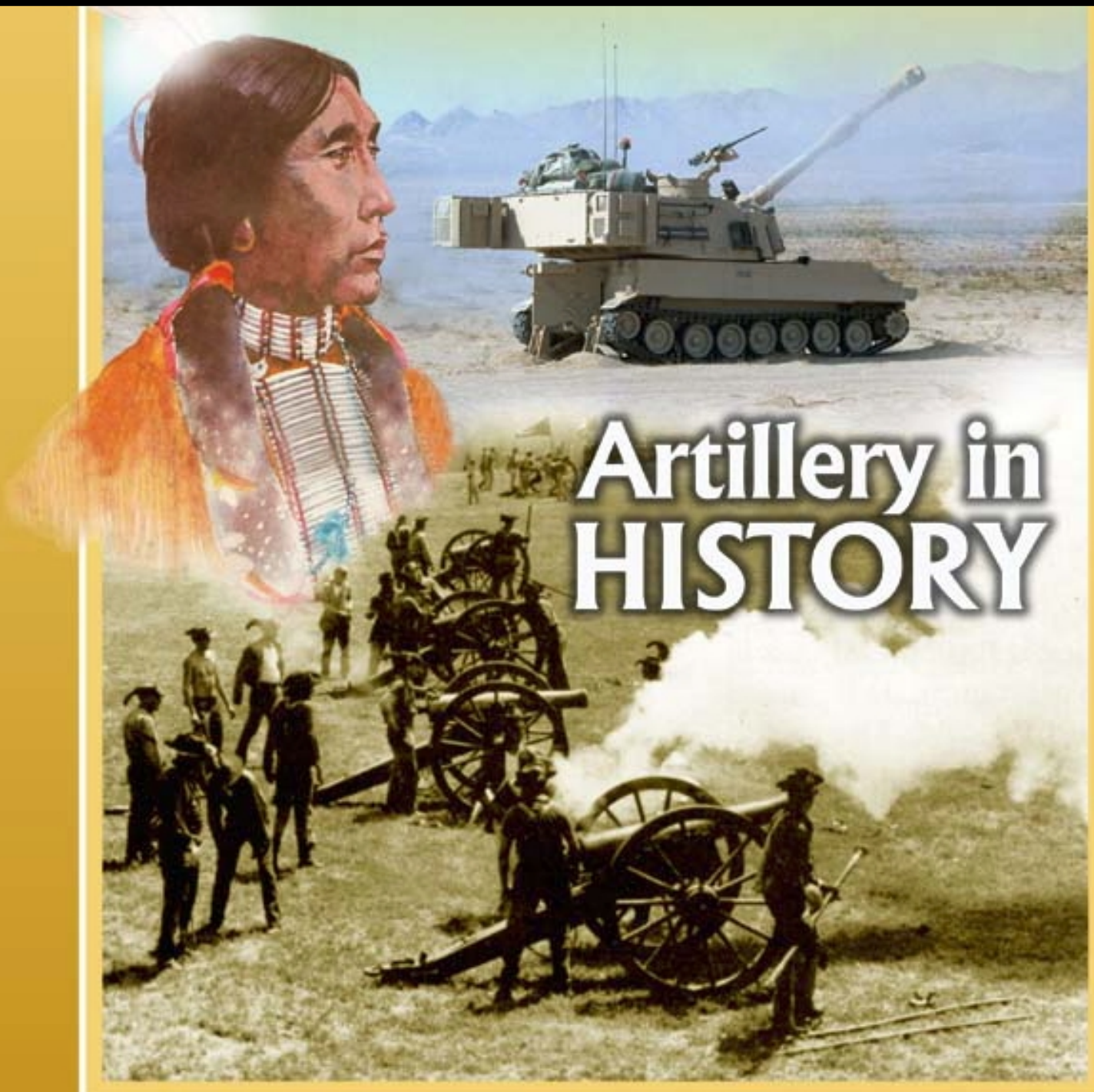
Field Artillery

A Professional Bulletin for Redlegs

July-August 2000



Approved for public release; distribution is unlimited.

HQDA PB6-00-4

Field Artillery

A Professional Bulletin for Redlegs

July-August 2000 HQDA PB6-00-4

INTERVIEW

ARTICLES: History

ARTICLES: Feature

DEPARTMENTS

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

OFFICIAL DISTRIBUTION: Distribution (free) is to US Army and Marine Corps Active and Reserve Components FA units: seven copies to corps artillery, division artillery and brigade headquarters; 13 to battalions; and seven to separate batteries. In addition, readiness groups, recruiting commands, state adjutant generals, Army and Marine Corps libraries and schools, liaison officers and other Department of Defense agencies working with FA or fire support issues or materiel may request a free copy by writing to the Editor (see "Submissions").

PAID SUBSCRIPTIONS: May be obtained through the US Field Artillery Association, P.O. Box 33027, Fort Sill, OK 73503-0027. Telephone numbers are (580) 355-4677 or FAX (580) 355-8745 (no DSN). Dues are $20.00 per year ($38.00 for two years and $56.00 for three years) to US and APO addresses. All others add $13.00 per subscription year for postage.

SUBMISSIONS: Mail to Editor, ***Field Artillery***, P.O. Box 33311, Fort Sill, OK 73503-0311. Telephone numbers are DSN 639-5121/6806 or commercial (580) 442-5121/6806 or FAX 7773 with DSN or commercial prefixes. Email is famag@.sill.army.mil. Material is subject to edit by the ***Field Artillery*** staff; footnotes and bibliographies may be deleted due to space.

REPRINTS: ***Field Artillery*** is pleased to grant permission to reprint articles. Please credit the author and ***Field Artillery***.

ADDRESS CHANGES: ***Field Artillery*** (ISSN 0899-2525) (USPS 309-010) is published bimonthly. Periodicals postage is paid by the Department of the Army at Lawton, OK 73501 and an additional mailing post office. POSTMASTER: send address changes to ***Field Artillery***, P.O. Box 33311, Fort Sill, OK 73503-0311.

Redleg Hotline
(Organization, Materiel, Doctrine and Training)
DSN 639-4020 or (580) 442-4020 (24-Hours)

Tactical Software Hotline
DSN 639-5607 or (580) 442-5607 (24-Hours)

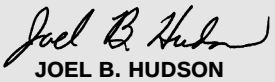
***Field Artillery* Home Page**
http://sill-www.army.mil/famag

FA Branch at PERSCOM
http://www-perscom.army.mil/opmd/fasitrep.htm
http://www.perscom.army.mil/epfa/fa_ltr.htm

By Order of the Secretary of the Army:

Eric K. Shinseki
General, United States Army
Chief of Staff

Official:



JOEL B. HUDSON
Administrative Assistant to the Secretary of the Army, 0012403

Toney Stricklin
Major General, United States Army
Field Artillery School Commandant

Editor:
Patrecia Slayden Hollis

Assistant Editor:
Linda L. Ritter

Art Director:
Bob T. Coleman

MAJOR GENERAL TONEY STRICKLIN
Chief of Field Artillery

Learning from the Past to Prepare for the Future

At some time, most of us have heard the uninformed and inexperienced charge that military history is of marginal value because it has little relevance to the present. This claim usually is based on a dangerously narrow and distorted view of the past and its influence on the present and future.

History as Teacher. As the Allies began the invasion of Normandy, General Patton wrote, "To be a successful soldier, you must know history."[1] Great battlefield commanders throughout history have echoed this sentiment. The study of history is essential in understanding the present and preparing for the future.

Despite recent changes in technology and the continued rapid evolution of operational and tactical doctrine, combat leaders can learn much from past battles and campaigns. The study of military history helps us understand the interaction of forces and battlefield dynamics that have shaped the present. It also provides the means of viewing current problems against the long-term perspective of how men have handled similar problems and situations in the past. A keen knowledge of the challenges those who preceded us faced and the solutions they devised allows us to benefit from their experiences and deal more effectively with many of the important issues we face today.

Preparing for the Future. Because human nature remains the same, history provides scenarios from which we can gain insights about likely events in the future. For example, history tells us that 50 years ago the United States found its military unprepared for war on the Korean peninsula. Military spending had fallen to its second lowest level since World War II. Today we have the *lowest* level of military spending since World War II,[2] and it is having a significant impact on the Army's ability to transform itself and the Field Artillery's ability to modernize.[3]

History has proven more than once that when America failed to modernize, we paid with the lives of our sons and daughters.

Crusader has been the Field Artillery's top modernization requirement since 1991. Applicable to the legacy force, the future Counterattack Corps and as augmentation for our Interim Brigade Combat Teams (IBCTs) and objective force, Crusader employs unique tactical and operational capabilities that our maneuver commanders need *now*. It is a highly effective platform capable of full-scale operations for decades to come. However, it is a target for those who don't understand warfare and history. Crusader is the essence of Field Artillery modernization.

Sense and destroy armor munition (SADARM) is the Army's first indirect fire *smart* munition, and it's poised to enter production. Effective against stationary and moving armored vehicles, SADARM will complement Crusader as well as all 155-mm cannons, current and future, and is an essential component of Field Artillery modernization.

SADARM is particularly important to the IBCT because it significantly enhances proactive counterfire while reducing our munitions logistical burden. History is replete with examples of logistical shortfalls that determined the outcome of wars. In combination with its devastating lethality that can defeat all known armor in the world, SADARM's precision makes it seven times as effective as dual-purpose improved conventional munitions (DPICM). That means the force requires fewer transport assets to bring the same or greater munitions lethality to the battlefield.

SADARM also is under attack from some who have yet to grasp the essence of this logistical lesson in history—and have yet to look ahead into the face of the future: precision munitions.

The proliferation of theater ballistic missiles was evident and problematic during Desert Storm. The threat of Scuds with chemical warheads aimed at Israel strained the strategic resolve of the coalition. It slowed the air campaign and nearly derailed plans for the ground phase of the operation as the US Air Force and Army Apache units conducted a massive Scud hunt with, at best, marginal effectiveness.

Our Army tactical missile system Block IIA (ATACMS IIA) is specifically designed to engage and destroy the transporter/erector launchers of theater ballistic missile systems. Although we learned this Scud missile lesson in our recent history, the ATACMS IIA became a victim in the last budget.

These historical insights have not been forgotten at Fort Sill, and we will not be dissuaded from finding new and compelling strategies to protect and recover our modernization programs. Learning from the lessons of the past, we must prepare for the future. *Field Artillery...King of Battle!*

Endnotes:

1. General George S. Patton, Jr., Letter to his son at the US Military Academy, June 1944, from *A Guide to the Study and Use of Military History* (Washington, DC: Center of Military History, 1988).
2. General Michael Ryan, Chief of Staff, USAF, "Air Force Chief Warns of Threat to Readiness," *USA Today*, 8 June 2000.
3. "Army Budget Fiscal Year 2000," AUSA Institute of Land Warfare, August 1999.

Proud and Disciplined: 2-15 FA in Bosnia

This letter is intended to publicly acknowledge a Field Artillery battalion's tremendous service for our Army.

I had the opportunity to visit the 10th Mountain Division at MND (N) [Multi-National Division (North)] in Bosnia, part of the peacekeeping Stabilization Force (SFOR). It was a great visit. One of the highlights for me was the pride and discipline of all the soldiers assigned and attached to the 10th Mountain Division [out of Fort Drum, New York].

While there, I observed the 2d Battalion, 15th Field Artillery, [2-15 FA] assigned to the 10th Mountain Div Arty [Division Artillery] and in direct support of the 2d Brigade. For the SFOR, 2-15 FA had the nearly thankless task as the combat arms battalion securing Camp Eagle. Commanded by Lieutenant Colonel Sam Johnson and Command Sergeant Major Rodney Beck, this terrific Field Artillery outfit was truly impressive.

The battalion knew and understood its mission. It had thoughtfully identified its essential fire support tasks [EFSTs] and deliberately organized to ensure mission accomplishment. And the battalion approached this nonstandard mission in an upbeat, positive, how-can-we-make-the-most-of-this-duty attitude. I was impressed.

First, let me tell you what I did not see. Of course, I didn't see a lot of FIST [fire support team], howitzer or FDC [fire direction center] crew drills—although the 2d Battalion, 87th Infantry FSE [fire support element] at Camp McGovern was training regularly on GUARDFIST [guard unit armory device, full-crew interactive simulation trainer]. I didn't see any battery or battalion live fires or any fire support or cannon battery lane training. But that wasn't the battalion's mission. And while the battalion did bring one M119 howitzer for section-level sustainment training, this wasn't what the battalion was in Bosnia for.

Neither did I see any pouting, grumbling soldiers. In their fifth month of a deployment and the excitement of their impending return to Fort Drum building, these soldiers were not fussing about being away from home or miserably counting the hours until they left. Nor were they complaining about the nonstandard duty they'd been assigned.

What I did see was a proud and disciplined battalion that gelled as a team to accomplish this difficult mission. I saw young, fit, disciplined soldiers who took their assigned duties seriously and surely felt good about their individual contributions to the effort.

I saw NCOs and junior officers coming into their own as young leaders—instilling those basic standards of discipline in things like handling a weapon, guard mount and vehicle safety in a quiet, professional manner. These leaders also were caring for soldiers, watching out for their welfare and attuned to families and problems back home.

And I saw an enthusiastic, caring senior leadership. The leadership set the tone and the environment in this battalion. The leaders weren't wringing their hands about peacekeeping missions—rather they were taking full advantage of the unique opportunities afforded the unit and its soldiers in this operational deployment.

In a time where there's lots of hand-wringing, nay-sayers all over our Army bemoaning the end of the Cold War and dragging us into doubt about what we're doing, it was refreshing to spend some time with the leaders and soldiers of 2-15 FA. They were focused and eager to contribute, carving out a place in the deployed force, as we relearn our age-old mission of building peace in a war-torn land.

Proud and disciplined—that's what I saw. It's what I felt. And I left Bosnia extremely proud of the young Field Artillerymen of 2-15 FA. *Let's Go! Allons!* And *Marne Thunder*.

COL Richard P. Formica, FA
Cdr, 3d IN Div (Mech) Arty
Fort Stewart, GA
(2-15 FA returned to Fort Drum on 15 March. Ed.)

Brant's Ten Commandments of Fire Support

1. Thou shalt always know where you are.
2. Thou shalt always know where your infantry elements are.
3. Thou shalt always report your position at each halt.
4. Thou shalt always have commo.
5. Thou shalt continuously update your fire support plan, adding targets and deleting old targets when you stop.
6. Thou shalt use the mortars first.
7. Thou shalt complete and distribute a fire support matrix to mortars, commanders, scouts, tube-launched optically tracked wire-guided missiles (TOWs), air liaison officer (ALO), supporting arms liaison team (SALT), etc., for each mission.
8. Thou shalt always designate a priority of fire (POF).
9. Thou shalt always use mortars, SALT, ALO, etc., in the planning process.
10. Thou shalt plan for close air support (CAS), smoke and illumination for each mission.

Colonel Bruce A. Brant, FA
As Cdr, 1-319 AFAR (1993)
82d Abn Div, Fort Bragg, NC

General (Retired) John M.D. Shalikashvili, Former Chairman of the Joint Chiefs of Staff

Army in Transition:
Keep Your Eye on the Ball

Interview by Patrecia Slayden Hollis, Editor

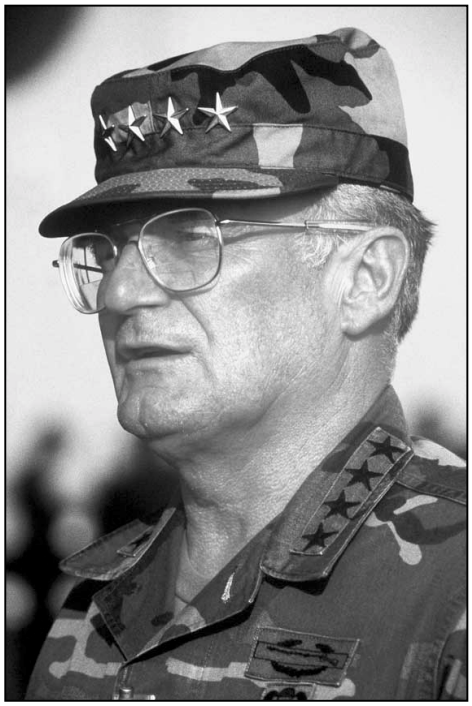
Q *The Army is rapidly transforming the force to make it lighter and more deployable by standing up the first and second brigade combat teams (Initial BCTs) in FY00 and 01, respectively, and the third, fourth and fifth (Interim) BCTs starting in FY03. The three Interim BCTs may become an Interim Division with other divisions like it being considered as part of the force until we field our objective force around 2010. Do you see our National Military Strategy changing (win two major theater wars nearly simultaneously), and how is our strategy having an impact on the Army's transformation efforts?*

A To begin with, we need to keep our priorities clearly in mind. Since the beginning of our nation, our military has existed to fight and win our nation's wars. After the Cold War, we have been preoccupied with a lot of additional missions—peacekeeping, humanitarian assistance, disaster relief, military-to-military outreach—but these missions are *not instead* of warfighting, they are *in addition* to warfighting.

I don't see our National Military Strategy changing in any significant way in the near term. As a global power, we must retain the capability to engage in two nearly simultaneous major theater wars. If we don't retain that capability, we stand in danger of being blackmailed.

Now, the expansion of our missions calls for a lot more flexibility by our military and results in more stress on the military. It also calls for additional resources.

The Army's ongoing transformation is an effort to come more in-line with our National Military Strategy that relies on power projection and demands strategic agility. We are transforming our forces to make them lighter and more deployable to crisis areas quickly.



1994

Q *Given that we're going to have a limited number of divisions, how should we structure the force—do we balance heavy, medium and light capabilities to accomplish our range of missions up to all-out war against a sophisticated threat or have a larger portion of "medium" units to execute small-scale contingencies?*

A That's the very tough question that the Army is wrestling with now—how to structure to become more strategically agile and retain the capability to engage in all-out war and win. It is not an issue of either-or.

I am confident that the Army is on the right track, both in the direction it has chosen and the process it has adopted.

Q *Although the BCT TOE [table of organization and equipment] is not final, a current draft includes infantry and light armor with no air defense and Army aviation (these are follow-on augmentation). In addition, funds are not committed for designing a self-propelled FA system on the common chassis being developed for maneuver systems in the Interim BCT—a platform called the interim armored vehicle (IAV). Without timely funding, fielding the IAV FA in the Interim BCT will be much later than the maneuver systems and the FA will be considerably less mobile using the alternative towed lightweight 155-mm howitzer and its primer mover. What do you think about the transformation designers' emphasis on maneuver vice balancing maneuver and fires?*

A I would have preferred that the design for the BCT had addressed maneuver and fire systems at the same time. Now we must make certain that the appropriate artillery support for the BCT is determined as soon as practical.

Until then, the BCT will have to depend more on joint fires, which are becoming more accurate and reliable. But anyone with any combat experience knows that the ground commander needs organic artillery, and his organic

"As a global power, we must retain the capability to engage in two nearly simultaneous major theater wars. If we don't retain that capability, we stand in danger of being blackmailed."

"But we, as a nation, must be very careful and selective about where we commit our troops around the world-understanding our interests and our priorities."

artillery needs to be as agile as the rest of his force.

That said, it's useful to remember that we have Crusader, the world's best artillery system, moving forward—although not as quickly as I'd like. Crusader can augment the BCT and significantly enhance medium-force operations.

Q During your 39 years in the Army and after, you have been involved in many US military conflicts, including serving as a Senior District Advisor to the South Vietnamese in 1968-1969, up to leading the US relief efforts for the Kurds in northern Iraq immediately after Operation Desert Storm and in your recent travels as a retiree into Bosnia and Kosovo. What significant operations/strategic trends have you observed?

A I have witnessed and been part of tremendous strategic changes. I started out during the Cold War when our strategic task was to prevent Soviet expansion and deter what surely would have turned out to be a catastrophic nuclear war. That task was straightforward and well understood, and it had great support throughout the country. All our training, energy and our vast resources were focused on that task.

When the Cold War ended, this clear-cut task ended with it. All of a sudden, we found ourselves the dominant power in the world—militarily, economically and politically. But at the same time, we discovered that the new world was much more complicated and uncertain and much more demanding.

Our global interests make it impossible for us to ignore the failed states, the humanitarian disasters, and the ethnic and religious strife that have become the signature of this period. Suddenly, our strategic task is not only to deter regional threats and, if deterrence fails, to fight and win such theater wars, but also to attempt to shape the international environment so as to minimize instabilities and crises that could turn into bloody wars. This is a very different strategic environment than we faced during the Cold War, and it places new demands on our nation and on our military.

But we, as a nation, must be very careful and selective about where we commit our troops around the world—understanding our interests and our priorities. Perhaps we need to be even more selective than we have been in the past.

Field Artillery's role in this new world, first and foremost, is to provide responsive fire support to the maneuver force...day, night and in all weather. We owe it to the combined arms team and to the success of the Army in years to come to remain the world's best artillery.

Q Joint Vision 2010, which you approved during your tenure as Chairman of the Joint Chiefs (1993 to 1997), says that for the US military "to retain effectiveness without redundancy," we must establish a "more seamless integration of capabilities…be fully joint: institutionally, organizationally, intellectually and technically" ["Joint Vision 2010—America's Military: Preparing for Tomorrow," Pages 8 and 9 (www.dtic.mil/jv2010/index.html)]. What does the US military need to do to achieve seamless joint integration and reduce redundancies?

A We are the world's leader in jointness. No other nation's military understands jointness and has acted on that understanding to the degree that we have. That's what has made our military so extraordinarily capable. Desert Storm was the first time we really put jointness to the test and then in a number of lesser operations since then.

Now, having said that, we are not yet where we could be with regards to jointness. One of the most important

General Shalikashvili listens as Brigadier General Stanley Cherrie, Assistant Deputy Commander-Maneuver for Task Force Eagle, briefs him about activities in Bosnia and Herzegovina during Operation Joint Endeavor in 1996. *(Photo by SSG Jon E. Long, 55th Signal Company)*

next steps is to improve the process by which we establish and validate requirements. We must do a better job of ensuring that our systems are fully interoperable, that they fully support the joint fight and that we make the tough trade-offs between that which we most need for the joint fight and that which is of lesser priority. Systems must be "born" joint.

Q *Should US air power priorities be for a new fighter (F-22 and Joint Strike Fighter) for the Air Force or more strategic airlift and why?*

A In terms of a "joint master plan," we need all three: the F-22, Joint Strike Fighter and more C-17 airlift.

Strategic airlift isn't just the responsibility of the Air Force, it's the responsibility of all forces, probably the Army as much as any.

Today, I think we have our air power priorities about right. We need the F-22 to replace the F-15 and be the undisputed air superiority fighter aircraft. The F-22 is the instrument that will continue to assure freedom of movement for our soldiers on the ground.

No soldier on active duty today has had to worry about being attacked from the air because our United States Air Force has been preeminent in sweeping the skies. Whether in Korea, Vietnam or Desert Storm, we have operated on the ground without having to look up and worry about being strafed or bombed. Now that's a tremendous advantage for the Army, but it comes at a very high cost. If we didn't buy the F-22, then we'd have to invest a lot more in air defense and other systems to protect our forces from air attacks—these are the kinds of trade-offs we have to make.

We also need the Joint Strike Fighter to replace a number of different aircraft in the joint force. It's a major step forward for the Air Force, Navy and Marines to buy one aircraft for their different missions and the cost reductions that this represents.

At the same time, we continue to be a nation that relies on strategic lift to get us to the fight. The C-17, which had a very rocky beginning, turned out to be our premier strategic airlifter. We must increase the buy of C-17s and continue to bring them on line.

"...our military is the envy of the world-not because we have the best tanks or helicopters, which we do, but because we have the best people manning those tanks and helicopters."

Q *Today, we're losing many junior officers, particularly captains; the reasons they give for their resignations are high operational tempo in their units with no time to train for their units' most difficult mission of warfighting, a crisis in confidence in Army leaders who they see as out-of-touch, a healthy national economy that lures them away for higher pay and the desire for more family stability in locations better suited for career-minded spouses, more of whom have higher education. What advice would you give Army leaders to keep more of these young officers in the Army?*

A We spend a lot of time and energy worrying about whether we have the latest tank or the greatest helicopters and so forth. And yet our military is the envy of the world—not because we have the best tanks or helicopters, which we do, but because we have the best people manning those tanks and helicopters. And so when our young officers have a high degree of concern and dissatisfaction, it's a matter of the most serious consequences.

First, we need to listen to them very carefully. We need to understand which of the young officers' concerns are issues we can affect and which ones we can't. Many of the things these young people are telling us we can affect, and if we don't, we will pay a very high price. Sometimes we "talk the good talk" about caring for our people but don't do as much as we should.

At the same time, I am under no illusion that we can fix all the concerns. We need to be honest with our young men and women about what we can affect and what we can't and why.

The Army will get through this period just like it got through similar periods when things looked a lot bleaker than they do today. What distinguishes us today from those periods in the past is that we are still the world's best Army. We are still the world's best artillery.

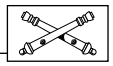
I think that if we listen to these young officers, understand what they are saying, fix those problems we can (do more than just email back and forth) and mentor them, many of these terrific young people will stay with us.

Q *What message would you like to send Army and Marine Field Artillerymen stationed around the world?*

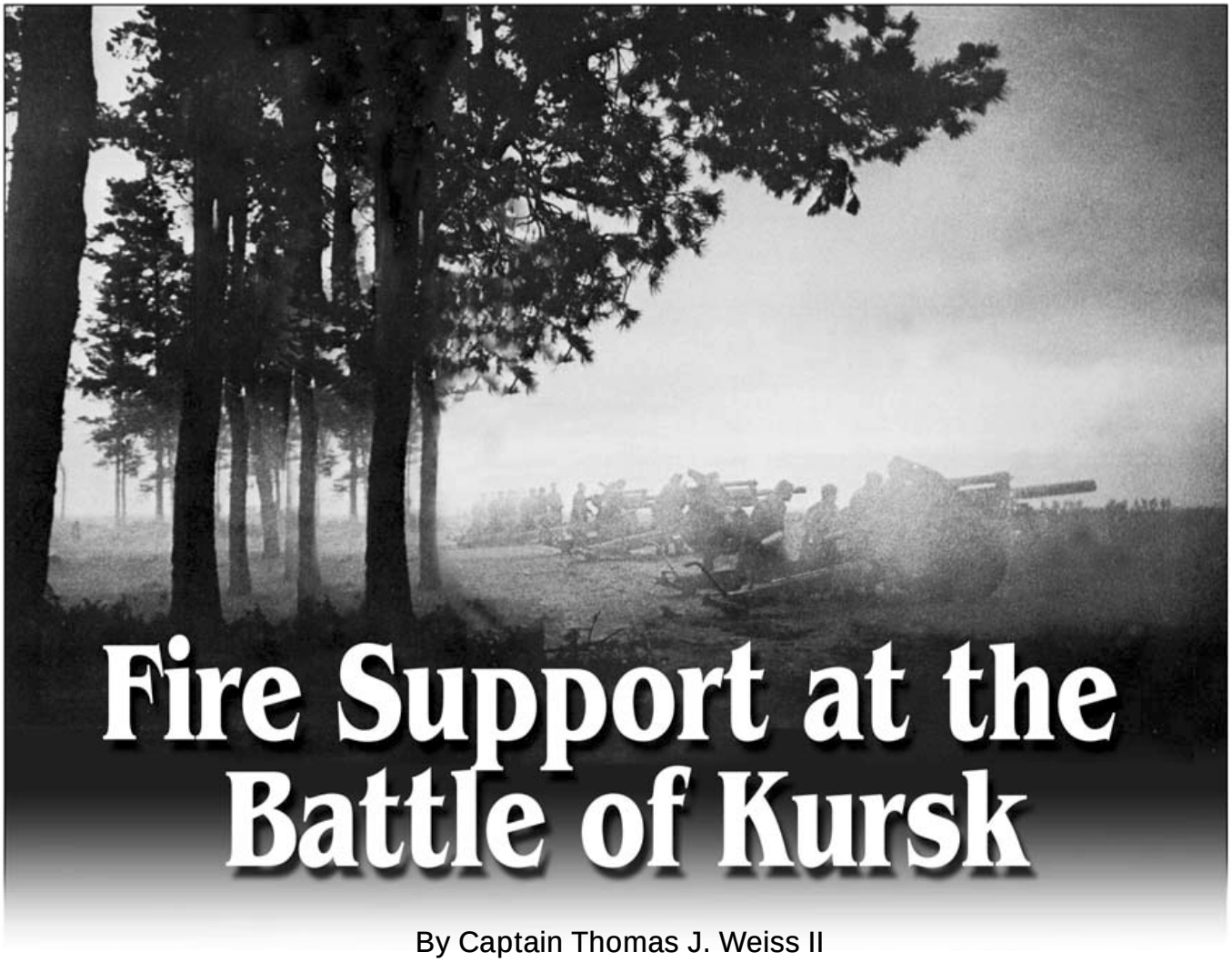
A Artillerymen always have been key to the fight, and they remain so today. No other branch has as much spirit and pride, such a rich history and such a promising future as does the Field Artillery.

The Army is entering the information age where our forces will be situational aware as never before and able to strike with great precision at greater ranges. Field Artillery has a central role in this transformation.

I wish every Redleg an exciting future in the service of our nation and offer my heartfelt thanks for all they do day-in and day-out to make our Army the best in the world—bar none.



General (Retired) John M.D. Shalikashvili was Chairman of the Joint Chiefs of Staff from 1994 until he retired in 1997. He also served as Supreme Allied Commander in Europe (SACEUR) and, simultaneously, Commander-in-Chief of the US European Command (EUCOM) in Belgium; Assistant Chairman of the Joint Chiefs of Staff; and Deputy Commanding General of US Army Europe during Operation Desert Storm. He was Commanding General of the 9th Infantry Division (Motorized) at Fort Lewis, Washington; Assistant Division Commander and Commander of the Division Artillery in the 1st Armored Division in Germany; and Commander of the 1st Battalion, 84th Field Artillery, 9th Infantry Division. General Shalikashvili is currently a Visiting Professor at Stanford University in the Center for International Security Cooperation and serves on the Boards of Directors of Boeing, United Defense, L-3 Communications Corporation, Plug Power as well as on the boards of a number of nonprofit associations.



Fire Support at the Battle of Kursk

By Captain Thomas J. Weiss II

First Place

Just after 0200 on 5 July 1943, Marshal of the Soviet Union Georgi Konstantinovich Zhukov received the call he had been waiting for. It was General Pukhov, commander of the Thirteenth Army, reporting that he had captured a German sapper. After some "persuasion," the sapper stated that the anticipated German offensive against the Kursk salient would commence at 0300, less than an hour away. There was no time to lose. Without hesitation, Zhukov turned to Marshal Konstantin Rokossovsky, commander of the Central Front, and ordered the artillery counter-preparation to begin immediately.[1] (See the map.)

At 0220, 10 minutes before German preparatory fires were to begin, the Central Front's command post trembled as more than 600 Soviet howitzers, Katyushas[2] and mortars opened fire on known and templated German artillery positions. This counter-preparation lasted for only 30 minutes but had a devastating impact on unsuspecting German forces preparing to attack. German artillery was unable to return fire in any organized manner until 0445, delaying the attack until 0530—two and one half-hours behind schedule.[3]

It was no accident that Zhukov was poised to inflict such a devastating blow that morning. The Soviet Army, like the Germans, analyzed lessons learned from the First World War and altered their fire support doctrine accordingly. The Germans discounted, for the most part, the firepower lessons learned and put their faith in the speed and maneuverability of the tank. The Soviets, however, anticipated the decisive role that conventional artillery would play on the battlefields of the next war. They correctly applied the lessons learned from the First World War—specifically the effectiveness of massed, centralized artillery fire, which enabled them to neutralize the attack at Kursk and, ultimately, seize the initiative on the eastern front.

As young artillerymen learning our trade on the battlefields of Fort Hood, Texas, the National Training Center at Fort Irwin, California, or the Joint Readiness Training Center at Fort Polk, Louisiana, we scrutinize our actions to provide insight as to how we can improve our performance. And when we turn to history, it is often exclusively within the American experience that we search

for answers. But this battle, fought between two nations that were both our adversaries at one time, can provide valuable insight into the correct application of our fire support doctrine.

Kursk—The Build Up. The Soviets handed the Germans a series of quick defeats in the first two months of 1943. On 9 February, the Soviet 40th Army took Belgorod. Seven days later, the I SS Panzer Corps disobeyed a direct order from Adolph Hitler and evacuated Kharkov just before Soviet forces encircled the city. The Red Army was marching west, and it looked as if Stalin had wrested the strategic initiative away from Hitler once and for all.

But Germany was not about to roll over, and on 6 March, the Germans launched a counterattack. Nine days later, after decimating the Soviet Third Tank Army, the I SS Panzer Corps recaptured Kharkov, the same city from which it had fled less than a month before. On 18 March, three days after Kharkov fell, the Germans once again took Belgorod. The Soviets lost all the ground they had captured during the winter offensives.[4]

Field Marshall Erich von Manstein, commander of Army Group South and perhaps Germany's most talented officer, now planned a pincer assault from the Orel area in the north and the Belgorod area in the south to encircle and annihilate the Soviet armies in the Kursk salient. However, he needed help to complete the encirclement of Kursk, and it was here that the plan began to unravel. Field Marshall Gunther von Kluge, commander of Army Group Center, refused to let any of his battered units participate in the attack. Indecision in the German high command and the *rasputitsa*, or spring thaw, which turned most of central Russia into an impassable quagmire, quickly squelched any notion that Manstein's plan or any offensive operation would become a reality that spring.[5]

At this point Manstein went to Hitler with two options. First, what Manstein called his "forehand" stroke, was the plan to encircle the Kursk salient with concentric attacks from the shoulders. Manstein argued that this stroke should be played at the earliest opportunity before the Soviets had a chance to recover from their losses or build up their defenses.[6]

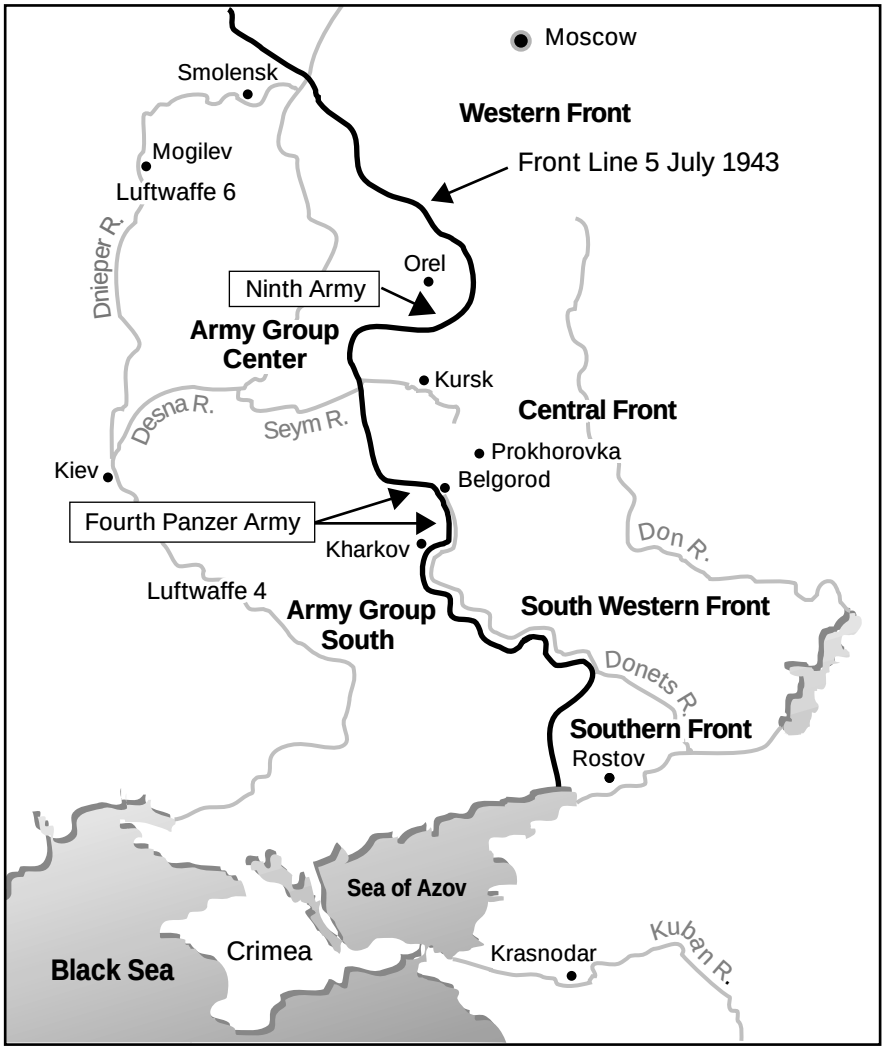
Manstein's "backhand" stroke was to wait for what he felt was an eminent Soviet offensive in the south, cede the entire Donets basin and launch a counterattack from the Kiev region, rolling up the Soviet's extended northern flank. Hitler, fanatical in his insistence not to yield ground to the Soviets for any purpose, immediately rejected the "backhand" stroke and gave the go-ahead for what would become known as Operation Zitadelle (Citadel).[7]

On 15 April 1943, Hitler signed Operations Order Number 6 announcing his decision to launch Citadel. As written in the order, his intent was quite clear and indicative of the tactics of the German Army: "The objective of the offensive is to encircle enemy forces deployed in the Kursk area by means of an extremely concentrated thrust conducted mercilessly and swiftly by one assault army each from the areas of Belgorod and south of Orel, to annihilate the enemy in a concentric attack."[8]

Hitler did not begin the attack right away, as Manstein had urged, deciding, instead, to wait until more armor could be brought to the region. Hitler had great faith in the Tiger and Panther tanks and felt that they alone could "…restore the strategic balance in the east."[9]

At the same time Hitler was agonizing over when and how to launch Citadel, Josef Stalin was pondering a decision of his own. He knew the Germans were planning an attack that summer. In fact, both Stalin and Zhukov agreed this attack would come against the Kursk salient. But each had a different opinion regarding how to handle the coming German attack.[10]

Stalin, initially, wanted to launch a pre-emptive strike in the Belgorod area. His aversion to a defensive posture was strengthened by the "…uncomfortable fact that, up to the spring of 1943, no German strategic offensive had ever failed to achieve immediate tactical and operational success."[11] Still reeling from



Battle of Kursk. The battle occurred in the Kursk salient, part of the Russian Central Front, that jutted west into the German's Army Group Center on 5 July 1943.

German 150-mm field howitzers soften up the Soviet defenses to prepare for a panzer assault. During their offensive, the Germans deployed 10,000 artillery pieces-only half of what the Red Army deployed.

the loss of Kharkov and Belgorod, Stalin did not want to risk the same fate on Kursk.

Zhukov, on the other hand, saw the coming German attack as an opportunity to deal with the mobile Panzer forces on terrain of his choosing and under terms of his choosing. On 8 April he dispatched a report to Stalin following an extensive tour of the Kursk salient in which he made it clear that defense would be their best option. Only after the initial German attack had been neutralized would a Soviet counterattack be most successful.

After much debate, Stalin finally deferred to Zhukov's judgment and agreed to stay on the defensive at Kursk.

An interesting facet of this decision is the means by which Stalin intended to defeat the German attack. According to Zhukov, Stalin "…firmly decided to meet the German attack with *artillery fire*, with air strikes and with counterattacks"[emphasis added][12] Stalin emphasized *fires before maneuver*. This decision set the stage at Kursk for the convergence of two vastly different doctrinal approaches to fire support.

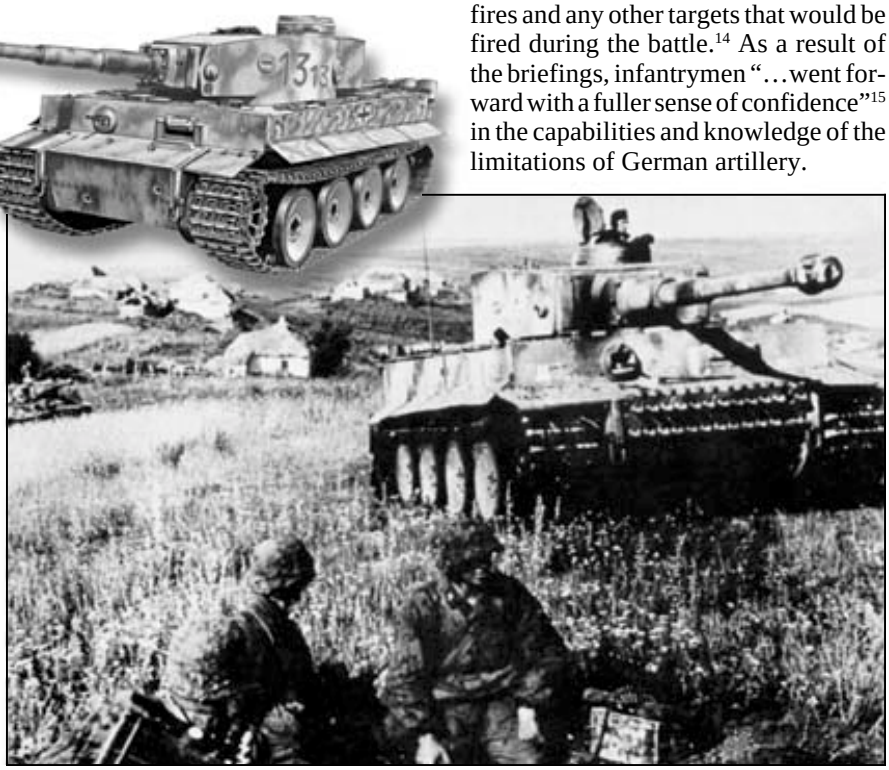
The Germans emphasized the speed and mobility of their armored formations, at times sacrificing artillery fire for infantry mortar or Luftwaffe support. The Soviets, on the other hand, held Field Artillery in higher regard and consistently emphasized massed fires as a prerequisite to any armor or infantry maneuver. In redesigning their fire support doctrine after the First World War, both armies came to radically different conclusions. How did this happen? Ironically, both conclusions can be at least partially attributed to a German artillery officer, Colonel Georg Bruchmüller.

Bruchmüller Doctrine. Bruchmüller was easily the most influential artilleryman of the First World War. During this period, indirect fire was still in its infancy, and Bruchmüller was the first to master the tactics and techniques of its employment. The fire support plans he designed helped Germany win stunning victories on both the eastern and western fronts. He taught scores of young German artillerymen the value of centralization and combined arms coordination.

German Army tactics at the beginning of the First World War stressed decentralization. Prior to 1916, artillery was never controlled above the division level. But Bruchmüller realized that decentralized infantry tactics called for increased centralization in artillery command and control. He argued that this architecture would allow the commander to place massed artillery at the decisive point in time and space on the battlefield.

Bruchmüller tested this concept in an attack against the Red Army at the Battle of Lake Narotch in early 1916. After the dramatic success of the German attack, senior military leaders began to take notice of Bruchmüller and his ideas.[13]

Centralization and massing were not the only concepts Bruchmüller helped to develop. In an effort to provide better coordination between branches, he began the now common practice of briefing the infantry on the fire support plan before battle. The briefings included the locations of the batteries, the location and duration of the preparation fires and any other targets that would be fired during the battle.[14] As a result of the briefings, infantrymen "…went forward with a fuller sense of confidence"[15] in the capabilities and knowledge of the limitations of German artillery.



Tiger Tank-The Germans emphasized the speed and mobility of their armored formations, at times sacrificing artillery fire for infantry mortar or Luftwaffe support.

As the First World War drew to a close, Bruchmüller was instrumental in the fire support planning and execution of General Erich Ludendorff's five great offensives. Ludendorff had great confidence in Bruchmüller and considered him "…one of the most prominent soldiers of the war."[16] Employing Bruchmüller's techniques, these offensives achieved great tactical success for Germany, but, ultimately, the German Army could not cope with the massive amounts of men and material the Allies poured into the theater. Germany succumbed to the *materielschlacht* (literally, war of materials).[17]

German Artillery Stagnation. Following the war, the Versailles Treaty was devastating for the German artillery. It prohibited Germany from having any heavy artillery and limited it to a total of 288 77-mm and 105-mm guns. This had a chilling effect on professional discussions of artillery tactics, techniques and procedures (TTPs) due to the fact that "…all further practical work with this arm [was] as good as forbidden."[18] The lessons that Bruchmüller had taught his army slowly began slipping away.

While artillery thought stagnated, the rest of the German Army eagerly reconsidered its entire doctrine in the interwar period. German military thinkers came to the conclusion that their army lacked the mobility to exploit the breakthroughs they achieved in the latter part of the First World War. The way to avoid losing the next war, they claimed, was to design a force to win so quickly it would not get bogged down in a *materielschlacht*. The spearhead for this new force would be the tank.

Colonel-General Heinz Guderian was the most influential proponent of tank warfare before the Second World War. In 1938 Hitler chose him to command the world's first armored corps. But in designing doctrine to complement his new command, Guderian had little time for fire support. The Germans could have produced a self-propelled artillery piece that would keep up with the armor, but Guderian had another idea: the Luftwaffe "…was to be the blitzkrieg's artillery."[19] As a result, the German Army had plenty of fast tanks and even faster aircraft, but not much room for sluggish, horse-drawn artillery.[20]

Soviet Adoption of Bruchmüller Doctrine. After the war, the Soviet military went through a similar period of identifying and analyzing lessons learned. Soviet military thinkers were also quite aware of Bruchmüller and his ideas. His centralized, violent artillery preparations had savaged the Soviets on many occasions. However, the Soviet military didn't eschew his tactics and techniques, but rather embraced them. There is evidence that as early as 1916 Soviet fire support plans began to closely imitate those of Bruchmüller.[21]

Bruchmüller's writings after the war immediately began to influence Soviet fire support doctrine. In his first book, translated into Russian by the first Chief of Red Army Artillery General Yuri Mikhaylovich Sheydeman, he identified three phases of fire support for offensive operations: preparation, support during the assault and follow-on support. Soviet doctrine subsequently identified these exact three stages, although worded slightly differently: fire preparation, fire support and fire accompaniment.[22] This is indicative of the extent to which Bruchmüller's concepts had permeated Soviet military thought.

Soviet artillery focused on centralization and massing in the interwar period, concepts Bruchmüller pioneered in the First World War. In fact, near the end of 1941, "the Soviets had centralized the deep attack mission at field army level."[23] This kind of centralization was firmly rooted in Soviet military theory that predicted the war with Germany would be a "…stubborn, protracted, and bitter war…[which] would entail the mobilization of the entire country and its people in the war effort."[24] They welcomed the *materielschlacht* that Germany was trying so desperately to avoid.

To this end the Soviets made the determination that massed, centralized artillery would be the decisive factor. This proved to be crucial in the planning and execution of fire support at Kursk.[25]

The Battle of Kursk. By 10 May 1943, Hitler was still waiting for his armor on the Eastern Front. The Porsche designed Tiger tanks and Ferdinand self-propelled guns were slow to arrive. Design and production problems had delayed the delivery of new Panther tanks, considered by the army general staff before its fielding as the "finest weapon of its type ever produced."[26] Assured that more than 300 of these weapons would arrive in early June, Hitler decided the attack would commence on the 13th of that month.

As the attack date drew near, tank crews began to discover problems with their new machines. They complained of poor performance in the drive, the track suspension and the optics. In a hurry to get these vehicles into the fight, the German Army never performed any acceptance tests. Hitler decided to push back the date for the attack once again.[27]

In the end, the attack that Manstein wanted to prosecute in March would not begin until early July. Consequently, the Soviets were given ample time to prepare and fortify their defenses in the

The Soviets made the determination that massed, centralized artillery would be the decisive factor. This proved to be crucial in the planning and execution of fire support at Kursk.

The screaming sound generated by the discharge of the Russian Katyusha rocket-launcher and its great firepower had a demoralizing effect upon German troops. Each of the eight launching ramps at the back of the truck held two rockets, one on top of the other; all 16 were fired simultaneously.

Kursk salient. Personnel, armor and, most importantly, artillery poured into Kursk. At the start of the attack, Rokossovsky's Central Front "…was equipped with more artillery than infantry regiments."[28] Both Zhukov and Rokossovsky place the number of artillery and mortar tubes at more than 20,000. The artillery concentration aimed at likely avenues of attack was nearly 150 tubes per mile of front line.[29] The conditions were set for the Soviet artillery to inflict a decisive blow on advancing German artillery, armor and infantry.

It should come as no surprise to learn that the German fire support plan at Kursk relied heavily on the Luftwaffe. On airfields surrounding Kharkov on the morning of 5 July, more than 800 aircraft waited wingtip to wingtip for the go-ahead to take off. The plan was for each one of these aircraft to be aloft when the tanks started rolling forward. The Luftwaffe, like the rest of the German Army, believed it would achieve tactical surprise that morning.[30]

But early warning radars soon picked up the Soviet Seventeenth Air Army heading toward Kharkov and its crowded airfields. The Germans immediately scrambled their aircraft to deal with the threat and ultimately claimed victory in the massive air battle that followed. Although the Soviets failed to catch the Luftwaffe on the ground, they succeeded in diverting it from its mission of providing fire support for attacking ground troops. German artillery would have to take up the slack.[31]

At 0445 on the morning of 5 July 1943, it looked as if a preponderance of German artillery had recovered from the savage beating that took place two hours prior. They started to return fire in a more concentrated manner when Rokossovsky decided to unleash an even greater barrage, using nearly double the artillery pieces. For approximately 30 minutes, more than 1,000 tubes and rockets pounded the German lines.

The effect was immediate and nearly fatal to the German attack. The barrage prevented German infantry and armor from moving to their attack positions. And German assembly areas were cut off from their command and control structures. This second counter-preparation was most effective in "…tearing up communications, as well as observation and control systems 'almost everywhere' within the German assembly areas."[32]

But the Germans were not about to quit. Recovering quickly from the barrage, they were able to commence the attack on both the northern and southern shoulders at 0530.

From the north, the initial probing attacks of the Ninth Army commanded by Field Marshal Walter Model were "…beaten back by a hail of artillery fire at close range."[33] Model pulled his forces back and preceded his next assault with an hour-long artillery preparation on the left flank of the Soviet Thirteenth Army. Begrudgingly, the Soviets began to give ground. As they did, they left behind tank destroying teams in deep slit trenches that emerged only after the German armor passed overhead. These teams, coupled with the hundreds of thousands of mines laid by Soviet engineers, accounted for the loss of more than a hundred of Model's tanks on 5 July.[34]

On the southern shoulder of the Kursk salient near Belgorod, General Hermann Hoth's Fourth Panzer Army detected a weakness in the Soviet defenses. Basing his decision heavily on aerial reconnaissance, Hoth decided to first attack northeast, toward the land bridge at Prokhorovka, before the Soviet's "…massive armoured reserve poured across it to slam into [the German's] right flank."[35] A German victory at Prokhorovka would facilitate the destruction of a large amount of Soviet forces in the southern half of the salient as well as open a route to Kursk.

As this attack commenced, the "…Russian artillery did not waste its chance to pound the unprecedented concentrations of armour packed into Hoth's attack frontage."[36] A withering hail of artillery fire battered German tanks bogged down by minefields and mud. A German tank gunner recalled the fighting that took place that day, stating that "…all around shells burst from the enemy artillery. 'Stalin Organs' also join in. It's a hellish concert."[37]

During the next five days, Model's Army in the north continued to grind against the Soviet defenses only to achieve minimal advances. Early in their preparation, the Soviets concluded that the main attack would come from the north and, consequently, identified this as their main effort. The Germans suffered casualties that would have "…broken the back of any army….One regiment in its first hour of battle lost every officer killed or wounded."[38] By 10 July, Model's attack ground to a halt. The only chance for a German victory at Kursk rested in Hoth's Fourth Panzer Army.

Hoth was doing well by comparison. During the same five-day stretch, he created a bulge in the Soviet line, but couldn't create the breakthrough he was

looking for. He had penetrated far enough to allow the XLVIII Panzer Corps and the II SS Panzer Corps to make a run for the land bridge at Prokhorovka. But they would have to defeat the Soviet Fifth Guards Tank Army, also racing toward Prokhorovka to shore up its defense.[39]

At 0630 on 12 July, the two forces met. The battle began typically with German fighters pounding Soviet positions. Soviet fighters arrived soon after and drove their German counterparts back to their bases. As Soviet and German bombers and fighters roared over the battlefield at Prokhorovka, Soviet artillery began its barrage. The Germans had lost their air superiority and with it a good deal of their fire support. The advantage now shifted to the Soviets.[40]

Soviet howitzers and *Katyushas* hammered German armor formations and forced them to emerge from their hiding positions just as the Soviets began their attack. What followed was a "…head-on collision of armour which has become one of the great myths of military history."[41] German and Soviet armor battled toe-to-toe for the rest of the day.

Ironically, in the last battle of a campaign decidedly influenced by the effectiveness of fire support, the artillery of both sides remained idle, unable to distinguish between vehicles in the confusion and obscuration of the battlefield. In the end, the Soviets' brand new equipment and full complement of ammunition simply wore down their weary opponents. By 2100 both sides established defensive positions, but the Germans were beaten.[42] The battle of Kursk was over. The Soviet Army would soon go on the offensive and remain there for the rest of the war.

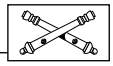
Kursk—Lessons Learned. The battle of Kursk pitted against each other two armies that had distinctly different doctrinal approaches to fire support. Until Kursk, no adversary had been able to expose a flawed German doctrine rooted in the aftermath of the First World War. The Soviets had correctly applied the lessons learned from that war and developed a doctrine that survives largely intact to this day.

In many ways, the United States military of today resembles the German military of the Second World War. Following a stunning victory over Iraq in the Gulf War, we have considerably reduced the size of our armed forces. Within the last year, we have begun the process of making our heavy forces lighter and more agile. We are attempting to leverage technology to create a smaller, more lethal and deployable force capable of quickly massing fires at the decisive place and time on the battlefield.

Our Air Force, like the Luftwaffe, is a powerful asset. The near flawless campaigns in the skies over Iraq and Kosovo illustrate its destructive capability. However, as the Germans found out at Kursk, our air power may not always be there when we need it.

We cannot let the incredible speed and agility of our maneuver forces and our complete domination of the skies mislead us into thinking that conventional artillery is less relevant on the modern battlefield. The Germans learned that lesson more than 50 years ago. But, unlike the Germans, we have yet to encounter an enemy who values centralized, massed artillery and has written its doctrine and designed its forces around this concept.

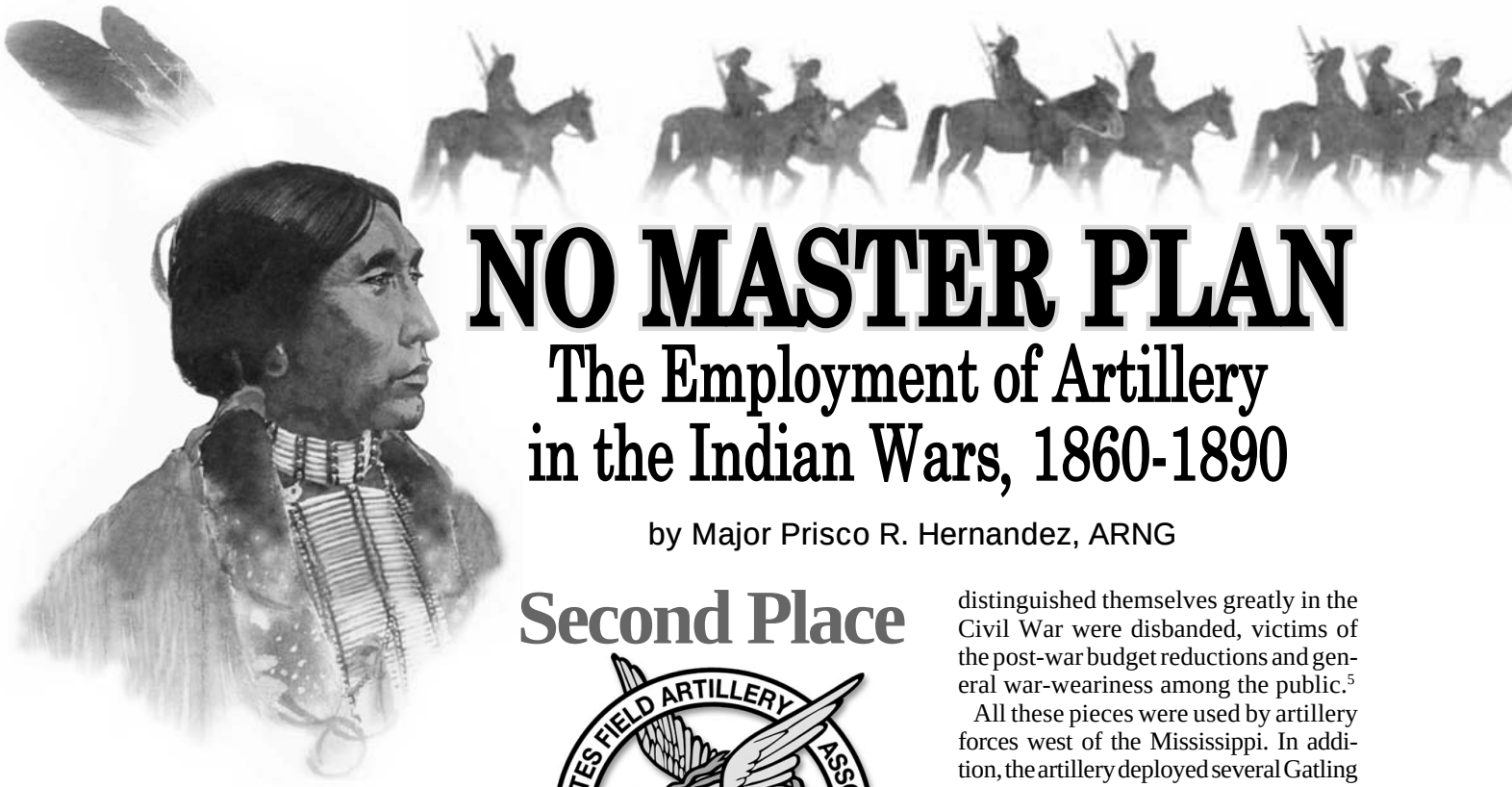
The battle of Kursk ultimately was lost on the battlefields of central Russia, but it may have been decided years earlier when Germany was writing its doctrine and determining how to structure its forces to win the next war. By the same token, the lessons young artillery officers and NCOs learn today will influence our future artillery doctrine. With a perspective grounded in the hard lessons learned by other armies on distant battlefields, we can ensure that the Field Artillery remains the *King of Battle.*



Captain Thomas J. Weiss II won First Place in the US Field Artillery Association's 2000 History Writing Contest with this article. He is the Fire Support Officer for the 3d Battalion, 8th Cavalry, 1st Cavalry Division, Fort Hood, Texas. His previous assignments were as the Assistant Operations Officer in the 2d Battalion, 82d Field Artillery and Battalion Fire Direction Officer in the same battalion. He also served as a Battery Executive Officer, Fire Direction Officer and Company Fire Support Officer for the 4th Battalion, 11th Field Artillery, which is in direct support of the 172d Infantry Brigade (Separate) at Fort Wainwright, Alaska.

Endnotes:

1. Martin Caidin, *The Tigers are Burning* (New York: Hawthorn Books, 1974), 168.
2. The Katyusha, or Little Kate, was a rocket launcher mounted on a heavy truck that fired volleys of up to 48 rockets nearly four miles. The Katyusha was infamous among German troopers who quickly learned to dread its distinctive scream. They named the Katyusha "Stalin's Organ."
3. Robin Cross, *Citadel, The Battle of Kursk* (New York: Barnes and Nobel, 1993), 160-161.
4. Janusz Piekalkiewicz, *Operation Citadel* (Novato, California: Presidio, 1987), 31.
5. Ibid.
6. Cross, 86.
7. Ibid., 86-92.
8. Piekalkiewicz, 41-42.
9. Cross, 92.
10. Ibid., 112.
11. Ibid.
12. Ibid., 113.
13. David T. Zabecki, *Steel Wind* (Westport, Connecticut: Praeger, 1994), 28 and 37.
14. Ibid., 45-46.
15. Ibid., 29.
16. Ibid., 27.
17. Ibid., 97.
18. Ibid., 106.
19. Len Deighton, *Blitzkrieg* (New York: Knopf, 1980), 139-140. This doctrine was first tested in the Polish campaign of 1939. Echoing the sentiments of many senior German military leaders, General von Bock, commander of Army Group North, wrote in his diary, "The artillery may not delay the infantry." The message was clear: maneuver would win the war for Germany, not fire support.
20. Zabecki, 106. Even toward the end of World War II, a typical German infantry division artillery had 441 horse-drawn vehicles and 2,308 horses.
21. Ibid., 126.
22. Ibid., 131. These are the same three stages the Soviets identify even today, with the exception of a fourth stage added to the beginning of the attack: fire protection. The purpose of this is to protect troops moving into the attack position.
23. Ibid., 130.
24. S. A. Tyushkevich, *The Soviet Armed Forces: A History of Their Organizational Development* (Moscow: USAF, 1978), 249.
25. J. B. A. Bailey, *Field Artillery and Firepower* (Oxford: Military Press, 1989), 222.
26. Caidin, 80.
27. Ibid., 82.
28. Ibid., 104.
29. Ibid. and Cross, 140.
30. Cross, 169.
31. Ibid., 169-170.
32. Caidin, 171.
33. Cross, 162.
34. Caidin, 186-187.
35. Cross, 201.
36. Ibid., 171.
37. Ibid., 177.
38. Caidin, 194.
39. Cross, 204-210.
40. Ibid., 213.
41. Ibid.
42. Ibid., 213-216.



NO MASTER PLAN

The Employment of Artillery in the Indian Wars, 1860-1890

by Major Prisco R. Hernandez, ARNG

Second Place

Although there are many studies on the employment and effectiveness of Field Artillery during the American Civil War, there are few detailed studies of its use in the many campaigns the US Army conducted against the western Indians in the second half of the 19th century.[1] Furthermore, military writers often prefer to focus on campaigns and battles that demonstrate brilliance in planning and execution or in which cherished principles are validated. Most of these factors are absent in the case of artillery employment in the Indian campaigns.

Artillery employment in the west was haphazard, at best, and was not based on well-developed doctrine or solidly conceived planning. Nevertheless, these operations are worthy of careful study because we learn not only from successful or brilliant operations but, perhaps, even more from those that fall short of the ideal. This article examines the Indian wars and extracts lessons that may prove to be valuable today.

Artillery Equipment, Organization and Doctrine. In the mid-19th century, American artillery doctrine and practice were modeled on professional European doctrine and practice, especially French.[2] Artillery doctrine emphasized the use of massive firepower to destroy or severely weaken enemy infantry or cavalry formations in preparation for an attack or to attrit the enemy when in the defense. This doctrine was used with relatively minor modifications during the great clashes of the Civil War.

Compared to the European style of warfare represented by formal set-piece battles with thousands of combatants on each side, the Indian wars approximated modern low-intensity conflict and even peacekeeping and peace-enforcing operations.[3] Indeed, many of the Army's operations were conducted to round up and return recalcitrant Indians to their assigned reservations or to protect settlers or friendly tribes from attack by hostile bands.

The standard battlefield pieces were the 12-pounder smoothbore "Napoleon" and the 10-inch Parrott "rifle."[4] These large pieces were very effective in set-piece battles, and their carriages offered adequate battlefield mobility. Smaller pieces also were in use. They supplemented the fire of their larger counterparts and some, like the "mountain howitzers," were intended for use in restrictive terrain or where heavy loads presented too great of an impediment to tactical mobility.

The lighter pieces belonged to the horse or light branches of the Field Artillery. However, the veteran batteries of light or horse artillery that had distinguished themselves greatly in the Civil War were disbanded, victims of the post-war budget reductions and general war-weariness among the public.[5]

All these pieces were used by artillery forces west of the Mississippi. In addition, the artillery deployed several Gatling guns. These were considered light artillery pieces rather than machineguns.

In the western campaigns, artillery was allocated piecemeal to support cavalry or infantry formations. The most common practice was to attach a two-piece section of guns or howitzers to a cavalry or infantry regiment. Given these arrangements, junior artillery officers commonly operated in isolation from any higher artillery headquarters.

Tactical and Operational Environment. The style of warfare practiced by western plains and desert Indians was radically different from the formal European model. It was characterized by ambush, rapid maneuver, hit-and-run tactics, dispersion, avoidance of the enemy's strength and a lack of discrimination between soldiers and civilians. Thus, when fighting its western campaigns, the US Army relied mostly on its mounted arm for operational and tactical actions, while the infantry guarded major forts and installations, which secured lines of communications and supply.[6] In addition, artillerymen were often pressed into service as infantrymen or cavalrymen as the situation demanded.[7] Paradoxically, in many instances, artillery pieces were served by hastily trained infantry or cavalry soldiers, not by artillerymen.[8]

In the western plains, mountains and deserts, the role of the artillery was problematic. Soldiers soon recognized that the fire and thunder of even a small howitzer made a big impression on Indians whose experiences with firearms

had been limited to small arms. The usual shocking psychological effect of artillery was intensified due to the cultural disparity of the antagonists.[9]

However, even the lightest artillery was a hindrance to movement over the vast arid western spaces, and its logistical requirements were a heavy burden on the Army's strained and barely adequate supply and transportation system.[10] Nonetheless, operational level commanders included artillery pieces in their campaign plans more for their value as "firepower insurance" and the availability of the pieces than because they followed a well-developed plan of employment founded on sound doctrine. The actual tactical employment of the pieces rested in the hands of a small group of junior artillery officers who had to adapt quickly to the situation at hand and improvise solutions to novel tactical problems.

Tactical Employment of Artillery in the West. The following is a discussion of some of the most notable combat actions that pitted artillery against western Indians and several engagements in which artillery might have turned the tide of battle if it had been employed. (See the figure.)

Adobe Walls. In 1862, Kit Carson, then a colonel of New Mexico volunteers, led a punitive expedition against the southern plains tribes who had been raiding into eastern New Mexico and southeastern Colorado. The expedition included two troops of cavalry, a battalion of infantry and two small mountain howitzers.

Carson's troops were led by Ute and Jicarilla Apache scouts, blood enemies of the Comanches, and their allies. Carson came upon an Indian encampment near the headwaters of the Canadian River in the Texas panhandle. The troopers attacked the camp but found themselves surrounded by a large group of Comanche, Kiowa and Cheyenne warriors. The outnumbered troopers sought refuge in Adobe Walls, a ruined trading post, and organized a defense against persistent attacks by the plains warriors.

At this point in the battle, Colonel Carson's two howitzers played a decisive role.[11] Their fire broke the back of the plains warriors' charge, but it could not destroy them once the braves decided to disengage. The artillery's success was strictly defensive.

Apache Pass. Also in 1862, a similar type of action occurred at Apache Pass in eastern Arizona. This time, a large band of more than 700 Apache warriors under Chiefs Mangas Coloradas and Cochise ambushed a column of 126 California militiamen under Captain Thomas Roberts in a narrow mountain defile. The initial Apache volley severely disorganized the column, causing some casualties and scaring the animals.

Artillerymen managed to move the two mountain howitzers to both sides of the trail, unlimber them and get them into action. Their fire dispersed the attackers, causing some casualties among the Indians. The Apaches sought cover among the rugged boulders and kept up an accurate harassing fire. The artillerymen then loaded explosive shells, which burst over the heads of the Indians, forcing them to withdraw uphill. Later, the Apaches mounted an evening attack on the soldiers. It failed largely because of the fire of the two howitzers.

Despite a successful defense, the initiative remained with the attackers who retained the ability to disperse, regroup and resume combat on their terms. Nonetheless, the howitzers arguably saved the column from annihilation, considering the Apaches outnumbered the soldiers about seven to one, had chosen the terrain well and had achieved surprise.

This limited defensive success of artillery against Indians unaccustomed to heavy caliber fire was significant as it showed without a doubt that artillery gave soldiers a tremendous survivability advantage even in the most disadvantageous of tactical situations.

Bozeman Trail. Purely defensive, also, was Colonel Henry B. Carrington's employment of howitzers to cover woodcutting and foraging parties that sallied forth from Forts Kearney, Laramie and other posts guarding the Bozeman Trail in Wyoming in 1866. On several occasions during Chief Red Cloud's War,

Engagement	Commander	Artillery Pieces	Opponents	Type of Engagement
1862 Adobe Walls	Colonel Kit Carson	Mountain Howitzers (2)	Kiowa/Comanche/Cheyenne	Defense
1862 Apache Pass	Captain Thomas Roberts	Mountain Howitzers (2)	Apache/Chief Cochise/ Chief Mangas Coloradas	Defense Against Ambush
1866 Bozeman Trail	Colonel Henry B. Carrington	Various Howitzers	Sioux	Defensive Covering Fire
1868 Soldier Creek	Major Andrew W. Evans	Mountain Howitzers (4)	Comanche	Defense/Attack/Pursuit
1872-73 Lava Beds	General Oliver Otis Howard	Various Howitzers/ Mortars	Modoc/Chief Kintpuash (aka Captain Jack)	Siege
1875 Cedar Creek	Colonel Nelson Miles	3-Inch Ordnance Rifle	Sioux/Chief Sitting Bull	Open Battle
1876 Wolf Mountain	Colonel Nelson Miles	Napoleon/Rodman Rifle	Sioux	Defense Against Ambush
1877 Clearwater	Colonel Marcus Miller	Mountain Howitzers	Nez Perce/Chief Joseph	Attack Against Camp
1877 Big Hole	Colonel John Gibbon	Mountain Howitzer (1)	Nez Perce/Chief Joseph	Attack Against Camp
1877 Snake Creek	Colonel Nelson Miles	Napoleon/Hotchiss Gun (1 Each)	Nez Perce/Chief Joseph	Attack Against Camp
1890 Wounded Knee	Colonel James Forsyth	Hotchiss Guns (4)	Sioux/Cheyenne/ Chief Big Foot	Attack Against Camp

Examples of the Use of Artillery in the West

these parties were attacked by Sioux warriors in sight of the forts. The howitzers saved many a soldier's life as the surprised warriors dispersed under their fire.[12]

Encounter with Crazy Horse. Also in 1866, when Captain William J. Fetterman sallied forth to pursue Chief Crazy Horse's braves in reckless disregard to his orders and without artillery support, he paid for it with his life and the total annihilation of his 80-man command.[13] His actions and motivations eerily foreshadowed those of General George Armstrong Custer a few years later at the Little Big Horn.

Custer and Evans on the Staked Plains. In 1868, General Phillip Sheridan ordered a winter campaign against the southern plains tribes. Establishing a pattern for future western campaigns, Sheridan ordered three converging columns on the Indians' winter campgrounds in the largely unexplored barren wilds of the *Llano Estacado* (the Staked Plains) of the Texas panhandle.[14] In November, Major Andrew W. Evans moved northeastward from New Mexico into the Texas panhandle while Lieutenant Colonel George Armstrong Custer set out from Fort Dodge, Kansas, on a southwesterly route that took him to Camp Supply in Indian Territory and on to the Washita River. The third column proceeded from Colorado. The campaign resulted in two major engagements: one involving Custer's column, the other Evans'. A comparison between the actions of both commanders is instructive.

Custer's column consisted of virtually the entire 7th Cavalry Regiment with no infantry or artillery support. Although there were several howitzers available at Fort Dodge and at least one at Camp Supply, Custer chose not to take them.

After weathering a severe snow blizzard, his scouts came upon the winter encampment of Chief Black Kettle of the Southern Cheyenne at the Washita River just east of the Staked Plains. Custer divided his forces into four groups and attacked the village from various directions. His troopers surprised the Indians, burning their lodges and inflicting many casualties.

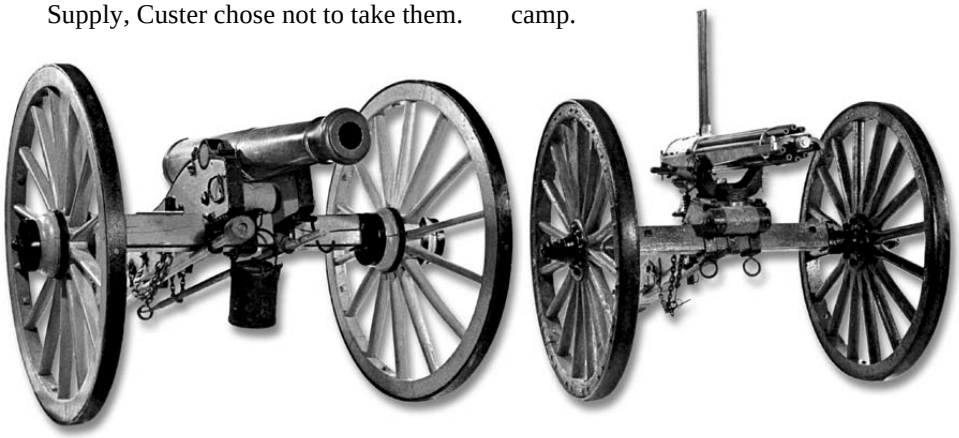
However, the noise of battle attracted many warriors from neighboring camps. These warriors harassed the 7th Cavalry from a distance, following the soldiers and menacing the supply trains. As time passed, more and more warriors gathered, sniping at the tired troopers and threatening to cut off their line of communications.

Under these circumstances, Custer was forced to withdraw. By conducting a circuitous night march he was able to escape northeastward toward Camp Supply.

Major Evans followed the old Adobe Walls trail through the Staked Plains along the Canadian River. He led a combined arms column of cavalry, infantry and a battery of four mountain howitzers.

After weeks of fruitless searching, his men noticed they were being tracked by Indians. Evans sent a detachment under Captain Tarleton to chase them off. The Indians drew the soldiers into an ambush. Tarleton, heavily outnumbered, dispatched a courier to ask for reinforcements.

Evans immediately dispatched a "flying column," consisting of a cavalry troop and a section of two howitzers, followed shortly thereafter with the main body and the rest of the artillery. Artillery fire dispersed the Indians, allowing the troopers to pursue them to their camp.



Artillerymen in the West employed the 12-pounder smoothbore "Napoleon" (left) and the Gatling gun (right). Gatling guns were considered light artillery pieces rather than machineguns.

Again, the fire of the howitzers quickly persuaded the Indians to flee and abandon their lodges and prized possessions, including many horses. It would be a hard winter for them.

Evans' success was firmly secured by his howitzers. The following morning, he withdrew in good order after destroying the Indian camp.

Although both engagements were successful, in one case an entire regiment of cavalry was forced to withdraw under considerable pressure from the Indians, while on the other hand, a combined arms column was able to consolidate and reorganize, stave off attacks and withdraw at its leisure. Custer was able to achieve surprise but was forced to withdraw under pressure. Evans, on the other hand, turned the tables on the Indians and retained control of the battlefield. The difference in their situations was that Evan's howitzers provided him an overmatching firepower advantage that gave him a strong measure of force protection "insurance."[15]

The Lava Beds. Guns, howitzers and mortars were taken into action against the Modocs of California. The Modoc War of 1872-73 was a six-month campaign fought over some of the most forbidding terrain in the west. The Modocs, led by Chief Kintpuash (aka, "Captain Jack"), retired to the rugged Lava Beds of northeastern California and defied the Army until they were starved out of their inhospitable refuge. The fighting resembled trench warfare rather than the war of movement common to most of the western theater.

The forces mustered against the Indians included mountain howitzers and small Coehorn mortars. The howitzers proved to be largely ineffective in the rugged terrain, which restricted mobility and offered ample cover and concealment to the Indians. The mortars were able to reach into "dead space" but were limited by their lack of proper sighting and the constant sniping of Modoc sharpshooters, which prevented accurate observation and adjustments of fires.

In addition, the pieces were manned by green units made up largely of untrained recruits. This resulted in some unfortunate incidents, such as soldiers panicking under the Modocs' incessant sniping and abandoning their guns.

However, when observers were able to adjust fire on Captain Jack's suspected hideout, they forced him out of his Lava stronghold. The Indians be-

came disheartened when faced with a seemingly random and unstoppable rain of destruction from the sky.

Interestingly, artillery soldiers proved to be the deciding factor in this war. The artillery batteries, even when acting as mounted infantry, proved to be the most disciplined and effective troops in the campaign. Fittingly, they were the ones that finally captured Captain Jack and put an end to this bitter war.

Cedar Creek. Colonel Nelson Miles, the commander who brought the Indian wars to a close, customarily included howitzers in his columns. Miles, a pragmatic realist, appreciated the huge psychological and firepower advantage these pieces gave his soldiers when facing mounted Indians.

In his winter campaign of 1875-76, Miles carried his guns concealed within supply wagons.[16] This increased their effectiveness tremendously as their fire came as a total surprise to the Indians.

At Cedar Creek, Montana, Miles encountered Chief Sitting Bull's Sioux. They gave battle. During the ensuing fighting, his three-inch ordnance rifle cooperated with the long-range rifle fire of the infantry to keep the warriors at bay and disperse them, inflicting serious casualties. Captain Simon Snyder, who directed the gun during this engagement, later wrote in his diary, "I had charge of the artillery; which did excellent service, as it appeared to completely demoralize the enemy and kept them at a respectable distance."[17]

Wolf Mountain. Similarly, when attacked by large groups of Sioux warriors in the area of the Wolf Mountains, Miles brought his guns into action with telling efficiency. This time he surprised the mounted Indians by waiting until they pressed their charge. At the last moment, he uncovered the artillery wagons and fired canister from a Napoleon and a three-inch ordnance rifle. The effect was devastating.[18]

In his memoirs, Miles noted that "the Indians could not stand artillery."[19] Miles' appreciation for the value of artillery in the west led him to request that the War Department field a modern breechloading mountain howitzer. His request was approved, and he received a steel Hotchiss gun for testing at his post in Montana.[20] It was to see service within a few months.

The Nez Perce War of 1877. This war included some actions in which artillery figured prominently. Hostilities broke out when the southern band of the Nez Perces defied government orders to abandon their ancestral lands in Oregon's Wallowa Valley. Government troops under General Oliver Howard were tasked to subdue the defiant Indians.

During the Modoc War of 1872-73, Fourth Artillery gunners were dispatched from the San Francisco Bay Area. Here, an artillery sergeant stands next to a 12-pounder mountain howitzer that could launch its projectile 900 yards. It was a primary weapon for the military in the West after the Civil War because of its mobility.

The Nez Perces under Chiefs Joseph and Looking Glass numbered only some 150 warriors accompanied by about 550 older men, women and children.[21] Despite their small number, the Indians fought an impressive defensive campaign over extremely forbidding terrain, keeping many larger regular Army units at bay for almost four months.

Howard's command consisted of more than 2,000 infantry, cavalry and artillery soldiers, militia volunteers and Indian scouts. At the beginning of the campaign, his complement of artillery included no less than six guns, a battery of mortars and several Gatling guns.[22] Most of these lagged behind once the Indians began their retreat. The Army fought at least six major engagements in this campaign of which only two proved to be clear battlefield victories.[23] Artillery figured prominently in three of these.

At the Clearwater stream in northwestern Idaho, the Indians fought a defensive engagement that lasted for two days. Soldiers of the Fourth US Artillery under Colonel Marcus Miller of Modoc War fame figured prominently in this action. The Indians understood the significance of the artillery and attempted to silence it by concentrating their fire on the gunners. The Redlegs stood to their guns and poured effective canister and shellfire on their opponents, enabling the soldiers to stand firm and eventually dislodge the Nez Perces.[24]

Another engagement occurred when Colonel John Gibbon marched against the Nez Perces from his post in Fort Raw, Montana. At Big Hole in the Bitterroot Mountains of southwestern Montana, he found the Indians and attacked their lodges in a dawn assault. The Indians rallied and conducted a fierce defense. In this fight, Nez Perce warriors captured Gibbon's only howitzer and disabled it. They were then able to disengage and make good their escape.

Gibbon erred when he didn't bring the howitzer forward with the assaulting troops. It couldn't support his assault and, at the same time, lacked infantry or cavalry support. Gibbon's actions are puzzling because he had written a manual for artillerists in 1863 where he advocated using the artillery in conjunction with the other arms.[25]

This skirmish also proved that the Nez Perces understood the value of artillery and concentrated their efforts against it. The taking of the gun was a tribute to their bravery and acute tactical sense.

By late September, the Nez Perces, tired, hungry and decimated, had, nonetheless, repeatedly contained and outwitted a much larger and better-equipped army. Their valiant odyssey was cut short by Colonel Miles only about 40 miles south of the Canadian border. His mixed column of cavalry and mounted infantry included a Napoleon and his new Hotchiss gun. Miles surprised the Indians in their lodges, but his assault was brought to a halt by the usual accurate Nez Perce marksmanship. Some braves occupied prepared rifle pits while others ensured the safety of their women and children.

Cannon crews conduct an artillery drill on a plain outside Fort Douglas, Utah. The dust and heat of such practices yielded little in the way of useful skill: Indians rarely presented a massed target for an artillery attack.

Miles' artillerymen improvised by digging up the ground to the rear of their pieces, sinking in the tailpieces and elevating the guns in order to achieve a higher trajectory against the entrenched Indians.[26] Their high-angle fire caused some casualties and held the Indians at bay, but it did not prove decisive.

The engagement was inconclusive; both sides sniped at each other for a few days without either being able to press the attack or withdraw. Resistance finally ceased with the arrival of the main body under the command of General Howard. These reinforcements convinced the Nez Perces of the futility of further resistance. The campaign ended on a poignant note when Chief Joseph surrendered his rifle to General Howard exclaiming: "From where the sun now stands, I will fight no more—forever."[27]

Tactical Analysis. As has been shown, artillery was commonly used in attacks on Indian encampments. This isn't the place to comment on the morality or appropriateness of these actions. Suffice it to say that they were controversial, even in their own day. Both Generals Sherman and Sheridan considered attacking Indian villages in winter an integral part of their campaigns of attrition.[28] On the purely technical level, they only confirm the destructive power of artillery against a massed target.

Artillery was used by Major Evans against the Comanches and Kiowas at Soldier's Creek. Some years later Colonel Miles employed artillery against the Sioux. Most of the engagements in the Nez Perce campaign were fought when the Indians defended their camps against the Army. Finally, artillery was employed in the last tragic act of the Indian wars. At Wounded Knee, the 7th Cavalry and its attached battery of four Hotchiss breechloaders killed and wounded more than 200 Sioux, including many women and children.[29]

Perhaps the true battlefield significance of Field Artillery in the western environment may be judged by comparing those engagements in which it was present to those where it was lacking. The Custer and Fetterman debacles were the worst defeats the Army suffered in the western campaigns against the Indians. Both were inflicted upon units whose commanders were recklessly overconfident, disobeyed or very liberally interpreted their orders and were lacking in artillery. Given similar tactical situations, it is possible that without artillery firepower other engagements, such as those at Adobe Walls, Apache Pass and Evans' fight at Soldier's Creek, could have been just as disastrous.

Lessons for Today. What can today's Redlegs learn from the experiences of the Field Artillerymen who fought in the Indian wars? First and foremost, military forces that operate without clear, practical doctrine oriented to the battlefield realities they will likely face do so at their peril. They are forced to make-do with a continual search for immediate *ad hoc* solutions to critical battlefield situations. Although history shows that American soldiers have been great tactical improvisers, reacting to new challenges with flair and imagination, the lack of a doctrinal framework in the friction-fraught environment of battle recklessly invites disaster.

In the case of the Indian wars of the second half of the 19th century, the problem wasn't an absolute lack of doctrine. A highly developed doctrine based on European models existed and was practiced and modified to suit the realities of the great American Civil War.

The problem was that the Indian campaigns lay outside the accepted parameters of "civilized warfare." The Indian wars were regarded variously as "policing the frontier," conducting expeditions against "renegades" or "punishing raiders." All these types of actions were considered unworthy of serious military thought and, consequently, were thought to be outside the pale of the "major and minor" tactical practice of the period. The underlying stream of thought seems to have been that professional military officers should have no trouble overcoming bands of "half-naked savages."[30]

This is eerily similar to the situation we face today. US Army units are called upon to conduct operations against warring factions that don't follow the model of war against a duly constituted nation state. Similarly, the Army possesses an adequate and battle-tested doctrine. However, there is a tendency to equate this doctrine to more abstract and, presumably, unalterable principles of war. I suggest that the appropriate response isn't to make doctrine fit a procrustean theoretical framework, but to tailor it to more specific likely theaters of operations.

Collectively, we prefer to think and write about Desert Storm, and even World War II rather than about Grenada, Mogadishu, Haiti, the Balkans, et al.[31] Again, commonly heard comments, such as "the Army is not a police force," "we're not in the disaster relief business," etc., fail to accept the most likely operational realities and leave us unprepared for them.[32]

The fact is that even a cursory study of American military history reveals that small conflicts of all descriptions far outnumber "real" high- to mid-intensity wars fought between "nation states." The problem, then as now, is a lack of appropriate theater-specific doctrine. This is especially critical as it pertains to the role of Field Artillery and firepower support in general.

Clearly, the formulation of doctrine is a central element of strategy and isn't the exclusive purview of artillerymen or even of the Army as a whole. But as the coordinators of the fire-support battlefield operating system (BOS), artillery officers must make their voices heard at every step of the doctrine writing process.

Second, artillery employment must be an integral part of the operational commander's overall campaign plan. In the Indian campaigns, artillery was included in the plans more as an afterthought or because a particular asset was readily available than as part of a well thought-out plan of action.

The sole exception to this practice appears to have been Nelson Miles, who not only included artillery and infantry in his columns, but also attempted to maximize the element of surprise by concealing the pieces in covered supply wagons. Significantly, Miles included infantry in his mixed columns to exploit the firepower advantage of the infantry rifle and to protect his supply trains.[33] The pragmatic and efficient Miles presents a stark contrast to the overconfident and romantic Custer who derided both infantry and artillery support, assuming he would conquer solely through his cavalry's elan.

Third, artillery is almost always a tactical "heavy hitter." Whenever artillery firepower can be effectively brought to bear, it can decisively alter the balance of combat power. Even relatively light pieces are "heavy hitters" in a light environment. This battlefield reality was clearly demonstrated whenever light pieces were brought to bear against the Indians. In such an environment, artillery provides a significant measure of force protection insurance against threats but only if it is kept at the ready. Now, as then, the ability of Field Artillery to harm the enemy at a distance gives the force with the artillery a marked advantage.

The protection Field Artillery provides to infantry and cavalry is an enormous contribution to their morale and operational effectiveness. As Robert Scales observes in his book *Firepower in Limited War*, "Bold strokes across the map mean little in such [guerrilla] wars. Occasional maneuver by battalions is the practical limit. The purpose of supporting firepower should be to amplify the destructive power of a limited maneuver force and to protect it against catastrophic losses in the field."[34]

On the other hand, the offensive decisiveness of Field Artillery is directly tied to its deployment capabilities and the rapidity with which it can be "unlimbered" and brought into action. Many of the tactical possibilities and limitations of Field Artillery that emerged during the Indian wars remain true today in similar operational environments. Today's technology offers much greater operational and tactical mobility, but to maximize these capabilities, the artillery commander must be proactive and anticipate where his pieces may be most effectively deployed.

Finally, in common with many other chapters in US Army history, it was the junior officer or NCO on the ground that made a difference. By quickly appraising the situation and reacting energetically to the tactical problem at hand, these junior leaders made the best out of bad situations, sometimes turning the tide of battle in their favor. This type of energetic, decisive action at the small unit-level has been, and continues to be, a distinctive strength in the American Army.

Nonetheless, the penchant for improvisation and clear thinking in critical situations should never serve as a substitute for foresight and detailed planning. Now, as then, the wise artillerist must ensure his voice is heard at all stages of the planning process—operational, tactical and in the conduct of battle. Only then can the Army maximize the true potential of artillery while minimizing its limitations.

Major Prisco R. Hernandez, Army National Guard (ARNG), won Second Place in the US Field Artillery Association's 2000 History Writing Contest with this article. He is a National Guardman assigned as an a Training Officer in the Training Section of the 4th Brigade, 75th Division, Training Support (TS) at Fort Sill, Oklahoma. Previously, he served as Battalion S3 in the 1st Battalion, 120th Field Artillery, an M109A5 howitzer battalion in direct support to the 32d Infantry Brigade with the Wisconsin National Guard, headquartered in Wisconsin Rapids. He also has served as Assistant S3 for this battalion, Commander of a mechanized infantry company, twice as an infantry company Executive Officer, rifle company Platoon Leader and antiarmor company Platoon Leader. Major Hernandez holds a master's degree from Indiana University and a Ph.D. in Music History from the University of Wisconsin.

Endnotes:

1. The most comprehensive study on this subject is Larry Don Roberts, "The Artillery with the Regular Army in the West from 1866 to 1890," Ph.D. dissertation, Oklahoma State University, 1981. However, as its title indicates, it does not treat the use of artillery by irregular forces such as state militia or volunteers.
2. Fairfax Downey, *Sound of the Guns: The Story of American Artillery* (New York: David McKay Company, 1955), 86; the book covers artillery history from the ancient and honorable company to the atom cannon and guided missile.
3. "A century of Indian Warfare…should have taught us much about people who did not fight in conventional ways, and our military might reasonably have been expected to reflect the lessons thus learned. Some were not without relevance in Vietnam." Robert M. Utley, *Soldiers West: Biographies from the Military Frontier* (Lincoln, Nebraska: University of Nebraska Press, 1987), 3.
4. Roberts, 32-34.
5. Downey, 174.
6. Roberts, 14-28.
7. "Even when doctrinal myopia converted batteries into infantry and cavalry troops, artillerymen served well. Captain Marcus Miller commanded admirably during the Modoc, Nez Perce and Bannock campaigns. He was twice brevetted for gallantry in action against the Indians. Captain Henry Hasbrouck's men hounded Captain Jack's band until the majority surrendered to him. He, too, was brevetted for meritorious conduct and gallantry in action. Lieutenants Hawthorne and Humphrey were awarded Congressional Medals of Honor for Heroism at Wounded Knee and the Clearwater battles, respectively." Ibid, 251-260.
8. Ibid., 259.
9. Ibid., 70.
10. Ibid., 32-28.
11. Ernest Wallace and E. Adamson Hoebel, *The Comanches: Lords of the South Plains* (Norman, Oklahoma: University of Oklahoma Press, 1952, reprint ed. 1985), 306.
12. Downey, 174.
13. David Nevin, *The Soldiers, The Old West* (Alexandria, Virginia: Time-Life Books, 1974), 136-143.
14. Roberts, 50-51.
15. For a thorough comparison of Custer's and Evans' actions, see Ibid., 56-61.
16. Ibid., 71.
17. Ibid., 70.
18. Ibid., 71.
19. Ibid., 70.
20. Ibid., 192.
21. Benjamin Capps, *The Great Chiefs, The Old West* (Alexandria, Virginia: Time-Life Books, 1975), 175.
22. Roberts, 197.
23. Ibid., 201.
24. Ibid., 163-164.
25. Ibid., 182-183.
26. Ibid., 195.
27. Capps, 183.
28. Nevin, 159-167.
29. John P. Langellier, *Redlegs: The U.S. Artillery from the Civil War to the Spanish-American War, 1861-1898,* in the series "G.I.: The Illustrated History of the American Soldier, His Uniform and His Equipment" (London: Greenhill Books, 1998), 7; also see photographic essay in Capps, 226-33.
30. Note: This derogatory terminology was regularly used by whites to describe the various Native American tribes that fought the Army in the west.
31. For a provocative treatment of the recent past, present and likely future environment of war and other violent conflict, see Martin van Creveld, *The Transformation of War* (New York: The Free Press, 1991).
32. For a critical appraisal of current Army doctrine in relation to likely contingencies, see John Kirk, (Brigadier General, US Army, Retired), "Move it on Over," *Armor* (November/December 1999), 14-21.
33. Roberts, 74-75.
34. Robert H. Scales, Jr., *Firepower in Limited War* revised ed. (Novato, California: Presidio Press, 1995), 295.

Cannons Under Canopy

American Parachute Field Artillery in Operation Market-Garden

by Major Scott T. Glass, QM

> The mission of parachute Field Artillery is to render fire in close support of airborne infantry...in the tactical operations after dropping."
>
> *Employment of Airborne Field Artillery*, 1943[1]

Third Place

The United States Army currently maintains four battalions and two batteries of cannon artillery on airborne status. Parachuted guns played roles in several World War II operations, Korea and, most recently, Panama in 1989. However, the airborne artillery has placed a battalion-plus under canopy successfully into combat only once—more than 55 years ago in September 1944 during Operation Market-Garden. In this operation, the 376th Parachute Field Artillery Battalion (PFAB) and B Battery, 377th PFAB dropped into Holland near Nijmegen and Eindhoven, respectively.

The Market phase of Market-Garden saw the largest wartime parachute insertion of Field Artillery by any combatant in World War II. It remains the largest and most successful to this day. Given the Chief of Staff of the Army's recent initiatives for light forces that stress quick combat deployment, Field Artillery arriving on a battlefield by parachute will continue as a viable combat option. Cannoneers in the airborne artillery community can prepare their units for success by examining the experiences of the FA parachuted into Holland.

Cannons Light for Flight. "...paracrate packing make[s] necessary the occasional disassembly of various parts of the howitzer and carriage." *Technical Manual 9-319 75-mm Pack Howitzer M1A1 and Carriage M8*, 1943[2]

American airborne Field Artillery units in World War II primarily employed the M1A1 75-mm pack howitzer on an M8 carriage. Initially designed in the 1920s as a weapon for disassembly into loads carried by mules, it delivered a 14-pound shell to a maximum range of 9,610 yards.[3] The artillery community later developed the M8 carriage specifically for airdrop operations.

The gun weighed 1,339 pounds, and during the opening phases of airborne operations, the gun crews wheeled it by hand without a prime mover as standard practice.[4] Indeed, the doctrinal manual for airborne Field Artillery at the time recognized crew muscle as the prime means of moving guns on the airborne battlefield.[5]

The 75-mm howitzer's relatively small size and weight allowed disassembly into nine paracrate or parapack loads containing gun components and ammunition. (See Figure 1.) Gun crews packed loads One through Five and Nine and attached them to fuselage and wing racks of C-47 transport aircraft. The jumpmaster released the bundles over the drop zone (DZ) by toggling a series of switches. As he did so, gunners pushed out a bundle from the troop door containing 75-mm howitzer loads Six, Seven and Eight roped together and then followed the bundle out. A daisy-chain harness connected the loads jettisoned from outside the aircraft and ensured they arrived on the DZ close together.[6] The M1A1 had few peers at the time as an airborne indirect fire weapon, and the British airborne forces used it instead of attempting to develop a similar weapon.[7]

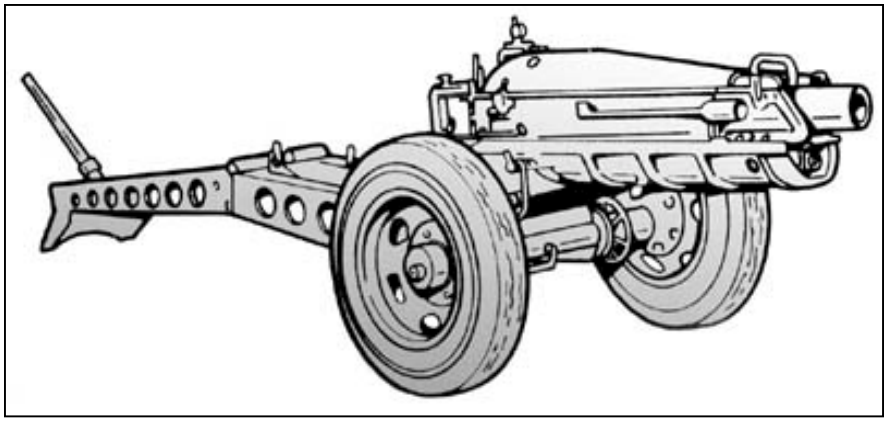
Challenges Not Conquered…Yet. "Parachute artillery didn't fare too well in Sicily and Normandy." Major General James M. Gavin, Former Commander of the 82d Airborne Division[8]

Airborne guns figured to play a prominent role during the assault onto the island of Sicily on 10 June 1943 when elements of two artillery battalions were to participate in a night drop. However, unusually high winds coupled with poor navigation by aircraft crews and friendly anti-aircraft fires scattered guns and gunners far from the DZs.[9] This dispersion prevented the airborne artillery from making a battlefield contribution proportionate to its potential.

The parachute drops scheduled for the night of 5 and 6 June 1944 preceding the Normandy invasion also promised roles for the parachute Field Artillery. Perhaps influenced by his experiences in Sicily, Brigadier General Gavin, limited the 82d Division's 456th PFAB to two howitzers accompanying his first drops. The 101st Airborne Division envisaged a battalion mission for its 377th PFAB and planned to drop all 12 of its howitzers.[10]

1. Front Trail Section and Drawbar
2. Axle, Rear Trail Section and Toolbox
3. Sleigh and Gun Cradle
4. Top Gun Cradle
5. Cannon Tube
6. Breechblock and Sights
7. Carriage Wheels
8. 10 Ready Rounds of Ammunition
9. Paracaisson Handcart of Eight Additional Rounds

Figure 1: The 75-mm Pack Howitzer Disassembled into Paracrates or Parapack Loads. (Information taken from *The American Arsenal* edited by Ian V. Hogg and published by Stackpole Books, Mechanicsville, Pennsylvania, 1996, Pages 144-145.)



The 75-mm howitzer's relatively small size and weight allowed disassembly into nine paracrate or parapack loads containing gun components and ammunition. The version shown here is the M1A1 on the M1 (M116) carriage *(TM 9-3305 Principles of Artillery Weapons,* Page 2-9).

But once again, the airborne cannon crews entered combat under extremely adverse conditions that rendered them unable to provide immediate fires to supported units. Aircraft scattered guns and crews over wide areas in the darkness. Very few howitzers could be recovered from the mostly marshy terrain, and those that could, in many cases, experienced irreparable drop damage. Of the 12 howitzers it dropped into Normandy, the 377th PFAB recovered and placed into action only one gun in the critical days after the drop.[11] The drop scattered and damaged guns so thoroughly that the battalion was nearly useless as an indirect fire force for the initial two weeks after the landing.[12]

At best, the performance of the airborne artillery during the Sicily and Normandy operations didn't live up to its potential. At worst, the artillery absorbed valuable airframes with little or no return on the investment. Batteries landed widely dispersed during hours of darkness across the wrong DZs. Efforts failed to concentrate the guns, crews and ammunition necessary to mass fires shortly after landing. Even so, several key airborne leaders still recognized the value of artillery during an airborne operation. Brigadier General Gavin was in this group and, although he dropped only two guns in Normandy, his influence played a large role in crafting the most successful airborne artillery drop of World War II.

Concept for Success. "...it looked as though artillery would come in very handy in the first 24 hours, so the decision was made to take it in by parachute." Major General Gavin[13]

In late August and early September 1944, Allied mechanized forces broke away from the Normandy beaches and chased retreating German units across northern France. Planners in the recently created 1st Allied Airborne Army proposed a series of operations to trap major German maneuver formations. Allied ground troops overran the proposed DZs before the operations could be launched, but these events only increased enthusiasm for another mass parachute assault.

After the first week of September, a plan evolved to insert three divisions by parachute and glider to support a thrust across the Rhine River in Holland. By successfully vaulting the Rhine, Allied planners hoped to turn a major portion of the Siegfried Line defenses, threaten German industrial areas and remove the last great river obstacle to Germany's interior.

Airborne gunners prepare parapacks next to their C-47 transport. Note the paratroopers are preparing the 75-mm howitzer bundles themselves.

The final plan called for the 101st Airborne Division to drop into St. Oedenrode north of Eindhoven to secure multiple canal crossings. (See the map in Figure 2.) The British 6th Airborne Division would drop into Arnhem to seize the bridge over the Lower Rhine River. The 82d Airborne Division formed the vital link between the 101st and British 6th airborne divisions by grabbing bridges and canal crossings around Nijmegen over the Maas and Waal Rivers.[14] The three divisions' landing sites were connected by what became known as "Hell's Highway."

Simultaneous with the three divisions landing by parachute and glider, the British XXX Corps would advance along a narrow corridor through the two American divisions to Arnhem. This entailed a move of 50 miles in about two days.[15] The allied leaders accepted the risk involved in this undertaking, given the opportunity to strike quickly across the Rhine River. It was an operation tailor-made for airborne troops.

Major General Maxwell Taylor, Commander of the 101st Airborne Division, devoted almost all his first lifts to infantry. Because his division would jump closest to the advancing XXX Corps, he reasoned that his infantry could quickly capture their assigned objectives without needing the firepower options provided by parachute Field Artillery. B Battery of the 377th PFAB would jump on D+3 with the majority of the division artillery arriving by glider before the battery.[16]

Brigadier General Gavin took a much different perspective because his mission specified capture of the Groesbeek Heights. This was a rare piece of high terrain southeast of Nijmegen that dominated the area for miles. Included was the task of blunting German mechanized counterattacks on the Groesbeek Heights from the Reichswald, a heavily-wooded forest astride the Dutch-German border.[17] (See Figure 3.)

Gavin and his planners knew that a parachute artillery battalion would provide the firepower necessary for accomplishing these tasks. An added bonus was that a PFAB required 48 C-47 aircraft versus 95 to deploy a glider Field Artillery battalion. These 48 aircraft needed four minutes of airspace; the 95 towing gliders required 15 minutes.

Key to the airborne artillery's performance was the decision to execute the parachute drop in daylight. This eliminated the requirement of a time-consuming and confusing rehearsal of a night drop immediately before the actual operation. But most importantly, planners hoped this decision would help to achieve the high degree of troop and equipment concentration on the DZs, concentrations that were missing in the Sicily and Normandy operations.[18]

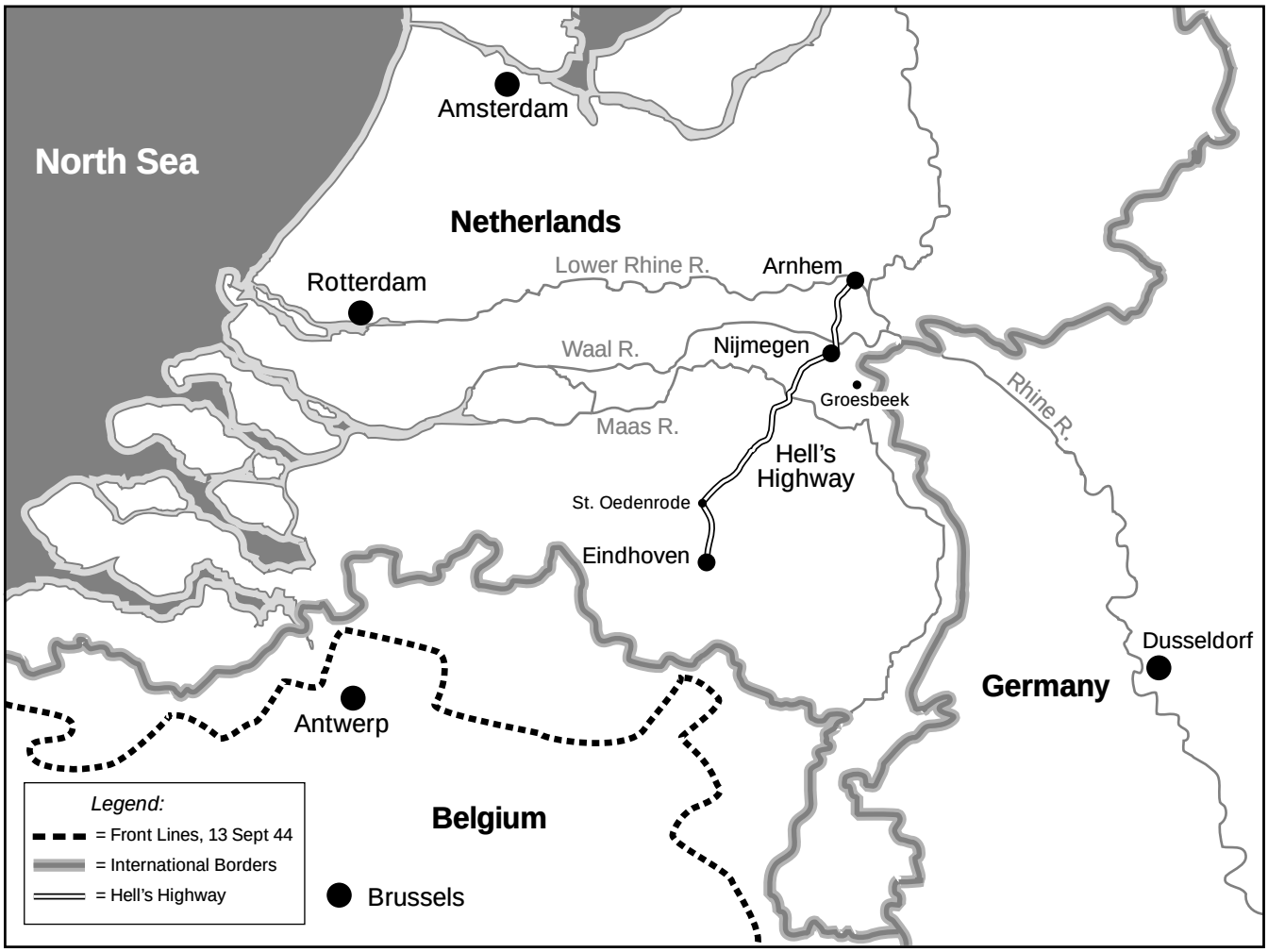


Figure 2: The Airborne Artillery Area for Operation Market-Garden, September 1944. During this operation, the 376th Parachute FA Battalion (PFAB), 82d Airborne Division, dropped into Groesbeek near Nijmegen and B Battery, 377th PFAB, 101st Airborne Division, dropped into St. Oedenrode near Eindhoven. Hell's Highway linked the airborne drop zones (DZs) from Eindhoven through Nijmegen to Arnhem.

Cross-Training, Crating and Chuting Up. "The 377th PFAB got back to England in late July 1944. From then on, we trained replacements and worked hard to fix things we knew did not work in Normandy." Second Lieutenant Everett G. "Red" Andrews, Assistant S3, 377th PFAB[19]

While waiting in England for another opportunity to demonstrate the value of parachute artillery, the parachute Field Artillery had not been idle. Training intensified for new gunners, leaders and staff officers. Crews drilled constantly on recovering and assembling the component parts of airdropped howitzers. Changes in organization and support relationships required new liaison officers to train on evolving doctrine with their supported units.[20] Many senior artillerymen went about their tasks driven by the knowledge that their next chance to prove their worth might be the last one allotted by skeptical planners.

The 376th PFAB received orders on 11 September to prepare its equipment for a parachute jump behind German lines. Preparations continued with the move to the departure airfield (DAF) at Fullbeck, England, on 14 September. Crews disassembled the guns, prepared the parapacks and loaded 72 more rounds of ammunition per howitzer in airdrop bundles. Briefings, orders drills and rehearsals continued while liaison teams left the DAF to make jump preparations with their supported units.

The simplicity of the 376th's mission greatly eased planning and preparation. The battalion was to land by parachute at 1340 on 17 September on DZ "N" south of Groesbeek and fire in direct support (DS) of the 505th Parachute Infantry Regiment (PIR). (See the map in Figure 3.) Follow-on missions included supporting the 504th and 508th PIRs and interdicting suspected German gun positions in the Reichswald.[21]

Canopies Over Colonjes. "Right after I landed, I knew this had been a good, tight drop. Crews started to assemble quickly. I saw a three-story house nearby and took it for the battalion headquarters. We were in business just minutes after hitting the ground." Captain Robert A. Lally, Commander of Headquarters and Headquarters Battery and S2 of the 376th PFAB[22]

Thirty-eight officers and 506 men of the 376th PFAB boarded 48 C-47 transports on Sunday morning, 17 September for the flight to Holland. Twelve guns and 42 tons of supplies would drop

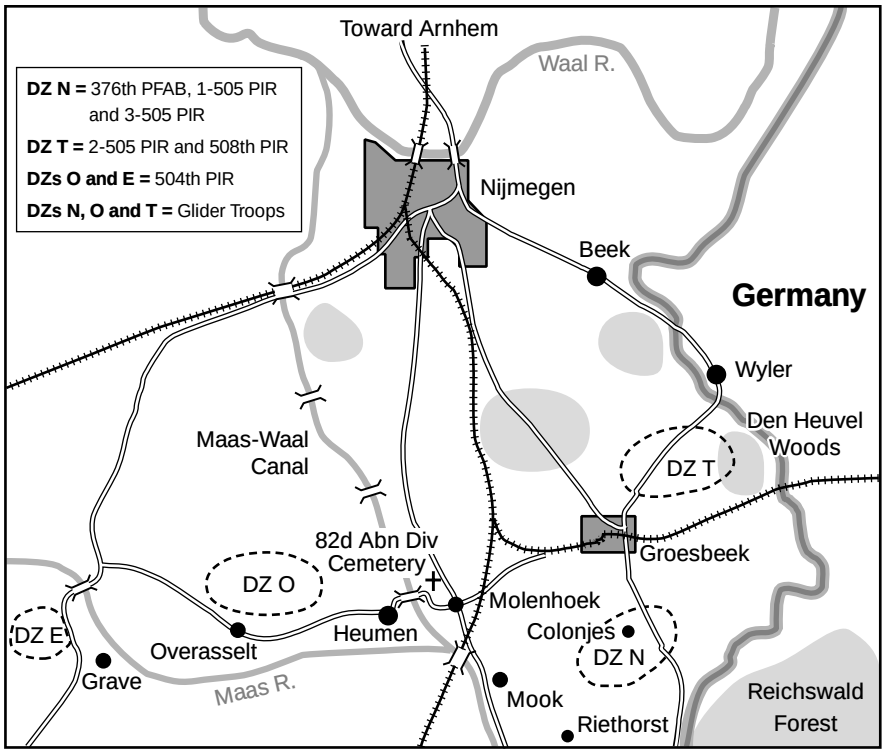


Figure 3: 376th PFAB Operational Area Around Groesbeek, Holland, 17 September 1944. In support of the 504th, 505th and 508th Parachute Infantry Regiments (PIRs), the 376th PFAB landed on DZ N where Germans fired on them from the Reichswald Forest. The battalion returned fire, engaged targets around Mook and moved into the town of Groesbeek. On D+1, the 376th helped evict Germans from DZs N and T to secure them for the arrival of glider troops.

with the cannon crewmen from 500 feet above DZ N. Some German anti-aircraft flak hit the transports on the way to the DZ, but all 48 continued on. At 1333, seven minutes ahead of schedule, paratroopers kicked out the first door bundle from the lead C-47. The 376th PFAB commander followed the bundle out into space and started the most successful wartime airborne delivery of artillery in history.[23]

After just seconds suspended in their parachute harnesses, the airborne gunners rejoined the earth on the fields of DZ N around Colonjes. It was a beautiful Sunday morning southwest of Groesbeek, and every stick had landed within a mile of the planned impact point. Jump injuries, considering the seeming acceptance of high jump risk at the time, were remarkably light at approximately 30 men. A few soldiers didn't jump due to wounds received from the German flak during aircraft flight. The transports carried the wounded back to England with one cannoneer dying from his wounds during the return flight.[24]

376th PFAB at Groesbeek. "...the gunners brought in ammunition from parachute containers...only to fire it as fast as possible as the Germans attacked our front." Major Robert H. Neptune, Executive Officer, 376th PFAB[25]

On the ground, the cannon crews rushed to accomplish their mission of supporting three infantry regiments in the division until additional artillery could arrive by glider more than a day later. Gunners hurriedly derigged the parapacks and assembled the howitzers. Other paratroopers assembled the supply bundles, their task greatly eased by the color-coding of parachutes with different loads.

German soldiers scattered in the local area fired on these activities. The gun crews fought back, killing several Germans and taking a total of 37 prisoners before their first 30 minutes on the ground had expired. The crews suppressed the enemy in their immediate area and manhandled the guns about 1,000 yards from the DZ toward the southern edge of Colonjes to the battalion collection point and initial firing position.[26] Leaders set up wire and radio communications, established an all-around defense and sited incoming howitzers in a 360-degree perimeter. Soldiers manning the battalion command post (CP) interrupted their work to attack the high ground north of the CP that sheltered a German flak position.[27]

Twenty-two minutes after landing, one howitzer was ready for action with 24 rounds of ammunition standing by. Liaison teams had linked up with the 504th PIR and the aid station for battalion wounded was operational. By 1440, barely an hour after the jump, one battery was completely assembled. The other two firing batteries had one damaged howitzer each from the drop. Unfortunately, the damaged guns couldn't be repaired from the extremely limited repair parts and tools that the batteries brought with them.[28]

At 1800, the 376th PFAB fired its first on-call mission for the 505th PIR, although the battalion had several guns ready to fire for some time before 1800. The target was a German infantry force with some light vehicles moving out of the cover of the Reichswald. The 75-mm fires called in by the forward observer (FO) teams with the 505th PIR disrupted this movement.

A short time later, the 376th PFAB shifted fires nearly 2,400 mils to respond to calls-for-fire from the vicinity of Mook. Shells from the pack howitzers helped blunt a dismounted German attack north along the highway south of Mook that threatened the DZ areas. Throughout the afternoon and into the night, gun crews fired missions, helped retrieve supply bundles by hand and stockpiled ammunition near the guns. Everyone expected the German reaction to be a violent one the next day.[29]

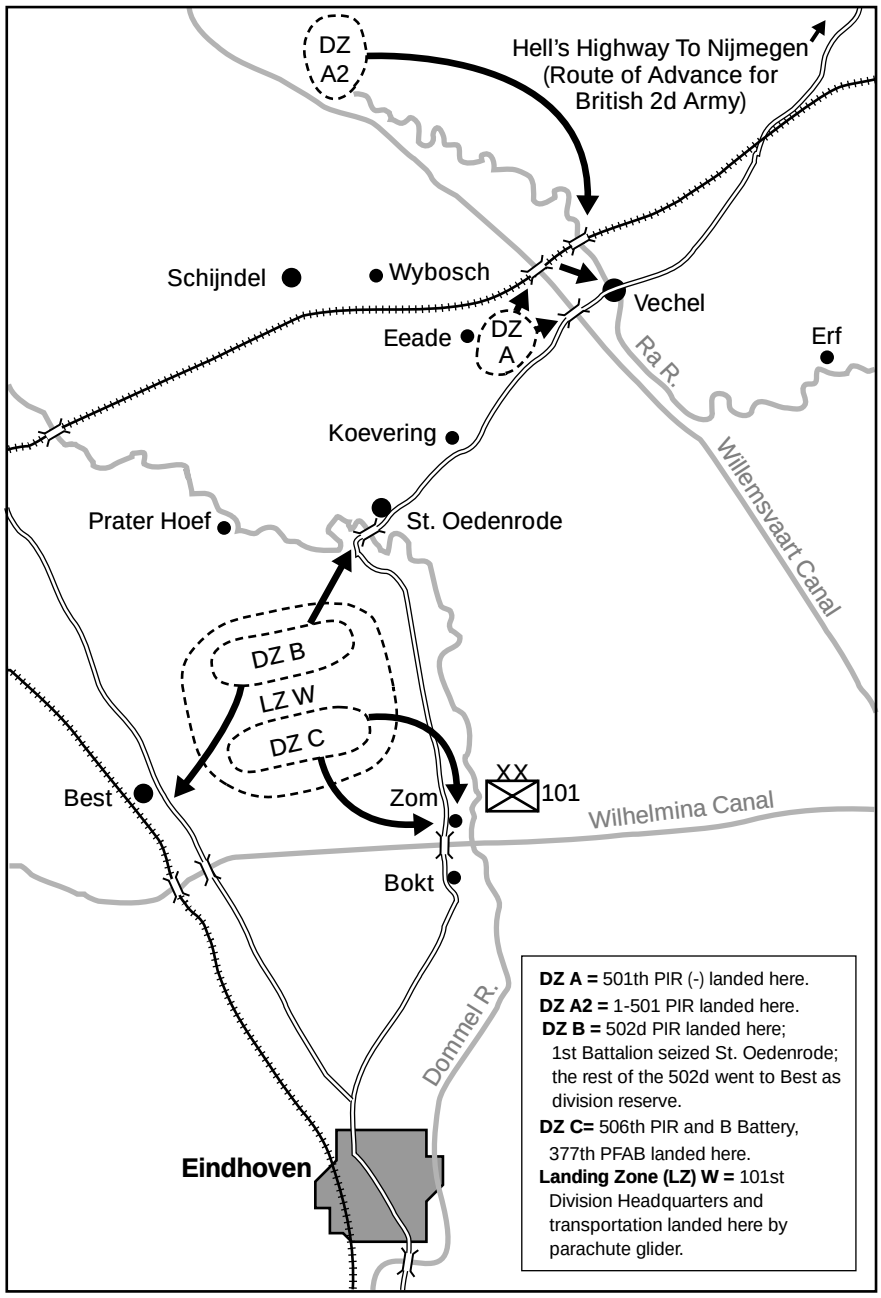


Figure 4: Initial Operational Area of B Battery, 377th PFAB, 17 September 1944, in Operation Market-Garden. B/377 PFAB parachuted into DZ C on D+3.

Early on D+1, C Battery displaced to support the 508th PIR. The move encompassed 4,300 yards with the guns and ammunition moved by hand. C Battery almost immediately went into action, firing on German paratroopers and light armored vehicles. Less than an hour before the scheduled D+1 glider landings, a German force attacked out of the Reichswald and overran the planned landing areas.[30] The fires from C Battery assisted the 508th PIR in evicting the German forces and securing DZ T as one glider landing site. Both A and B Batteries successfully fired in support of the 505th PIR against a German force detected south of Riethorst and threatening DZ N.[31]

All three batteries materially assisted in securing the two DZs in the nick of time. Just after the German attackers retreated, gliders started pouring out of the sky with guns and equipment from the 456th PFAB and the 319th and 320th Glider Field Artillery Battalions. The 376th PFAB gunners fired suppression missions on German anti-aircraft positions while the gliders swooped down. As the three arriving battalions struggled to assemble, the airborne gunners once again engaged targets near Riethorst and the Reichswald.[32]

The arrival of three reinforcing battalions ended the 6,400-mil responsibility of the 376th PFAB. As soon as each battalion assembled, it transferred six jeeps and two trailers to mechanize the 376th PFAB. Each FA glider battalion also established its fire direction center (FDC) and assumed support relationships with its respective PIR, relieving the 376th of that responsibility. The 376th PFAB went DS to the 504th PIR with the 456th providing reinforcing fires. The battalion continued to fight in the Nijmegen area until the second week of November, but by the evening of D+1 around DZ N, the strictly parachute role of the 376th PFAB was over.

B/377 PFAB at St. Oedenrode. The mission of B Battery, 377th PFAB was just beginning with its drop south of St. Oedenrode onto DZ C on D+3. (See the map in Figure 4.) The four parachuted guns, when added to the 12 already dropped by the 376th PFAB, made the Holland operation the largest artillery drop of the war.

Like their brethren of the 376th PFAB, B Battery's gun crews quickly assembled their 75-mm guns and went into action. One of their first tasks involved firing in support of the 506th PIR, deflecting German attacks by the 33d Panzer Regiment on the Hell's Highway near Zom. The 75-mm fires helped the 506th PIR keep the road open for Allied tanks and supplies.[33]

1943 photo showing a pack howitzer crew moving the gun with a system on harnesses. These harness assemblies went in the paracrates and were dropped with the gun.

Artillerymen from the 377th PFAB did some of their best work as infantrymen around St. Oedenrode. German tanks and infantry attacked frequently, attempting to cut Hell's Highway. Sergeant Art Parker, a surveyor assigned to one of the batteries, secured a bazooka rocket launcher to help stop one of these assaults. Parker personally knocked out two tanks from close range, stopping the attack. For his actions, he received the Silver Star.[34]

The Cost of Success. "That Holland jump was a good jump. We did our job and everything that we were called on to do. Every fire mission I called in was answered right away." Second Lieutenant Robert S. Hutton, FO, B Battery, 376th PFAB.[35]

By every yardstick, the airborne cannoneers achieved success around St. Oedenrode and Groesbeek. They assembled efficiently and displaced quickly when needed. For more than 24 hours they fired missions over a 6,400-mil arc, defending the perimeter and providing fire support to attacks on key water crossings. They broke up German counterattacks, interdicted enemy assembly areas and kept armored vehicles at arm's length from the perimeter. FO teams continued to call in fires, even after attacking German units had surrounded their positions.[36] German aircraft strafed their positions. Enemy artillery present on the battlefield consistently outranged them, and yet their fires were essential to securing the landing zones (LZs) for gliders on D+1.

Neither the 376th PFAB nor B Battery, 377th PFAB lost any guns due to enemy infantry attacks or counterbattery fires. In addition to the 30 men temporarily disabled during the jump, several were wounded by German defensive fire in the initial stages of the parachute assault. A handful died from enemy action, and, ironically, a landing glider struck and killed one 376th PFAB soldier on D+1.[37]

Conclusions from Parachute Artillery in Market-Garden. "The Airborne troops accomplished what was expected of them." 1st Allied Airborne Army appraisal of Operation Market-Garden[38]

The experiences of the airborne artillery around Groesbeek and St. Oedenrode contain many points of reflection for airborne as well as air assault and air-landed cannoneers more than 55 years later.

Airborne Operations in Daylight. Unquestionably, darkness contributed greatly to dispersion, gun damage and lost time in assembling the PFABs in Sicily and Normandy. Scheduling the Holland drop for daylight hours resulted in unprecedented concentration on the DZs. Anti-aircraft defenses have improved markedly since 1944, but commanders still may consider parachuting Field Artillery during daylight. The gunners of the 376th and 377th PFABs showed that improved DZ concentration, increased efficiency of assembly, accurate calls-for-fire and speed in getting the guns into action should be some of the primary factors weighing in this decision.

Class V Resupply. Ammunition is critical to artillery units inserted a great distance from their source of replenishment. In the airborne artillery, a key source of ready ammunition is the prime mover vehicle for the howitzer. Accompanying loads can be rigged on the 105-mm prime movers, the high-mobility multipurpose wheeled vehicles (HMMWVs).

However, the five-ton medium tactical vehicle (MTV), which functions as a prime mover for the M198 155-mm system, only can be airdropped in emergency wartime situations. Even then, it will be without an accompanying ammunition load. Gun crews for the M198 system must rely on a small quantity of ammunition dropped with the gun.

Bundles and platforms rigged with 155-mm munitions are, at best, a half measure. Gunners in Holland struggled to recover ammunition bundles and reposition the contents at firing sites. This was a difficult task, even with the relatively light 75-mm shells; the 155-mm munitions in use today are about seven times heavier. The process of testing accompanying ammunition loads airdropped with the MTV is underway at Fort Bragg, North Carolina, in the XVIII Airborne Corps Artillery. A successful conclusion to this testing could not come too soon.

If possible, airborne artillery units should take maximum advantage of door bundle loads. The Holland operation dropped medical supplies, howitzer rounds and small-arms ammunition in their bundle loads. However, machine gunners wasted no time recovering bundles that didn't contain .50 caliber rounds.

How was this possible? The bundles parachuted to earth under color-coded canopies that greatly aided identification and retrieval. This system of many canopy colors for equipment bundles might be financially constrained today, but colored riser streamers for bundle parachutes might be a low-cost solution for daytime drops. Night drops should feature bundles adequately marked by chem lights with a specific color matching the material inside. Large markings on the canvas bundle covers in Holland also clearly identified the contents.[39] This saved critical time in separating items for which there was an emergency need.

Gunners as Infantrymen. Artillery gunnery is the most important shooting that gun crews can do, but it is not the only shooting that's important. The airborne artillerymen who jumped on DZ N landed within range of German flak crews. The automatic weapons could have been devastating to troop carriers, gliders and resupply aircraft. Nearly every cannoneer participated in an infantry action immediately after landing,

voluntarily or not. These sharp fights were for individual survival, aiding assembly or securing the initial firing positions.

The table of organization and equipment (TOE) in effect at the time allotted a parachute cannon battalion approximately 24 .50 caliber machineguns,[40] with almost all arriving broken down in door bundles. Gun crews knew how to assemble and use them as effectively as their individual weapons. They knew how to shoot and conduct elementary tactical maneuver. Crew proficiency with small arms and small unit tactics paid a huge dividend in the 376th PFAB's assembly under fire. That all cannon battalions need to be good shooters with weapons, large and small, is an understatement.

Medical Support. Medics in the 376th PFAB loaded their own door and aircraft fuselage bundles with equipment and supplies for the battalion aid station. These bundles were easily identified on the ground from cover markings and parachute colors. The aidmen quickly found the bundles, classified them by contents and set up the aid station within minutes of landing to treat jump and enemy-fire casualties. The officer in charge reported the battalion aid station fully functional within an hour of landing.

The medics were able to achieve this efficiency and speed because they routinely practiced these operations during the battalion training events and jumps. They didn't have to learn how to do it under fire in the fields south of Groesbeek. The lesson is to involve medics in all medical aspects of airborne training operations, not just administrative DZ coverage.

Maintenance Support. The 377th PFAB lost several guns to drop damage in Normandy. The 376th PFAB lost two of its 12 guns to drop damage in Holland. In 1989, Battery A, 3d Battalion, 319th Field Artillery [Indiana Army National Guard] lost one 105-mm howitzer to drop damage in Panama during Operation Just Cause. So this possibility exists for guns light, heavy, old and new. None of the units had the capability to immediately repair the guns and get them into action. However, units today can train for this contingency by embedding maintenance training in airborne operations.

When howitzer platforms are rigged for aerial delivery, due consideration should be given to incorporating mechanics' tools and selected demand-supported repair parts. Tools and parts also can arrive on the battlefield via door bundles. DZ training on simulated repairs by airborne artillery mechanics is key to enabling cannon units to cope with a maintenance contingency. Commanders can and should make maintenance training a challenging part of peacetime airborne mission planning and training.

Closing Shot. "Holland was an experiment. Every airborne operation was at the time. We always thought that we had proven ourselves when we were given the chance." First Lieutenant Herman Swope, Executive Officer, C Battery, 376th PFAB[41]

Parachuting Field Artillery is a viable technique that increases the battlefield options available to the US Army. If airborne artillery leaders and soldiers remember the lessons learned in Market-Garden, the airborne artillery will remain a capable combat force in the next millennium. In future operations, airborne cannoneers must ensure that an adversary learns, again, that American parachute FA will intervene decisively on a battlefield.

Major Scott T. Glass, Quartermaster Corps (QM), won Third Place in the US Field Artillery Association's 2000 History Writing Contest with this article. He is the G4 for the XVIII Airborne Crops Artillery at Fort Bragg, North Carolina. He commanded the Forward Support Company (Airborne) of the Lion Brigade and served as S3 for the 22d Area Support Group, both in the Southern European Task Force, Vincenza, Italy. He was Commander of Headquarters and Service Company and then S3 of the 528th Special Operations Battalion, Special Operations Command at Fort Bragg. Also at Fort Bragg, Major Glass was the S1 of the Division Support Command and then Assistant Plans and Operations Officer in the G4 of the 82d Airborne Division. He's a graduate of the Command and General Staff College, Fort Leavenworth, Kansas, with a Master of Military Arts in Military History and holds a Master of Arts in Human Resource Development from Webster University in St. Louis, Missouri. **The author wishes to acknowledge the assistance of Nijmegen resident Mr. Jan Bos, Colonel (Retired) Arthur P. Lombardi, the combined veterans of the 376th and 377th PFABs and, especially, Mr. Robert S. Hutton of the 376th PFAB.**

Endnotes:

1. *Employment of Airborne Field Artillery* (Fort Sill, Oklahoma: Field Artillery School, 1943), 9.
2. *Technical Manual 9-319 75-mm Pack Howitzer M1A1 and Carriage M8* (Fort Sill, Oklahoma: Field Artillery School, 1943), 56.
3. Ian V. Hogg, *Artillery In Color, 1920-1963* (New York: Arco Publishing, Inc., 1980), 183.
4. Gary Howard, *America's Finest* (Mechanicsburg, Pennsylvania: Stackpole Books, 1994), 148.
5. *Employment of Airborne Field Artillery*, 10.
6. John Andrews, *Airborne Album: Normandy* (Williamstown, New Jersey: Phillips Publications, Inc., 1994), 3-4.
7. Hogg, ed., *The American Arsenal* (Mechanicsburg, Pennsylvania: Stackpole Books, 1996),182.
8. James M. Gavin, *Airborne Warfare* (Washington: Infantry Journal Press, 1947), 103.
9. Clay Blair, *Ridgway's Paratroopers* (Garden City, New York: Dial Press, 1985), 328.
10. Leonard Rapport and Arthur Northwood, Jr., *Rendezvous with Destiny* (Medelia, Minnesota: 101st Airborne Division Association, 1948), 103.
11. S. L. A. Marshall, *Night Drop: The American Invasion of Normandy* (Boston: Little, Brown, and Company, 1962), 240.
12. Blair, 328.
13. Gavin, 103.
14. *Command Decisions* (Washington: United States Army Press, 1984), Chapter 19.
15. Gerard M. Devlin, *Paratrooper!* (New York: St. Martin's Press, Inc., 1979), 470.
16. Rapport and Northwood, 267-313.
17. Devlin, 472.
18. Jan Bos, *Circle and the Fields of "Little America"* (Baltimore: Gateway Press, Inc., 1992), 77-103.
19 Everett G. Andrews' interview with the author, 4 December 1999.
20. Ibid.
21. Bos, 77-84.
22. Robert A. Lally's interview with the author, 4 December 1999.
23. Bos, 92.
24. Ibid., 89-98.
25. Herbert C. Banks II, ed., *82nd Airborne Division* (Paducah, Kentucky: Turner Publishing Company, Inc., 1997), 94.
26. *A Graphic History of the 82nd Airborne Division: Operation Market* (1944), 3.
27. Bos, 100-102.
28. Ibid., 98.
29. Ibid., 101-103.
30. Banks, 39-41.
31. Bos, 104-106.
32. Ibid.
33. Mark Bando, *The 101st Airborne: From Holland to Hitler's Eagle's Nest* (Osceola, Wisconsin: Motorbooks International Publishers, 1995), 44.
34. Ibid., 43-44.
35. Robert S. Hutton's interview with the author, 4 December 1999.
36. Banks, 94.
37. Bos, 105.
38. James A. Huston, *Out of the Blue* (Nashville: The Battery Press, 1981), 38.
39. Andrews, 59.
40. *Table of Organization 6-215: Parachute Field Artillery Battalion, 75-mm Pack Howitzer* (Washington: US Government Printing Office, 1942).
41. As quoted from a letter written to the author by Herman Swope, letter dated 20 November 1999.

2000 History Writing Contest Winners

First Place- "Fire Support at the Battle of Kursk" by Captain Thomas J. Weiss II

Second Place- "No Master Plan: The Employment of Artillery in the Indian Wars, 1860-1890" by Major Prisco R. Hernandez, ARNG

Third Place- "Cannons Under Canopy: American Parachute Field Artillery in Operation Market-Garden" by Major Scott T. Glass, QM

Honorable Mention- "Do Preparation Fires Work? A Historical Perspective" by Major Michael J. Forsyth

Judges of the 2000 History Writing Contest

Major General (Retired) Gerald P. Stadler holds a Master of Arts in History from Duke University and taught a variety of subjects, including history, at the National War College, Washington, DC. He also taught history at the US Military Academy at West Point, New York. Among his assignments, he commanded four batteries, one in Vietnam; the 2d Battalion, 27th Field Artillery, 3d Armored Division in US Army Europe; the 1st Cavalry Division Artillery, Fort Hood Texas; and III Corps Artillery, Fort Sill, Oklahoma. General Stadler currently is an investment executive with Local Securities Corporation, Lawton, Oklahoma.

Lieutenant Colonel James J. Carafano is the Executive Editor of *Joint Force Quarterly,* published by the National Defense University in Washington, DC. He is a candidate for a Ph.D. in History from Georgetown University, also in Washington. Colonel Carafano taught history at the US Military Academy at West Point, Marymount College in Tarrytown, New York, and the Field Artillery School, Fort Sill. His recently published book *After D-Day: Operation Cobra and the Normandy Breakout* was selected Military Book of the Month Club for June. He edited *Soldiers are Our Credentials: The Collected Works and Selected Papers of Dennis J. Reimer,* Center of Military History, 2000.

Dr. Boyd L. Dastrup received a Ph.D. in History from Kansas State University. He has authored several books, including *The US Army Command and General Staff College: A Centennial History* (1982); *Crusade in Nuremberg: Military Occupation, 1945-1949* (1985); *King of Battle: A Branch History of the US Army's Field Artillery* (1992, 1993); *Modernizing the King of Battle: 1973-1991* (1994); and *The Field Artillery: History and Sourcebook* (1994). He also has written articles for *A Guide to the Sources of United States Military History* (1998) and *The Oxford Companion to American Military History* (1999). Dr. Dastrup has been the Command Historian for the US Army Field Artillery Center and Fort Sill since 1984.

Field Artillery Themes for 2001

Edition	Theme	Deadline
Sep-Oct	Developing Adaptive Leaders	1 Jun 1999
Nov-Dec	Red Book Annual Report	1 Aug
Jan-Feb	The Field Artillery Battery	1 Oct
Mar-Apr	Supporting the Maneuver Force	1 Dec
May-Jun	Targeting	1 Feb 2000
Jul-Aug	History	1 Feb: Contest* 1 Apr: Other
Sep-Oct	FA and Fire Support Doctrine	1 Jun
Nov-Dec	Transforming the Force	1 Aug

*Due date for Contest submissions; all other articles due 1 April.

2001 History Writing Contest Rules

The US Field Artillery Association is sponsoring its 16th annual History Writing Contest with the winners' articles to be published in *Field Artillery* and the Association subscribers' version of the magazine, *FA Journal*. To compete, submit an original, unpublished manuscript on any historical perspective of Field Artillery or fire support by 1 February 2001. The Association will award $300 for the First Place article, $150 for Second and $50 for Third. Selected Honorable Mention articles also may appear in *Field Artillery*. Civilians or military of any branch or service, including allies, are eligible to compete. You don't have to be a member of the Association.

Your submission should include (1) a double-spaced, typed manuscript of no more than 4,000 words with footnotes, (2) bibliography, (3) your comprehensive biography and (4) graphics (black and white or color photographs, maps, charts, etc.) to support your article. The article should include an analysis of lessons or concepts that apply to today's Redlegs—it should not *just* record history or document the details of an operation. Authors may draw from any historical period they choose.

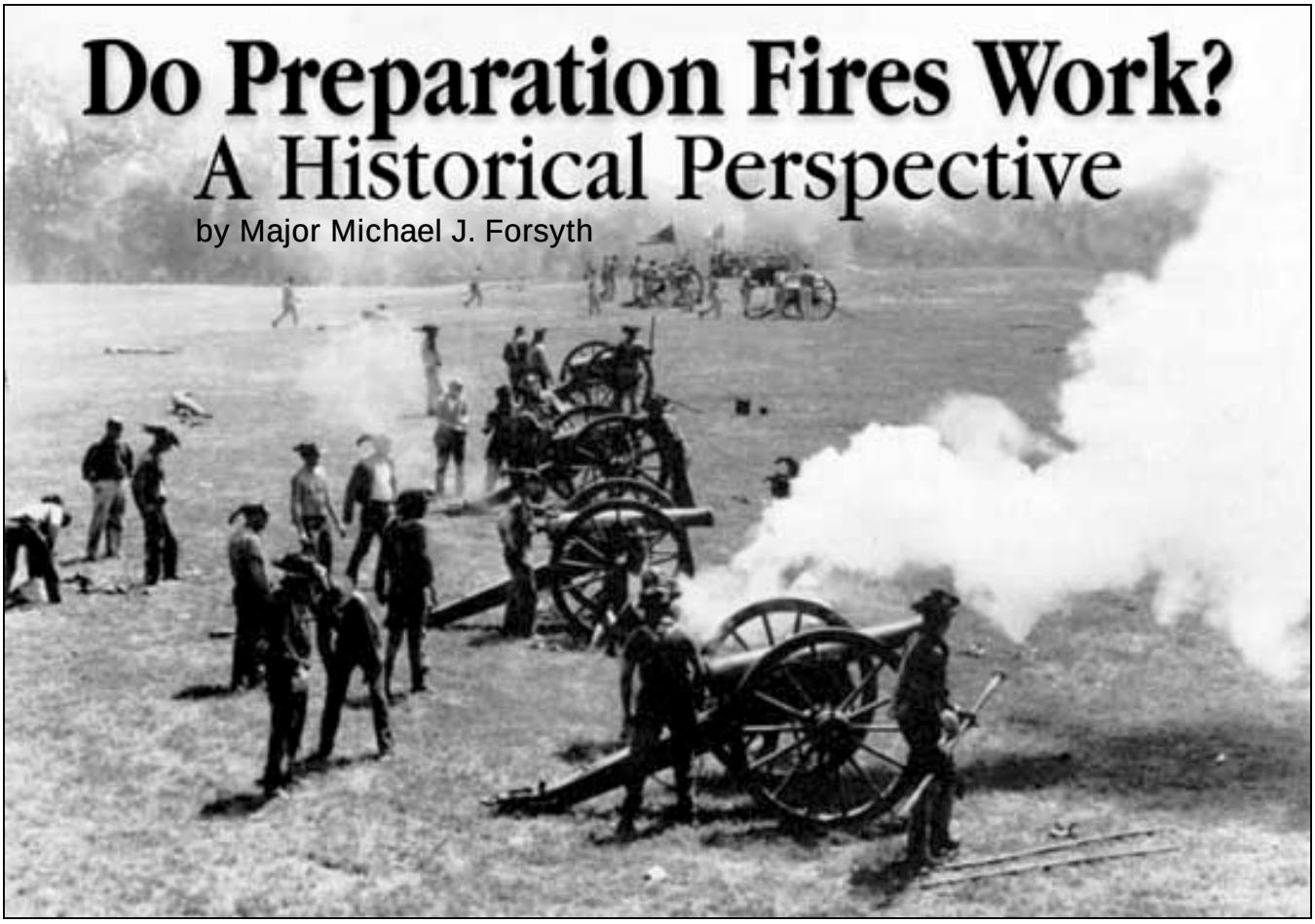
A panel of three historians will judge the manuscripts without the authors' names. The panel will determine the winners based on the following criteria:

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

By 1 February 2001, send the manuscript to the US Field Artillery Association, ATTN: History Contest, P.O. Box 33027, Fort Sill, Oklahoma 73503-0027 (FedEx to Building 758, McNair Road). For more information, call DSN 639-5121/6806 or commercial (580) 442-5121/6806 or email: famag@sill.army.mil.

Do Preparation Fires Work?
A Historical Perspective

by Major Michael J. Forsyth



Civil War Reenactors

Honorable Mention

Have you ever heard someone, perhaps a maneuver commander, say, "Preps are a waste of time?" When inquiring as to why he believes this, invariably the answer is, "A prep gives away our element of surprise with little tangible results for the expenditure of the ammunition."

History is rife with examples of preparation fires that waste ammunition, telegraph the location of the attack and have little to no effect on the target. However, history also provides ample evidence of highly effective preps that greatly facilitated the success of the maneuver force. This begs the question, "Why are some preparation fires effective while others negligible?"

To answer this question, this article examines the discriminators of a failed prep with a follow-on assault and a successful prep, both from the Civil War. The preps at the Battles of Gettysburg and Pea Ridge show the critical elements in a prep are sound intelligence and target identification and observation.

Gettysburg, 1863. The third day at Gettysburg, 3 July 1863, proved to be the climax of the battle and the high-water mark for the Confederacy. Two days prior, the Rebel Army under General Robert E. Lee had pushed the Union Army to the brink of defeat. Yet, the Federals managed to hang on tenaciously, staving off Lee's heavy assaults. Frustrated, Lee believed one final push would send the Federal Army flying to Washington and, ultimately, open the door to independence for the Confederacy.

The Plan. Lee's plan of attack consisted of four parts. First, Lee would mass his artillery at the point of breakthrough in a preparatory barrage before the assault. (See the map in Figure 1.) Following the prep, "Longstreet, reinforced by Pickett's three brigades" would lead the attack "and Ewell was ordered to assault the enemy's right at the same time," Lee wrote.[1]

Lieutenant General James Longstreet's corps would serve as the main effort to split the Union center in the vicinity of an angle in a low stone fence just west of the Taneytown Road. Lieutenant General Richard S. Ewell's corps would comprise the supporting effort to prevent the Federal Army from reinforcing the center with troops from the Union right on Culp's Hill. Simultaneously, Major General J. E. B. Stuart's Cavalry Corps would move around the Federal right flank and disrupt activities of the Army of the Potomac's rear area.[2]

The plan immediately went awry, however, when Federals from the XII Corps launched a preemptive attack on Ewell's corps at daybreak. Ewell easily repulsed the assault and attempted to follow up the success by pursuing the attackers.

Yet, Longstreet didn't have his force in position to launch his assault and could not support Ewell's premature attack. As a result, Ewell found his corps "severely repulsed" in the pursuit and was unable to launch his supporting attack later in the day.[3]

Fires. Because the Federals neutralized Ewell's corps, the artillery preparation took on greater importance in paving the way for Longstreet's attack. According to Colonel Edward Porter Alexander, acting corps artillery commander for Longstreet, the purpose of fires was "to drive off the enemy or greatly demoralize him, so as to make our effort pretty certain."[4] To verify that fires met this purpose, Longstreet expected Alexander to take up a good position to observe the fires to ensure "great care and precision in firing."[5]

The ground the Confederates occupied wouldn't facilitate observation because Seminary Ridge slopes down from Cemetery Ridge where the Army of the Potomac anchored its center. As Alexander supervised the emplacement of the batteries, he realized from terrain analysis that once the cannonade began, the slope and "smoke [from the prep] will obscure the field." He wrote, "I will only be able to judge the effect of our fire on the enemy by his return fire."[6] This meant that because Alexander couldn't physically observe the effects of his fires, he couldn't adjust them if it became necessary to achieve Longstreet's intended purpose. Simply put, Alexander wasn't sure he could accomplish the mission.

Longstreet wouldn't accept this and told Alexander in a curt note that the intention is "to advance the infantry if the artillery has the desired effect."[7] But, based on Alexander's reservations, could the prep achieve the "desired effect"?

Effects. The prep began with a prearranged signal of two guns at 1307, according to one observer.[8] The Confederate artillery had imperfect intelligence about the location of the Union infantry because they were "little exposed to view," and the Rebels occupied the descending slope from Cemetery Ridge. Though, the gunners knew the approximate location of the blue infantry, their observation was quickly obscured by the smoke of their own fires.

Initially, Confederate fire found its mark, destroying several artillery caissons with the first shots, but gradually the batteries began to overshoot badly.[9] In fact, veteran Union infantrymen of

This photo was taken 200 meters west of the angle. The "clump of trees" is at the right center. Note the disadvantage encountered by the Rebel gunners in terms of the slope.

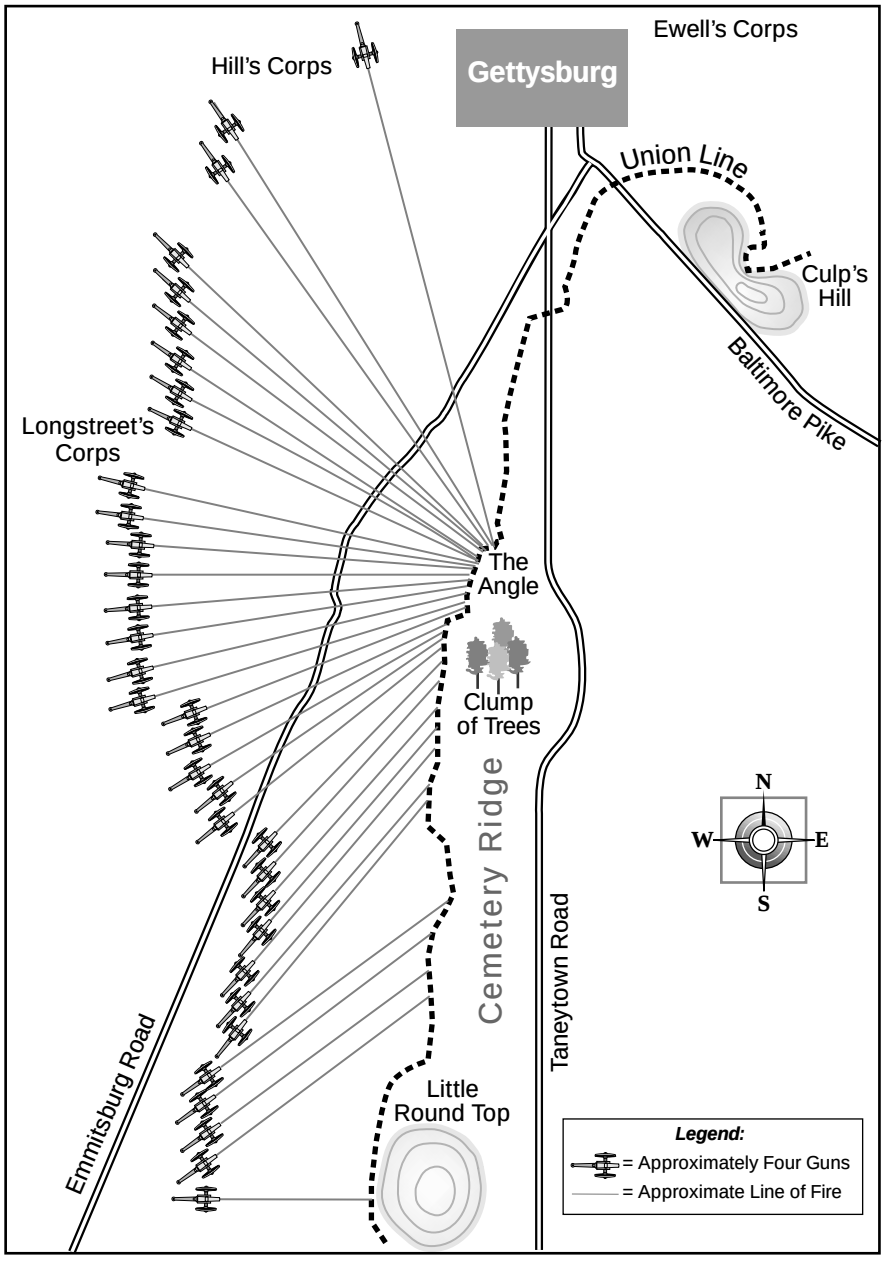


Figure 1: Pickett's Charge at Gettysburg, 3 July 1863. One hundred and forty-three guns participated in the preparation of the Union Line.

Major General Winfield Scott Hancock's II Corps found the sustained fire "soon became monotonous." The Federal infantry simply settled in for what they knew was coming next.[10]

The Federal artillery responded with counterbattery and also overshot their targets. Ironically, their projectiles landed among the Rebel infantry waiting in their assembly areas before the assault. As the cannonade continued for more than an hour, the Union gunners began to run low on ammunition. At this point, Brigadier General Henry J. Hunt, Chief of Artillery for the Army of the Potomac, decided to cease firing gradually. He reasoned that this would not only conserve ammunition for the imminent assault, but also "lure" the Confederates to the attack by making them believe the fire was having an effect.[11]

Alexander took note of the slackened fire and sent a note to Longstreet, exhorting him to "come quick or my ammunition will not let me support you properly." Finally, at 1455, Longstreet silently nodded approval to Major General George Pickett to start the advance.[12]

Shortly after 1500, the assault (known as Pickett's Charge) stepped off toward the objective—the little clump of trees. The charge moved steadily forward as a strange silence enveloped the field. When Pickett's men had made it about halfway across the mile-wide open field, they came under long-range cannon fire. As the fire cut swaths through the gray ranks, everyone in the high command realized the prep had failed to "drive off the enemy."[13] Indeed, as the attacking column drew closer to the Union line on Cemetery Ridge, the Federal infantry opened with deadly fire. The vast hail of iron from the Confederate guns hadn't greatly demoralized the enemy. The preparation had failed.

What Failed. Among the several factors leading to the failure of Pickett's Charge, the ineffectiveness of fires merits particular attention. Specifically, the fire support system failed due to poor artillery target intelligence, an inability to track detected targets and poor observation of fires. These elements played an enormous role in the inability of Longstreet to achieve his objective. Had the fire supporters of the Army of Northern Virginia had better intelligence, tracked their targets and implemented a workable observation plan, could the prep have had greater effects? Examination of another Civil War battle shows what happens when these factors for a preparation are considered.

Pea Ridge, 1862. In February 1862, the North and the South engaged in a struggle for the control of Missouri. As a result, the Union launched a winter offensive to break the Confederate grip on the state. In the ensuing weeks, Brigadier General Samuel R. Curtis commanding the Federal Army of the Southwest maneuvered his main antagonist, Major General Sterling Price, completely out of the state in a near bloodless campaign. Curtis pushed on into northwest Arkansas to consolidate his hold on the newly won Missouri.

The first week of March found the Union Army widely scattered across the corner of Arkansas. Confederate Major General Earl Van Dorn, the newly appointed commander of all Rebel forces west of the Mississippi River, saw an opportunity to "give battle," and as he stated in a circular, "I have no doubt of the result."[14] He massed all available Confederate forces in the area for a counter-blow on the Federal Army.

On 7 March 1862, the Southerners found their mark, landing a hard blow on the Federal force. Curtis barely drew his army together in time to withstand the impact. Although the Army of the Southwest successfully defended its position near the hamlet of Leetown in the northwest corner of Arkansas, it received a serious setback near Elkhorn Tavern, two miles northeast of Leetown. The Federal Army was in grave danger of destruction on 8 March.

The Plan. Instead of succumbing to defeat, Curtis read the situation in the best light. The way he saw things, he had defeated half the Confederate Army while fighting a tough holding action against the rest. In addition, he did it while changing his front from south to north. On the evening of 7 March and the early morning hours of 8 March, Curtis decided on a course of action to "whip the rebels."[15]

That night Curtis issued orders to concentrate the army south of Elkhorn Tavern. (See the map in Figure 2.) "In the morning I will attack at Elkhorn," exclaimed Curtis to his commanders. He wanted to bring Brigadier General Franz Sigel's command—the 1st and 2d Divisions—from the Leetown fight to "form on the left of [Colonel E. A.] Carr's [3d] Division…to renew the battle at daylight." In addition, all available artillery would mass on the high ground overlooking the Confederate lines. From here, the Union gunners would open a prep before assaulting Van Dorn's command around Elkhorn Tavern.[16]

Fires. Curtis wanted the artillery to pave the way for the infantry assault. Specifically, he wanted to suppress the fires of two Confederate batteries posted west of the Telegraph Road. Also, Curtis wanted to force the Rebel infantry to take cover deep in the woods adjacent to Pea Ridge to facilitate the advance of his own infantry.[17]

The Redlegs in the Army of the Southwest had a decided advantage in positioning over their Rebel antagonists. South of Pea Ridge lies a gently rising slope, known to history as Welfley's Knoll, named for the battery commander who chose the position. This position provided excellent observation of the Confederate batteries and battle line and offered a clear field of fire.[18]

General Sigel brought his wing of the Union Army to its prescribed place in the line shortly after dawn on the 8th of March. Upon setting his units, Sigel immediately took personal control of the artillery in his divisions, providing the battery commanders their targets. All the battery commanders (who acted as observers for their batteries in the Civil War) had a firm grasp of their target locations and could easily observe the effects of their fires. In addition, Sigel made the battery commanders focus their fires on one target at a time to ensure mass and unified adherence to the purpose of fires.[19]

Effects. Six Federal batteries opened on the two Rebel batteries at 0800. For the next two hours, the blue cannoneers pummeled the Rebels near Pea Ridge. "Sigel deserve[s] much of the credit" for the highly effective fires that morning. Eyewitnesses reported Sigel moving from battery to battery, personally sighting individual pieces. By providing on-the-spot leadership, he assured Curtis' instructions were carried out and that fires remained concentrated until they had achieved the desired effects. In the words of two respected historians, "the effects were devastating."[20]

Indeed, after "firing without interruption," the Federal batteries gained the upper hand and "compelled the enemy to stop firing its batteries."[21] After silencing the enemy batteries, the Union artillery "turned its whole attention to a high rocky hill [Pea Ridge] opposite our plateau [Welfley's Knoll], occupied by the strongest force of the enemy."[22] Soldiers on both sides describe

the fires on the Confederate battle line in weather metaphors. "Such a cyclone of falling timber and bursting shells I don't suppose was ever equaled" wrote one Confederate survivor. A Federal soldier would write that "it was like a continual thunder," and yet another recorded that it shook "the ground like an earthquake."[23]

Aside from the metaphors, the real effects proved destructive and ghastly. Solid shot crashed against the rocky prominence of Pea Ridge, creating secondary projectiles. Scores of Rebel infantry lay before the face of the ridge in twisted piles where they were caught in the maelstrom.

More importantly, the physical and moral effects of the fires pushed the Rebel line far into the woodline. This prevented the Confederates from effectively observing the Federal attack when it came, and as a result, the Rebels couldn't mount a coherent defense.

As noted historians William L. Shea and Earl J. Hess point out, the prep at Pea Ridge "was one of the few times in the Civil War when a preparatory artillery barrage effectively softened up an enemy position and paved the way for an infantry assault."[24] Fires had accomplished their purpose, and when the main attack stepped off shortly after 1000, the blue infantry swept everything before it.

By 1200 Van Dorn's butternut army was in full retreat from the field, suffering a decisive defeat. Not only had Curtis' stout little army secured a victory, it ensured Federal control of Missouri for the rest of the war.

What Succeeded. The factors that enabled this prep to succeed offer a stark contrast to the failures of the prep at Gettysburg. Curtis and Sigel had a firm idea of the target locations (artillery target intelligence) they wanted to attack and ensured the battery commanders understood the mission. Further, Sigel personally supervised the engagement, confirming that the fires were massed and focused.

Photo taken from the position of the Union batteries at Pea Ridge looking northeast toward Confederate lines below the ridge. Note the downward slope offering excellent observation.

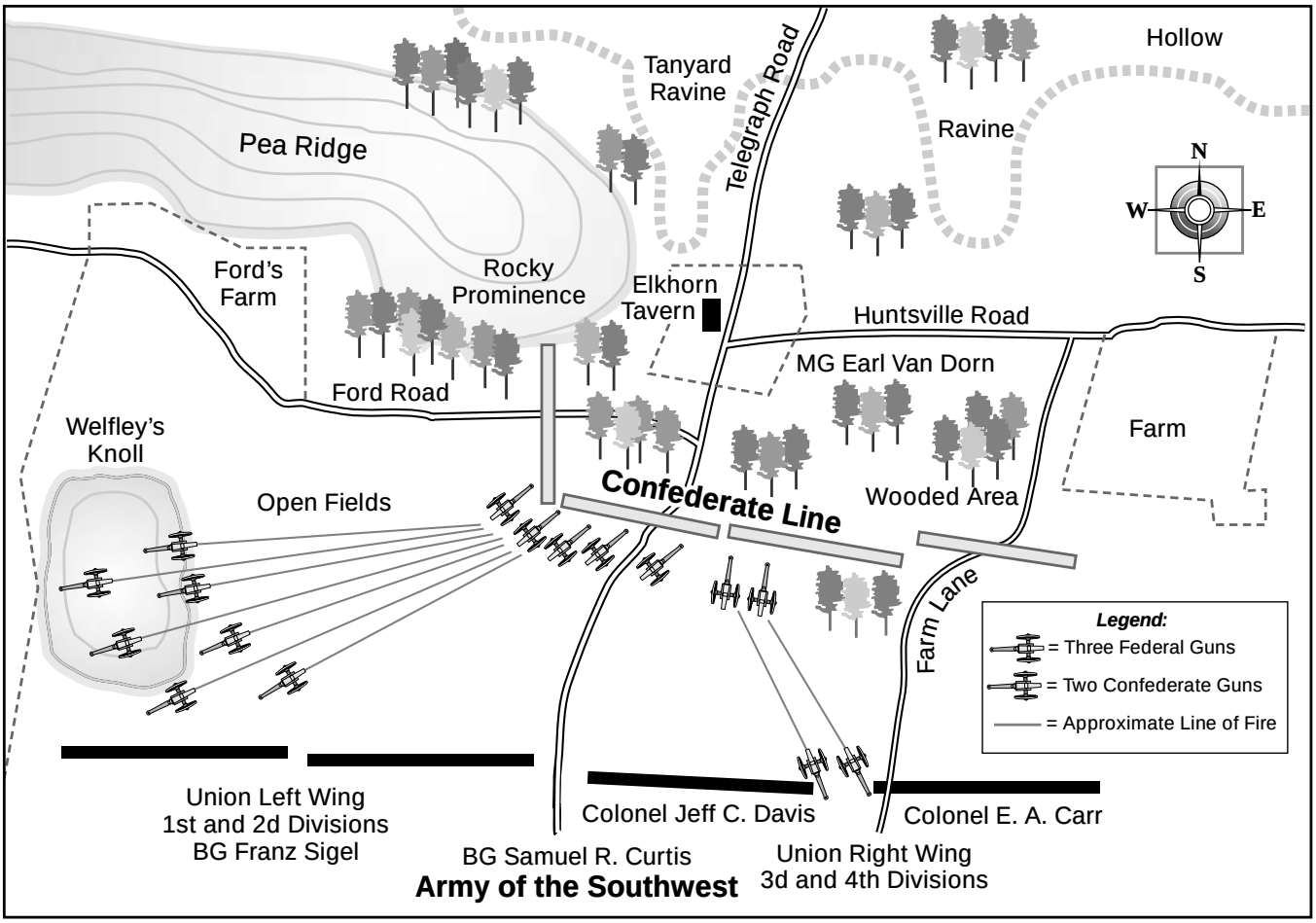


Figure 2: Battle of Pea Ridge, 8 March 1862

Arguably, the most important difference is that the Union gunners at Pea Ridge had the advantage of occupying the high ground overlooking the target area, giving them exceptional observation of their targets and enabling them to track enemy movement, adjust fires when necessary and assess the effects of their fires. Conversely, the Confederate Redlegs at Gettysburg held the lower ground.

While the Gettysburg Federal gunners were able to make quick adjustments to zero-in on the foe, the graybacks found themselves looking up the slope. This, combined with the inevitable black powder smoke of the Civil War battlefield, made the Confederates' adjustment and assessment of fires nearly impossible. As a result, after the first few rounds, the Rebel batteries overshot their targets wildly.

The ease of observation at Pea Ridge allowed the Federal battery commanders to adjust and assess the effects of fires. In turn, this provided Curtis and Sigel the information they needed to assess when the conditions were set to shift the fires to the infantry targets and when to lift fires to kick off the assault. The resulting attack realized a resounding success.

Applicability Today. Despite technological advances made since the Civil War, the same factors that led to success at Pea Ridge and failure at Gettysburg remain relevant today. Once a maneuver commander states his intent to use a preparation, the fire support system has to do its part to fulfill the mission. This starts with deciding what it must attack.

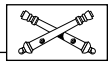
FM 6-20-1 Tactics, Techniques and Procedures for the Field Artillery Cannon Battalion states what the artillery should attack in three phases for a preparation. In Phase One, fires target enemy indirect fire systems. The prep shifts to command, control and communications nodes; logistical sites; and assembly areas in Phase Two. And in Phase Three, the prep concludes with the fires shifting to the forward enemy maneuver elements just before the friendly assault.[25]

Once we've decided what to attack, the appropriate assets should receive the mission to detect and track the targets based on intelligence. When these assets (observers) detect the target, they must track it from the time it is physically identified until the fire support system delivers the ordnance on the target. The observers—ground, aerial or electronic—then can make the required adjustments if the fires are not on the target.[26]

Following the engagement, observers assigned to the target remain on station to assess the effects of the fires. This is critical to ensure the fires achieved the desired effects, so the maneuver commander knows when the conditions are set for his force to begin the assault. If fires haven't met his criteria set and the assault jumps off, it can jeopardize the success of the assault, as at Gettysburg. Therefore, the critical element to the success of any prep is the ability to observe the targets to assure they are accurately located or their fires quickly adjusted to achieve the effects stated by the commander.

A recent campaign demonstrating the criticality of observed fires for a preparation is the British expedition to retake the Falkland Islands in 1982. The British established a harassing and interdictory (H&I) program and planned a prep before the assault on Port Stanley. These fires had marked effects because the British commander demanded that the H&I and prep fires be observed to ensure precision and effects on targets. The excellent positioning of observers from the 148th Naval Gunfire Observation Battery and the observers with the infantry units significantly contributed to the success of the final assault.[27]

Conclusion. Preps can work and greatly facilitate the success of the maneuver unit. The critical element in both Civil War battles was observation. The fire support system can achieve adequate effects in the prep, provided it implements a workable observation plan using both ground and aerial observers and available electronic means. If the FA can't observe its prep fires properly, then the maneuver unit's probability for failure increases when it assaults the objective. Historical analysis provides the after-action review (AAR); we simply need to apply the lessons.



Major Michael J. Forsyth is a Fire Support Instructor at the Officer Basic Course at Fort Sill, Oklahoma. In other assignments, he served as an Observer/Controller (O/C) at the Joint Readiness Training Center (JRTC), Fort Polk, Louisiana; Commander of Headquarters and Service Battery of the 3d Battalion, 320th Field Artillery, 101st Airborne Division (Air Assault) at Fort Campbell, Kentucky; Fire Support Officer for 1st Battalion, 5th Infantry in Korea; and as a Platoon Leader and Fire Direction Officer in the 1st Battalion, 39th Field Artillery Regiment (Airborne), 18th Field Artillery Brigade, Fort Bragg, North Carolina. He holds a Master of Arts in Military History from Louisiana State University. His book about the 1864 Red River Campaign in Louisiana, *Lost Opportunities in the Red River Valley,* is scheduled to be released by Savas Publishing, Mason City, Iowa, in December.

Endnotes:

1. United States War Department, *The War of the Rebellion: A Compilation of the Official Records of the Union and Confederate Armies* (Washington DC: Government Printing Office, 1880-1901), Series 2, Volume 27, Part 1, report of General Robert E. Lee, 308-309.
2. Ibid. and Bruce Catton, *Gettysburg: The Final Fury* (New York: Doubleday), 73.
3. Edward Porter Alexander, *Military Memoirs of a Confederate* (New York: Charles Scribner's and Sons, 1907), 415.
4. Ibid.
5. James Longstreet, *From Manassas to Appomattox* (New York: Mallard Press, 1991), 390.
6. Alexander, 421.
7. Ibid.
8. Shelby Foote, *Stars in Their Courses* (New York: Random House, 1994), 196.
9. *Official Records*, Series 1, Volume 27, Part 1, report of Brigadier General Henry J. Hunt, 389.
10. George R. Stewart, *Pickett's Charge: A Microhistory of the Final Attack at Gettysburg, July 3, 1863* (Boston: Houghton Mifflin Company, 1987), 132, 149.
11. Ibid., 154-155 and *Official Record,* Series 1, Volume 27, Part 1, report of Brigadier General Hunt, 238-239.
12. Alexander, 423.
13. Stewart, 194-195.
14. *Official Records,* Series 1, Volume 8, Circular from Major General Earl Van Dorn, 755.
15. William L. Shea and Earl J. Hess, *Pea Ridge: Civil War Campaign in the West* (Chapel Hill: University of North Carolina Press, 1991), 231-236.
16. Ibid. and *Official Records,* Series 1, Volume 8, report of Brigadier General Samuel R. Curtis, 202.
17. Ibid. and Shea and Hess, 231-236.
18. Ibid., 231 and *Official Records*, Series 1, Volume 8, reports of Captains Martin Welfley and Louis Hoffman, 236, 238.
19. Ibid., report of Brigadier General Franz Sigel, 214; Robert U. Johnson and Clarence C. Buell, eds., *Battles and Leaders of the Civil War*, "The Pea Ridge Campaign," article by Brigadier General Franz Sigel (New York: 1887; Reprint, New Jersey: Castle Company, 1989), Volume 1, 327-329; and Shea and Hess, 232.
20. Ibid.
21. *Official Records*, Series 1, Volume 8, report of Captain Louis Hoffman, 239.
22. Ibid.
23. Shea and Hess, 233-236.
24. Ibid., 236.
25. *FM 6-20-1 Tactics, Techniques and Procedures for the Field Artillery Cannon Battalion* (Washington DC: Department of the Army), F-2-F-3.
26. *FM 6-20-10 Tactics, Techniques and Procedures for the Targeting Process* (Washington DC: Department of the Army), Chapter 2.
27. Robert H. Scales, Jr., *Firepower in Limited War* (Navato, California: Presidio Press, 1995), 214-233.

Paladin as a Maneuver Element

Keep the THUNDER ROLLING

The days of march order and 10- to 20-minute emplacement and ready-to-fire times are gone. Paladin can travel in close proximity to maneuver battle formations although with a greater risk for fratricide without appropriate risk management or combined arms training. Paladin can fire a mission within 75 seconds of receiving it.

Given the M109A6 Paladin's capabilities, our integration of this weapon into the brigade fight has to change to maximize its potential on today's battlefield. This article addresses where we have been and, more importantly, where we need to go in the context of the brigade and FA battalion military decision making process (MDMP) to ensure the FA remains the "King of Battle."

Where We've Been. Using the pre-Paladin howitzer mentality, brigade and FA battalion planning was not necessarily well linked. A primary reason was fire support planners (typically the assistant brigade fire support officer, or FSO) and the FA battle staff were not well trained on FA positioning and movement considerations. The operations tempo (OPTEMPO) of an orders process doesn't allow for a "learn as you go" method. Even today, our field manuals (FMs) only briefly address the intricacies of moving a Paladin battalion in a brigade area of operations (AO).

FM 6-70 Tactics, Techniques and Procedures for the M109A6 Howitzer (Paladin) Operations discusses terrain management and coordination in some detail. However, it does not cover ways to integrate and synchronize the Paladin battalion in the brigade scheme of maneuver. What continues to occur is the FA battalion receives position areas (PAs) that are "measle sheeted" throughout the brigade sector. The PAs are not always linked to the scheme of maneuver, intelligence preparation of the battlefield (IPB) products or the brigade combat team's MDMP as a whole. Moreover, the PAs aren't placed with a specific task and purpose in mind. The result is the FA units aren't *integrated* across the brigade because the FA battalion battle staff had to "re-synch" Paladin's PAs and movement without time to coordinate with the brigade S3 and (or) FSO.

Where We Need To Go. We need to educate maneuver and fire supporters and fight Paladin as a *maneuver system* using indirect fires. We need to break the pre-Paladin mentality and get into the brigade MDMP early, refining the products of the MDMP throughout the planning and preparation phases. (An FA battalion liaison can help the assistant brigade FSO do this.)

During the brigade MDMP, the battle staff decides how to assign terrain and position units in the brigade battlespace. Terrain management always will be a challenge for any battle staff; however, units no longer need exclusive space. Battle staffs can plan for sequential and, at times, concurrent use of land by employing control measures.

The tactical model already exists in our maneuver FMs (the 71-series manuals) and *FM 101-5 Organization and Operations*. A typical "Maneuver 101" diagram shows a basic attack with control measures, such as company/team boundaries, an axis of advance, two support-by-fire (SBF) positions and the main and supporting efforts. The control measures are linked to the IPB, event template and critical task of seizing an objective.

The FA model takes the diagram one step further for the deliberate attack (see the figure). The model establishes control measures to integrate with maneuver; links to the brigade IPB and event template; and supports essential fire support tasks (EFSTs) that have a specific task, purpose, method and effect.

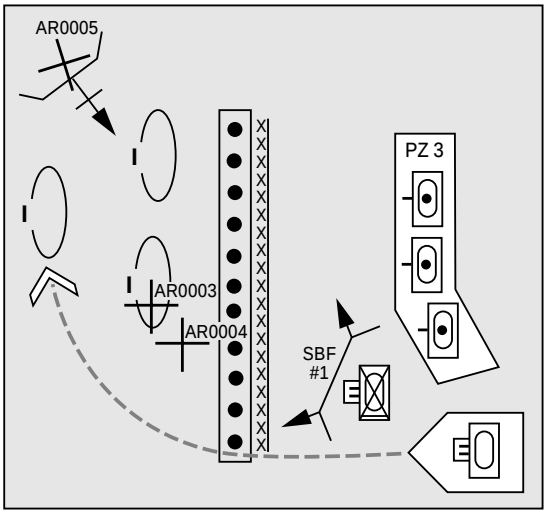
During the brigade MDMP, the FA battalion has land assigned to it in the form of an axis of advance or avenue of approach (vice PAs) with an anticipated endstate based on the brigade MDMP. The FA battalion, like its maneuver counterparts, assigns individual battery movement control measures within its axis of advance, ensuring the batteries stay tied to the maneuver force to their front. Using the gunnery sergeant as the primary reconnaissance expert facilitates the link with a maneuver force and allows the FA battalion to lead the batteries to the final position that supports seizing the maneuver objective. The FA battalion S3 implements phase lines, axis of advance or route, limits of advance and checkpoints, as needed, to establish the control of the final position—the Paladin zone.

Planning a Paladin zone to support seizing an objective in the deliberate attack is no different than establishing an SBF or assault-by-fire (ABF) position. The Paladin zone's task, purpose, method and effects must all relate to the suppression, obscuration, security and reduction (SOSR) execution and follow-on objective.

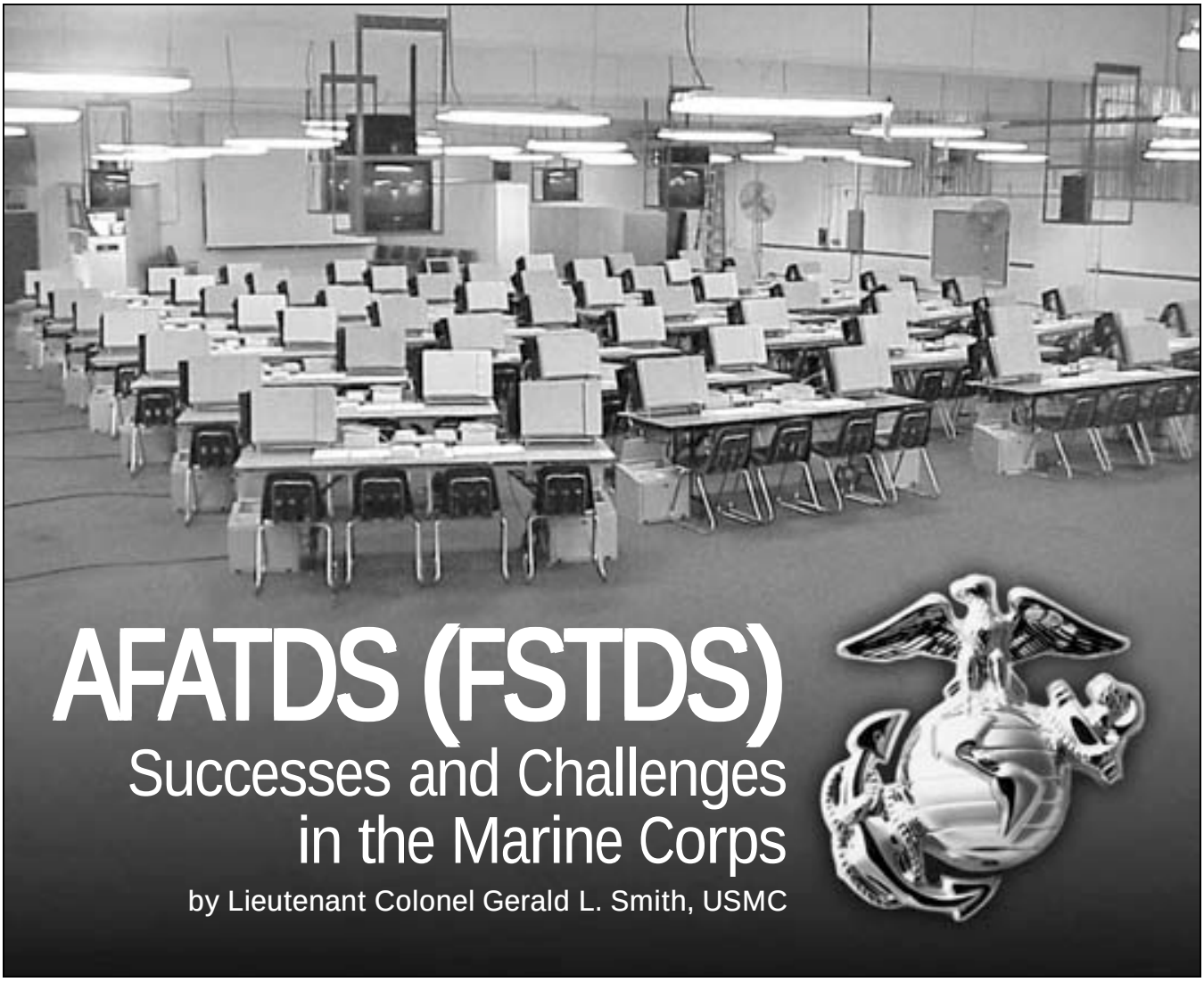
Our maneuver brethren use the same process for the movement-to-contact and other forms of the offense. The difference is the SBF/ABF positions are less definite and often get developed just before or upon first contact.

Thinking Paladin as a maneuver element during the MDMP allows the FA to keep pace with maneuver in the attack and continue as the "Greatest Killer on the Battlefield" for the 21st century.

CPT John A. O'Grady, FA
Armor Task Force Observer/Controller
Combat Maneuver Training Center
Hohenfels, Germany



FA Maneuver Model- The Deliberate Attack. In the attack, the brigade is breaching an obstacle on its way to its objective and has positioned its FA (Paladin Zone 3) to destroy the enemy's motorized rifle battalion and his repositioning reserves coming in from the north.



AFATDS classroom at the 11th Marine Regiment's Artillery Training School

AFATDS (FSTDS)

Successes and Challenges in the Marine Corps

by Lieutenant Colonel Gerald L. Smith, USMC

The Marine Corps' advanced Field Artillery tactical data system (AFATDS) test bed was established four years ago at Camp Pendleton, California. Its purpose was to provide user input to identify and resolve operational, training, logistical and technical issues before the US Marine Corps (USMC) fielded AFATDS. During this time, the combined efforts of Marine Corps Systems Command (MARCORSYSCOM), Quantico, Virginia, and I Marine Expeditionary Force (I MEF), also at Camp Pendleton, have influenced the system that began fielding in June.

While the test bed helped implement several changes that have been successful, a number of significant challenges remain for the future of AFATDS: training the force and integrating the system into Marine automated command, control, communications, computers and intelligence (C^4I) systems.

AFATDS Successes. The successes include reducing the system's size to make it more manageable, increasing its functionality and enhancing its user friendliness.

During the past four years, test-bed units used 40 ultrasparc computer units (UCUs). The system's weight exceeded 360 pounds and required four men to lift it. Without exception, users commented that the system was too large. The fielded hardware now will consist of compact computer units (CCUs) and weigh about 120 pounds (SL-3 complete mobile kit).

The limited users test and evaluation (LUTE) conducted in late 1997 revealed many problems with the tactical air support module (TASM). Plainly put, the fire support system didn't process air missions (fixed- or rotary-wing) very well. With Camp Pendleton's 3d Marine Air Wing (MAW) Direct Air Support Center (DASC) Marines providing detailed input, the new A98 software was designed to provide more support to Marine air ground task force (MAGTF) air operations. The new software fully integrates TASM functionality to process air missions into AFATDS. The software now differentiates not only between fixed- and rotary-wing aircraft, but also attack or assault aircraft.

AFATDS provides tremendous fire support mission processing capabilities. These capabilities, however, come with a price—the system has historically been difficult to master. Input from Camp Pendleton's 1st Marine Division fire support coordination center (FSCC) and the 11th Marines ensured the system became easier to use with each software upgrade, requiring less training. The new software now requires fewer key strokes to perform tasks and has new icons and tabbed windows that simplify navigating through the menu. The new CCU hardware processes data faster.

AFATDS to USMC FSTDS. With the enhanced air functionality in the new A98 software, AFATDS is no longer just an artillery system, it's a fire

support command and control system. In the Marine Corps, the combination of the new hardware (CCUs) and the A98 AFATDS software has required the system's name be changed to the fire support tactical data system (FSTDS).

Although the change may seem insignificant, test-bed experience proves otherwise. AFATDS denoted a system that was artillery-specific and generated little interest from non-artillerymen. But non-artillerymen will have to employ FSTDS to exploit the firepower of the MAGTF; the name change helped break the "arty-only" mindset.

The test bed currently is fielding 135 systems to I MEF and focusing on training. The new equipment training team (NETT), in conjunction with the 11th Marine Artillery Training School (ATS) instructors, recently concluded the largest Marine Corps FSTDS class to date. More than 130 Marines from division, wing, support and reserve units, plus resident schools' instructors, were students in the course, providing a diverse cross-section of military occupational specialties (MOS).

Cross-training MOS is essential to integrating FSTDS with other C^{4}I systems. As we field the system, we need instructors outside the artillery MOS. A notable training deficiency in the test bed has been the lack of FSTDS instructors with aviation/air command and control MOS.

I MEF (west coast) began fielding in June. FSTDS production delays may push III MEF (Okinawa) units' fielding and training back to later this year, while II MEF (east coast) units will be fielded in 2001. The delays slow the development of tactics, techniques and procedures (TTPs) for FSTDS and its integration with other MAGTF C^{4}I systems.

As FSTDS is fielded, several significant challenges remain; training and C^{4}I systems integration are two important issues.

Training Challenges. The system requires 10 to 14 hours of sustainment training per week, partly because of frequently changing software versions. The number of hours may be reduced in the future, once the force has a standard suite of hardware and software.

But even with consistent hardware and software, the sustainment training effort will be significant, especially for units where the system isn't used routinely (i.e., higher level staffs at MEF and the 3d MAW). FSTDS operators and supervisors will have a very perishable skill set—the kind that "if you don't use it, you lose it."

Training for reserve Marines is also a concern. Reservists will have a difficult time with initial training due to the length of the class. Proficiency will be difficult to maintain, given the requirements and scheduling challenges in the reserve community. We must be very innovative to maintain FSTDS proficiency once the reserve unit is trained initially.

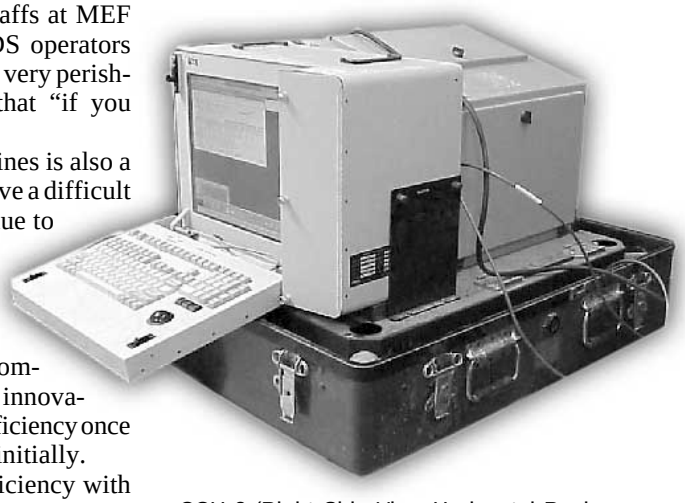
In fact, maintaining proficiency with FSTDS also will be a challenge for the active Marine Corps. I MEF is examining several options to meet training challenges.

MARCORSYSCOM funded three billets for on-site contractors to assist with FSTDS training and employment. The on-site contractor will implement an in-depth sustainment training program integrated with unit training plans. Each MEF will have one billet as its FSTDS program is fielded. FSTDS training must merge with and complement other training requirements and not become an additional training burden.

Another training initiative is the local area network (LAN) command post exercise (CPX). FSTDS will communicate over the secure internet protocol net (SIPRNET) or non-secure internet protocol net (NIPRNET) LAN. I MEF will conduct CPXs over the NIPRNET on a recurring basis. The advantage is that units can exercise their skills from desks in their offices rather than training in a full-scale, on-site CPX.

An I MEF FSTDS operator works on the new CCU2.

CCU 2 (Front View Horizontal Rack)



CCU 2 (Right Side View Horizontal Rack with Laser Printer)

Other potential training methods include self-paced computer-based training (CBT), detailed "how to" publications (i.e., *FSTDS for Dummies*) and a Marine Corps Institute (MCI) correspondence course. The CBT is under development, but efforts need to focus on sustainment training aids.

C^{4}I Integration Challenges. Another concern the test bed revealed is for FSTDS' integration with other MAGTF C^{4}I systems. For the Army, AFATDS integration with maneuver and intelligence systems (the Army's maneuver control system, or MCS, and its all-source analysis system, or ASAS) is less problematic because the systems were designed to interface within a single overarching digital system, the Army battle command system (ABCS).

With the new A98 software, FSTDS now "talks" to the tactical combat op-

This FSTDS operator is working a multi-workstation operational facility (OPFAC) that also shares a hardened printer for both FSTDS systems.

erations (TCO) system, which is the Corps' maneuver C4I system. The TCO links with FSTDS that ties into systems such as the intelligence analysis system (IAS) and the command and control personal computer application (C2PC).

With the introduction of AFATDS, the Marine Corps is trying to integrate systems designed to different standards and interfaces. In addition, the Air Force's theater battle management core system (TBMCS), the replacement for its contingency theater automated planning system (CTAPS), will make its debut this summer. FSTDS also will "talk" to this system.

Currently, the only place in the Corps where all of these systems are set up in the same location on a semi-permanent basis is the Battle Staff Training Lab in Quantico, Virginia. There are only a handful of Marines who have basic operator knowledge on more than one system, and they are mostly in Quantico.

The developers are meeting the requirement to make the systems interoperable. The problem, however, is that even if all the systems can interface, we may not have the expertise in the operating forces to make them "talk." Our ability to integrate the systems depends on how well we train the users, employ our systems' contractors and manage our systems' development.

In some regards, training and integration comprise a single interrelated challenge. The fielding of potentially powerful and integrated 21st century C4I systems has rendered our 20th century stovepipe training methods obsolete. This situation severely limits the Corps' ability to fully use the systems, regardless of how much money is spent on hardware or software upgrades.

Another aspect of the interoperability challenge is that contractors developing these systems are geographically separated. Each only knows what's happening with its own system. We must get the contractors working *together* with knowledge of *all* the systems to produce an operable, integrated C4I system.

But the systems still won't be fully integrated until we learn how to provide integrated C4I systems training. In fact, the continuous stream of software/hardware upgrades magnifies the problem. As soon as new software versions become compatible (or work-arounds are created), one of the systems receives a major upgrade, eliminating the interoperability. This is referred to as *the C4I train wreck*—the rapidly evolving integrated systems of the future colliding with stovepipe, lock-step training methods of the past.

As artillerymen, we can't focus solely on FSTDS as the C4I fire support answer. We must take a wider view of the interrelated C4I challenge and ensure the field has realistic expectations for the integrated employment of these systems.

One potential solution is the creation of an integrated C4I schoolhouse/lab at each MEF (or one on each coast). Contractor and instructor support could be consolidated at these facilities. Integrated C4I system TTPs could be developed or refined by the experts in the schoolhouse vice the operating forces. The consolidated instruction would draw a diverse cross-section of MOS that would enhance training. The instructors would return to the operating forces to fill critical billets with a broader understanding of C4I integration and how to leverage systems against the enemy.

Unfortunately, this integrated schoolhouse vision comes with a hefty manpower and equipment price tag. A low-cost alternative may be to modify the mission of existing facilities, such as the Marine Corps Tactical System Support Agency (MCTSSA) at Camp Pendleton or the Expeditionary Warfare Training Group (EWTG) Pacific (PAC) in Coronado, California, or EWTG Atlantic (LANT) in Little Creek, Virginia. But this would require overhauling the existing facility and may be too far "outside the box" for a number of reasons. At this point, we still have a long way to go in cleaning up the C4I train wreck.

Originally, the plan was for the I MEF FSTDS test bed to conclude with the initial I MEF fielding. However, we now realize "what we don't know" in terms of C4I systems integration. As such, we anticipate the FSTDS test bed to continue beyond the initial fielding. The test bed will become less resource-intensive but will assume more of a C4I systems integration mission with fire support requirements as the cornerstone. MCTSSA must take a more active role in the future.

Conclusion. The FSTDS test bed has been very beneficial, but successes have been largely FSTDS-centric (stovepipe) and expensive in terms of I MEF manpower and time. FSTDS alone doesn't provide the answer for all fire support challenges of the future. Integrating FSTDS with the other C4I systems promises tremendous potential.

However, given our integration challenges, we must carefully manage expectations. If we continue our stovepipe mindsets and don't adjust training to accommodate emerging technologies, we are inviting failure. Overly optimistic and unrealistic expectations create false assumptions that will ensure these systems will hinder, not help our efforts on tomorrow's battlefield.

Lieutenant Colonel Gerald L. Smith, United States Marine Corps, is the Operations Officer for 11th Marine Regiment at Camp Pendleton, California. Previously, he served as I Marine Expeditionary Force (I MEF) Fires Officer at the G3 Force Fires Coordination Center (FFCC) and as the I MEF Advanced Field Artillery Tactical Data System's (AFATDS') Test Bed Director, both at Camp Pendleton. Other assignments include serving as Current Fires Officer at I MEF; Commanding Officer of Headquarters Battery, 12th Marine Regiment, Okinawa, Japan; and Commanding Officer of M Battery, 4th Battalion, 12th Marines, also in Okinawa, the same battalion in which he served as the Battalion Logistics Officer. Lieutenant Colonel Smith holds a Master of Arts in Military History from the Marine Corps Command and Staff College in Quantico, Virginia.

National Guard
AFATDS Fielding and Training

The Army will begin issuing advanced Field Artillery tactical data systems (AFATDS) to the National Guard, beginning in FY01. National Guard units nationwide will receive AFATDS equipment and training for their Guard personnel via new equipment training (NET) through FY07. In addition, Guard units will train in a new course designed specifically for selected Guard personnel—called the AFATDS Subject Matter Expert (SME) Transition Course.

In FY01, the NET curriculum increases by 50 hours to a total of 250 hours of training for AFATDS operators. The increase is due to the simultaneous fielding of a more sophisticated AFATDS software revision that, for the first time, introduces technical fire direction functions; the software will have about twice the functionality of the previous software, requiring more training time. AFATDS' new software has significant operational implications for all units but especially for those first fielding the digital system. (The current NET training of 200 hours will remain in effect through FY00.)

AFATDS SME Course. Representatives of the Program Manager-FATDS, from Fort Monmouth, New Jersey; the Fire Support Automation Branch of the Fire Support and Combined Arms Operations Department (FSCAOD) at the Field Artillery School, Fort Sill, Oklahoma; and the Training and Doctrine Command (TRADOC) System Manager (TSM)-FATDS, also at Fort Sill, developed the course for National Guard FA units. The course is presented at Fort Sill by the Communications and Electronics Command (CECOM) FATDS NETT. Each FA brigade/division artillery can send 10 personnel to the course—plus supporting training support battalion personnel.

The course is 200 hours (20 working days) long with the first held in July. Courses will continue through late 2007 until all National Guard units have been fielded AFATDS. (See the figure.)

The training strategy is to train a selected core of Guardsmen to be SMEs on the system and help train others in the unit. Guardsmen from National Guard units identified for AFATDS fielding attend the course just before their NET.

As NET approaches, personnel already trained on AFATDS can brief their commanders on the capabilities of the system and help the unit work on critical tasks for fielding and training on AFATDS. These critical tasks include updating the master unit list (a list of units within the parent organization, with division being the smallest and Army being the largest) and developing standing operating procedures (SOPs).

In addition, the trained Guard personnel can help the fielding unit develop a validation exercise database "shell." This shell has firing unit data in it for an exercise to be conducted during NET.

The pre-trained personnel will be used as assistant instructors during NET. One hundred and twenty soldiers from Guard units will be trained each FY to help transition the force to AFATDS.

Prior to NET, a unit's personnel must complete the AFATDS SME Transition Course. Personnel must commit to the training 90 days before the start of a course. Training in the courses is consolidated at the Field Artillery brigade/division artillery level. To enroll students, the units contact Rodger Baker at CECOM NET (see contact information at the end of this article).

Class #/Year	Dates
1-2001	3 - 31 Jan
2-2001	6 Feb - 7 Mar
3-2001	6 Sep - 6 Oct
1-2002	7 Jan - 1 Feb
2-2002	11 Feb - 8 Mar
3-2002	9 Sep - 4 Oct
4-2002	14 Oct - 8 Nov
1-2003	6 Jan - 1 Feb
2-2003	10 Feb - 10 Mar
3-2003	8 Sep - 3 Oct
4-2003	13 Oct - 7 Nov
1-2004	5 - 20 Jan
2-2004	9 Feb - 5 Mar
3-2004	6 Sep - 4 Oct
4-2004	11 Oct - 5 Nov

AFATDS Subject Matter Expert (SME) Transition Course Schedule. Each class will accommodate 10 to 30 students. (Although not listed in this figure, transition classes are planned through 2007.)

AFATDS Fielding. Three FA brigades will be the first National Guard units to field AFATDS. The 197th Field Artillery Brigade, New Hampshire Army National Guard, will field AFATDS April through June of 2001. The 196th Field Artillery Brigade, part of the Tennessee Army National Guard, will field AFATDS May through July of 2001. The 45th FA Brigade, Oklahoma Army National Guard, also will field AFATDS June through August next year. Further National Guard unit fieldings will be announced as scheduling conflicts are resolved and equipment becomes available.

AFATDS is an integral part of the future of the Field Artillery, active and National Guard. Proper NET will greatly increase the effectiveness of digital fires integration on the future battlefield and the success of the force in combat operations.

For information regarding fielding, units can call the CECOM FATDS NET Operations, Fort Sill, at commercial (580) 442-4892/4782 or DSN 639-4892/4782.

For information about training or to enroll students, units can contact Rodger T. Baker of the CECOM FATDS NET Training and Developments Division, Fort Sill, commercial (580) 442-2292/4892 or DSN 639-2292/4892. His email is bakerr1@mail1.monmouth.army.mil.

Rodger T. Baker
AFATDS Trainer
Orval O. Darrow
AFATDS Team A
CECOM FATDS NET, Fort Sill, OK

SADARM

Deadly Against Armor in Testing

by Lieutenant Colonel Michael T. Walker
and Major John W. Gillette

M109A6 Paladins recently fired 96 rounds of the Army's first smart, fire-and-forget munition, the M898 sense and destroy armor (SADARM), against sophisticated enemy armored vehicles under tough tactical conditions. In its final operational test, SADARM was deadly, exceeding the Operational Test Command's (OTC's) requirements on every mission.

At Yuma Proving Ground, Arizona, SADARM submunitions scanned targets from one hundred-plus meters above the target area, detected and verified the heavily countermeasured armored targets and fired explosively formed penetrators at high-velocity to attack the tops of the armored vehicles. And because SADARM's penetrators defeat all known armor and the munition is more lethal than any 155-mm round in the world, a direct hit with SADARM is catastrophic to armored vehicles.

SADARM's performance clears the way for its production. The munition could start fielding to 155-mm FA units (heavy, medium and light) in FY03, pending funding.

The test was conducted 11 April to 2 May by A Battery, 1st Battalion, 17th Field Artillery *Copperheads* of the 75th Field Artillery Brigade, III Corps Artillery, Fort Sill, Oklahoma. A/1-17 FA's six Paladins each fired a four-round volley per mission in four tactical missions separated by one-week intervals. This article discusses SADARM test parameters; firing tactics, techniques and procedures (TTP); and test unit training. The test differed from previous OTC SADARM tests in that the battery fired SADARM under tactical conditions with minimal intervention by OTC test and evaluation personnel.

Tough Test. Although any 155-mm howitzer (current and developmental) in light, medium or heavy forces can fire SADARM on any enemy armored formation, moving or stationary, SADARM's primary target is self-propelled artillery. Therefore, the four test missions were portrayed as counterbattery missions fired by Paladins. A/1-17 FA fired SADARM against tactically employed enemy howitzers that were heavily countermeasured. The test assumed the enemy was a sophisticated modern heavy force and employed world-class countermeasures, such as protecting the target howitzers with berms, radar-defeating camouflage and other countermeasures.

SADARM's final operational test was its toughest. In its last two tests, September 1999 and January of this year, SADARM was fired on uncountermeasured targets, resulting in almost one hit for every round fired.

The final test's two key performance parameters were to achieve maximum range using the highest propelling charge and a high target-kill ratio at maximum range. All missions were fired with the M203, Charge 8S, the max charge Paladin can fire. While the details of the test results are still classified, SADARM performance exceeded OTC test requirements to remain in production.

SADARM Operations. SADARM consists of two submunitions deployed by the dual-purpose improved conventional munition (DPICM) family carrier. When the fuze functions, the submunitions deploy and separate from one another. At a height of 130 meters, each armed submunition deploys a parachute and scans a circular pattern on the ground (more than 17,600 square meters) with infrared and millimeter wave sensors. (See Figure 1.)

Once a submunition detects and verifies the target, it fires an explosively formed penetrator. The penetrator moves at a speed of 2,500 meters-per-second, enabling it to pierce all existing types of armor (and armor countermeasures) and those under development.

Firing TTP. SADARM is a "wooden round," meaning it requires no special

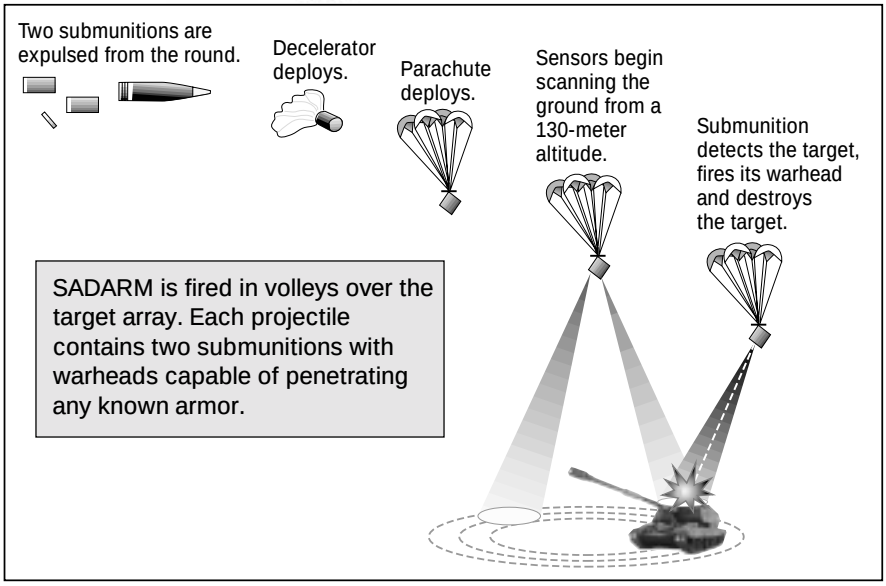


Figure 1: Employment of Sense and Destroy Armor (SADARM)

pre-fire preparations. Although SADARM's capabilities are far beyond those of any round in the inventory, it's easy to use—the round is self-contained and fired like most conventional rounds. For example, Cannoneers fuze and load it exactly like a DPICM round.

With few exceptions, units will process SADARM missions using the standard counterfire battle drill. Because SADARM is a precision munition, units firing it must carefully meet all the requirements for accurate, predicted fires to ensure the submunitions will scan the intended target area.

After receiving a mission from a Firefinder Q-36 or Q-37 radar, the counterfire headquarters determines if the target is appropriate for SADARM. Considerations for selecting SADARM are whether or not the target is a self-propelled unit and if the target meets the commander's criteria for SADARM use.

Once the counterfire team has decided to shoot SADARM, the mission is transferred digitally from the counterfire headquarters' initial fire support automated system (IFSAS) to the firing battalion fire direction center's (FDC's) IFSAS. The battalion FDC selects a firing unit, enters SADARM in the projectile field and executes the mission. The battalion's IFSAS automatically parcels the single target grid into two platoon aim points perpendicular to the gun-target line. (See Figure 2.)

After the platoon FDCs receive the mission, they execute it via their battery computer system (BCS). The BCS selects three howitzer aim points with the first aim point oriented to grid north and subsequent aim points in an equilateral triangle around the platoon aim point. The individual aim points for the guns are transmitted digitally to the howitzer sections to calculate each individual firing solution. Paladin's automated fire control system (AFCS) calculates the firing solution and provides the crew the data needed to load and fire the round.

To the crew of the Paladin, firing SADARM will be similar to firing any other mission. AFCS Version 11 software includes the algorithms to calculate a SADARM mission at the gun and is fielding now through September to the total force. For M198 towed 155-mm howitzer units, BCS will calculate the entire mission and transmit the gun commands to the individual sections.

A/1-17 FA's Train-Up. A/1-17 FA began training and developing TTP in November 1999 for tactical testing of SADARM by conducting a Firefinder customer test at Fort Sill. The purpose of the test was to develop the target offsets to use in SADARM's final test.

In final testing at Yuma Proving Ground, these Paladins from A/1-17 FA fired SADARM against tactically employed enemy howitzers that were heavily countermeasured.

A/1-17 FA, acting as a threat artillery battery, fired 20-volley fire missions of M795 high-explosive rounds, using the M119A2, Charge 7 Red Bag. III Corps Artillery's 231st FA Detachment provided a Q-37 radar to track the fire missions and determine the "enemy" battery's locations. The Firefinder test

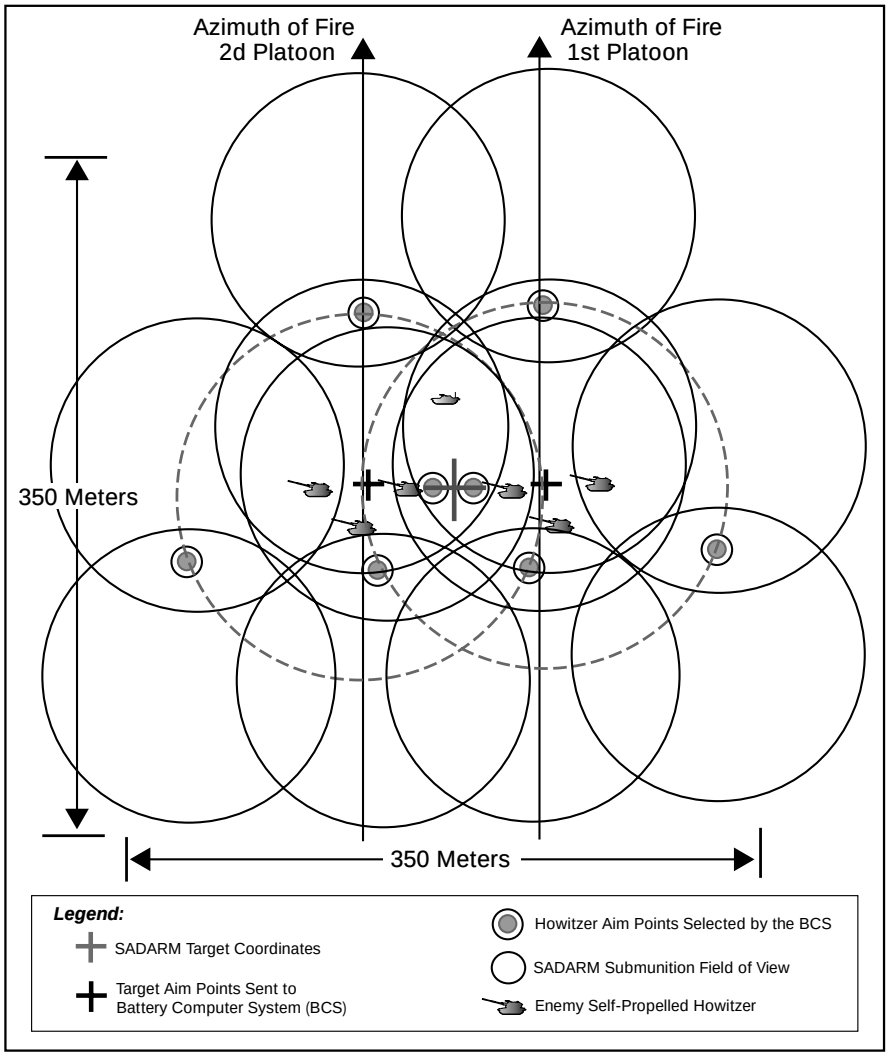


Figure 2: SADARM Area Coverage. The Q-37 target acquisition data determines the center of the target, shown as the SADARM target coordinates, for the two-platoon volley of SADARM over the armored formation.

resulted in offsets to apply to the SADARM test and established the battery's ability to fire multiple rounds accurately at extended ranges.

A second exercise the battery conducted before the SADARM test was the M93 muzzle velocity system (MVS) validation. (The BCS Version 10.028 software doesn't allow the application of registration data when computing the SADARM mission.) The M93 MVS is a retrofit modification to the original Paladin. After the M93 was fielded, most units struggled with operating the system due to the lack of adequate technical instructions. (The current technical manual has corrected that deficiency. The FA School's Paladin Division in the Gunnery Department at Fort Sill also is training units on the M93 during AFCS Version 11 software new equipment training, or NET).

For the SADARM test, the Paladin NET team, along with personnel from the office of the Program Manager (PM) Paladin, provided training and resources to ensure A/1-17 FA could employ the M93 with success at all charges.

Another challenge A Battery gun crews had during the train-up was accurately measuring the temperature of the M203 powder as one element of meeting the requirements for accurate, predicted fire.

SADARM An All-Weather, Long-Distance

From 22.5 kilometers away, Paladin howitzers firing the new sense and destroy armor (SADARM) precision round can destroy self-propelled artillery, tanks–any armored vehicles—in a matter of minutes.

The M898 SADARM is an armor-killing all-weather, precision munition, the Army's only smart, fire-and-forget munition in production. All 155-mm howitzers in the inventory and those under development, including our new lightweight 155 howitzer and Crusader, will fire SADARM at their maximum ranges. That means *one* Crusader howitzer will be able to fire SADARM in multiple volleys from 27 kilometers away and render an armored company combat ineffective before the company even knows where the fire is coming from.

SADARM contributes significantly to the seven tenets of the Army's Vision: lethality, versatility, deployability, survivability, sustainability, responsiveness and agility. In this brief article, I address SADARM's contributions to the first four tenets of the Army's Vision.

Lethality. SADARM is the most lethal 155-mm round in the world, capable of causing mobility, firepower and catastrophic kills against armored formations. SADARM is fired in volleys over an armored formation, resulting in multiple kills per volley.

Once delivered over the target area, the two armed submunitions are ejected from the base of each SADARM projectile. A despin mechanism slows and orients the submunition toward the ground. Then a vortex ring parachute (VRP) deploys, stabilizing the submunition to a constant vertical drop velocity and spin rate.

The spinning allows the submunition's sensors to scan the target area and locate an armored combat vehicle in its search footprint. Each submunition has a sophisticated suite of sensors, active and passive, that identify and verify a target.

SADARM's aiming algorithm uses the sensor data and determines a firing solution. Detection occurs with a single scan of the target vehicle, and during the submunition's second rotation, the submunition fires automatically.

The lethal mechanism of each SADARM submunition is an explosively formed penetrator (EFP), which is fired through the top of the armored combat vehicle. The EFP, an inert heavy metal rod, travels into the vehicle at approximately 2,500 meters-per-second, allowing it to penetrate any existing or developmental armored vehicle in the world today.

A direct hit with the EFP often results in the complete destruction of the target vehicle. The EFP penetrates the vehicle with tremendous kinetic energy, striking critical components and causing mobility, firepower and catastrophic kills. Inside the vehicle, casualties also are caused by the "spalling" effect of the EFP's penetration. The molten fragments of the vehicle's armor shell and the EFP set off powder increments, detonate on-board ammunition and ignite fuel.

Based on kill-per-round rates, SADARM is 39 percent more lethal than dual-purpose improved conventional munitions (DPICM) against armored formations and 23 percent more effective in the counterfire fight.

Versatility. With its two lethal submunitions, SADARM gives combat units a revolutionary force multiplying capability. It provides a committed force an overwhelming long-range precision strike capability, allowing the combined arms commander to shape his battlespace at depth and set the conditions for success in the close fight.

SADARM is adaptive and flexible, capable of being employed against combat vehicles in practically all scenarios. Although SADARM was designed for self-propelled artillery targets, in mechanized warfare, it will be a killer of all armored vehicles, moving and stationary. Heavy, medium and light forces will be able to deploy more rapidly with increased lethality to destroy one of the biggest threats to friendly forces: enemy artillery. Light forces also will be able to reach out and kill threatening armored formations before the threat can close within direct fire range. Because of its precision and lethality, SADARM has significant potential for special effectiveness in unique theaters of operations, such as those with restrictive terrain.

This precision munition can kill armored targets at long distances because each submunition uses a robust sensor suite to identify and engage its target. The sensor package consists of an infrared (IR) sensor to detect heat emitted from the target vehicle within the search footprint and can detect temperature differences between the ground and target vehicles. The IR telescope is sensitive enough to detect heat generated from a warm engine, residual heat remaining in a howitzer tube from recent firings or even the heat from the sun on an armored shell.

Both active and passive millimeter wave (MMW) sensors round out the submunition's sensor package. The passive millimeter wave detects changes in the magnetic field of the earth's surface, which occurs wherever an armored combat vehicle is located. The active MMW sensor transmits radio frequency energy continually within the footprint and processes the reflected returns. The returns from a target vehicle are signifi-

Units today train with bag powder charges, such as the M4A2 and the M3A1. All SADARM missions were fired with the M203A1 charge that is solid, except for the igniter pad. Existing TTPs don't address measuring the powder temperature on the M203A1.

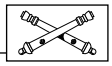
The Gunnery Department developed a temperature-measuring test that experimented with different techniques on the M203A1. The experiment determined that the best way to measure the M203A1 powder temperature is to apply the temperature of a bag powder (M3A1, M4A2, M119A2), if one is available. This method was used with great success during the SADARM test. However, there is still a debate as to the best method of temperature measurement if only M203A1 is available.

Participating in SADARM's final test not only provided A/1-17 FA the opportunity to fire the Army's first smart munition, but also to train the full breadth of its mission-essential tasks. The battery's 24-week train-up centered around the III Corps Artillery Tables of standardized, progressive training that culminates with a battalion live-fire qualification.

During the train-up for SADARM's final test, A Battery fired more than 1,000 M203 charges. This not only gave the battery confidence in its ability to fire accurately at extended ranges, it also provided valuable experience in using the M93 MVS at maximum charge and proved Paladin's hydraulic system can withstand multiple maximum charge missions with no significant problems.

Conclusion. The already deadly SADARM will get even better. A SADARM product improvement program is planned that will increase the scanning area threefold (from a search footprint of more than 17,600 to almost 54,000 square meters per submunition), improve the aiming of the attack, increase SADARM's reliability and lower its cost. Operational testing of the improved SADARM is projected for 2006.

The *Copperheads* of 1-17 FA and Team SADARM proved this new smart munition was effective when employed against *real targets* by *real soldiers*. SADARM is ready to "report for duty" and protect our forces well into the 21st century.



Lieutenant Colonel Michael T. Walker, until recently, commanded the 1st Battalion, 17th Field Artillery, 75th Field Artillery Brigade, Fort Sill, Oklahoma. Currently, he's the Chief of Mobilization for Headquarters, First Army at Fort Gillam, Georgia. Previous assignments include serving as Chief of Field Artillery Operations, Allied Rapid Reaction Corps in Sarajevo, Yugoslavia, and Executive Officer and Brigade Fire Support Officer for 3d Battalion, 41st Field Artillery, 24th Infantry Division (Mechanized) at Fort Stewart, Georgia. He also commanded two batteries.

Major John W. Gillette is the Operations Officer of the 1st Battalion, 17th Field Artillery *Copperheads* at Fort Sill. His previous assignments include serving as a Company and Battalion Tactical Officer at the US Military Academy at West Point; Commander of B Battery, 1st Battalion, 41st Field Artillery, 24th Infantry Division (Mechanized) at Fort Stewart; and Battalion Fire Support Officer, S1, S2 and Targeting Officer, also with the1st Battalion, 41st Field Artillery. Major Gillette is a graduate of the Command and General Staff College, Fort Leavenworth, Kansas.

Armor-Killer

cantly stronger than from the earth's surface.

With its revolutionary capabilities, SADARM is the most autonomous, lethal and versatile FA round in the US inventory to date.

Deployability. With artillery ammunition comprising a significant portion of the warfighting logistical burden, smart munitions can be a tremendous enabler of this Army Vision tenet.

According to Target Acquisition and Fire Support Model (TAFSM) testing scenarios, as certified by the Training and Doctrine Command Requirements and Analysis Center (TRAC), SADARM's increased lethality decreases the ammunition logistical burden for our light and heavy forces by 30 percent over DPICM. When deploying a light artillery force package (including three battalions of 155-mm M198 howitzers), the Army can save 53 sorties by deploying SADARM vice DPICM. The artillery force package using SADARM retains the equivalent firepower effectiveness but requires one less M198 battalion (saving 36 sorties) and fewer follow-on sorties for ammunition resupply (saving 17 sorties).

Survivability. SADARM will give our light forces, those most vulnerable to the threat of heavy armor and artillery, the armor-killing firepower of a heavy force. Because SADARM provides multiple target kills and kills quickly, the threat is rendered combat ineffective more rapidly and the duration of combat is shorter.

Based on TRAC-certified force-on-force modeling during SADARM's testing and development, our artillery force survived 35 percent better with SADARM and experienced a 175 percent increase in effectiveness during counterfire. TRAC also certified that in

TAFSM force-on-force modeling, friendly maneuver forces survived 33 percent better with SADARM.

An added force protection feature of SADARM is its submunition will self destruct if it doesn't detect a target. Unlike DPICM that has a five percent dud rate, SADARM leaves no hazardous duds to threaten friendly forces or innocent civilians who occupy the area later.

Conclusion. SADARM is the Field Artillery's first fully autonomous cannon munition. It gives the force an all-weather, day or night, smart munition that can kill artillery or render entire tank formations combat ineffective from long distances in a matter of minutes. Once the target area is located, SADARM's submunitions scan, detect and attack all armored targets as one of the most lethal munitions in the world today.

MAJ James J. Chapman, AC
Chief of the Munitions Branch
TRADOC Systems Manager-Cannon
Fort Sill, OK

AFATDS-Kiowa Warrior
A Deadly Digital Interface

by Sergeants First Class James L. Johnson, Jr., and Anthony E. Lynch

The hovering OH-58D Kiowa Warrior helicopter of D Troop, 1st Squadron, 7th Cavalry (1-7 Cav) of the 1st Cavalry Division, Fort Hood, Texas, began to rise slowly. Only the mast-mounted sight was showing over the tops of the trees when the crew lased the enemy armored formation moving through the field to the north. As the aircraft vanished below the tree line, a call-for-fire (CFF) was transmitted to the squadron fire support element (FSE). In less than a minute, the crew heard the thunder of the division's multiple-launch rocket system (MLRS) battalion's rockets engaging the enemy formation.

This scenario was played out during a recent 1st Cav task force external evaluation (EXEVAL). The division cavalry squadron was the opposing force (OPFOR) during the EXEVAL, which used fire markers instead of actual rockets on 1-7 Cav's "targets."

A few weeks before this exercise, 1-7 Cav's FSE had demonstrated to the division artillery (Div Arty), division and squadron commanders its ability to interface digitally with the advanced FA tactical data system (AFATDS). The aircraft initiated the system status (SYSTAT) message from the OH-58D's improved data modem (IDM) computer to the squadron FSE and, through the auto-relay process of data distribution in AFATDS, to the division fire control element (FCE). The aircraft then flew through an established air corridor, updating its location with a SYSTAT every 1,000 meters, which allowed the division and Div Arty commanders to continuously monitor its location.

After arriving in its hide position, the aircraft spotted a target in the engagement area (EA). Using the mast-mounted sight, it lased the target, generating a fire mission transmitted to the squadron FSE that was forwarded to the division FCE for target servicing. The entire process was digital and took less than a minute.

This article discusses the AFATDS-Kiowa Warrior communications protocols and tactics, techniques and procedures (TTP) for the digital interface to accomplish fast, lethal missions.

AFATDS-IDM Communications. AFATDS is the primary method of transmitting CFFs to agencies outside the squadron. The squadron's three ground troop fire support teams (FISTs) transmit fire missions to the squadron FSE using handheld terminal units (HTUs) on the digital fire support net.

The artillery also taps the squadron's 16 OH-58Ds to engage targets with artillery fires. The Kiowa Warrior has a laser, global positioning system (GPS) and thermal night vision. Additionally, the on-board IDM allows the aircraft to communicate digitally with other aircraft or ground units.

The IDM is similar to the FA's forward entry device (FED) or HTUs, and when "talking" digitally to AFATDS, it has the same net characteristics. Fire supporters talk to the aircraft IDMs on the same net used by FISTs.

The communications configuration of AFATDS and IDM is not difficult. The communications protocol is for the airborne target handover system (ATHS) on the helicopter that uses the single-channel ground and airborne radio system (SINCGARS) advanced system improvement program (ASIP). The ASIP settings are "frequency hopping" and "cipher text" in the tactical fire direction ("TACFIRE") mode. This allows AFATDS and IDM to send targeting data digitally. 1-7 Cav currently uses IDM Version 2.0 and airborne SINCGARS software Version 6.0. All of the 1st Cavalry Division Artillery uses AFATDS Version A98U.0.15.

Tactics, Techniques and Procedures. The pilots and the FSE worked out the

exact procedures to make the two devices talk through trial and error. In a tactical environment, the digital link is established during a communications exercise (COMEX) before executing a mission. Voice contact is made on the squadron fire support net, and the crew begins sending SYSTATs when it leaves the forward area rearm/refuel point (FARP). The icon of the aircraft is automatically updated in AFATDS. (The aircraft are built into the AFATDS' database according to tail number, which is how the IDM subscriber data is organized.)

When in the FARP, the icons for the aircraft are pulled out-of-zone on the screen. When the SYSTAT is sent, it has the location of the aircraft and updates the AFATDS icon. The aircraft then can send the FSE SYSTATs as it moves through the zone.

When a pilot lases a target, several things occur. The onboard GPS tells the inertial navigation system where the aircraft is, and the laser tells the system how far the target is from the aircraft. The aircraft's improved master control processing unit (IMCPU) then plots the target's heading and angle, based off the mast-mounted sight measurements, and an eight-digit grid is automatically placed in the target buffer. The IDM supports fire mission processing (formatted messages, as with the HTU) and can have multiple active and preplanned missions in its buffer.

The pilot then transmits the data to AFATDS. In case of laser failure, the pilot also can manually input the target location, and the mission is processed as if a FED or HTU had sent the information. On the AFATDS screen, the aircraft icon moves as the aircraft updates its location.

When the Kiowa Warrior sends a target to AFATDS, it is displayed in bold on the AFATDS screen as an active target, and the AFATDS fire mission processing screen appears. If the target is sent as an artillery target intelligence (ATI) message, it is displayed normally without the fire mission screen. Depending on how AFATDS guidance is set up, the mission will be sent to either a firing unit or FSE. Messages-to-observer (MTOs) also can be sent to the IDM.

CFFs are cleared in the squadron tactical operations center (TOC) with the aid of AFATDS and then sent to the firing unit. If the squadron is under division control and no direct support (DS) FA assets are available, the missions go through the division tactical command post (TAC) FSE and then to the Div Arty FCE. If the squadron is under division control with a DS unit, missions are cleared and sent to the FA battalion fire direction center (FDC).

Sometimes the squadron is under the operational control of (OPCON to) one of the 1st Cav's maneuver brigades. In this case, the missions are transmitted to the brigade FSE, not the battalion FDC.

Great care must be taken when the squadron is OPCON to a brigade combat team (BCT) because of the differences in AFATDS' attack criteria. In the squadron, air defense artillery (ADA) is at the top of the list for target engagement. When OPCON, squadron missions are sent to AFATDS in the BCT's FSE and must compete with the missions generated by task forces organic to that brigade. Usually, ADA is not ranked as high as maneuver targets in the BCT's FSE, causing squadron missions against ADA to be delayed. This, in effect, controls the squadron's maneuver tempo. The aircraft must detour, wait until FA fires are available or wait until squadron mortars come into range.

The fix is simple: the fire support annex must reflect the changes needed to the AFATDS fire support guidance at the brigade FSE. If the squadron is given priority of fires (POF) and AFATDS is set up to process missions according to POF instead of target type, missions will not be slowed. This doesn't disrupt the brigade as ADA targets require a much smaller volume of fire than any other target type.

AFATDS also helps manage the squadron's airspace. By enabling the vector function in AFATDS map overlays, the gun/target line is displayed as a thick blue line on the AFATDS digital map, automatically alerting the aircraft and artillery to any conflicts. Because the squadron routinely operates forward of the division, it uses AFATDS to provide situational awareness across the division.

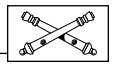
For example, if the attack aviation battalion is conducting operations across the forward-line-of-own-troops, Kiowa Warriors and AFATDS receive the attack battalion's graphics and can deconflict the airspace. The air corridors come through the data distribution process and are highlighted as graphics on the screen, confirming the attack battalion's coordinates. This updates the TOC map graphics in a timely fashion. The function also works in the reverse: data about aircraft and FIST locations is distributed out to other units.

Finally, the AFATDS-Kiowa Warrior interface is particularly useful when operating in restrictive terrain, such as in Korea. In this tactical situation, the Kiowas work with ground cavalry scouts to find the enemy who may be concealed in defiles overlooking narrow maneuver approaches. Digital CFFs are quick and responsive and enhance flexibility of the entire maneuver force.

Using the AFATDS-Kiowa interface allows artillery to coordinate, clear and process fire missions throughout the 1st Cavalry Division area of operations. 1-7 Cav relies on quick, decisive maneuver to carry out its mission. As the aircraft screen forward, the artillery is always poised to provide suppression of enemy air defenses (SEAD) against any ADA threat.

To reinforce this digital link, the Div Arty commander has instituted monthly training on a rotating basis for the BCT FSEs and battalion FDC sections with the 1-7 Cav. In addition, the 4th Brigade's 1-227 Attack Battalion has replicated this digital link with its AH-64D Longbow Aircraft. 1-7 Cav will execute this digital link during National Training Center Rotation 01-04 at Fort Irwin, California, in January 2001.

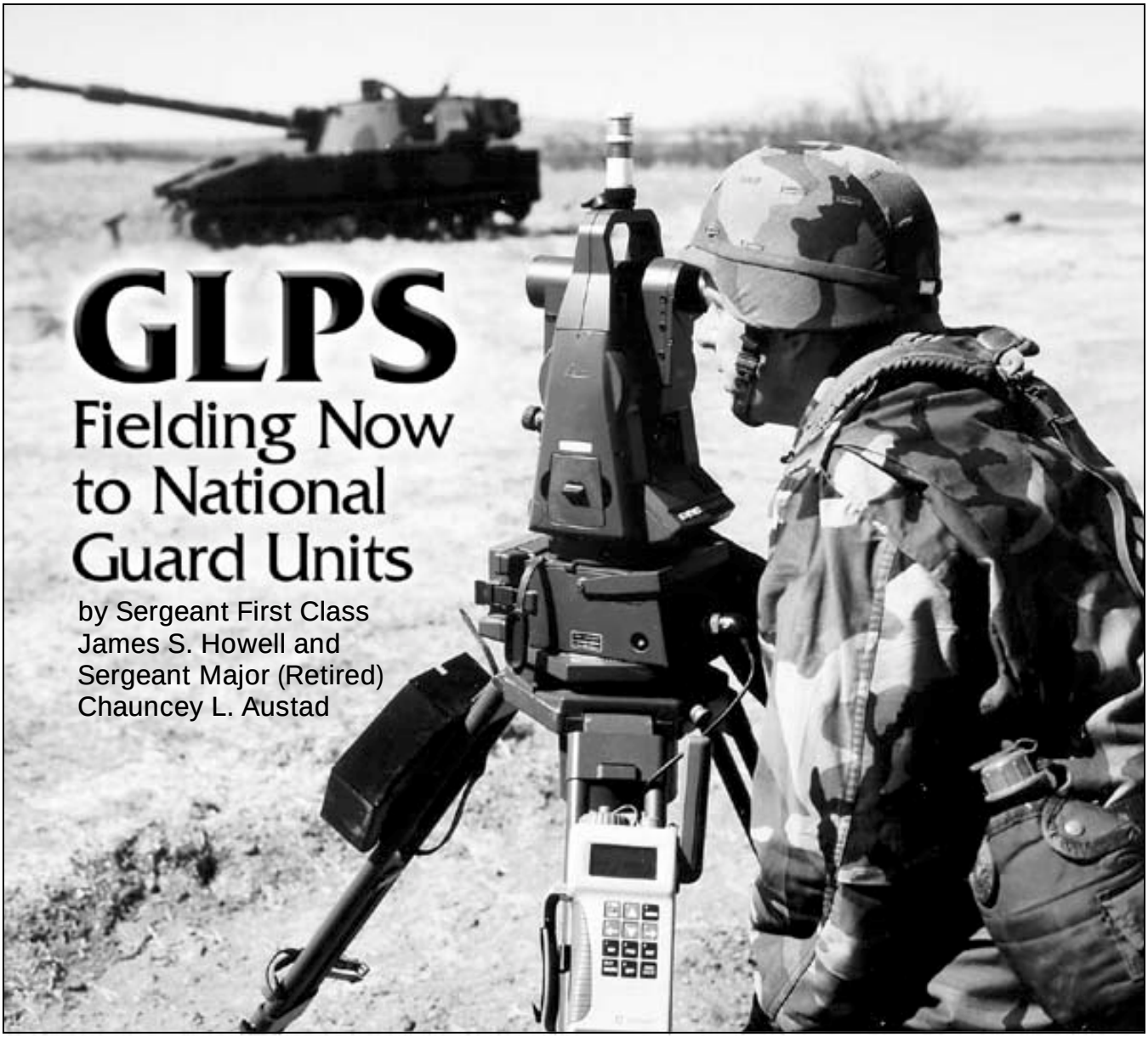
The bottom line is the equipment and software already exist—units only need to train on these devices as one integrated digital system. Then they will be assured of an AFATDS-Kiowa Warrior interface for fast deadly fires.



Sergeant First Class James L. Johnson, Jr. is the Squadron Fire Support NCO for 1st Squadron, 7th Cavalry, 1st Cavalry Division at Fort Hood, Texas. Previously, he was the Brigade Combat Observation Lasing Team (COLT) Observer/Controller (O/C) and Fire Support Element Analyst at the National Training Center at Fort Irwin, California.

Sergeant First Class Anthony E. Lynch is the Division Fire Control NCO for the 1st Cavalry Division at Fort Hood. Previously, he served as the Battalion Fire Direction Chief of the 1st Battalion, 82d Field Artillery, part of the 1st Cav at Fort Hood.

The authors wish to acknowledge the outstanding contributions of the 1st Squadron, 7th Cavalry to this article and the digital link- *GarryOwen!*



GLPS
Fielding Now to National Guard Units

by Sergeant First Class James S. Howell and Sergeant Major (Retired) Chauncey L. Austad

(Photo Courtsey of Leica Geosystems AG)

The gun laying and positioning system (GLPS) provides accurate directional control and position location data for gun-laying applications in the firing battery or platoon. GLPS is being fielded to all non-Paladin howitzer units (M119, M198 and M109A5) to enhance the tactical ability of the firing battery or platoon to occupy a firing position.

Components and Operations. The GLPS is a tripod-mounted positioning and orienting device composed of four fully integrated components: a north-seeking gyroscope, a Class I eye-safe laser rangefinder (LRF) and a digital electronic theodolite interfaced with a precision lightweight global positioning system receiver (PLGR).

Using an accurate azimuth provided by the gyroscope, distance measurement provided by the laser rangefinder and position information provided by survey or a PLGR, the electronic theodolite measures deflection, vertical angle and range to an aim point (howitzer pantel or distant aiming point). Then it calculates the easting, northing and altitude to this aim point. The theodolite is an accurate angle measurement device integrated with the system's central processing unit and contains the GLPS software package. This data, including grid coordinates, is displayed to the operator in a matter of seconds.

GLPS Fielding. As of July, all National Guard FA battalions in direct support (DS) to separate infantry brigades were fielded GLPS, with the exception of the 2d Battalion, 162d Field Artillery, Puerto Rico Army National Guard. This unit is scheduled to receive its equipment in March of 2001. The new equipment training team (NETT) began fielding GLPS in National Guard FA brigades, starting with the 196th FA Brigade, Tennessee Army National Guard, in July and will field most of the FA brigades through January 2002. From February 2002 through January 2004, the NETT will field GLPS to National Guard division artilleries and a few battalions in the 54th and 153d FA Brigades to complete the fielding.

The fielding strategy is to issue GLPS to each firing element down to the platoon level. Towed and self-propelled 155-mm (less Paladin) units receive two systems for each firing battery and a battalion float for a total of seven per battalion. Towed 105-mm units receive one system per battery and a battalion float for a total of four per battalion.

Tactics, Techniques and Procedures (TTP). The GLPS was bought under the Warfighter Rapid Acquisition Program, and fielding began without TTP. The Gunnery Department of the Field Artillery School, Fort Sill, Oklahoma, is writing the TTP, which should be available on the Gunnery Department's home page in the fourth quarter of this FY (sill-www.army.mil/gunnery/). Until then, here are some key factors impacting GLPS tactical employment and emerging TTP.

Line-of-Sight. The GLPS needs location data to start its orienting process. The tactical positioning of the system has the same considerations as the aiming circle, but electronic line-of-sight is a key factor when using the PLGR for location data. If survey is not available, the PLGR is the primary source of location information.

Location Data. The location data entered in the system has one software constraint: the data must be within +/- 200 meters easting and +/- 1,000 meters northing from its actual location for the GLPS to maintain the directional accuracy of +/- 0.2 mils. There are several methods of providing GLPS location data. The PLGR is the primary means of getting location data if survey information is not available. But if the PLGR's access to satellite transmissions is disrupted, GLPS has two procedures for using known position data. (See the discussion under *Loss of PLGR.*)

Settings. The PLGR has specific settings in the set-up menu screen when used with the GLPS. The location data is received in the averaging mode and must have an accuracy reading of Figure of Merit 1 (FOM1) for use in artillery positioning. Selected datum must be the same as the operational or map datum used throughout the unit. The specific settings for a PLGR interfacing with GLPS are taught to units by the fielding team and will be included in the TTP on the Gunnery Department home page.

Loss of PLGR. There may be times when PLGR is not available. This occurs when the PLGR is non-mission capable, when electronic line-of-sight between the PLGR and supporting satellites isn't possible due to terrain masking or when electronic interference (intentional or unintentional) prevents the PLGR from receiving satellite signals.

GLPS software provides two alternative methods of inputting location data: the "back polar plot" and "input position" methods found on the GLPS positioning menu screen. Units must develop position data and have it available for the GLPS operator. Units can use known, visible points within 2,500 meters of the battery/platoon area. (The GLPS eye-safe laser rangefinder is effective from 30 to 2,500 meters.) The known-point data can be input manually or extracted digitally from one of GLPS' stored reference points or from one of the 999 waypoints that can be stored in the PLGR. (GLPS can store position data for up to nine locations.)

GLPS doesn't eliminate the need for external survey assets, such as the position and azimuth determining system (PADS), that establish known points. But it can set-up over an orienting station (OS) or use the known point in the back polar plot submenu.

Orientation Process. Once location and directional control is established, the GLPS operator begins the orientation process of the gun line. While using the gun-laying menu and selecting the lay-by-deflection submenu, the GLPS operator first inputs the azimuth-of-fire for the firing point. He determines deflections to the nearest tenth of a mil using the digital theodolite.

Additionally, with the incorporation of the eye-safe laser rangefinder and digital electronic angle-measuring instrument, the system determines range and measures the vertical angle. The system takes the range and vertical angle, along with its known location and direction to the gun, and provides the grid coordinates of the howitzer. GLPS can store this information (lay deflection, vertical angle, range-to-gun and grid coordinates) in the gun coordinates submenu of the gun-laying screen. The system stores up to eight gun locations.

During advance party operations, the gunnery sergeant stores initial data for the guns and passes initial deflections to the gun guides. Transmitting the advance party report digitally to the main body FDC speeds up the unit's ready-to-fire time.

GLPS is a tripod-mounted positioning and orienting device. *(Photo Courtsey of Leica Geosystems AG)*

The system also can be used to help the gunnery sergeant prepare the unit's defense diagram. By using the lay-by-azimuth submenu, he can determine an azimuth and grid coordinates to all locations within the perimeter, including positions such as observation posts (OPs), listening posts (LPs) and crew-served weapon positions. GLPS can accurately identify avenues of approach and dead spaces for indirect artillery fires against the enemy.

Directional Control. GLPS can place directional control on the ground using the lay-by-azimuth submenu. When occupying the OS, the system established location. The GLPS operator can establish direction by using the GLPS to emplace an orienting line (OL).

One method is to move the safety circle to a 30-meter distance (minimum distance for laser rangefinder) from the GLPS and use it as the end-of-orienting line (EOL). Any object can be used as the EOL, as long as it's 30 to 2,500 meters away from the system.

There may be times when GLPS won't be in the position area with the gunnery sergeant or advance party, and the unit will have to maintain directional control with a conventional aiming circle.

Position Data. One question units frequently ask the GLPS NETT is, "If the GLPS is used to orient the battalion, can this be considered 'common survey,' especially if the PLGR is used for position data?" The only way to truly provide common survey is to have a system that "closes" on a known point and is able to carry any errors consistently to all stations using that survey data. PADS is the primary system to provide common survey information. If survey data is not available and GLPS is using the PLGR for location, and the PLGR is receiving data as stated in this article, units can use the GLPS for artillery positioning and howitzer orientation. However, GLPS doesn't meet the definition of "common survey," despite its accuracy, because it has no means of ensuring "common error" at every station in the unit. Using PLGR, each station receives its own location with a unique error.

The PLGR originally was intended to be an aid to navigation and a hasty survey instrument. The GLPS/PLGR combination is a more accurate means of hasty survey than units previously had (especially in terms of direction). Unfortunately, this combination is not as accurate as PADS or conventional survey for location. With no better alternatives, GLPS and PLGR provide direction and location of sufficient accuracy to engage targets.

Another question is, "Using GLPS, can my unit mass effectively?" Units will be able to mass as effectively as they would using PLGR data combined with accurate directional control.

The final development of TTP for employing GLPS is a cooperative effort between the Field Artillery School and the users in the force. Units with questions about GLPS may call the Gunnery Department in the Field Artillery School at DSN 639-5625 or 5523 or commercial (580) 442-5626 or 5523. If units have questions about the GLPS fielding schedule, they call Marta Favati, Tank and Automotive Command (TACOM), Rock Island, Illinois, at DSN 793-0564/3462 or commercial (309) 782-0564/3462.

"With only a handful of exceptions, today's soldiers have never witnessed a protracted, high-casualty ground campaign. They have never fought a war where progress is measured in blood. It is critical that they learn from and not repeat the mistakes of the past.

"We face a similar challenge with the public at large. Our recent military successes have eroded the nation's healthy respect for the costs of combat. Smart bombs seemingly allow us to remove ourselves from the suffering of war. Much of the American public—and some even in the military's ranks—now hold the false belief that future wars can be fought with little or no loss of American lives. We simply push cruise missile buttons from over the horizon and then go to the video as we surgically destroy our faceless enemy.

"This folly of believing in the possibility of war without bloodshed has fostered a dangerous revisionist notion that wars should be fought 'fairly'—as if our first responsibility is to the enemy, not our own soldiers and tactical purpose. This ill-considered view argues that American forces should attack only in kind or in proportionate response to the violence of the enemy. Abstract concepts of fairness are poisonous to war aims where American lives and vital national interests are at stake....It is the primary responsibility of all our national security leadership—from the President to the fire team leader—to rapidly achieve the nation's strategic objectives and, also, safeguard American lives.

"...Allow me to suggest five national security principles to guide our thinking about the employment of military power in the prosecution of armed conflict:

" **1. Fight to win.** Fairness is great for the playing field—but no one ever died from wounds suffered in badminton...

" **2. Accept that US casualties are unavoidable in defeating an enemy force.** Don't expect our next fight to be a 'walk.' Force protection is synonymous with casualty minimization, not elimination. We must not allow the unattainable goal of zero dead, zero missing, zero maimed to jeopardize the security of the American people as a whole...

" **3. Evolve the military force structure and doctrine to meet new threats.**...Today's soldiers are expected to tackle problems ranging from building the peace, to providing humanitarian aid, to combating terrorism, to interdicting drugs. These 21st century missions....are central to our national security, even under the most narrow of definitions...

" **4. Make decisions- don't be paralyzed by second-guessing.**...

" **5. Commit as a nation to the prosecution of armed conflict.** In any prolonged conflict, where lives are at risk, our soldiers at the front stand little chance of victory absent the full support of the American people...

"America has an obligation to focus overwhelming, coordinated military power to achieve vital national security purposes. [US servicemen] must never be asked to put their lives at risk for us—unless we give them the battlefield resources, political resolve and public support to achieve their military purpose."

Excerpt from Remarks of GEN(R) Barry R. McCaffrey
Director, Office of National Drug Control Policy
National Security Seminar, 8 June 2000
Army War College, Carlisle Barracks, PA

Sergeant First Class James S. Howell is the Gun Laying Positioning System (GLPS) New Equipment Training Team (NETT) NCO-in-Charge (NCOIC) with the Gunnery Department of the Field Artillery School, Fort Sill, Oklahoma. In previous assignments, he served as a Gunnery Sergeant and Platoon Sergeant in the 24th Infantry Division (Mechanized) at Fort Stewart, Georgia, and in the 2d Infantry Division in Korea. He also served as Gunnery Department Operations Sergeant and taught the Platoon Leader block of instruction to students in the FA Officer Basic Course. He can be reached at howellj1@sill.army.mil.

After D-Day: Operation Cobra and the Normandy Breakout

James Jay Carafano, Boulder, Colorado: Lynne Rienner Publishers, 2000, 295 Pages, $55.00

Writing any history is a complicated and difficult task, but it's even more difficult when writing about an event that has been dealt with previously by influential historians. In *After D-Day: Operation Cobra and the Normandy Breakout*, James Jay Carafano, a lieutenant colonel and Field Artilleryman in the US Army, tackles the events surrounding the Normandy breakout with a new perspective and more focus than previous evaluations of the event.

After D-Day is an extremely well researched book, combining a wealth of primary source documents, memoirs, interviews and oral histories with the well-known works on Normandy and the European theater by historians Martin Blumenson, Russell Weigley and Stephen Ambrose. More impressive is the effort the author went to, to ensure he included the most recent works on the topics, as demonstrated by his inclusion of the 1994 *Closing with the Enemy* by Michael Doubler, as well the 1998 works of Lieutenant Colonel Pete Mansoor, *The GI Offensive in Europe: The Triumph of the American Infantry Divisions, 1941-1945* and Colonel Bill Odom, *After the Trenches: The Transformation of U.S. Army Doctrine 1918-1939.*

The author builds a case for the importance of the field grade commanders at the battalion- and regimental-level in the success of Operation Cobra. He argues that too much has been focused on the generals and the common soldiers in histories and not enough on the men who really made it succeed through critical decisions, clear situational awareness and sheer leadership—the field grade commanders. He does this well with multiple accounts of the regimental and battalion commanders, but I would have liked to have seen even more detail and accounts of those leaders.

The organization of the work begins in Normandy in early July of 1944. The author reviews the strategic and operational issues that set the stage for the decisions at all levels leading to Operation Cobra.

Much of his criticism focuses on the planning and decisions made in the use of heavy bombers for the aerial bombardment to set the conditions for the offensive. Carafano is particularly critical of Martin Blumenson's and other traditional interpretations that treat the short bombing tragedy of 24 and 25 July 1944 and the corresponding responsibilities of senior leaders too gently. He provides lucid evaluations of their works and is critical of several of the corps and division commanders, such as J. Lawton Collins of VII Corps. Even though, in the end, he gives General Omar N. Bradley overall credit for success, he is critical of Bradley's decisions leading to the bombing fiasco and the deaths of US soldiers, including artilleryman Lieutenant General Lesley J. McNair.

There are several issues pertinent to today's fire supporters. Carafano discusses the use of the planning process in organizing the complicated and multifaceted operation to break out of Normandy. One particularly relevant discussion is the fire support plan of the 9th Infantry Division and its development by the division artillery executive officer, Lieutenant Colonel William Westmoreland. The major problems identified as causing unsuccessful artillery support were poor target location, poor observer planning and the lack of a coherent targeting process. Another major point was the flaw in joint air-ground planning that led to the tragic bombing results.

Finally, Lieutenant Colonel Carafano assessed that while the bombing was not a tactical success, it was critical at the operational level in disrupting German command and control, communications and logistics.

As fire supporters, there are tremendous lessons we can apply today in all these areas, which we continue to see as trends at the Army's training centers. For example, in his May-June edition article "Report to the Field: Tactical Operational Fire Support Conference," Brigadier General William F. Engel, Assistant Commandant of the Field Artillery School, reported, "Failure to provide accurate target location...is the reason most cited by O/Cs [observer/controllers] for poor fires effects in the close fight."

After D-Day is a great study of combined arms warfare, and its unique approach is refreshing. This book is important reading for soldiers as a significant contribution to the body of works on leadership and warfare, in general, and World War II, in particular.

LTC Frank J. Siltman, FA
Brigade Fire Support Trainer
National Training Center, Fort Irwin, CA