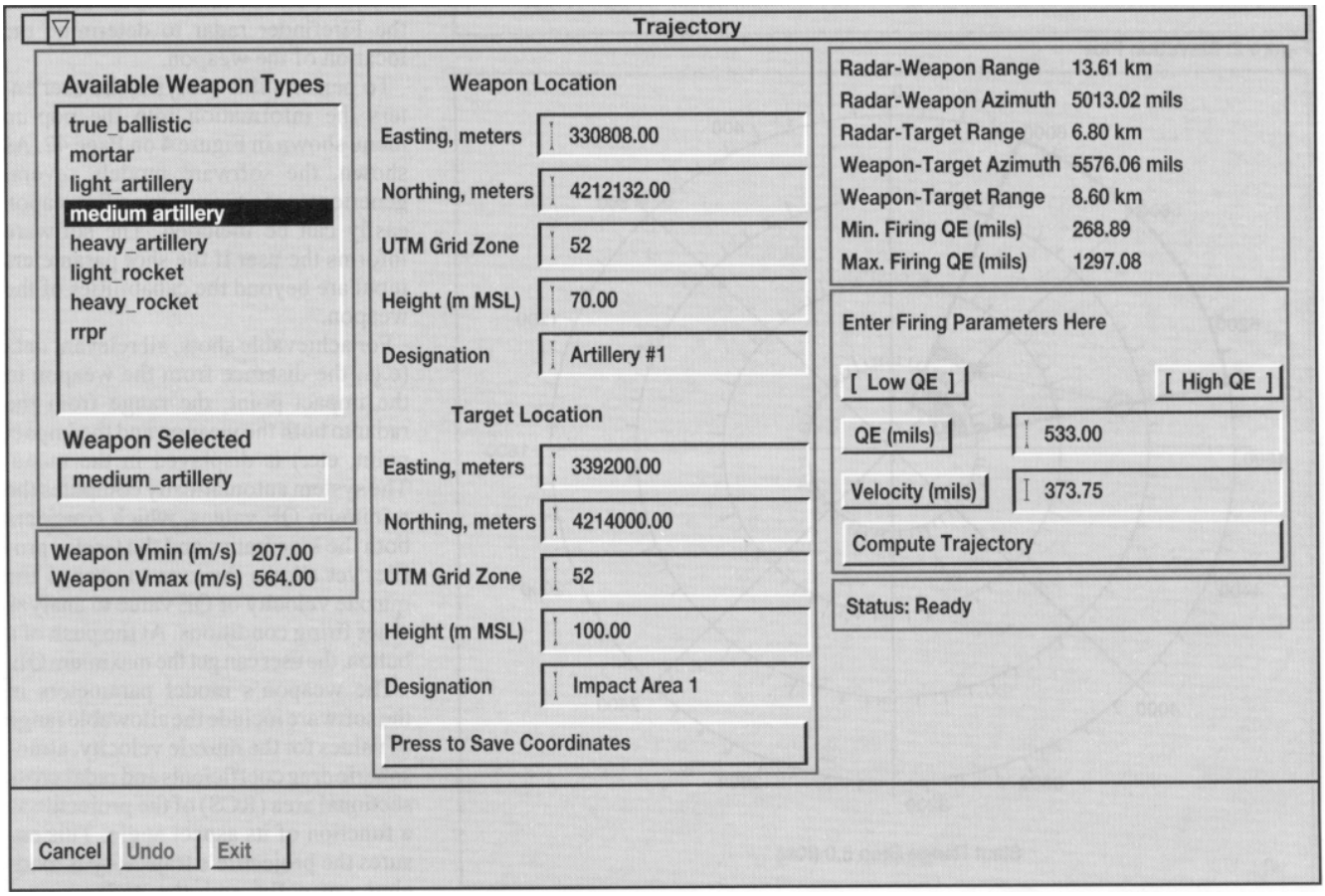


Figure 4: Pop-Up Menu—Analysis to Determine the Threat Weapon Location

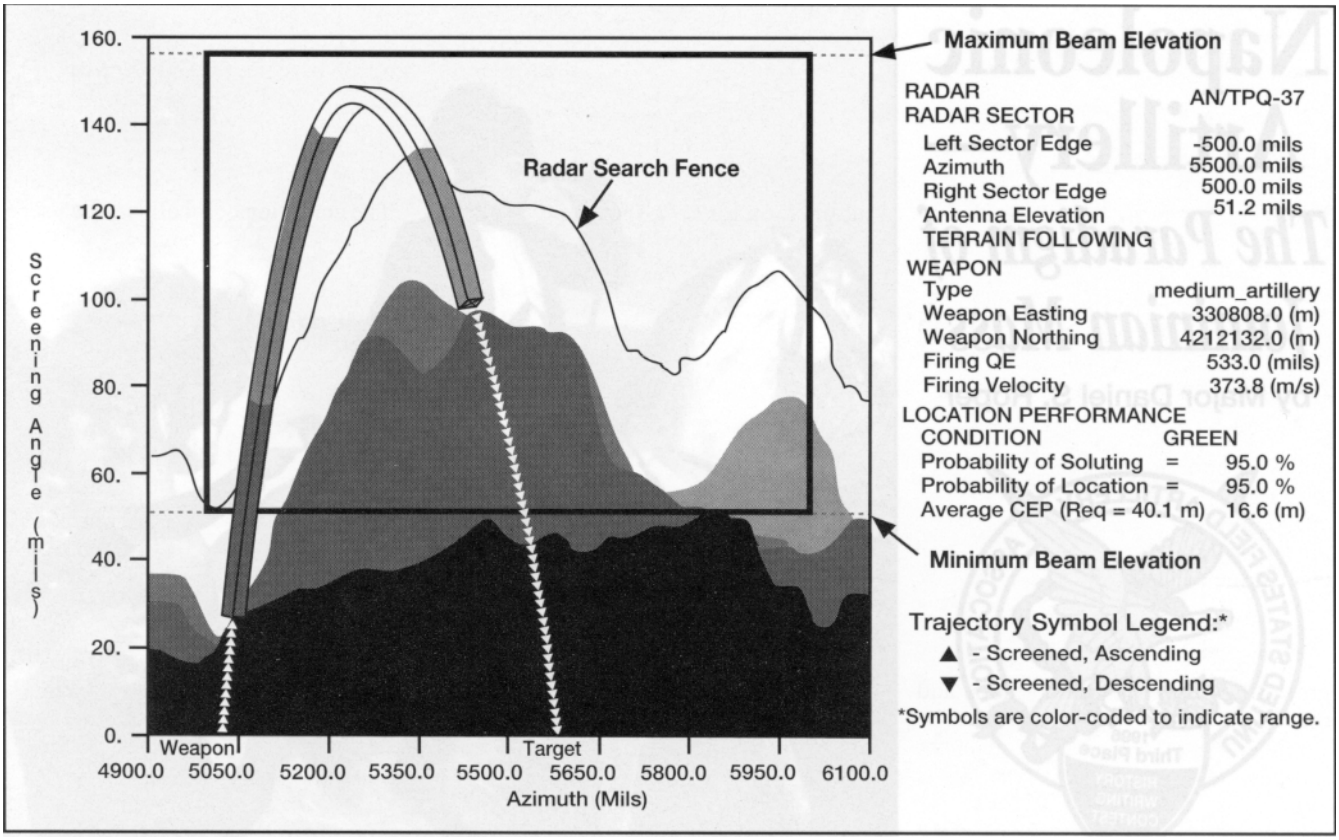


Figure 5: Magnified Screen Angle Plot (Figure 1). The portion of the trajectory between the ascending and descending "triangles" is the portion visible to the radar.

Applications and Enhancements

The Army will use the software to select radar sites, establish optimal mechanical tilt angles and search fences and determine the cause of operating problems in the field. The software also is being used as a teaching aid for instructing personnel in Firefinder radar siting, as well as in weapon theory and tactics.

The FFPAS/ADM software readily can be modified to support other Army missions. The most obvious application would be to site other types of Army radars, such as those used for battlefield surveillance, aircraft surveillance, transportable air traffic control (ATC) and ground-based missile guidance systems. The software also could also be applied to siting communications systems, identification friend or foe (IFF) systems (e.g., battle combat identification system), beacons and navigational aids. In addition, FFPAS/ADM can be enhanced to assess the interceptibility and electronic countermeasure (ECM) vulnerability of Army systems in site-specific environments.

This software could be used to assess the artillery coverage by not only hostile systems, but friendly as well. Enhancements could allow the user to determine coverage when weapons are deployed at specific locations, optimizing force deployment, and assessing the vulnerability of friendly forces to hostile fire. Finally, the software could assess the vulnerability of our forces to Firefinder-like radars employed by the enemy and determine the effectiveness of our ECMs against these radars.

Although the FFPAS/ADM is a powerful system, it's an engineering prototype. Potential enhancements to the system include area-to-area analysis, radar network coverage assessment and automatic site selection capabilities. Many of these capabilities already exist in the precursor FAA software and other simulations.

By automating the site selection and radar set-up processes, the FFPAS/ADM significantly reduces the time and effort required to deploy a Firefinder. The software's capabilities help Firefinder radars perform with maximum effectiveness on the modern battlefield.

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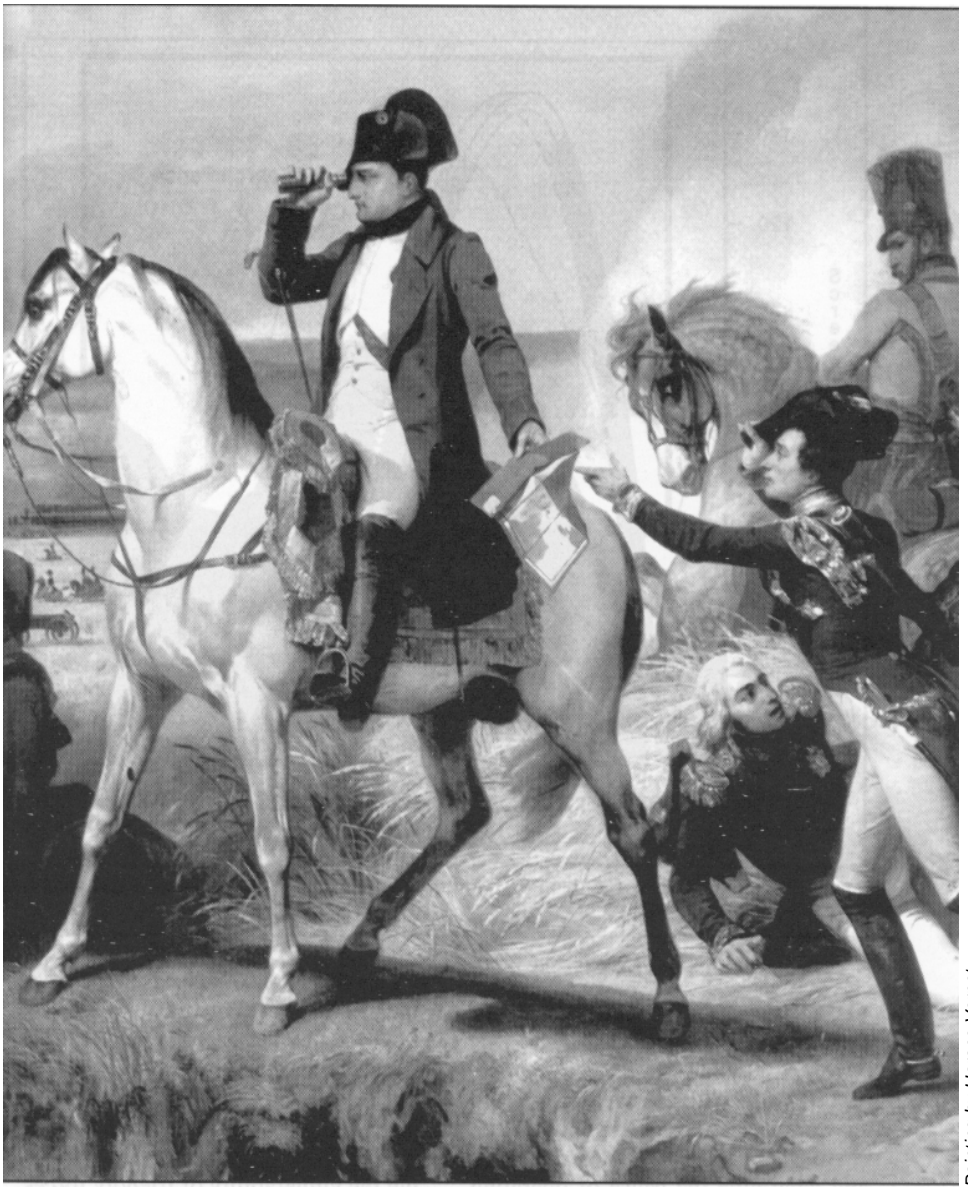
Chief Warrant Officer Five Joseph A. Stephens is Chief of the Radar Branch of the Target Acquisition Division, Fire Support and Combined Arms Operations Department at the Field Artillery School, Fort Sill, Oklahoma. He has more than 30 years of experience with Field Artillery radar systems, including combat tours in Vietnam and the Gulf, the latter as a Radar Technician in the 2d FA Detachment (Target Acquisition) with the 101st Airborne Division (Air Assault).

The authors wish to thank Technology Services Corporation's John A. DiDomizio, Firefinder Position Analysis System (FFPAS) Program Manager, and Christopher B. Fish, FFPAS Project Engineer, for their assistance with this article.

Napoleonic Artillery—

The Paradigm of Jominian Mass

by Major Daniel S. Roper



Painting by Horace Vernet

"Fire is everything; the rest does not matter."
General Napoleon Bonaparte

"There have existed in all times fundamental principles on which depend good results in warfare....these principles are unchanging, independent of the kind of weapons, of historical time and of place."[1] Furthermore, "these principles prescribe offensive action to mass forces against weaker enemy forces at some decisive point if strategy is to lead to victory."[2]

Antoine Henri Jomini, the Swiss war theorist, first advocated these dictums in "Traite' des Grandes Operationes" ("Characteristics of Great Operations") in 1803 and reemphasized them in his widely read classic, "Pre'cis de l'Art de Guerre" ("Summary of the Art of War") in 1836. Much of Jomini's inspiration came from his extensive analysis of the Napoleonic Wars and his involvement in many of these campaigns as a member of Napoleon's staff. This essay examines Jomini's principle of mass and demonstrates how Napoleon, primarily through the use of his artillery, mastered its application on the battlefield.

The Principle of Mass. Studying Jomini's "fundamental principle" of massing as manifested by Napoleon not only provides insights into the conduct of earlier wars, but also into how the US Army fights today. Jomini's work has had a lasting impact on Western warfare. For example, the American Civil War was fought by officers who had been immersed in Jominian thought through the teachings of Dennis Hart Mahan and others at the US Military Academy at West Point.[3]

During the Civil War in 1862, the Federal Army restructured to capitalize on the effects of mass. Artillery batteries were assigned to divisions rather than brigades to facilitate greater concentration of fire at decisive moments. The Confederates were quick to recognize the merits of this initiative and responded by forming artillery battalions and assigning them to corps in 1863.[4]

Jomini advocated that it was imperative to "throw the mass of forces at the decisive point"[5] and "arrange that these masses not only be thrown on the decisive point, but that they...engage at the proper times and with ample energy."[6] Jomini's influence is clear in the 1993 US Army capstone doctrinal manual, *FM 100-5 Operations*: "Mass the effects of overwhelming combat power at the decisive place and time. Synchronizing all the elements of combat power where they will have decisive effect on an enemy force in a short period of time is to achieve mass."[7]

The linkage for US artillerymen is clear and compelling. *FM 6-20 Fire Support in the AirLand Battle* states that "fire support must exploit the principle of mass,"[8] and that "fire support weapons and units...must be able to provide maximum massed fires when and where they are required to support the battle plan."[9]

Napoleon explained his success in straightforward terms: "In a battle...skill consists in converging a mass of fire on a single point:...the commander who is adroit will suddenly and unexpectedly open fire with a surprising mass of fire on one of these points and is sure to seize it."[10] He compared traditional battle to siege warfare in which the commander should "concentrate fire against a single point. Once the breach is made, the balance is shattered and all the rest become useless."[11] Napoleon's words convey the significance he attached to the artillery as the means to mass combat power: "Fire is everything; the rest does not matter."[12]

Napoleon was not the first great captain to grasp the importance of mass, but he exploited historical lessons, organizational changes and technology to apply this knowledge with unique and exceptional effectiveness. From a diligent study of history, he learned how Frederick the Great repeatedly succeeded when outnumbered by massing firepower against only a part of the opponent's army.[13]

Napoleon took full advantage of organizational changes in the French Army, such as the divisional structure that, with its mobility, allowed the concentration of superior combat power at decisive points.[14] He capitalized on the significant French advances in artillery during the latter half of the 18th century, significantly, on Gribeauval's improvements in the mobility of field guns. He adopted the ideas of the du Teil brothers who stressed mobility and tactical speed of light field guns and the rapid concentration of artillery fire to blow gaps in the enemy line to be followed up by infantry or cavalry.[15]

Napoleon skillfully employed his mobile artillery to allow artillery fires to closely support the infantry in all phases of battle. This substantially increased the striking power of the French Army.[16] From his decisive victory in the recapture of Toulon in 1793,[17] to Eylau (1807), Wagram (1809) and Borodino (1812), he relied heavily upon his artillery to mass at crucial points.[18] A classic example occurred at Friedland in 1807 when Marshall Lannes' corps was pinned down by a superior Russian force. The French artillery unleashed a barrage to turn the enemy flank and cut off the Russians from the bridges. This set the conditions for an attack across the entire front that devastated the Russians, inflicting casualties on almost one-half of the 80,000-man force.[19]

Napoleon's artillery was the paradigm of Jominian mass. Succinctly stated, Napoleon practiced the principle of mass and Jomini preached it. Napoleon was dominant on the battlefield, due in large part to his ability to mass combat power decisively with his artillery. Jomini's examination of Napoleon's tactics confirmed his belief that mass was war's "fundamental principle." Jomini felt so strongly about the artillery's role in achieving decisive mass that he advocated that the outcome of his treatise, "Summary of the Art of War," should be the "doubling of the materiel and personnel of the artillery and the adoption of all improvements capable of augmenting its destructive effect."[20]

It is clear that Napoleon would concur with this sentiment. While in exile at Saint Helena, he reflected that "it is with artillery that war is made ...it is by fire and not by shock that battles are decided today."[21]

The Principle Endures. The lessons of Napoleon and Jomini are applicable to the artilleryman of the 1990s and beyond. Napoleon and Jomini's impact on US warfighting doctrine is clear and significant, in particular with regard to the role of artillery. In both structure and tactics, the artillery must not miss the opportunity to ensure we can mass fires decisively.

Napoleon offers an even broader lesson to today's leaders. His ability to exploit historical lessons, organizational changes and technology to rise up to the challenges of his day parallels the challenges facing our leaders as they "reengineer" the Army for the 21st century. Like Napoleon, our leaders must apply their knowledge of the imperatives of warfare to capitalize on the opportunities presented by technological advances and achieve greater effectiveness on the future battlefield.

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Notes:

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18. Rothenberg, 144.
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