Field Artillery

A Professional Bulletin for Redlegs

January-February 2001

The Field Artillery Battery

HQDA PB6-01-1

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INTERVIEW

ARTICLES: The FA Battery

DEPARTMENTS

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

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Retaining Quality Leaders for the Objective Force

As the Army moves forward into this new century and proceeds with its very important transformation initiative, I would like to discuss some of my thoughts and perceptions on an interrelated and equally important topic. In order to succeed in transformation and guarantee our future success, the Army and the Field Artillery need committed, capable leaders and soldiers.

Junior Officer Retention. In 1999, our branch experienced the most difficult year in retaining junior officers. Termed "captain retention," the issue, in my opinion, is one of *lieutenant* retention. Although many leave the service at the rank of captain, their decisions were made while they were lieutenants—many of them making the decision while in their *pre-commissioning phase* before attending the officer basic course.

As the Field Artillery entered 2000, we had the highest captain attrition of any branch in the Army and exceeded the Army average by some two percentage points. We obviously are pleased that this year we have reversed the trend and decreased our attrition at a time when the Army average increased remarkably. Although our attrition rate remains marginally higher than the Army's average, we are moving in the right direction.

Even so, it is not time to declare victory and relax. In fact, it is even more important that we continue to address this problem and provide a solid foundation of leaders who will command our battalions in the years 2012 and beyond.

This is an Army problem that now has the attention of our most senior leadership. Unfortunately, we senior leaders were not quick to realize the true magnitude of the problem initially but now are working to better understand the sources of the retention problems. We are paying attention to the issue and are asking the difficult questions to determine why our junior officer leaders are leaving the service.

Sources of Retention Problems. A recent report published by the Strategic Studies Institute of the Army War College, Carlisle Barracks, Pennsylvania, concluded there are generational issues between our senior leaders and the young men and women who comprise our junior officer corps. The report is insightful as it identifies some of the cultural differences between the "Baby Boomer" generation that represents our lieutenant colonels and above and the so-called "Generation Xers" who are mainly the captains and below.

The study also notes that many of these problems actually are less pronounced in the Army because it tends to be a more homogenous institution than a private sector organization—meaning the Army shares a more common set of values and ideals largely derived through our adherence to Army values.

It is important to note that organizational culture is subject to continual change and that we, as an institution, should not expect to remain so rigid. One need only remember the "Brown Shoe" Army of the past or even the Army of World War II, the "Greatest Generation," that restored democracy to the world to see how our Army has changed.

Undoubtedly, the study's findings are true. But as I travel across the Army and discuss captain retention with leaders and young officers, the problem becomes clearer and less difficult to understand. In the eyes of our young officers, we senior leaders lack credibility—battalion commanders, division artillery (Div Arty)/FA brigade commanders and two-star commanders, including me.

Our captains and lieutenants are astute enough to discern the problems around them. They describe unit readiness concerns that result from personnel shortages, aging equipment, limited training opportunities, diminishing facilities and eroding dollars. They tell me issues that concern them: high operational tempo (OPTEMPO); deferred equipment services; unpredictability bred by constantly changing training schedules; short-notice, 179-day TDY taskings; and the major-captain-lieutenant-NCO intensive nature of Battle Command Training Program Warfighter exercises with little training value for the "pucksters." Then they ask me what the Army is doing to alleviate these issues. This calls into question whether or not we senior leaders are calculating these deficiencies into the readiness equation—in other words, our credibility is being questioned.

Restoring Senior Leader Credibility. My reply to these questions is to reassure them that their senior leaders are, in fact, aware and concerned with the issues they describe. One only needs to read the branch commandants' readiness comments that were leaked to the press a few months ago to understand that senior leaders are expressing their readiness concerns. But at the same time, I explain some of the factors that keep us from changing as quickly as we all would like.

We must restore the junior officers' confidence in their senior leaders—battalion commanders, Div Arty/FA brigade commanders and two-star commanders. At Fort Sill, our PreCommand Course for battalion and Div Arty/FA brigade commanders is addressing credible leadership head-on. From Day One,

we address the importance of welcoming the new lieutenant and spouse to the battalion team and the importance of senior leaders being good listeners. (We have a tendency to get stuck in the transmit mode when we should be in receive.) We must take the time to mentor younger officers and demonstrate we are interested in their future, well being and concerns.

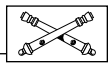
The course addresses realistic training expectations. Even though the commander may not be able to achieve all the unit's training needs, he must, more importantly, execute the training that is planned. In other words, the commander must make his training plan credible.

And, finally, we senior leaders must make the tough readiness calls.

Captain retention remains an issue we must continue to address. There are absolutely no concerns about the quality, integrity or loyalty of our junior officers. Clearly they are the most talented I've served with during my career. We senior leaders must, however, make time to give them the leadership they are calling for.

The Field Artillery branch is addressing this issue aggressively and responsibly. There is more work to do, and we have a plan.

My thanks to all Field Artillery senior leaders for helping make a noticeable difference in retention for the Field Artillery in the past year.



INCOMING

LETTERS TO THE EDITOR

Where's George Bruchmueller?

The July-August 2000 History edition of the magazine was *terrific*. Particularly impressive is "Fire Support at the Battle of Kursk" by Captain Thomas J. Weiss II—very deserving of first place in the US FA Association's History Writing Contest. Concentrated with General [Retired] John M. D. Shalikashvili's interview ["Army in Transition: Keep Your Eye on the Ball"] and Colonel Richard P. Formica's letter ["Proud and Disciplined: 2-15 FA in Bosnia"], we strike at the very heart of our greatest challenge in the near future: Sustaining competency in our core fire support tasks while coping with a myriad of other missions.

GEN Shalikashvili rightly points out the missions of "peacekeeping, humanitarian assistance, disaster relief and military-to-military outreach" and how they are "*in addition*" to our primary task of warfighting. And COL Formica extols the virtues of the "proud and disciplined" Field Artillerymen of 2-15 FA fulfilling one of those "additional" missions "relearning the age-old mission of building peace in a war-torn land." You could probably pull that same line from the *Field Artillery Journal* in May 1950 with an observation from war-torn Japan.

When you read each of these pieces and then focus on the Battle of Kursk, you ask yourself, "Where is the American George Bruchmueller?" What does he look like today? In five years? Ten years? Look no further than your unit TACSOP [tactical standing operating procedures] and count the number of pages you have on fire missions of attack, defend and movement-to-contact. You certainly won't find the details of Bruchmueller's three phases of fire support. And, unfortunately, peacekeeping won't "write" those pages—it will delete them.

For those great soldiers from 2-15 FA, executing this additional mission to a high standard, their opportunity to practice fire support, the heart and soul of our warfighting tasks, is forever lost—displaced by the wave of peacekeeping future. Even more disconcerting is the loss of leader experience. From section chief to battalion commander, these future leaders in higher positions will lack experience in the warfighting skills most essential to our Army and our nation. Blanket our Army with this experience and tomorrow's "George Bruchmueller" will be the master of base camp security, not a fire planning genius.

All of us must understand the ramifications of these additional missions—that they atrophy our warfighting skills and dilute the tactical experience of our leaders. To embrace them as our future almost certainly is to welcome another hard chapter in *America's First Battles*.

Fortunately, our Army's senior leaders continue to fight for resources to increase combined arms training at the task force level to keep the fighting edge to our combat forces keen. This will allow our leaders to gain experience in synchronizing fires with maneuver. With that as our primary focus, who knows, maybe George Bruchmueller will return—this time in a US Army uniform.

LTC Gary H. Cheek, FA
Senior Fire Support Trainer
NTC, Fort Irwin, CA

Response to "Proud and Disciplined: 2-15 FA in Bosnia"

I read with very mixed feelings the letter from Colonel Richard P. Formica published in July-August. While I applaud Colonel Formica in his public praise of 2-15 FA's "proud and disciplined" attitude toward its nonstandard mission in Bosnia, that mission and the apparent neglect of the battalion's need for standard mission training are very disturbing.

The fact that (1) a Field Artillery battalion was selected to perform a task totally unrelated to its wartime mission (and one that, certainly, does not require anything near the level of technical capability possessed by such an organization) and (2) the battalion was, apparently, not exercising the key parts of its organization—i.e., FISTs [fire support teams], cannon crews and FDCs [fire direction centers]—in its wartime mission tasks is an indictment of leadership up and down the line.

Field Artillery skills are perishable. It is absolutely essential that they be maintained.

We should be praising soldiers. But we also should be strongly criticizing poor leadership decisions.

COL (Retired) Gregg H. Malicki, FA
Moline, IL

Response to "The Practical Application of Army Values"

I would like to respond to values article [byCaptain Patrick D. Quinn III] that appeared in the September-October edition. In the final comments of the article, the author clearly articulates his view, claiming that upholding the greater good is sufficient as a simple answer to every ethical and moral dilemma one may face. Unfortunately, he says there is no one simple answer.

The Answer—*Not* Outcomes of Actions. That there is an answer is sure, and that it is not "upholding the greater good" is also sure. I would like to argue that the claim of "the greater good" as a measure of moral worth or guide for action is implausible and that there is a better way.

To evaluate a possible action in terms of upholding the greater good is to look at the outcomes of the action—call them the consequences of the action. The consequences of an action are evaluated from a certain point of view, be it individual or cultural.

If this view were correct, 1LT Brox could have determined the greater good was to help 1LT Rash clear the Bedouins more quickly or even shoot a camel or two to expedite the process for his soldiers to commence training. This obviously seems counter-intuitive and contradicts Army values, such as integrity and respect. A moral theory that allows two contradictory actions the same moral permissiveness is implausible and not adequate to serve as a basis for action.

"Rightness" of Will. Another problem generated by this view is that it doesn't account for "rightness" or "wrongness" of the will, the intent of an action, to determine moral worth.

I think most would agree that SFC Jenry did the right thing by returning to correct the duty log. But what if the reason SFC Jenry approached the commander was not due to a feeling of duty or integrity but because he wanted the commander to think he was a great NCO or solely to avoid non-judicial punishment? Would we still say that his action was right, that it had moral worth? This example is different from the first in that the consequences are the same but the moral permissiveness of the action seems to be different.

Once again, this contradiction renders the notion of "the greater good" as a measurement for moral action implausible and contradictory to already established and defined Army values.

Being a Good Soldier. A better way to think about applying Army values is not to focus immediately on the action, or *doing* something but, rather, to focus on the actor, the *being*. The question, as Aristotle saw it, is not, "What shall I do?" The question is, "What shall I be?"

Army values are FM 22-100's [*FM 22-100 Army Leadership*] definitions of virtues selected to represent what it is to be a "good" soldier. If what we are can be thought of as our character, then others become familiar with our character through witness to our actions. The "being" is clearly linked to the "doing."

As a battery commander, I often spoke about the believability of behavior. This is critical for leaders and is, I believe, the implicit part of Army values training. When posed with a moral dilemma, you must ask first what kind of soldier you want to be. To be a good soldier means pursuit of and adherence to the virtues determined necessary to be a good soldier, as currently defined by the seven Army values [loyalty, duty, respect, selfless-service, honor, integrity and personal courage].

Had 1LT Brox determined he wanted to be a good soldier, to pursue the virtues that define a good soldier, he could have stopped 1LT Rash immediately. At least he could have said something to him following the incident. He also could have decided to demonstrate loyalty, bearing true faith and allegiance to the US Constitution, the Army, etc. He also could have decided to demonstrate respect, to treat the Bedouins and their property as they should be treated.

Crawl-Walk-Run Training. Through learning about the virtues of a good soldier, the Army values, the inclinations to behave toward the virtues can become custom or habit. Learning often begins with understanding simple concepts.

Once accomplished, these concepts can be brought together and the difficulty level increased. Eventually learning takes place and the learning can be applied. When applied to military training, this technique is called the crawl-walk-run methodology.

The Army's values training is conducted the same way and starts with understanding concepts and definitions. This is the only way we can, according to the article, "conduct effective values training for the wide diversity of ethical, religious and cultural backgrounds we have." The Army's current approach

to teaching Army values is perfectly acceptable, arguably more effective than any program outside military circles.

The Army is crawling, beginning with the understanding of concepts and definitions. The thing to keep in mind, however, is that the crawl phase of this training never ends. Units get new soldiers throughout the year, and training for them must start at the beginning.

The walk and run portions of values training take place as soldiers progress in their careers and are precisely the reason there is a perceived "zero defects mentality" for adherence to Army values. If I am correct and the virtues represented by the seven Army values are the measure of a good soldier, then what better reason do we have for letting someone go than failure to be a good soldier? Surely we don't want "bad" soldiers, do we? Can a character flaw be corrected? Can values be retrained?

Fail at what it is to be a good soldier, not just a poor decision maker but a soldier with genuine character deficiency, and despite manpower shortages, I have no problem letting him go.

Army Values "About Right." I believe the definitions of virtue that describe a good soldier, the Army values, are about right. That is to say they quite accurately describe those traits we want all soldiers to adhere to, not for a measure of the moral worth of their specific actions but as a measure of character, a measure of being a soldier.

The Army values as currently taught and enforced are perfectly acceptable. The crawl-walk-run methodology of

training applies to all mission-essential task list [METL]-related training activities—why should it not also apply to values training?

The virtuous character traits we want in soldiers and the morality they represent are not subjective. Morality is not a meat grinder. You can't throw all the facts of a situation into the press of a moral theory and expect an answer as to how to behave. You must focus on character, on what it is to be a good soldier.

Will we always get it right? Some of us won't. We are soldiers and we are human. Some may choose incorrectly, choose to do the right thing for the wrong reason or just choose the wrong thing. People sometimes run red lights and stop signs. That doesn't mean that they are ineffective for controlling traffic. It just means we need to pay more attention to our driving or, in this case, our behavior. We just need to get better at it.

CPT Brett E. Kessler, FA
Student, MA in Philosophy
University of Colorado, Boulder

Response to "Fire Support at the Battle of Kursk"

As a history teacher and an FA NCO, I look forward to your History edition [July-August]. However, I must point out an inaccuracy in Captain Thomas J. Weiss's article. When he discusses the Bruchmueller doctrine, he states it was tested against the "Red Army" in 1916. Later he states the Germans employing this doctrine "savaged the Soviets….as early as 1916, Soviet fire support plans began to closely imitate those of Bruchmueller."

As the Russian Revolution didn't occur until March 1917 (on the Western calendar) and the Bolsheviks did not take control until November 1917, until at least 1918, there was no "Red" Army, and the Soviet Union was not formally proclaimed until 1922. While the Czar's army may have learned from these tactics and some of those same officers may have carried the lessons to the Soviet Army, a continuous connection seems tenuous.

CSM Robert F. Donahue, FA
2-355 USAR, Wichita Falls, TX

2001 Senior Fire Support Conference

Preparations for the 2001 Senior Fire Support Conference, "The Field Artillery in Transformation," are progressing on schedule. The dates for the conference at the Field Artillery School, Fort Sill, Oklahoma, are 23 through 27 April. The conference will focus on the organization and role of the Field Artillery as the Army transforms to a lighter, more lethal force where the emphasis is on technologically advanced systems. It also will address Marine Corps artillery issues—both in the near term and future.

Several of our most senior leaders will speak at the conference, including leaders from other services. This conference promises to be a dynamic and informative one that unquestionably will have an impact on the future of our branch.

Conference invitees include senior Army and Marine commanders and their command sergeants major (CSMs), both Active and Reserve Components; retired and active Field Artillery general officers; TRADOC school commandants; and Field Artillery Association corporate members. Invitations are being mailed in January.

The first day of the conference, Monday, April 23d, will be devoted to Army division artillery, FA brigade and corps artillery commanders and their CSMs. This session will focus primarily on near-term issues of concern to the field and feature panels to address several of these issues. There will be separate sessions for Army National Guard commanders and their CSMs as well as an off-line session for CSMs.

On Tuesday morning, there will be a golf scramble. Also, a number of special subject matter expert (SME) presentations will be scheduled throughout the day and attendees will have the opportunity to visit the many exhibits. Tuesday afternoon activities will include briefings for commanders.

The general conference will begin on Wednesday morning, April 25th. Major General Toney Stricklin, Chief of Field Artillery, will kick off the conference and present the Field Artillery Strategic Vision. His presentation will be followed by the Field Artillery Modernization and Transformation Strategy and a National Guard transformation briefing. Joint and combined training will be covered in the afternoon with speakers from the Joint Forces Command, Marine Corps and Air Force. Wednesday evening, the US Field Artillery Association will hold its annual meeting and honor General (Retired) J. H. Binford Peay III with a military Tattoo. General Peay is a former Commander of the US Central Command and Vice Chief of Staff of the Army.

The Chief of Staff of the Army General Erick K. Shinseki has been invited to be the keynote speaker on Army Transformation, Thursday, April 26th. Attendees also will be updated on the Quadrennial Defense Review and other subjects of interest. Discussions on small-scale contingency (SSC) and stability and support operations (SASO) challenges will round out the day. The Senior Fire Support Banquet is Thursday evening.

Most of the discussions on Friday, April 27th, will focus on Objective Force and Initial Brigade Combat Team (IBCT) challenges. This will be a short day to allow attendees to begin returning to home station. The formal portion of the conference will end at 1130. But the National Guard Association of the United States (NGAUS) Task Force will be meet Friday afternoon.

As details become available, the conference agenda with the guest speaker schedule and other information is being posted on the Fort Sill Home Page: http://sill-www.army.mil/sfsc.

General John N. Abrams, Commanding General of the Training and Doctrine Command
Fort Monroe, Virginia

The Role of the FA and Fire Support in Transformation

Interview by Patrecia Slayden Hollis, Editor

Q *During the past year, the Army has been taking actions to bring about the Chief of Staff of the Army's vision to transform the Army. What is the transformation and how will it impact the Army?*

A The transformation is the Army in action to remain on the cutting edge in terms of capabilities for soldiers and leaders to do their jobs. So the transformation is about change—taking a look at who we are and the environments in which we have to be able to operate and posturing ourselves for the future.

Two other times in our history the Army has had to go through similar processes. Between World War I and World War II, Leslie J. McNair, the famous educator, trainer and Field Artilleryman, led a strategy for change. The by-products of that effort were the creation of branches and branch schools and the creation of a quality Active Component Army that could expand and that had redundant capabilities in the Reserve Component. The model was built around a draft army, an army of involuntary members led by a cadre of professionals. That framework of the nation's Army served us very well at the time.

The second period where the Army underwent significant change was the post-Vietnam era. The change, again, was in the human dimension; it wasn't a material thing. The Army moved from a draft to an all-volunteer army. Enlisted and junior officer draftees no longer came into the Army, served for a short period and then departed.

During this transformation, we went from an army postured for mobilization to major theaters of war and world wars to a professional army. We retained our branch orientation during that process and moved forward with the McNair model. The Army committed to developing a professional force, an army at the cutting edge in terms of knowledge, skills and attributes, one with an enormous sense of pride—from the most junior private to the most senior leader.

What's different now in today's transformation is we have seen an operational environment emerge. The new patterns of warfare and behavior—the willingness to use force—and the proliferation of technologies and capabilities in the international market have demanded we look at how we're organized and equipped and whether our previous strategies and operational concepts will be effective for the future.

As you know, we've been working for decades on digitizing the force and other initiatives, such as Force XXI and Army After Next. We no longer are postured to defeat the Warsaw Pact, a monolithic threat that operated with a professional cadre in patterned and echeloned capabilities. The Army is taking a more introspective look at how to operate in the presence of new threat variables with the requirement to be more capable across a broader range of tasks, across a full spectrum of contact.

We need a universal quality in the Army that allows us to win in all-out war but also accomplish small-scale contingencies and other missions, including humanitarian relief, homeland defense and stability operations, such as in Kosovo or Bosnia, all the while serving as a deterrent, which we have done so well on the Korean peninsula since the Korean War.

This transformation will affect our organizational construct for education, training and leadership development to ensure we are getting the human dimension "about right." Such a construct includes three theoretical foundations for land warfare: maneuver, maneuver support and maneuver sustainment. It is from that perspective that Leslie J. McNair came up with the idea of branches. He asked, "How do I promote excellence in each of the three primary functions for land warfare?"

For example, combat arms, a core theoretical construct of how land warfare is conducted, is a tradition of Infantry, Armor and Field Artillery. That triad was built around the early partnership of those three branches working together to seize upon their decisive qualities. Today, Army Aviation is a part of that construct along with Air Defense.

Q *This transformation—will it have as dramatic an effect as the other two?*

A This transformation will evolve over time, but we are set on a pathway for it to be as revolutionary as the Leslie J. McNair model was.

To put it in context, our transformation is a part of national discussions that have been ongoing for five years. These

discussions are led by panels commissioned by both the Office of the Secretary of Defense and the US Congress and are not just focused on the Army but on the United States armed forces. So the Secretary of the Army and the Chief of Staff of the Army are looking at the Army as part of US land forces, which includes the United States Marine Corps and our special operations forces as the two other components. The transformation is a holistic view for the joint force capabilities of the armed forces of the United States of the future. Each of the services is moving down this path.

Q *The July 2000 edition of Army contains some thought-provoking articles on transformation. One of the most futuristic articles was "The Defense of Fombler's Ford" written by General (Retired) Paul F. Gorman. It introduced the future combat systems (FCS) concept of operations with technology that can be fielded by 2012. Do you agree with the concept of operations presented in "The Defense of Fombler's Ford," and if not, why not?*

A General Gorman is one of the finest military minds of the 20th century. He is a seasoned vet and clearly an influential contributor to our thinking, not just about the Army but in the totality of warfare. His article discusses the application of advanced technologies in the hands of small units in a setting postulated in the future. These technologies are significant—are on the order of magnitude of the introduction of the repeating rifle following the black powder rifle.

He writes about advanced sensors that can sniff things going on and tell soldiers about it early before the enemy knows, enabling our soldiers to respond early. He writes about precision munitions and armaments that are "automatic" without a lot of layers of bureaucracy between the point of action and the unit with the delivery system. He operationalizes the advanced technologies of 2012. It is a wonderful thinkpiece.

So, the short answer is "Yes, I basically agree with the article." Now, having said that, our transformation effort has a complementary piece: When emerging technology drives our soldiers' abilities to contribute to land warfare, we have it a little bit reversed. Technology should enable the soldier to perform, not drive him. So we are looking for increases in the effectiveness of teams of soldiers at the lowest possible level as enabled by technology. Our transformation strategy focuses on the human dimension.

In the Army transformation periods that succeeded and had enormous impact on our force, we kept the human dimension at the forefront. Attempts at major transformations did not succeed when the Army focused on material solutions. The Army is not about things—it's about people who must perform difficult tasks while in harm's way.

Technology is a two-edged sword. If we are not careful, it can work against us. It can consume our energy. It can shift us from focusing on performing our task to operating the equipment to perform our task.

General Abrams accepts the TRADOC flag at his change of command in September 1998.

Q *Although the Objective Force will evolve as we get closer to its implementation, what is your vision of the FA's role in the Objective Force? Of fire support's role?*

A Field Artillery and fire support will provide critical support to complement the capabilities of forces engaged in land warfare. That's true today, and it's going to be true in the future.

Just as General Gorman's article illustrated, teams of soldiers in contact are going to need additional capabilities from somewhere to create overmatch...to create shock effect and change the correlation of forces so smaller groups have greater effect. So the force will need precision and responsiveness as well as the desired effect. It's the "fire support equation," the core of which is this wonderful branch. That equation will include not only the Army, but also joint capabilities to achieve the effects. And some of those effects needed are non-lethal.

Today, when people think of the Field Artillery, they think "lethality"—which needs to remain at the forefront of the FA's continued capabilities. But there is a second, equally challenging dimension for the future: increased range with

General Abrams gets feedback from young warriors at Fort Benning, Georgia.

General Abrams talks with soldiers at the Joint Readiness Training Center (JRTC), Fort Polk, Louisiana.

variety of effects. Ranges of weapons have increased to the point that it is difficult to find sanctuary from the opposing forces' combatant elements operating in proximity.

For decades, we have created an overmatch in lethality by denying sanctuary to those who we would oppose us, whether they were the Warsaw Pact or the Iraqis. It was our responsiveness and accuracy. Because of the proliferation of technology, we no longer have the clear advantage in terms of range and effects.

In our new operational environment, forces will oppose each other in general proximity to each other, both with access to enormous lethality. So what do we need to achieve overmatch? What is going to make the difference? We are at the cutting edge right now in the world. Built around a breakthrough in information technologies and the development of advanced sensors, our force will be able to see first and take action first with greater precision.

So the notion is that our force in close proximity to the opposing force must have the ability to take decisive action in a very timely way—spontaneously react to a threat. This future battlefield will have a mix of combatants and noncombatants on it, further complicating the situation. So the construct of effects in time and space is going to be a challenge, not only from the technology perspective, but also in terms of fire support operations in urban or restricted environments at a tempo that demands agility, the ability to maneuver at will and maintain freedom of action to support integrated teams. Those teams must be able to conduct very deliberate, decisive actions to achieve results with continuous, reliable support that comes from over-the-horizon.

Such a formula reverses a potential stalemate or war of attrition. That's the core of the theoretical foundation of fire support for the future force. It is the connection of sensors, command and control and delivery means, but it's also an operational paradigm that's much different with a different tempo. I'm not talking about a sequence of fires to complement maneuver, but a seamless integration of real-time fires as part of maneuver—a synergy of combined arms. That is the core of the Objective Force capabilities the Field Artillery needs to achieve in the transformation.

Transformation is more than a process. It's a clear understanding of what kind of future operational capabilities we need to achieve. The force must be more lethal, more survivable and more mobile. We need very agile, responsive forces that are proactive in imposing their will on the other force. We then will maintain our freedom of action and survive.

Q *What message what you like send to Field Artillerymen around the world?*

A Field Artillery, the King of Battle, always has had a wonderful tradition of significant contributions to the Army. The level of professionalism of Field Artillery NCOs sets the standard. They have a high level of technological competence and tremendous leadership skills—you can see that down on the gun line watching the "Smoke" operate.

Field Artillery officers are all raised as commanders and staff officers to support our formations in a very strategic way. Fire support officers and artillery commanders develop strong bonds with the field commanders, and the Army has greatly benefited from those relationships.

Well done; keep up the good work.

★★★★

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The Field Artillery Battery
Its Past, Present and Future

by Colonel Thomas G. Waller, Jr.

To an artilleryman, the term "battery" is one of endearment. After all, it's unique to us—every branch has platoons, battalions and brigades, but only cannoneers, rocketeers and missilemen have batteries. The word itself comes from its ancient role, which was "to batter" down the walls of fortresses. It came to America, as did most of our military traditions, from our European forebears.

In our new age of technology, however, the days of the battery could be numbered. The futurists among us look to flatten organizations and do away with some intermediate headquarters. The future combat system (FCS) being contemplated portends a sameness of weapons and soldiers that, ultimately, promises a branchless, hi-tech Army and an artillery force of sensors and shooters, centrally controlled by digital technology. Are we near the end of the days of branches and the traditions of Field Artillery and its batteries?

This article submits that the heyday of the FA battery may be yet to come—in fact, the FA battery may be among the most significant fighting organizations of the Interim Brigade Combat Team (IBCT) and the Objective Force of the 21st century Army.

The Evolution of the Battery. From the Revolutionary War until the build-up preceding the Mexican War, the term "company" was used to describe the number of pieces able to be maneuvered in battle by a single commander. As various British and French artillery texts were translated and the Army organization matured, the battery took its place.

The seminal work ushering in what became a heyday for the battery was Captain Robert Anderson's translation of the French "Instruction for Artillery, Horse and Foot," which was the basis for the "Instruction for Field Artillery, Horse and Foot" adopted by the War Department in March 1845. This work covered specifically the tactics, techniques and procedures (TTP) of serving the piece and maneuvering the field battery.[1]

Brevet-Major Samuel Ringgold modified these instructions in the field and organized the proto-typical "flying artillery" battery, that is, one equipped with light, highly mobile, horse-drawn field guns that achieved fame on the battlefields across

John Pelham on horseback with part of his "flying battery" at Fredericksburg, 1862.

Mexico.[2] Batteries from the Mexican War through the end of the century were identified by the name of the battery commander; thus Ringgold's and Duncan's batteries won distinction in 1846-47 as did Pelham's and Pegram's in the Civil War and Reilly's at the gates of Peking in 1900.

The make-up of a battery assumed familiar proportions by US Army General Order in 1861. " Each field battery is to be composed, if practicable, of six, and none to have less than four guns, those of each battery to be of uniform caliber."[3]

Significantly, these instructions and the performance of the flying batteries in the Mexican and Civil Wars established the principle that the FA battery was the basic building block of artillery task organization. This organizational concept changed little until World War I. It is important to note, however, that the battery was only a building block of a larger artillery force. "As for fighting purposes, it is well known that allowing batteries to go into battle alone is to be avoided…every effort [should be] made to bring all batteries of the brigade into action at the same time, that concentration of fire and weight of metal thrown may produce decisive results."[4] Thus was born the idea of massed artillery that became part of US Army fighting doctrine. Whenever possible, the three to five batteries in a division would be physically massed to achieve massed effects, sometimes hub-to-hub.

Of course, the great tactical distinction of the 19th century was that artillery was a direct fire weapon. A maneuver commander could see the primary enemy formations arrayed against him and would mass his artillery accordingly. Flying batteries would be concentrated at the point of attack in the offense or against the enemy's concentration in the defense.

When rifled muskets appeared, gun crews began to be picked off at long range by infantry sharpshooters, which inevitably forced a tactical revolution in Field Artillery—*the First Revolution in American Artillery.* As the 20th century progressed, artillery began to move rearward out of direct fire range and fire indirectly from defilade positions to targets identified by someone who could see the enemy. Firing instructions were passed from observers to batteries first by voice and then by hand, arm or flag signals or telephone. Firing batteries remained the building block of artillery—still four to six guns, still horse-drawn in World War I and then finally motorized or mechanized in World War II.[5]

Due to the increasing inaccuracies of longer ranges and indirect fires and the increasing mobility of motorized or armored units on the battlefield, all countries began to develop advanced technical gunnery techniques that enabled them to maneuver *fires* and not batteries. Such techniques were pioneered in World War I and became the focus of much interwar experimentation. The development of the fire direction center (FDC) by the Gunnery Department at Fort Sill, Oklahoma, was perhaps the single most important artillery development of the 20th century.[6]

By World War II, the advent of radio-equipped forward observers (FOs), surveyed gun positions and ballistic and meteorological computations were all giving indirect fire artillery the ability to mass fires at long ranges. At this point, artillery battalions became more important than batteries because it took more guns firing indirectly (thus less accurately) at the same target to achieve massed effects. This organizational concept of batteries, battalions and indirect fire artillery directed by an FDC remains to the present day, even though technological innovations in the 1980s began another revolution in artillery organization.

The State of the Battery. For hundreds of years, batteries had been positioned in one location with guns no farther than 50 meters apart to facilitate massed effects. This concept did not change for most of the 20th century, even though guns and rockets were firing indirectly at ranges of many miles with firing data calculated by a fire direction computer. If one wanted massed effects on the target, the guns of batteries had to be close together on the ground.

The traditional firing battery tactical employment concept (four to six guns in close proximity controlled by an FDC) remains in force today in all towed artillery battalions, which comprise 33 percent of the active Army artillery. Fully 70 percent of the battalions of the Army National Guard employ the traditional structure; thus, 56 percent of our artillery, some 84 battalions of the total force,[7] is organized and operates much like it did 50 to 60 years ago.

First Revolution in American Artillery. Artillery began to fire indirectly from defilade positions to targets identified by someone who could see the enemy.

The 1980s and 90s saw the introduction of two weapons that ushered in the *Second (and Latest) Revolution in American Artillery*—the M270 multiple-launch rocket system (MLRS) and the M109A6 (Paladin) howitzer. Computer and communications technology combined to enable these weapons to operate virtually autonomously anywhere on the battlefield. On-board inertial navigation and firing data computation allow these weapons to spread out and fire autonomously but precisely with massed effects and at a rapid rate of fire.

Paladin and MLRS units now comprise 65 percent of our active force, 30 percent of the Army National Guard artillery and 44 percent of the total artillery force. Interestingly, these two systems are evolving to more and more similar organizations and concepts of operations. In the early 90s, Paladin battalions were organized with three batteries of eight guns each (3x8) while MLRS was organized as 3x9. Today, each type of battalion has six-weapon batteries (3x6) that each can operate in two platoons.

Both the Paladin and MLRS battalions can operate autonomously, and their best feature is the ability to shoot quickly with surveyed accuracy, even from the move. Both systems do their own position locating and technical fire control, and their computer screens are looking evermore alike, even though different companies developed them. Their fire control headquarters, whether an FDC, platoon operations center (POC) or battery operations center (BOC), is primarily engaged in tactical fire control and digital connectivity. While their munitions and range capabilities are differ-

The Second (and Latest) Revolution in American Artillery-the M270 MLRS and the M109A6 Paladin. Computer and communications technology combined to enable these weapons to operate virtually autonomously anywhere on the battlefield, ideal for a Battery Team.

ent, they overlap, making the two systems highly complementary.

In sum, Paladin and MLRS batteries have much in common in their organization, tactics and even their fire control capabilities. These similarities indicate a closer cooperation in the future.

Meanwhile, the towed and non-digital self-propelled force also is organized similarly with six-gun batteries and one FDC. If simplicity is a virtue, then one can say that the good side of restructuring the force to 3x6 in the late 1990s has made all batteries of our artillery force similarly organized.

Our light forces have long been very good at tailoring their forces for quick deployment. They routinely train to deploy with platoon and battery packages of both 105-mm and 155-mm howitzers. US Army Europe (USAREUR) recently has developed similar techniques for deploying heavy artillery packages. Today's firing batteries, then, are smaller and more deployable.

So, the six-gun organization has its strengths. One weakness, however, spans digital and non-digital, towed and self-propelled batteries: FDCs have only one battery computer system (BCS), and with the end of the useful life of the back-up computer system (BUCS), there is no automated back-up. This weakness will not be fixed by initial versions of the advanced Field Artillery tactical data system (AFATDS).

Again, harking back to mid-century, many non-digital units have regenerated manual firing charts as a back up to BCS. This is particularly a problem with Paladin, as manual charts are impossible to manage for properly dispersed howitzers.

Only the MLRS battery has sufficient redundancy of computers, but no doubt the force structure gurus have their eyes on the three operations centers (two POCs and one BOC) in the battery. It must be remembered that MLRS has no manual capability and no capability for degraded mode. It is absolutely dependent on redundancy of fire control nodes. Of utmost significance is a new principle of digital warfare: *Redundancy—with it, we will succeed; without it, we set ourselves up for catastrophic failure.*

The Future of the Battery. The Army Chief of Staff's vision for a lighter, more deployable Army is a natural evolution from the Cold War to an environment of a less monolithic, but increasingly global threat and a predominantly continental US (CONUS)-based force. The present focus is on developing a medium-weight capability in units that can deploy quickly and operate without fixed forward bases yet have enough punch to slug it out and win campaigns decisively. Heavy forces must be more strategically deployable and more agile with smaller logistical demands. Light forces must be more lethal, survivable and tactically mobile.[8] Perhaps we have come full circle back to the concept of the heyday of the flying batteries.

A firing battery that can be dynamically tailored to add or subtract capabilities, depending on mission, enemy, terrain, troops and time available (METT-T), and can support the close fight, conduct counterfire and attack high-priority targets at long ranges is well within our grasp today. As suggested previously, Paladin and MLRS have evolved such that their technical and tactical fire control TTP are much the same. It is only a short step to develop a fire control architecture that can command and control either system. The next organizational innovation could be to develop a "Battery Team" concept under which both Paladin and MLRS batteries are similarly organized and routinely trained to operate with a mix of systems.

One Battery Team scenario, perhaps something similar to Task Force Hawk in Kosovo, may call for a significant rocket/missile capability with a lesser requirement for close support from cannon. A Battery Team of four MLRS launchers and two Paladins could deploy under one commander to operate across the spectrum of small-scale contingency (SCC) requirements. Paladins could fire illumination to assist infantry patrolling or aerial reconnaissance. If an armored threat appeared, rockets could suppress along routes for combat aviation. Hostile command posts could be attacked at long ranges by Army tactical missile system (ATACMS) missiles. All this could come from one battery.

HIMARS-The present focus is on developing units that can deploy quickly and operate without fixed forward bases yet have enough punch to slug it out and win.

In an SSC scenario with little or no armored threat, similar teams could be formed of M119A1s, M198s (both towed systems should be equipped with on-board communications and technical fire control computers) and the high-mobility artillery rocket system (HIMARS). Three pairs of two weapons each could provide a helicopter-

delivered artillery raid package to operate across the entire SSC theater. HIMARS could carry a preponderance of ATACMS for strategic targets. Again, all this from one battery.

The seven characteristics of the future force can be met to a degree by these 21st century flying batteries. A well-trained Battery Team would be highly *deployable* in packages of capabilities, much like the XVIII Airborne Corps deploys today. It would be employable upon arrival and capable of simultaneously conducting close support, counterfire and operational or even strategic attack.

Such a battery would be *responsive*, able to move with speed and shoot with dominating firepower. It would be *agile*, operating at tactical, operational and strategic levels and could go from stability and support to high-intensity combat quickly. While just a battery, it would be extremely *lethal* in its 24-hour, all-weather fire capabilities, especially with smart precision munitions such as sense and destroy armor (SADARM) and the MLRS smart tactical rocket (MSTAR).

The two most difficult of the seven characteristics to satisfy are *survivability* and *sustainability*, both of which will take some work. Survivability will be enhanced by better situational awareness and the tactical dispersion enabled by the revolutionary digital capabilities already discussed. Most certainly, we need more precision munitions to be able to reduce ammunition requirements and meet collateral damage concerns of stability and support operations.

The Battery Team could be the next step after the IBCT to bridge the gap to our FCS-equipped Objective Force. The future force will repackage functional organizations to make them unit-centric, not platform-centric. Forces will be "mission tailored for tactical overmatch, but with a standard organizational base."[9] Because the focus of battle is migrating to smaller, more deployable units, the firing battery well could be the organizational base for the future force artillery. The Battery Team could presage the FCS-equipped firing battery and ensure a smooth transition from the IBCT to the Objective Force for the fires community.

The Role of Crusader. While the threat of high-intensity combat seems to have abated since Desert Storm, there are many plausible scenarios for major theater war involving heavy forces from many nations. Our Army still needs heavy forces, and we need them to be robust and equipped with the best technology.

As good as Paladin is, even today there are several howitzers in the world that can challenge its digital, automated capabilities. Automotively, it remains early 1960s technology, far slower than today's maneuver systems.

Crusader promises to bring additional agility, lethality, deployability and flexibility with fewer platforms due to its unprecedented rate-of-fire—in fact, a Crusader *battery* could provide the lethality of a Paladin *battalion*.

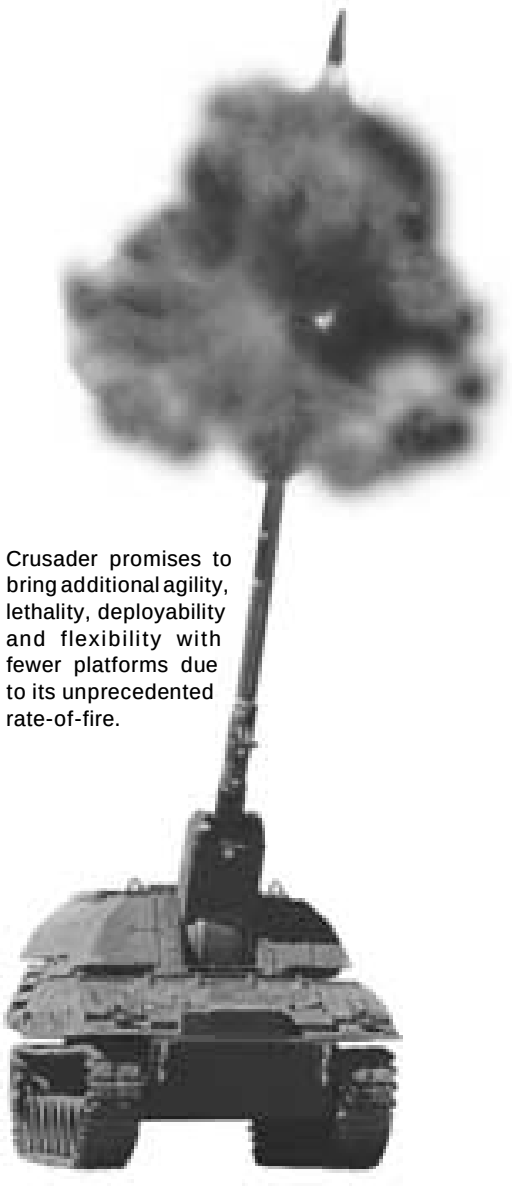
We need Crusader's speed and ability to maneuver with the infantry and armor. We need its ability to range across the breadth and depth of a distributed battlefield. We need it to provide the mass of a battalion with the footprint of a battery. Our modernization strategy calls for us to have tactical overmatch with smaller forces. Crusader will give it to us.

In sum, smaller and more lethal firing units are available to us today. The BOC could become the most significant artillery command and control node on the battlefield, replacing the battalion FDC of former times. In the days to come, tactical and operational commanders will be able to electronically "see" the extended battlefield and the enemy array somewhat like Zachary Taylor could see the battlefield of Buena Vista. The dynamically tailored Battery Team, equipped with Paladinized lightweight 155s, HIMARS and a BOC, could be flown to the critical point to support the IBCT with tactical, operational and strategic fires. Linked batteries of Crusaders and M270A1s could dominate a heavy battlefield like no field batteries have since the Mexican War.

Are We Forgetting Something? While a smooth transition is within our grasp, there are challenges. Much of the downsizing, flattening and modernizing of our forces is at the expense of some age-old principles of war.

• *Mass*. One of these is the very important principle of mass. Columnist Richard Hart Sinnreich (Colonel, retired from the FA) asks the probing question: "Could a fighting force be built, using new tactics and the latest technologies, that would be light enough to transport by air, yet powerful and survivable enough to defeat heavy formations like those of Iran and Iraq?"[10] He questions whether such a lean force would be robust enough to survive the inevitable friction of war and be able to "slug it out" when certain technologies don't work as advertised. We again should go back to the battery's heyday and remember that "…allowing batteries to go into battle alone is to be avoided."[11]

There remain in the world at least six nations with heavy forces bigger than those of the United States and whose interests could one day lead to war. We must be prepared to deploy battalions of artillery equipped with area (dumb) munitions that can suppress the enemy, screen large areas with smoke and enable maneuver forces to close with and destroy superior enemy formations. We never will have enough precision munitions to win a heavy fight at long ranges with an enemy that outnumbers us. We must not forget that, ultimately, the battle that is decisive is the close one and that the most important mission of the Field Artillery is to support maneuver in the close fight at danger-close ranges.



Crusader promises to bring additional agility, lethality, deployability and flexibility with fewer platforms due to its unprecedented rate-of-fire.

• *Simplicity*. Sinnreich's point on friction challenges our entire command and control architecture. Clausewitz said that in war, even the easy things become difficult. We always have had redundant firing and fire control capabilities. They are being whittled away by "the downsizers." We are forgetting the fog and friction of war and the consequent need for back-up equipment and procedures when equipment breaks and things go wrong.

We see in peacetime, even in civilian Internet structures, how difficult it is to keep an automated network functioning. Everyone has experienced the frustration of servers on the Internet going down and this in a world where there is an effort to provide redundant servers to take up the slack.

Yet even today we have reduced the number of computers assigned to batteries and battalions and, more significantly, have reduced the number and the robustness of FDCs. Success on the digital battlefield, as seen at the National Training Center (NTC) at Fort Irwin, California, is all about sufficiency of command and control nodes with adequate computers and communications capability. For modern, digital artillery, it's all about redundant FDCs or POCs and BOCs with the right stuff. Our batteries must have redundancy if they are to function. In simpler times, we always could fall back on voice fire missions, BUCS or manual computations when computers went down. Those times are no more.

• *The Human Dimension.* There seems to be an assumption among many that somehow the shooting end of the artillery is automatic. Artillery batteries are complex, highly mobile organizations that always will be faced with a hostile enemy dedicated to disrupting or destroying them.

Most observers of artillery performance and modernization focus on either fire support structures (which get the blame when fires are not timely or accurate) or on some technological development, which will take the human out of the gun. The ultimate is a recent proposal for a box of missiles that can be remotely commanded to fire by a digital signal generated by a fire support computer. Another is a robotic artillery piece—a computer pulls the electronic lanyard.

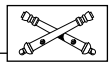
These are the extremes, of course, of what already has begun. But have we introduced so many automated systems to replace human actions that we are losing our intuitive sense and the binding force that causes units to fight and win on the battlefield? This is clearly evident at the NTC where the senior fire support trainer writes, "We have lost the human dimension of warfare—the intimate bond between observers and firing batteries and all that comes with it: The ability to transcend quantitative data with intuitive judgement, the complex translation of emotions and instincts into action, the sense of urgency that comes from human need and the great sense of satisfaction from serving your fellow soldier."[12]

A principle that we, the entire Army, seem to be forgetting as we look to the future is that people fight wars, not technology. If we put a box of unmanned missiles out on the battlefield, we will find out the hard way that a resourceful, human enemy will find a way to shoot them back at us. The Army that gets robots to fight their wars will inevitably be defeated by humans who have minds, wills and emotions that are more effective than any computer. Soldiers will think, work and fight harder because they know why and for whom they fight.

Forward the Flying Batteries. In conclusion, the Field Artillery has a glorious history and strength of tradition. From its earliest days in the Mexican War, the artillery battery has flown to the point of attack and wreaked havoc on every foe from Santa Ana to Saddam Hussein. In the dark times, the artillery battery has erected a wall of steel around our beleaguered soldiers from Bastogne to the Ia Drang Valley.

A great debate about artillery organization arose in 1814 over a proposal to replace Field Artillery regiments and their traditions with functional battalions that combined artillery, engineers and ordnance. History records the failure of that effort because it failed to recognize the human dimension of a military unit. So far as the names of units were concerned, the changes were made, but "the organization actually given was but a soulless form, devoid of life, of that which could impart animation to the system."[13]

As we contemplate the future and decide whether to do away with or significantly alter our branches and their traditions, our Field Artillery and its batteries, we would do well to remember this failure of our forefathers. We also would do well to recognize that the Field Artillery battery is a unit ideally suited to the combat requirements of the 21st century, yet one that retains its soul.



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Endnotes:

1. William Birkheimer, *Historical Sketch of the Organization, Administration, Material and Tactics of the Artillery, United States Army* (New York: Greenwood Press, 1968), 306.
2. Ibid. See also Frank E. Comparato, *Age of Great Guns* (Harrisburg: Pennsylvania, 1965), 180.
3. Ibid., 80.
4. Ibid., 85.
5. Other branches of artillery picked up on the traditions of the battery, from the siege batteries of heavy guns and mortars to the coastal batteries of long-range naval guns, to anti-aircraft and rocket artillery.
6. Boyd Dastrup, *King of Battle* (Fort Monroe: Virginia, 1992), 198-199.
7. *FA Journal* (November-December 1999), 20-22.
8. Major General Toney Stricklin, "Field Artillery: Relevant, Trained and Ready," *FA Journal* (September-October 1999), 1.
9. Preliminary discussions among working groups on Objective Force Organization and Operation Principles.
10. Richard Hart Sinnreich, "Army's New Medium-Weight Forces Must Show Resilience," *The Lawton Constitution* (Lawton: Oklahoma, 24 September 2000), 4A.
11. Birkheimer, 85.
12. Unpublished paper, Lieutenant Colonel Gray H. Cheek, "The Emperor Is Wearing No Clothes: Why Joe Can't Get The Lead Out," Senior Fire Support Trainer, National Training Center, Fort Irwin California, September 2000.
13. Birkheimer, 44.

Digital and More Lethal
The 21st Century Battery

by Captains Shawn P. Reese, Dewey A. Moseley and Bernard Taylor

Due to the increased lethality and battlespace of the Force XXI maneuver brigade, the direct support (DS) artillery batteries had to become more lethal and more situationally aware of the brigade's battlespace. The new Force XXI Paladin battery table of organization and equipment (TOE) and digital devices have enhanced the battery's warfighting capability, not only making it digital, but more lethal as well.

A 3x6 TOE (three batteries per battalion, each battery with two firing platoons of three guns) replaced the 3x8 TOE. In the new TOE, the two firing platoon fire direction centers (FDCs) were replaced by one battery FDC and one battery operations center (BOC). With these changes, came the addition of a support platoon with a platoon leader and sergeant. And instead of two gunnery sergeants (one per firing platoon), the battery now has one.

Each of these TOE changes individually makes little difference in battery operations, but taken collectively, the battery had to change its tactics, techniques and procedures (TTP) to survive on the modern, expanded battlefield.

This article addresses how the new TOE coupled with the new digital devices of Force XXI change the way Paladin batteries fight in the Army, based on our experiences in the 4th Infantry Division (Mechanized), Fort Hood, Texas—the first division to be digitized. We do not pretend to have all the answers for Paladin operations, only suggestions for TTP to help units that will be digitized in the future. The TTP in this article are the results of lessons learned in the past year of training, to include a digitized rotation at the National Training Center (NTC), Fort Irwin, California, and a Force XXI battle command, brigade and below ($FBCB^2$) customer user's test (April-June 00).

BOC/FDC Operations. At first, the loss of one FDC per firing platoon caused difficulties. The lack of redundancy in battery internal fire direction forced the battery to rely on sister batteries when transferring guns or when equipment malfunctioned. With the addition of the BOC, the battery now can transfer the howitzers within the battery.

However, the BOC is not present merely for redundancy in fire direction; its primary function is to serve as the central location for the battery's command and control. The BOC is the information conduit that connects the howitzers to the battery's combat trains and the battery to the battalion. It is the logistical hub that not only tracks the battle, but also tracks maintenance and ammunition resupply triggers and requests.

The BOC is not one identifiable vehicle, but a group of several. The center of the group is the M1068 command post vehicle, replacing the old M577. This tracked vehicle is identical in equipment to the battery FDC; the only difference is manning. BOC personnel are 13E Fire Direction Specialists; the support platoon leader (who also serves as the battery executive officer) and support platoon sergeant; the nuclear, biological, chemical (NBC) NCO; and the attached communications NCO. The support platoon leader's/sergeant's high-mobility multipurpose wheeled vehicles (HMMWVs) are also part of the BOC. This configuration helps command and control the battery combat trains.

The responsibilities of the BOC are similar to those of the battalion tactical operations center (TOC). (See Figure 1 on Page 14.) Along with these duties, the BOC also must conduct information management similar to the battery FDC. The BOC updates and maintains the information in Figure 2 on Page 14.

With the addition of the support platoon leader and sergeant, the battery commander does not have to be heavily involved in battle and logistical tracking. He can obtain critical information from his BOC without engaging in the cumbersome task of detailed battle tracking. That frees the battery commander to move to the "point of penetration"—to position himself and his attention on the battlefield where he can best influence the fight.

- Control and discipline communications traffic on the battery command net.
- Disseminate tactical information to all battery leadership.
- Maintain the battery's logistical status.
- Provide for its own defense.
- Receive messages, reports and orders from battalion.
- Monitor tactical information (friendly and enemy).
- Maintain and update unit locations and activities.
- Distribute information:
  - Submit reports to battalion when directed.
  - Serve as the Force XXI battle command, brigade and below ($FBCB^2$) system link between the battalion and battery.
  - Relay orders and instructions to platoon leaders.
  - Distribute tactical and administrative information to appropriate elements of the battery.
- Analyze information:
  - Consolidate reports, identifying and disseminating only pertinent information.
  - Anticipate events and activities, and take appropriate actions.
  - Identify and report information that relates to the commander's critical information requirements (CCIRs).
  - Identify and report the need to execute battery contingency plans to support battalion branch plans.

Figure 1: Duties of the Battery Operations Center (BOC) Similar to the Duties of Battalion Tactical Operations Center (TOC)

Manning Challenges. Along with the advantages of the new TOE come some disadvantages. One battery FDC means that the majority of the battery's 13Es are located there. To provide a viable redundancy in battery fire direction, the BOC must be manned with at least two 13Es. One must be an advanced Field Artillery tactical data system (AFATDS)-battery computer system (BCS) operator and the other a 13E20 to ensure the BOC has the technical expertise to conduct fire missions in the absence of the FDC.

When the battery's howitzers are transferred to the BOC, the support platoon leader acts as the battery fire direction officer (FDO) and the BOC's 13E20 acts as the battery's fire direction NCO, thus allowing the battery to continue to fight even after losing its FDC. The BOC is not as robust in fire direction personnel and does not have the depth to continue as the battery FDC for extended periods. To ensure the BOC is capable of receiving the howitzers from the FDC, the BOC must update its AFATDS and BCS databases in conjunction with the FDC. The BOC also must maintain the current fire support coordinating measures (FSCMs).

Another disadvantage of the new TOE is having only one gunnery sergeant. Because of the increased battlespace of the Force XXI brigade, the battlespace of the Paladin battery also has increased. The artillery position areas (PAs) have been replaced with Paladin axes of advance (PAAs) during offensive operations. The land that a Paladin battery used to occupy has now doubled, if not tripled.

This is a large area for one gunnery sergeant to reconnoiter. He quickly can become overwhelmed if the PAAs aren't managed properly and if the full capability of the battery's Force XXI $FBCB^2$ isn't fully implemented.

Battery Digital Systems. The digital systems of the battery separate it from other conventional batteries: $FBCB^2$ and AFATDS' new technical fire direction software. $FBCB^2$ has done more to increase the battery's warfighting capabilities and lethality than any other change. Figure 3 shows the vehicles/battery personnel who have $FBCB^2$.

- Battery Database:
  - Center of Fire Area Grids
  - Left, Right and Center Sectors
  - Minimum and Maximum Elevations
  - Muzzle Velocity Variations
  - Registrations
- Ammunitions Status
- Battery Mission Statement
- Battery Essential Field Artillery Tasks (EFATs)
- Situation Map:
  - Fire Support Coordinating Measures (FSCM)
  - Combat/Field Trains
  - Friendly Units (At Least All Brigade Elements with Company-Sized Icons)
  - Enemy Locations (Platoon or Larger Elements)
  - Nuclear, Biological and Chemical (NBC) Hazardous Areas

Figure 2: Information the BOC Updates

• *$FBCB^2$*. This is the battle command information display system that provides on-the-move, real-time command and control information. $FBCB^2$ supports situational awareness (SA) down to the section level by showing the user his location, the location of other friendly forces, observed enemy forces and all known battlefield obstacles.

The enhanced position location reporting system (EPLRS) data radio transmits and receives digital information between vehicles. This allows $FBCB^2$ to automatically update and keep the SA current. The networked EPLRS also allows for extended communications as a message processes through the spider web of servers to its destination.

Battery Operations Orders. The TTP for $FBCB^2$ are divided into two categories: planning and preparation before the battle and execution during the battle. In the first category, the battery leadership uses $FBCB^2$ in its troop-leading procedures to decrease the time it takes to plan for the battle—which increases the time the section chiefs and soldiers have to prepare for the fight. Using the $FBCB^2$, a battery commander can send a warning order (WARNO) immediately after receiving the battalion operations order (OPORD) without leaving the battalion TOC. The battery commander can build battery graphics immediately, based on $FBCB^2$ battalion graphics, and disseminate them down to the Paladin section chief level.

The dissemination of timely information negates the need for the battery commander to return to his battery, gather the battery leadership and issue guidance. Before $FBCB^2$, if the commander wanted to issue a WARNO (without gathering his leaders in one location), he had to give the information over the radio, which often resulted in confusion and misunderstanding. With the $FBCB^2$, he can issue guidance in real time.

Reconnaissance Operations. $FBCB^2$ also facilitates reconnaissance operations. When the gunnery sergeant maneuvers forward attached to the trail maneuver company, the battery is better able to track and follow his movements. The gunnery sergeant also can input the exact route the battery needs to follow to get to

- Battery Commander (High-Mobility Multipurpose Wheeled Vehicle, or HMMWV)
- First Sergeant (HMMWV)*
- BOC (M1068**)
- Support Platoon Leader (HMMWV)
- Firing Platoon Leaders (HMMWVs)
- Gunnery Sergeant (HMMWV)
- Section Chiefs (Paladins)
- FA Ammunition Supply Vehicles (FAASVs)

*If equipped with a HMMWV; see *FM 6-70 Tactics, Techniques and Procedures for M109A6 Howitzer (Paladin)*.

**New vehicle replacing all M577s.

Figure 3: Battery Personnel/Vehicles Equipped with Force XXI Battle Command, Brigade and Below (FBCB^2)

the new location. This is extremely important, especially during the deliberate attack that involves breaching operations. The gunnery sergeant or any battery leader who is forward can transmit the route via the FBCB^2 in real time.

Land Management. One of the problems with the expanded battlefield is the fact that the division and corps need to position their assets forward within the brigade's area of operations, thus making land management an even greater problem than before. The FBCB^2's SA function alleviates many of the challenges associated with land management. This function facilitates battery reconnaissance efforts focused on land deconfliction. Also it allows the battery commander to send free-text messages to maneuver company commanders around the battery without having to obtain nets, call signs or locations.

Situational Awareness. Along with friendly SA information, FBCB^2 provides enemy SA information. An observer can add enemy icons to the display, whether the observer is part of a Striker team or a brigade ambulance outfitted with FBCB^2; any FBCB^2 platform can add an enemy icon to the network. This information is posted immediately on all FBCB^2 platforms in the brigade, which allows the battery leadership to see the latest enemy situation and adjust battery operations.

Logistical Reports. Report formats are another advantage of FBCB^2 that can be used both in planning and execution. These reports include the logistical status (LOGSTAT) that rolls up the brigade's on-hand quantities of all classes of supply and the personnel status (PERSTAT) that rolls up the brigade's personnel on-hand. These reports allow the battery to send supply and ammunition requests both before and during battle. The battalion and brigade send reports to the battery to ensure it is situationally aware of the logistical picture throughout the brigade.

Extended Communication Range. An additional facet of FBCB^2 is its ability to pass information at greater ranges than the single-channel ground and airborne radio system (SINCGARS). Once a report is sent, it relays through any platform with an EPLRS, thus extending the range of the battery's communications. The commander's and platoon leaders' vehicles are the only FBCB^2 platforms with EPLRS. As long as one platform is active, the FBCB^2 message can be relayed. This facilitates communications between the battery and gunnery sergeant when he is forward with the maneuver element and out of range.

SA for the Section Chief. The greatest advantage of FBCB^2 is the capabilities it brings to the Paladin section chief. He has SA and can follow a route the gunnery sergeant or battery commander puts on a screen instead of on a lamented map. The section chief can use the screen to navigate to his next position without having to be guided by another howitzer or a platoon leader.

Finally the section chief, for the first time, immediately can access all graphics, WARNOs, fragmentary orders (FRAGOs) and real-time SA information to facilitate his section's operations and accomplish fire missions.

• *AFATDS Technical Fire Direction Software*. Once this software upgrade is fielded, the AFATDS in the FDC/BOC will need only one computer operator (AFATDS) instead of two (BCS and AFATDS). This lowers the requirement for personnel to man the FDC and BOC.

The new software also will decrease fire mission processing times because the fire mission no longer will have to be transferred from AFATDS to BCS.

The AFATDS software will allow the FDC/BOC to fire up to 12 howitzers at a time instead of just eight in BCS. This increases the FDC's handover capability; no longer will guns have to be paired or a battery split between one of the other two batteries.

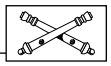
• *Training Limitations*. With all new equipment come some limitations that only extended use and training can identify. We fielded the AFATDS technical fire direction software in December.

Due to the relative newness of FBCB^2, the only limitations we have identified are related to training. We anticipate there will be training challenges associated with the new AFATDS software similar to those for FBCB^2.

Because of the typical turnover rate in the battery, new personnel constantly have to be trained on FBCB^2. The battery is forced to train personnel with little outside support. One fix is to include FBCB^2 training in the basic NCO course (BNCOC), the advanced NCO course (ANCOC) and officer basic course (OBC). Additionally, an FBCB^2-specific course can be implemented at units equipped with the system to ensure incoming personnel are trained properly.

Another running challenge is the training required for the constant upgrades to the system's software. The fix, which has been implemented in the 4th Infantry Division Artillery, is a proactive training program that ensures key personnel are trained before the upgrade is issued throughout the division artillery.

The digitized battery of the future promises increased situational awareness down to the section level, more effective command and control, and redundancy in fire direction. The Paladin battery's warfighting capabilities are increasing to provide the Force XXI brigade more rapid, lethal fires.



Captain Shawn P. Reese commands A/4-42 FA of the 4th Infantry Division (Mechanized), Fort Hood, Texas. He also served as a Battalion Operations Officer for 2-20 FA and Assistant Operations Officer for the 4th Infantry Division Artillery. As a lieutenant, he served with 2-3 FA of the 1st Armored Division in Germany, including 15 months in Bosnia-Herzegovina as a Combat Observation Lasing Team (COLT) Platoon Leader and a Firing Platoon Leader.

Captain Dewey A. Moseley commands C/4-42 FA, part of the 4th Infantry Division. He served as the Brigade Fire Support Officer (FSO) for the 21st Cavalry and Battalion Fire Direction Officer (FDO) for 4-42 FA, both in the 4th Division. In A/2-17 FA of the 212th FA Brigade, III Corps Artillery at Fort Sill, Oklahoma, he was a Platoon FDO and Firing Platoon Leader.

Captain Bernard Taylor commands B/4-42 FA, 4th Infantry Division. Also in the 4th Division, he was the FSO for 1-22 IN. He served as the S1 for 1-10 FA, 3d Infantry Division (Mechanized) and as a Company FSO and FDO in 4-41 FA of the 24th Infantry Division (Mechanized), both at Fort Stewart, Georgia.

Paladin Platoon Operations versus Battery Operations

by Lieutenant Colonel Kerry J. Loudenslager and Captain Ryan J. LaPorte

Which is better: platoon or battery operations in a Paladin battery? Is battery operations the best method of employment? Have units given up on Paladin platoon operations? Does operating by platoons offer any advantages over battery operations-say, in a desert, forested, urban or other environments? How do we employ Paladin to provide the most timely, accurate fires both now and in the future?

The answers to these questions are not simple. They depend on too many variables to give one-answer-fits-all responses. Many commanders have chosen to implement Paladin battery operations and tactics as their method of employment—some without seriously considering platoon operations as an option.

The Army needs flexibility. We are in the process of transforming from a highly specialized force to a more general-purpose force with special-purpose applications, to include small-scale contingency (SSC) operations.[1] In the Paladin battery, we must maintain our proficiency in both employment methods to provide the fire support flexibility needed for today's force and tomorrow's Objective Force.

This article discusses the advantages of conducting Paladin platoon and battery operations and suggests Paladin battalions maintain the ability to conduct both; it also discusses changes upcoming in the Force XXI units and calls for additional resources to maintain the option of conducting both platoon and battery operations.

Historical Perspective. US Army cannon FA units (heavy) first began operating under the platoon concept in June 1986. This resulted from an Army of Excellence (AOE) Field Artillery organization initiative for heavy divisions that recommended improved firepower, survivability and man-to-equipment ratios to counter the huge Soviet artillery threat.

Supported by the Legal Mix V Study of 1978 conducted by the Field Artillery School, Fort Sill, Oklahoma, the Field Artillery abandoned the six-gun battery in 155-mm self-propelled howitzer battalions and the four-gun battery in 8-inch battalions in favor of an eight-gun battery for both systems. This reorganization was known as the 3x8 battalion force structure (heavy) where three, eight-gun batteries were created within the battalion. Each battery was sub-divided into two, four-gun platoons with a fire direction center (FDC) organic to each.

This battery model helped facilitate semi-autonomous operations while enhancing survivability within the firing battery.[2] It gave each platoon the capability to operate over a wider, more dispersed battlefield while providing better protection against enemy counterfire and air threats.

In 1993, active duty FA battalions (heavy) began fielding the M109A6 Paladin howitzer. Paladin revolutionized the means by which the Field Artillery provided fire support to maneuver commanders.

Perhaps the most significant operational improvements over earlier M109 systems were the Paladin's superior enhancements to responsiveness and survivability. Paladin reduced the ready-to-fire time from 11 minutes to 75 seconds. Improved technology allowed the system to occupy autonomously without orienting stations, gun guides, aiming circles or hard wire. Position occupations were accomplished over wider frontages in more varying terrain. "Shoot and Scoot" displacements and emplacements were exercised considerably faster, making both platoon and battery operations much more efficient.

Employment options were many. Commanders could bring all their assets together for enhanced survivability against the ground attack, or they could spread them out in platoons or pairs to cut down on the howitzer vulnerability to counterbattery fires. Commanders could "leap frog" platoons in the offensive while passing control from one FDC to another.

Starting in 1996, the 3x8 battalion force structure was converted back to the six-gun firing battery (3x6 battalion) to help facilitate modernization efforts for FA units in heavy divisions while cascading Paladins and multiple-launch rocket systems (MLRS) into the Army National Guard.[3] Contrary to popular belief, this conversion had nothing to do with the obsolescence of split-battery (platoon) operations. The need to more widely disperse the guns to reduce the threat of enemy counterfire still exists today, for example in Korea.

The battery organization of two firing platoons, each with three guns and one platoon operations center (POC), formerly known as the FDC, remains in Paladin units today under the 3x6 battalion force structure.

Paladin Platoon Operations. *FM 6-70 Tactics, Techniques and Procedures (TTP) for Paladin Operations* defines platoon operations "as a POC controlling three Paladin howitzers in a position area (PA) that is approximately 1,500 x 3,000 meters. The number of howitzers in each platoon may be altered and various employment techniques can be used to meet mission requirements. Command and control is critical to maintaining responsiveness and survivability of the platoons."

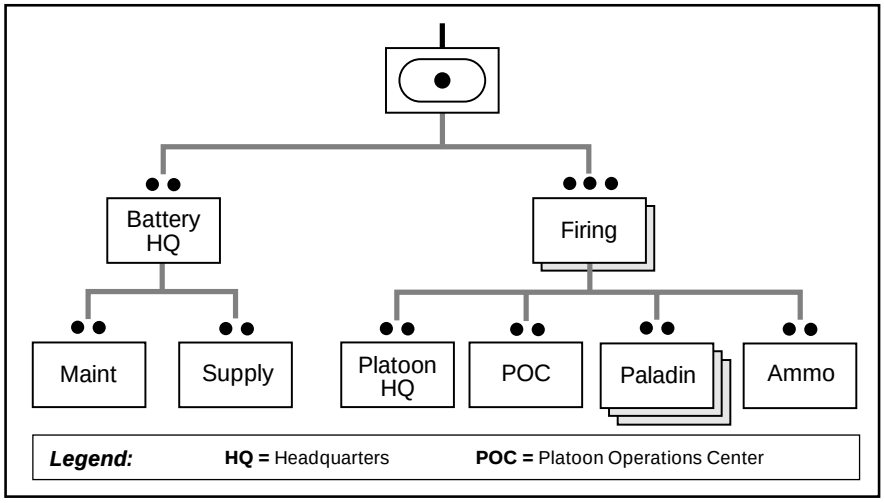


Figure 1: Paladin Battery Organization (Not the Force XXI Paladin Battery)

Simply stated, platoon operations require two functional POCs to command and control organic firing elements. Each POC is primarily responsible for database management, movement control, fire mission processing, administrative and logistics management, situational awareness and battle tracking. Figure 1 illustrates how the Paladin battery currently is organized to perform these functions (less Force XXI Paladin units).

The POC in each platoon consists of eight personnel: one fire direction officer (FDO) and seven enlisted fire direction personnel. This gives the battery enough manpower to conduct simultaneous platoon operations. Additionally, each POC has the devices to conduct autonomous operations, including an armored command post carrier with a lightweight computer unit (LCU) and radios to support both digital and voice communications.

Platoon operations require each POC to control three howitzer sections. There are lots of things going on in the POC. Database management and tactical fire control are the POC's primary functions. However, both POCs must maintain databases for all six of the battery's guns so either can assume command and control of all guns if one POC is incapacitated. The POC must be prepared to pick up the technical fire direction piece immediately if howitzers go into a degraded mode—i.e., the guns lose digital communications or Paladin's automatic fire control system (AFCS) computer fails. (FM 6-70, Appendix A, discusses degraded operations.)

Well-trained POCs can handle these requirements. The two POCs provide the battery a redundant means for command and control of its guns.

Paladin platoon operations work very well in mountainous or restrictive terrain that may force a unit to disperse more than usual. For example, the Paladin howitzer battery organic in each of the three squadrons of an armored cavalry regiment (ACR) must be prepared to provide fire support over a wide frontage. Dispatching platoons or pairs of howitzers may be the only practical means of providing fires in this situation.

Platoon operations offer several advantages.

Greater Dispersion. Platoon firing elements can achieve greater dispersion in the battery area of operations (AO) because of two command and control nodes. Each platoon can "stretch out" its tactical dispersion, which is limited only by the range of voice and digital communications assets. Employing paired howitzers further enhances dispersion within firing areas.

Fire Control Redundancy. Both POCs are actively engaged in fire mission processing and command and control. The constant exchange of gun database information between platoons facilitates a smoother transition during the POC changeover process.

Under battery operations, primary fire control is conducted in the POC and redundant fire control is maintained in the battery operations center (BOC). However, it normally takes much longer to conduct a changeover because the primary focus in the BOC is usually on administrative and logistics management, situational awareness and battle tracking—vice database updates.

Communications. Platoon voice and digital radio nets are less likely to be-

come congested than battery nets. Operational control becomes more efficient because of shorter net access delay times during digital radio transmissions. Voice nets are usually less crowded within the platoon net structure, as compared to one battery net.

Mission Flexibility. Platoon operations facilitate a better opportunity to conduct simultaneous or special mission requirements within the firing battery, such as platoon raids employing family of scatterable mines (FASCAM), rocket-assisted projectiles (RAP), Copperhead, illumination and marking rounds for close air support (CAS).

13E Fire Direction Specialist Training Proficiency. Fire direction personnel may sustain better training proficiency in platoon operations because they are constantly engaged in processing fire missions and controlling the movement of firing elements. Under battery operations, the technical skills of those in a BOC may erode without a quality cross-training program.

Better Leader Ratios. Each platoon has a platoon leader, platoon sergeant and a gunnery sergeant organic to the platoon headquarters. This maximizes command and control between the POCs and firing elements while maintaining a continuous reconnaissance capability. Furthermore, it enhances the coordination effort for terrain and mutual support operations with adjacent maneuver units. (Under the new Force XXI table of organization and equipment, or TOE, the Paladin battery has only one gunnery sergeant.)

Battery Operations. FM 6-70 defines battery operations "as one POC controlling all six howitzers in an area that is approximately 3,000 x 3,000 meters. The Paladin firing battery normally operates with two firing platoons. However, the battery commander may designate one POC to control all six howitzers to meet mission requirements."

This method of control does not preclude the commander from employing his howitzer sections in platoons or pairs. The key difference is that there is only one controlling POC, which requires all howitzers to tighten up their dispersion to remain within radio contact of the POC.

Although all Paladin units (less Force XXI units) are organized similarly, most use the POC/BOC (battery operations) concept. This means the POC conducts all tactical control and fire mission processing for all six howitzers, while the BOC oversees battle tracking, administrative and logistics management, and situational awareness. In this situation, the BOC must maintain the capability to perform technical and tactical fire direction while continuously updating howitzer databases to provide backup control when the POC is out of action.

The *Steel Dragons* of 2d Battalion, 82d Field Artillery (2-82 FA) of the 1st Cavalry Division, Fort Hood, Texas, developed an effective means of conducting battery operations. This example of battery operations is outlined in the article "3x6 Operations in the Paladin Battery" by Lieutenant Colonel Stephen D. Mitchell and Captain Patrick D. Quinn III in the March-April 1999 edition. The article provides some excellent ideas for employing the battery consistent with how many Paladin units operate today and emphasizes the backup fire direction capability and proficiency of the BOC.

The *Steel Dragons* of 2d Battalion, 82d Field Artillery (2-82 FA) of the 1st Cavalry Division, Fort Hood, Texas, developed an effective means of conducting battery operations.

There are some advantages to battery operations.

Compensates for Manpower Shortages. Battery operations are a better employment option if a unit has significant shortages in 13E personnel. These shortages may preclude a unit from physically manning two separate POCs during platoon operations.

Simplicity. At the battalion level, command and control is easier with one controlling POC. The battalion FDC only has to work with three subordinate elements instead of six.

Better Information and Logistics Management. Logistics management and battle tracking is easier and more efficient because the BOC can focus on these tasks while the POC tackles tactical control and fire mission processing. Some batteries flip-flop the BOC and POC functions from position to position to facilitate continuous operations and reinforce changeover crew drills for both elements.

Force XXI Paladin Battery. The 4th Infantry Division (Mechanized) Paladin units at Fort Hood are organized under the Force XXI design (See Figure 2). According to current force structure plans, all remaining Paladin units (both active component and Army National Guard) will convert to this new design sometime in the future.[4]

Note that the Force XXI battery has a support platoon added to manage the battery's administrative and logistics actions. Another key difference is the Force XXI design does not have a POC in each firing platoon. Instead, there is one BOC for the firing battery. The BOC TOE designates nine personnel: one FDO and eight enlisted fire direction specialists. The BOC's equipment includes an armored command post carrier with one LCU and associated radios. This means that the BOC must perform all functions necessary to maintain tactical control and fire mission processing functions for six howitzers.

Sound familiar? It's battery operations. But...where's the battery's command and control redundancy?

Under the current TOE, redundancy means are inadequate. There is no second armored command post, no second LCU, no second set of radios, etc. Therefore, when a battery BOC becomes incapacitated, another battery will have to pick up the six firing elements for command and control.

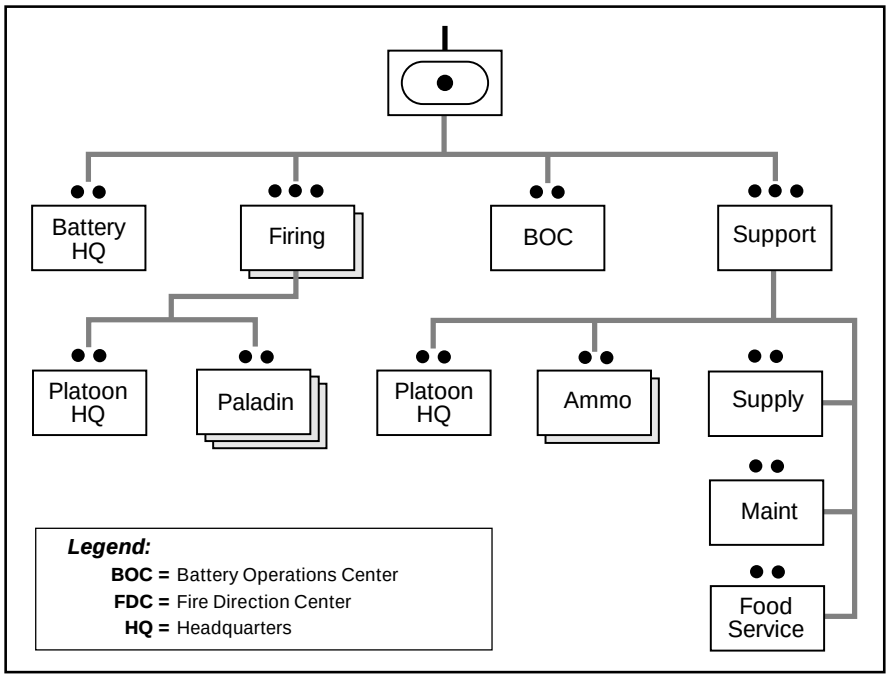


Figure 2: Force XXI Paladin Battery Organization

This is a poor option because the gaining BOC also only has one LCU, which gives it the digital capability to handle eight guns at a time. That means the gaining BOC can achieve digital command and control with only two guns from the sister battery while maintaining command and control of its own six guns. The other four guns will have to conduct degraded operations using voice communications, which minimizes Paladin's capabilities.

Suggested Solution. The Force XXI Paladin unit design does not provide enough resources for a firing battery to achieve command and control redundancy. The TOE needs to be redesigned, and Paladin batteries need to be resourced to conduct both battery and platoon operations.

As stated in the *Experimental Special Text (XST) 6-70 Draft TTP for Force XXI Paladin Units*, the firing battery is organized with a BOC to serve as the command and control node for the unit. This function includes operations planning and execution and tactical and technical fire mission processing. In order to accomplish these tasks, the BOC requires two identical sets of equipment so it can split into two command and control nodes to maintain continuous contact with the battery's cannon systems. Due to the fluid nature of the battlefield, these cannons may be operating outside the normal range of one command and control node.

Specific equipment requirements for redundancy of command and control include a command post carrier vehicle for mobility and protection, the capability to operate on five high-powered combat net radio (CNR) nets for voice or data tactical communications, a high-speed data radio, the enhanced position location reporting system (EPLRS) for situational awareness information; an Army tactical command and control system (ATCCS), the advanced Field Artillery tactical data system (AFATDS) for command and control and fire mission processing, a position-location determining device, precision lightweight global positioning system receiver (PLGR), and other items of equipment associated with support.

Conclusion. Paladin is flexible enough to operate in platoons or as a battery. The decision to employ a method should be based primarily on the factors of mission, enemy, terrain, troops, time available and civil considerations (METT-TC). Some situations require a Paladin unit to operate with two command and control nodes. If Paladin units are destined to organize under the Force XXI design, then we must provide adequate resources to maximize Paladin's capabilities and allow the units to operate in platoons or as a battery.

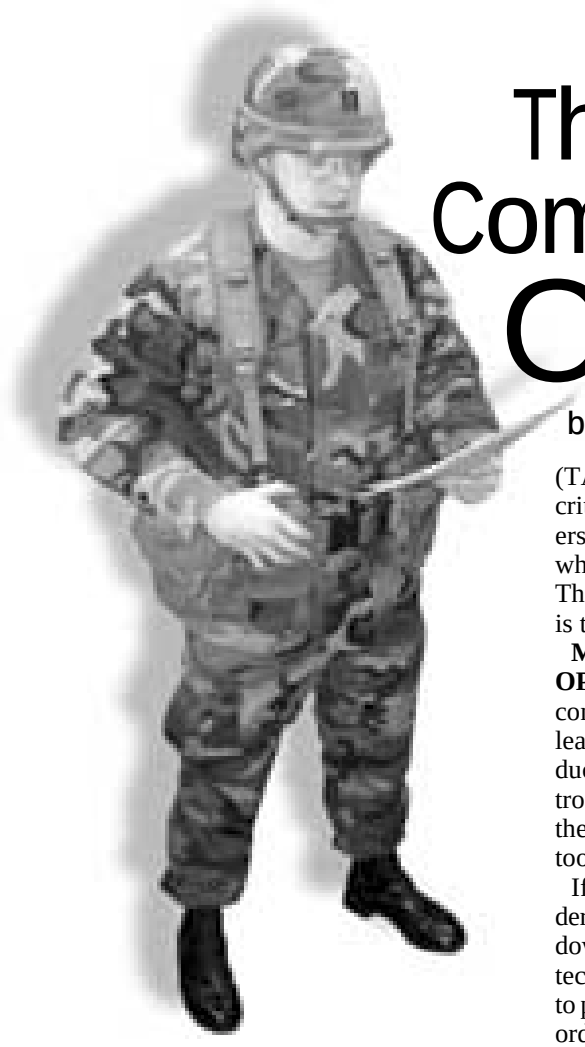
Efforts are underway to change the Force XXI TOE to reflect these recommendations.

Lieutenant Colonel Kerry J. Loudenslager, Active Guard Reserve (AGR) Title 10 Officer from the South Dakota Army National Guard (SDARNG), is the Chief of the New Systems Division in the Gunnery Department at the Field Artillery School, Fort Sill, Oklahoma. His previous assignment was as the Chief of the Paladin Division in the Gunnery Department. He also has served as the Operations Officer, Brigade Fire Control Officer, Brigade Counterfire and Intelligence Officer for the 147th Field Artillery Brigade, SDARNG; Operations and Training Officer in the Plans, Operations and Training Office (POTO) at the State Area Command (STARC), SDARNG. He commanded B Battery and served as Assistant Operations Officer, among other positions in the 1st Battalion, 32d Field Artillery, 41st Field Artillery Brigade, Germany. He has a Master of Arts in Human Resource Development from Webster University, St. Louis, Missouri.

Captain Ryan J. LaPorte is a Firing Battery Combat Trainer on the Werewolf Team at the National Training Center, Fort Irwin, California. His previous assignments include serving as Commander of B Battery, 3d Battalion, 82d Field Artillery and Task Force Fire Support Officer (FSO) for both 1st Battalion, 8th Cavalry and 2d Battalion, 12th Cavalry, all in the 1st Cavalry Division at Fort Hood, Texas. He also served as a Company FSO, Battery Fire Direction Officer, Firing Platoon Leader, and Assistant Operations Officer in the 3d Battalion, 41st Field Artillery in the 24th Infantry Division (Mechanized) at Fort Stewart, Georgia. He's a graduate of the Combined Arms and Services Staff School, Fort Leavenworth, Kansas.

Endnotes:

1. Major General Toney Stricklin, "Field Artillery Commander's Update" (unpublished), Fort Sill, OK, 14 September 2000, 1.
2. Boyd L. Dastrup, *US Army Field Artillery Center and School Monograph Series: Modernizing the King of Battle, 1973-1991,* (Fort Sill, OK: Office of the Command Historian, US Army Field Artillery Center and School, 1994), 16-17.
3. Interview of Christopher Klein, Force Structure Branch, Directorate of Combat Developments, US Army Field Artillery School, Fort Sill, OK, conducted 29 January 1997 by Boyd L. Dastrup for the "1996 US Army Field Artillery Center and School Annual Command History" (unpublished); Major General Randall L. Rigby, "3x6 Cannon-2x9 MLRS Transition," *Field Artillery* (September-October 1996), 18-21.
4. Briefing, Subject: "Force XX1 Paladin Firing Battery Organization" by Major Thomas Brown and Christopher Klein, Force Structure Branch, Directorate of Combat Developments, US Army Field Artillery School, Fort Sill, OK, 2 October 2000.



The Battery Commander's OPORD

by Major Troy A. Daugherty

Throughout the combat training centers (CTCs), Field Artillery battery commanders have demonstrated a weakness in executing the battery orders process. This weakness is most profound in their development and issuing of a battery operations order (OPORD).

There are several reasons for this weakness. First, the FA School at Fort Sill, Oklahoma, only now is beginning to teach the battery orders process in the FA Captains Career Course (FACCC). Second, units do not train the battery orders process as part of home-station training. The key to success in the battery orders process is standardization and home-station training.

This article addresses techniques for issuing the battery order and developing a standardized operations order, providing an example of a battery OPORD and execution matrix.

The biggest factor in the orders process is time. The time available determines the level of detail in the planning process, who attends the orders briefing and what rehearsals to conduct. A standardized order format in the battery tactical standing operating procedures (TACSOP) facilitates conveying the critical information to subordinate leaders in a timely manner, telling them what will be covered and in what order. The doctrinal five-paragraph OPORD is the format for the battery OPORD.

Methods of Presenting the Battery OPORD. Time permitting, the battery commander issues the order to platoon leaders and has the platoon leaders conduct the platoon orders process and troop-leading procedures. This allows the battery commander to train his platoon leaders to be commanders.

If time is limited, the battery commander may need to brief the battery OPORD down to the section chief level. The technique the battery commander uses to present the information in the battery order depends on his personality, presentation style, and the level of understanding within the battery. There are three means by which the commander can convey the contents of his order: oral presentation, map/overlay presentation and the terrain model.

The oral presentation is commonly used when time is short. A standard format is critical for this method to be effective. Oral presentation limits the audience's ability to grasp the relevance and (or) time/distance involved in an operation.

The map/overlay presentation is the easiest to do, but only those few personnel who can see the map will understand the contents. The battery commander can use the battery operations center (BOC)/platoon operations center (POC) situation map to brief the order. He must ensure each attendee brings his copy of the map to the operations order.

Another map/overlay presentation technique is to have the BOC/POC reproduce overlays for all track commanders. This ensures everyone is on the same overlay and has the same graphics.

The final means to issue the OPORD is the terrain model presentation. This is the most effective means because it allows the audience to visualize the operation as the battery commander describes it. Section chiefs must bring their maps to annotate key terrain, routes, etc., during the presentation. One limitation of a terrain model presentation is that it takes time to construct even a simple terrain form that conveys the link of the terrain to the graphics and the operation.

One technique useful in inclement weather or at night is to use a drop-cloth model, drawing key terrain features on a canvas or standard integrated command post system (SICPS) floor. This technique expedites the construction of the terrain model.

The battery TACSOP designates who is responsible for constructing the terrain model and what the standard is for the construction. The option some batteries use of having various people construct the model does not ensure the quality of the model. The BOC/POC personnel are best qualified and resourced to construct the terrain model.

The battery standardizes the OPORD format in the battery TACSOP. Then the selected leaders who assemble to receive the order have a standardized, fill-in-the-blank, laminated order format and a map with graphics.

Briefing the Order. The standard OPORD has five paragraphs, which are the basis of the battery commander's operations order briefing. Figure 1 is an example of a battery OPORD for a movement-to-contact. The following information describes a way, not the only way, to conduct the battery operations process and is based on the standardized format in Figure 1.

The battery commander can anticipate resource requirements by using standardized essential FA tasks (EFATs) to initiate action on precombat checks (PCCs) without guidance from battalion. The battery commander's ability to anticipate can save the battery valuable time—one resource the battery never has enough of during combat.

1. Situation. The battery commander orients the audience using a map or terrain model; he points out the area of operations (AO) and the area of interest (AI) that affect the battery. The AO is defined by the brigade or division boundaries. The AI includes the AO and all areas outside the AO the enemy can use to influence the mission; this includes as far back as the enemy artillery can range friendly forces but can include farther back if the enemy is attacking.

Next, the battery commander briefs the light and weather data, explaining

1. Situation:

a. Light and Weather Data/Effects.

High *77*	Moonrise *2359*	Sunrise *0611*
Low *46*	Moonset *1316*	Sunset *1850*
Wind Direction *NW*	NVG Window *2323/0550*	BMNT *0516*
Wind Speed *15 knots*	% Illum *65*	EENT *1745*

b. Terrain (Effects on Friendly and Enemy Forces).

- Observa tion- *High ground provides excellent observation and fields of fire, maximizing direct fire weapon ranges.*
- Cover and Concealment- *Little vegetation, providing only individual concealment. The rocky broken terrain in the hills and mountains provide excellent cover from direct fire. On the valley floor, wadis provide the only cover. Difficult to conceal vehicle movements during daylight hours because of the dust trails.*
- Obstacles- *Hill masses, rock outcroppings and boulder fields, vic grids: NJ2394, NJ2592 and NJ2322.*
- Key Terrain- *East range road, Colorado Wadi, Iron Triangle, Hill 760, Hill 800, Hilltop (vic NK2617).*
- Avenues of Approach- *The central corridor consists mostly of open areas that allow for fast, easy movement for up to regimental-sized units.*

c. Enemy Forces (Focus on Strength and Composition). AGMB formation, 7-10 T-80s, 21-29 BMPs, 3 AT-5s (emphasize weapon system capabilities); RAG has 12 tubes of 2S1s, 2 Bns of 2S19s; DAG has 1 Bn of BM-21s, 2 Bns of 2S5s, 1 Bn of 2S7s. Enemy has chemical PK and NP. (Again, emphasize weapon and range capabilities; identify where the enemy likely will use chemical munitions to influence the battle.)

d. Friendly Forces (Battalion Mission and Concept of the Operation). Use the map to brief the brigade mission/ concept of the operation and FA battalion mission/concept of the operation.

2. Mission:

A/1-41 FA provides fires in support of 1 BCT movement-to-contact to PL Corsair 080600May97 to expand the division lodgment area to protect the northern flank.

3. Execution:

a. Concept of the Operation. *Brief off the map or terrain model.*

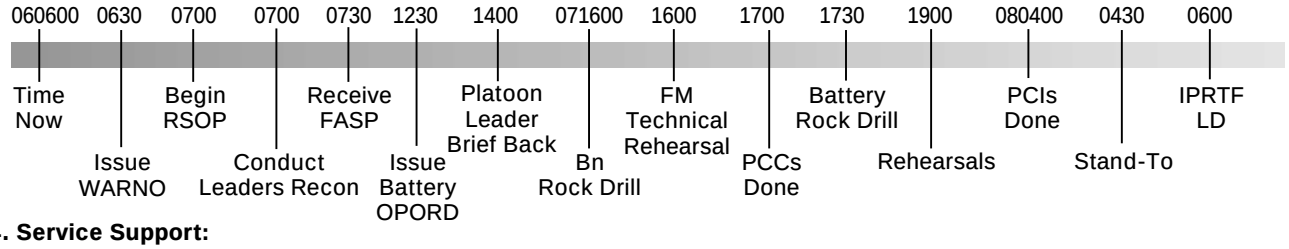
b. Execution. *See the Execution Matrix.*

c. Special Instructions.

PCCs (In Order By Priority)	PCIs (Conducted By)	Rehearsals
FASCAM Mass NBC CASEVAC POC Changeover	M2 Headspace and Timing Turret Loads Test M8 Alarms M256 Kits Straps and Litters Map Boards w/ Graphics	React to ground threat (defeat a single vehicle). Identify and navigate a breach in a minefield. Division Standard

PCCs/PCIs and Rehearsals based on EFATs and threat.

Battery Time Line



4. Service Support:

a. Turret Load. *See Execution Matrix.*

b. Resupply Trigger (Munition and # Rounds Fired). *See the Execution Matrix.*

5. Command and Control:

a. Succession of Command. *1 Platoon Ldr, 2 Platoon Ldr, 1 FDO, 2 FDO, 1SG*

b. Frequency and Call Signs. *IAW SOI and Battery TACSOP.*

c. Challenge and Password. *Day 1 in effect.*

Legend:

AGMB = Advanced Guard Main Body
BCT = Brigade Combat Team
BMPs = Tracked Infantry Combat Vehicles
Bns = Battalions
BMNT = Beginning Morning Nautical Time
CASEVAC = Casualty Evacuation
DAG = Division Artillery Group
EENT = End Evening Nautical Time
EFATs = Essential FA Tasks
FASCAM = Family of Scatterable Mines
FASP = FA Support Plan
IPRTF = In Position Ready to Fire
LD = Line of Departure
NBC = Nuclear, Biological and Chemical
NP = Non-Persistent Chemical
NVG = Night Vision Goggles
OPORD = Operations Order
PCCs = Pre-Combat Checks
PCIs = Pre-Combat Inspections
PK = Persistent Chemical
PL = Phase Line
POC = Platoon Operations Center
RAG = Regimental Artillery Group
RSOP = Reconnaissance, Selection and Occupation of Position
SOI = Standing Operating Instructions
TACSOP = Tactical Standing Operating Procedures
vic = In the vicinity of...
WARNO = Warning Order

Figure 1: Example of a Battery Operations Order (OPORD) in a Movement-to-Contact

Phase/Trigger Event	Phase 1 2-1 Infiltration	Phase 2 R&S Plan	Phase 3 LD to Defeat AGMB	Phase 4 Defeat Main Body
Enemy Actions	Scouts out; TF Angel secures hidden valley in the south and areas north of Brown Pass.	Phase 1 fires to neutralize C^2; PCHEM and FASCAM to shape battlefield.	CRP LD on contact report; Phase 2 fires +30 mins; FSE LD to fix LDTF and envelop and destroy TF; AGMB exploits success.	Main body exploits success; begins Phase 3 fires w/ Phase 4 fires in the close battle.
Threat to the Battery	Indirect Fires	Mounted/Dismounted Ground (Recon)	Counterfire Air	Counterfire Ground
Maneuver Forces	2-1 Scouts LD; 2-1 main body conducts truck infiltration; COLTs inserted.	2-1 denies enemy maneuver corridors; 3-7 recons south to LOA; 3-69 recons north to LOA.	3-7 leads; 3-69 follows, echelon left; 2-1 establishes blocking position.	3-7 destroys AGMB and fixes main body; 3-69 destroys main body.
Battery Location	NK361188 AOF 2100; occupy hides IPRTF 081100; RSOP alternate hides.		Follow 3-69, PA Steel AOF 2100; o/o to PZA2; LOA PL Warhawk; AOF 1800 Axis Steel.	o/o move to PZA3; LOA PL Ford, AOF 1600; o/o to PZA4, LOA PL Mustang; o/o to PZA5, LOA PL Corsair on Axis Steel.
EFAT/Purpose Target #/Ammo **Scheme of Fires**	Mass HE 6 Rds AE0002 to support 2-1 infiltration; o/o be prepared FASCAM AE0001 to delay; 1-10 FA primary shooter w/ A/1-41 FA alternate shooter.		Mass DPICM AE0051 3 Rds to suppress the FSE; AE0052 9 Rds countefire; AE0053 9 Rds main body.	Mass DPICM AE0055 10 Rds and AE0057 4 Rds to destroy main body.
Movement Trigger	Move out of hide positions 0881000.		Stay 1000m to rear of trail tank company (D Co).	
Order of March, Movement Technique/LOA	1, 2 Trains in platoon wedge; LOA PL Thunderbolt.		1A north, 2 A south, platoon wedge/column through passes.	1A stays in north sector; 2A stays in southern sector.
Survive Criteria	o/o upon receive counterfire.	3 Missions/30 Mins.	2 missions/10 Mins.	
ADA Status	Yellow/Tight			
NBC Level Decon Sites	MOPP 0 Decon NK 300158	MOPP 2; o/o Decon NK335201.		
LOGPAC/BRP	NK310159	AXP NK301401	BAS NK320134.	R^3SP NK397132

Turret Load	HEF	HEM	HEA	HEB	HER	SMA	SMB	SMC	ILA	ADAM	RAAMS	CPH	GB	WB	119	203
Gun	20		7		5			5				2		16	20	5
FAASV	30		15		7			10	10	2	16	3		40	46	7
PLS	176													176		

Resupply Triggers (# of Rds and Type)- *8 Rds HEF resupply howtizer; 30 Rds HEF resupply FAASV from PLS; 9 119 powders resupply with WB.*

Legend:

ADA = Air Defense Artillery
ADAM = Area Denial Artillery Munition
AOF = Azimuth of Fire
AXP = Ammunition Exchange Point
BAS = Battalion Aid Station
BRP = Battery Resupply Point
COLTs = Combat Observation Lasing Teams
CPH = Copperhead
CRP = Countrreconnaissance Patrol
C^2 = Command and Control
DPICM = Dual-Purpose Improved Conventional Munitions
EFAT = Essential FA Task
FAASV = Field Artillery Ammunition Resupply Vehicle
FSE = Forward Securtiy Element
GB = Green Bag
HE = High-Explosive Munitions
HEA = HE Lot A
HEB = HE Lot B
HEF = DPICM
HEM = Extended-Range DPICM
HER = HE RAP
ILA = Illumination
LD = Line of Departure
LDTF = Lead Task Force
LOA = Limit of Advance
LOGPAC = Logistics and Personnel Administration Center
MOPP = Mission-Oriented Protective Posture
o/o = On Order
OBJ = Objective
PA = Position Area
PCHEM = Persistent Chemical
PZ = Paladin Zone
RAAMS = Remote Anti-Armor Mine System
R&S = Reconnaissance and Surveillance
R^3SP = Rearm, Refuel and Resupply Survey Point
SMA = M110 White Phosphorous
SMB = HC 116A1
SMC = Smoke M825
TF = Task Force
WB = White Bag

Figure 2: Battery Execution Matrix

its effect on friendly and enemy forces. He addresses the effects of night-vision goggle (NVG) window and illumination rounds on the operation.

Then the commander discusses the terrain, describing observation, cover and concealment, obstacles, key terrain, and avenues of approach (OCOKA). He emphasizes aspects most important to the section chiefs: soil content, slope of the valley walls, hilltops that affect the executive officer minimum quadrant elevation (QE), intervening crests, etc.

The battery commander explains the enemy situation as it relates to the current situation and the mission. He describes the threat to the battery, focusing on the enemy's composition and strength. He identifies weapon systems and capabilities and explains how they will be employed against the battery.

The commander uses the battery execution matrix to describe enemy actions by phase and the concept of the operation. The matrix is part of the OPORD, Paragraph 3b. Figure 2 on Page 22 gives an example matrix in the battery OPORD for a movement-to-contact.

When describing each phase, the battery commander applies the "So what?" factor. For example, in Phase 1 of Figure 2, the battery commander might say, "As we prepare for operations through the night, the primary threat to the battery will be mounted and dismounted recon patrols of two to six enemy soldiers in BRDMs [wheeled armored reconnaissance vehicles] gathering information/intelligence. When possible, the patrols will attack undefended positions—so, stay alert and be prepared for dismounted attacks."

2. Mission. The battery commander explains the maneuver brigade mission/commander's intent and the FA battalion mission/commander's intent to ensure all soldiers understand how they fit into the fight. The mission statement is who, what, when, where and why. The battery commander keeps the explanations in Paragraph 2 brief; the details are covered in Paragraph 3.

3. Execution. This paragraph covers the concept of the operation, which gives the battery commander's intent and describes how the battery is going to execute the mission. The commander uses the map or terrain model to explain how the battery will move and execute its EFATs.

The battery commander uses the execution matrix to summarize the battery order and brief the details of the operation by phase. The execution matrix covers all areas essential to the battery's success.

Next are special instructions. The battery TACSOP should include PCCs based on EFATs and threats to the battery, at a minimum. The commander identifies the PCCs, precombat inspections (PCIs) and rehearsals the battery must conduct and in what priority for each mission. The battery TACSOP should include standardized PCCs (*FM 6-50 Tactics, Techniques and Procedures for the Cannon Battery* has several) and identifies PCIs inherent to those PCCs. PCCs are conducted at the section chief level. PCIs are conducted at the platoon leader/platoon sergeant level.

Rehearsals are conducted based on the time available and necessity. The battery rock drill rehearsal is critical. In this rehearsal, the battery commander verifies attendees (including track commanders) understand his intent and the concept of the operation. The battery commander asks questions and makes the battery rock drill an interactive exercise. He requires section chiefs and ammunition team chiefs backbrief him on portions of the OPORD. The commander uses the battery execution matrix format to conduct the battery rock drill. Other rehearsals include tasks the battery has to execute that are not standardized or are critical to the mission's success.

4. Service Support. The primary focus for combat service support at the battery level is on Class III Petroleum, Oil and Lubricants (POL); Class V Ammunition; and maintenance and medical support. Generally during a battle, Class III will not be a factor. The critical planning factor is Class V.

The battery commander determines the ammunition requirements for his battery, based on the EFATs and the scheme of fires. He must know the amount of ammunition available by type of projectile, propellant and fuze.

The platoon leaders must provide the battery commander accurate ammunition counts as part of the commander's mission analysis. The battery commander then develops plans for turret or high-mobility multipurpose wheeled vehicle (HMMWV) ammunition loads. Turret load refers to the number and type of rounds/propellants loaded in the self-propelled howitzer or in the prime mover for towed howitzers (HMMWV).

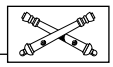
The battery commander develops the required turret loads based on the EFATs and by the section that must execute the individual EFATs. Turret loads can change with the phases of the operation.

The battery commander also establishes resupply triggers for the battery. Using battlefield calculus, the commander determines the number and type of ammunition required to accomplish each EFAT. He then determines triggers for the resupply from the FA ammunition support vehicle (FAASV) to the howitzer and from the palletized loading system (PLS) to the FAASV.

The resupply triggers need to be clear—"8 rounds of DPICM [dual-purpose improved conventional munitions]." This tells the howitzer section chief that when he fires eight rounds of DPICM, he needs to resupply his howitzer. The leadership must rehearse the EFATs to verify the battery will have enough ammunition at the critical times and places to execute the EFATs. The commander also addresses the maintenance recovery and casualty evacuation (CASEVAC) plans. He addresses them in the battery execution matrix.

5. Command and Control. This paragraph identifies the chain of command, the battery commander's location during the battle, the frequency and call signs addressed per signal operations instructions (SOI), coordination with adjacent maneuver units before execution to deconflict land resources, ammunition exchange points (AXPs) etc., and the challenge and password.

The key to success in issuing a battery OPORD is to use a standardized process that everyone understands. If the battery commander trains his unit on the OPORD's contents and that he will present the battery orders briefing in that sequence, he has a much better chance of his soldiers understanding the order. The commander then makes the most of his most limited resource: time.



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The First Multi-Component Battery

B/2-131 FA-D/2-20 FA

by Captain Craig R. Bowser, TXARNG

For the men of B Battery, 2d Battalion, 131st Field Artillery (B/2-131 FA), Texas Army National Guard (TXARNG), this story begins on a sweltering day in August 1999 on the 4th Infantry Division (Mechanized) parade field at Fort Hood, Texas. It was the integration ceremony for the Army's first multi-component battery in the new divisional multiple-launch rocket system (MLRS) battalion—the 2d Battalion, 20th Field Artillery (2-20 FA). B/2-131 FA picked up the additional designation of D/2-20 FA as the Army's first ARNG battery to be integrated into an active battalion to create an Active Component (AC)-Reserve Component (RC) combat unit, a unit capable of responding to worldwide contingency plans.

Written from the battery commander's perspective, this article tells the story of B/2-131 FA's first year of integrating into 2-20 FA, highlighting the solutions to our training, maintenance and deployment issues and the reasons the Army's charter integration process was a success.

I first learned of the integration plan in May 1999 when the 2-20 FA's leadership visited the our Armory in Wichita Falls, Texas. Initially, I was somewhat skeptical of the integration plan and a bit apprehensive as to how the integration design might affect my close-knit, combat ready unit. The "One Force" concept would require my battery to have two identities: B/2-131 FA, based in Wichita Falls, and D/2-20 FA at Fort Hood.

In peacetime and during home-station drills, we stay aligned with the Texas National Guard. However, during drills and annual training at Fort Hood or if we are called to active duty, we fall under the AC's command.

I had several questions: How would this affect my battery, its rich history, and the spirit of my men? Would we be able to maintain two identities? How would we integrate into 2-20 FA? As the battery commander, I feared the AC might take advantage of us or, even worse, doubt our dedication to duty and commitment to the Army and nation.

Our work started immediately, and the pace was furious. Our first order of business was to clean and turn in equipment to the Oklahoma National Guard, our former headquarters, and draw new equipment from the Texas National Guard. With our equipment in place, we began to adopt new command policies and embrace them as our own. We studied 2-20 FA's tactical standing operating procedures (TACSOP) and began to prepare ourselves for our frequent trips to Fort Hood, while proudly sewing both the 49th Armored Division (TXARNG) and 4th Infantry Division patches onto our uniforms. It was an extremely hectic, confusing and, at times, frustrating state of transition for us.

Within a few months of the integration ceremony, my initial concerns and uneasiness began to subside. The battalion leadership and the integration team were as interested in working with us as we were with them.

The battalion leadership made many trips to our armory and offered invaluable assistance. We talked through the liaison requirements and how the entire integration process would work. It was obvious from the start that the AC soldiers demonstrated the same level of commitment and sincere willingness to make it all work as Bravo Battery soldiers.

But as we moved toward integration, several issues remained. For example, how would training, maintenance, and deployment work?

Training. How would we plan, coordinate and facilitate training activities? 2-20 FA sent us a battalion integration team to assist in the transition. The team consisted of an FA first lieutenant, a senior 13M (MLRS Launcher Chief) and a senior 13P (MLRS Fire Direction Chief). The role of the integration team was to facilitate communications among all concerned parties, help with training

D/2-20 fired 18 rockets alongside active component batteries—the first time a multi-component MLRS FA battalion had fired together.

requirements and give assistance and council where needed.

Our training began immediately. The actual coordination of our training plans and the determination of the specific details, such as dates, times and objectives, generally took place between the respective headquarters of 2-20 FA and 2-131 FA.

For the purpose of integration, it was very important for us to train with the active force. We did just that. Our two-week annual field training exercise (FTX) at Fort Hood was scheduled with a battalion FTX planned jointly between 2-20 FA and 2-131 FA. During this FTX, the 2-20 FA tactical operations center (TOC) transmitted fire missions and movement orders and coordinated resupply operations with us just like the other firing batteries in the battalion. We accomplished this training in July 00, demonstrating how completely we integrated into our active duty battalion. We met the same rigorous training standards as the rest of our active duty battalion.

Deployment. How would readiness and deployment work for a multi-component unit? We discovered we would deploy alongside the 2-20 FA. Upon activation, usually by Presidential Selective Reserve Call-Up (PSRC), the deployment plan requires us to assemble our National Guard soldiers at the armory in Wichita Falls, allowing a couple of days for our soldiers to gather. Within 72 hours of notification, we then would move to Fort Hood to begin our mobilization processing. After about 21 days of train-up and preparation, we would deploy to the battlefield as a combat ready firing battery in 2-20 FA.

From a National Guard perspective, it was extremely important our family readiness group, mobilization books and individual soldier records be in order. Our family readiness group now is integrated into the overall 2-20 FA family readiness group plan. Key members of my readiness group have met and exchanged telephone numbers with the leadership of the 2-20 FA family readiness group—despite the four-hour driving distances between us. Members from both family readiness groups have met for social events.

It was going to be equally important that our mobilization and deployment plan be presented to the appropriate parties at Fort Hood because this was going to be the site of our deployment. To address this issue, our integration team worked with us to develop movement books that were submitted to the Fort Hood Directorate of Logistics for approval along with the movement books of the other firing batteries in the battalion. Activities, such as records processing, temporary lodging, ammunition, the preparation and loading of our equipment, rations and drawing other essential combat equipment, needed to be clearly defined. We accomplished this by working closely with the 2-131 FA and 2-20 FA headquarters staffs and integrating our deployment processes into the overall 4th Infantry Division deployment plan.

Maintenance. How would we handle the maintenance of our military vehicles? Which unit funds repair parts, and who reports my battery on its unit status reports (USR)?

The maintenance piece was an issue that had to be resolved for this integration process to work. Fortunately, the commanders of the 4th Infantry Division and 49th Armored Division were able to work out a memorandum of agreement (MOA) for requesting and funding our maintenance repair parts. The MOA simply states that if the battery needs a repair part when we are at Fort Hood conducting a training exercise, our first point of contact is the National Guard maintenance facility at north Fort Hood. If the facility doesn't have the part, then we requisition it through the 2-20 FA battalion maintenance section and funds are transferred electronically from the 49th Armored Division to the 4th Infantry Division.

This MOA allows us to maintain a high state of readiness and maximize the field training opportunities while deployed to Fort Hood. The arrangement also has resulted in an outstanding working relationship between the National Guard maintenance personnel at Fort Hood, 2-20 FA maintenance personnel and the 4th Division Support Command (DISCOM) staff. The goal of all parties has been to maintain my battery's equipment at the highest maintenance standards possible, regardless of whether the parts come through National Guard or active duty channels. Our ARNG 2-131 FA carries our battery on its USR.

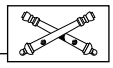
Success at Hand. I attribute the success of our integration process to two factors. First, Bravo Battery soldiers responded magnificently as they tirelessly turned in old equipment for the Army's latest and most technologically advanced radios, fire direction computers and weaponry. During many long days and late nights, none of my soldiers ever doubted the integration concept, the battalion or themselves. They remained confident in their abilities and eagerly anticipated the opportunity to showcase their talents and experience.

Bravo soldiers might have had to learn their new equipment, but they didn't have to learn "soldiering." Six Bravo soldiers served in Vietnam, including one with the 4th Infantry Division.

Second, the outstanding efforts of the battalion integration team, coupled with the unparalleled commitment of the Active Guard Reserve (AGR) personnel, contributed to the success of the integration process. The two components interacted with two chains of command—the National Guard Headquarters in San Antonio, Texas, and the 4th Infantry Division Headquarters at Fort Hood, making many trips to coordinate activities and ensure conformity.

This integration process was new to the Army, never having been attempted. There were no templates, and on a variety of issues ranging from mobilization to maintenance, there was minimal guidance. AC-RC efforts were vigilant and proactive.

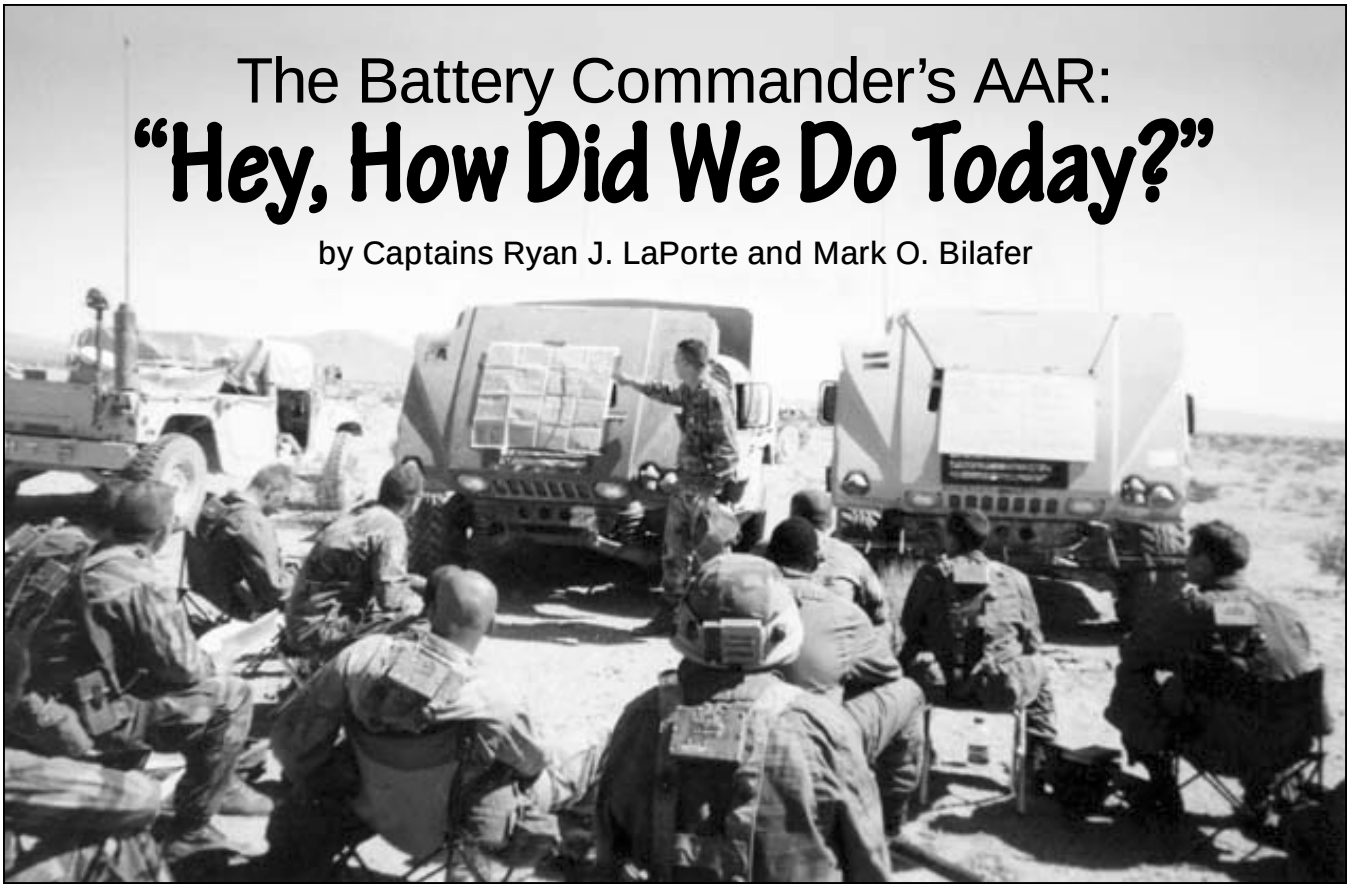
Today, 2-20 FA stands as a single fighting force, a shining example of how the AC and ARNG can work together. The integration effort culminated on 15 July 2000 when my battery safely fired 18 rockets alongside our active component batteries—the first time a multi-component MLRS FA battalion had fired together. We demonstrated that, despite having two units function under different commands, the "One Force" concept works.



Captain Craig R. Bowser, Texas Army National Guard (TXARNG), commands the first multi-component battery in the Army, carrying two designations: B Battery, 131st Field Artillery (B/2-131 FA), Wichita Falls, part of the 49th Armored Division, TXARNG, and D Battery, 2d Battalion, 20th Field Artillery, 4th Infantry Division (Mechanized), Fort Hood, Texas. He also served as a Fire Direction Officer in 1st Battalion, 127th Field Artillery, part of the 130th Field Artillery Brigade, Kansas ARNG. He transferred to the TXARNG in 1996 and served as a Firing Platoon Leader, Support Platoon Leader and Executive Officer in 2-131 FA. Captain Bowser is a Business Manager with TXU Gas and Electric Company in Dallas. He holds an MBA from Washburn University in Kansas.

The Battery Commander's AAR: "Hey, How Did We Do Today?"

by Captains Ryan J. LaPorte and Mark O. Bilafer



The Chief of Staff of the Army recently visited the National Training Center (NTC), Fort Irwin, California, and commented on the Army's after-action review (AAR) process. He remarked that one of the highlights of a unit's NTC training experience is the quality AARs observer/controllers (O/Cs) conduct during its rotation.

These AARs range from the formal, fully instrumented AARs conducted several hours after a battle to the more informal "Hummer-Top AARs" conducted just minutes after the battle. While the Chief was very impressed with the quality of O/C AARs, he was less certain that commanders and leaders in the field could lead AARs to the same standard for their own units.

The Chief tasked the NTC to allow unit commanders to lead AARs during their rotations as a vehicle to export high-quality AARs to Army units. With that guidance, the NTC embarked on a leader-led AAR program now in place from the platoon to the brigade commander levels.

This article illustrates the experience of Captain (CPT) Melvin Hubbard, a Paladin battery commander, who led such an AAR during his recent rotation at the NTC.

It had been another tough battle for CPT Hubbard. He knew that providing artillery fires in support of a brigade deliberate attack against the highly trained "Krasnovians" would be a tough mission for his Paladin battery. He had been in Mojavia for more than two weeks and fighting the Krasnovians for six days. Following his third encounter with the Krasnovians, he set up his campstool by his high-mobility multipurpose-wheeled vehicle (HMMWV) and went over the four-hour battle in his mind. He jotted down several remarks in his green notebook and then began to prepare for his AAR.

After participating in two AARs, it was CPT Hubbard's turn to lead a post-battle AAR for his battery. Before rehearsing his AAR, CPT Hubbard pondered on what he had learned about facilitating a battery-level AAR.

Before deploying to the NTC, CPT Hubbard had reviewed "Training Circular 25-20 A Leader's Guide To After-Action Reviews" dated September 1993. This was an excellent starting point to prepare for a professional AAR. From this handy circular, CPT Hubbard had noted the AAR process follows four simple steps: planning, preparation, conduct and follow-up. He also had learned a great deal about AAR delivery techniques during the AARs after his first two missions. He reviewed his experiences with O/C AARs.

Observer/Controller AARs. The day after the first battle, a defense in sector, CPT Hubbard joined other key leaders from his battalion for his first formal NTC AAR. During this AAR, the Senior Fire Support Trainer, Wolf 07, facilitated a two-hour, fully instrumented AAR for the FA battalion. As CPT Hubbard sat there in the expandable van just a few kilometers from his battery's final position, he marveled at all the high-tech equipment Wolf 07 had at his disposal for gathering tactical information and providing feedback to the leaders in his battalion. He knew he would not be as fortunate to have access to this equipment or feedback mechanism for his own AAR.

CPT Hubbard noticed that Wolf 07 focused the AAR on only three topics: delivery of fires, crew drill and the military decision-making process (MDMP). Before delving into these areas, Wolf 07 briefly discussed what happened and why it happened. But, the bulk of Wolf 07's AAR centered on having the unit identify who was responsible for fixing the shortcomings

and how the unit would fix them for the next battle. CPT Hubbard would remember this directed focus approach.

After the second battle, a movement-to-contact, Wolf 13, a firing battery combat trainer, exposed CPT Hubbard to another AAR style: the informal counterpart AAR. Wolf 13 had been in CPT Hubbard's shoes before and knew what was going through his mind. Wolf 13 recalled his own NTC experiences as a battery commander when he had become a true believer in the coaching and teaching approach to training.

Within minutes after the second battle, Wolf 13 and CPT Hubbard met next to Wolf 13's HMMWV. This Hummer-Top AAR was much different than Wolf 07's instrumented AAR. There were no screens, boards, computer-generated graphics or air conditioning. It was a one-on-one dialogue between two professional artillery officers.

Wolf 13 began the discussion with a simple, "How do you think we did today?" In an honest self-assessment, CPT Hubbard identified several areas that had not gone well during the fight. Wolf 13 let him dissect each of these topics, and the two determined fixes for the upcoming battle.

Toward the end of the exchange, Wolf 13 remarked, "OK, BC [battery commander], we have identified a bunch of areas that need improving. Let's narrow the list down to three, call them the 'Big 3' and work on those for the next battle." Without hesitation, CPT Hubbard replied, "We've got to 'get our arms around' reconnaissance operations, precombat checks and emergency fire missions before the deliberate attack."

The entire dialogue lasted 40 minutes, and CPT Hubbard left with his marching orders for the next battle. He also noted this self-discovery technique for his own AAR.

Battery Commander AAR. After learning from O/C-led AARs, CPT Hubbard now was ready to lead his first battery-level AAR. It was shortly after the third battle as he glanced over his notes from the last AAR and felt comfortable his unit had tackled the Big 3 successfully during this battle. It did not take CPT Hubbard long to come to the conclusion that ammunition resupply, battery time line and M825 smoke rehearsals had plagued his unit throughout the deliberate attack. He concluded these challenges would be the focus of his AAR. It was time to organize his own AAR. (See Figure 1.)

Based on this assessment, he decided to include all key leaders in the battery. Although he had the option of having the entire battery present, he wanted to concentrate on fixing leadership systems rather than individual soldier skills in this AAR. In addition to platoon leaders, fire direction officers (FDOs), platoon sergeants and section chiefs, he directed ammunition team chiefs and palletized loading system (PLS) drivers to come to the AAR.

He then moved on to AAR site selection. He chose a site underneath the fire direction center (FDC) camouflage net that provided some shade from the blistering desert sun. He also ensured the site was free of such distracters as the blare of radio traffic and the noisy FDC's generator.

As the battery's leaders assembled, all toting their campstools, a canteen of water and notebooks, CPT Hubbard looked over his training aids. He scrounged up a butcher-block easel with paper and a dry erase board with markers and used the FDC's map board with the maneuver graphics posted. With the few minutes he had remaining, he conducted a brief rehearsal with his scribe to ensure a smooth delivery.

CPT Hubbard had set the stage for his AAR. He had gathered all of the tools, selected the perfect site and assembled the key players. He now turned his attention to the AAR delivery.

Before covering the house rules, he grabbed the audience's attention with a relevant brief historical vignette about fire support in Vietnam. He then briefly discussed what happened in the battle action summary portion of the AAR. He included the battery's mission, the enemy's final positioning and battlefield statistics, courtesy of Wolf 13. CPT Hubbard then began with the first of his Big 3—the focus of his AAR.

Ammunition Resupply. CPT Hubbard started the discussion with an open-ended question, "How did we manage ammunition today?" At first there was silence. CPT Hubbard was tempted to fill the silence, but paused—waiting for his battery leaders to respond.

Finally, after several seconds, the 2d howitzer section chief, spoke up and responded with, "Sir, my job is to fire the rounds; it's the platoon leader's job to track the bullets! It's been that way since I've been a section chief."

One of the platoon leaders quickly chimed in, "Sir, the XO [executive officer] and the FDO decide when and what goes on the gun and ammunition vehicle. So how am I supposed to manage the ammunition?"

Sensing he had struck a nerve, CPT Hubbard interjected a leading question,

Personnel Considerations:

• AAR Focus (Leader vs Unit) • Unit Battle Rhythm • Travel Time

Site Selection	*Pros*	*Cons*
• TOC/Battery FDC	Central Location AAR Product Availability Participant Comfort	Can't See the Terrain Distracters
• Battery Position Areas	Terrain Unit Fought On Reduced Number of Distracters	Travel Time Product Availability
• Forward	View Battlefield Effects See the Enemy (Routes/Battle Positions)	Travel Time Battle Rhythm

Training Aids allow the unit to capture and maintain historical reference of the AAR (videos, map overlay, etc.). To select the right training aids, trainers should ask:

• What points do I want to make, and which aids support/illustrate the points?
• Can I use the actual terrain or equipment?
• Will the participants be able to see and hear the AAR?

Presentation:

• Maintain focus.
• Maintain Professionalism.
• Focus on the issue, not individual.
• Ask leading questions.
• Find two or three problems to fix for the next fight.

Figure 1: After-Action Review (AAR) Criteria

"Who is responsible for ammunition management in our battery?"

A hand appeared in the back of the assembled leaders. It was the 4th section ammunition team chief. He remarked, "Sir, I have a suggestion. I haven't been assigned to the battery that long; however, isn't ammunition everyone's responsibility?" Before Hubbard could ask another question, the headquarters platoon sergeant replied, "He's right. I know I didn't get into the details on how we track ammunition distribution from the PLS to the howitzer. We have to develop a better system."

The discussion went back and forth amongst the leaders for about 15 minutes with Hubbard facilitating and staying focused on fixing ammunition management. For the next fight, the XO said he would fix turret loads and PLS ammo accountability. The FDO would keep the advanced FA tactical data system (AFATDS) ammunition database up to date. The section chiefs would manually update ammo counts on the howitzers and FA ammunition supply vehicles (FAASVs), using DA Form 4513 Record of Missions Fired, as well as the automated fire control systems (AFCS) every hour.

CPT Hubbard knew the AAR was working. His unit was responding, and his subordinate leaders, the ones who would implement the fixes, were doing most of the talking. The battery was now ready to tackle its second topic.

Battery Time Lines. CPT Hubbard had depicted the battery time line graphically on the butcher-block easel prior to the AAR. He asked his 3d howitzer section chief to talk the battery through the planned time line.

The commander then asked, "XO, did you experience any time constraint issues during the planning portion of today's mission?" The XO responded, "Sir, we didn't receive the battery OPORD [operations order] until 2400 hours and immediately began ammunition upload. This took us most of the night to accomplish. According to the time line, I was supposed to have your directed PCCs [pre-combat checks] and inspections accomplished by 0800 hours, which we did not begin until 0900."

The battery ammunition NCO-in-charge (NCOIC), joined in: "Sir, there was nothing we could do. Battalion did not send us the correct ammunition on the PLS, so we were dead in the water."

CPT Hubbard sensed he was at risk of losing the training point. If he allowed the battery ammunition NCOIC to deflect the issue to battalion, then the battery would miss its own issues with the time line. Hubbard gently had to nudge the discussion back into the battery's court.

He refocused the AAR by asking, "Gentlemen, the PLS were late; however, did we download our current ammunition on the FAASVs to the guns to facilitate the ammunition upload?"

The XO responded, "Sir, we allowed ourselves to go into a wait-and-see mode and did not stay proactive. We'll get after that one."

CPT Hubbard now looked for a fix by asking the following question, "Who directed ammunition upload after 2400 hours?" The ammunition NCOIC quickly jumped in and said, "Sir, we had to unload the PLS immediately for them to return to the CAT [combat artillery trains] so they could upload our FASCAM [family of scatterable mine] for our upcoming mission."

CPT Hubbard realized, once again, that his key leaders had identified a problem and were working through fixes. The discussion continued for approximately 20 minutes with communications flow and flexibility being the solutions for updating the time line for the next fight. The ammunition NCOIC and the two platoon leaders signed up to fix the problem by recommending to the battery commander changes to the time line that would streamline communications and facilitate adjustments to the time line.

CPT Hubbard now thought the battery was ready to address the third topic.

M825 Smoke Rehearsals. The commander facilitated the discussion by asking the battery FDO, "Did we accomplish our M825 EFAT [essential FA task] during this last battle?"

The FDO replied, "No Sir, we had a 10-minute separation between the build phase and the sustainment phase. The AFCS on two of our guns went down, and those sections called themselves out of the mission."

CPT Hubbard asked, "Okay, so why did it take us 10 minutes to hand off the mission to our operational howitzers to fire? Did we rehearse contingencies?"

The 6th section ammunition team chief stood up and said, "Sir, I don't know if we rehearsed contingencies; however, I do know we did not get hot chow last night. We were told we were going to get hot chow and we *didn't*—talk about lowering a soldier's morale! Maybe we should rehearse LOGPAC [logistics personnel and administration center] procedures?"

Knowing that discussing LOGPAC procedures would lead the discussion away from one of his Big 3, CPT Hubbard replied, "That's a great issue. But let's finish our discussion on smoke, and then we'll discuss LOGPAC issues."

The 1st howitzer section chief said, "Sir, if I may, the FDC conducted a rehearsal with the 1st, 4th, and 6th sections last night because they were going to be our primary sustainment shooters during the battle; however, we did not rehearse any contingencies."

The battery fire direction NCO, interjected, "Sir, the other problem was that all of the smoke rounds were only uploaded on the three sections that conducted the rehearsal. We did not upload smoke rounds across the rest of the battery, causing us to have to cross-level rounds from section to section during the middle of the mission."

CPT Hubbard, feeling his leadership had found the source of the problem, now looked at fixing responsibility. The XO spoke up, "I will ensure M825 rounds are included in the turret load for all sections."

The FDO said, "I will make sure we rehearse contingencies with the entire gun line." After an additional 15-minute discussion, CPT Hubbard knew the AAR had been effective.

At the conclusion of the AAR, CPT Hubbard reviewed and summarized the key points from the scribe's board. CPT Hubbard brought the discussion full circle and emphasized the fixes for the next fight. He remarked, "OK, let's review the bidding here. XO, you've got the mission of fixing this ammunition issue for the next fight. We've got a good jump on it already. Get with the ammunition NCOIC and fine-tune it. Be sure to update the ammunition portion of our TACSOP [tactical standing operations procedures] as well.

XO and platoon leader, keep the communications flow open with the ammunition NCOIC throughout the planning and preparation phases of the battle so I can make adjustments to the time line, as necessary.

FDO, let me know the rehearsal schedule for special munitions so I can include them in the battery OPORD and rock drill. XO and platoon leader, I'll give you guidance on turret loads for

the battery. You must ensure they are complete and report to me when they are.

Before releasing his leaders, CPT Hubbard asked several of them to highlight one safety issue to address with their soldiers. As his leaders left the area, CPT Hubbard knew his unit would be ready for their next fight.

CPT Hubbard had learned to focus his AAR on the Big 3—that too many topics make the AAR unwieldy and hard to work the details for implementing fixes. He also had learned not to waste a lot of time on what happened (just enough to set the stage) and the key is to identify the problems and ensure at least one leader is responsible for fixing each. He had learned that self-discovery is how soldiers learn best and that asking leading questions involves the whole team and is more productive than a lecture from the boss.

He had learned how to set up the AAR site, how to keep it free of distracters as well as what equipment and assistance he needed to facilitate the AAR. He had learned about selecting the audience for his AAR and how to deal with silence, externalizing issues and keeping soldiers on track. (See the check list in Figure 2.)

Finally, he had learned about bringing both issues and the entire AAR full circle—closing out the discussion with realistic fixes as well as designating leaders to implement the fixes.

Armed with the confidence and experience of having led an AAR, he knew he would be able to conduct AARs at his home station and continue to increase the proficiency of his leaders and his battery.

AARs at home station can have a significant impact on the readiness of our Army—just as they had had on CPT Hubbard's battery during his trip to the High Mojave.

Personnel

☐ Unit ☐ Facilitator ☐ Officer Only ☐ Recorder ☐ NCO Only

Site Selection

☐ TOC/Battery FDC ☐ Battery Position Areas ☐ Forward

Training Aids

☐ Video ☐ Terrain Model ☐ Dry Erase Board ☐ Map Overlay

Presentation

Issue Focused	*Event Focused*
☐ 3 Up/3 Down	☐ Who/What/When
☐ Leader Challenges	☐ Planning/Preparation/Execution
☐ Identify Issue/Fix Responsibility	☐ Identify Key Events

Figure 2: AAR Checklist

Captain Ryan J. LaPorte is a Firing Battery Combat Trainer on the Werewolf Team at the National Training Center, Fort Irwin, California. His previous assignments include serving as Commander of B Battery, 3d Battalion, 82d Field Artillery and Task Force Fire Support Officer (FSO) for 1st Battalion, 8th Cavalry and 2d Battalion, 12th Cavalry, all in the 1st Cavalry Division at Fort Hood, Texas. He also served as a Company FSO, Battery Fire Direction Officer (FDO), Firing Platoon Leader and Assistant Operations Officer in the 3d Battalion, 41st Field Artillery, 24th Infantry Division (Mechanized) at Fort Stewart, Georgia.

Captain Mark O. Bilafer is a Firing Battery Combat Trainer on the Werewolf Team at the National Training Center. His previous assignments include serving as A Battery Commander, Task Force FSO and Assistant Operations Officer in the 2d Battalion, 3d Field Artillery, part of the 1st Armored Division in Germany. While serving in 2-3 FA, he deployed to Bosnia in support of the Implementation Force (IFOR). At Fort Wainwright, Alaska, he also served as a Battery Executive Officer, Battery FDO and Company FSO in the 4th Battalion, 11th Field Artillery, part of the 172d Separate Infantry Brigade.

Company-Battery-Troop Commander Web Site

Nine active-duty Army officers at the US Military Academy at West Point operate a nonprofit web site dedicated to helping company, battery and troop commanders lead their soldiers more effectively: www.companycommand.com. The web site serves as an online forum of resources and mentoring for company-level commanders in the Army.

CompanyCommand.com is a user-driven forum. All its contents come from the voluntary submissions of officers who are either past, present or future company commanders. The "Cmd Net" portion of the site includes on-line discussions with company command experts. For the month of January, commanders can have on-line discussions with Ed Ruggero on Cmd Net. He is a former company commander and author of *38 North Yankee*, co-author of the latest *FM 22-100 Army Leadership* and has a new book *Duty First: West Point and the Making of American Leaders* due to be released in January. In addition, the site includes Cmd Tools, Cmd Challenge, Cmd Reading and other features.

The site's co-founders—Infantry Majors Nate Allen and Tony Burgess—attribute its success to military leaders' ethos of teamwork. "Now," said Burgess, "CompanyCommand.com is harnessing the power of the Internet to transform the way the Army shares information—laterally rather than vertically—so company commanders can have the resources they need to create winning teams of warriors."

Founded in February 2000, the site has been received enthusiastically, logging more than 900, 000 hits. For more information on the web site, see several articles linked to the site. Volunteers at West Point plan to bring a Platoon Leader web site on line by the middle of 2001.

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SFC David Rogers, Master Gunnery Team, goes over the standardized crew drill.

The Master Gunnery Team
Training the Firing Battery

by Sergeant First Class Robert M. Castillo

More than a year ago, our battalion left the challenging environment of the Joint Readiness Training Center (JRTC) at Fort Polk, Louisiana, with binders filled with lessons learned from Rotation 99-10. As a result, the battalion command team (battalion commander, sergeant major and executive officer) identified specific areas the battalion needed to improve, including digital operations and firing battery operations.

The battalion realized that significantly improving those areas called for a partnership between the battery and the battalion leadership. The battalion was willing to assume some control of battery-level training in the interest of establishing effective digital operations and standardizing firing battery crew drills battalion-wide.

The "point man' for the training at the battalion initially was the Master Gunner. What became immediately clear, however, was he needed help.

FM 6-40 Tactics, Techniques and Procedures (TTP) for Manual Cannon Gunnery describes the gunnery team as the observers, the fire direction center (FDC) and the gun line. The 2d Battalion, 320th Field Artillery, 101st Airborne Division (Air Assault), Fort Campbell, Kentucky, decided to form a Master Gunnery Team to provide the nexus for an improvement program. Our team consists of the battalion's Master Gunner (13B40 Cannoneer), fire control NCO (13C40 Automated Fire Support Specialist) and communications chief (31U40 Signal Support Specialist). Each of these senior NCOs brings a wealth of experience and expertise to the Master Gunnery Team.

This article describes the conditions needed to implement a Master Gunnery Team (clear guidance and the support of the battalion and battery leadership), the duty description of each of the team members and TTP to help other units implement such a team.

Team Mission. The purpose of the Master Gunnery Team is outlined in Figure 1. The command team set the initial conditions for success by providing the Master Gunnery Team clear guidance. The team was to standardize the operations of the gun and FDC section digital equipment, establish and sustain digital FM communications from the handheld terminal unit (HTU) to the gun display unit (GDU) and plan and execute gunnery training and gunnery field training exercises (FTX) for standardized firing battery operations.

Finally, the new team needed a support structure. The Master Gunnery Team falls under the battalion S3 and his operations section. This allows the team to identify battery needs and integrate the training into the battalion training plan. Based on his experience and understanding of the battalion command team's guidance, the S3 then incorporates section/platoon-level training into the training schedule and allocates the battery time for battery training.

The second aspect of support for the Master Gunnery Team is the willingness of battery commanders and first sergeants to use and advocate the use of the Master Gunnery Team. At no time did the team circumvent the battery leadership. It merely offered the battery its experience and technical expertise as a training resource.

Team Job Descriptions. As evident by our modified table of organization and equipment (MTOE), the Master Gunner is a prominent position held by a battle staff-qualified senior 13B40 and usually is the most experienced Cannoneer in the battalion. The second member of the Master Gunnery Team, the fire control NCO, is the senior fire direction NCO in the battalion. Finally, the communications chief is the battalion's senior communications NCO. The job descriptions of the team members are shown in Figure 2.

Shortly after our JRTC rotation, the battalion commander introduced the Master Gunnery Team to the battalion during a training meeting. The Master Gunnery Team was introduced as a training resource for the battalion and battery commanders and would coach, mentor and evaluate the battery; prepare and direct training as needed; compose and validate standing operating procedures (SOPs); and serve as the eyes and ears of the battalion command team and the battalion staff. The Master Gunnery Team has subject matter experts in all matters of the firing battery and is the battalion's primary training resource.

The Team in Operation. The team focused the battalion on the entire digital package. The goal was to create a sensor-to-shooter link from the HTU to GDU and, at the same time, improve firing battery performance in advanced party procedures, occupations and gunnery.

The Master Gunnery Team started conducting digital communications checks during weekly battalion motor

- Improve the battery's training and performance.
- Provide a training resource for battery leaders with mixed tactical backgrounds, i.e., fire direction center (FDC) chiefs with Paladin background, section chiefs with no light experience and officers with no tube artillery experience.
- Improve standardization, and provide a formal system to standardize operations.
- Provide the battalion command team areas requiring emphasis to improve digital skills and gunnery training.

Figure 1: Purpose of the Master Gunnery Team

stables. The course of action formulated was that one battery would become the primary focus of the Master Gunnery Team. The team established the procedures needed for battery-level digital communications, which included for GDU to lightweight computer Unit (LCU) with battery computer system (BCS) software to the advanced FA tactical data system (AFATDS). Once the standards were established in one battery, the remainder of the battalion was brought on line. This allowed the Master Gunnery Team to focus its efforts and enhance its knowledge of all the digital systems. The goal for the battery was to operate these devices using FM communications as the primary method and wire communications as a secondary method.

The first lesson we learned was that firing digital missions only can be achieved consistently by placing the proper emphasis at each level of the digital communications path. We learned that the Cannoneers' familiarity with their digital equipment on the gun line is just as important as the fire supporters' knowledge of their digital equipment on the hill. Battery leaders must ensure all soldiers understand their equipment; having the Master Gunnery Team helped them achieve that goal.

Secondly, familiarizing the battery with the equipment to be used for digital communications was the ideal starting point for the team—it allowed the battery to tap the expertise of the team. Our team took a twofold approach: we reintroduced the equipment to the individual at the section level and consolidated training to ensure the standards adopted were the standards achieved.

For military occupational specialty (MOS)-specific situations, the Master Gunner's tasks included supervising and enforcing the GDU checks with the battery FDC during motor stables; cabling classes for all 13Bs for the GDU, both wire and FM, and for Army stationing and installation plan (ASIP) radio training; and mandating a gun section to participate in the battalion digital training each week. This plan allowed howitzer sections to become familiar enough with the equipment and troubleshooting procedures to begin the digital communications process.

The fire control NCO's tasks were to prepare the battery FDCs for digital communications by consolidating the battery FDCs and conducting digital communications training in increments. The incremental training was for cabling AFATDS to BCS; familiarizing with ASIPs; establishing the BCS to GDU link, both FM and wire; standardizing the net structure; building the communications net in AFATDS and BCS; conducting communications exercises (COMEXs); and finally introducing the GDU to the battery FDC chiefs. This gave the gun line and the FDCs knowledge of their own and the others' equipment, promoting success in digital problem solving.

The communications chief had a twofold role in the digital training challenge: building the confidence of the entire battalion in its ability to establish and maintain digital communications and distributing all communications cabling equipment. Initially, building the battalion's confidence took the form of consolidated communications classes taught once a week throughout the battalion. The communications classes, along with section-specific classes taught by other members of the Master

The Master Gunner, 13B40—

- Standardizes the battalion's firing batteries by developing and revising the standing operating procedures (SOP).
- Conducts safety, leader and section certifications and evaluations, and supervises the administration of the gunner's test and all other cannoneer-related testing.
- Advises the battalion commander and command sergeant major (CSM) on the level of training for all 13B tasks, providing them feedback and after-action reviews (AARs).
- Observes and evaluates all unit training exercises, air missions and deployment activities.
- Provides regulatory updates to unit leaders, as well as researches new ideas and issues though Army and artillery publications and other sources, including the Internet.
- Attends the Artillery Maintenance Course (U-6), and monitors the use of U-6 personnel. Also tracks fire control alignment tests, deadlines and other howitzer maintenance issues.

The Battalion Fire Control NCO (FCNCO), 13C40—

- Serves as the trainer for all 13Es/13Cs in the battalion.
- Conducts fire direction center (FDC) certifications, and administers the battery safety tests.
- Advises the battalion commander and CSM on the skill-level proficiency of all 13Es/Cs in the battalion.
- Plans and supervises the battalion's digital sustainment training.
- Observes and evaluates all battery FDCs.

The Battalion Communications Chief, 31U40—

- Acts as senior trainer for all battery communications sergeants.
- Serves as primary maintenance advisor for all digital equipment.
- Advises the battalion commander and CSM on the skill-level proficiency of all 31Us in the battalion.
- Observes and evaluates all battery-level equipment.
- Acts as primary trainer for all communications equipment.

Figure 2: Master Gunnery Team Job Descriptions

SFC Castillo discusses the FDC digital crew drill during the battalion consolidated Sergeants Time training.

Gunnery Team, reinforced a working knowledge of all digital systems in the battalion. The distribution of special equipment involved the communications chief's making periodic checks during the consolidated training and becoming aware of each section's particular needs. That allowed the battalion communications section and the battery communications sergeants to understand and meet the needs of the individual sections.

After consultations with the S3, the battalion training schedule reflected the importance of the digital challenge with the initiation of battalion digital sustainment training. This training began with the set-up of the battalion's digital room on Tuesday afternoons and training all day Wednesdays. Initially, the training involved the brigade fire support element (FSE) with an HTU, the battalion FDC and one battery FDC with a GDU and was supervised by the Master Gunnery Team. Within two weeks, the training involved all the firing batteries and a GDU, as well as the battalion task force FSEs.

The training began slowly with each member of the digital link explaining the steps needed to establish digital communications. Concurrently the Master Gunnery Team began to establish and record the steps for each link in the battalion's SOP. As a result of the training, a trouble-shooting SOP is being written, as well as a digital cabling SOP to help the battalion establish sustainment training.

FTXs to work on digital training also were added to the battalion's training schedule. The "One Day Shoot" FTX involved one gun section and FDC per battery, the battalion FDC and a task force FSE. Although digital fire mission processing was the focus, voice missions also were trained so sections would know how to conduct missions in a degraded mode. The Master Gunnery Team members became the observer/controllers (O/Cs) for the One Day Shoot FTXs and provided the training sections and the rest of the battalion feedback via an after-action review (AAR) within 24 hours of each FTX.

During the battalion FTXs, the Master Gunnery Team spent most of the time at the battery positions, coaching and mentoring individual sections. The members provided on-the-spot corrections, SOP validation, preventive maintenance checks and services (PMCS) quality checks and battalion- and section-level AARs. The team's ability to move freely around the training area was key to its success. Team member visits were coordinated with the battalion's mission events list (MEL) to ensure the visits occurred during peak training opportunities.

In a March FTX, our battalion established and consistently maintained the entire digital path from HTU to GDU, to include FM voice and digital communications at the gun section level. From a static observation post, we sent a digital call-for-fire and adjustments to the task force FSE that sent it digitally to the brigade FSE, then to the battalion FDC that sent the digital data to the battery FDC, which sent the data to the guns.

Today, the Master Gunnery Team remains active. One of the keys to its success involves the team's staying on top of changes—researching new doctrinal procedures. Examples include battalion-directed training for the updated method used to compute manual gunnery safety in FM 6-40; leaders' training for new equipment, such as the gun laying and positioning system (GLPS); and training the updated procedures for rigging air assault equipment.

As a result of the Master Gunnery Team's success in digital training, the team initiated a gunnery training program to improve firing battery performance. The program included training in consolidated fire direction gunnery and the standardization of advanced party procedures, gunnery discussions during "brown bag" luncheons, AARs conducted within 48 hours of all field exercises, the standardization of howitzer section area layouts and a soon-to-be-published gunnery leaders' book for all fire direction personnel.

Although digital communications are important to a direct support light artillery battalion, the Master Gunnery Team could address other issues. These might include FDC certifications, standardized leader's certifications and fire support team (FIST) certifications. The latter would call for the brigade fire support NCO to join the Master Gunnery Team. Although he is critical for training FISTs, he does not need to join the team until the firing battery can sustain digital communications. Our future training will include more autonomous operations because firing batteries now can shoot missions digitally.

The Master Gunnery Team can never replace the battery leadership. However, if used correctly, the team's training, coaching and mentoring will enhance the battery's performance.

As with any new TTP, this article does not have all the answers to questions about setting up and employing a Master Gunnery Team. But our battalion's team has been able to address specific deficiencies with success. Our battalion and battery leadership have been very supportive. The hope is that other battalions setting up similar teams can learn from what we learned.

Sergeant First Class Robert M. Castillo is the Fire Control NCO on the Master Gunnery Team of the 2d Battalion, 320th Field Artillery, part of the 101st Airborne Division (Air Assault) at Fort Campbell, Kentucky. In his previous assignment, he was a Battery Fire Direction Trainer, Company Fire Support Analyst and Observer/Controller for the National Training Center, Fort Irwin, California. He also has served as the Fire Direction Chief for the 1st Battalion, 7th Field Artillery in the 10th Mountain Division (Light) at Fort Drum, New York, and Fire Direction Chief and Platoon Sergeant for the 5th Battalion, 29th Field Artillery and Fire Control NCO for the 3d Battalion, 29th Field Artillery, the latter two in the 4th Infantry Division (Mechanized) at Fort Carson, Colorado. He holds a Bachelor of Arts in English from Saint Edwards' University in Texas.

FA CSM Conference at Fort Sill

The Command Sergeant Major of the Field Artillery convened the five-day, first-ever FA Command Sergeants Major (CSMs) Conference at the Field Artillery School, Fort Sill, Oklahoma, on 18 September 2000. One hundred and twenty-eight Army CSMs from around the world—active, National Guard and retired—and some from other proponent or career management fields attended. The theme of the conference was "Today's Vision, Tomorrow's Transformation."

The conference included many briefings on subjects, including transformation, personnel management, training and updates from the field. The attendees then broke into five groups to discuss specific issues and make recommendations. (See the figure for a list of topics discussed by the groups.)

The group chairmen then back-briefed Chief of Field Artillery Major General Toney Stricklin on their topics, discussions and recommended solutions. Various departments in the Field Artillery School are researching the solutions and will forward some of their findings to the appropriate agencies inside and outside Fort Sill.

Several guest speakers traveled from higher headquarters and other agencies to brief at the conference. Total Army Personnel Command (PERSCOM) briefers generated discussions on career management issues, such as new assignment projections, policies and procedures.

PERSCOM discussions covered personnel shortages and what was being done to overcome the shortages. Of interest was the fact that promotions in "star" military occupational specialties (MOS) are tied to counseling sessions having been conducted for these soldiers.

Some of the discussions centered on promotion board selection procedures and the need for CSMs to volunteer for this duty. Also of interest was that assignments to Korea for 24 months will continue. The briefers clarified that non-resident Sergeant Major Academy graduates can compete for CSM positions.

The Army National Guard (ARNG) Bureau Deputy Chief of Staff for Personnel (DCSPER) sergeant major (SGM) and the I Corps Artillery CSM facilitated discussions on many ARNG personnel and training issues during an off-line session with other ARNG CSM and SGMs. Also, the Training and Doctrine Command (TRADOC) CSM gave an overview on changes going on in TRADOC. Training Command CSMs provided updates about their units, which included Fort Sill's Artillery Training Center and the NCO Academy.

National Training Center (NTC), Joint Readiness Training Center (JRTC) and Combat Maneuver Training Center (CMTC) Operations Group SGMs briefed NCO training problems and possible solutions. Of note is that most, if not all, the training issues at the various Combat Training Centers (CTCs) were the same. The most significant issue was the lack of training time for units to prepare for CTC rotations.

The corps artillery CSMs updated attendees on their activities. Topics discussed ranged from equipment to retention and soldier quality of life.

The briefing on Army Transformation and its effect on the Field Artillery structure generated discussions about the required equipment and the lack of NCO participation in the decision-making process when it comes to the enlisted structure.

The discussion topics mentioned in this short article plus several more with recommended solutions and the briefings presented at the conference that were released by the expert presenters are posted on the Fort Sill home page menu as "CSM Conf." The web site is http://sill-www.army.mil/csmc/index.htm.

The first FA CSM Conference received many accolades. Its overall success was gauged by responses from the attendees; they wanted to know when the *next* FA CSM Conference would be held.

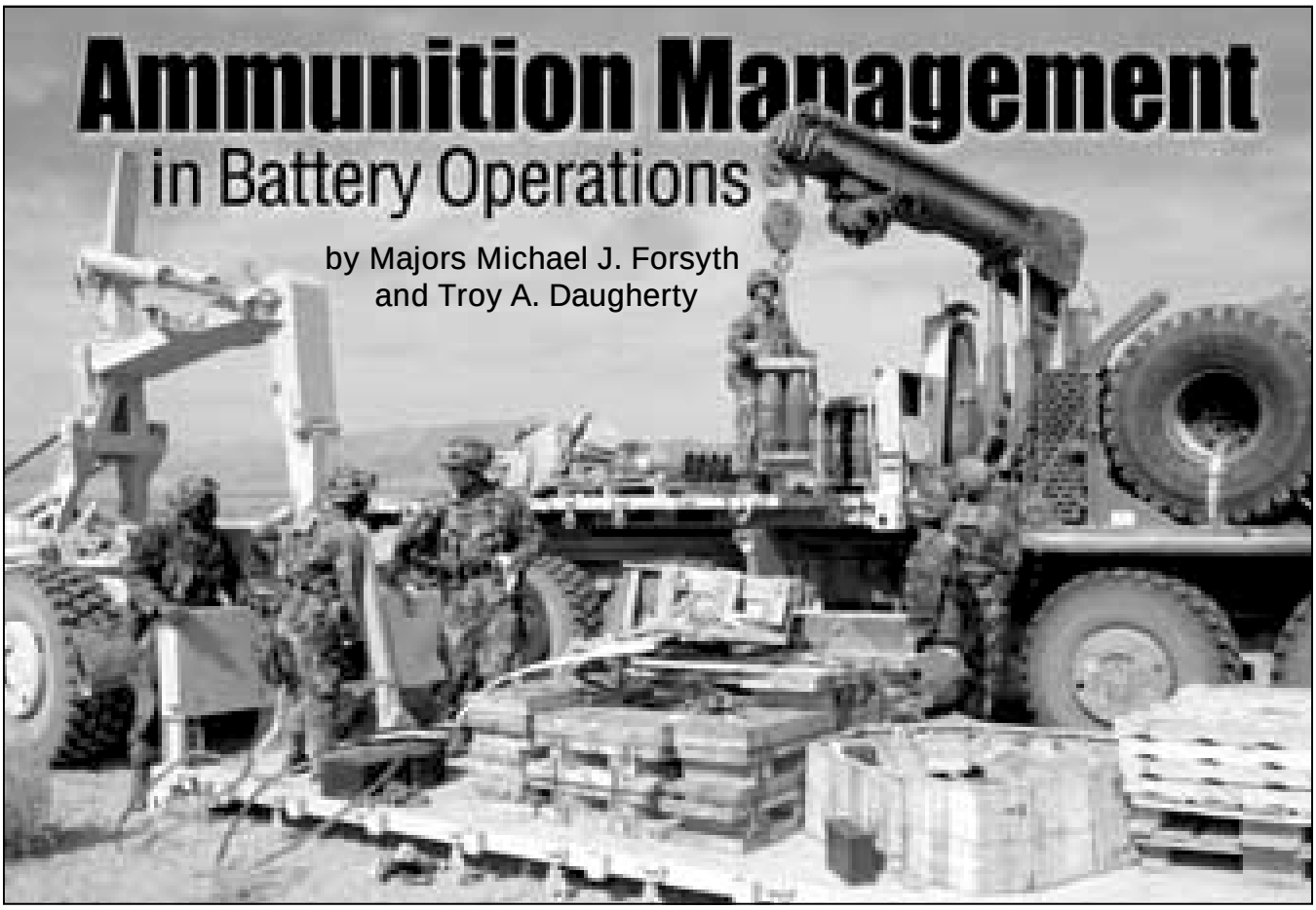
CSM of the FA Anthony J. Williams
SGM Wayne S. Hashimoto
FA Proponency Office
Fort Sill, OK

- **Adaptive NCO Leaders—**"Right" command climate, how to develop them (experience vice institutional training), etc.
- **Multi-Skilled Soldiers—**How much development in the institution or the field, should we begin merging military occupational specialties (MOS), etc.
- **NCO Career Development—**Career maps for promotion boards, professional reading list, reasonable rank expectation for soldiers with 20 years, etc.
- **Operations vs Command Tracks—**Different MOS on separate tracks, which MOS on each track, etc.
- **Training—**does distance learning train adequately, is the schoolhouse teaching what NCOs need to know, what kind of training devices or simulators do we need, etc.
- **Personnel Management—**Define "taking care of soldiers," should a CSM attend the PreCommand Course with his commander, why MOS 13M/P retention rates are low, why MOS 13R has a shortage, etc.
- **Force Structure—**Should the sergeant major carry a 9-mm pistol vice an M-16, do we need a driver position for the CSM, how much should NCOs be involved in structure decisions, etc.

The CSM Conference had five discussion groups that addressed questions related to the topics listed in this figure. The specific questions and a short explanation of recommendations are listed on the Fort Sill home page at sill-www.army.mil/csmc/index.htm.

Ammunition Management in Battery Operations

by Majors Michael J. Forsyth and Troy A. Daugherty



During the past few years, the combat training centers (CTCs) have identified battery ammunition management as a continuing training shortfall. There are several reasons for this trend, ranging from battery leaders' not understanding their responsibilities, to unrealistic home-station training, to a wide variety of powder lots being issued as a part of a single unit basic load (UBL), which makes managing the lots difficult. Poor management of ammunition leads to slower fire mission response times, poor gunnery procedures and, in extreme cases, increased safety risks.

Although ammunition management is a challenge, it's a task any unit can tackle. This article offers ways for battery leaders to improve their ammunition management before deploying to a CTC or combat.

The Challenge. Battery leaders rarely have to deal with the sheer number of rounds that compose a UBL. During home-station training, units routinely draw enough ammunition for a field training exercise (FTX). These numbers usually are small and don't stress the battery's haul capacity or illustrate the importance of load planning for turrets or ready racks.

Additionally, during home-station training, units don't use a wide variety of munitions. Typically a battery will draw high-explosive (HE), white phosphorus (WP), hexachloroethane (HC) and illumination (Illum). Only on the rarest of occasions will a unit draw any type of improved conventional munitions (ICM) or copperhead (CPH); but at the CTCs, batteries receive the entire spectrum of artillery ammunition ("dummy" rounds, except during live fire). The complacency fostered at home station leads to headaches in juggling turret/ready rack load plans at the CTCs.

Compounding the problem is the challenge of powder lot management. At home station, units rarely have to sort through more than two or three lots of powder for a field exercise. As a result, batteries don't have to segregate lots and ensure the validity of the ammunition information as a part of the gunnery solution. At a training center, however, it is not unusual for a battery to have in excess of 10 different lots of powder.

Improper load configuration not only places inordinate strain on battery operations, it also can throw maneuver unit execution out of synchronization. For example, a 155-mm battery often receives the task to emplace a family of scatterable mines (FASCAM) at the various training centers. Poor distribution of the area denial artillery munitions (ADAMs) can increase emplacement time. If the task for the battery is to fire 16 ADAMs but the unit has all the rounds consolidated on one gun, it will take an additional 13 minutes to deliver the minefield at the sustained rate-of-fire. If emplacement timing is critical to the synchronization of the maneuver plan, a slower delivery of the rounds can lead to a minefield emplaced too late to achieve its purpose.

This actually happened recently at a training center, exposing the battery to a heightened counterfire threat and desynchronizing the entire maneuver brigade. Battery commanders can prevent this from happening in their units, and it starts with leaders' understanding their responsibilities.

Pinning the Rose On. Several battery leaders have ammunition management responsibilities.

The *battery commander* has overall responsibility for battery ammunition management. (See Figure 1 for troop-leading procedures as a framework for ammunition management.) He focuses

the unit on future operations and provides guidance for ammunition load planning. After receiving a mission, he issues a warning order (WARNO) to his unit, which allows the executive officer (XO)/platoon leader to begin uploading, downloading or trans-loading ammunition on the battery vehicles. Configuring loads early in the planning process means the unit gets a head start on preparation and has less wasted time. This also enables the battery to quickly adjust the loads as the mission is "fleshed out."

The battery commander issues an ammunition tracking matrix. The matrix tracks the location of the ammunition—turret/gun or prime mover and FA ammunition supply vehicle (FAASV) or palletized loading system (PLS) truck—and the amount of ammunition by type, such as dual-purpose ICM (DPICM), HE, rocket-assisted projectiles (RAP), illumination and other munitions, plus propellants. The XO/platoon leader, fire direction officer (FDO), chief of firing battery (CFB) and gunnery sergeant (GSG) use the matrix to track the distribution of ammunition throughout the battery's vehicles. The matrix includes resupply triggers by rounds and vehicles: after eight rounds of DPICM, resupply the howitzer; after 30 rounds of DPICM, resupply the FAASV from the PLS; and after nine M119 powders, resupply with White Bag.

The *XO/platoon leader* takes the battery commander's guidance and executes the load configuration under his direct supervision. He disseminates that guidance to the CFB/platoon sergeant (PSG) and section chiefs, so they can begin shifting ammunition. The XO/platoon leader then ensures the loads are correctly configured and correctly distributed across the vehicles. He also must thoroughly understand the tactical situation and fire plan to make valid decisions concerning ammunition management.

The *FDO* is the "honest broker" in ammunition management. In many instances at home station, FDOs hold direct supervisory responsibility for ammunition distribution and tracking, but this should not be the case. It is the XO's responsibility to supervise ammunition management.

The FDO provides an independent secondary check by keeping the XO informed of the ammunition required to support the fire plan and gunnery validity and suggests changes to the load configuration. He then tracks the ammunition count as a double check for the XO and informs the XO of any discrepancies requiring correction.

The *CFB/PSG* is the "butt-kicker" on the line of metal and is assisted by the *GSG*. Using the battery commander's guidance disseminated through the XO, he implements the load plan. He ensures the section chiefs understand the proposed configuration and starts the loading process. He identifies for the XO and battery commander potential problems with the plan and suggests alternatives that will solve the problems and help accomplish the mission.

After loading is completed, the CFB and XO conduct inspections to check for correctness. (See *FM 6-50 Tactics, Techniques and Procedures for the Field Artillery Cannon Battery*, 1996, Pages 1-4 and 1-5. All the responsibilities for battery personnel are derived from the duty descriptions in this manual.)

How to Configure Loads. Based on the tactical mission (offense or defense), the essential Field Artillery tasks (EFATs) and the scheme of fires from the FA support plan (FASP), the battery commander identifies the required munitions for the operation. For example in a deliberate defense, a battery could receive the task (through an EFAT) to emplace a FASCAM minefield. This requirement forces the battery commander to decide how to configure his

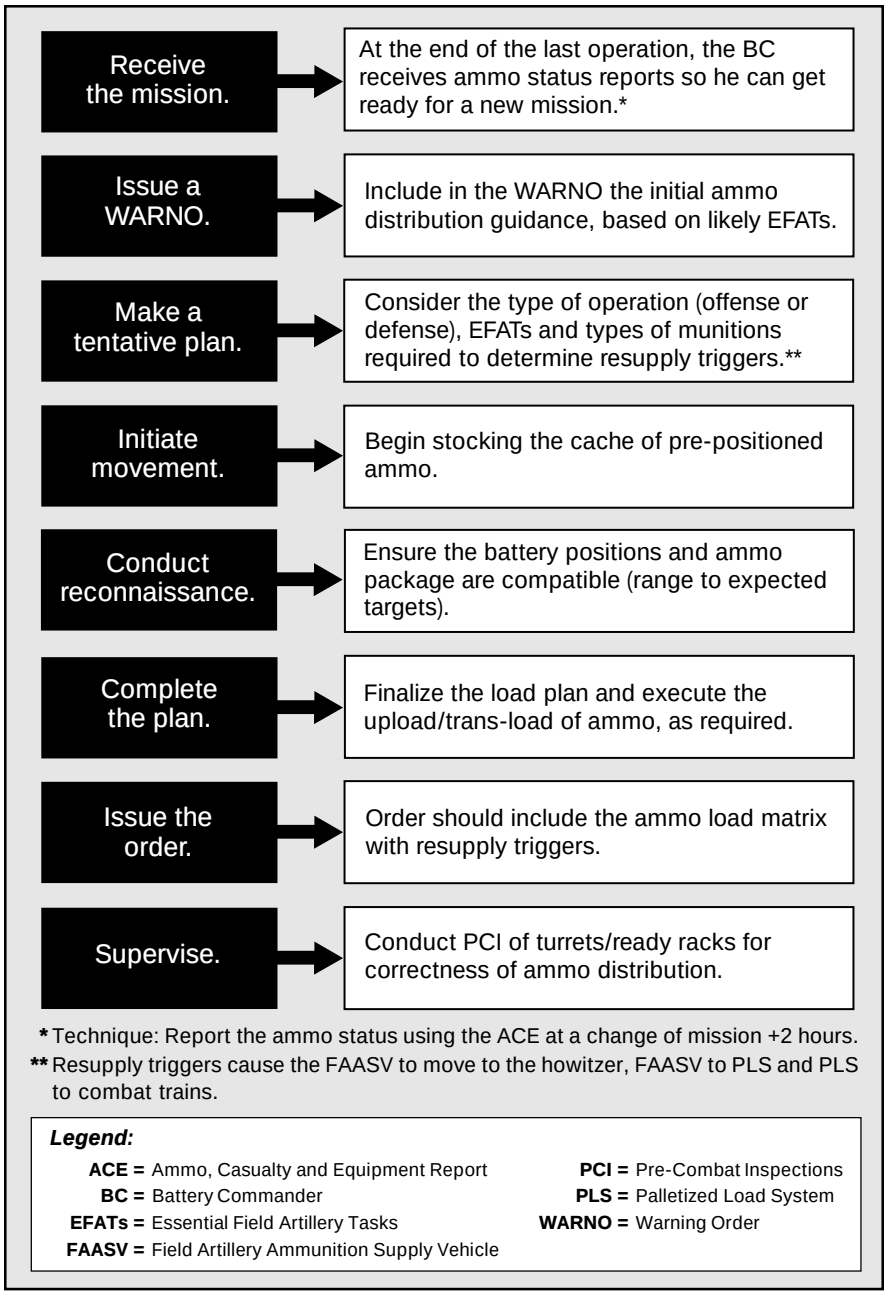


Figure 1: Troop-Leading Procedures as a Framework for Ammunition Management

1. **What ammunition do I need now?** This means the ammunition stored in the gun turret for a heavy unit or in the ready rack for light units.
2. **What ammunition do I need readily available?** This means the ammunition stored in the FA ammunition supply vehicle (FAASV) for heavy units or in the section ammunition truck for light units.
3. **What ammunition do I need for immediate resupply?** This is the ammunition stored on the palletized loading system (PLS) truck for heavy units or the 5-ton ammunition trucks for light units.
4. **What are the unit resupply triggers?** Triggers cause ammunition to be brought by complete round from the FAASV to PLS and FAASV to the howitzer. A trigger also causes the PLS to return to the combat trains for resupply.

Figure 2: Questions the Battery Commander Asks to Develop an Ammunition Plan

ammunition. He answers the questions in Figure 2 to develop a plan. Once he develops the load plan, he allocates the ammunition across the gun line and support vehicles.

Next, the commander (with the XO and FDO) identifies powder lots to ensure the validity of the gunnery solution. The battery uses the most plentiful powder lot as its base lot for accuracy and as the fire-for-effect (FFE) fire mission powder lot. Inevitably, the battery will receive several other powder lots in small numbers. The commander ensures these lots are used for adjust fire missions and non-precision munitions, such as smoke or illumination.

In its standing operating procedures (SOP), the battery must have a powder lot marking system for powder canisters. This prevents the battery from using the wrong powder canisters in a FFE mission requiring precise fires. A simple system is to use chalk to mark a lot number (given by the FDO) on the canister and then segregate the powders by the lot chalked on the containers.

Some missions require pre-positioning of ammunition to support the operation. The battery commander identifies those locations and the munitions required, if not specified in the FASP. He decides what munitions to pre-position, based on the mission, EFAT and phase of the battle.

Reconnaissance, either map or ground, verifies much of the ammunition planning guidance. Positioning has a great effect on load configuration. While conducting recon, the commander checks to ensure the battery loads are compatible with the expected range-to-target for fires and there are no site-to-crest problems. Also, some positions will not support pre-positioning or ammunition vehicular traffic, which could require modification to the movement plan or load configurations.

The battery commander then finalizes the tactical plan and briefs the ammunition distribution load plan to his subordinates as a part of the battery operations order (OPORD). The plan should not only cover the gun and vehicle breakdown, but also specify the resupply triggers by ammunition type.

Since the battery already has configured its loads based on the guidance in the commander's WARNO, the battery should only have to adjust and refine the load plans. The XO and CFB compare the ammunition matrix from the OPORD to the actual count on the gun line. The XO identifies the changes and then gives the adjustments to the section chiefs for final configuration.

After all section chiefs report their uploads are complete, the XO, CFB and GSG conduct final inspections to verify ammunition distribution and count. The FDO double-checks the count, by having the section chiefs report section counts to the FDC. The XO and FDO identify any discrepancies, and then the XO and CFB reconcile the differences. As a final check, the battery commander conducts spot inspections to validate distribution. The battery then can get on with the business of delivering fires.

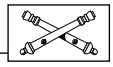
Execution. While executing the operation, the battery leadership must maintain situational awareness to ensure the unit is resupplied at the appropriate time. Digital communications make it difficult to monitor ammunition expenditure, especially in Paladin units, and battery leaders can lose touch with the situation. To alleviate this possibility, the leaders work out a system to monitor control of ammunition usage.

One technique battery leaders use is to have the FDO always announce "fire mission" over the battery internal voice net. Using a standard fire order, the BC, XO and CFB can track the expenditure of ammunition to anticipate when the unit will require resupply. If the fire mission deviates from the standard ammunition and fire order, the FDO simply announces the changes.

Any unit can meet the challenge of ammunition management. The key is to develop a systematic approach to handling ammunition and commit it to black and white in the battery SOP.

It is too late to start considering ammunition management when the UBL is issued at a CTC or in combat. Training and preparation for ammunition management begins at home station.

The effort expended to develop and validate an SOP will pay great dividends when a battery receives the call to deploy. Sound ammunition management helps ensure timely and accurate fires, the standard for all Field Artillerymen.



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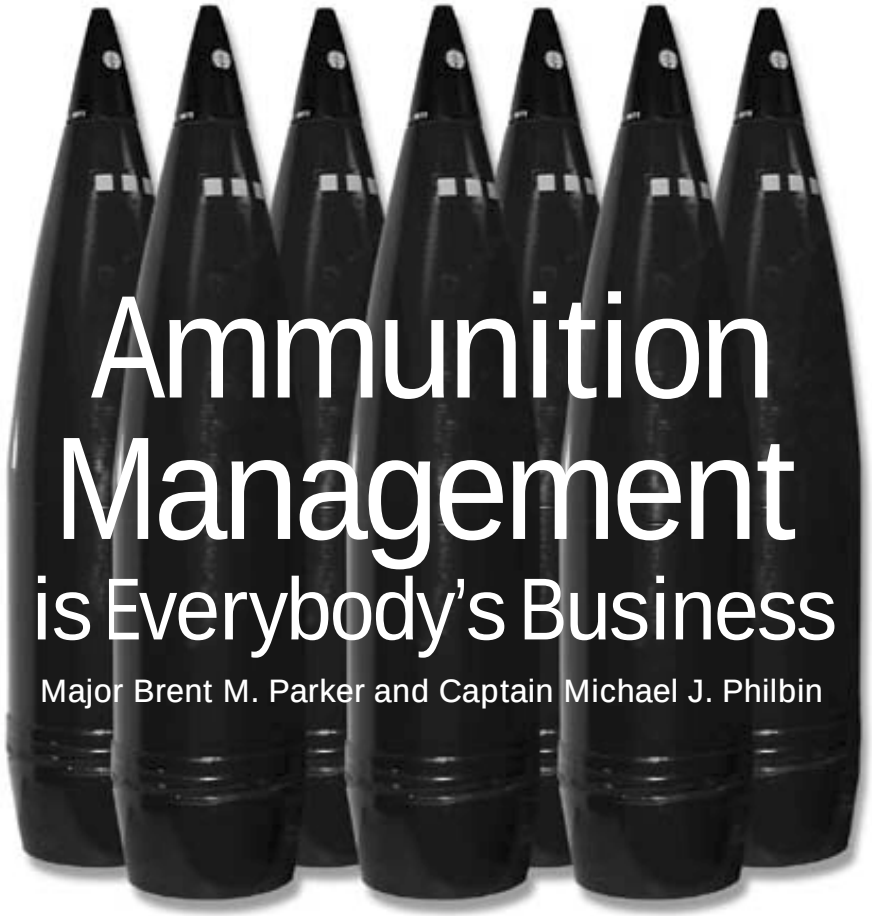


Ammunition Management is Everybody's Business

Major Brent M. Parker and Captain Michael J. Philbin

The *Strikers* battalion was going into its second battle during its rotation at the National Training Center (NTC), Fort Irwin, California. The unit had had time to plan and prepare for its initial encounter with the "Krasnovians." It had considerably less time to plan for this next fight and would no longer have its unit basic load (UBL) as a baseline for ammunition planning.

During the previous six months, the battalion supply officer (S4) had helped prepare the *Strikers* for the rotation. In addition to the logistics planning and preparation for deployment, the S4 wisely focused on ammunition management during the train-up. Many units had difficulty managing ammunition at the NTC because of a lack of home-station training with such large quantities of ammunition.

In conjunction with the S3 and the battalion executive officer (XO), the S4 developed measures and a training plan to solve the battalion's ammunition management shortfalls. Five months before the rotation, the XO, S3, S4 and the battalion fire direction officer (FDO) began revising the ammunition portion of the battalion tactical standing operating procedures (TACSOP); developing a UBL, ammunition haul plans and standard combat configured loads (CCLs); planning for ammunition during the military decision-making process (MDMP); and developing a service support paragraph in the battalion operations order (OPORD) that included an ammunition distribution plan.

UBL, Haul Plans and CCLs. According to *FM 6-20-1 Tactics, Techniques and Procedures (TTP) for the Field Artillery Battalion*, the "UBL is that quantity of ammunition authorized and required to be on-hand in a unit to meet combat needs until resupply can be accomplished."

The group started with the battalion's haul capacity to determine the total amount of ammunition the battalion could carry. Using historical data from previous NTC rotations and Janus exercises, the group calculated how much ammunition the battalion would need to execute an attack or defense. Then the group built the UBL to be able to conduct either mission within the haul capacity.

Before modifying the battalion TACSOP, the S4 reviewed the doctrine on ammunition management in *FM 6-20-1* and *FM 6-70 TTP for M109A6 Howitzer (Paladin) Operations* and the battalion's and other units' NTC take-home packets. He then developed a list of the responsibilities of the key players in ammunition management: XO, S3, battalion FDO, S4, battalion ammunition officer (BAO), ammunition platoon sergeant, headquarters/service battery commander, firing battery commander, battery XO/platoon leader, battery/platoon FDO, section chief, ammunition section team chief and palletized loading system (PLS)/5-ton chief. (For a list of their responsibilities, see the web site at www.irwin.army.mil/wolf/wolveshome/Default.htm. The job descriptions listed are taken from FM 6-20-1 and FM 6-70 plus some recommended additions.) What surprised the S4 was the large number of battalion personnel necessary for successful ammunition management—managing ammunition was *everybody's* business.

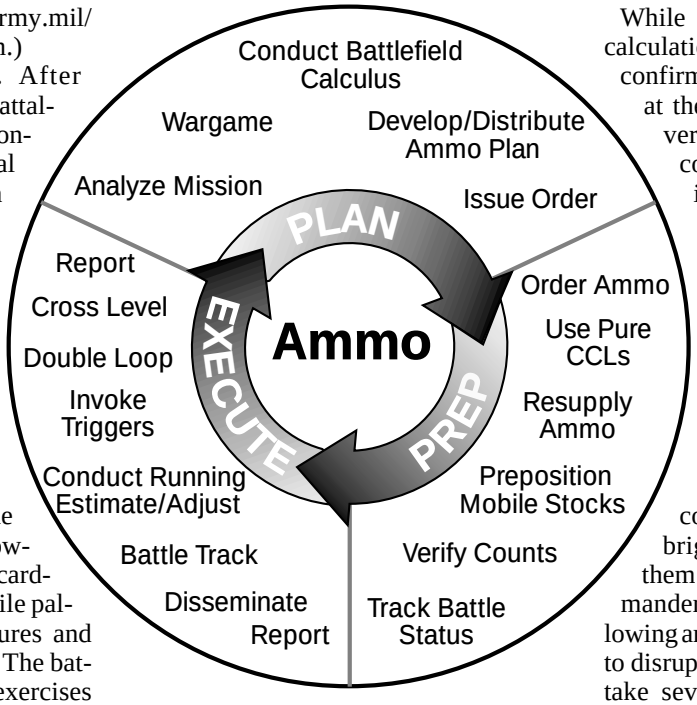
Next, the S4 discussed with the S3 and battery commanders a standard ammunition report every 30 minutes and PLS habitually being associated with the same firing batteries. The administration and logistics operations center (ALOC) was the central location for ammunition management. It was easy for the ALOC to track the total battalion ammunition count by consolidating battery reports and incorporating ammunition counts at the combat and field trains. With this information, the S4 could recommend to the S3 movement and cross leveling of ammunition and adjustments to resupply triggers.

The S4 added the standard ammunition report formats and times to the TACSOP. Additionally, the TACSOP had the standardized ammunition tracking charts used at the tactical operations center (TOC), ALOC and battalion support operations center (BSOC).

The S4, S3, battalion FDO and BAO developed standard CCLs for the TACSOP. The CCLs were based on mission requirements, haul capacity and flexibility. For example, the family of scatterable mines (FASCAM) CCL included 108 remote anti-armor mine systems (RAAMS) and 24 area denial artillery munitions (ADAMs), enough to build a 400x400-meter medium-density minefield. The FASCAM CCL contained an additional 56 dual-purpose improved conventional munitions (DPICM) to maximize haul capacity. To maintain flexibility, this CCL had six different possible combinations of propellants, ranging from M3A1 (Green Bag) to M119A2 (Red Bag) to a mix of powders in between. (For an example of this CCL, see

the web site at www.irwin.army.mil/wolf/wolveshome/Default.htm.)

Home-Station Training. After modifying the TACSOP, the battalion began training. The S3 conducted an officer professional development (OPD) session and NCO development program (NCODP) to discuss the revisions to the TACSOP. Next, the S3 divided the field training exercises (FTXs) into live-fire and dry-fire portions. During the dry-fire portions, the battalion trained with notional ammunition tracked on paper and primers to replicate live ammunition. The PLS trucks used expended powder canisters, wood pallets and cardboard boxes the size of projectile pallets to train tie-down procedures and simulate hauling ammunition. The battalion XO used these dry-fire exercises to focus the battalion on ammunition reporting and tracking procedures.



The XO started each Janus exercise with the historical ammunition counts from the battalion's last Janus exercise to conduct ammunition battlefield calculus and maintain a running estimate of the ammo supply. This technique worked the staff's ability to analyze on-hand ammunition against required ammunition by using an action-reaction-counteraction approach to determining ammunition shortfalls. Additionally, the staff had to maintain a running estimate of ammunition expended during battles and ammunition resupply and to account for ammunition losses due to counterfire and air attack. The XO was a demanding leader who kept his staff members on their toes.

Second NTC Battle. The S4 hoped all the training of the past months would pay off in the next NTC battle. The S3 entered the TOC at the NTC with a copy of the brigade's operations order for the second battle—it was a deliberate attack. Now was time to conduct battlefield calculus.

Battlefield Calculus. During mission analysis, the unit tailors its ammunition for the mission and then refines the ammunition type and count in the wargaming portion of the MDMP. The XO said some units had tried to resupply up to their original UBL instead of conducting ammunition analysis for each mission. These units would not have had enough special munitions at the decisive point of the battle. The UBL is generic enough to execute either an attack or defense, but it might not be able to meet all the requirements for a specific mission.

The S4 and the battalion FDO quickly scanned Annex D, the fire support annex, and found six essential fire support tasks (EFSTs) associated with this mission from which the essential FA tasks (EFATs) for each battery are derived. The six EFSTs were disrupt enemy engineer preparation, destroy an infantry strongpoint, suppress two motorized rifle platoons (MRPs) at the zone of penetration, obscure the breach point, neutralize the combined arms reserves (CAR) and neutralize the regimental artillery group (RAG). As part of mission analysis, the S3 determined the *Strikers* battalion was responsible for the first four EFSTs. The reinforcing battalion was responsible for neutralizing the RAG; close air support (CAS) would neutralize the CAR.

The battalion FDO consulted his munitions effects tables and determined it would take a battalion six-rounds of DPICM to destroy the infantry strongpoint. It would take a battery three-rounds of DPICM per target to disrupt the engineer prep and to suppress each MRP. The battery firing smoke would need 50 M825 rounds to provide a 1,000-meter smoke screen for 30 minutes. After a brief discussion with the S3, the battalion FDO calculated the engineer targets and infantry strongpoint would require M119A2 propellants and the remaining targets would require M4A2.

While the battalion FDO made his calculations, the S4 called the ALOC to confirm the current ammunition count at the combat and field trains. He verified the battery ammunition counts against what the battalion fire direction center (FDC) was tracking. When the FDO completed his analysis, the S4 subtracted the battalion ammunition on-hand from the ammunition the FDO said was required. According to his math, the battalion had plenty of the right type of ammunition for the next fight.

When the staff members had completed their analyses of the brigade order, the S3 gathered them to brief the battalion commander. The commander gave the following ammunition guidance: "The task to disrupt the engineer preparation will take several missions—I would estimate 15 to 20—so you need to take that into account in your planning. Plan to re-attack the infantry strongpoint three or four times to achieve the desired effects. The suppression against the MRPs will be continuous suppression for at least 30 minutes; you might even plan for an hour. The breach will take far more than 30 minutes, so plan to provide screening smoke for at least 90 minutes. Although our [direct support] battalion is not responsible for neutralizing the CAR or the RAG, we must be prepared to shoot SEAD [suppression of enemy air defenses] and a marking round for CAS. S4, based on these changes, do we still have enough ammunition on-hand to execute our EFATs?"

The S4 and FDO recalculated the ammunition requirements and found the battalion was short 14 battalion-ones of Red Bag and approximately 50 smoke rounds. The S4 then checked his controlled supply rate (CSR) and concluded there was more than enough ammunition available in the CSR to make up for the current shortfalls to execute the EFATs, and the ammunition could be on-hand in 12 to 24 hours.

The S4 reported the information to the battalion commander and immediately contacted the BAO to get an update on ammunition haul available. The BAO reported that after supplying the batteries and consolidating flat racks, the battalion would have four empty PLS available. The S4 ordered three Killer/Red Bag CCLs and one Smoke/White Bag CCL, asking that a Killer/Red Bag CCL

be issued to each firing battery as soon as possible. The BAO knew how to use the standard CCLs in the battalion TACSOP. Although the S4 knew that "pure" CCLs might not work for every mission, he tried to use them as much as possible. Standard CCLs make ammunition management a little easier.

Resupply Methods and Triggers. Once the S4 started the ammunition resupply moving, he rejoined the staff for the course of action (COA) development phase of the MDMP. The staff developed two different COAs for the next battle. The S4 analyzed each COA to determine the best resupply method. He looked at the amount of ammunition to be resupplied, battery locations compared to the combat ammunition trains location, experience of the ammunition platoon and the environmental factors that may affect resupply, such as terrain, weather and light. After careful consideration, he chose to use flat rack exchange points as the optimum method of resupply and plotted potential exchange points for each COA.

With the S3 and battalion FDO, the S4 calculated resupply triggers. They had to answer several questions to develop resupply triggers. How much ammunition is available in each battery, including pre-positioned ammunition and ammunition on trucks? The less ammo in the positions, the lower the number of volleys required to trigger resupply.

How far from the resupply point is each battery, and how long will resupply take? The longer the time for resupply, the lower the number of rounds that triggers resupply.

What is the method of resupply? A unit using flat rack exchanges will want to empty or almost empty a flat track before conducting the exchange.

When does the battalion plan to fire a high volume over a short time? The S4 recalled the battalion almost ran out of propellants in the last fight. He learned to focus more on propellant resupply triggers than projectile resupply triggers.

Ammunition Distribution Plan. When the staff finalized its COA, the S4 reviewed the EFAT responsibilities for each battery. Each battery was responsible for a different block of time or phase to engage enemy engineer assets. All batteries would fire a preparation against the infantry strongpoint. A and C Batteries, primarily, would be responsible for providing suppression. Finally, B Battery would provide the smoke screen.

With this information, the S4 continued to develop his ammunition distribution plan. He looked at the on-hand ammunition counts of each battery to see if he needed to cross-level ammunition. Also, he sent word to the BAO to send the smoke flat rack to B Battery. He verified that alternate batteries had enough ammunition on-hand to accomplish at least part of the EFAT, just in case B Battery could not maintain a firing capability during this critical EFAT. For example, C Battery had the alternate responsibility to fire the smoke screen. Although C Battery did not have 90 minutes of smoke on-hand, it did have enough to provide a 60-minute screen or a smaller screen for 90 minutes.

During the action reaction-counteraction sequence of wargaming, the S4 validated his ammunition distribution plan. Along with the FDO, the S4 tracked each mission fired during the wargame. Missions fired accounted for accomplishing the EFATs, re-attacking targets and firing targets of opportunity. He decremented the ammunition from the planned starting point for each battery, using battlefield calculus (see Figure 1).

The S4 also developed decision points to resupply batteries as the batteries expended their ammunition and recorded them for inclusion in the OPORD's service support paragraph. At the end of the wargame, the S3, S4 and FDO had a clear understanding of the minimum ammunition requirements to support the EFATs to be published in the operations order.

The commander also specified the battery commanders inform him if a

Type	On Hand	Phase 1	Phase 2	Phase 3	Total	Delta
A Battery						
HE	93			6	6	87
DPICM	643	108	72	108	288	355
BBDP	90	36			36	54
ADAM	12		24		24	-12
RAAMS	48		96		96	-48
CPH	28	2			2	26
SMK	29		58		58	-29
RAP	76	36			36	40
GB	180				0	180
WB	670	110	130	114	354	316
RB	160	62	120		182	-22
B Battery						
HE	30			36	36	-6
DPICM	378	108	108	108	324	54
BBDP	126	36			36	90
ADAM	0				0	0
RAAMS	0				0	0
CPH	24				0	24
SMK	72			58	58	14
RAP	43	36			36	7
GB	162					162
WB	322	110	108	144	362	-40
RB	27	62			62	-35

Legend:

ADAM = Area Denial Artillery Munition
BBDP = Extended-Range DPICM
DPICM = Dual-Purpose Improved Conventional Munition
CPH = Copperhead
GB = Green Bag
HE = High Explosive
RAAMS = Remote Anti-Armor Mines System
RAP = Rocket-Assisted Projectile
RB = Red Bag
SMK = Smoke M825
WB = White Bag

Figure 1: Example of Battlefield Calculus for Ammunition Purposes

During the action-reaction-counteraction sequence of wargaming, the S4 validated his ammunition distribution plan. Along with the FDO, the S4 tracked each mission fired during the wargame.

battery fell below its minimum determined EFAT ammunition requirement before executing its EFAT. The S3 added this requirement under the commander's critical information requirements (CCIRs) that are part of the FA support plan (FASP).

After the wargame, the staff began FASP production. The S4 included the ammunition distribution plan in the service support paragraph. The plan included when, in what quantities and where the ammunition platoon would deliver each battery's ammunition; ammunition resupply triggers; resupply methods; locations of resupply points; and the ammunition CCIRs. This gave the BAO all the guidance he needed to deliver the ammunition to the batteries. By publishing a complete ammunition distribution plan, everyone understood the scheme and resupply method.

Ammunition Resupply. Immediately following the first fight, the BAO had gone to the S3 and S4 for guidance on what ammunition to push to the firing batteries during reconsolidation. Generally, the battalion resupplied the batteries with Killer CCLs of DPICM and White Bag because the batteries always have opportunities to fire them. He exchanged half-empty flat racks at the batteries with full CCL racks of Killer munitions.

The BAO's platoon sergeant supervised the cross leveling and consolidation of ammunition in the combat trains. The platoon sergeant preferred having the same six PLS crews with him at the combat trains. That way, they knew what to expect from him and he knew what to expect from them.

By the time some of the racks had been emptied and all the ammunition consolidated, the S4 contacted the BAO with the ammunition order for the next fight. The BAO then relayed the order to his ammunition platoon representative in the field trains. He also sent instructions to bring the three full flat racks in the field trains forward to the combat trains to exchange for the empty racks and then pick up ammunition requested from the CSR.

When the ammo platoon rep arrived at the combat trains with three full PLS, the BAO found out the time and location for the ammunition draw: 0600 hours at the brigade's ammunition transfer point (ATP). The BAO or his platoon sergeant always was present at ammunition draws in case there were complications.

The instructions were to get the Killer/Red Bag ammunition to the batteries as soon as possible, so the ammo platoon sergeant took the loaded flat racks immediately to an exchange point. En route, he contacted the ALOC and reported the total ammunition drawn using the format for tracking the battalion's ammunition (see Figure 2); he also instructed the ALOC to tell each firing battery to send a PLS to the exchange point. As it was, A Battery, the "hot battery," was down to battery-three volleys of Red Bag firing against the enemy engineer preparation targets when its PLS returned with the Killer/Red bag CCL.

When the BAO returned to the combat trains with his copy of the FASP, he immediately gave instructions to the platoon sergeant to have the smoke CCL sent to B Battery. When the ammunition distribution was complete, the BAO and his platoon sergeant rehearsed their soldiers on the routes and actions on contact for the next day's mission. The BAO monitored the firing batteries' ammunition consumption during the battle and prepared for any resupply.

Battery Ammo Management. Meanwhile, the A Battery commander reported to the S4 that he received the ammunition and sent a battery consolidated ammunition report. He instructed his battery XO to continue to track ammunition and report the count every 30 minutes while he developed the battery OPORD.

After digesting the information provided in the service support paragraph, the A Battery commander had a clear understanding of his EFATs and began developing his battery order. He established his battery turret loads by adjusting the standard turret load for the offense in the TACSOP, based on the EFATs his battery was responsible for at that phase of the battle.

He had to decide which battery internal resupply method to use and develop triggers for the ammunition carrier-to-PLS resupply (e.g., methods are separate or mated, and resupply is every 16 volleys of DPICM, eight volleys of Red Bag or 16 volleys of White Bag). He knew initially his counterfire and ground attack threats would be low, so the battery would use mated operations and resupply combat ammunition trains to the PLS every 16 rounds during Phase I of the operation. He then adjusted his resupply methods and triggers to equally support the different phases of the operation.

The A Battery commander noticed in the service support paragraph that the battalion ammunition resupply trigger for the battery was 27 volleys. He quickly did the math (six guns x 27 volleys = 162 rounds); he or the XO had to notify the battalion S4 to trigger resupply when the battery fired that many rounds. The battalion then would direct a PLS to move from the combat trains to a designated ATP point to exchange flat racks. Once the flat racks in the battery were empty, the PLS would move to the exchange point for a full CCL from a combat trains PLS.

Understanding that the key issue was propellant, the A Battery commander thought a good overall CCL would be a pure CCL of DPICM/Red Bag triggered to replace what he had fired. However, the PLS currently in his position had a mix of White Bag and Red Bag. He

informed the S3 that his resupply trigger must be modified and that firing 10 volleys of Red Bag, based on his on-hand count, should be a trigger, ensuring his battery had Red Bag until it received a pure CCL with Red Bag.

The A Battery commander knew he had to manage the ammunition on the flat racks in complete rounds. He could not allow ammunition carrier crews to take only propellants, which could rapidly cause ammunition accountability problems. Additionally, he developed resupply triggers divisible by eight to minimize random numbers of leftover rounds and ensure efficient transfers of ammunition from the flat racks to the ammunition carriers. The PLS crew would then be able to keep ammunition banded and ready for rapid movement.

The battery commander directed his ammunition carrier crews replace one propellant type for another if they removed only propellants from a PLS. The S3 concurred with the battery commander's recommendations and directed the S4 to adjust the resupply trigger for Red Bag based on current CCL configurations.

The A Battery commander also was to be notified immediately about the loss of one of his howitzers, ammunition carriers or PLS, including the amount of ammunition destroyed on that vehicle. He ensured this info was included in the CCIR portion of his order. It was

155-mm Ammo	DPICM	BBDP	HE	RAP	ADAM	RAAMS	CPH	Illum	SMK M835	SMK HC	WP	GB M3A1	WB M4A2	RB M119 Chg 7	RB M203 Chg 8	Total Rds	Total Propellant
DODAC	D563	D864	D544	D579	D502	D509	D510	D505	D528	D506	D550	D540	D541	D533	D532		
CSR	89	12	33	12			1	3	6		6	46	61	34	26	162	167
Total	1602	216	594	216	24	108	18	54	108	0	108	828	1098	612	468	3048	3006
A Btry	360	162	60	78			30	12	60		12	80	258	258	178	774	774
B Btry	360	162	60	78			30	12	60		12	80	258	258	178	774	774
C Btry	360	162	60	78			30	12	60		12	80	258	258	178	774	774
FR # 1	50	12			18	96							118	58		176	176
FR # 2	50	12			18	96							118	58		176	176
FR # 3	120	56											118	58		176	176
FR # 4	120	56											118	58		176	176
FR # 5	120	56											118	58		176	176
FR # 6	120	56											118	58		176	176
FR # 7	120	56												150	26	176	176
FR # 8	120	56												150	26	176	176
FR # 9	120	56												150	26	176	176
FR # 10	120	56												150	26	176	176
FR # 11	120	56											176			176	176
FR # 12	120	56											176			176	176
FR # 13	120	56											118	58		176	176
FR # 14	120	56											118	58		176	176
FR # 15	120	56												100	76	176	176
FR # 16		176													176	176	176
FR # 17	98	14	64										48	32	96	176	176
FR # 18		14	142	20									48	32	96	176	176
FR # 19			176												176	176	176
FR # 20			100	76									48	42	86	176	176
FR # 21	6			94	12	24			40						176	176	176
Total	2844	1442	662	424	48	216	90	36	220	0	36	240	2214	2044	1520	6018	6018

Legend:
Chg = Charge
CSR = Controlled Supply Rate
DODAC = Department of Defense Ammunition Code
FR = Flat Rack (of Ammo)
Illum = Illumination
SMK HC = Smoke HexaClorathan
WP = White Phosphorous

Figure 2: Example of a Battalion Ammunition Tracking Sheet

155-mm Ammo	DPICM	BBDP	HE	RAP	ADAM	RAAMS	CPH	Illum	SMK M835	SMK HC	WP	GB M3A1	WB M4A2	RB M119 Chg 7	RB M203 Chg 8	Total Rds	Total Propellant
DODAC	D563	D864	D544	D579	D502	D509	D510	D505	D528	D506	D550	D540	D541	D533	D532		
CSR	89	12	33	12			1	3	6		6	46	61	34	26	162	167
Total	1602	216	594	216	24	108	18	54	108	0	108	828	1098	612	468	3048	3006
Gun 1	15	4	6				2	2	8		2		25	14		39	39
FAASV 1	48	10		10	4	18	3					10	40	25	18	93	93
Gun 2	15	4	6				2	2	8		2		25	14		39	39
FAASV 2	48	10		10	4	18	3					10	40	25	18	93	93
Gun 3	15	4	6				2	2	8		2		25	14		39	39
FAASV 3	48	10		10	4	18	3					10	40	25	18	93	93
Gun 4	15	4	6				2	2	8		2		25	14		39	39
FAASV 4	48	10		10	4	18	3					10	40	25	18	93	93
Gun 5	15	4	6				2	2	8		2		25	14		39	39
FAASV 5	48	10		10	4	18	3					10	40	25	18	93	93
Gun 6	15	4	6				2	2	8		2		25	14		39	39
FAASV 6	48	10		10	4	18	3					10	40	25	18	93	93
FR #13	176												176			176	176
FR #14	176													176		176	176
FR #15		76							100					100	76	176	176
Total	730	160	36	60	24	108	30	12	148	0	12	60	566	510	184	1320	1320

Figure 3: Battery Ammunition Tracking by Guns, FA Ammunition Supply Vehicles (FAASV's)

critical to maintain total ammunition accountability at all times to determine if the battery had enough ammunition to service its EFATs. In his OPORD, he directed the battery XO report the consolidated ammunition count every 30 minutes by shell/propellant/fuze and lot for all ammunition carrying vehicles in the position in accordance with battalion formats (see Figure 2).

The A Battery commander learned from his last battle that not having a battery consolidated ammunition count caused poor decisions to be made, resupply triggers to be missed and the loss of accountability when equipment was destroyed. The battery FDC only had been able to give him a current count of ammunition on the gun line, not the entire position. The battery commander directed his XO to develop a document to account for all battery ammunition by element (see Figure 3).

He then developed a set of battery triggers based on past missions and added this to his battery TACSOP: reporting triggers of 10 volleys of DPICM/White Bag or five volleys of special munitions/Red Bag. He also directed the platoons to report every 25 minutes on the battery net and the XO to forward the consolidated report to the ALOC.

The battalion had enforced the habitual association of specific PLS with a battery, making reporting battery ammo counts easier. That way the PLS drivers became integrated into battery operations and knew key leaders and when to report statuses. They also were familiar with the battery's TACSOP.

The battery XO's habitual relationship with his PLS crews helped him maintain his ammunition count. They knew he wanted an update every 25 minutes, starting at 15 minutes past the hour, so he did not have to constantly ask them for it. The FDC crew also sent their ammunition counts to him in a timely manner. This reporting process helped the XO be proactive in sending his reports to the S4 in the ALOC. As a result, A Battery never went to a red status for ammunition on-hand. At the end of the battle, the battery XO reported to the ALOC that A Battery still had enough ammunition to continue the attack.

The S4's hard work on ammunition planning, preparation and execution in this battle had paid off. He began to collect the information he needed for mission analysis for the next fight to start the ammunition planning and management cycle over.

Everyone from the battalion to battery knew and understood his role and responsibilities in ammunition management. The S4 had developed an ammunition plan early and passed this information on to the executors quickly. He also had refined the plan as the battalion developed the order.

Everyone in the battalion understood the plan and provided feedback on its execution. Everyone reported ammunition levels accurately and often.

The battalion fired more than 300 rounds in the first hour of the battle. The S4 now understood why so many units had difficulties managing ammunition at the NTC. At home station, they typically fired 200 to 300 rounds in a five-day live-fire FTX.

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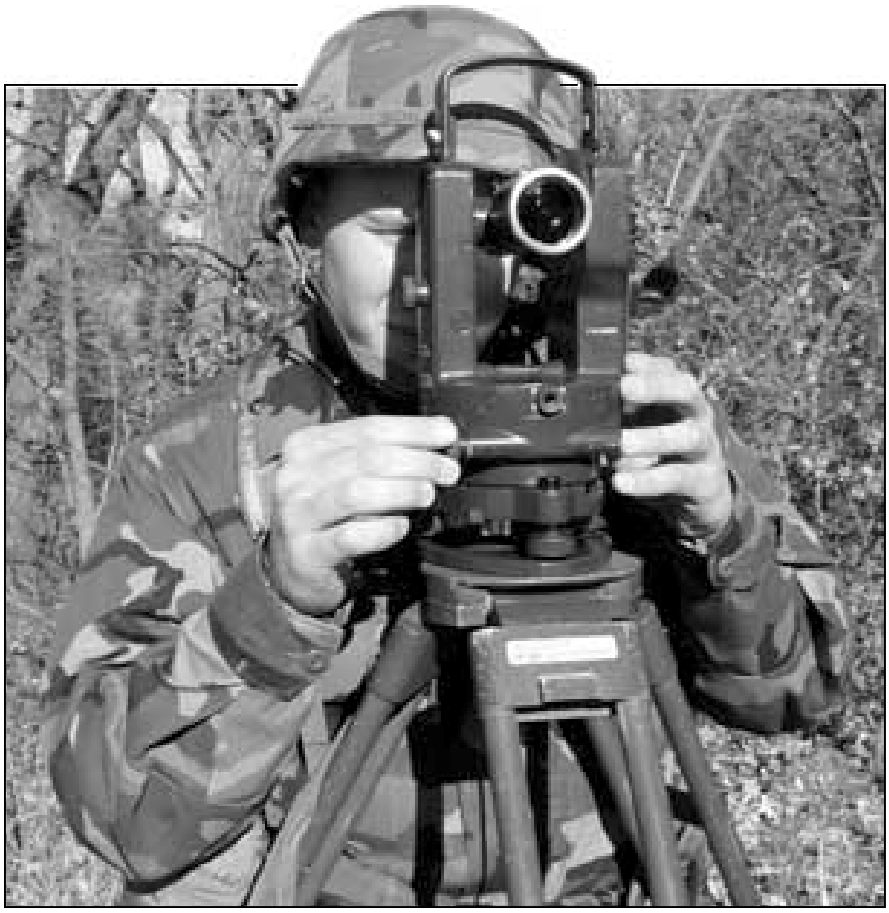

T-16 Theodolite

Artillery Surveyors
Nomads of the Battlefield

by Chief Warrant Officer Three W. Mark Barnes, USMC

In the old days, determining the accurate location of artillery batteries and target elements so units could mass fires was the arduous task of the artillery surveyor—on foot with transits, aiming circles, tapes and slide rules. The magnitude of the effort was directly proportional to the number of units present, size and topography of the area of operations, the nature of the operations and the extent and accuracy of existing survey control.

Survey teams were nomads on the battlefield, operating during the day without higher level supervision and coming home at night to tell what they had done (and seen) and determine where they were needed for the next day. If their units were able to mass fires, then they had done their job.

Today we put no more thought into having survey data available than we do into turning on a light switch. We have instant electronic position locating devices, such at the global positioning system (GPS).

Due to advances in technology and personnel cuts, the modern surveyor may be on the verge of extinction. Some proposals get rid of the surveyor altogether while others suggest integrating survey functions into another military occupational specialty (MOS). But before the FA decides to do away with or integrate this nomad with other MOS, we must understand the impact of this decision on the artillery community.

This article discusses the training for today's surveyors, the difficulties with the Marine Corps surveyors' career development assignments and the dangers of relying on new GPS-aided devices for primary position location because those systems are so easily defeated. I propose units train more to prepare for position location device failures and that we do not eliminate our surveyor MOS until our devices are more robust and reliable on the battlefield.

Training and Developing the Surveyor. The modern artillery surveyors are MOS 82C (Army) and MOS 0844 (USMC). Both MOS have unique skills and training to ensure survey data is available to their firing units in any situation.

There are some major differences between how the Army and the USMC develop their survey personnel. However, both services have proposals to downsize or do away with their surveyors that could negatively impact US artillery capabilities.

The Army 82C spends seven weeks at the FA Training Center, Fort Sill, Oklahoma, for his advanced individual training (AIT). He receives training on a multitude of tasks, to include operating the T-16 theodolite, astro (azimuth using stars and sun) and position and azimuth determining system (PADS).

The remainder of the 82C's instruction is on applying his newly learned survey skills. His sole responsibility is survey until he becomes a 13Z master sergeant. Along the way, he attends the basic and advanced NCO courses (BNOC and ANOC) and receives additional survey training. Currently the Army only has about 800 82Cs.

In contrast, the Marine 0844 receives different training and career development than the Army 82C. The 0844 starts his career as a 0844 fire direction controlman, spending eight weeks at Fort Sill learning manual and automated gunnery. After graduating, 99 percent of the 0844s report to the fleet marine force (FMF) where they work in battery fire direction centers (FDCs) as the equivalent of an Army MOS 13E Cannon Fire Direction Specialist. Approximately one percent of these graduates stay at Fort Sill to attend the Marine Survey Course.

The four-week Marine Survey Course is similar to its Army counterpart, but it is not MOS-producing. Its content covers different equipment, with the exception of PADS, which both services have.

Every artillery battalion and regiment has a survey section; optimally, the 0844s rotate through survey section and FDC billets. The challenge occurs when, due to an operational necessity, a first-tour surveyor does not rotate into a battery FDC—yet is expected to be experienced in fire direction when he becomes a staff sergeant FDC chief. This creates a problem because the individual is expected to be qualified on multiple tasks with limited time and resources to learn them and maintain his proficiency.

Both Army and Marine Corps surveyors use PADS.

When the 0844 becomes a staff sergeant, he attends the Marine Operations Chief Course (MAOCC) and becomes an operations chief (MOS 0848). The 0848 acts as a survey chief, operations chief, radar employment chief, meteorology chief or even an 81-mm mortar platoon sergeant with an infantry battalion.

The Marine Corps achieves such flexibility of the 0844 based on the expertise of the warrant officer (0803) in each survey section. The WO 0803 is the technical expert in survey, radar and Met and ensures quality control and the movement of people to spread experiences—a challenge with the wide variety of training and experience of the individuals serving in the positions.

Although each service has its own way of training surveyors, the surveyors' mission and expertise are critical to the operations of every US artillery unit. Before we eliminate these essential members of our team, we must understand how vulnerable the new position location devices are and the impact of their failure on the accuracy of our firing units. The systems we would use today for position location "instead of" using the surveyor are susceptible to defeat by the enemy.

GPS Systems. Probably the most significant advancement in technology threatening to eliminate the surveyor is GPS. The artillery community has put a tremendous amount of confidence into GPS technology and is counting on GPS' being available at all times, which may not be the case. Here are a few examples of current and future systems that depend on GPS to some degree.

Improved Stabilization Reference Package (ISRP). The GPS-aided ISRP provides north-seeking and pointing functions as well as full three-dimensional land navigation and location capabilities for the current M270 multiple-launch rocket system (MLRS) and Army tactical missile system (ATACMS).

Gun Laying and Positioning System (GLPS). This is a GPS-dependent, man-portable, north-seeking gyroscope with an integrated precision lightweight GPS receiver (PLGR) capable of determining position, azimuth and deflection for quick, accurate gun-laying data for towed and non-Paladin howitzers. The GLPS is being fielded to the force with a basis of issue of one per firing battery or platoon.

Positioning and Navigation Unit (PNU). The PNU is a line replaceable unit (LRU) in the M270A1 MLRS and high-mobility artillery rocket system (HIMARS) launchers that will replace the M270 ISRP and position data system (PDS). The GPS-aided PNU provides launcher position and navigation data via a self-contained strap-down inertial platform system, an embedded GPS receiver module and associated GPS antenna.

Bradley Fire Support Team (BFIST) and Striker Equipment Mission Package (EMP). The GPS-aided BFIST/Striker EMP provides the two vehicles three-dimensional position location and azimuth, using an inertial navigation system (INS), PLGR and a vehicle measuring system (VMS).

GPS-Dependent Precision Munitions. In addition to these artillery systems, we are developing munitions that incorporate GPS technology to guide rounds precisely onto targets.

GPS Vulnerabilities. If we could be sure accurate GPS capabilities were available at all times, there would be no need for concern. But today's GPS technology has vulnerabilities that, when taken advantage of, can cause the GPS to function improperly or not at all, thereby denying users accurate position data.

Modernization efforts are ongoing to make GPS more reliable and robust, so the artillery community can use it as the sole means of receiving position data in the future. However, these improvements won't be in place for years to come. Some of the improvements include better receivers and upgrades to the current satellite constellation.

Jamming the GPS. The most profound vulnerability GPS has is its susceptibility to jamming. The satellite signal strength needed for GPS operations can be compared to the strength of that a 100-watt light bulb emitting 300 miles away. In addition to the signal's being so weak, the satellite frequencies are published openly so anybody with a few hundred dollars can manufacture an inexpensive and effective jamming device. In fact, one entire industry has developed GPS jammers and will sell them to anyone who wants to buy them.

Several years ago at an air show in Russia, a company called Aviaconversia demonstrated a four-watt GPS jamming device that could jam GPS signals within a 200-nautical mile radius. The cost of this GPS jammer was $4000 dollars. There are indications that business is booming for this company because it is on its fourth version of this device and has increased its power to eight watts. In addition to Russia, several other countries are selling GPS jammers on the open market.

Shown in the picture is a "Nestea" can that is an actual GPS jammer. This is a one-watt jammer disguised in a soda can that has an effective range of 20 to 40 nautical miles. This device easily could be scattered throughout the battlefield, thereby denying US forces the use of GPS.

Spoofing the GPS. "Spoofing" is the ability to record the GPS signal and, at a later time, re-transmit those same signals at a higher power, introducing position errors. Because this signal is transmitted at a higher power, users receive

This one-watt jammer disguised in a soda can has an effective range of 20 to 40 nautical miles.

the spoof signal and are not aware the data is old and inaccurate.

Military users who have crypto fill loaded in their GPS receivers make those GPS hard to spoof. But as spoofing technology advances, we have cause for concern. The international military industry is working on means to spoof our currently protected military receivers.

Training to Compensate for Vulnerabilities. With these vulnerabilities, the artillery community may be relying too heavily on GPS technology to accomplish the mission. A good example of this over reliance is seen everyday in the artillery community's weak land navigation skills. It takes only a few hours to train an artilleryman to use the PLGR, but it takes several weeks for him to master map, compass and terrain association skills. The path chosen is the easier one—if not more risky.

Today, it has become more difficult to train military GPS users in the field because working with jamming affects many other civilian GPS users in the area. To train a unit in the field on degraded operations, we must coordinate extensively with many agencies outside the military. Therefore, military GPS users rarely experience GPS problems, which has led to a false sense of security among military GPS users.

To ensure their units are truly combat ready, commanders should ask themselves two questions. Is my artillery unit prepared to operate in a GPS-jammed environment? When was the last time my unit conducted basic land navigation training without GPS?

The Army has conducted limited tests to evaluate how well units perform in this environment, and some of the results should cause concern. In one case, just the threat of GPS jamming caused units not to use the GPS equipment. Subsequently lots of personnel got lost—so lost, in fact, that several elements went into an artillery impact area. What if it had been a minefield?

Units that eventually got jammed lost confidence in the equipment and put it away. Once again, due to a lack of basic land navigation skills, personnel got lost.

Another lesson learned during testing was that the enemy can jam support units and have the same defeating effect as when they jam the main forces. One tank unit had invested a tremendous amount of money in anti-jam technology to make it more difficult to jam the GPS on the tanks. But the enemy didn't attack the tanks; he jammed the logistics trains. The result was the tanks didn't get resupplied because the log train couldn't find them without the aid of GPS. Surveyors are trained to operate without GPS.

Among other tasks, surveyors conduct crater analysis as CWO5 Lou Lozada does here in Beruit, Lebanon, 1983.

During Operation Desert Storm, the artillery community quickly found out how difficult it was to operate with several different datums. Our allied forces, different services and individual units all used their own maps or mapping systems with different datums. Zone-to-zone transformations and datum conversion weren't as easy as expected.

A surveyor can overcome the multi-datum obstacle. Envision a situation where GPS is unavailable and all the maps of the area are in geographic coordinates. The surveyor can convert the geographic coordinates to Universal Transverse Mercator (UTM) and then establish a survey control point (SCP). From this SCP, he can extend survey control to all elements, thus ensuring all are on a common grid.

Currently, there are more than 1,000 map datums identified by the National Imagery and Mapping Agency (NIMA). This agency is working to reduce all these datums to one worldwide datum, called WGS 84. Until NIMA completes this complex task, the artillery community will face the challenge of operating with different datums. Even within the US, some of our map products have not been converted to WGS 84; until the inventories of these maps are exhausted, we will need the expertise of our surveyors to convert the data.

Without proper conversion, units firing with different datums can create large errors—miss critical targets and, perhaps, endanger friendly forces.

When the GPS becomes more robust and less vulnerable and the world converts to WGS 84, then the day may come when this nomad of the battlefield will be less critical. But today, his skills are necessary to meet the five requirements for accurate, predicted fires. This nomad of the battlefield, this soldier or Marine surveyor, can provide the US artillery position data 24 hours a day, seven days a week and in any type of environment—with or without the aid of GPS.

Chief Warrant Officer Three W. Mark Barnes, US Marine Corps (USMC), has been the Officer-in-Charge of the Survey Branch of the Gunnery Department in the Field Artillery School, Fort Sill, Oklahoma, since July 1997. In his previous assignment, he was the Survey Officer for the 5th Battalion, 11th Marines at Camp Pendleton, California. Among other assignments, he served as the Radar Employment Chief attached to the 5th Battalion, 10th Marines in the Gulf during Operations Desert Shield and Storm. While stationed with the 10th Marines at Camp Lejeune, North Carolina, he was the Radar Team Leader attached to the 22d Marine Expeditionary Unit (MEU) in support of Operation Urgent Fury in Granada and, subsequently, for operations in Beirut, Lebanon. Chief Barnes first entered the Marine Corps in 1981 and will retire in April 2001.