Field Artillery

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Anniversary of the KOREAN CONFLICT

DIETZ

Field Artillery

A Professional Bulletin for Redlegs

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Wrap-Around Cover is the painting *Chosin Fires* in commemoration of the Korean War by internationally known military artist James Dietz. Mr. Dietz began his career as a commercial artist in 1971 and moved to creating paintings for military prints 18 years ago. Of note, he created the paintings for three prints depicting Rangers and one for the 82d Airborne Division in the late 1980s. Limited edition prints of *Chosin Fires* are on sale at the US Field Artillery Association homepage: usfaa.com.

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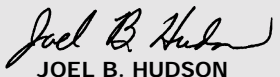
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Fires *First* in Combat—Train the Way We Fight

A great strength of the United States Army is that we are a learning, adaptive institution; this includes the Field Artillery. Through examination of the past, we consider how the experiences of others might apply to current and future requirements and operations. As in all historical experiences, we must carefully select the right lessons from recent operations, those that will have applicability on future battlefields in diverse environments against different adversaries.

As military professionals, we have become skilled in the after-action review (AAR) process, a critical self-examination of our performance, to determine the focus of future training and amend our tactics, techniques and procedures (TTPs), as appropriate.

Training at the Combat Training Centers (CTCs). Our CTCs certainly have contributed greatly to the acceptance of the AAR and lessons-learned process, and the training experience of our CTCs has been invaluable in preparing soldiers and units for the rigors of combat. Experiential, immersive training in realistic simulated combat conditions best prepares soldiers and leaders to function under the stresses of high-intensity combat.

It is a precept of our Army that we should train as we intend to fight. Our current training systems enable this, in large part, and certainly have produced exceptionally well-trained soldiers and units. However, looking closely at the volumes of analysis and lessons learned from our training centers reveals that we, as an Army, do not truly train the way we intend to fight, particularly with respect to the employment of fires.

While FA units generally arrive at our CTCs at a high state of training, the synchronization of fires with maneuver has been reported repeatedly to be a training weakness, and joint fires are largely absent. Even when fires are effectively employed, the organizational construct of the training environment and the inability to fully replicate the effects of fires reduces the impact of indirect fires on the battle and increases the reliance on direct fire engagements to produce decisive outcomes.

Fires in Combat. Contrast our training with the experience that we, as an Army, have every time we enter combat: our reliance on indirect fires increases, and undeniably, there is a propensity to employ indirect fires wherever possible to achieve decision. The performance of those who plan and deliver indirect fires in combat is consistently praised, both for the competence of the soldiers and for the lethality that the indirect fire system brings to the combined arms force.

Certainly this is the case in the preliminary review of lessons emerging from Operation Iraqi Freedom where the Field Artillery made an enormous contribution to the success of the combined arms team and the joint fight. Field Artillery soldiers were well-trained; leaders were skilled in integrating fires and reacting to the changing situations of combat; our digital system provided a tremendous advantage in coordinating and expediting the application of fires; our delivery systems performed superbly; and the lethal effects produced by our munitions were exceptionally effective.

Maneuver commanders consistently moved their formations under the cover of supporting fires. Field Artillery fires were used extensively to prepare the battlefield and provide enabling effects. Fires were routinely exploited to maintain the tempo of the fight. Indirect fire solutions were clearly preferred to the tactical assault.

Commanders chose to fight *first* with indirect fires—those fires were synchronized, responsive and accurate.

So…Why the Difference? Why the difference between what we generally observe in training and what we have witnessed consistently in historical combat and just witnessed again?

First, we must credit those soldiers and units who were responsible for this terrific demonstration of professional competence. Second we should cite the true level of integration that was achieved, including the integration of fires with maneuver as well as the integration and application of joint fires. Finally, when maneuver commanders faced a killing enemy in a live combat situation, they understood and applied our doctrine. They employed indirect fires to set the conditions for success and enable their maneuver forces. Those fires were effective, and the maneuver forces were successful.

We now are engaged in a detailed analysis of the lessons learned in Operation Enduring Freedom and Operation Iraqi Freedom. In some instances, our experiences will indicate a need to modify doctrine or how we organize and equip the force.

A larger lesson for the Army to focus on will be on how to train: how to develop leaders to employ fires instinctively, how to ensure the effects of joint fires are integrated fully, and how to modify our CTCs to ensure the effects of indirect fires are replicated and rewarded.

When the Army fights, it fights with fires *first* to destroy enemy capabilities. We fight with fires *first* to enable maneuver and provide special purpose fires and effects. We fight with fires *first* in combat.

We need to train the way we fight.

Major General Jonathan B.A. Bailey,
MBE, Noted Military Historian and Director of
General Development and Doctrine for the British Army

Firepower in the Third Dimension— A Joint and Coalition Future

By Patrecia Slayden Hollis, Editor

Q *The expanded second edition of your book,* Field Artillery and Firepower*, is due out in September [United States Naval Institute, Newport, Rhode Island]. As discussed in your book, please briefly describe how the Field Artillery emerged as a combat power to be reckoned with in the 20th century.*

A For millennia prior to 1914, battles were two-dimensional, linear encounters. The front line was where the action was—direct fire and quite short range. You only could engage targets that were in sight, whether it be with arrows, spears, rifles, muskets or field guns. So target acquisition was a matter of what you could see.

With the introduction of indirect fire, you suddenly could engage the enemy anywhere in his entire area of the battlefield. Warfare was still two dimensional, but engagements were far from being just encounters on a line; simultaneously, you could engage the enemy's command and control, communications, logistics and his reserve.

Interestingly, indirect fire started out as a tactical measure to protect the detachment or the gun from enemy fire. The main threat at that time was from the infantry because of the introduction of the high-velocity rifle conoidal bullet that allowed the infantry to match the range of the field gun. Consequently, guns employed in the open in the American Civil War, the Franco-Prussian War and the Russo-Japanese War frequently were blown away by infantry firepower—the rifle and the machine gun.

After the summer of 1914, guns began moving behind hills as a self-protection measure, a tactical expediency that transformed warfare. Suddenly, a gun could engage a target it couldn't see anywhere in the enemy's battlespace as long as it could identify where the target was and

range it. Now you could fire ballistically through the third dimension to attack any target in the area of operations.

Some people imagine that even in the days of direct fire it was a three-dimensional battlefield—that gunners moved rounds from an artillery point through the third dimension to attack the enemy. Actually, direct fire with, say muzzle-loading cannons, was generally horizontal.

If the gunners elevated the gun tube slightly, it caused the cannonball trajectory to be above head height for the majority of its travel. Fired parallel to the ground at or below head height, the lethality of the cannonball was horrendous for its entire journey.

For the best effects, gunners ricocheted rounds off the ground into the enemy. For example, in an enfilade when taking an enemy from the flank, the cannonball could bounce and skip down a file of troops for maximum effect. Shells could be fired in a higher trajectory, but until 1870, they were not a very effective munition.

Indirect fire through the third dimension was a revolutionary change that only was fully revealed in the First World War—it can be argued that indirect fire constituted the birth of the modern style of warfare. Artillery became the major combat arm and probably played the dominant role in World War II, increasingly in concert with airpower.

Q *What were the two major shortcomings of indirect fire after World War II that you discuss in your book? Are these shortcomings still present today?*

A During the Cold War in Europe, the importance of artillery waned relative to the other arms. That was largely because it lacked the ability to acquire moving armored targets—the high-payoff mobile Soviet armor in depth—and engage those targets effectively, even if it could acquire them. Meanwhile in smaller wars, artillery firepower lacked utility because its effects often were excessive and high-payoff targets seemed elusive. The need for a more sophisticated application of fire became apparent.

Artillery could regain its utility only by acquiring the highest payoff targets and engaging them effectively with the appropriate degree of force in time and space—in other words, by employing a precision indirect fire system.

The future of the indirect fire system depends on target acquisition systems that are highly accurate over long distances and the speed and accuracy of communications that transmit the data to the people who can engage targets. Likewise, precision depends on the accuracy of the munitions, either through target designation or "fire and forget" technology, and the munitions' ability to create the desired effects on any target.

If we can improve these two major shortcomings in indirect firepower—target acquisition and munitions—the ability of future land systems to engage high-payoff targets throughout our battlespace effectively seems likely to be restored, having implications for warfare analogous to those of the introduction of indirect fire a century ago. Just as indirect fire changed warfare at the operational level, so the technical advances of target acquisition and munitions in the 21st century will have other and more important operational and strategic implications.

For example, about 100 years after the introduction of indirect fire, the science of precision means accuracy is no longer a function of range. Today you can fire a munition into the general area of the target and either by designating the target by ground or air means or using some form of terminal guidance in the munition itself, you can hit the target precisely—the range from the gun or the launcher doesn't matter.

Suddenly the techniques of precision give artillery opportunities that appeared to have diminished since 1945.

In addition, warfare itself will become more three dimensional. Many systems—munitions, unmanned aircraft, loitering objects—will operate in the third dimension, not just pass through it. As a natural progression, combat will occur increasingly in the third dimension and be inherently joint with artillery and airpower the big players.

Exploitation of the three-dimensional battlespace will bring new challenges.

Q *You caution military leaders not to limit the word "precision" to mean only "accuracy at a point," such as in a precision munition. What does "precision" mean?*

A Our terminology is in danger of being out-of-date and misleading—in fact, quite damaging. People are tempted to limit precision to accuracy at an exact point—our ability to hit a precise grid reference or the "first door on the north side of a munitions factory."

Precision is that and much more. Precision entails creating the desired effects at the exact time and place, and the place may or may not be a point—it might be an area. For example, the commander might want very precise effects on an enemy deployed in an area 500 meters by 500 meters—whether he wants to suppress, neutralize or destroy the enemy. The commander may want his area effects to be precise because churches, mosques, schools or hospitals surround the 500-by-500-meter area, and he doesn't want them damaged by the effects.

To achieve precision, the entire system must be precise. The commander must judge precisely what outcome he wants on what target and understand precisely what is going to happen to that target when and where the munition(s) hit the ground—x weight on this grid will have an xx effect.

Chucking a lot of inexpensive, relatively inaccurate munitions into a large area may be the best answer—but it should be the result of a careful decision.

Target acquisition must be precise; logistically, the right munitions must be at the right place and time; and the firing platform must fire the munition precisely followed by accurate battle damage assessment to determine if the desired effects were achieved.

Also, when we calculate precise "effects," we are in danger of using measurements that have served us well in the past but will not serve us well in the future.

In past attritional models of measuring effects, if you fired x number of rounds at an enemy tank company and destroyed 10 percent of the tanks, it was deemed that the crews of the other 90 percent were shaken up by the shock effect of the massive number of rounds dropped to achieve the 10 percent kills and were ineffective. With precision munitions taking out 10 percent of the tanks in an increased volume of battlespace, the other 90 percent might not even *know* the 10 percent have been hit. Therefore, the same percentage calculations would not result in neutralizing or suppressing the enemy.

The Field Artillery must develop more precision munitions, including area munitions that can precisely suppress and neutralize. Sometimes, dumb munitions will work—but they tend to be a logistical burden. There are other options, such as thermobaric weapons.

The Air Forces have been the first with precision munitions with the reach to take down operational and strategic targets, such as bridges and other infrastructure. And 70 years after the advent of indirect fire artillery, Air Forces too have become indirect fire systems with the introduction of standoff munitions. The Air Force went to standoff munitions to keep the aircraft safe when firing the munitions—the *same* reason the artillery moved behind the hill in 1914.

The Air Force also has developed unique close support capabilities without which ground forces would be in severe trouble. But the question is, are Air Force precision munitions the most cost-effective and efficient means to deliver fire in close combat (or at any range) compared to surface-to-surface fires (or even a Tomahawk from a submarine, for that matter)? With the Air Force's unique strategic capabilities essential in interdiction, is it the best use of airpower to have it available on-call to engage "ten mortars over there"? At the moment, there are no surface-to-surface precision systems that can deliver many of the capabilities the Air Force brings to the battle.

The Artillery still has not brought in the precise systems that we've talked about for 20 years, although the technologies have been around for sometime. The programs have either been cancelled or delayed. Why? I think partly because it was assumed that the aircraft could do the job.

But what if you need to engage 500 targets in bad weather or within the next hour? The artillery's all-weather responsiveness in sensor-to-shooter links for close support or counterfire and its flexibility of effects simultaneously across the theater—10,000 rounds over here and smoke and illumination over there—often make surface-to-surface fires better than airpower.

When the FA has the reach (increased range and equipment mobility) and precise effects (more than just precision at a point), then we will make a considerably greater contribution to joint fires.

Q *How do we integrate joint fires more effectively?*

A The Battle of Cambrai in 1917 was the first time we had large formations of aircraft as part of the fire plan. Since then, Air Forces often have been reluctant to be part of the land scheme of maneuver.

For example in 1944, it was difficult to get Air Forces to divert resources

from strategic operations against Germany to support the invasion of Normandy. They saw themselves as a strategic arm, not an arm of land forces. That's why Air Forces were formed as a separate service.

In recent operations, Air Forces have very successfully conducted both strategic operations and operations in support of the land forces.

But our future is going to become much more complicated. As we move into three-dimensional warfare where combat will be conducted throughout the volume of battlespace, it will become increasingly quaint to categorize capabilities in terms of land or air—the integration of the two will be seamless.

Other distinctions we've lived with for 100 years will become increasingly meaningless: direct and indirect fire, platform versus munition, and counterfire or air defense. For example, if you fire a missile from the ground and it flies over a target area and loiters for a couple of hours and then suddenly dispenses submunitions directly at a target it located below it, is that a direct or indirect attack?

The distinction between platforms and munitions is going to become rather meaningless. The cargo munition that dispenses a load of submunitions, is that a munition or a platform? Is Netfires a platform or munition?

What's the distinction between ground-based air defense and counterfire—two concepts people think they understand quite clearly? If your armored tank battalion is being attacked by a rocket that dispenses submunitions and you shoot down that rocket, have you conducted the last stage of a counterfire mission or an air defense mission?

Ground-based air defense will be everybody's business because of the scale of combat operations in the third dimension. Suppose a dozen enemy attack helicopters heading somewhere are 30 kilometers away and Field Artillery has precision. You will be able to acquire and track those helicopters, lob a round in their general direction and engage the aircraft with your submunitions.

In the past, we have tended to think about the third dimension in terms of airspace management, corridors and so on for manned fixed-wing aircraft. In the future, the third dimension is going

This AS90 British self-propelled 155-mm howitzer was not used in Operation Desert Storm—made its combat debut in Iraq.

to be very densely populated by mobile objects and very few of them will be manned—for example, there will be air-to-air combat between UAVs [unmanned aerial vehicles].

We will talk in terms of battlespace exploitation instead of airspace management. We'll have networks with situational awareness to make rapid decisions to knock out enemy targets, ensuring they aren't our own platforms or munitions.

It's going to be very complicated. Technology will give us the ability to exploit the three-dimensional battlespace, but first we have to understand the challenges of the future before we can solve them with technology.

Q *Today is 1 May and, although major combat operations in Iraq are essentially over, the war is not over. As a military historian, please give us your initial analysis of the employment of fires in Operation Iraqi Freedom.*

A In a superficial examination of the use of artillery in the Second Gulf War, one of the surprises is how absolutely traditional some aspects have been while dramatic progress has been made in other areas.

From the coalition artillery point of view, the war has been fought with quite old artillery equipment. If you take the equipment that has been deployed—MLRS [multiple-launch rocket system] ATACMS [Army tactical missile system], M109A6 Paladin, AS90 [British tracked 155-mm howitzer], your Marine's M198 155-mm towed howitzer, our M118 105-mm light gun, your M119—all but the AS90 took part in the First Gulf War. (Also, today's Paladin is very much more capable than the M109 of 1991.)

There have been some significant advances in joint target acquisition and intelligence systems in the past ten or so years—for example, we deployed our new and very effective advanced sound-ranging programme (ASP) in Iraq, which is a passive target acquisition system for mobile operations; and UAVs and new radars played an important role.

We employed much the same platforms and munitions in, basically, very traditional ways, i.e., close support, counterfire, deep operations and to provide smoke and illumination. Yet many aspects of Operation Iraqi Freedom were nonlinear, more nontraditional. Operations were conducted over a large area. There wasn't a secure rear area, and long lines of logistical support were not at right angles to the front. Artillery demonstrated mobility, and while traveling a vulnerable route over long distances, it was good to have a bit of armor on your weapons platforms.

It's quite clear the Artillery has been extremely busy in this Second Gulf War firing conventional munitions in support of maneuver and especially effective during sandstorms and in countering enemy mortars. I would be amazed if any maneuver commander would have foregone his artillery support in Iraq.

The credit goes to the Field Artillery that has performed *magnificently* with elderly equipment. It would appear that some who predicted the demise of the Field Artillery have done so prematurely.

And with the introduction of precision, the artillery will offer considerably more to the joint fight in the future.

Now in some areas of operations in Iraq, we have made dramatic progress. One of the triumphs of recent operations is the increasing integration of joint fires in support of maneuver—the way we meshed interdiction, CAS [close air support] and land-based fires. And many of those integrated fires came from maritime forces—from submarines, ships or carrier-based aircraft. So the good news is we have a culture that can learn from experiences.

From a coalition view, operations have been significantly more interoperable. We are better at technical and procedural interoperability and interoperability of the mind—the meshing of commanders' thinking during operations.

Q *You participated in the British War in the Falklands against the Argentines and have written articles about it and the role of firepower in that war. What was the role of fires in the Falklands and what can we learn from that war?*

A The War in the Falkland Islands was very unusual and primitive, even by 1982 standards. There were no roads—was no urban environment. There was almost no civilian population, and the weather was dreadful in semi-arctic conditions.

We did not have air superiority—very often the Argentine Air Force controlled the air. The British forces were at their logistical extremity.

There was no NBC [nuclear, biological, chemical] threat; there were only a couple of tracked armored vehicles on the islands, and we had no UAVs for air reconnaissance.

Most fighting took place at night without night-vision devices. There were some helicopters but not many because most of our Chinooks were sunk when our big container ship went down. Most of our soldiers were on foot, only occasionally lifted by helicopter, and it was extremely physically demanding.

From an artillery point of view, there were no computers because in those days our computers were fitted into vehicles that we couldn't drive because there were no roads. Computations were done by slide rule under ponchos in semi-arctic conditions.

There were no meteorological data—yet the Met errors in some wind conditions was up to 500 meters, and we were firing in close support of infantry maneuver at night. Survey was very difficult and based on information that was more than 100 years old.

We fired in close support of infantry attacking at night when we weren't sure where our own infantry was. We fired

The British M118 105-mm light gun and the American M119 are, basically, the same gun platform.
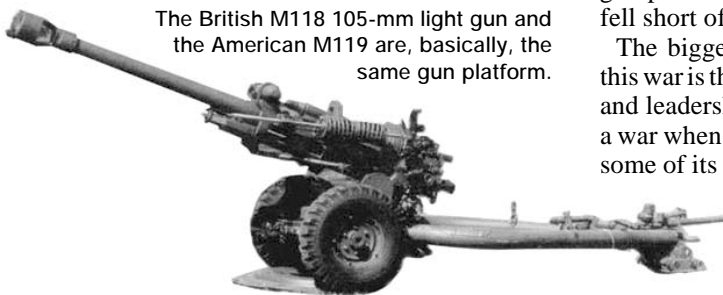
coordinated illumination to support infantry maneuver. We fired at flashes on hillsides when we didn't know the altitude of the target or the angle of sight to be applied in support of our troops who might be 50 or 100 meters away from the enemy we were engaging.

Fire missions were sometimes hundreds of rounds per gun, and the most common fire order given was "Continuous Fire." In the weather conditions, the guns often slid through the mud back several meters, even though they were held down with ground anchors made out of wire to try to keep them in position.

There were piles of ammunition all over the place. It was very hard to unbox ammunition and get rid of the refuse in the thick mud with water everywhere.

There was very little CAS, but naval gunfire was excellent. The ships sailed around the islands and shelled the Argentine rear areas at will. The naval gunfire was very accurate and very effective at harassing and demoralizing the Argentines throughout the night, shelling continuously. Naval gunfire observers on the shore, sometimes behind the Argentine lines, were essential.

It was extremely messy and difficult business, yet the British Field Artillery in the Falklands War, although significantly outgunned and outnumbered by the Argentine artillery, played an essential role in the decisive victory.

The Argentines had many more guns that were 155-mm compared to our 30 105-mm guns. Whenever possible, we sequenced concentrations of fire from all 30 guns in support of whichever of our infantry battalions was attacking at the time. The Argentines couldn't concentrate fires, often fired single guns and couldn't move their guns.

They often couldn't get the angle of sight right. So if you tucked your guns away in the right position, they had trouble getting rounds down into the gun positions—the rounds overshot or fell short of the positions.

The biggest lesson that came out of this war is that superior morale, training and leadership are the keys to winning a war when your army is outnumbered, some of its equipment is inferior and it must fight halfway around the world from home base in horrendous conditions. It was extremely risky and all

kinds of things could have gone wrong—but they didn't.

We won due to good morale instilled by good leaders and the confidence good training brings.

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

A In recent operations in Iraq, indirect fires have been an *indispensable* element of ground operations.

However, in relative terms, the capabilities of the Field Artillery to engage the high-payoff targets in time and space has not kept up with technological developments or the capabilities of other services. We must make it our highest priority to bring on precision technologies so the Field Artillery can play its proper role in the joint systems of fires.

I congratulate you Gunners on the significant role you played in Operation Iraqi Freedom. Although I did not deploy to the Gulf, I can safely say for the British Army what a privilege it has been for our forces to work in partnership with yours.

★★

Major General Jonathan B.A. Bailey, Member of the British Empire (MBE), is Director of the General Development and Doctrine for the British Army at Wiltshire, England. In his previous assignments, he was the Director of the Royal Artillery at Larkhill; Chief of Fire Coordination for the Allied Command Europe Rapid Reaction Corps (ARRC) in Germany; and Chief of the Joint Implementation Commission at the Headquarters of the Kosovo Force in 1999. In addition, he commanded the 40th Field Regiment in Germany and a battery in the 4th Field Regiment, Royal Artillery, in Germany. He also served as a Tactics Instructor and member of the Directing Staff at the Staff College in Camberley, from which he graduated, and as the Artillery Operations Officer for the 4th Armoured Division in Germany. Other highlights of his service include serving as an Operations Officer and Battery Commander during the Falklands land campaign in 1982 and commanding a Zipra Guerrilla Assembly Place in Rhodesia as part of the Commonwealth Cease-fire Monitoring Force in 1979. Major General Bailey holds a Bachelor of Arts in Medieval History and Philosophy from the University of Sussex. He has written a number of articles and books on artillery and military history.

Major General Paul D. Eaton,
Chief of Infantry

Indirect Fires *First*—
The American Way of War

By Patrecia Slayden Hollis, Editor

Q *As the Chief of Infantry, you and the Chief of Field Artillery have joined to send the message throughout the Army "Indirect fires first is the American way of War." What does that mean, and why did we need that message?*

A Another way to say it is "Never send a soldier when a bullet (of some caliber) will do." The intent is for the infantry to engage the enemy with somebody else's ordnance—indirect fire or close air support [CAS] or some other means—and we need to apply those effects to avoid having to commit soldiers in the close fight.

Now, that's not to say we are "walking away from the close fight"—we're not. The close fight is what the Infantry is about.

The close fight has been called the "Red Zone." I like the "Last 100 Yards." It's that direct fire rifle range of soldiers' eyes on target, day or night. The infantryman is our "final answer" after we've done all we can with indirect fire effects.

So, what prompted the need for that message? We've had some training problems that surfaced at our Combat Training Centers [CTCs] for any number of reasons. By reflex, infantrymen and tankers understand their direct fire systems. We train at the individual level all the way up to the collective level on our direct fire systems. We spend a lot of time on tank gunnery, Bradley gunnery, rifle marksmanship and antitank missile systems. That's great—that's what we do and we must do it well.
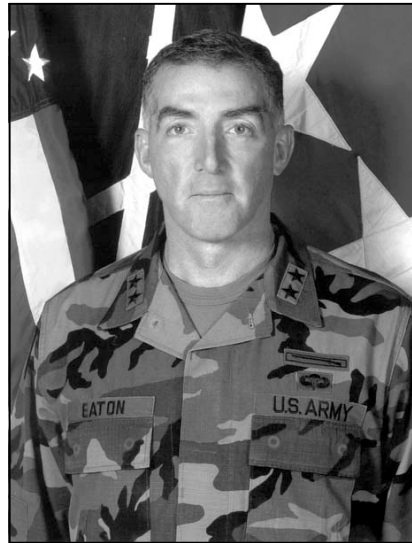
But when things get busy leading into the Last 100 Yards, the first thing we need to do is call for indirect fire…and that also needs to be by reflex. We've got to *apply* indirect fire and CAS planning to kill the target with anything from the M203 40-mm high explosive [HE] through 60-mm, 81-mm and 120-mm mortars into the artillery of 105-mm, 155-mm to MLRS [multiple-launch rocket system] to ATACMS [Army tactical missile system]—the entire panoply of indirect fires.

Part of the problem is we don't reward the use of indirect fires at our training centers well enough, particularly mortars. There's work to be done to replicate the real effects of fires in training. We have fire markers, but there is a delay.

In comparison, the soldier has immediate satisfaction when he lays a gun tube of some sort on a target and executes direct fire. He gets the kill indicator, the blinking lights, immediately.

Feedback on indirect fires for the attacking soldier in training is not quite as sophisticated. We're moving in the right direction, but we're not there yet.

In the Last 100 Yards, the 11B NCO looks to his lieutenant to arrange for killing fires from somebody else's asset, not just apply direct fires, and rightly so. This is particularly true of light infantrymen who can't carry all of the killing power available on their backs. As it is, every light infantryman carries two, three, four 60-mm mortar rounds to bring them into the area of operations. But he can't carry enough "stowed kills" to deliver all the effects he needs. We have to train our infantry lieutenants to call for and adjust indirect fires and captains to plan and execute indirect fires by reflex.

Q *What aspects of integrating and synchronizing fires and maneuver in the close fight make it so difficult?*

A In training when soldiers are pressing toward an objective, we shift from 155 to the 120 to 81, 60 and 40 to ensure the last thing the enemy sees is an indirect round before our infantryman is on him. The desired end state, of course, is to kill the enemy or render him unable to respond to our infantry assault. That takes practice.

We don't practice integrating and synchronizing fires in home station training often enough to execute them by reflex.

When Major General Dave Petraeus, CG of the 101st Airborne Division [Air Assault], was a brigade commander, he started "walk and shoot" home station training to practice those skills. He walked around the impact area and presented dilemmas to his leaders, for example how to take an objective in certain circumstances. Then he had indirect fire systems live fire to help the leaders take the objectives. This made the lieutenant or captain react immediately to a combat dilemma and execute

a fires and maneuver mission. [For more information on this training, see the article "Walk and Shoot Training" by Colonel David H. Petraeus and Major Robert A. Brennan, *Infantry*, January-February 1997.]

Q *What are the initiatives in the Infantry School to ensure the soldier uses indirect fires first?*

A The first thing we did was recognize we had a problem. Then we took a long look at three leader development courses: officer's basic course [OBC], captain's career course [CCC] and the precommand course [PCC]. What we found is that we focused a lot of training at the individual knowledge level as opposed to the application of fires—how to integrate fires with a maneuvering force that is constantly changing. For example, we were teaching the lieutenants how to call for and adjust fires and the captains indirect fire capabilities and the basics of static indirect fire planning. If you want to synchronize fires and maneuver in an overall fight, you've got to get beyond these "Skill-Level Two" tasks.

What did we change? In the basic course, we pared down the knowledge-based instruction and gave them disks with that information to study on their own. Now we focus on not only the call-for-fire and adjust fire tasks—because those are a big part of what they need to know—but also on risk estimate distances [REDs] and the concept of the spatial relationship between maneuver and fires so they can continue to echelon fires as they maneuver. The idea is to ensure the lieutenant understands indirect fire is not an afterthought when his initial reaction fails—indirect fire is *first*.

Also, we just opened our GUARD-FIST [guard unit armory device, full-crew interactive simulation trainer] facility and are exploiting its capabilities to train lieutenants to execute indirect fire missions. Before GUARDFIST, our only virtual simulation with indirect fire was the CCTT [close combat tactical trainer], which is great for collective training, but not ideal for what we are trying to teach the lieutenants.

We would like to institute walk and shoot training, but resources are an issue, in terms of ammo, time and indirect fire assets to implement the training. That's a long-term goal.

In the CCC, we raised the standards of our indirect fire instruction. We hold the students responsible for the information taught in OBC and encourage them to refresh their knowledge via the Internet. We've also reduced the classroom ratio from one instructor for every 200 students to one over 40 for the knowledge-based portion of indirect fire instruction. We focus the classroom instruction on concepts—echeloning fires, determining tactical triggers, working with REDs, determining what rounds will give them the effects they want, etc.—before they go into the execution phase in small group instruction. Certainly, these captains will have FSOs [fire support officers] to help them in their companies, but they're on their own during the course.

During small group instruction, the SGIs [small group instructors] train the captains to be rabid disciples of indirect fires. The captains have to plan operations for a variety of organizations, such as light infantry, mechanized infantry and SBCT [Stryker brigade combat team] infantry, in a number of different environments so they understand the factors that affect the fight, including direct and indirect fires. If they can't demonstrate the ability to integrate fires into their plans, they don't graduate.

The students also execute their plans using constructive simulations, such as Janus, BBS [brigade/battalion battle simulation], MPARS [the mission, planning and rehearsal system] and the developmental full-spectrum command [FSC]. Right now we are the only school with MPARS, a great new system championed by Lieutenant General [Richard A.] Cody when he was the CG of the 101st. Unlike Janus and BBS, MPARS provides students a virtual look or "fly through" capability during the fight as opposed to the old top-down God's eye view. It allows student company commanders to see their simulated infantrymen, tanks and Bradleys along with the effects of indirect fires as they fight—see the results of their planning, their execution of fires and maneuver, their decision making.

The key is to prepare them to employ not only mortars and artillery, but also Army aviation

and CAS—all forms of fires available to them—before committing their infantrymen. We are drawing on the recent experiences of our 75th Ranger Regiment's use of CAS in Afghanistan.

We also are using and continuing to develop FSC to provide an urban operations simulations program that's interactive virtual combat training against a thinking enemy, thanks to FSC's artificial intelligence capability. FSC allows students to employ company-level mortars, but we need more funding to fully integrate indirect fires, CAS and Army attack aviation—our major complaint about an otherwise excellent program.

We depend on simulations to train the synchronization of fires with maneuver in the schoolhouse and build the skills needed for combat. You can do all the planning and visualizing of time-distance factors "on paper" you want, but you must *see* and *direct* the dynamic synchronization of fires and maneuver repetitively to be able to do it in combat—recognize when things start to break down and practice resynchronizing them.

Q *How are you preparing brigade and task force commanders to better integrate all their available assets in combined arms operations—including indirect fires and CAS assets?*

A Not well. We only have them for two weeks before they go to Fort Leavenworth [Kansas] for the final part of PCC.

We've added a two-hour block of instruction on how to give commander's guidance for fire support. We also introduce them to essential fire support tasks [EFSTs] to allow them to communicate with their technical advisors, their FSCOORDs [fire support coordinators] and FSOs. These new commanders went to CGSC [Command and General Staff College, Fort Leavenworth] back in the mid-1990s, and the concept of the EFST wasn't even in "white paper" yet. I admit that two hours is not adequate if they are not already prepared.
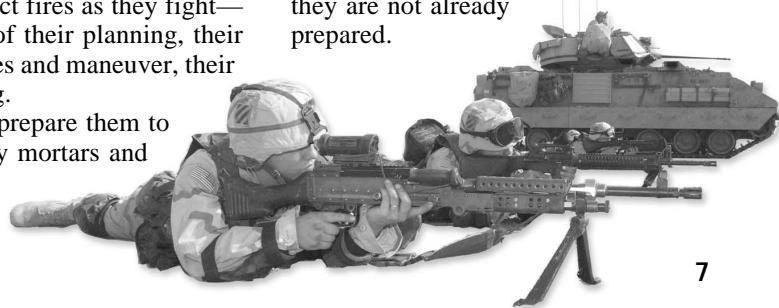
We are developing instruction for PCC students to teach them how to plan and conduct walk and shoot training at their home stations. Ideally, I'd like to resource a walk and shoot with lieutenants and captains playing all the fire support roles and align it with the PCC instruction as an observed execution event. But, again, this is a long-range goal.

Top priorities that will help commanders in home station training are increasing mortar STRAC [standards in training commission] allocations to resource walk and shoots and increasing STRAC for our family of full-range mortar training rounds. Walk and shoot training is becoming standard in our light divisions. The Field Artillery has been resourcing this training very well, but we are behind on mortar rounds. Right now, units have to "harvest" mortar rounds from individual and squad training to have only a few to fire during walk and shoots—not enough rounds to be effective.

We have rewritten our combined arms training strategy to recommend that any time a platoon or higher trains in any FTX [field training exercise] or LFX [live-fire exercise] that indirect fires be integrated—mortars and artillery. Our mortar STRAC recommendation will resource this strategy fully.

The family of full-range mortar training rounds will mitigate the limitations of training at our posts where the impact areas are either offset from our direct fire ranges or not adjacent to them at all. Because the rounds don't explode, they don't produce duds. The rounds will allow commanders to turn virtually any live-fire exercise into a CALFX [combined arms live-fire exercise] using organic mortars. We already have a full-range training round for 120-mm mortars with the 60-mm round being fielded as we speak; the 81-mm round is awaiting material release.

Q *Based on what you've seen in the news about Operation Iraqi Freedom and read in initial reports, did units apply indirect fires first?*

A Yes. The feedback is that units applied indirect fires far more agilely and at a faster pace than we've been used to seeing. We should note that these soldiers trained intensely and had the luxury of some pretty sophisticated live-fire training before they embarked on combat operations.

The 75th Rangers' ability to draw upon "over the shoulder" assets was very effective—hence, our interest in CAS and indirect fires.

Q *What subject haven't we discussed that we should?*

A We need to be able to employ CAS in infantry and armor formations when we don't have a TACP [a USAF tactical air control party]. We need to proliferate the TACP function so that when we don't have enough Air Force ETACs [enlisted tactical air controllers] in our ground force units, we can supplement with fire supporters trained in the ETAC skill sets.

Afghanistan showed that we need the ETAC function at much lower levels than we are resourced for. We already have most of the training tools needed to train fire supporters in that function, or they are inbound. We must train and do the hard work up front—not wait until we deploy our ground forces into combat when they'll need timely CAS.

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

A You're doing the Lord's work, and we appreciate it. To illustrate the infantryman's expectations for lethal indirect fires swiftly delivered, we recently had to deploy a mobile training team to field the 120-mm mortar to one of our divisions in Afghanistan because it did not deploy with artillery.

We absolutely must have a combined arms approach to prosecuting warfare. Indirect fires, in fact, are the American way of delivering killing power while the infantry closes on the objective.

★★

Major General Paul D. Eaton is the Chief of Infantry, Commandant of the Infantry School and Commanding General of Infantry Center at Fort Benning, Georgia. Currently, he is deployed to Iraq as the Commanding General of the Coalition Military Assistance Training Team (CMATT) under the Coalition Provisional Authority; his mission is to man, equip and train a new Iraqi Army and design a long-term plan for the development of the Iraqi armed forces. He commanded the 1st Brigade in the 3d Infantry Division (Mechanized) in Germany; 3d Battalion, 14th Infantry of the 10th Mountain Division (Light Infantry) at Fort Drum, New York; and C Company, 2d Battalion, 22d Infantry in the 8th Infantry Division (Mechanized), also in Germany. Additional assignments include serving as the Assistant Division Commander (Maneuver) in the 1st Armored Division, Germany, where he deployed to Bosnia in support of the Stabilization Force (SFOR); Deputy Commanding General of Fort Benning and Assistant Commandant of the Infantry School; Deputy Commanding General for Transformation at Fort Lewis, Washington; G3 (Operations) of the 10th Mountain Division during Operation Restore Hope in Somalia; and Executive Officer to the J3 of the Joint Staff at the Pentagon. He holds an MA in French Political Science from Middlebury College in Paris, France, and is a graduate of the Class of 1972 at the US Military Academy at West Point.

I n partnership with Major General Eaton, Major General Michael D. Maples, Chief of Field Artillery, is working to improve the integration of fires in the close fight. He is instituting a number of initiatives to improve the confidence and competence of leaders and fire supporters. These include "walking" shoots vice static call-for-fire training; increasing the rigor on instruction, such as in the two-day Light Fire Support Officer (FSO) Lane Training exercise for FA Officer Basic Course (FAOBC) lieutenants and 13F Fire Support Specialists; integrating close air support (CAS) into the mounted lane training for FAOBC lieutenants; increasing the realism of danger close indirect fires in bunker shoots for FAOBC lieutenants; increasing the tactical focus of the FA portions of the PreCommand Course; increasing the outreach to/interface with the Combined Arms Center (CAC), Combat Training Centers and Infantry School; and pushing for Infantry, Armor, Aviation and Engineer officers and NCOs to be assigned to the FA School to work on combined arms exercises and instruction.
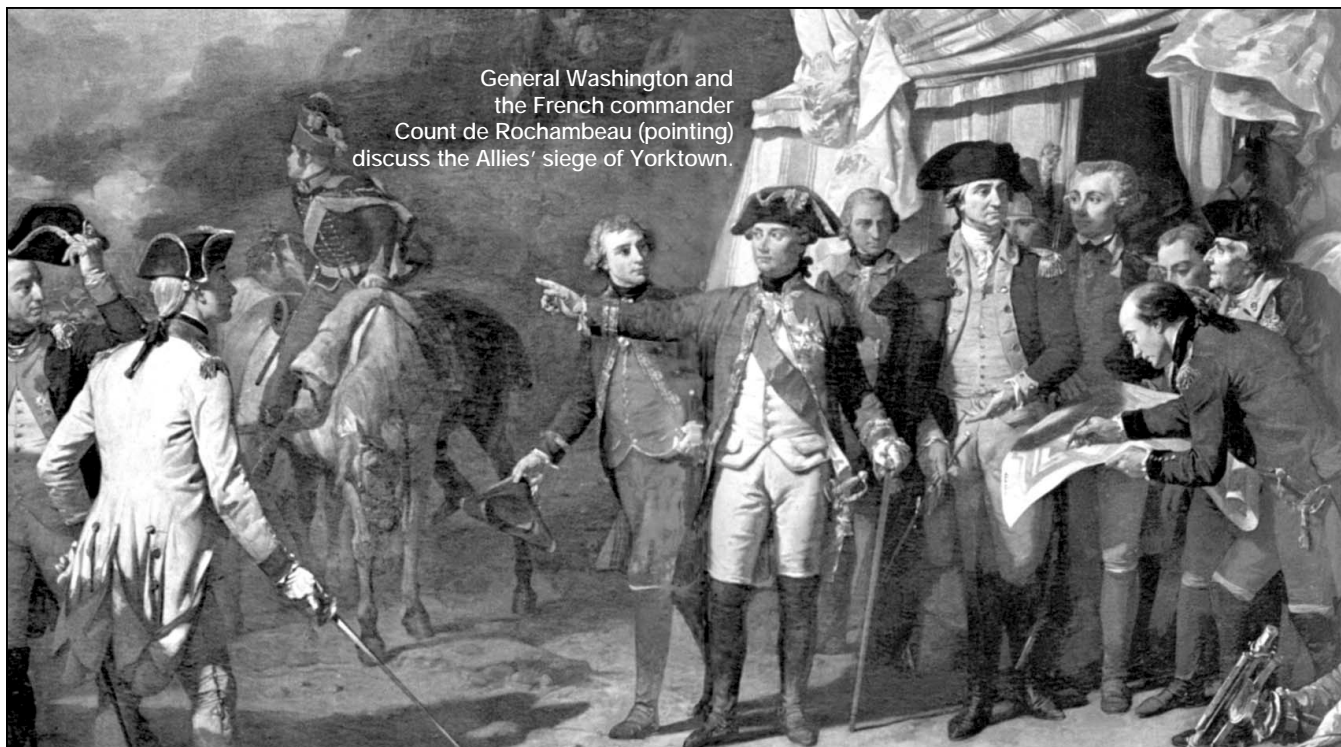
General Washington and the French commander Count de Rochambeau (pointing) discuss the Allies' siege of Yorktown.

Painting by Louis-Charles Auguste Couder, Musee de Versailles

THE SIEGE OF YORKTOWN

Joint and Multinational Operations in the American Revolution

By Captain W. Cochran Pruett

Currently and perhaps even more in the future, the US finds itself at the center of a coalition to fight a war against the enemies of freedom. Our military adheres to four basic tenets of multinational operations: respect, rapport, knowledge of partners and patience.[1] The Yorktown campaign in 1871 during the American Revolution provides the modern Redleg an excellent example of these principles and the effects that successful implementation can provide.

Background. General George Washington fretted in camp outside of New York. Although the French had promised men and money, they had not arrived. His army was dwindling. Completely frustrated with the lack of pay and supplies, his troops were near mutiny.

First Place

Meanwhile, a large British Army still held one of the most important cities in America, the port city of New York. Sir Henry Clinton, the Commander-in-Chief of British forces in America, re-

mained in the New York harbor. There he indulged in the good graces of his mistress and argued through letters with General Charles Cornwallis over the conduct of the war in the south.

Cornwallis had convinced the high command in Great Britain, largely through his political connections, that the focus of the British effort should be in the southern colonies. Despite several battlefield victories, he had been ineffective.

After the disastrous American defeat at Camden and recognizing the shift in British strategy, Washington had replaced Horatio Gates with his best general, Nathaniel Greene, as commander of American forces in the south. Greene took full advantage of the terrain and guerrilla warfare to delay, attrit and stifle Cornwallis' Army.
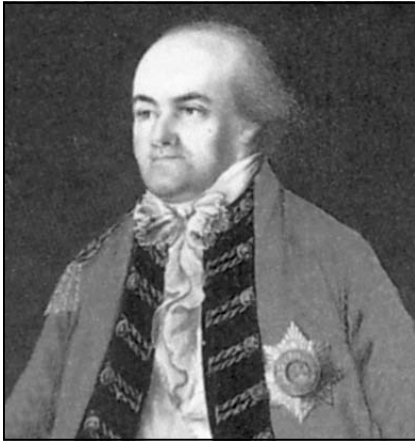
Lieutenant General Sir Henry Clinton, Commander-in-Chief of British forces in America

Cornwallis was dumbfounded with the efforts of Greene's militia under Thomas Sumter and Francis Marion against his supply lines, communications centers and isolated garrisons. He decided the best course-of-action was to march to Virginia.

To Cornwallis, Virginia was the center of the colonial war effort. Left untouched by the war, except for a few raids from the traitor General Benedict Arnold and the British artillerymen General Phillips, Virginia was the heart of the revolution.

Suffering from battlefield losses and detached garrisons, Cornwallis sought to link up with the forces of Arnold and Phillips that had been operating in Virginia. After inspecting the Virginia coast, he found a suitable and somewhat defensible port at Yorktown, a few miles from the old Virginia capital of Williamsburg.

Washington's young, confident and able subordinate, General Marquis de Lafayette, had done an admirable job of shielding the interior of Virginia from Cornwallis. Lafayette had learned from Washington's Fabian tactics and avoided and shadowed the British Army, steering it to the coastline. Meanwhile, the French Army under Rochambeau had arrived at Newport to reinforce Washington's Army in front of New York.

Lafayette and his troops were successful in protecting Virginia from attack by Cornwallis' Army. Cornwallis stalled in Yorktown. The rigorous tussles with General Greene in the south, the demonstrations of Lafayette, the ever-arriving orders from General Clinton and the need to resupply and refit his army with provisions via the British Navy all prevented Cornwallis from conducting offensive operations.

Initial Movements. Washington wanted nothing more than to act against New York, believing the British Army under Clinton was the enemy center of gravity. Understanding the intentions of the French Fleet, his French counterparts urged an attack into the south. Respectfully demurring, Washington abandoned his ideas against New York and built a deceptive plan to begin his march south without revealing his hand to Clinton in New York.

General Clinton realized too late that Washington and Rochambeau moved the American and French Armies south into Virginia with Cornwallis' Army as its objective. He promised Cornwallis reinforcements that would arrive much too late.

Washington understood the importance of the relationship with his French allies, particularly how the French warships would play an essential role in local naval superiority. Consequently, he fostered a brilliant relationship with the Count de Rochambeau, who was his superior in military experience. Because of Rochambeau's admiration for Washington and his appreciation of his abilities, he subordinated the French to American command.

Rochambeau was a man who was very intimate with the siege and the artillery. He had been a hero at the battle of Laufeldt, where he was wounded by grapeshot at the siege of Maestrich. He masterfully handled the siege artillery

Lieutenant General Charles Earl Cornwallis

during the capture of Fort St. Philip at Port Mahon.[2] Washington wisely and respectfully listened to the advice and counsel of the French, including Rochambeau, who were much more experienced with the complexities of naval/land combined operations.

Washington sent Colonel John Lamb's artillery from its station at Dobb's Ferry to King's Ferry on the west bank of the river and then to Philadelphia. Washington wrote in his diary, "As our intentions could be concealed one march more (under the idea of marching to Sandy Hook to facilitate the entrance of the French Fleet within the Bay), the whole Army was put into motion in three columns; the left consisted of the Light Infantry, First York Regiment and the Regiment of Rhode Island; the middle column consisted of the Parke, Stores and Baggage, Lambs Regiment of Artillery, Hazens and the Corps of Sappers and Miners; the right column consisted of the whole French Army, Baggage, Stores….This last was to march by Rout of Morristown…."[3]

On 31 August 1781, the artillery companies from West Point, under Major Sebastian Bauman, joined the main artillery train.

Fortunately, the alliance with France paid huge dividends with the French Naval victory over the British at the Battle of the Capes on 5 September 1781. This action pushed the British Fleet back to New York for repairs. With naval superiority achieved on 10 September, the heavy artillery was loaded onto Admiral de Battas' Fleet in order to link up with the main force farther south.[4]

Leaders and Guns. General Fredrich von Steuben, the hero and drillmaster of Valley Forge, was the American officer with the most siege experience under Washington at Yorktown. Well-rehearsed officers of the engineers and artillery also surrounded him. Such veterans of the sieges of Boston and Quebec included General Henry Knox, Washington's Chief of Artillery, and Colonel Lamb. Also present was the notable engineer, Louis Duportail.

Knox and Duportail formed an excellent liaison team with the French Naval forces under Admiral De Grasse. In fact, they and Washington persuaded the French admiral to stay in the York River, effectively sealing off the seaward route of retreat, despite the Admiral's worries of an attack by a combined British Fleet.
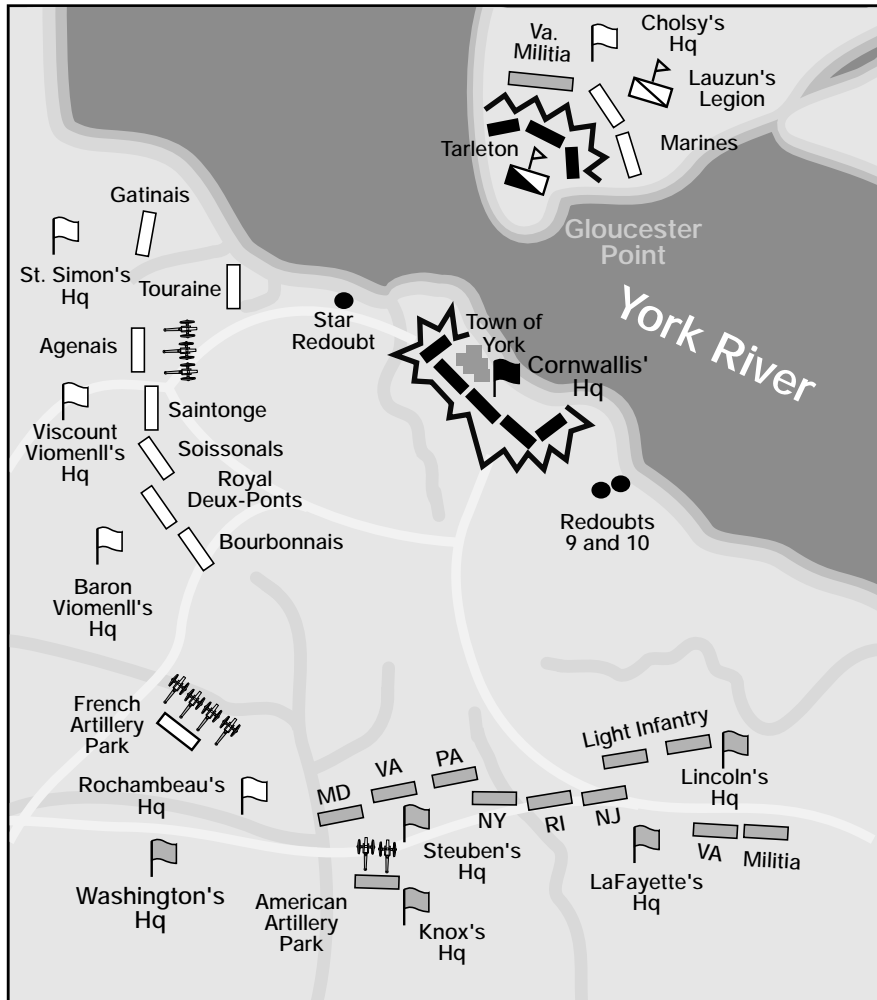
Siege of Yorktown, September 1781

The force of allied artillery under Washington and Rochambeau was considerable. General Henry Knox commanded two regiments of Continental Artillery consisting of 91 officers and 711 other cannoneers. The French train had six artillery companies.[5]

Lieutenant Colonel D'Aboville commanded the French Artillery. He was a seasoned veteran of the War of Austrian Succession and had proven his ability by being particularly distinguished during the Seven Years War.

Captain George Rochfort commanded the British Artillery at Yorktown. He had served near New York under General James Pattison, commander of the Royal Artillery in America, until his battery was selected to go south with General Cornwallis. He was a veteran of the most important British victory so far, the successful siege of Charleston. At Yorktown, Rochfort commanded 11 officers and 226 enlisted men in 14 batteries with 65 guns. Some of these pieces were iron naval 18-pounders served by officers and men of the

Charon, notably British Navy Lieutenant Bartholomew James.[6]

The Action. Unfavorable winds delayed the small French Fleet that sailed from Philadelphia under de Barras. However, the fleet with the siege guns

General Henry Knox, Washington's Chief of Artillery

arrived on the James River on 25 September 1781. Colonel Lamb quickly surveyed and selected the disembarkation site at Trebel's Landing. On 27-28 September 1781, the American and French Armies arrived and established themselves within a mile of the British prepared fortifications. This effectively sealed off the British from the landward avenues of retreat.[7]

Because of his relatively few troops and the difficulty of defending extended lines, Cornwallis, over the objection of some of his officers, withdrew from his outer works and closed in on the town of York.

Many historians and even some of his general officers criticized this move. However, considering the number of cannons at his disposal and, more importantly, the limited number of trained crews to operate the pieces, holding the outer works would not allow the mutually supporting cannon fires required to protect each battery along the line.

The outer works were arranged in a convex arc. On these outer works, the British Army stretched across frontal field works covering approximately 5,000 yards.

Enfilade fires were required for defensible batteries. Each battery needed at least six guns, each within a supportable range of at least 500 yards of another. This requirement alone created a minimum need for 10 cannon batteries of six guns each—60 cannons—to simply cover the main works. Redoubts and outer works also required cannons.

When the British withdrew to the inner works (approximately 2,000-yard frontage), they erected 14 batteries for its defense. They only had pieces and crews to service a total of 65 guns, which included the iron naval 18-pounders stripped from ships.

Cornwallis' withdrawal was most likely decided with advice from his artillerists and engineers and allowed the British Army to mount a much stronger defense against both assault and siege. It provided the best opportunity for his works and batteries to be effectively covered and supported by cannon fire. He must have counted on the howitzers and mortars to cover the dead space and main avenues of approach.

It is unlikely that the British had 60 12-pound cannons. Many of Cornwallis' cannons were probably smaller field guns with a less effective range, which increased the enfilade fire requirements and left batteries and works uncovered.

Knox wrote to his wife, "Yesterday [31 September 1781] the enemy evacuated their outposts, which gives us a considerable advantage in point of time. Our prospects are good, and we shall soon hope to impress our haughty foe with a respect for the continental arms."[8]

The first battery to open on the British works was a French battery of four 12-pounders and six mortars and howitzers. They pummeled the extreme right of the British line. The fusiliers' redoubt was a strong defensive work that anchored the British fortifications to the York River. The fusiliers began bombarding the British from a tree line at about 400 yards, within point blank range of 12-pound cannons.[9]

The effectiveness of the French 12-pounder at this range must have been tremendous. It would have fired a solid shot, a heavy case shot or a combination of both on the redoubt.[10]

A contemporary British artillerist and mathematician, John Muller, measured the effectiveness of a British 12-pounder at 600 yards range, using round shot, to hit its target (a screen six feet high; the rough equivalent of the redoubt height) and found it hit 100 percent of the time.[11] Therefore, it would be safe to assume that the French 12-pounder, at roughly 400 yards, with round shot would have a very high probability of hit.[12]

The gunner would have slightly elevated his piece to aim his round shot to land just over the top of the work (parapet). This allowed the remaining momentum of the cannonball to bounce and do hideous damage to heads poking up for a peek and possibly ricocheting into the redoubt itself before impacting the inside wall of the opposite face.[13]

The French Lieutenant Wiolhelm Graf von Schwerin, serving in the German contingent of the Royal Deux-Ponts Regiment wrote, "When we opened our first line of entrenchment, a lot of cannons were fired at us which did not do great damage…"[14]

In contrast, the French fire was effective, requiring the British to abandon the position. The French also succeeded in setting several British ships on fire in the harbor with red hot shot, a devastating blow to soldiers' morale.

In his general orders, Washington maintained patience and excellent control over his guns to ensure that no ammunition was wasted. He further insisted that all fire be held until all guns could be brought up and readied for action.
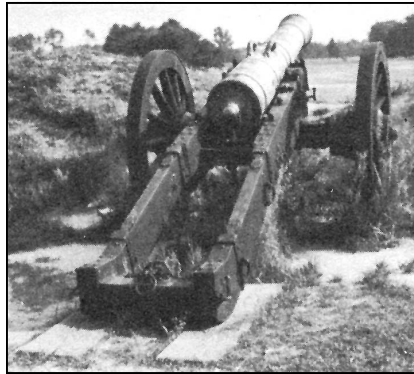
The French Lafayette 12-pounder, at roughly 400 yards with round shot, would have a very high probability of hit.

The officers personally sited the pieces for the greatest accuracy. Additionally, senior American artillerists rotated duty as artillery officer of the day. Colonel Lamb's day on watch was the day that General Washington lowered the slow match over the porthole and initiated the first American fires on the British works.[15]

Observing the effectiveness of American artillery fires, perhaps General Knox remembered his pre-war readings; therefore, he knew the increased effectiveness of mortars on fortifications if the angle of fire was increased. The British Artillery theoretician, John Muller, ironically suggested this technique,[16] and Knox took advantage by constructing mortar carriages that allowed them to be fired at a higher angle than the normal 45 degrees. These modified mortar carriages provided more downward force upon impact because of the increased angle of fall.[17]

The British Army desperately held to its works, bottled up in Yorktown by land and sea and suffering the effects of overwhelming Allied firepower. On 11 October 1781, General Cornwallis wrote to his superior commander in New York, "The enemy made their first parallel on the night of the 6th at the distance of 600 yards and have perfected it and constructed places of arms and batteries with great regularity and caution. On the evening of the 9th, their batteries opened and have since continued firing without intermission with about 40 pieces of cannon, mostly heavy, and 16 mortars…many of our works are considerably damaged; with such works on disadvantageous ground against so powerful an attack, we cannot hope to make a very long resistance."[18]

On the left side of the British lines were two advanced redoubts, Numbers 9 and 10. These redoubts anchored the left side of the British works to the York River. In order to force the British position, the Allied leaders knew they would have to take the redoubts. Furthermore, the redoubts quickly could be added to a second parallel siege line much closer to the main British works. This second parallel would make Allied artillery fire more effective at only 300 yards.[19] Therefore, Washington decided that a limited assault could secure this important objective.

Understanding the need to share the glory with his French allies, Washington picked troops from both armies to conduct the assault. On the designated night, Lieutenant Colonel Alexander Hamilton, a former artillery officer and the aide to Washington, was the field officer of the day and insisted on a command in the assault. General Washington granted the request. Hamilton would lead one of the battalions under Lafayette's overall command.

The rapid fire from six howitzers signaled the attack, and nighttime covered the movements. Bayonets were fixed, hearts were thumping and each man was straining his eyes to maintain sight of the soldier in front of him. They knew their mission was a difficult one, a "forlorn hope."

But it was a quick affair with few losses by the Allies and many British prisoners captured. The French and Americans celebrated their mutual victories over Redoubts 9 and 10 by working overnight to incorporate them into the Allied parallel.

With the addition of these positions, the noose had tightened on the British in Yorktown. Cornwallis knew his position was untenable. The British did salvage some of their honor by coordinating an effective assault to spike French guns under the cover of darkness. The guns were back into action almost immediately.

The British would not surrender without attempting an escape onto boats into the York River under the cover of darkness. Nevertheless, the winds and rain of a wonderful storm prevented their success. Under a slow drumbeat and a single British officer waving a white kerchief, a meeting was arranged, and the beginning of the end had arrived. Colonel Lamb commanded the artillery the day that Cornwallis beat a parley and signaled the ending of hostilities.[20]

Lessons for Today. What lessons can the Battle of Yorktown offer artillerymen today?

Exploitation, Liaison and Unity of Command. First, modern artillerymen can realize through an examination of the Battle of Yorktown the importance of effective joint and allied operations. Yorktown provides a great example of their effectiveness. This effectiveness can be summarized in three points: exploitation of advantages, effective use of liaison and the principle of unity of command.

Joint/allied operations capitalize on the capabilities and advantages that each arm of service and (or) allied force can provide. In the case of Yorktown, it was the naval superiority of the French that provided Washington the opportunity to trap Cornwallis' Army on the banks of the river at Yorktown.

The mobility and protection of transport vessels provided by the French Fleet allowed Washington to move many of his heavy siege guns by water. This allowed a speedy arrival of artillery material in theater and bypassed the enumerable problems associated with ground transportation over rough roads.

The understanding of cultural differences by the use of effective liaison teams and the stress on the unity of effort established by Washington mirrors current US Army doctrine on multinational operations.[21]

The Battle of Yorktown illustrates the importance and effectiveness of unity of command. It would have been easy for Rochambeau to control and coordinate the operational movement of his forces. However, he chose to place himself completely under the command of General Washington. When the British General O'Hara, out of shame, attempted to surrender to Rochambeau after Yorktown, he simply directed him to Washington, reflecting professionalism and the respect essential for unity of command.

General Knox wrote after the siege, "This important affair has been affected by the most harmonious concurrence of circumstances that could possibly have happened: a fleet and troops from the West Indies, under the orders of one of the best men in the world; an army of American and French troops marching from the North River—500 miles—and the fleet of Count de Barras, all joining so exactly in point of time as to render what has happened almost certain."[22]

Artillery and Engineer Efforts. The Battle of Yorktown, indeed the entire American Revolution, provides the modern Redleg numerous examples of the close coordination needed between engineering efforts and artillery fires. On both sides of the conflict, particularly at Yorktown, fields of fire were clear; embrasures, gabions, fascines, escarpments and platforms were constructed in order to bring the most effective fire against enemy positions.

Engineers designed and supervised the construction of the works. Artillerymen designed and supervised the destruction of those works—material and troops through cannon, mortar and howitzer fire. Engineers and artillerymen won the Battle of Yorktown, and consequently, the American Revolution, through effective synchronization and coordination of works and fires.

Urban Warfare. Perhaps most imminently applicable lesson we can learn from the Battle of Yorktown is Washington's approach to conducting warfare in and around cities. Washington, as it has been shown, used a detailed and systematic approach to the siege of Yorktown. His most important approach was to use well-coordinated and overwhelming firepower with limited, well-planned and well-lead assaults to seize key terrain. Firepower supported these assaults, and the terrain was then incorporated into the larger system of works.

It also should be noted that Washington assembled a massive force overwhelming in its numbers and strength at Yorktown.[23] In fact, this alone significantly contributed to the eventual capitulation of Cornwallis.

Particularly hopeful, recently our military leaders have expressed their reliance on such techniques.[24] Perhaps they've been studying their history as well.
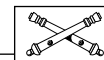
Captain W. Cochran Pruett is the Battalion Fire Support Officer, 1st Battalion, 101st Aviation Brigade (Attack), 101st Airborne Division (AAslt) at Fort Campbell, Kentucky, currently deployed to Iraq in Operation Iraqi Freedom. His other assignments include Commander of A Detachment and Executive Officer of the 1st Battalion, 19th Field Artillery, both in the Field Artillery Training Center, Fort Sill, Oklahoma, and Company Fire Support Officer (FSO) for the 1st Battalion, 9th Infantry Battalion, 2d Infantry Division in Korea. Captain Pruett holds a BA in History from Middle Tennessee State University.

Endnotes:

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2. Albert Durfee McJoynt, "Rochambeau," *Gorget & Sash: Journal of Early Modern Warfare,* 3 (1990). Available online at http://www.xenophongroup.com/mcjoynt/rochamb.htm.

3. John C. Fitzpatrick, Editor *The Diaries of George Washington 1748-1799: Vol. II, 1771-1785* (Boston: Houghton Mifflin, 1925), 257.

4. Isaac O. Leake, *Memoir of the Life and Times of General John Lamb* (New York: Da Capo, 1971), 277.

5. Robert K. Wright, Jr., *The Continental Army* (Washington, DC: US Army Center of Military History, 2000), 168.

6. James Pattison, "Official Letters of Major General James Pattison, as Commandant of the Royal Artillery in North America," *Collections of the New York Historical Society* (New York: 1875), 218. Brendan Morrissey, *Yorktown 1781: The World Turned Upside Down* (Oxford: Osprey, 2001), 26, 34. Burke Davis, *The Campaign that Won America: The Story of Yorktown* (Eastern National, 2000), 143.

7. Leake, 277-78.

8. Francis S. Drake, *The Life and Correspondence of Henry Knox* (Boston: Samuel G. Drake, 1873), 69-70.

9. The measurements of this approximate range were taken from *Plan de l'Armee de Cornwallis attaquee et faitte prisoniere dans York Town, le 19 8bre par l'Armee Combinee Francaise et Americaine…*Paris, Le Rouge, December 1781.

10. Major General Hughes shows that French guns would use both round and heavy case at ranges from 250 to 500 yards in Diagram 8: B.P. Hughes, *Firepower: Weapons Effectiveness on the Battlefield, 1630-1850,* Diagram 8 (New York: Sarpedon, 1997), 41.

11. Ibid., 37.

12. Ibid, 38. Hughes further shows that French pieces were considered more accurate than British ones due to the decreased windage. Muller's experiments with British six pounders on small targets (embrasures) at short ranges are particularly applicable. His findings show a 50 percent hit probability at 520 yards.

13. John Muller, *A Treatise of Artillery* (Ottawa, Ontario: Museum Restoration Service, 1965), 163.

14. Robert A. Selig, "Eyewitness to Yorktown," *Military History* (February 2003), 60.

15. Leake, 278.

16. Muller, 153-54. Muller also mentions that the French exercised this practice regularly. Knox may have learned it from them.

17. Burke Davis, *The Campaign that Won America: The Story of Yorktown* (Eastern National, 2000), 217.

18. Jeremy Black, *War for America: The Fight for Independence 1775-1783* (Stroud, Gloucester, Great Britain: Sutton, 1998), 270.

19. 300 yards was the estimate of Dr. Thatcher, an American surgeon in Richard Wheeler, *Voices of 1776: The Story of the American Revolution in the Words of Those Who Were There* (New York: Meridian, 1991), 400.

20. Leake, 280.

21. *JP 3-0, Doctrine for Joint Operations* (Washington, DC: Joint Staff, 10 September 2001), vi-2.

22. Drake, 70.

23. Washington had approximately 16,000 soldiers, not including militia, as compared to the 7,000 of the British, well over two-to-one odds in manpower alone.

24. Eric Schmitt and Thom Shanker, "US Refines Plan for War in Cities," *New York Times* (22 October 2002), 1.

SAVED BY ARTILLERY

How MG Lucas Lost the Initiative at Anzio and the Allied Artillery Regained It

By Captain Colin J. Williams

According to *FM 3-0, Operations*, "initiative is setting or dictating the terms of action throughout the battle."[1] Historically, units that lose the initiative rarely are able to recover and reassert themselves in combat against the enemy.

In the American and British invasion of Anzio, Italy, on 22 January 1944, the Allies in Major General (MG) John P. Lucas' VI Corps quickly lost the initiative to the surrounding German units. The Germans sent some of their best units to push the Allies back to the sea. They came close to succeeding. The conflict devolved into a costly defensive struggle characterized by an intense exchange of indirect fire. Due to effective counterbattery fires that met the five requirements for accurate predicted fire and the intelligent use of different firing techniques, the Field Artillery demonstrated FM 3-0's validity by turning the tables on the Germans.

How Lucas Lost the Initiative. The invasion of Anzio occurred on 22 January when the US VI Corps landed the American 3d Infantry Division and the British 1st Infantry Division on the Anzio-Nettuno beachhead. Enemy resistance was minimal, and by the day's close, the Allies had advanced seven miles inland. Over the next few days, Lucas allowed his division commanders to make piecemeal attacks by battalion or regiment.
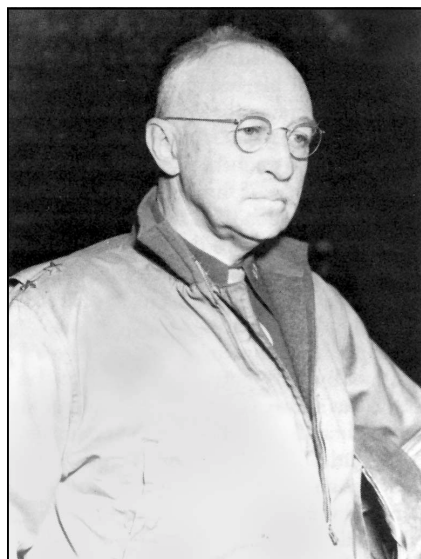
For example, Major General Lucian Truscott, the 3d Infantry Division Commander, had his forces conduct a reconnaissance-in-force on the town of Cisternia on 24 January. This reconnaissance failed to take the town, forcing Truscott to plan for a larger assault. On 26 January, four days after the Allies first landed, he ordered an assault by two battalions while a third battalion conducted a diversionary attack. Truscott backed this advance by division artillery fires and naval gunfire from one cruiser and two destroyers. After the Germans pushed this attack back, Truscott asked Lucas for the corps reserve (the 179th Infantry Regiment) to use in a corps-supported assault by his division. Lucas denied this request because he did not want any more attacks against the Germans until Combat Command A from Major General Ernest Harmon's 1st Armored Division had arrived.

Unfortunately, the wait for Harmon's tanks delayed a corps-level attack until the 29th of January.[2] When the attack did finally materialize, the reinforced German defenders were ready.

After several days of fighting, the Allies gained little ground. In mid-February the Germans counterattacked, causing more than 3,500 Allied casualties.[3] With the Germans now present in large numbers, Lucas feared his command would be pushed back to the sea. He placed his corps in a defensive posture and concentrated on building up combat power. This concentration ensured a successful supply system,[4] but it paralyzed his corps and surrendered all initiative to the German commanders.

Lucas' decision to attack with more later instead of with less now proved costly to the corps. Instead of forcing the Germans to react to the plans of VI Corps, VI Corps reacted to German initiative.

Lucas did not push off the Anzio beachhead partly because he had received conflicting guidance from his superiors, 5th Army Commander, Lieutenant General (LTG) Mark W. Clark and 15th Army Group Commander, General Sir Harold Alexander. Neither officer agreed with the other on VI Corps'

Major General John P. Lucas
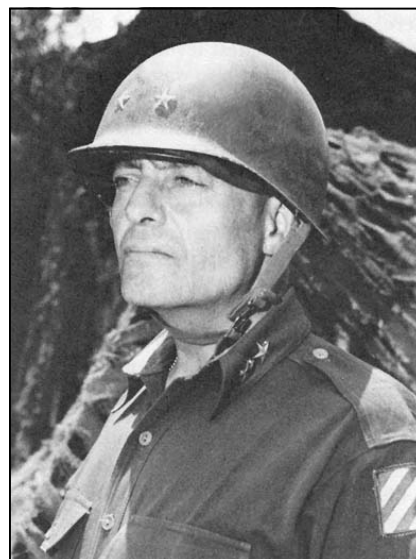
Major General Lucian Truscott

exact mission. Alexander wanted the corps to advance 25 miles inland to seize the Alban Hills, thereby threatening both Rome and the rear of the Germans defending the Gustav line (See the map.)

Clark, who had commanded the difficult Salerno invasion, wanted an advance on Rome but also felt that Lucas, as the senior commander on the ground, needed the flexibility to decide when and how far his penetration should go. His final instructions, therefore, ordered Lucas to "seize and secure a beachhead in the vicinity of Anzio" before an advance on the Colli Laziali (Alban Hills).[5]

Lucas, an experienced commander, was overjoyed to learn that he wasn't expected to take the Alban Hills. Although he respected Clark, he had less confidence in the operation's success than his superior did. Lucas foresaw his corps surrounded, attritted and cut off from supply lines if forced to advance that far inland.

As a corps commander, he did not have access to the Ultra intelligence used by high-level commanders like Clark. Lacking Ultra knowledge and depending upon information gleaned from unreliable prisoners of war, Lucas and his staff assumed that partly deployed enemy divisions on the Anzio beachhead had arrived at full strength. He feared that "they [the Germans] could build up faster than I could." While Field Marshall Albert Kesselring did surprise the Allied Command by having all or part of 11 divisions on the move in just six hours after the landing, Lucas still outnumbered his enemy.[6] Over estimation of the enemy's size combined with a confusing commander's intent from Clark caused Lucas to keep his corps dug in on the beachhead.

The Consequences. With the conflict at Anzio in a stalemate, the various branches of the Allied forces began to adapt their doctrine to match the changed style of war.

One change occurred in the 1st Armored Division. The topography, presence of villages and limited operational space did not suit tank warfare. Lieutenant Colonel (LTC) Schull, the commander of the division's 1st Armored Regiment, advised his subordinates that "care should be taken by all commanders to avoid committing more tanks than can be used effectively on the contemplated mission."[7]

Armored commanders began to use their tanks as artillery pieces. Platoons would either attach themselves to artillery battalions or fire as an independent battery. By allowing his armor to fight as artillery, Lucas wasted his best breakout-enabling asset in needless and minimally effective fighting. He had, in effect, surrendered initiative to the enemy.[8]

The loss of initiative also changed the types of missions fired by the corps artillery. Instead of targets of opportunity and preparations on objectives, the artillery had to shoot mostly harassment and destruction missions.

For example, the 698th Field Artillery Battalion (-) was general support (GS) tactical to the VI Corps Artillery. From 11 May to 4 June, the battalion fired 513 harassing missions out of a total of 746 (69 percent). During the same period, the battalion shot 54 destruction missions (seven percent) for a total of 567 (76 percent)[9]—numbers that prevent regaining the initiative. Furthermore, 698 FA had only large caliber pieces: four 240-mm howitzers and three 8-inch guns. Relying on large caliber weapons to shoot harassment and destruction missions increased the battalion's logistical train and took rounds away from counterbattery and other offensive missions.

A bigger consequence of the "inexplicable, hesitating conduct of the American VI Corps"[10] was that the Germans had time to build up their defenses, especially in artillery. Within a week or so, the Germans outgunned the Allies
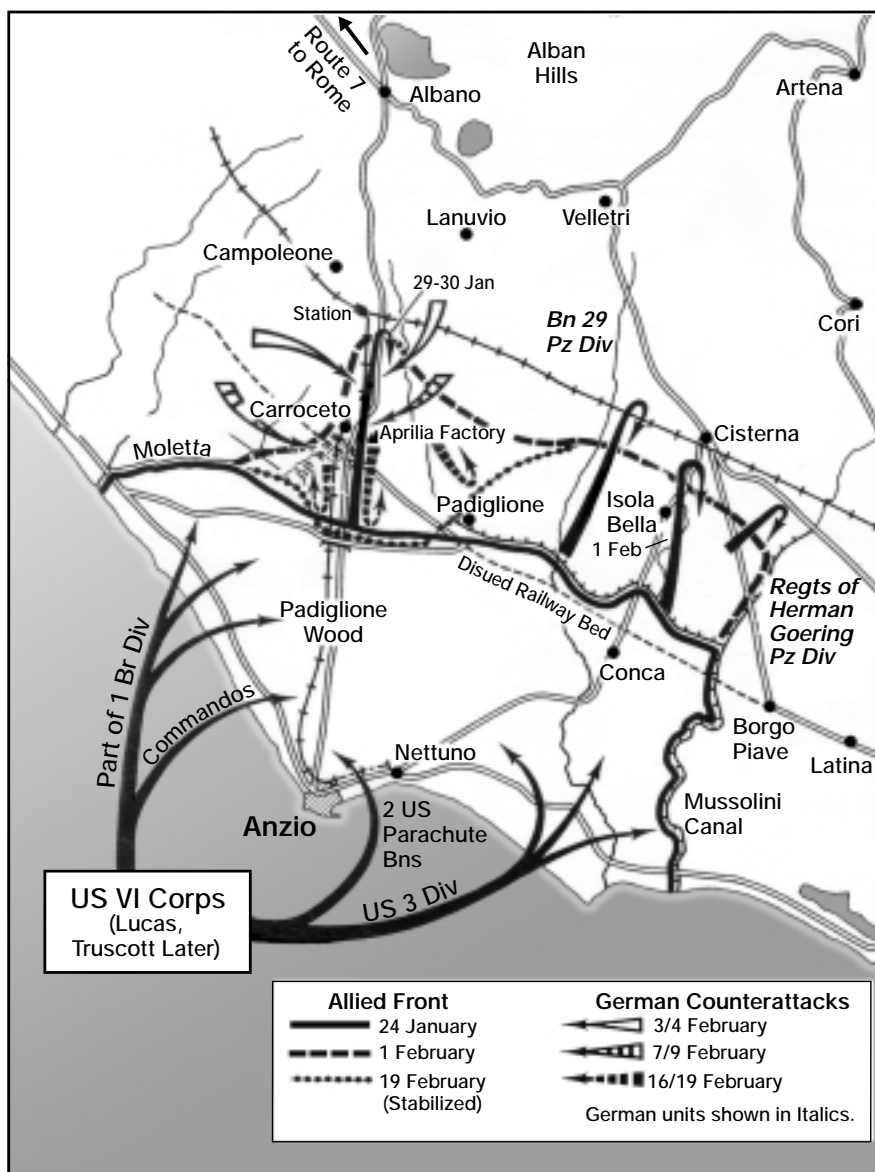
Anzio Beachhead, 22 January 1944– US VI Corps. The remainder of the British 1st Division stayed in ships off shore as a floating reserve. The US 1st Armored and 45th Infantry Divisions were follow-up reserves.

US 240-mm Howitzer

US 8-Inch Howitzer
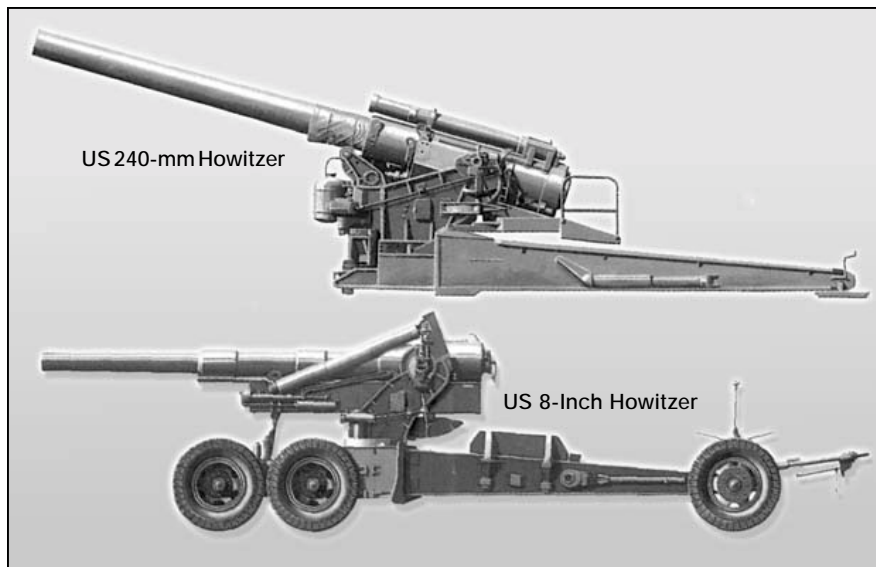
both in number of pieces and caliber.[11] The enemy dug his guns and gun crews into naturally good fighting positions while Lucas lost the initiative as he built up combat power on the beachhead.[12]

The Germans also made good use of the buildings in the towns of Carroceto and Aprilia. From these buildings, German observers could see the entire Allied position and direct fire onto it with ease. In order to move unobserved in daylight over the flat, open terrain, the British and Americans had to fire intense smoke screens to obscure themselves from the enemy.[13]

German observation posts (OPs) proved especially effective before German counterattacks when observers directed fire on the defending Allied forces. VI Corps soldiers suffered from German artillery fires because Lucas did not push fast enough, strong enough and early enough to seize the high ground.

How the Artillery Regained the Initiative. After four months of stalemate on the beachhead, the Field Artillery enabled the 3d Division to resume offensive operations at Anzio. Major General Truscott, the new VI Corps commander, called for a conference on how to improve the effectiveness of counterbattery fire. This conference resulted in the splitting of the beachhead into two separate (but collocated) counterbattery offices.

Brigadier General Frederic B. Butler, the Assistant Corps Commander, staffed these offices with a handful of junior Field Artillery officers and one major. He dedicated several battalions to each office in order to decrease response time.[14]

These changes, with help from the Allied air corps, limited the effectiveness of the extremely well dug-in German artillery. While the constant air cover forced the enemy to take cover and abandon his weapons, rapid counterbattery destroyed the enemy's fire control and command telephone networks.

In addition to improvements in counterbattery procedures, the Allied artillery leadership used the pause in movement to increase the accuracy of corps and division artillery fires. They improved the accuracy of target location and size by manning OPs when and wherever possible. Throughout the campaign, the Allied artillery shot a large percentage of its fire missions with observers. During the 3d Infantry Division's attack on Cisterna on 31 January, 630 of the 1,216 fire missions were observed (52 percent).[15]

Even when not on the attack, the Allies managed to post observers. The 3d Infantry Division's artillery shot 55 percent of its fire missions with observers in February, 49 percent in April and 53 percent in May.[16] Comparatively, the US XV Corps, fighting in a static campaign around Strasbourg from 26 October to 22 December 1944, fired a mere 17.75 percent of its missions with observers. As the corps switched to purely defensive operations from 22 December to 13 March 1945, the percentage increased to 24.72 percent but fell to 12.19 percent during the 13 to 22 March offense.

Although not a perfect comparison, a study of World War II gunnery practices in the European Theater used XV Corps artillery numbers as a basis for its recommendations.[17]

Throughout the 3d Division battle, forward observers (FOs) like First Lieutenant (1LT) Donald E. Knowlton of the 160th Field Artillery Battalion, showed many examples of heroics. Knowlton refused to retreat from his OP during an enemy attack on the town of Aprilia. When two German soldiers entered the abandoned building he was using for his OP, Knowlton shot them dead with his carbine. With more enemy approaching and assuming that all was lost, he called for fire on his own location. Immediately after this call, a German shot Knowlton in the head. As Germans approached the injured Knowlton, the rounds that he called for impacted. Scared by the fire, the Germans left Knowlton alone. Later that day, Allied forces counterattacked and recovered the injured observer.[18]

In addition to OPs, leadership also stressed using shell reports for target location. According to LTC Prichard, the 68th Armored Artillery Battalion's commander, shell reports "proved very helpful in counterbattery work."[19] For the final breakthrough on 23 May, the Allies conducted extensive reconnaissance of enemy positions to plan, not just template targets.

Allied Field Artillery battalions used both survey and meteorological reports (Met) to ensure accurate battery locations and account for the variances in the atmosphere. According to LTC Prichard, his battalion fired noticeably more accurately with Met data applied.[20]

During the Army Ground Forces Board report of 24 April 1944, Colonel (COL) L. S. Griffing suggested codifying some techniques used by artillery units at Anzio. Suggestions included accounting for the fact that smoke is a heavier projectile than high explosive (HE) and supplying units with more timepieces (stopwatches).[21] The increased accuracy obtained by measures such as these enhanced the artillery's lethality in a fight where success turned, in part, on the artillery's lethality.

In addition to increased accuracy and improved counterbattery fire, the Allied artillery hurt the enemy by effectively using time-on-target (TOT) fires, time fuzes and HE followed by white phosphorus (WP) fires. Captain (CPT) L. E. Weisenburg, Jr., 10th Field Artillery Battalion, found HE followed by WP effective in defeating the enemy's tactic of infiltration. When a platoon of 20 Germans infiltrated at night in between a parachute troop and units from

the 7th Infantry Regiment, small arms, machine guns and HE rounds failed to dislodge them. HE followed by WP worked.[22]

Perhaps the factor contributing the most to artillery success in regaining the initiative was the massive number of FA rounds fired. Many of these rounds were fired in massed missions where several different firing units fired at the same target at the same time.

In the early fighting, the Allies massed by combining fires from several battalions. For the 15th Infantry Regiment's attack on 31 January, for example, three Field Artillery battalions fired intense preparatory fires on the enemy.[23] Later in the campaign, however, massing occurred at the corps level. When a corps piper cub pilot spotted 2,500 German soldiers massing for an attack against the American sector of the beachhead, his call-for-fire was answered in less than 12 minutes by 224 British and American guns. The guns kept firing on remnants of the enemy force for 50 minutes, breaking up the attack before it occurred.[24]

During the German counterattack that started on 16 February, the Allies fired approximately 65,000 rounds on the first day and 45,000 and 25,000 rounds during the next two days.[25] When this German attack failed, Lucas in the last few days of his command, counterattacked on 19 February. The Allies attacked with a regiment of infantry and a regiment (-) of armor. This force was preceded by fire from eight British Field Artillery regiments, eight Field Artillery battalions from corps artillery, naval gunfire, 90-mm anti-aircraft gunfire used in indirect fire, 132 fighter bombers and 92 medium bombers.[26]

Due to this massive indirect fire support, the attack succeeded in capturing a key road intersection south of Aprilia. More importantly, it stopped the counterattack and blunted the enemy's initiative. The Germans lost 5,389—killed, wounded and missing—plus 609 prisoners during their five-day counterattack.[27] Shell fragments from British and American artillery accounted for 75 percent of these casualties.[28]

From 14 February on, the Allies fired approximately 20,000 rounds a day as compared to 1,500 for the Germans. Of course, these round counts exclude naval gunfire shells and the weight of munitions dropped by Army air forces. The resupply capabilities of the British and American forces proved their worth at Anzio.

Lessons Learned. Anzio stands as an example of how artillery can take initiative away from the enemy at the operational level. The outstanding lessons learned from the conflict still apply today.

First, meeting the five requirements of accurate predicted fire increases artillery lethality. Second, the timeliness of counterbattery fires can turn a defensive fight into an offensive one. Third, the use of smoke and WP munitions increases a commander's options on the battlefield. Finally, artillery is at its most effective in mass missions, especially when supported by planned naval gunfire and aviation.

As an experienced maneuver commander, MG Lucas must have realized the capability of his indirect fire branch. Unfortunately, he did not see the operation as an artillery officer would have seen it. If Lucas had fought the battle with an artillery point of view, he would have taken the high ground and pushed forward until his rear echelon was out of range of enemy artillery. If Lucas had understood the artillery, he would not have had to be saved by artillery.
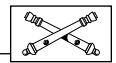
Captain Colin J. Williams is the S4 Supply Officer in the 2d Battalion, 17th Field Artillery, 2d Infantry Division in Korea. Prior to that, he was the Fire Support Officer (FSO) for A Company, 3d Battalion, 327th Infantry, and Fire Direction Officer (FDO) and Executive Officer in C Battery, 2d Battalion, 320th Field Artillery, all in the 101st Airborne (Air Assault) Division, Fort Campbell, Kentucky. Captain Williams is a graduate of the Field Artillery Captains Career Course, Fort Sill, Oklahoma, and the Combined Arms and Services Staff School at Fort Leavenworth, Kansas. He holds a BS in Military History from the US Military Academy at West Point.

Endnotes:

1. *Field Manual (FM) 3-0, Operations* (Washington, DC: Department of the Army, 2001), 4-15.
2. According to Carlo D'Este, Lucas should have attacked no later than 26 January. On 26 January, the Allies had approximately 41,000 troops while the Germans had 43,700. Carlo D'Este, *Fatal Decision: Anzio and the Battle for Rome* (New York: Harper Collins, 1991), 146, 450.
3. Total German losses were more than 5,000. William L. Allen, *Anzio: Edge of Disaster* (New York: Talisman/Parrish Books, 1978), 115.
4. Lucas had his supply vessels dock at mobile piers. Trucks loaded with a single class of supply would roll off to a pre-designated site on the beachhead. Lucas had these trucks cross-loaded on ships to prevent a shortage in one particular class. Convoys would load in Naples, sail and unload in less than two days. Ibid., 51.
5. Ibid., 43.
6. Lucas expressed his fear in his diary on 1 Feb 44. By that time, the Germans had managed to send about 90,000 troops to Anzio. Clark, however, reinforced Lucas to a strength of 100,000, giving him more than the Germans. Ibid., 84.
7. *Comments on Anzio Operations by Various Commanders of Units of 1st Armored Division*, (Morris Swett Technical Library, Fort Sill, 1944), text-fiche, 8.
8. According to LTC Schull, firing as artillery gave his "medium tankers something 'effective' and interesting to do." Lucas needed his tankers to be offensive, not just effective. Allen, 6.
9. If measured by the number of rounds instead of missions, the numbers are 2,952 out of 5,215 rounds fired in harassment missions (57 percent) and 796 rounds fired in destruction missions (15 percent). *The 240-mm Howitzer Battalion and the 8-inch Gun in a Mobile Situation* (Morris Swett Technical Library, Fort Sill, 1944), text-fiche, 5.
10. Walther Kuhn, *The Artillery at Anzio-Nettune* (Privately printed, 1947), 10.
11. By 4 February 44, the Germans had 372 pieces, with many of these having large caliber. By 16 February 44, the Germans had 452 pieces as compared to the Allies' 432. A*nzio Beachhead, 23 January-25 May 1944* (Washington, DC: Center of Military History, 1990), 51, 70. The German division artillery was organized into two Panzer regiments, six full artillery regiments and three partial artillery regiments. The German headquarters artillery consisted of four 100-mm guns, eight Italian 100-mm guns, 18 170-mm guns, three French 220-mm guns,

two French 240-mm guns, two 280-mm railroad guns, 20 150-mm howitzers, eight self-propelled howitzers, 36 150-mm mortars and 21 210-mm mortars. Kuhn, Appendix A.
12. L. S. Griffing, *Army Ground Forces Board of 15 July 1944*, (Morris Swett Technical Library, Fort Sill, 1944), text-fiche, 8.
13. MG Kuhn, a German artillery general at the battle, recalled that the towns of Cisterna and Carroceto were "still 70M above sea level, so that excellent ground observation toward the coast is everywhere possible." Kuhn, 2.
14. Griffing, *Army Ground Forces Board of 21 April 1944*, (Morris Swett Technical Library, Fort Sill, 1944), text-fiche, 3-4.
15. *Anzio Beachhead*, 33.
16. The division did not tally the number of observed fire missions in March. "3d Infantry Division Report of Operations," *Historical Documents of World War II* (Morris Swett Technical Library, Fort Sill, 1944), text-film, Roll 81, Document 1181, 5, 8, 14.
17. *Report on Study of Field Artillery Gunnery, #6* (Headquarters, European Theater of Operations: General Board, US Forces Europe), 27-28.
18. *Anzio Beachhead*, 72.
19. *Comments, 1st Armored Division*, 4.
20. Ibid.
21. Other suggestions included announcing "splash" to observers five seconds before impact, combining the roles of horizontal control officer and vertical control officer, and turning aiming post lights on and off by yanking on a wire attached to switches. Griffing, *Board of 21 April 1944*, 21-22.
22. Ibid., 21.
23. Fires came from the 39th Field Artillery Battalion, the 69th Field Artillery Battalion and the 1st Battalion, 77th Field Artillery. *Anzio Beachhead,* 33.
24. Ibid., 81.
25. Kuhn, 13.
26. *Anzio Beachhead*, 86.
27. Ibid., 87.
28. This percentage comes from a report filed by General Eberhardt von Mackensen to Kesselring on 28 February 1945. Ibid., 89.

Three Men of Gettysburg

A Study in Civil War Battery Command

By Captain Brian C. Hayes, ARNG

By July 1863, the artillery of the Army of the Potomac had evolved into a large and powerful force. It was well trained, well equipped and well led by Brigadier General Henry J. Hunt. Like all large military organizations, however, the Army's artillery was a complex organism made up of many subordinate units, each with different experiences and abilities. In the first days of July 1863 as the Union and Confederate armies converged on Gettysburg, Pennsylvania, it was ultimately the performance of individual batteries that determined the success of the Union Artillery.

Sixty-seven Union batteries took the field at Gettysburg, and many commanders served with distinction.[1] This is a story of three of those commanders. They are included not as the most outstanding or most typical but because together their experiences mirror the structure of the battle and illustrate its lessons for today's Field Artillerymen. Each commanded an artillery battery at a decisive point on the field on one of Gettysburg's three bloody days. One survived the trial by fire; two died at their guns. From their stories, a portrait emerges of the challenges and horrors of battery command at the fiercest moments of the American Civil War.

1 July 1863: Captain Hubert Dilger, Battery I, 1st Ohio Light Artillery. Hubert Dilger, a former officer in the Army of Baden, brought both experience and expertise to Gettysburg. Having already served as a professional

Third Place
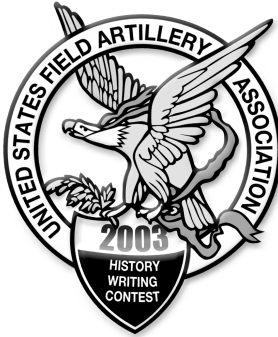
soldier in his native Germany, Dilger adjusted rapidly to North American warfare and distinguished himself at Second Manassas and Chancellorsville.[2] His third major action began on the afternoon of 1 July in the fields north of Gettysburg College.

Dilger's battery of six 12-pounder Napoleons fired in support of the XI Corps' Third Division as it opposed Robert Rodes' attack. His gunners quickly silenced one Confederate battery and then continued to fire in support of the surrounding Union infantry.[3] When newly arrived Confederate rifled guns resumed counterbattery fire, Dilger called for and received an attachment of four Union 3-inch rifles (William Wheeler's 13th New York Battery).[4] Thus reinforced, Dilger's battery remained in action until Confederate infantry flanked the XI Corps line and made the Union artillery's position untenable.[5]

Dilger's performance at Gettysburg shows him to be an intelligent battlefield leader and a highly proficient artilleryman. His report of the 1 July action is remarkable for its clarity (with one notable exception) and its attention to technical and tactical concerns.[6]

Dilger had received orders to personally select his initial position, an unusual degree of independence for a battery commander and a mark of the confidence his superiors placed in his judgment.[7] Reinforced by Wheeler, Dilger commanded a mixed two-battery formation, combining smoothbore and rifled guns. He skillfully deployed the different pieces so as to take advantage of each one's strengths. At Dilger's direction, Wheeler suppressed the Confederate rifled guns; Dilger then aggressively moved his Napoleons forward to achieve greater effects on the Confeder-

Captain Hubert Dilger

ate infantry.[8] In both advance and with-drawal, Dilger was able to maximize the effectiveness of both batteries, bounding sections forward while positioning others in overwatch.[9]

Throughout the day, Dilger was conscious of the importance of effectively managing his ammunition. "During the whole engagement," he wrote, "three of my caissons were always employed to carry ammunition, and as slowly as I directed the fire, we were twice nearly out of ammunition."[10] With limited supply and heavy firing, this savvy use of caissons was critical to ensure that the division's infantry never found themselves without support.

Dilger's mastery of the artillery profession extended to the technical as well as the tactical. He expressed frustration with the lack of reliability of fuzes for the 12-pounder shell and spherical case and concern about the safety and effectiveness of fuzes for the 3-inch rifle. His discussion of the subject ends with emphasis on the limitations imposed by these deficiencies and a practical temporary solution of firing only percussion shells.[11]

Careful selection of firing positions, effective displacement, wise management of ammunition, knowledge of the capabilities of his weapons and a thorough understanding of the technical problems of contemporary artillery—today's artilleryman would easily recognize these as fundamentals of successful battery command. Dilger's professionalism set a standard that is still valid today.

2 July 1863: First Lieutenant Charles E. Hazlett, Battery D, 5th US Artillery. The fierce defense of Little Round Top by Lieutenant Colonel Joshua L. Chamberlain's 20th Maine Infantry is one of the best-known and most celebrated episodes in American military history. Less recognized is the heroic labor of First Lieutenant Charles E. Hazlett and Battery D, 5th US Artillery, in action less than 300 yards from the 20th Maine in the late afternoon of 2 July.

Hazlett's gunners, part of the V Corps Artillery Brigade, had the unenviable task of occupying a position on Little Round Top's rock-strewn summit. Because of the terrain, the battery's horses were able to pull only one of the guns directly into position. To move into battery, Hazlett's men had to unlimber the five remaining guns below the crest of the hill and drag them up by hand.[12] Like the guns, ammunition and water

Lieutenant Charles E. Hazlett

had to be hauled up from a point that the limbers and wagons could reach—on a July afternoon that was painfully hot to soldiers in wool uniforms.[13]

Despite these challenges, the battery established firing capability within minutes of arriving in position.[14] Throughout the gunners' toil, Hazlett was "with whole-souled animation encouraging our men and pointing toward the enemy amidst a storm of bullets[.]"[15]

Sadly, Hazlett did not live to see the Union triumph on Little Round Top. A few minutes after opening fire, he was fatally shot through the head, and he died several hours later.[16]

His gunners' efforts, however, were not in vain. As Battery D went into action, the Confederate brigade of Brigadier General Henry L. Benning had already attacked and overrun the Union strongpoint in Devil's Den. The hastily prepared defense of Little Round Top, however, closed the door to any Confederate exploitation of initial success.

As Benning described it, "The enemy on the mountain itself [Little Round Top] was in a position which seemed to me almost impregnable to any merely front attack even with fresh men. In-

deed, to hold the ground we had appeared a difficult task. The shells of the enemy from the adjacent mountain were incessantly bursting along the summit of the peak."[17] The agony of Hazlett's men—dragging guns and ammunition up a rocky slope in searing heat—had proven worthwhile.

Military leadership is the art of convincing soldiers to do the unpleasant, uncomfortable and dangerous. Nineteenth-century artillerymen worked hard under normal conditions, but the challenges facing D Battery, 5th US were extreme. Hazlett's legacy is that he inspired his soldiers to rise to the occasion.

3 July 1863: First Lieutenant Alonzo H. Cushing, Battery A, 4th US Artillery. The morning of 3 July found First Lieutenant Alonzo Cushing's battery of six 3-inch ordnance rifles positioned behind a low stone wall on Cemetery Ridge—almost directly atop the primary objective of Confederate Major General George E. Pickett's assault. As the Confederate attack unfolded, Cushing's battery was at the center of one of the most ferocious artillery fights of the Civil War.

The battery's ordeal began before 0800 on 3 July when Confederate shells smashed into its position. A direct hit blew up one of the battery's limbers; secondary explosions touched off two others.[18] Although Union counterbattery fire ended this first exchange, rebel artillery fell on the battery's position three more times over the next three hours.[19]

A two-hour pause ensued, during which Cushing's men readied additional ammunition and ate. Then, shortly after 1300, the Confederate artillery reopened with nearly 150 guns concentrating against Union positions on Cemetery Ridge.[20]

The effects of the Confederate bombardment on the exposed Union batter-

View from Lieutenant Hazlett's Position on Little Round Top

ies were appalling. Colonel Norman Hall, a II Corps brigade commander who had survived ambush in the West Woods at Antietam and the attack on Marye's Heights at Fredericksburg, was nevertheless horrified as he watched the corps artillery brigade suffer under withering Confederate fire.

"The experience of the terrible grandeur of that rain of missiles and that chaos of strange and terror-spreading sounds, unexampled perhaps in history, must ever remain undescribed, but can never be forgotten by those who survived it. I cannot suffer this opportunity to pass without paying just tribute to the noble service of the officers and men of the batteries that were served within my sight. Never before during this war were so many batteries subjected to so terrible a test."[21]

Cushing's battery bled heavily under the bombardment. A shell smashed a wheel on the number 3 gun carriage, prompting the crew into near panic. Cushing, with pistol drawn to keep the gun's crew from fleeing in terror, directed the gun's repair under fire. Casu-

Union
12-Pounder
Napoleon

Union 3-Inch
Ordnance Rifle

Lieutenant Alonzo H. Cushing

alties began to mount as Confederate fire struck men as well as material. As Cushing's gunners continued to fall, the young lieutenant—himself wounded in the right shoulder and groin, vomiting from the pain—shuttled in borrowed infantrymen from the 71st Pennsylvania to keep his guns manned.[22]

As Confederate infantry moved to the assault, Cushing directed two guns forward to the stone wall that marked the forward edge of the Union battle position. Cushing, now the lone officer in the battery, stepped up to help crew one of the guns. As he fired the battery's last canister round into the charging gray line, a bullet severed his brain stem, killing him instantly.[23]

First Lieutenant Cushing's fate is a reminder that the artilleryman is first and foremost a warrior. Although artillery officers share many of the responsibilities of all walks of life and branches of military service—training, maintaining, administering and motivating—the combat arms soldier's profession is fundamentally different from any other. Technical prowess and hard work are

insufficient. Today's artillerymen, like their predecessors, must be prepared to fight and die at their guns.

Conclusion. Technical and tactical proficiency, leadership and courage under fire—these qualities are as vital today as in 1863. When considering these commanders, it is important to remember that they were not perfect officers or supermen. Dilger, for example, misidentified his location on the battlefield (See endnote 4), and Hazlett expressed concern about having drawn such a difficult assignment.[24] Instead, they were talented but ordinary men, rising to meet the challenges of extraordinary times.

Their frailties do not diminish the value of their example. On the contrary, they make the experiences of Dilger, Hazlett and Cushing more real to today's artillerymen. As Redleg captains struggle to be the best battery commanders they can be, they should remember that on an old foundation—professionalism, strong leadership, and moral and physical courage—they can continue to build batteries that will meet the challenges of combat.
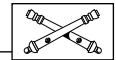
Captain Brian C. Hayes, Army National Guard (ARNG), is the Commander of B Battery, 1st Battalion, 246th Field Artillery, located at Chatham, Virginia, as part of the 29th Infantry Division (Light). Prior to that he was a Fire Support Officer and Assistant Battalion S3 in the same battalion. Before transferring to Field Artillery, he was an active duty Armor officer in the 1st Armored Division, stationed at Fort Riley, Kansas. Captain Hayes is a graduate of Princeton University ROTC; Airborne School at Fort Benning, Georgia; and the Field Artillery Captains' Career Course at Fort Sill, Oklahoma. In his civilian profession, he is a Law Student at the College of William and Mary in Williamsburg, Virginia.
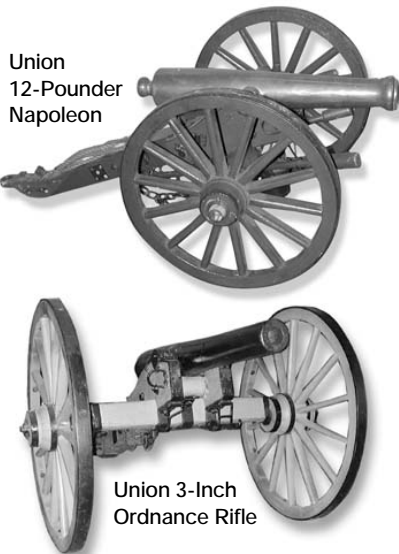
Endnotes:

1. L. Van Loan Naisawald, *Grape and Canister: The Field Artillery of the Army of the Potomac, 1861-1865* (New York: Oxford University Press, 1960), 556.
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6. Pfanz correctly points out that Dilger confused his location in the report, erroneously writing that he was posted between the Baltimore and Taneytown roads. Pfanz, 407 (note 31).
7. Naisawald, 355-356.
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10. *The War of the Rebellion: The Official Records of the Union and Confederate Armies,* Vol. XXVII, No. 1, (Washington, DC: US Government Printing Office, 1883), 754.
11. Ibid., 755.
12. Pfanz, *Gettysburg: The Second Day* (Chapel Hill: University of North Carolina Press, 1987), 224.

13. It was hot enough during the fight at Little Round Top that COL William C. Oates, commanding one of the attacking Confederate regiments, was overcome and had to relinquish command. *Official Records,* Vol. XXVII, No. 2, 393.
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16. Pfanz, *Gettysburg: The Second Day,* 240.
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19. Earl J. Hess, *Pickett's Charge: The Last Attack at Gettysburg* (Chapel Hill: University of North Carolina Press, 2001), 116.
20. Ibid., 125. *Official Records,* Vol. XXVII, No. 2, 351.
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23. Naisawald, 430, 433. Hess, 143, 144.
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Transforming Joint Air-Ground Operations for 21st Century Battlespace

By Major General David A. Deptula, USAF, and
Lieutenant Colonel Sigfred J. Dahl, USAF

The face of warfare is undeniably changing. Former CIA Director James Woolsey coined the term "World War IV" to characterize and codify the fight against a fluid and, at times, diaphanous foe. No longer are we focused solely on the notion of engaging an enemy state that has clearly defined borders and a national identity. These days, we find ourselves more often than not contemplating ubiquitous networks of hostile opponents. With this new threat comes an ever-increasing need for improved agility, lethality and prescience. Even so, we need to maintain the ability to engage and defeat our enemies at any level of conflict, from stability and support operations (SASO) to a major theater war (MTW).

The ability to engage across the full spectrum of conflict in the future requires that all services review their capabilities, battle systems and doctrine. Joint air-ground operations (JAGO) is a complex set of issues at the confluence of two very large battle spheres.

In this article, we look at the intersection of Army transformation actions with related Air Force operations and the impact on terminal air control (TAC), the common operating picture (COP) and battlefield air operations (BAO).

Moving Out Sharply—Transforming. During attendance at the Army Transformation Conference in January 2003, it was clear the US Army is moving swiftly down the path from legacy warfighting systems of the past through the Stryker brigade combat teams (SBCTs) and, ultimately, to transforming to the Objective Force. Likewise, the Air Force is continuing to refine its future warfighting organizations and concepts of operations. The need to rethink how the Air Force and Army synthesize transformation initiatives to best facilitate victory in the JAGO environment is paramount.

Recently in both Operation Enduring Freedom in Afghanistan (OEF-A) and Operation Iraqi Freedom (OIF), we have seen a great display of creativity and ingenuity in this regard. Operations in Afghanistan captured the attention of the nation as the electronic news media beamed indelible images of America's Special Operations Forces (SOF) with USAF TAC specialists climbing rugged slopes astride small horses in pursuit of terrorists and murderers. Air Force Chief of Staff General John P. Jumper described these scenarios and methods as "transformational."

To the casual observer, it may have seemed that we had taken a 100-year step backwards. The simpler truth, however, is that these men were adapting and fusing the technologies available to them to engage the enemy most effectively within the battlespace they suddenly found themselves.

Indeed, a TAC specialist riding a horse with a laptop computer strapped to the saddle horn, communicating via satellite and using laser range-finding devices coupled with a global positioning system (GPS) to find the exact location of both enemy and friendly forces, is a *transformational* step. It is a large step toward transforming how our tactical air control party (TACP) warriors will integrate and function in the future yet remains consistent with our basic beliefs.

Emerging information indicates OIF applied many of these initiatives and lessons in operations—and assuredly created others—as the coalition forces dominate in Iraq.

Air Force's Core Competencies. General Jumper recently redefined USAF core competencies into three simple statements. The Air Force is "developing airmen at all levels of the spectrum," rapidly getting "technology to warfighting" and "integrating operations."

As we transform JAGO, we will exploit each of these competencies to the benefit of all servicemen and women. By using USAF core competencies as a resonating board, we stay focused on transforming our forces and approaches and methods to optimize air and space operations within the sphere of JAGO.

Today, we are in the process of rethinking how we man, train, equip and employ in the JAGO arena. The Air Force is committed to developing JAGO employment and doctrine to integrate air operations with the SBCTs and Objective Force that will result in optimal warfighting capability for those organizations. This commitment is critical to transforming how our forces will conduct joint warfare in the future.

Organizing to support SBCT Stand-Up. Just as we've developed the air operations center (AOC) over the last decade as a separate "weapons system," we need to rapidly develop our TACPs and make their capabilities more robust. It may be prudent to designate the TACP system and associated air support operations center (ASOC) as an integral weapons system in a similar fashion. In doing so, we may vastly improve the capacity for proactive systemic and technological growth as well as enhance interoperability for this critical operations area.

At the point where "the rubber meets the road," the Air Force will continue to integrate capabilities with those of ground commanders by modernizing our TACPs. We are currently reviewing TACP manning within the Air Combat Command (ACC) to ensure we have the right numbers and types of airmen working with the various echelons of new ground force organizations. We will make sure we have the right ratios of TACs and ASOCs where and when they are needed.

The Army also needs to reevaluate its doctrinal concepts that call for air operations to be tied to and deployed with corps as maneuver elements. Recent warfighting experience has shown that the corps most likely will *not* be the lowest deployed element.

The Air Force is also in the process of acquiring the most advanced targeting and communications equipment available to assist the TACPs in their difficult tasks. However, simply recruiting, equipping and training these highly motivated airmen aren't enough. We need to make sure they have both quick and survivable ways to maneuver and employ.

The Army's SBCTs are making great strides toward that end. The new Stryker vehicle is agile and fast. It affords battlefield protection against munitions up to the rocket-propelled grenade (RPG) class of weapons.

The fielding of the first SBCT demands the services carefully scrutinize how to combine the capabilities of both terrestrial and airborne systems to achieve the maximum desired effects within the battlespace. These medium-weight force units are bringing a heretofore unknown combination of agility, survivability and lethality; they are significantly more powerful than light bri-

gades and half the weight of current heavy brigades. They are the interim step in the long-term transformation of our ground forces and will be around for many years.

We must make certain TACPs have the same level of agility and survivability that their Army counterparts have. To ensure our TACPs can go where the SBCTs go, they need similar equipment. That means our TACPs need Stryker vehicles.

An Army/Air Force memorandum of understanding (MOU) that addresses these equipage issues exists and calls for the Army to provide vehicles to TACPs and other air elements assigned to ground force elements.

Overcoming the Tyranny of "Stove Pipes" for a COP. To achieve success in future conflicts, our TACPs will need an ever-increasing ability to know the full three-dimensional battle array at a glance.

Air Combat Command Commander General Hal Hornburg has established a series of six focus areas for the command. One of those—information operations—has as its goal "[To] integrate air, space, intelligence and information operations capabilities into a seamless array providing real-time, actionable information to its users."

Probably the single most daunting task facing our command, control, communications and computers (C^4) community is that of getting needed information access to all levels in the JAGO environment. Past constructs were built to feed information up the chain to the commanders and, in turn, feed decisions back down the chain. True transformation requires we become more "information agile."

Our TACPs (as end users) have a need to know exactly where the "good guys" and the "bad guys" are throughout the battlespace to be most effective. This requires they be able to push and pull across the information pathways of all services to build and have a common JAGO picture. It is imperative we continue to build programs that bridge the information service stove pipes built over the course of 50 years. To be effective, combat information must not be viewed as the "property" of any given service or entity. Integration of information must happen both horizontally *and* vertically.

If information is power, then we make our entire joint force stronger by making information available at all levels. But even having acute situational aware-

To ensure our TACPs can go where the SBCTs go, they need similar equipment. That means our TACPs need Stryker vehicles. *Photo by Ann Zetterstrom*
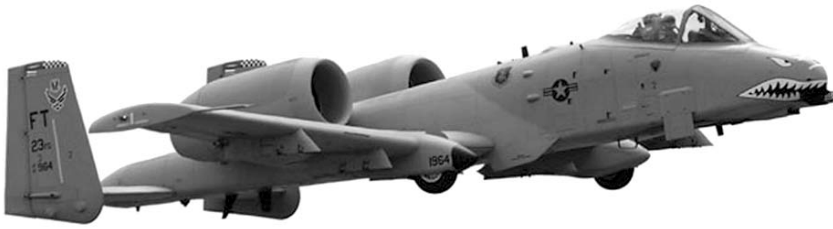
ness is not sufficient alone to win in modern battlespace. We need to think about *how we think*. We must train and educate our warriors, from the most senior commanders on down, on what information is available, how to use it best as well as what possible pitfalls await them in information age warfare.

JAGO is Ripe for Revision and Growth. The battlespace of future conflicts will not be characterized by linear means, but rather by nonlinear and noncontiguous areas of operations—leaders in all the services agree on this statement. As our land, sea and air forces begin transforming toward more flexible and integrated capabilities, we must be ever mindful of the need to assess and respond in a timely fashion to the demands of future conflict.

Enabling technologies in the realms of communications, graphics and computational tools, and enhanced weaponry across the spectrum are forcing the armed services to reevaluate how and why we engage an enemy. The advent of precision for both geo-location and strike as well as multi-spectral sensing systems now affords our fighting men and women a previously undreamt of lethality and accuracy. With these enhanced systems comes a need to re-look how we use them.

JAGO—It Ain't Just CAS. Traditionally, we have described air attack and "bombing" as fitting into one of three missions categories: close air support (CAS), air interdiction (AI) or strategic attack (SA).

CAS missions are those flown in close proximity to friendly forces that require detailed integration with those forces to avoid fratricide. AI missions are defined as those having an effect on enemy forces before they can engage friendly forces and are flown in advance of friendly ground forces—beyond the fire support coordination line (FSCL). SA missions are associated with striking enemy leadership, command and control, war-sustaining resources and critical infrastructure to directly achieve strategic outcomes.

Air attack missions flown inside the FSCL currently require a great degree of coordination, deconfliction and skill.

Further, the techniques and procedures for employing in this area differ throughout the various theaters. Any fire support officer (FSO) or air liaison officer (ALO) can tell you that this is a point of constant friction and endless debate.

Another point of friction is the lack of understanding of what is and what is not CAS. Operations in Afghanistan highlighted the misconceptions and confusion that exist between CAS and time-sensitive targeting (TST).

The two areas are quite different, especially in regard to the rules of engagement (ROE) and the level of engagement authority. TST can occur regardless of the position of friendly forces relative to enemy forces—CAS is defined by that relationship. TST is subject to more centralized control and target approval, while CAS is designed to be responsive to the lowest level that needs assistance on the ground. CAS is a mission; TST is a process and can involve interdiction, CAS, strategic attack (as we saw in the opening attacks of OIF on 19 March 2003 against an Iraqi command and control compound) or any other mission.

Unfortunately, the mindset of "It's all CAS to me" continues to exist among many ground warriors in the field, leading to disagreements and consternation between soldiers and airmen—but much worse, it can have negative consequences in terms of optimally employing our respective forces in joint operations.

One collateral issue that has been getting some dialogue lately is the mistaken belief that the Air Force is somehow not in favor of Army terminal attack controllers. This is not true. The Air Force does not believe that a fire support team member (FISTer) is incapable of controlling an air attack—they are highly capable and dedicated warriors.

What the Air Force does believe—for the benefit of all forces involved—is that *any* terminal attack controller must have a level of training and currency equal to that required of a TACP, combat control team and Marine terminal air controllers to plan and control a CAS mission involving USAF aircraft.

This is not an issue of merely filling out and reading a 9-line CAS briefing form. It takes advanced situational awareness and weapons systems knowledge to both "rack-and-stack" multiple flights of attack aircraft and choose the correct delivery system and ordnance for desired effects. Couple these basic needs with the ability to determine appropriate restrictions and control measures in a complex environment and our reason for insisting on a minimum level of training and currency becomes clear.

In cases of emergency, we maintain emergency CAS (ECAS) procedures. However, by definition, there is never a time when we *plan* to do ECAS.

The Air Force believes that *any* terminal attack controller, including FISTers, must have a level of training and currency equal to that required of a TACP, combat control team and Marine terminal air controllers to plan and control a CAS mission involving USAF aircraft.
Photo by MSGT Val Gimpis

There is a concerted effort among the services to develop a joint terminal attack controller (JTAC) standard. JTAC certification programs are a needed piece of the JAGO puzzle. It is time to stand up a JTAC Center of Excellence. The Air Ground Operations School (AGOS) at the Air Warfare Center, Nellis Air Force Base, Nevada, is the preeminent locus for both developing and teaching the evolving tactics, techniques and procedures for use in JAGO. AGOS would be an excellent location for a JTAC Center of Excellence.

As we transform our fighting forces and training methods, we need to transform how we conduct JAGO as well.

Redefining the Bridge Between CAS and AI. Lessons from Operations Desert Storm in the Gulf in 1991, Deliberate Force in Bosnia in 1995, Allied Force in Kosovo in 1999, Enduring Freedom and early returns from Iraqi Freedom hammer home the use of asymmetrical air attacks—the application of force from the air at specific points and times that cannot be prevented by the adversary—in the prosecution of enemy ground forces in an environment containing few or no friendly ground forces. These operations highlight a doctrinal issue with JAGO.

Adding to this issue is the increased involvement of SOF in executing JAGO. Integrating SOF and conventional forces on a routine basis is a step we must make as we transform toward a more effective joint force.

SOF Wars. In the Afghan 2001 and Iraq 2003 campaigns, there were many scenarios in which we employed airpower as an element of those joint campaigns to achieve the joint force commander's (JFC's) goals that did not involve troops in contact. Iraqi Freedom also saw massive use of SOF forces in a more conventional role.

These scenarios don't fall within the definitions of CAS or AI. Rather, they were situations where a small number of SOF or friendly forces acted as human sensors to provide accurate data that enabled *offensive* force application from airborne systems.

As we continue to see greater integration of unconventional ground forces to accomplish this kind of function, we have an expanding set of issues with regard to lines of control and employment doctrine. It may be time to rethink and adjust the doctrine associated with JAGO. The first step toward this end is to define the "undefined" battlespace.

Battlefield Air Operations (BAO). Desert Storm, Deliberate Force, Allied Force, Enduring Freedom and Iraqi Freedom saw the use of airpower as a distinct maneuver element against enemy ground forces. Its effects were asymmetrical, and it was used in this mode on a large scale. These kind of air attacks were not the only air-to-ground operations conducted during these operations, but they do stand out as a use of airpower in a fashion relatively different from traditional surface attack mission categories and present a potent option for use in future joint campaigns.

In these conflicts, air operations against an enemy arrayed on a battlefield were conducted using innovative concepts of operations and combinations of targeting methods to create desired operational effects. Currently, some of these air operations are not described very well in either Air Force or joint doctrine. Specifically, BAO are air operations against enemy regular and irregular ground forces in instances where "friendly" ground forces are not present or, when present, are engaged in actions in direct support of the air operations. Clearly, an update to current doctrine is warranted for the benefit of future joint force commanders.

SOF training at Pope Air Force Base, North Carolina. SOF have acted as human sensors for offensive air operations. *Photo by Tech. Sgt. Michael Featherston*

During OEF, the preponderance of air attacks that resulted in the progress made by the Northern Alliance—ultimately leading to the removal of the Taliban regime—were flown as BAO events. In these instances, BAO created significant operational effects including shock, degradation and destruction of entrenched enemy forces. BAO was the key enabler for Northern Alliance forces to capture Mazar-e-Sharif, Qala Qatar, Kabul and Toloqan in the north and Kandahar in southern Afghanistan.

There were other air operations conducted independently of support to ground forces, particularly after the Northern Alliance gained control of a large portion of Afghanistan. These air attack operations supported an *aerial* scheme of maneuver and targeted dispersed retreating and fleeing al Qaeda and Taliban ground forces.

When matched with new operational doctrine and capabilities, new warfighting approaches can significantly enhance if not revolutionize the way we conduct warfare. BAO in Operation Allied Force, OEF-A and OIF are the genesis of such a merger. BAO—when viewed in terms of developing a comprehensive concept of operations involving an aerial scheme of maneuver, real-time fusion, time-critical targeting, support by SOF and integration with other surface forces—has clearly demonstrated a warfighting advantage of transformational character.

To capitalize on this capability, it is important to define BAO as distinct from CAS and AI for two principal reasons: (1) to highlight a critical capability for JFCs and (2) to ensure the proper organization, training and equipping of joint forces for the effective conduct of this mission.

With recognition of BAO as a distinct mission area, the appropriate actions required to train, maintain and equip for that mission will follow. In addition, such delineation would establish the requirement to provide appropriate command and control arrangements for BAO.

TACPs and ASOCs would be given appropriate systems, capabilities and training to facilitate such operations. Emphasis, if not acceleration, of interoperability upgrades for terminal air controllers and existing aircraft also is needed. New targeting and attack capabilities as well as improved intelligence, surveillance and reconnaissance (ISR) fusion would result and bring significant improvement in Air Force surface

A SOF commando from Task Force K-BAR conducts special reconnaissance on an undisclosed location in Afghanistan during Operation Enduring Freedom.

attack capabilities, flexibility and accuracy.

Taken together and in concert with changes in doctrine, such upgrades can ensure BAO is solidly established for future JAGO.

Likewise, based on an understanding of BAO, a better working relationship between the Army and Air Force can be fostered to fight more effectively. Battlefield collection devices and Army intelligence assets will be needed for optimal execution of BAO. This support is critical for the air scheme of maneuver and both operational and tactical success.

Effects-Based Targeting is the Hallmark of Well-Orchestrated JAGO. An effects-based targeting methodology was critical to the resounding successes in I Corps' 2002 Warfighter Exercise. The unprecedented joint effects targeting method was used in a way that highlighted the magnifying results of viewing JAGO in terms of *desired effects* vice simply moving men, material and firepower to engage and attrit an enemy.

Effects-based processes must underpin any new BAO doctrinal development in support of future joint force, air and ground component commanders.

Putting It All Together. The JAGO environment is extraordinarily complex in its breadth and scope. The Air Force and Army are committed to transforming our forces and our methods to maximize effects across the spectrum of conflict. We recognize that the crux of true joint integration is making sure we have

done everything we can to shape our forces and doctrine in ways that make rapid success in the battlespace a certainty. To guarantee this successful transformation, recognizing and actualizing innovation and new constructs in JAGO is crucial.

Establishing TACPs and ASOCs as weapons systems, acquiring the most advanced communications and graphic display tools available, and ensuring the compatibility and interoperability of our airmen operating with SBCTs by equipping them with Stryker vehicles are actions required to match the "air" piece of JAGO with the transformation of its ground element.

Continuing and spurring our technological efforts to connect stove-piped information systems in order to make battlefield information available at all levels of the continuum is critical to future successes. Adherence to joint force standards rather than service legacies will enable our forces not only to communicate, but also to evolve synergistically into a truly integrated fighting force.

Developing a JTAC Center of Excellence is a keystone to the transformation of JAGO. This center can serve as a single-source wellspring of information and training as well as the arbitrator of healthy dialogue and debate to produce a common understanding of JAGO across the services.

Establishing BAO as a separate mission will bridge the gap between the traditional, linear battlespace of the past

and the reality of the nonlinear, noncontiguous and nontraditional battlespace of today and tomorrow.

JAGO will continue to be an integral element of joint warfare. How effective those operations will be depends on how far we are willing to go in transforming traditional approaches to airground operations and doctrine with the aim of achieving true jointness—the use of the right force at the right place at the right time.
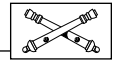
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Whatever defeat mechanisms are employed in a particular engagement, the outcome generally is decided by how well opponents can maneuver, destroy and suppress, protect and lead at the point of decision in the settings imposed by the mission and environment. This ability to perform these four basic functions of combat and, thus, influence the outcome of battles and engagements is referred to as *combat power*. It has meaning only in a relative sense—relative to that of the enemy—and has meaning only at the time and place where outcomes are determined.

Revolutionizing Firepower:
The Enabling Destructive and Suppressive Element of Combat Power

By Brigadier General (Retired) Huba Wass de Czege

This is how the US has thought of combat power since this definition was introduced in the 1982 version of the capstone tactical manual *FM 100-5, Operations*. But what is interesting to note today, is that while modern information technologies enhance all the traditional elements of combat power, they have the potential of revolutionizing firepower.

To fully appreciate this, we have to first think of this element of combat power more broadly. In a modern sense, firepower combines all lethal and suppressive effects against enemy personnel, organizations and materiel. Firepower provides the enabling, violent, destructive and suppressive force essential to realizing the effects of maneuver. It is the means of suppressing the enemy's fires, neutralizing his tactical forces and destroying his ability to fight. This is done by killing, wounding or paralyzing the enemy's soldiers and by damaging the materiel and installations necessary for his continued combat effectiveness.

But achieving superior relative lethal and suppressive effects in a given situation will require more than raw firepower. It will hinge on the ability to find and identify suitable targets; decide and plan strikes quickly; engage with systems within reach; apply both lethal and suppressive effects with precision, volume and potency; employ weapons systems flexibly; replenish supplies of munitions; and assess the results of strikes. Enhanced technologies will improve the chances that friendly soldiers will employ overwhelming lethal and suppressive effects when and where required.

However, there is nothing new in what I have said so far. Destroying the enemy's equipment and killing enemy personnel may not always be necessary or even desirable, depending on the situation, but it may be sufficient to suppress their ability to function. Some suppressive, incapacitating and psychological shock effects are byproducts of lethal and destructive weapons; some are products of nonlethal weapons, such as jammers and various other incapacitants. Enhanced technologies can greatly improve the ability to produce both lethal and suppressive effects in the future.

The lethal firepower and suppressive effects system combines lethal, incapacitating and psychological (shock) effects against personnel, organizations and materiel. One measure of effectiveness is the ability to concentrate and shift these effects as required within the scheme of operations. This involves targeting, precision, lethality, range and mobility.

T-55 tank destroyed during Operation Iraqi Freedom. Photo by Sgt Paul L. Anstine III, USMC

Better targeting and greater precision in delivery achieves better effects per round, but they also achieve greater economy because the basic loads of tactical organizations last longer. And increasing the lethality or suppressive effect per pound of munitions could greatly enhance the potency of the on-board basic load.

The longer range at which targets can be engaged greatly increases the number of engagement opportunities from a given position. More importantly, it multiplies the number of opportunities to concentrate firepower and suppressive effects in support of subordinate combined arms tactical organizations. It also speeds the sequential concentrations of support between foci of effort.

Enhancing the air and ground mobility of delivery systems can enhance the speed and agility with which "bases of fire" can be positioned, repositioned and protected. Overall, the lethal output per person of fire support organizations potentially could be increased dramatically.

These are all important ways to improve fire support systems, but they do not affect basic paradigms. There are several developments that will: ambush-like strikes; changing roles of direct and indirect fires in schemes of maneuver; a new suppression paradigm; and proactive and reactive fire networks.

Ambush-Like Strikes. The ability to acquire, track and process more targets at greater ranges revolutionizes fire planning—particularly in the ability to plan and execute long-range ambush-like strikes using large volumes of precision and suppressive weapons in synergistic combinations against specific organizations or functional groupings.

The concept of time-on-target (TOT) artillery strikes is not new. However in many cases it will be possible to strike the many discrete targets that comprise the essential elements of a military organization or functional grouping at the same time.

There are great advantages to employing precision weapons in large numbers within a compressed timeframe. But the advantage of precision fires begins to degrade rapidly once the enemy begins to evade and the difficulty of targeting increases.

Engaging in a very compressed timeframe also magnifies suppressive effects. Suppressive munitions can be interspersed with precise ones. Communications can be jammed, electronics

can be made inoperable and humans can be isolated, shocked and disoriented. Thus the enemy could be presented with an overwhelming problem.

These ambush-like engagements could cause more rapid and complete organizational collapse.

Equally important will be a planning mindset that sees target sets in terms of their systemic significance. This merely requires the adaptation of the principles of target value analysis (TVA) developed by the Field Artillery School in the early 1980s. This approach to deep battle targeting was used to identify the highest payoff targets (HPTs) in a large force array based on our knowledge of Soviet doctrine, the context of the engagement and the mission of the friendly force.

The capability to conduct such precision ambush derives from enhanced situational understanding with savvy analysts who can identify targets of the greatest systemic value, the ability to use information technologies, and a layered and fused sensor system to evolve fire plans and achieve multiple high-speed sensor-to-shooter linkages. It also derives from a layered system of firepower and suppression with the mobility and reach to engage the high-value targets of an entire formation in depth and simultaneously (rather than sequentially and over time).

While ambush-like TOT strikes are possible in theory, current organizations and methods require revision. Today's organizations and fire delivery methods are optimized for serial engagements rather than parallel engagements of multiple HPTs.

The Changing Roles of Direct and Indirect Fires in Schemes of Maneuver. Advancements in indirect fire support could affect the force's ability to maneuver greatly and change the roles and relationships of direct and indirect fires at the lower tactical levels in mechanized combat. By indirect fires, we mean any fires that originate from beyond-line-of-sight (BLOS) to the target. Being able to begin an engagement out of visual contact and reliably create de-

sired lethal and suppressive effects allow a more rapid advance in assaulting maneuver.

Increasingly, the combined arms commander's preference in a "deliberate" situation will be to use indirect precision munitions to open engagements and carry the burden of killing. This is because having confidence in the lethality of these systems, he can avoid revealing his forward direct fire systems and can save direct fire ammunition for tasks to which they are better suited. He will prefer to initiate action with direct fire systems in hasty situations because of the relative rapidity, reliability and simplicity with which these systems can be brought to bear under chaotic conditions.

Thus in deliberate engagements, he will engage his objective with precision indirect fires just before he clears the last "inter-visibility line." Then he will assault through the objective using direct fire systems to suppress and decisively finish the enemy.

In dismounted warfare, the change is not so extreme because indirect systems have been the most lethal instrument for at least a century. But even there, the ability to control and focus lethal and suppressive effects during close combat assault could be greatly enhanced. This permits a more rapid and secure closure.

Information age fire support will change the way combined arms commanders plan their battles and engagements. Because they will be able to count on the effects of precise fires and suppression to a much higher degree, they will plan their maneuver around those expected results.

There also will be more stringent operational control over the allocation of munitions, especially the more capable, more precise and, thus, more expensive kind that will never be available in unlimited numbers.

To the extent that greater understanding of the enemy situation leads to more frequent deliberate engagements, higher commanders will be able to allocate

- Exploit the new complementary relationship between indirect and direct fires.
- Adopt new planning paradigms for fire and maneuver.
- Integrate long-range target acquisition into fire support systems.
- Understand how to optimize beyond-line-of-sight (BLOS) capabilities at the lower tactical levels.
- Learn how to network fires, sensors, and command and control for force protection, defensive and offensive purposes.
- Enhance the suppressive effects of modern "fire support" systems.
- Organize for and employ large-scale precision and suppressive time-on-target (TOT) strikes against systemic wholes.
- Enhance the ability of the echeloned system to concentrate combined effects in depth and shift the foci of concentration flexibly throughout the battlespace.

Revolutionizing Firepower

such munitions more often, based on requirements. For instance, if the objective of an attack is an organization comprised at most of x key targets suitable to such munitions, the allocation of munitions for that mission could be based on x and conditioned by only two other factors—uncertainty about the enemy and the importance of the mission. This is similar in theory to former US Army doctrine for the allocation of tactical nuclear munitions.

New Suppression Paradigm. Still another development that affects basic paradigms is the great potential for enhancing suppressive effects that are not the byproduct of lethal munitions. A precision munitions-dominated battlefield may produce much less suppressive byproducts. This is not a problem in standoff attrition engagements, such as counterbattery fire, but it is a problem in the assault phase of close combat.

The large number of conventional munitions required to kill produce a great suppressive byproduct of blast and flying steel well beyond the munitions' lethal radius. This effect can keep enemy resistance in check while the assault force is closing.

Fire support with precision munitions has a much smaller suppressive byproduct. Far fewer rounds are required to produce lethal effects, and it is generally not wise to use these expensive munitions to fire at anything but confirmed targets.

At the same time, it would not be profitable to transport tons and tons of conventional munitions across oceans merely to serve suppression requirements during close combat. Future suppression weapons could combine the properties of some crowd-control weapons with methods for degrading the performance of soldiers and defeating the

functioning of weapons, vehicles, electronics, communications and optics.

These enhanced suppressive weapons would have the additional benefit of being tailorable to the situation. They could be combined with lethal munitions, as required, and capable of far greater suppressive output per ton than conventional munitions.

Proactive and Reactive Fire Networks. Another development affecting basic paradigms is the concept of networking fires, sensors and command and control in several contexts—force protection, defense and offense. Combining such capabilities can yield active organization-level protection systems, rapidly reactive defenses and proactive systems in support of offensive maneuver.

The Soviet Army of the 1980s understood the potential of these systems. The US Navy and Marine Corps have gained some experience with network-centric warfare in Operation Sea Dragon and other experiments. The Soviets would have called their approaches "surveillance strike complexes."

A surveillance strike complex is an aptly named very rapid reactive system. Any penetration of the area of surveillance is immediately identified friend or foe, an engagement decision is made, the optimum "shooter" of the moment is selected, targeting data is sent to that shooter, the target is engaged, damage is assessed and the cycle may repeat again, if required. This entire "kill chain" could be automated, or it could contain human nodes as sensors or decision makers. Some elements could be very low-tech.

To a US Army artilleryman, this looks very much like old news. The Army's long-established and well-functioning counterbattery system integrates long-

range radars, automated fire control and firing batteries in "quick-fire" loops. Well-planned defenses of all the services for most of the last century included such rudimentary surveillance strike complexes although sensors were forward observers (FOs) or manned radars linked by radio or telephone to fire direction centers (FDCs) that further were linked to aircraft or to firing batteries on the ground or afloat. The replacement of analog with digital technology greatly speeds the kill chain and renders it *far* more efficient.

The more important point is that this concept has great potential at every level from the smallest tactical unit upward within each service and across service boundaries. It is theoretically possible to establish systems at every level to respond very rapidly to every *recognizable* hostile phenomenon.

Two important points need to be made about surveillance strike complexes. First, ground targets will be the most difficult to differentiate, especially in circumstances where neutral civilians and hostile combatants are intermixed and immersed in ground clutter. The science of automatic target recognition is advancing rapidly but will remain the weakest link for some time.

Second, this application of technology has *the potential for strengthening defenses* to a remarkable degree, especially in circumstances in which target discrimination is not a great concern. We also should expect our opponents to exploit this concept.

The Soviets in the 1980s were very much interested in applying similar concepts to the offense—these they called "reconnaissance strike complexes." In a surveillance strike complex, the enemy initiates action that suits him well for defensive situations. In a reconnaissance strike complex, the reconnaissance element of the system initiates the kill chain.

The idea is based on the same fundamental notion as the old German concept of "reconnaissance pull tactics" where reconnaissance units looked at "surfaces and gaps" in the enemy dispositions to find maneuver opportunities. Here the network is established in support of offensive maneuver and responds immediately when certain triggering events occur or sought-after targets are found.

Firing resource availability is not based on the *chance* of their availability. Resources are deliberately emplaced based

on best estimates of requirements and are dedicated to respond reliably and instantly when the triggering event occurs.

All future offensive actions at all levels could be supported by reconnaissance strike complexes keyed to finding and destroying specific key components of the enemy's system of defense.

Offensive operations also will depend on *reactive* protection systems. These are, in essence, a mobile variant of defensive networks. An ever-increasing danger for advancing air or ground maneuver is entering the zone of effect of a surveillance strike complex. Any potential opponent could cover every prepared defense at every echelon with difficult-to-spot sensors and hidden observers networked to indirect surface and air defense weapons.

A two-pronged approach is required to avoid unacceptable casualties when these kinds of defenses cannot be out flanked and there is insufficient time to reduce them with standoff means only. On the one hand, over watching reconnaissance strike complexes could find and dismantle the most vulnerable elements of the opposing unit's system ahead of the advance. But this will usually be insufficient and need to be accompanied by a layering of *reactive* protection systems that are really very rapid counterfire systems set to react immediately to defeat any source of missile, artillery, mortar or rocket fire.

Relatively close-in "reactive protection" from long-range, high-caliber direct fire systems is also possible. These systems can be organized into attacking network-centric air and naval formations, but these principles also apply to tactical combat formations on land.

One of the great dangers to mobile ground tactical units will be encounters with hidden dismounted infantry armed with simple antitank weapons or direct fire systems in "keyhole" positions. In these cases, active and passive protection alone could be insufficient. Classical overwatch techniques using vehicular optics and direct fire weapons also could be insufficient. But combining these with a system of overwatch that is capable of sensing the first enemy shot, locating the source and immediately engaging it with a combination of lethal precision and suppressive effects could be sufficient to limit casualties and permit more rapid and more audacious advances.

If the enemy came to understand that any shot fired at the friendly unit could result in an immediate and deadly response, he could be greatly deterred.

While some portions of these capabilities have been demonstrated in recent combat situations, we also have seen failures. Failures tend to be at the beginning and end of the kill chain (target identification and damage assessment) when human eyes are replaced with technical sensors and when firing decisions are based on inadequate discrimination. Reactive protection systems also will have problems finding the source of missiles without predictable trajectories.

These are issues we will resolve eventually, but so far we have been generous in funding shooters and far too miserly in funding the networking and sensing capabilities to make these systems reliable. The full potential of modern organizations only can be achieved when vital networks are functioning. Their combat power contracts dangerously as networks are degraded.

Impact on Organizational Designs. These new capabilities will require new approaches to organizational design. Robust over-the-horizon target acquisition (TA) capabilities could become an integral part of fire support organizations at every level. In a system for BLOS fighting, every link is equally important for success.

Dedicated aerial targeting sensors ensure the latest and most timely targeting data and report fire mission results. These could become a permanent feature of fire support systems at every level that has indirect or BLOS capabilities.

The current practice of relying on dual-purpose reconnaissance, surveillance and TA (RSTA) organizations for this vital function represents a false economy because it makes this important new potential only conditionally available. RSTA organizations must serve two masters: the commander who wants decision information and other equal elements of the command who need TA support. In the future, combined arms commanders will prefer to separate RSTA functions in organizational designs.

An important measure of the effectiveness of any system of lethal and suppressive support is the degree to which commanders can concentrate combined effects at critical foci and with what agility they can shift those concentrations to new foci within both hasty and deliberate settings. To the extent that echelons within tactical organizations share an understanding of the situation and are unified in purpose, new technical combinations make it possible to reinforce the efforts of organizations more than one echelon deep, as is the current practice. These new technical combinations are primarily more integrated fire control and greater accuracy and ranges for higher level supporting systems.

In deliberate situations, the potential for reinforcement in depth is far greater than in hasty ones. In hasty situations the nearer and more responsive components of the overall system will have greater value. Therefore it will still be important to provide a layer of fire support for each echelon, but what is required at each layer is still in question. All-told, the combination of integrating fire control in depth and increasing range, accuracy and functional agility for lethal and suppressive support at each echelon can greatly enhance the productivity of the overall system.

What can be done to enhance firepower effects is impressive. Overall, the lethal output per person of fire support organizations potentially could be increased dramatically. Enhanced technologies can improve the degree to which the organization can bring to bear lethal and suppressive capabilities when and where required.

But the key is to do more than improve current approaches. We must design new organizations and tactical methods to exploit the new approaches. (See the figure.) Such changes easily could lead to order of magnitude increases in firepower effects—could revolutionize fires.

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OBSERVATIONS FROM IRAQ:
The 3d Div Arty in OIF

By Colonel Thomas G. Torrance and
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"Greta… Greta… Greta."

With those three words, Major Bill Howard, Fire Support Officer (FSO) for the 3d Infantry Division (Mechanized) Aviation Brigade, gave the green light for the 3d Division Artillery (Div Arty) howitzers to destroy the intelligence, surveillance and reconnaissance (ISR) observation posts (OPs) along the Kuwait-Iraq border in Operation Iraqi Freedom (OIF). Less than 60 seconds later, the night sky lit up with brilliant flashes of light as 54 howitzers from the three direct support (DS) battalions of the Div Arty fired the first rounds of the war for the *Marne Division*. As projectiles hurtled toward their targets, the motors of the rocket-assisted projectiles (RAP) ignited, leaving telltale streaks across the moonless sky.

While the world watched, the Redlegs of the 3d Div Arty and AH-64 Apache pilots of the aviation brigade performed their jobs with deadly precision. Apache helicopters patiently hovered in air battle positions, observing the effects of the artillery barrage, waiting to hear "Rounds Complete" so they could move forward and complete the destruction of the OPs.

OIF was a watershed event for the 3d Infantry Division. Never in the history of warfare has a division moved so far, so fast: 720 kilometers in 21 days.

The Div Arty headquarters occupied Baghdad International Airport and looked back on our accomplishments with a sense of pride. Among our *firsts*— first use of the M109A6 Paladin in combat, first use of the M7 Bradley fire support team (BFIST) vehicle in combat, first employment of the divisional multiple-launch rocket system (MLRS) battalion in combat, first use of advanced FA tactical data system (AFATDS) in combat, first use of sense and destroy armor (SADARM) in combat, and first use of the M795 improved high-explosive (HE) projectile in combat.

The missions were equally impressive: 610 DS missions fired for a total of 13,923 155-mm rounds sent down-range and 90 counterfire plus 26 reinforcing missions for a total of 794 MLRS rockets and six Army tactical missile system (ATACMS) missiles fired in support of V Corps shaping operations.

This article outlines our observations in OIF with an eye toward continuing to

improve our systems and ensuring the Field Artillery maintains its stature as the *King of Battle*.

Terrain and Enemy. To understand the battlefield environment, one must understand the terrain and enemy we fought. Our zone of operation stretched for more than 700 kilometers, beginning with the flat, relatively featureless desert terrain along the Kuwait-Iraq border in southwestern Kuwait to the urban sprawl of Baghdad. Along the way, we encountered the compartmented terrain of the Euphrates River Valley that restricted movement to roads and highways due to the numerous canals and ditches.

We faced three distinct types of Iraqi forces: the Regular Army, Republican Guard Forces and Saddam Fedayeen. The Regular Army fought hard and put up a respectable fight. The Republican Guard, considered the regime's center of gravity, was not as aggressive as their irregular counterparts but was better trained—as evidenced by their ability to mass multiple artillery units against a single target.

The unexpected strength was the irregular Fedayeen and Baa'th Party militia. These groups were very aggressive, well armed and fanatical in their consistent attacks against superior firepower. They presented a threat to coalition forces from all sides, anywhere, anytime. There was no sanctuary or safe haven from potential attack.

M109A6 Paladin. The combat performance of the M109A6 Paladin was magnificent. It is an extremely capable system that consistently put rounds down-range in less than two minutes after mission receipt, even while on the march. Firing batteries regularly fired from superhighways, narrow secondary roads and open desert to deliver their munitions with devastating accuracy. The system held up extremely well to the rigors of battle as shown by our fighting strength's never dropping below 51 of 54 systems.

However, the system needs a few improvements. First, we had problems with the M93 chronograph and W92 and W93 power data cables. The M93 is fragile and often not mission-capable. Long lead times for repairing or replacing M93s make this problem worse.

Additionally, there is no clearly defined troubleshooting guide that explains the interoperability of the M93, automatic fire control system (AFCS) and AFATDS. Many times a firing bat-

3d Div Arty Paladin near Tallil Airfield during OIF.

tery lost all muzzle-velocity variations (MVV) data on a howitzer when the M93 sent an erroneous reading to the AFATDS in the platoon operations center (POC). In combat, most units simply used shooting strength as a baseline for the guns and turned the M93 off.

In addition, we experienced many generator failures and leaking elevation cylinders while firing M203 propellants or high-angle missions.

Our final concern is that the Paladin was easily outranged by Iraqi cannon systems. Throughout the conflict, we were outranged consistently by the G-5 and GHN-45 155-mm weapon systems. As a result, we had to position well forward in the maneuver formations during movements and position very close to the forward line of troops (FLOT) when stationary to ensure we could mass all firing units. This created force protection concerns (addressed later in this article).

Future systems need to address this range disparity and achieve a conventional munitions range of 40 kilometers with extended-range munitions out to 50 kilometers.

M7 BFIST. The M7 BFIST performed brilliantly. For the first time, the artillery community has a vehicle that allows FISTs to keep up with their maneuver counterparts and remain in the fight. Every crew praised BFIST's speed, survivability and capability as a communications platform. It gave the company FSO the ability to remain well forward in maneuver formations without compromising his safety.

As a result, BFIST teams initiated 407 of the 657 DS fire missions. All BFISTs employed the 25-mm gun and M240C

machine gun in a defensive role, and in every case, the crew credited its Table VIII proficiency for its survivability. The average *Marne Division* BFIST fired 300 rounds of 25-mm and 900 rounds of 7.62-mm ammunition.

We learned several ways to enhance BFIST significantly. It does not have a mounted laser designation capability. The only way for a BFIST team to designate a target is to dismount and set up the ground/vehicular laser locator designator (G/VLLD). The G/VLLD took too much time to set up, making the crew vulnerable to enemy fire, and took up half the internal crew space when stowed. It's not practical to use the G/VLLD during offensive operations, and its age, size and reliability make it obsolete. None of the 30 BFIST teams in the 3d Division used their G/VLLDs in combat.

The optics package on the BFIST requires the crewman to switch between two separate modes: direct fire and FIST modes. Company fire supporters need one fire control sight instead of having to change sights between the two modes, which hampers target acquisitions.

A single sight would allow the BFIST crew's laser zero to be accurate for both indirect and direct targets. Targets would not be lost during the time it takes to switch sights.

BFIST sights are effective out to the max range of the Bradley tube-launched optically tracked, wire-guided missile (TOW) weapon system (3.7 kilometers). This hinders the ability to call-for-fires because, by the time a target is identified and acquired, the company is already in direct fire range and maneuvering to destroy the enemy.

In contrast, the long-range scout sight (LRSS) can acquire targets beyond 10 kilometers with great clarity. Mounting LRSS to the BFIST would significantly upgrade the vehicle's ability to acquire targets before maneuver forces close into enemy direct fire range.

Finally, the mission equipment package (MEP) digital components need updating. Specifically, the handheld terminal unit (HTU) and forward observer software (FOS) link to the lightweight computer unit (LCU) require continuous troubleshooting for most crews. The placement of the HTU over the M240C access door is an issue.

During combat operations, the crews needed to remove the HTUs daily to clean and service the M240s. This led to damaged connections and the inoperability of many HTUs across the Div Arty. Additionally, the HTU needs a power cable for the system rather than having to rely on internal battery power.

The digital communications link through the LCU is another source of friction. Because our units have fielded AFATDs, there are few LCUs available as floats when systems go down.

AFATDS. This is another new system that passed its first combat use with flying colors. It is a very stable and reliable fire control platform that allowed us to provide timely, accurate and lethal fires in support of ground maneuver forces. Units effectively used it tactically and technically to deliver Field Artillery fires, manage fire support coordination measures (FSCM) and provide a common operating picture (COP) down to the platoon level. The ability to view unit icons with range fans displayed for specific firing units combined with adequate digital maps simplified the conduct of tactical fire direction.

From the Div Arty perspective, AFATDS' best feature was the Div Arty fire control element's (FCE's) ability to tactically direct fire missions on the move inside an M1113 rigid-wall shelter (RWS) high-mobility multipurpose wheeled vehicle (HMMWV). Similarly, DS battalion fire direction centers (FDCs) executed missions on the move in their M577A2/3 tracks.

AFATDS received digital updates from units on the move, and the fire direction officer (FDO) directed which firing unit to send the mission to. At the lowest level, POCs executed fire missions on the move using the AFATDS to manage the AFCS database and to verify

the technical commands sent to the Paladin.

We did have some issues with regard to AFATDS hardware. The AFATDS box is too big. A simpler, more robust laptop computer would be better and more user-friendly. This would allow the rapid replacement of components with commercial peripherals (keyboards, mice and memory devices).

Our biggest maintenance problem was the reliability of the mouse and keyboard as well as hard drive failures. Any mouse or keyboard failure required we evacuate it to Kuwait, with no hope of getting it back.

The system also is too susceptible to any fluctuation in voltage, and power generation issues continue to plague it. The simple process of the AFATDS box's switching to internal battery power caused an operational facility (OPFAC) reconfiguration, resulting in the loss of firing capability for at least 20 minutes.

The challenges with size and power generation would be greatly simplified by repackaging the system in a laptop computer. Team AFATDS reports that units fielding AFATDS for the first time will receive laptops starting in the spring of 2004 and that units already

- Have the mobility and speed to match the Bradley family of vehicles.
- Include armor protection that defeats up to .50 caliber class weapons.
- Have crew workstations that can use the systems on the move.
- Allow for mounting the following:
  - Five FM radio nets (with telescoping long-range antenna systems)
  - One HF radio net
  - Two SCTACSAT nets
  - EPLRS or FBCB ^{2} terminal
  - Full range of ATCCS systems (depending on the role of unit, AFATDS, ADOCS, ASAS-L, etc.)

Legend:
    ADOCS = Automated Deep Operations Coordination System
    AFATDS = Advanced FA Tactical Data System
    ASAS-L = All-Source Analysis System-Light
    ATCCS = Army Tactical Command and Control System
    EPLRS = Enhanced Position Location Reporting System
    FBCB² = Force XXI Battle Command Brigade and Below
    SCTACSAT = Secure Tactical Satellite

Minimum Requirements for an FA Battle Staff Vehicle to Conduct Command and Control On the Move

fielded AFATDS will start receiving laptop replacements for their AFATDS boxes in FY05.

The AFATDS software improved dramatically with Version 6.3.1, which includes not only technical fire direction capabilities, but also the effects management tool (EMT). The biggest software improvement was the communications package. FM radio range was the only limiting factor. Occasionally, systems had modem failures, but communications among local area network (LAN), variable message format (VMF) and tactical fire direction system (TACFIRE) protocols were extremely reliable as compared to the previous versions of AFATDS software.

Version 6.3.1 simplified geometry workspaces and is a vast improvement. The division tactical command post (DTAC) fire support element (FSE) as well as maneuver brigade FSEs were able to build, verify, update and disseminate geometries much faster with 6.3.1. The division main (DMAIN) and DTAC FSEs received battlefield geometries from subordinate task force FSEs, V Corps, the 1st Marine Expeditionary Force (MEF) and the Coalition Forces Land Component Command (CFLCC) continuously during pre-war rehearsals and throughout the entire war. We effectively managed hundreds of no-fire areas (NFAs) and restricted fire areas (RFAs), constantly changing zones of responsibilities (ZORs), and a plethora of Army airspace command and control (A^2C^2) measures using AFATDS.

The late introduction of the EMT limited its use by battalions due to operator training levels; however, the system is a promising addition to the AFATDS suite. The the mapping tool, view fire missions and target lists, as well as view enemy counterfire vectors were great additions to the situational awareness down to the battalion level.

The drawback to EMT is its reliance on the AFATDS box that it is attached to. It cannot display friendly maneuver icons or interface directly with the global command and control system-Army (GCCS-A) for enemy icon feeds. Additionally, FSEs could not view the current air tasking orders (ATOs) on EMT—which needs to be a future software upgrade.

Some software changes to the adjust fire and emergency mission procedures would maximize the system's technical fire direction capability. While in the adjust fire mission, AFATDS won't dis-

play the adjusted grid on the "Weapons Status" window for the FDC to verify before it is sent to the gun. Paladin units cannot change the shell-fuze combination between the adjustment and fire-for-effect phase of the mission, and they can't select the POC or gun to adjust. These capabilities also could be improvements for future software.

During emergency missions, the system won't send a mission to a gun that's in a moving status. As a procedure, the section chief did not send a howitzer update before moving. Therefore, AFATDS considers the Paladin in a "Ready Status." This resulted in the AFATDS computing the gun out-of-range, but allowed the AFCS to accept the mission, which in reality was in range.

Finally, some degree of flexibility is required for the guidances in AFATDS. The system generates a fire order based on guidances or defaults to the joint munitions effectiveness manuals (JMEMs) without guidances. The FDO needs the latitude to choose whatever fire order is appropriate for the tactical situation instantly rather than have to change guidances/rely on JMEMs in a computer program that does not have situational awareness and understanding.

Munitions. We employed a wide range of munitions. Most notable was the first combat use of the M895 SADARM round. We fired 108 rounds and recorded 48 vehicle kills.

DS battalions developed the tactics, techniques and procedures (TTP) of firing two to four rounds against single or multiple stationary targets. SADARM was so effective that maneuver commanders asked to use it to destroy stationary vehicles rather than using massed artillery.

The drawback to these munitions is its two-kilometer danger close range and susceptibility to temperature inversions and restrictions during windy conditions.

Dual-purpose improved conventional munition (DPICM) was the munition of choice for killing tanks and personnel in the open. We destroyed many enemy artillery units with six M26 MLRS rockets.

The only drawback to DPICM is the dud rate. The duds produced by these weapons became a major concern in post-combat stability and support operations (SASO) as they littered the battlefield and created a hazard to the local populace.

21 March 2003–1-10 FA en route to Position Area Artillery Bacon received a mission to fire immediately.

We need to develop a bomblet for cannons and MLRS that self-destructs or re-engineer the round to significantly reduce the dud rate.

Finally, we relearned how effective our HE projectile is. When the division entered the Baghdad area, HE consumption doubled because of the concern with dud-producing munitions. The M795 improved HE is a great projectile that increases the range to 22.5 kilometers (as compared to 17.5 from the M107 projectile) and provided increased flexibility in positioning and moving howitzers.

Multiple-Launch Rocket System. Operation Iraqi Freedom marked the combat debut of an MLRS battalion organic to the heavy Div Arty. This organization was an unqualified success as it allowed the division to control the counterfire fight without relying on an FA brigade; it also enhanced flexibility in providing additional fires to the maneuver brigades and immediately available general support (GS) fires. The system was very reliable and held up well as we always had at least 16 of 18 launches in the fight.

A major shortcoming of the system is the range of the M26 conventional rocket. The Iraqis had four cannon systems and two rocket systems that outranged MLRS. We need to increase the range for conventional rockets out to 50 kilometers.

Our average MLRS target was fired at a range of 27 kilometers; we had 20 counterfire acquisitions we did not fire because they were out of range. A longer-range rocket would enable the launchers to engage enemy artillery and units before friendly forces move into the enemy artillery's range and allow us to engage targets almost to the maximum range of the Q-37 radar.

Some may argue the ATACMS missile offsets the range limitations of the conventional rocket; however, we did not have ATACMS release authority, and the A^2C^2 clearance process was slow and cumbersome.

Another drawback with MLRS is that DPICM is its only munition. Incorporating different types of munitions would significantly increase the capability of MLRS on the battlefield. For example, a global positioning system (GPS)-guided rocket with HE, similar to the current unitary missile, may reduce the danger close restriction to the 600-meter range of cannon munitions and could be devastating against point targets.

Another recommendation is to create a smoke rocket with white phosphorous (WP) soaked felt wedges similar to the 155-mm M825 smoke round. With 12 rockets in a launcher, one launcher could create a smoke screen for river crossings or breaching operations in a fraction of the time it would take tube artillery.

We had great success using MLRS in the close fight. This has been debated for years, and our combat training centers (CTCs) teach different approaches to this contentious subject.

Our experience showed that MLRS is potentially the maneuver commander's "silver bullet." Our TTP was to first assess the situation and decide if rockets were an option. We consulted the MLRS risk estimate tables in *FM 3-09.60, Tactics, Techniques and Procedures for MLRS Operations* and decided how far friendly troops needed to be away from the target, based on the range and probability of incapacitation (PI) we were willing to accept.

In at least one case, one troop of the division cavalry squadron was decisively engaged and in danger of being overrun. Although the range-to-target was 25 kilometers, the risks were calculated and deemed acceptable, and the squadron commander called the mission within 1,200 meters of his location. The effects were devastating on the enemy, and the cavalry troop broke contact and repositioned in good order.

In a second example, the 1st Battalion, 39th Field Artillery fired a four-target MLRS prep of 24 rockets just before the 2d Brigade Combat Team's (BCT's) famed "heavy metal" run into the heart of the Baghdad Palace District on 7 April. The rocket preparation obliterated enemy defensive positions around a key intersection. The FSO described the MLRS damage: "There's nothing left but burning trucks and body parts."

We recognize that MLRS fires are not suitable for every situation. However, appropriate planning can mitigate the dangers involved and make it an acceptable risk for the maneuver commander if the situation warrants.

Force Protection. A major concern throughout the operation was the level of force protection available to FA units across the battlefield. The nonlinear nature of this battlefield offered no sanctuary or safe haven. Everyone was subject to attack, no matter where he was on the battlefield.

The organic M2 machine guns and MK-19 grenade launchers provided cannon batteries adequate security; however, tactical operations centers (TOCs) and trains elements were very vulnerable. With too few maneuver elements to secure everything, units provided their own route reconnaissance and security, patrolling, and checkpoint operations. Our modified tables of organization and equipment (MTOEs) do not provide enough crew-served weapons for these elements to secure themselves.

During the Army prepositioned stocks (APS) draw, we fortunately were issued M1025 HMMWVs in lieu of M998 HMMWVs. As part of the M1025 draw, we drew accompanying pintle mounts and stanchions to mount crew-served weapons on the

vehicles, increasing our security. On several occasions, we used these vehicles to clear positions still occupied by enemy dismounts.

When two members of the Baa'th Party militia attempted a "drive-by-shooting" of the Div Arty TOC, their privately owned vehicle (POV) and AK-47 were no match for the M2 machine gun on the M1025 that stopped the attack before the POV got into the perimeter.

The days of maneuver units providing security for the artillery are over. We must ensure our units are equipped to defend themselves and trained to that standard.

The biggest force protection concern is that FA commanders at all levels, platoon leaders and senior NCOs in both cannon and rocket units don't have adequate vehicles to perform their combat tasks. They are on the battlefield, fully integrated into maneuver formations in soft-skinned HMMWVs that don't protect them from small-arms fire. They need vehicles that provide the same protection as the maneuver leaders' vehicles moving with them in formations.

Command and Control on the Move. Command and control (C^2) on the move requires the battle staff to monitor and track operations while moving and leverage information systems to ensure

enough control to accomplish the task and purpose of the mission. Furthermore, C^2 on the move implies that command posts (CPs) can transition rapidly from a static configuration to a short-halt configuration or to an on-the-move configuration.

Current MTOEs, however, do not include such a platform for artillery units. Combat operations during OIF demonstrated, once again, that the five-ton expando van (M932A2) at the Div Arty level and M577A3 at the battalion level do not provide the speed with which to keep pace with maneuver forces, the physical environment from which to effectively employ C^2 terminals or an adequate degree of protection for the crew.

At the Div Arty level, the expando van is an excellent static CP but is hopelessly obsolete in supporting the requirements of today's rapidly changing battlefield that demands C^2 on the move. The cross-country capability of this vehicle is severely limited, it affords no protection from enemy fires (direct or indirect), and it cannot support even basic communications while moving.

Furthermore, the primary Army tactical command and control system (ATCCS) for artillery (AFATDS) must be shut down during movement because the expando will not accommo-

29 March–1-39 FA fires MLRS south of Karbal Gap. 1-39 FA fired almost 700 rockets in OIF.
Photo by David Leeson/The Dallas Morning News

22 March-3d Div Arty TAC at Tallil Airfield preparing to move. But before the TAC moved, it engaged a D30 battery eight kilometers away.

On several occasions the only system capable of assisting the squadron with the destruction of attacking forces in adverse weather conditions were the rockets. They saved many a trooper's life with their pinpoint accuracy in severe conditions."

Despite the belief by some that the Field Artillery branch has "walked away from the close fight," maneuver commanders in the 3d Infantry Division will argue otherwise—13,923 155-mm rounds and 794 MLRS rockets fired in OIF back them up.

The soldiers of the 3d Div Arty performed their mission with a sense of excellence and professionalism, traveling farther and in a shorter amount of time than any campaign in history. We took the fight to the enemy, whether close or deep, and proved, once again, the Field Artillery is the *King of Battle*.

date a powered and manned workstation while moving. This significant shortfall degraded the FCE's ability to control GS fires throughout the division battlespace.

At the battalion-level, the M577A3 provides a better C^2 on-the-move platform because the battle staff can monitor the battle from within the crew compartment, and it affords the crew a small degree of armor protection. The M577A3, however, cannot keep pace with the current fleet of M1A1 tanks and M2/M3 Bradleys. Its armor design is obsolete and inadequate, and the basic ergonomics of the system for the crew is 30 years outdated.

Furthermore, the M113 family of vehicles requires the main support battalion (MSB) to maintain a large inventory of repair parts, an inventory that could be reduced by having a common Bradley family of vehicle chassis for CPs.

A combat-proven vehicle with none of these shortcomings, one that excelled at the division level during OIF, is the C^2 vehicle (C^2V). The commanding general used one in his assault command post (ACP), while the DTAC employed two. From this modern C^2 platform, the crew not only could exercise C^2 on the move, but also keep pace with maneuver forces in a vehicle that afforded satisfactory armor protection.

Additionally, the division assistant fire support coordinator (AFSCOORD) worked out of a C^2V in the DTAC and could use his AFATDS terminal while

moving or stationary without having to power AFATDS down and reconfigure it. The division FSCOORD (Div Arty commander) did not have this capability because the Div Arty TOC was configured in five-ton expando vans.

The C^2V platform increased C^2 on the move, but it is just one example of such vehicles. Regardless of the chassis, the figure outlines the baseline requirements for a vehicle that can provide battle staffs C^2 on the move.

Conclusion. The Redlegs of the 3d Div Arty distinguished themselves repeatedly over the course of 21 days of sustained combat during OIF and won the admiration of maneuver commanders throughout the division. Colonel Dan Allyn, the commander of the 3d BCT, is fond of saying, "Prep with steel, lead with lead, count the dead." He began every 3d BCT engagement with preparatory fires and repeatedly used his artillery to shape the battlefield before entering the enemy's direct fire range.
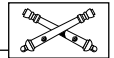
Lieutenant Colonel Terry Ferrell, commander of the division's cavalry squadron, would not move his squadron unless they were under Q-37 radar and MLRS coverage. According to him, "Indirect fire was the killing system of choice within the squadron. Fires allowed the troops to destroy the enemy without actually getting into a knife fight."

Lieutenant Colonel Ferrell goes on to say, "MLRS in the close fight *works*.

Colonel Thomas G. Torrance commands the 3d Infantry Division (Mechanized) Artillery, Fort Stewart, Georgia, currently deployed in Operation Iraqi Freedom (OIF). He commanded 1st Battalion, 10th Field Artillery, also part of the 3d Infantry Division, and C Battery, 2d Battalion, 92d Field Artillery, part of the 42d Field Artillery Brigade, Germany. His past assignments include service as the Chief of Staff for Task Force Eagle and Multinational Division North in Bosnia during Stabilization Force (SFOR) 9; Brigade Fire Support Trainer and Deputy Senior Fire Support Trainer at the National Training Center (NTC), Fort Irwin, California; and S3 of the 2d Battalion, 82d Field Artillery, 1st Cavalry Division, Fort Hood. During Operations Desert Shield and Storm, he was the Fire Support Officer (FSO) for 2d Brigade, 24th Infantry Division (Mechanized).

Lieutenant Colonel Noel T. Nicolle is the Deputy Fire Support Coordinator (DFSCOORD) for the 3d Infantry Division, and until recently, the Division Artillery S3, deployed for OIF. Previous assignments include serving as FSO for 3d Brigade and S3 for 1st Battalion, 10th Field Artillery, both in the 3d Infantry Division; Small Group Instructor at the Field Artillery Captain's Career Course at the Field Artillery School, Fort Sill, Oklahoma; and an Observer Controller for the Mechanized Task Force Trainers and Fire Support Trainers at the NTC. He commanded B Battery, 4th Battalion, 27th Field Artillery (Multiple-Launch Rocket System), part of the 1st Armored Division in Germany. He holds an MA in History from Louisiana State University.

MLRS AFATDS and Communications
Lessons Learned in OIF

Captains Rhett A. Taylor, Matt T. Wegner and
George T. Tatum and Sergeant First Class Wayne Bui

The 214th FA Brigade (214 FAB), part of III Corps Artillery, Fort Sill, Oklahoma, deployed to Kuwait in support of Operation Enduring Freedom in February 2003 and to Iraq for Operation Iraqi Freedom (OIF) in March 2003. The brigade initially deployed with the 2d Battalion, 4th Field Artillery (2-4 FA) as its subordinate firing unit, with 2d FA Detachment, part of the 101st Airborne Division (Air Assault), attached for target acquisition (TA) capabilities.

2-4 FA was the first multiple-launch rocket system (MLRS) unit to reach the theater with M270A1 launchers and, initially, V Corps Artillery's only MLRS unit firing when ground forces crossed into Iraq. During OIF, the battalion fired 174 Army tactical missile system (ATACMS) Block 1 missiles, 36 Block 1A missiles, 13 unitary missiles and more than 220 M26 rockets.

214 FAB fired suppression of enemy air defense (SEAD) missions and preparatory fire plans before crossing the line of departure (LD), then crossed the Iraqi border directly behind maneuver forces and traveled more than 1,000 kilometers, moving as far north as Tikrit. The brigade fire control element (FCE) received fire plans on the move via the PRC-150 Harris HF radio, while 2-4 FA moved into pre-cleared position areas to fire and move again to range deep targets ahead of maneuver forces.

The 214th FAB provided reinforcing (R) fires to the 3d Infantry Division (Mechanized) and the 4th Infantry Division (Mechanized) as well as general support reinforcing (GSR) fires to the 3d and 4th Divisions with V Corps Artillery as the Force FA headquarters. This enabled the brigade to provide fires for shaping operations, close support and counterfire, with targets originating at all levels from individual maneuver task forces all the way up to the Coalition Forces Land Component Command (CFLCC) and 1st Marine Expeditionary Force (MEF).

The advanced FA tactical data system (AFATDS) was the vital link in providing responsive fires for such a large battlespace. AFATDS allowed us to efficiently service targets throughout the entire Iraqi area of operations (AO) with various munitions for many units. The system is user-friendly and allows smooth processing of fire missions and fire plans once the database is set up and verified. AFATDS provides a significant improvement in fire planning capability over previous fire control systems.

AFATDS works great with mobile subscriber equipment (MSE) and local area network (LAN) communications, and the data distribution is smooth with this setup. Overall the communications setup is simple, and it is easy to switch from LAN to variable message format (VMF), etc. The software layout makes it easy to troubleshoot communications with AFATDS, allowing units to quickly get back into the fight.

We did, however, have some challenges with AFATDS. Once hostilities ended, the brigade compiled some AFATDS lessons learned and workarounds or tactics, techniques and procedures (TTPs) used during the conflict as well as some recommendations for improvements. This article addresses I AFATDS Lessons Learned with recommendations and TTPs, II Counterfire TTP and III The Communications Structure.

I AFATDS Lessons Learned

Many of the challenges we experienced were MLRS-specific, and Team AFATDS already is correcting most of them in the next couple of versions of AFATDS software. Until these versions are available, the TTPs and workarounds we used during the war will help units in their training and preparation for our nation's next conflict.

• **AFATDS, the System.** During OIF, we used AFATDS Version 6.3.1.0, with Service Pack 1. Version 6.3.2 is due out in December 2003, while Version 7 is due out in December 2004.

– *Geometries.* AFATDS would not display a large number of individual geometries. When providing fires for corps-level operations, we needed to display more geometries.

TTP Solution. Team AFATDS reports the inability to display individual geometries was due to a programming glitch that will be corrected in Version 6.3.2 .

Until all units have the 6.3.2, we recommend they use the following workaround: go into the geometry workspace, open

"Geometry," click on "Coordinates" and then move all the windows to the side so the geometry is displayed on the screen.

–*Compact Computer Unit (CCU).* The 214th FAB Headquarters fought from an assault command post (ACP). The brigade FCE opted to use the CCU to fight from the ACP. The section was impressed with how well the CCU held up in the desert. The CCU proved to be very rugged, and the $35 keyboard skins the brigade bought before deploying proved to be invaluable.

When things slowed down, the section rotated back-up CCUs in and cleaned out the two used during the war with an air hose. We all watched the four different colors of dust blow out during the cleaning and were amazed we didn't have more problems with the CCU.

–*Jaz Storage Drive.* As rugged as the CCU is, it still fell short when it came to the Jaz drive's storing data. Very seldom did the Jaz drive work.

Recommendation. Team AFATDS can either replace the CCU with a Pentium laptop (toughbook) with CD rom (CDR) and floppy disk drives or replace the Jaz drive with a CDR drive.

–*Ultra Computer Unit (UCU).* While the brigade FCE was fortunate enough to operate with CCUs—on the modified table of organization and equipment (MTOE) for brigade liaison officer (LNO) teams— the battalion used UCUs. The UCUs proved to be bulky, and the battalion had trouble protecting the tactical communications interface module (TCIM) cards from damage due to their large size.

Recommendation. We recommend AFATDS go to laptops. Team AFATDS says laptop replacements for UCUs will starting fielding in FY05, followed by the fielding of laptops to replace CCUs. Beginning in spring 2004, units fielding AFATDS for the first time will receive laptops.

–*Free-Text Messages.* The free-text message has become a necessity of digital communications. The current version of AFATDS takes an average of seven to 10 seconds to bring up the free-text screen, which is far too long.

Many times, we had to relay time-sensitive digital traffic from higher to lower units with large amounts of text. To relay the message, we had to open a new text message and copy everything from the original message to the new message.

Recommendation. Time could be saved with functional forward and reply buttons. Along with a hardware upgrade providing a faster processor, an audio alert for incoming free-text messages needs to be added—much like the fire mission audio alert.

–*Time Drifting.* Our AFATDS was powered by either a three-kilowatt or 10-kilowatt generator throughout the operation. Even with a three-kilowatt generator dedicated to running only AFATDS, we still had problems with time drifting. This problem can be attributed to the fact that the AC power supplied from a generator does not stay constant like commercial AC power.

TTP Solution. The easiest procedure is to activate AFATDS using the precision lightweight global positioning system receiver (PLGR) time and to verify the time during each shift change and time hack before conducting fire planning. What we learned is that if you hit the "Synchronize" button when the seconds hit zero, AFATDS takes three to five seconds to establish the time. To compensate for the delay, we synchronized three to five seconds before the actual mark time.

–*Time Displayed in Seconds.* AFATDS time does not show seconds in the upper right hand corner display. We needed seconds displayed on the screen so AFATDS operators could verify if they were on PLGR time. Team AFATDS provided a procedure to use the system clock; however, the process took a while and periodically locked up the system.

Recommendation. Team AFATDS reports the December software release will add seconds to the display, solving the problem.

• **Computing Maximum Ordinate.** When the brigade closed in on Baghdad, the 3d Division required maximum ordinate (Max Ord) and the gun target line for every fire mission due to a corps-imposed restricted operating zone (ROZ) placed over Baghdad.

The battalion or battery fire direction center (FDC) had to either compute Max Ord using the chart in the back of *FM 3-09.60, TTP for MLRS Operations* (Final Draft) for max trajectory (then add the launcher altitude) or wait until the launcher fired the mission and get the data off the fire control panel (FCP).

Solution. Team AFATDS reports that AFATDS Version 7 will display Max Ords in the "Mission Monitor" window.

• **Coordination Handshakes.** Coordination handshakes for violated geometries took too long to process and had to be overridden.

One of the reasons for this problem was the target came to V Corps Artillery through the automated deep operations coordination system (ADOCS) software; then once the decision was made to engage the target with missiles, the corps artillery initiated a fire mission via AFATDS. Therefore, there was no direct or indirect route through AFATDS to the originator of the fire mission at CFLCC; as a result, the establishing headquarters could not override any coordination violations.

Another reason it took so long for coordination handshakes was that not all the units requiring coordination had good digital communications with the battalion's AFATDS, even though they had voice comms with the clearing headquarters. To expedite the process, the 214th FAB considered any targets sent from higher headquarters, reinforced FA headquarters or the supported maneuver brigade combat team (BCT) and higher (division) fire support elements (FSEs) to be cleared. These units all had Force XXI battle command brigade and below (FBCB[2]) and other automated unit tracking systems that the 214th FAB did not have. This TTP enabled the battalion to pre-clear all fires except counterfire acquisitions from the attached radars.

Recommendation. FBCB[2] and other devices used to track friendly forces need to be available at the general support (GS) brigade level to expedite clearing fires.

• **Unit Icon Distribution.** As the only initial ATACMS (Block 1A and unitary) missile shooters in theater, CFLCC required individual launcher updates whenever the launchers moved to expedite the clearance of airspace. With our configuration, AFATDS only would update two levels down. For example, the brigade FCE only could receive the battalion FDC icon and the three firing battery FDC icons.

The procedure adopted was either for the firing battery to go into the unit workspace and send each individual launcher icon to battalion (then battalion to brigade, etc.) or for the firing battery to transfer current units, selecting its individual launcher icons. Brigade, in turn, used the same procedure to send the icons to corps and then on up the chain.

Recommendation. A future software upgrade should allow launcher icons to be distributed to any unit in accordance with the setup in the distribution list—perhaps programming the software to know that any launcher with ATACMS uploaded

2-4 FA, 214th FA Brigade firing an ATACMS missile into Baghdad from a location east of An Najof.

will automatically update units in the distribution list. A potential solution includes automatic updates any time the launcher is uploaded and in position ready to fire (IPRTF).

• **Loaded Munitions Manager (LLM).** The classified LMM loaded well. However, the ranges for all the munitions didn't seem to be classified. In the tactical assembly area (TAA), the battalion FDC computed missions outside the unclassified range and would not get a "Green Gumball" allowing it to fire. When battalion sent the "Order To Fire/Fire Order" (OTF/FO) down to the battery, the battery FDC would not get a Green Gumball. However, when the OTF/FO went down to the launcher, the launcher would get a solution.

The effects management tool (EMT) tells if a solution exists; however, a fire control officer (FCO) or fire direction officer (FDO) shouldn't have to go outside AFATDS to find this out.

Solution. Team AFATDS reports this capability will be in the December 2003 Version 6.3.2 software.

• **Fire Mission Processing.** At times the MSE data link would go down, or the brigade would move out of FM communications range with higher headquarters. The secure tactical satellite (SCTACSAT) and the Harris radio then became the primary means of voice communications with corps artillery.

When the brigade received a fire mission by voice, it had two options. The mission could go down to the battalion by voice comms, or the brigade could initiate a fire mission at the brigade level and send it down digitally.

To initiate a fire mission, the operator must go through too many tabs. The FCE/FDC must go through (potentially) five separate tabs to open one voice mission to process it. Units need a simpler, one-page method of initiating a fire mission, allowing the operator to tab from field to field quickly.

With the current system, guidances should and often do make fire mission processing easier. However, when a *missile* fire mission comes down via voice, the operator has to go to the munitions tab and enter the desired dispersal pattern for the missile.

Also, while at the munitions tab, operators can't choose between Block 1 or Block 1A. When it comes to selecting the "Fire for Effect" (FFE) shell, "ATACMS APAM" (anti-personnel and anti-material munition) is AFATDS' alias for both Blocks 1 and 1A. This becomes a problem with the classified LMM loaded when a Block 1A mission is sent and the launcher only can calculate a solution for the target with Block 1. The workaround was to send the fire order by voice, directing the battalion/battery to engage the target with Block 1A.

The brigade also experienced issues in supporting several different units with different standard tactical missions because the guidances and standard fire orders changed from unit to unit. The fix was a matter of database management and staying on top of changes.

Recommendation. Only the first two tabs are used to initiate a fire mission at brigade and below. We recommend either taking out the other tabs to speed up the fire mission process or, if upper echelons or units require them, setting up the "Initiate Fire Mission" window to best support each attack analysis level.

• **Fire Planning.** Fire planning is relatively easy with AFATDS. One problem we experienced with fire plans was that occasionally corps artillery sent down changes to a fire plan to brigade with a duplicate target number but with a different grid. From brigade, this fire plan was sent down to the battalion and its batteries for execution.

When the brigade received last-minute changes to the fire plan (target location refinements) without changes to the target numbers, AFATDS would not accept the fire plan unless all targets associated with the original fire plan were deleted and purged from the inactive target list. In contrast, if a target came down with a different target number but the same or similar grid, that target failed target duplication standards set in the guidances (depending on the guidances). These issues prevented our AFATDS from receiving changes to fire plans at the brigade or battalion levels.

On the first day of the war, a last-minute change was made to a fire plan. Corps artillery updated the fire plan and sent it to brigade, but AFATDS would not receive the plan. The initial workaround was to delete the fire plan and target list so that the corps artillery could resend the fire plan. We then had to do the same procedures at the battalion and battery levels. The battalion had trouble deleting the 20-plus targets in time to send the plan via AFATDS, so the fire plan had to be printed out and carried to the battalion FDC to get "steel on target."

TTP Solution. AFATDS needs to analyze and compare targets by target number blocks, not just location and target type. Target duplication standards prevent attacking a target multiple times when effects are not achieved or when the target is very large, etc. This is a great feature by design, but it causes problems during fire planning when target refinement is continuous.

A lesson learned is to go back to the basics of targeting taught at the schoolhouse and change the target number when the target is refined. AFATDS requires that. We also need to enforce target refinement cutoffs at all levels. This is essential to give units time to process large numbers of targets and changes before firing.

• **Continuous Operations (Con Ops).** Con Ops procedures for AFATDS are complex. The current AFATDS Version 6.3.1.0 manual (dated 31 October 2002) doesn't cover these procedures.

Recommendation. Team AFATDS reports that *TM 11-7025-297-10-1 AFATDS Operations System Software Operator's Manual,* Chapter 6, "Miscellaneous," Paragraph 6.25, covers Con Ops and that the procedures, by their nature, are complex, requiring training. We recommend Team AFATDS streamline the procedures in future software upgrades.

• **Internet Protocol (IP).** When units built into our AFATDS sent a free-text message via the LAN with a different IP than in the subscriber table, AFATDS locked up. Sometimes, AFATDS just locked up for 30 seconds or so, but sometimes it crashed. The latter usually occurred during fire mission

processing, forcing us to go voice until the AFATDS came back up.

With units' short-range extension network (SEN) support changing as often as it did throughout OIF, AFATDS cannot be locking up every time a new IP enters the network from a unit already in the subscriber table.

Solution. Team AFATDS reports that Version 7 will fully automate AFATDS' recognition of new IPs for units already on the subscriber list.

• **MSE.** MSE works great with AFATDS. We could easily push geometry and unit icons via the LAN, and data distribution worked perfectly. Crucial to success with the LAN is occupying position areas with good line-of-sight (LOS) SEN shots or having the TSC-93 satellite attached to the unit. We were fortunate to have both during most of the war.

While MSE worked extremely well, VMF had trouble with large volumes of traffic, specifically the large amount of geometries and unit updates pushed down from higher headquarters. In some cases, we had to lower our data rate to allow more data to be pushed over longer distances when comms were degraded. This slowed digital communications down but still allowed us to maintain a link.

Recommendation. The TSC-93s (or newer version of satellite link) and SENs need to become organic to all FA brigade-level units and SEN teams organic to all MLRS battalions. This will allow MLRS units to cover the large battlespace associated with MLRS operations and provide the opportunity to train MSE/AFATDS in peacetime.

Team AFATDS says Service Pack 1 allows AFATDS to communicate with HF radios (MRC 138 and 150s), but units didn't have the radio cables to connect to AFATDS. Team AFATDS is getting cables for FA units still in Iraq.

• **Ammunition Tracking.** When the launcher transmits its update, AFATDS can track what munitions are uploaded in the launcher but not the ammunition in the stored munitions file. In the past, we used the MLRS fire direction system (FDS) to track munitions by what munitions were loaded on the launcher and what munitions were available by response time. AFATDS should have this same feature.

Ideally, when a unit draws its initial authorized basic load (ABL), the launcher should transmit its update with what munitions it has uploaded. The battery FDO then inputs what munitions are available and their response times, based on what the ammo platoon sergeant reports is on the heavy expanded-mobility tactical trucks (HEMTTs) or heavy expanded-mobility ammunition trailers (HEMATs). When the launcher expends its pods, the update automatically is transmitted to higher headquarters, and when the launcher goes to the reload point, the pods uploaded on the launcher are subtracted from the ammunition tracked by response time.

Solution. Team AFATDS says ammunition management in AFATDS is different than in the FDS; the December software release will facilitate the ammo tracking procedures.

II Counterfire TTP

Due to lengthy clearance of fires procedures required by higher headquarters, it was difficult, at best, to achieve counterfire responsiveness, whether the brigade was serving as the counterfire headquarters or fulfilling a reinforcing role.

TTP Solution. When the brigade received TAs in the counterfire AFATDS, the mission was sent directly to the FCE AFATDS and then down the firing battery "At My Command" (AMC) for MLRS or "Do Not Load" (DNL) for cannons. Simultaneously, the brigade cleared the target grid by voice through whichever maneuver unit was the current higher headquarters (V Corps/3d or 4th Infantry Division). The total time to clear a target was roughly the time it took to lay on the target. Once clearance was received from maneuver, the method of control was changed to "When Ready" (WR) for cannons or the command to "Fire" was given, placing steel on target.

These AFATDS lessons learned in OIF allow units to focus future training to provide battalion and lower FDCs a realistic scenario and a chance to work through problems they could face in combat.

III The Communications Structure

The biggest lesson learned during Operation Iraqi Freedom is the importance of a communications structure in a large, fast-pace battlespace. We learned that during occupations, it takes at least 30 minutes to get an MSE data shot in that provides LAN and digital non-secure voice telephone (DNVT) communications. At the brigade level and below, the FM radio was used exclusively and was inadequate for the battlespace covered.

The Harris radio provided continuous voice communications with higher and subordinate units throughout the war. At times we talked with radios more than 500 kilometers away on the whip antenna.

Recommendation. The Army should expand the use of the Harris radios by developing the software and hardware, if needed, to talk digitally. That would enable the artillery to better "Shoot, Move and Communicate" on the move in future conflicts. We also need to expand the capabilities of the SCTACSAT radio and incorporate it into FA MTOEs.

AFATDS Version 6.3.1 was critical to our operations in OIF. We have identified the challenges we faced and our TTP for dealing with those challenges—plus our recommendations for improvements—in hopes of making a good system better for those who follow.
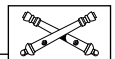
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Captain Matt T. Wegner is a Brigade FCO in the 214th FA Brigade and deployed to Iraq for OIF. While serving as a Company FSO with the 1st Battalion, 6th Field Artillery, he deployed to Kosovo and Macedonia. He also served as a Platoon FDO, Platoon Leader and Reconnaissance and Survey Officer in the same battalion.

Captain George T. Tatum is the Battalion FDO for the 2d Battalion, 4th Field Artillery, part of the 214th Field Artillery Brigade, and deployed to Iraq for OIF. In the same battalion, he also served as a Firing Platoon Leader and Battery FDO.

Sergeant First Class Wayne Bui is the Senior Fire Control NCO in the 214th FA Brigade and deployed to Iraq in OIF. He also served as the Fire Control Chief for the 2d Infantry Division Artillery in Korea; Chief Tactical Automated Fire Direction Instructor for the FA Captain's Career Course, Fort Sill; and Communications and Electronics Command Advanced FA Tactical Data System (AFATDS) Instructor on the New Equipment Training Team, also at Fort Sill.

IRAQ:

101st Division LNO in the V Corps FECC

By Lieutenant Colonel Patrick J. Sweeney
and Captain Jason G. Montgomery

Serving as a division liaison officer (LNO) in a corps headquarters is a lot tougher than it appears at first glance. For example, when the LNO's division's attack aviation has a mission, he must ensure the Air Force knows about the Army tactical missile system (ATACMS) fires for suppression of enemy air defenses (SEAD), that the battlefield coordination detachment (BCD) has cleared the airspace, and that the corps fires and effects coordination cell (FECC) assistant fire support coordinator (AFSCOORD) and the coalition forces land component command (CFLCC) fire support element (FSE) know about the attack and are supporting it. Meanwhile, he must stay in constant touch with the aviation fire support officer (FSO) and the corps air liaison officer (ALO).

It is his job to ensure division operations are synchronized with corps and CFLCC operations. Without that, as in the example, ATACMS fires could be delayed, the Army aviation may not fly…or worse, might fly and take casualties…and the divisional unit on the ground needing the fires might not get them when they need them most.

FECC LNO job is a lot more than just attending meetings and reporting back to division. *Synchronization* is his job.

This article discusses the role of the 101st Airborne Division (Air Assault) LNO to V Corps in the corps FECC during Operation Iraqi Freedom (OIF). To fulfill the role, the LNO first must understand how his corps FECC operates.

The V Corps' FECC brings all the agencies involved in deep operations together in one location to facilitate the exchange of information and coordination. The FECC has elements from the corps FSE, corps artillery fire control element (FCE), corps FA targeting officer, corps G3 air, Army airspace command and control coordination cell (A^2C^2), corps rescue coordination center (RCC), command and control cell, joint weapons officer (JWO), corps ALO, corps staff judge advocate, engineer, air defense, and division and Special Forces LNOs. The corps artillery commander is in charge of the FECC.

The deputy FSCOORD (DFSCOORD) oversees the daily operations of the FECC and runs and facilitates the corps' targeting meeting and board. The AFSCOORD is the floor boss and the driving force of the FECC's combat operations. He is responsible for outside coordination and internal checks to ensure all deep fires and operations are synchronized.

The FECC is the functional organization that ensures the corps' deep fires and operations are coordinated, synchronized and executed. The division LNO to the corps FECC has specific duties.

Division Deep Fires and Effects Coordinator. This is the LNO's primary job. He ensures all agencies and resources at corps and outside of corps are fully aware of division operations and ready to support the division at the appropriate time.

Air Support Coordination. This includes ensuring the division's air support requests (ASRs) are complete and submitted to the corps JWO on time. The LNO must be prepared to submit nominations when the division FSE cannot because of operational constraints.

The LNO attends the daily corps ASR priority board meeting to fight to get the division's nominations on the corps' ASR nomination list. The LNO then checks the corps' ASR nomination list before it is sent to CLFCC to ensure all the approved division nominations are on the list and accurate.

If the division is nominating joint SEAD (JSEAD) on the ASR list, then the LNO completes a Central Command Air Force (CENTAF) Form 1972 to make the request and notify higher headquarters of the intent to use electronic jamming assets. The LNO then attaches the air control points (ACPs) for the flight routes to Form 1972, if known, or sends them as soon as he knows them. This form is submitted electronically to the corps electronic warfare (EW) officer 72 hours before the operation.

Each evening, the LNO reviews the air tasking order (ATO) to determine which division ASRs made the cut and determine if the package is enough to complete the upcoming mission. The LNO prepares an air support package spreadsheet and forwards it to the division FSE and corps ALO. (See Figure 1.) If air resources are not enough, the LNO works with the AFSCOORD to contact the corps' CFLCC LNO to coordinate for additional air resources or priority of use for the corps' close air support (CAS) assets.

Furthermore, the LNO determines the squadron and air base location from the ATO for the forward air controller-airborne (FAC-A) and EW assets. The LNO, with the help of the corps ALO, then sends the aviation unit's concept of operations word sketch with unit contact information to the respective squadron's email or briefs them telephonically. (See Figure 2 on Page 42.) Before he sends the concept sketch, he has the corps ALO review it to ensure all the information the pilots need is included.

The following information is important to include in the concept sketch: the supported unit's ALO frequencies, digital non-secure voice telephone

(DNVT) numbers and the air mission commander and ALO secure email addresses so the pilots can contact them directly with questions about the operation. In addition, the sketch should have locations listed in latitude and longitude coordinates, gun target line for artillery and missile fires in degrees magnetic, frequencies the unit wants jammed and the kill boxes the unit wants cleared for ATACMS fires. Finally, the concept sketch must include the concept of fires for how the commander will integrate CAS and cannon/missiles fires.

This concept sketch provides the flight operations officer and (or) the pilots the information to synchronize their efforts in the operation. The sooner the LNO can provide the pilots the concept sketch, the better. The LNO must be prepared to develop this sketch from a verbal

Armed Recce									
Mission	0730Z	0800Z	0830Z	0900Z	0930Z	1000Z	1030Z	1100Z	1130Z
FAC		4107 GS			4111 GS		6325A GS		
CAS	4535A	3163 GS		4551A		3065 GS			
EA-6B	4500					776 GS			
EA-6B	1657 GS								
F-16CJ	6403A			2463A					
EC-130H	2511								

101st DATK IVO Shavka Mazhar Air Field 0900Z-1300Z							
ASR Num	Msn ID	Sortie Count	A/C	Call Sign	Tgt ID/Loc	SCL	Time On/Off
CAS	4535A	2	2-A-10	Ewok35	87AS	2A65X4M82XB	100700ZAPR/100800ZAPR/-
	4551A	2	2-A-10	Rodney51	87AS	2A65X4M82XB	100900ZAPR/101000ZAPR/-
EA-6B	4500		1-EA-6B	Agnew08	88AR	3ALQX2	100630ZAPR/101000ZAPR/-
F-16CJ	2255A		2-F-16CJ	Hallow55	90AR	Best	100400ZAPR/100600ZAPR/-
	6363		2-F-16CJ	Eli63	90AR	Best	100600ZAPR/100800ZAPR/-
	6403A		2-F-16CJ	Toxic03	90AR	Best	100700ZAPR/100900ZAPR/-
	2463A		2-F-16CJ	Audi63	90AR	Best	100900ZAPR/101100ZAPR/-
EC-130H	2511		1-EC-130H	Stiff11	Fattie1	Best	100300ZAPR/101100ZAPR/-

General Support							
FAC	1233A	2	2-FA-18D	Upshot33	87AT	Best	100600ZAPR/100930ZAPR/-
	4107	2	2-F-14D	Mafia07	87AS	4G12S1W2LT	100630ZAPR/100930ZAPR/-
	1235A	2	2-FA-18D	Motown35	87AT	Best	100830ZAPR/101200ZAPR/-
	4111	2	2-F-14D	Redi11	87AS	4G12S1W2LT	100930ZAPR/101030ZAPR/-
	1237A	2	2-FA-18D	Capgun37	87AT	Best	101000ZAPR/101330ZAPR/-
	6325A	2	2-A-10	Peak25	87AS	2A65X4M82XB	101030ZAPR/101130ZAPR/-
CAS	7303	2	2-AV-8B	Harris03	87AT	1G12X1A65E	100800ZAPR/100845ZAPR/-
	3163	2	2-TORGR-4	Pirana63	87AS	2EPW2X2WXTDXL2	100800ZAPR/100900ZAPR/-
	6351	2	2-A-10	Irish51	87AT	2A65XB	100800ZAPR/100900ZAPR/-
	6361A	2	2-A-10	Quaker61	87AT	2A65XB	100830ZAPR/100930ZAPR/-
	7305	2	2-AV-8B	Llama05	87AT	1G12X1A65E	100900ZAPR/100945ZAPR/-
	6367A	2	2-A-10	Chop67	87AT	2A65XB	100900ZAPR/101000ZAPR/-
	3063	2	2-TORGR-4	Honcho63	87AS	2EPW2X2WXTDXL2	100900ZAPR/101200ZAPR/-
	4303	2	2-FA-18C	Kermit03	87AS	1G35X1G12A1W2	100930ZAPR/101000ZAPR/-
	7307	2	2-AV-8B	Harris07	87AT	1G12X1A65E	101000ZAPR/101045ZAPR/-
	3065	2	2-TORGR-4	Abram65	87AS	2EPW2X2WXTDXL2	101000ZAPR/101300ZAPR/-
	7311	2	2-AV-8B	Llama11	87AT	1G12X1A65E	101100ZAPR/101145ZAPR/-
EA-6B	T2501		1-EA-6B	Kimbo01	94AS	3ALQ1A88X1	100630ZAPR/101000ZAPR/-
	6357		1-EA-6B	Agnew57	87AS	3ALQX2	100715ZAPR/100945ZAPR/-
	1657		1-EA-6B	Shiloh75	88AR	3ALQX2	100930ZAPR/101200ZAPR/-
	T2502		1-EA-6B	Moxie02	94AS	3ALQ1A88X1	101000ZAPR/101400ZAPR/-
	776		1-EA-6B	Basket56	87AS	3ALQX2	101015ZAPR/101230ZAPR/-
	4503		1-EA-6B	Jugs03	90AQ	3ALQX2	101100ZAPR/101130ZAPR/-

Legend:
A/C = Aircraft
ASR = Air Support Request
CAS = Close Air Support
FAC = Forward Air Controller
IVO = In the Vicinity of
Msn ID = Mission Identification
Recce = Reconnaissance
SCL = Standard Conventional Load
101st DATK = 101st Division Attack

Figure 1: Air Support Package Spreadsheet

briefing when email communications are not established or time constrains prevent the unit from developing it.

Likewise, the FECC LNO must get with the FECC AFSCOORD to ensure the air support operations center (ASOC) air boss has the concept sketch and is thoroughly briefed on division operations. If the corps is operating two headquarters (main and forward command posts), the LNO must ensure the air boss in the ASOC forward also has received the sketch and is briefed. This step is especially important if the corps is providing the division CAS assets out of its own stack of aircraft.

Intelligence Collection. In synchronizing assets for a deep attack or an air

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Scheme of Fires: From H-6 (min) to H+40 (min), fires (K19N, K20N, K21N) will suppress EADA and maneuver formations during 1-101AHB's ingress from TAA Roadway, along route Cancer 3, to PL Anne (LD) IOT provide freedom of maneuver. Nonlethal JSEAD will jam ADA radars while lethal JSEAD engages targets of opportunity from H-49 (min) to H+1:40. Lethal JSEAD will break off station at H+15 (min). A dedicated FAC-A will be on station from H-49 to H+2:00 IOT facilitate integration of CAS and maneuver. 1-101AHB will pass all immediate targets of opportunity to CAS during ingress. From H-49 (min) to H-15 (min) CAS will attack targets in Grids 86AR4/5/7 under the control and direction of a FAC-A. When 1-101AHB reaches their ACP E258 on route Cancer 3, CAS will move from 86AR into a holding area in 86AQ. When the lead element of 1-101AHB hits the RP-4 (min) Group K19N is fired. Group K20N is fired at PL Anne. Group K21N is fired when the 2d Company crosses PL Maine. Upon the completion of K21N, 1-101AHB will engage targets with direct fires and pass targets to CAS in 88AR. CAS will utilize precision munitions near sensitive sites and in or around populated areas around the U/I Tank Bn. Series Destiny Lightning is an on-call fire plan for 1-101AHB's egress; it consists of Group K19N. The on-call trigger is when the first egressing element departs its ABFs Andromeda 4. The combined effects of fires and maneuver will result in the destruction of: 30xT55s; 9xD30s; 6xS60s; 2xZSU 23-4s; 10xSA-7s. **Firing unit is located at 32 35 07N 044 02 03E (Kill box 85AS1) shooting on azimuth of 340 degrees magnetic.**

Wheels up: 0811Z
TOT/H-Hour: 0900Z
Egress: 1000Z
End of Mission: 1100Z
EAs: Nova (Stomp/Murder)
Ingress: Cancer 3
Egress: Andromeda 4
KI/CAS: H-49 to H + 2:00 (0811Z-1100Z)
ATACMS: H-6 TO H+40 (0854Z-0940Z) SEAD; On-call missions until 1100Z
Lethal JSEAD: H - 49 to H + 15 (0811Z-0915Z)
Nonlethal: H - 49 to H + 1:40 (0811Z-1040Z)
Kill Box Keypads ATACMS cleared: 88AP 3, 4, 5, 6, 7, 8

EA: Nova (33 15 47N 043 37 19E, Kill box 86AP3)

38SLE640670, 38SLE693753, 38SLE720855, 38SLE770813, 38SLE778800, 38SLE890690, 38SLE870669

Sub EA:
a. EA Stomp–38SLE660744, 38SLE738806, 38SLE758748, 38SLE703707
b. EA Murder–38SLE728837, 38SLE782853, 38SLE816749, 38SLE763729

Call Signs and Frequencies		
	C/S	Freq
AMC	No Mercy 6	UHF: 350.340, 540.665, 451.640
C² A/C	Tide 50	Kaki 30: UHF: 433.960
	(ALO)	Kaki 9: UHF: 459.800
FSO	Destiny 95	75 (WB TACSAT)
41 FAB	Railgun 35	75 (WB TACSAT)
1-27 FA	Smasher 8	FH980
Div ALO	LTC Zane Mitchell	
	581-0871/0738/steve.murray@us.army.mil	

Frequency and Location of Known ADA Assets	
Asset	Freq
Roland Tgt Acq:	1113-1501 Mhz
VISOBs Controller SAT Phone:	1228-1940 Mhz
Spoon Rest	1153-1580 Mhz

Pre-Planned CAS	
H-40 to H+2:00: FAC-A on Station	4 sorties
H-40 to H:	6 sorties
H to H+10:	2 sorties
H+10 to H+1:00:	10 sorties
H+1:00 to H+2:00:	12 sorties

Pre-Planned ATACMS Fires	
Group	Targets
K19N(Z)	KN0656, 0670, 0675, 0680, 0725, 0726
K20N(Z)	KN0660, 0727, 0728, 0729
K21N(Z)	KN0685, 0690, 0700, 0705, 0710, 0715

Legend:

ABF = Attack-by-Fire Position	**Bn** = Battalion	**KI** = Kill-Box Interdiction
ACP = Air Control Point	**C²** = Command and Control	**LD** = Line of Departure
Acq = Acquisition	**Div ALO** = Division Air Liaison Officer	**PL** = Phase Line
ADA = Air Defense Artillery	**EADA** = Enemy Air Defense Artillery	**RP** = Release Point
AHB = Assault Helicopter Battalion	**FAB** = Field Artillery Brigade	**TAA** = Tactical Assembly Area
ALO = Air Liaison Officer	**FAC-A** = Forward Air Controller-Airborne	**TACSAT** = Tactical Satellite
AMC = At My Command	**FSO** = Fire Support Officer	**TOT** = Time-On-Target
ATACMS = Army Tactical Missile System	**IOT** = In Order To	**VISOBs** = Visual Observers
	JSEAD = Joint Suppression of Enemy Air Defenses	

Figure 2: Concept of Operations Sketch: Air Tasking Order (ATO) F-101st Aviation Brigade Search and Attack in the Vicinity of Engagement Area (EA) Nova

assault, the FECC LNO checks with the corps collection manager to ensure the division collection manager has submitted the unmanned aerial vehicle (UAV) request and that corps plans to fly the routes and objective area. The LNO also ensures the target deck submitted with the UAV request focuses on specific locations for enemy targets. (The target deck is the list of locations along the flight routes and objective area that the unit wants the UAV to collect on.) Specified locations allow the UAV to focus its collection effort, which greatly increases the effectiveness of the asset. Next, the LNO checks the time the UAV is scheduled to fly the division routes and objective to ensure the data gets back before the final conditions check, which normally is three hours before the mission. Finally, during fast-paced operations, the LNO must be ready to develop a target deck for the UAV.

The LNO continues to monitor the UAV coverage throughout the day because UAV priorities may change. The LNO ensures the collection manager and corps chief of staff know that UAV collection on the target set and routes is a necessary condition for a deep attack or air assault.

The LNO requests an electronic intelligence (ELINT) analysis of flight routes and objective area from the analysis control element (ACE) ELINT analyst. This analysis helps the division FSE refine SEAD targets and identifies the enemy air defense artillery's frequency ranges, making the electronic attack squadron more effective. The LNO can specify the time-search criteria for the analysis that will narrow the search and number of targets. He sends the results of this analysis (or reports it verbally) to the division FSE.

Airspace Clearance. Clearance of airspace to fire ATACMS SEAD and on-call ATACMS fires for a deep operation is another area the LNO ensures is synchronized. Because ATACMS missiles travel at altitudes of up to 160,000 feet, the BCD must clear airspace to shoot them.

The process is initiated by putting the ATACMS SEAD and on-call ATACMS missions on the division's ASR nomination sheet. This alerts the BCD to the request so it can adjust tracks for refueling aircraft and CAS stacks to accommodate the fires.

The day before the operation, the LNO checks with the AFSCOORD to ensure the CFLCC LNO and the BCD know about the request to clear airspace for ATACMS fires for the upcoming mission. At least 12 hours before the mission, the LNO coordinates with the AFSCOORD the specific time window the division wants the airspace cleared for ATACMS fires. The LNO should add a 20-minute buffer to the front of the window to allow the BCD extra time to clear the airspace and account for unforeseen circumstances. The LNO notifies the division FSE when the airspace is cleared for ATACMS fires.

The airspace is cleared for all air interdiction (AI) and non-CAS aircraft. CAS aircraft operating in this airspace must be under the control of either a FAC-A or the ALO. Immediately after the mission is complete, the LNO notifies the AFSCOORD to open the airspace to all Coalition Force Air Component Command (CFACC) assets' use.

Finally, the LNO ensures the SEAD plan for the deep operations arrives at the corps FSE at least three hours before its execution. This allows the corps FSE time to analyze the targets and do another check for fire support coordination measure (FSCM) violations and legal review. The LNO reviews the SEAD plan and plots the targets to validate the timing and sequencing of their attack. The LNO resolves any issues the

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- Verify that CENTAF Form 1972 (Request for Electronic Warfare Support) is filled out and submitted to the corps EW officer.
- Verify JSEAD package is on the ATO the evening before the mission.
- Develop and send the Air Support Package Spreadsheet to Div FSE and corps ALO.
- Work with the AFSCOORD or CFLCC LNO to cover gaps in air support coverage.
- Distribute the Concept of Operations Sketch to corps CFLCC LNO, A²C², G3 air, collection manager, ACE targeting officer, JWO, VCA G3, corps FCE, corps FSE, AFSCOORD, ALO, air boss, EW officer and G3.
- Send Concept of Operations Sketch to respective squadrons that the FAC-A and EW aircraft are coming from.
- Verify the collection manager has the division's target deck for the mission and the flight plan ensures the unit will receive the data NLT 3 hours before wheels up.
- Request from the ACE an ELINT analyses of routes and objective area and send results to the Div FSE.
- Twelve hours out, coordinate with FECC AFSCOORD the specific time period for clearance of ATACMS fires for SEAD and on-call targets; ensure the window has a 20-minute buffer up front.
- Get routes and their respective ACPs to the corps collection manager and EW officer.
- Receive mission execution checklist and send to the FECC deep fires coordinator.
- Ensure the AFSCOORD verifies that the air boss has and understands the Concept of Operations Sketch and has identified aircraft to support the operation.
- Receive SEAD plan and plot targets; check to ensure targets do no violate FSCM and the concept of SEAD and timings are synchronized.
- Verify with the AFSCOORD that corps CAS is available and scheduled to support the mission.
- Verify the corps FSE has the SEAD plan at least two hours before execution.
- Verify that corps units have rehearsed the SEAD and there are no issues at least one hour prior to execution.
- Twenty minutes before wheels up, verify that airspace is cleared for ATACMS fires.
- Ensure that corps does not try to push additional assets or fires into the Avn Bde's area of operations, unless requested.

Legend:

A²C²	= Army Airspace Command and Control	ELINT	= Electronic Intelligence
ACE	= Analysis Control Element	EW	= Electronic Warfare
AFSCOORD	= Assistant Fire Support Coordinator	FCE	= Fire Control Element
Avn	= Aviation	FSCM	= Fire Support Coordination Measures
Bde	= Brigade		
CENTAF	= Central Command Air Force	FSE	= Fire Support Element
CFLCC	= Coalition Forces Land Component Command	JWO	= Joint Weapons Officer
		VCA	= V Corps Artillery

Figure 3: 101st Fires and Effects Coordination Cell (FECC) Liaison Officer's (LNO's) Deep Attack and Air Assault Synchronization Checklist

corps FSE or FCE may have and ensures the unit firing rehearses the plan.

The bottom line: The LNO conducts the behind-the-scenes coordination that ensures his division has the resources it needs and they are synchronized for delivery at the time the division needs them. (See Figure 3 for the LNO's deep attack and air assault synchronization checklist.)

Division Ambassador for Corps Targeting. The FECC LNO is the division's ambassador at the corps targeting meeting and board. His primary mission at these meetings is to influence the corps' leadership to get the priorities and resources the division needs to accomplish its deep operations.

To influence the targeting team and board, the FECC LNO must be able to communicate the division's capabilities and limitations accurately, anticipate the resources the division will need, inform and educate the team on how the division fights, and have technical and tactical creditability with the corps leadership and members of the targeting team.

The targeting meeting and board are the forums in which the FECC LNO can make his most significant contributions to the division's efforts. For instance, during Operation Iraqi Freedom, the V Corps targeting team initially did not put a high priority on engaging low-level air defense artillery (ADA) systems. The 101st FECC LNO explained the increase in the number of missions the 101st would be able to conduct with better conditions set for attack helicopter operations, persuading the corps to target the lower-level ADA assets for SEAD. This resulted in the 101st Division's executing many deep operations without losing an aircraft to enemy ADA.

Furthermore, the FECC LNO must be proficient in doctrine and targeting for civil military operations (CMO). During Operation Iraqi Freedom, the 101st and 82d Airborne Divisions simultaneously conducted combat operations to clear cities of Iraqi Army remnants and para-military forces and started CMO operations in other cities. The FECC LNO helps the corps team in targeting for both types of operations. He must thoroughly understand information operations (IO), psychological operations (PSYOPs) and civil affairs (CA) operations plus the various assets to execute these operations.

As the fighting ebbs, most of the LNOs time and efforts will be directed to targeting for the CMO fight and coordinating and obtaining resources for CMO. The LNO must be familiar with CA battalion operations and the organization and functions of the CA brigade staff, the corps humanitarian assistance coordination center (HACC) and the office of reconstruction and humanitarian assistance (ORHA) because he will interact with these elements to coordinate and synchronize the division's CMO.

The FECC LNO must have the flexibility and knowledge to target-to-kill and target-to-build at the same time.

Active Member of the Corps Targeting Team. The FECC LNO must understand he is an active member of the corps targeting team—not just a division representative. He does not simply sit in the meetings taking notes but comes fully prepared, shares information with other board members, makes suggestions to improve the targeting process and works hard to implement improvement suggestions.

The LNO must adopt a team versus a zero-sum attitude when fighting for resources for the division. At times, two units will have a need for the same asset at the same time, and the LNO must support the unit that has the greatest need.

For example, during Operation Iraqi Freedom, both the 101st and 11th Attack Helicopter Regiment (AHR) were executing aerial reconnaissance missions at the same time in different areas of the corps area of operations. Both units requested UAV coverage; however, the UAV only had flight time to support one unit. Because the 11th AHR mission had the greatest ADA risk, the 101st LNO supported UAV coverage for the 11th AHR. A team attitude helps the corps shape the overall fight and enhances the LNO's ability to influence on behalf of his division.

Division Commander's Ears, Eyes and Hands. The FECC LNO gleans relevant information from staff updates, situation reports, conversations and meetings and reports it to the division. Likewise, at the end of the targeting meeting and board, the FECC LNO publishes his notes and forwards them to the elements of the division FSE, division artillery commander and G3 The timely reporting of relevant information allows the division's leadership to anticipate and conduct parallel planning for upcoming missions.

Furthermore, the FECC LNO tracks down information the division leaders need, voices division leaders' concerns to key corps leaders and works through the corps staff to coordinate resources outside of the corps. The FECC LNO is in the business of gathering and exchanging information and being the division and division artillery commanders' utility man at corps.

Conclusion. The duties outlined in this article require the LNO have extensive fire support coordination experience and knowledge regarding how the division fights and its capabilities. To facilitate the LNO's credibility and allow him to interact with the corps primary staff on a more equal basis, we recommend the LNO be a senior major or lieutenant colonel. The more experienced, more senior LNO will increase the division's likelihood of getting the resources it needs. The Marine Corps had colonels as their LNOs to V Corps during OIF.

The FECC LNO's job is a lot more than getting information for the division. The FECC LNO can make the difference in resources and support for the division's fight. *Air Assault!*
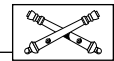
Lieutenant Colonel Patrick J. Sweeney is the 101st Airborne Division (Air Assault) Liaison Officer (LNO) at V Corps Headquarters in Operation Iraqi Freedom (OIF). In previous assignments with the 101st Division at Fort Campbell, Kentucky, he commanded the 3d Battalion, 320th Field Artillery (3-320 FA) and served as Executive Officer (XO) of the Division Artillery. Lieutenant Colonel Sweeney commanded A Battery in 5-11 FA, 6th Infantry Division, Fort Wainwright, Alaska. He holds MAs in Social Psychology from the University of North Carolina at Chapel Hill and in Military Arts and Science from the Command and General Staff College at Fort Leavenworth, Kansas.

Captain Jason G. Montgomery recently assumed command of A Battery, 1-320 FA, part of the 101st Airborne Division now deployed to Iraq. For major combat operations in OIF, he served as the 101st Division LNO at V Corps Headquarters. In his previous assignment, he was the S4 for the 1-320 FA. Captain Montgomery also served with 2-3 FA, part of the 1st Armored Division in Germany, as a Battalion and Battery Fire Direction Officer and Company Fire Support Officer. He is a graduate of the FA Captain's Career Course, Fort Sill, Oklahoma, and the Combined Arms and Services Staff School at Fort Leavenworth.

History Writing Contest Winners 2003

First Place: "The Siege of Yorktown–Joint and Multinational Operations in the American Revolution" by Captain W. Cochran Pruett

Second Place: "Saved by Artillery–How MG Lucas Lost the Initiative at Anzio and the Allied Artillery Regained It" by Captain Colin J. Williams

Third Place: "Three Men of Gettysburg–A Study in Civil War Battery Command" by Captain Brian C. Hayes, ARNG

Judges of the 2003 History Writing Contest

Colonel Bruce A. Brant is the Army Forces Command Inspector General at Fort McPherson, Georgia. He holds three master's degrees, including a Master of Military Arts and Science with a concentration in History from the Command and General Staff College, Fort Leavenworth, Kansas. Among other assignments, he commanded the 214th Field Artillery Brigade, III Corps Artillery, Fort Sill, Oklahoma, and the Combined Battlefield Coordination Detachment in Korea.

Lieutenant Colonel William G. Pitts is the Chief of the Doctrine Division in the Field Artillery School at Fort Sill. Currently, he is deployed to Iraq as the Fire Support Observer compiling lessons learned during Operation Iraqi Freedom for a book to be published by the Center for Army Lessons Learned (CALL), Fort Leavenworth. He holds a Bachelor of Arts in Civil War History and a Master of Arts in History from American Military University, Virginia.

Mark K. Megehee has been the Field Artillery Specialist at the Fort Sill Museum for the past 10 years. He holds a Master of Arts in History from the University of Oklahoma. He has more than 18 years' experience with US Army museums, including as Curator of the Frontier Army Museum at Fort Leavenworth. He has published military articles and papers, several of which were featured recently on the History Channel–"Tales of the Gun: Big Guns" and "Dangerous Missions: Forward Observers."

Field Artillery Themes for 2004

Edition	Theme	Deadline
Sep-Oct	Operation Iraqi Freedom	1 Jul 2003
Nov-Dec	Fires and Effects in Worldwide Environments	1 Aug
Jan-Feb	The FA Battalion	1 Oct
Mar-Apr	Joint Fires	1 Dec
May-Jun	Stability and Support Operations (SASO)	1 Feb 2004
Jul-Aug	History Contest	1 Feb: Contest* 1 Apr: Other
Sep-Oct	Command (Leadership), Control (Digitization) and Targeting	1 Jun
Nov-Dec	Red Book	1Aug

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

2004 History Writing Contest Rules

The US Field Artillery Association is sponsoring its 19th annual History Writing Contest with the winners' articles to be published in *Field Artillery* and the Association's 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 2004. 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 all branches and services, including allies, are eligible to compete. You don't have to be a member of the Association.

Your submission should include (1) a 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 2004, 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.