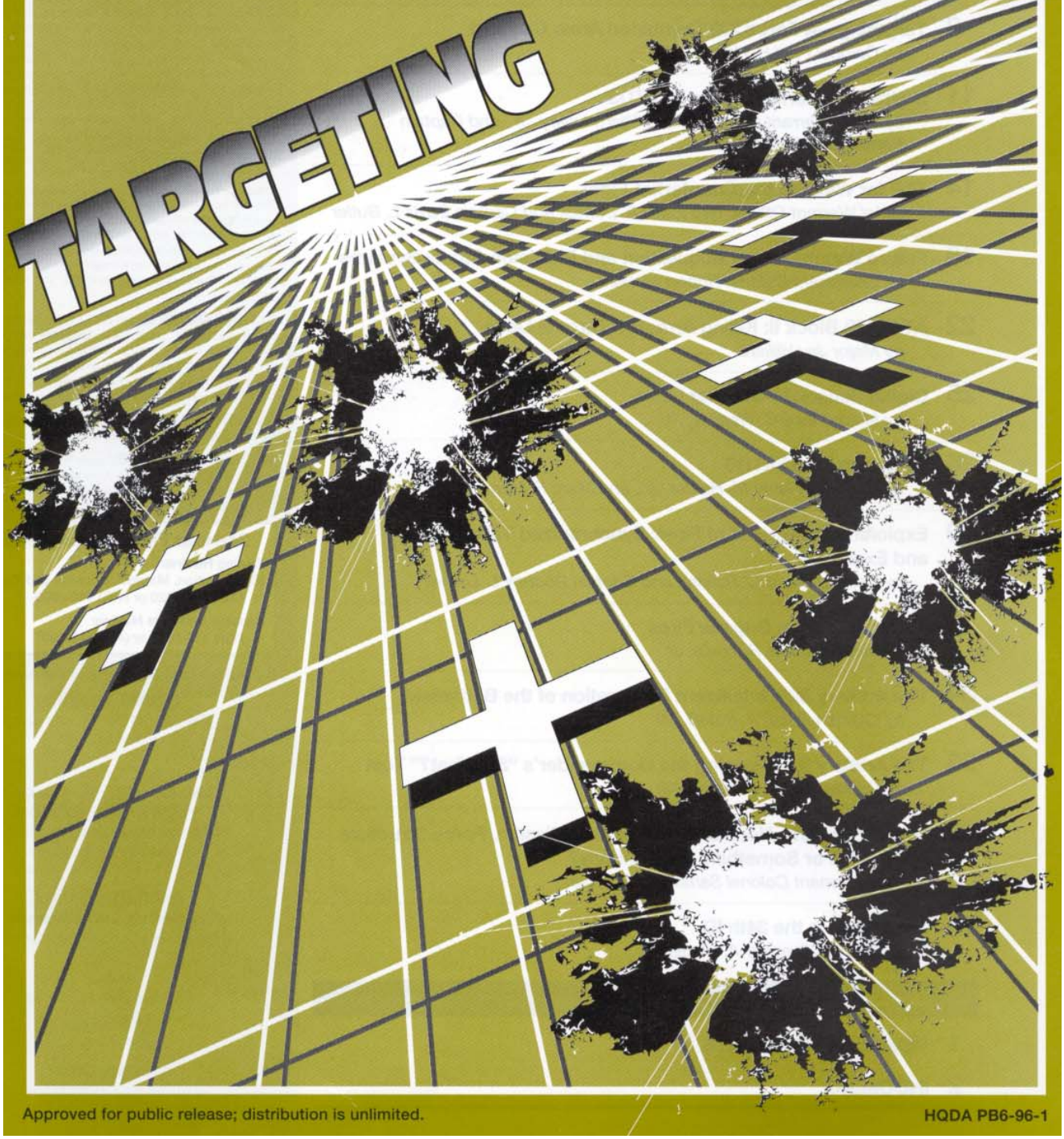
Field Artillery

A Professional Bulletin for Redlegs

January-February 1996

TARGETING



Approved for public release; distribution is unlimited.

HQDA PB6-96-1

Field Artillery

A Professional Bulletin for Redlegs

January-February 1996 HQDA PB6-96-1

ARTICLES: Targeting

DEPARTMENTS

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

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

SUBSCRIPTIONS: May be obtained through the US Field Artillery Association, P.O. Box 33027, Fort Sill. OK 73503-0027. Telephone numbers are DSN 639-5121/6806 or commercial (405) 355-4677 or FAX (405) 355-8745 (no DSN). Dues are $18.00 per year ($35.00 for two years and $52.00 for three years) to US and APO addresses. All others add $12.00 per subscription year for postage. Subscriptions are also available through the Superintendent of Documents, US Government Printing Office, Washington, DC 20402. The telephone number is (202) 512-1800; FAX is (202) 512-2233.

SUBMISSIONS: Mail to Editor, ***Field Artillery***, P.O. Box 33311, Fort Sill, OK 73503-0311. Telephone numbers are DSN 639-5121/6806 or commercial (405) 442-5121/6806 or FAX 5127 with DSN or commercial prefixes. Material submitted for publication is subject to edit by the ***Field Artillery*** staff; footnotes and bibliographies may be deleted due to space limitations.

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

ADDRESS CHANGES: Second-class official mail postage is paid by the Department of the Army at Lawton, OK 73501. Send address changes to ***Field Artillery***, P.O. Box 33311, Fort Sill. OK 73503-0311.

24-Hour Field Artillery Hotlines

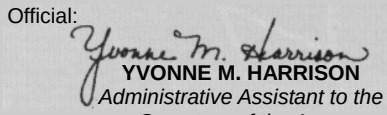
Redleg Hotline:
(Organization, Materiel, Doctrine and Training)
DSN 639-4020 or (405) 442-4020

Tactical Software Hotline:
DSN 639-5607 or (405) 442-5607

By Order of the Secretary of the Army:

DENNIS J. REIMER
General, United States Army
Chief of Staff

Official:



YVONNE M. HARRISON
Administrative Assistant to the Secretary of the Army
01136

RANDALL L. RIGBY
Major General, United States Army Field Artillery School
Commandant

Editor:
Patrecia Slayden Hollis

Art Director:
Bob T. Coleman

Assistant Editor:
Joanne Alexander Brown

MAJOR GENERAL RANDALL L. RIGBY
Chief of Field Artillery

Targeting for Combat Power

We face multiple threats in the future—potentially, a no-tech, dismounted infantry-based army; a low-tech mechanized army; or a high-tech information-age army with advanced tactics and technology. We must be able to find, track and destroy the enemy within the battlespace, dominating him from the outset.

For our force projection Army to dominate battlespace, targeting must be the heart of operations planning, not just an adjunct. Effective targeting requires concepts, information systems and weapons; we are working on all these at Fort Sill.

Targeting Concepts

Targeting is the combined arms commander's tool for coordinating and synchronizing the fire support, intelligence and command and control battlefield operating systems (BOS) to achieve his intent. Our *decide-detect-deliver-assess* (D^3A) methodology (described in *FM 6-20-10 Tactics, Techniques and Procedures for the Targeting Process*) translates the maneuver commander's intent into a plan by determining what targets to attack, how to acquire those targets, how to attack them and how to assess the effects of the attack. Targeting is a complex, dynamic process and seems, at first glance, like it ought to be the special province of fire supporters.

But it isn't. Targeting is a process for applying combat power and affects the total force—not just fire supporters. In any future conflict, we'll face numerous targets and have limited resources with which to attack them. We'll have enhanced detection capabilities and improved sensor-to-shooter links, but we'll have to make timely targeting decisions to synchronize the proper application of combat power or risk squandering valuable assets.

The combined arms commander must integrate targeting into the decision-making process, addressing targeting decisions simultaneously with maneuver decisions. As the combined arms commander's planners develop courses of action (COAs), they must integrate targeting into war-gaming. In this way, planners will consider all methods of applying combat power as they develop COAs. This puts targeting at the heart of operations planning—from COA development to COA analysis and approval.

Information Technology

As we incorporate more and more information technology, the targeting process will become faster, more dynamic and more compressed. These technologies facilitate our ability to attain information dominance, which will allow us to use information systems and capabilities to achieve an operational advantage while denying those capabilities to an enemy. In plain English, we'll know more about the battlefield than our enemy will.

Information dominance is the aggregate of information operations that creates an advantage over the enemy. Information dominance includes the maneuver commander's understanding of his current state in relation to the enemy and environment, his ability to see these within the context of a desired end state, and his ability to visualize the sequence of activities that will move his force to that end state. Information dominance will not only provide the maneuver commander more information, but, even more importantly, a higher capacity to accurately visualize the battlefield.

As a concept, information dominance is not new. Historically, talented commanders have taken advantage of superior situational awareness. But understanding this situational awareness in the context of achieving an end state has been largely an intuitive process. Information technologies have the potential for making this grasp of the battlefield and the advantages it affords more universally attainable.

Information dominance will both require and facilitate a higher degree of specificity in targeting objectives. We'll need specificity in targeting because we'll have to acquire and attack the right targets to achieve information dominance in the first place. For example, we'll attack and destroy enemy sensors to blind him and destroy any enemy systems that might jam our sensors.

Once achieved, information dominance will allow us to acquire and attack the high-payoff targets (HPTs) that facilitate-or even obviate the need for-decisive operations. We could, for example, find and destroy key enemy command and control nodes, decapitating enemy forces and opening the opportunity for our decisive operations.

The advanced Field Artillery tactical data system (AFATDS) being fielded to the 2d Armored Division is the Field Artillery's link to the Army's combat information system. It will play a key role in gaining information dominance. But all the information and the best targeting procedures in the world will be useless if we can't impose our will on the enemy through direct combat.

Weapons Systems—Crusader

To impose our will in the close fight, we need a delivery system designed for an information dominant force, one that can rapidly deliver devastating firepower at a moment's notice. That system is Crusader.

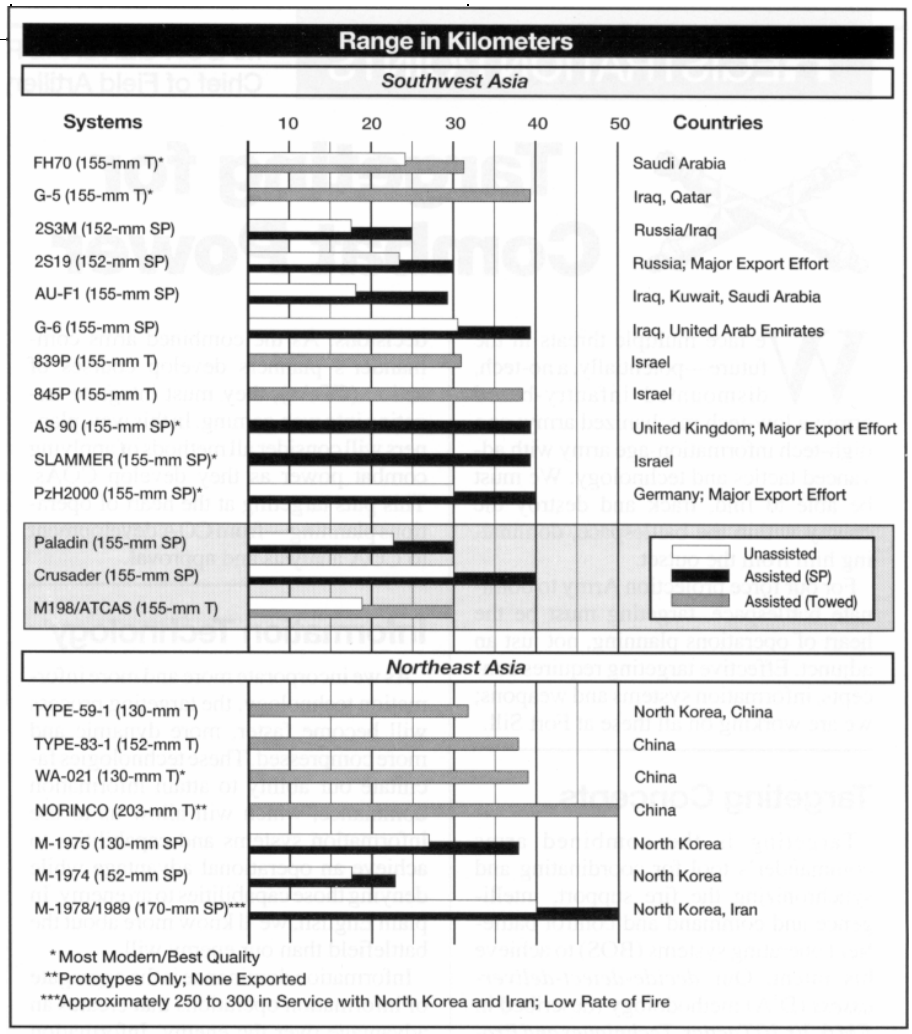
Crusader is designed for the digital battlefield. Its on-board technical and tactical fire direction capability coupled with its advanced command, control, communications, computers and intelligence (C^4I) architecture promise unprecedented situational awareness and tactical flexibility. With Crusader, the combined arms commander will have the sensor-to-shooter link he needs to rapidly mass precision fires at great depth to ambush enemy forces with fires—in effect, to execute a mechanical ambush.

Crusader's ability to rapidly emplace, fire, displace and move will enhance its survivability and also the commander's ability to gain and maintain information dominance. Immediately after the Crusader fires, it will be able to rapidly displace and move, frustrating the enemy's attempts to acquire and target it. Thus, Crusader renders counterfire on it ineffective and denies the enemy key information, confusing his picture of the battlefield.

Crusader's enhanced lethality and mobility are our most urgent needs. The worldwide proliferation of military technology has led to rapid advances in threat artillery capabilities. In theaters where major regional conflicts are likely to occur, friendly forces will face both greater quantity and better quality threat artillery. Even with the fielding of the Army's most modern self-propelled howitzer, the Paladin, US forces risk being outgunned by potential foes. The figure clearly shows that our current howitzers' ranges lag behind possible threat artillery.

Crusader's greater range and rate of fire will blend with the fires of the extended-range multiple-launch rocket system (MLRS) and the Army tactical missile system (ATACMS) to create spheres of fire that allow us to attack a wide spectrum of targets simultaneously, denying the enemy any options, robbing him of the ability to conduct decisive operations. With fires coordinated through AFATDS, Crusader will attack closer-in targets while ATACMS and MLRS engage targets at greater ranges, creating a synergy that increases total force lethality.

Concepts, information systems and new delivery systems will enhance a proven methodology: targeting. Advanced technology systems and the D^3A process put powerful tools in the hands of the combined arms commander. As players in the targeting process—as fire supporters—we must ensure the commander takes full advantage of these tools to generate and synchronize his combat power.



INCOMING

LETTERS TO THE EDITOR

Response to the Army Science Board Study

I read with great interest the article "Army Science Board Study: How Much Field Artillery is Enough?" [by John J. Todd and Lieutenant Colonel James M. Holt] in the June issue. While I applaud much about what Mr. Todd's Army Science Board Study Group accomplished, I believe they missed the mark in one aspect of their effort: modeling options for the makeup of artillery systems for the corps artillery brigades supporting the divisions.

I believe there is a deficiency in identifying an M109A5 battalion as a "modernized" unit. The only modernized self-propelled cannon unit fielded is the M109A6 Paladin. Only the Paladin, with its onboard position/navigation system and its capability to compute firing data and automatically point its cannon, is truly a modernized system.

The M109A5 is a system that essentially possesses the same operational characteristics as its Korean and Vietnam predecessors, the single exception's being its M284 cannon. The "A5" is laid in formation with other guns, has to be lead from position to position, requires a fire direction

center [FDC] to compute its data and is manually pointed.

With the advent of IFSAS [initial fire support automation system] and AFATDS [advanced FA tactical data system], the M109A5 adds nothing to the construct of modernized artillery. In fact, I believe that artillery as incapable as the A5 will be shunned by commanders in the future.

It seems apparent that the most viable option for this critical evaluation would have been two corps artillery brigades composed of both Paladins and MLRS [multiple-launch rocket system] (a brigade with two cannon and one MLRS battalion and a brigade with one cannon and two MLRS battalions). This option appears to have been absent from those modeled.

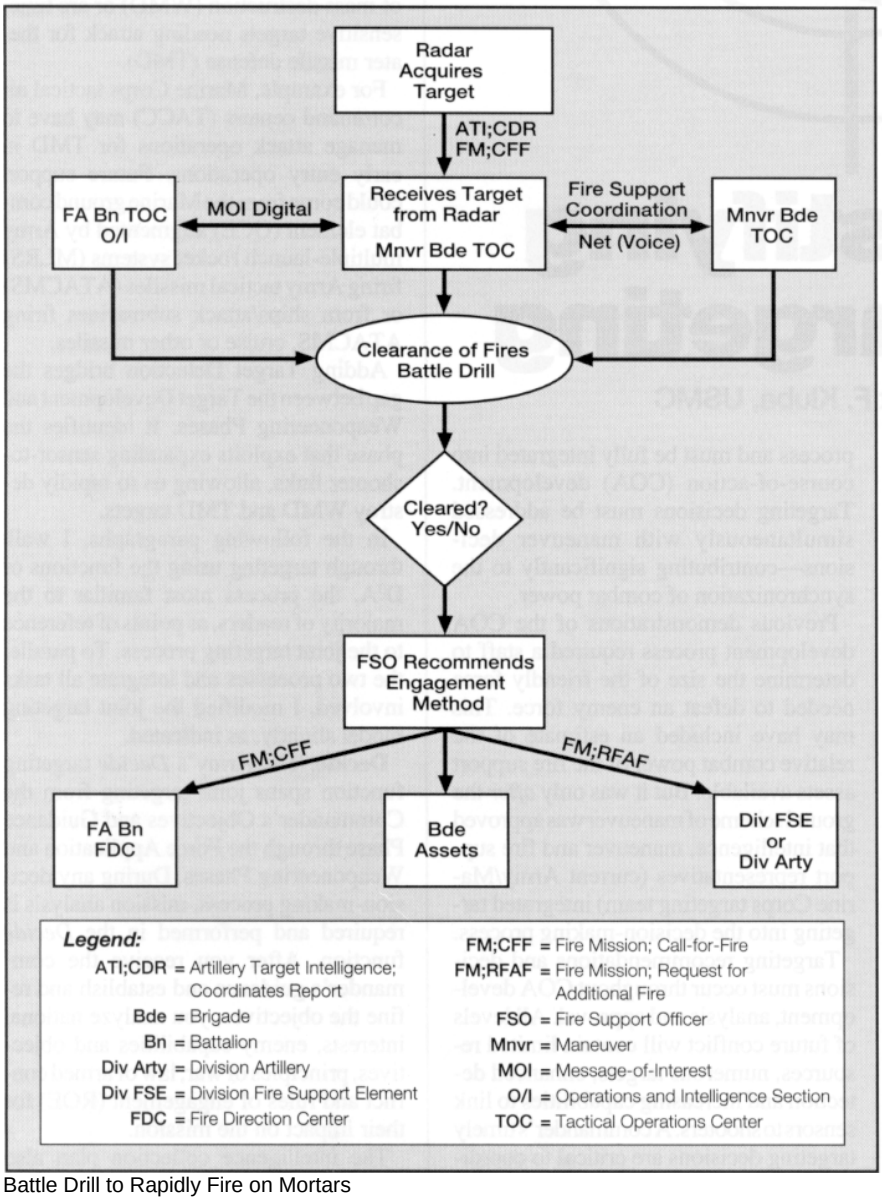
These two brigades would bring to any analysis the best, most modern capabilities the Field Artillery has. Each system can shoot and scoot, and each system is the most responsive artillery of its kind, making it the most lethal.

I would welcome seeing what the effects tables would show with this more reasonable mix of systems. Perhaps the Board could add this option to its study.

COL(R) Daniel L. Whiteside, FA
Products Group Director,
Fire Support Products
United Defense, L.P., York, PA

Target Acquisition Reporting Channels Made Standard

The 18th FA Brigade (Airborne) agrees with the February 1995 article "Put Out the Fire: Countering Mortars in Operations Other Than War" by Captain Keith R. Yoder and Chief Warrant Officer Four Luke M. Thompson. But we offer one improvement to Figure 3, "Battle Drill to Rapidly Fire on Mortars" (Page 41 of the article).



Battle Drill to Rapidly Fire on Mortars

As depicted in our slight redesign of their diagram, the radar sends its acquisition to the brigade TOC [tactical operations center] via the brigade FSE [fire support element] LTACFIRE [light tactical fire direction system] versus sending it directly to the FA battalion TOC as shown in the original figure. At the brigade TOC, the FSO [fire support officer] receives the acquisition and begins the clearance of fires battle drill. At the same time, a digital MOI [message-of-interest] is sent to the FA battalion TOC allowing it to track radar acquisitions and make tactical decisions. Once the decision to attack with artillery has been determined, the target acquisition leaves the brigade TOC via the brigade FSO/FSE as a digital fire mission call-for-fire (FM;CFF) to the FA battalion.

This system works in OOTW [operations other than war] and any level of conflict, providing safe and timely fires. It is a standard way of doing business that fits any scenario because the FSO is the common denominator. The brigade FSO recommends the method of engagement (direct versus indirect fire weapon systems) to achieve the effects the commander has determined. In OOTW, for instance, it might be more responsive and appropriate to send a nearby infantry platoon to attack a mortar acquisition than to fire artillery at it—as the article made clear in Figure 2: "Counterfire Attack Assets" (Page 40 of the article). If the brigade FSO does not designate an indirect fire unit to engage the target, the FA battalion has wasted little effort when using the procedures we recommend in our diagram. This method simply puts the decision to use the right attack asset at the infantry brigade TOC level.

CW3 Millard Lowry, Jr.
Counterfire Targeting Officer
18th FA Bde (Abn)
Fort Bragg, NC

De-Mystifying Joint Targeting

by Major Robert F. Kluba, USMC

This article describes the simplicity, effectiveness and commonality of the *Decide-Detect-Deliver-Assess* (D^3A) targeting methodology as it parallels the joint targeting process. D^3A and joint targeting are similar processes, both of which are integral to tactical and operational decision making.

Figure 1 shows the cyclic nature of the two targeting processes. The outer ring in Figure 1 is the D^3A process (from *FM 6-30-10 Tactics, Techniques and Procedures for the Targeting Process*, Final Draft). The generally accepted six-phase joint targeting process is listed in the inner ring of Figure 1 (from *Joint Pub 3-09 Doctrine for Joint Fire Support*, Second Draft). The joint targeting phases are Commander's Objectives and Guidance, Target Development, Weaponeering, Force Application, Execution Planning/Force Execution and Combat Assessment. As you can see in the figure, the two methodologies are compatible and perform the same basic functions.

Regardless of the level at which targeting is being conducted, it must be an integral part of the commander's planning process and must be fully integrated into course-of-action (COA) development. Targeting decisions must be addressed simultaneously with maneuver decisions—contributing significantly to the synchronization of combat power.

Previous demonstrations of the COA development process required a staff to determine the size of the friendly force needed to defeat an enemy force. This may have included an estimate of the relative combat power of the fire support assets available. But it was only *after* the ground scheme of maneuver was approved that intelligence, maneuver and fire support representatives (current Army/Marine Corps targeting team) integrated targeting into the decision-making process.

Targeting recommendations and decisions must occur throughout COA development, analysis and approval. All levels of future conflict will contain limited resources, numerous targets, enhanced detection and increasing capabilities to link sensors to shooters. A commander's timely targeting decisions are critical to coordinating target detection requirements with attack assets.

Joint Targeting Process

The model in Figure 2 on Page 6 not only combines D^3A and the six phases of joint targeting, but also integrates the tasks involved in both (the inner most circle of the figure). I modified the joint targeting phases to include a Target Detection Phase.

Most targets capable of affecting the joint force or designated for strategic attack are known and will be under constant surveillance with information updated in the joint intelligence data base. Mobile launchers with the capability to interdict joint operations are proliferating and require rapid identification and location. Some are capable of delivering weapons of mass destruction (WMD) or are time-sensitive targets needing attack for theater missile defense (TMD).

For example, Marine Corps tactical air command centers (TACC) may have to manage attack operations for TMD in early entry operations. Future support could come from the Marine ground combat element (GCE) augmented by Army multiple-launch rocket systems (MLRS) firing Army tactical missiles (ATACMS) or from ships/attack submarines firing ATACMS, cruise or other missiles.

Adding Target Detection bridges the gap between the Target Development and Weaponeering Phases. It identifies the phase that exploits expanding sensor-to-shooter links, allowing us to rapidly destroy WMD and TMD targets.

In the following paragraphs, I walk through targeting using the functions of D^3A, the process most familiar to the majority of readers, as points of reference to the joint targeting process. To parallel the two processes and integrate all tasks involved, I modified the joint targeting model slightly, as indicated.

Decide. The Army's *Decide* targeting function spans joint targeting from the Commander's Objectives and Guidance Phase through the Force Application and Weaponeering Phases. During any decision-making process, mission analysis is required and performed in the *Decide* function. After you receive the commander's guidance and establish and refine the objectives, you analyze national interests, enemy capabilities and objectives, principles of war, law of armed conflict and rules of engagement (ROE) for their impact on the mission.

The intelligence collection plan also provides information that must be considered in creating and modifying plans up to

the point of attack. For this reason, *Decide* and *Detect* overlap. The intelligence preparation of the battlefield (IPB) begins in *Decide* and continues throughout the tactical decision-making/targeting process.

Target development is accomplished in *Decide*. Targets critical to the enemy's success, called high-value targets (HVTs), are identified for later incorporation during the high-payoff target (HPT) nomination portion of war-gaming. Determining the enemy's strategic, operational or tactical center of gravity is an important element of target development. Once you know the enemy's center of gravity, you transition from the initial IPB process to COA development (friendly and enemy).

Another important part of target development is establishing target selection standards (TSS). The TSS define what makes a target attackable: when it can be attacked (compared to target ability to displace before attack), where, what the target activity is triggering the attack and to what degree of accuracy it must be located (target location error).

Detect. The Target Detection Phase (modification to the joint process) is next; assets must be located with the required degree of accuracy and immediacy to allow effective attack. *Detect* officially begins with the execution of the collection plan and answering the commander's critical information requirements (CCIR) or similar information requirements for the other services.

The key to this phase is the focused execution of the collection plan to support the identification and location of HPTs in sufficient time to support an attack achieving the effects and objectives desired by the commander. If the commander-approved attack guidance and HPT list do not support victory, battle reporting will identify this command failure and trigger an immediate reassessment to modify the plan (determined in *Decide*).

There is another critical aspect of the Target Detection Phase: units at all levels must be prepared at any time to hand off targets to senior, subordinate and adjacent units. This requires units have the ability to track significant targets. Targets could be the enemy's entire operational reserve newly on the move or an enemy platoon that has just disengaged from contact and is threatening the flank of an adjacent friendly unit. Tracking targets/units is inherent in *Detect*.

The Weaponeering Phase determines the probable outcome of an attack by the use of selected munitions or attack means. Target vulnerabilities, weapons effects (fractional damage/effective casualty radius, or ECR), reliability, delivery accuracy (circular error probable, or CEP), delivery conditions (five requirements for accurate predicted fire) and damage criteria are considered. This analysis spans the range of systems available from dedicated ATACMS or USAF Scud combat air patrols (CAP) for TMD attack operations to the array of a division, regiment, battalion, company, platoon or squad versus an enemy unit of comparable combat power.

In the Weaponeering Phase, the commander makes decisions that equate to the Army or Marine maneuver commander's decisions to use close air support (CAS), Army attack aviation or USMC close-in fire support (CIFS), artillery and/or naval surface fire support (NSFS). These decisions include the type of munitions required to achieve the desired effects to carry out the commander's fire plan.

Matching munitions, tactics and delivery means facilitates shaping the battlefield. For this reason I've modified the joint targeting cycle to examine both the Weaponeering and Force Application Phases together (see Figure 2). Force Application analyzes operational tradeoffs, such as the probability of success in reaching the target (range fans), optimal type and quantity of weapons, delivery tactics (Joint Munitions Effectiveness Manuals and Gunnery Munitions Effectiveness Tables to determine firing element size and quantity of munitions), weaponeering results and collateral damage limitations. Establishing the artillery organization for combat or determining how best to synchronize warfighting capabilities to increase the probability an element will reach an objective are examples of Weaponeering/Force Application decisions.

The Execution Planning/Force Execution Phase prepares input for and supports the actual tasking, construction and subsequent execution of missions by weapons systems or maneuver forces. At this point in the planning process, the COA with its corresponding targeting taskings have been war-gamed by the staff and approved by the commander. From the maneuver perspective, effective war gaming provides the tasking, integration and synchronization considerations that facilitate the development and execution of the operations order with its fire support and other plans. Integrating the latest intelligence assessments into the operational concept leads to the commander's approving the scheme of maneuver and generally concludes the *Decide* function.

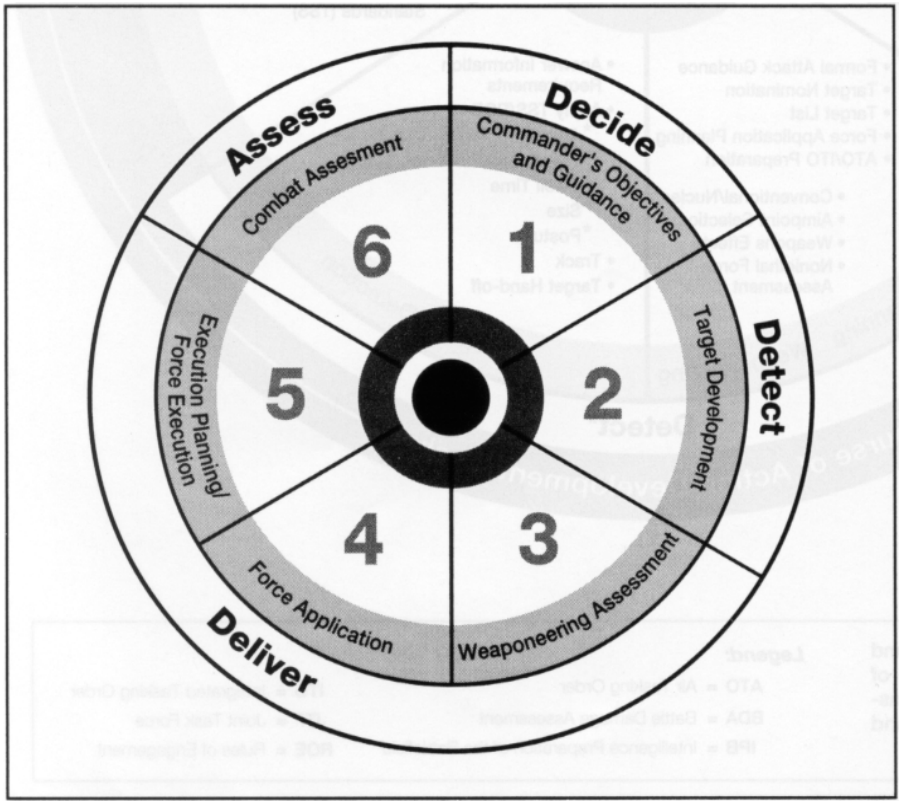


Figure 1: Phases of Targeting. Information in this chart is from *FM 6-30-10 Tactics, Techniques and Procedures for the Targeting Process* (Final Draft) *and Joint Pub 3-09 Doctrine for Joint Fire Support* (Second Draft).

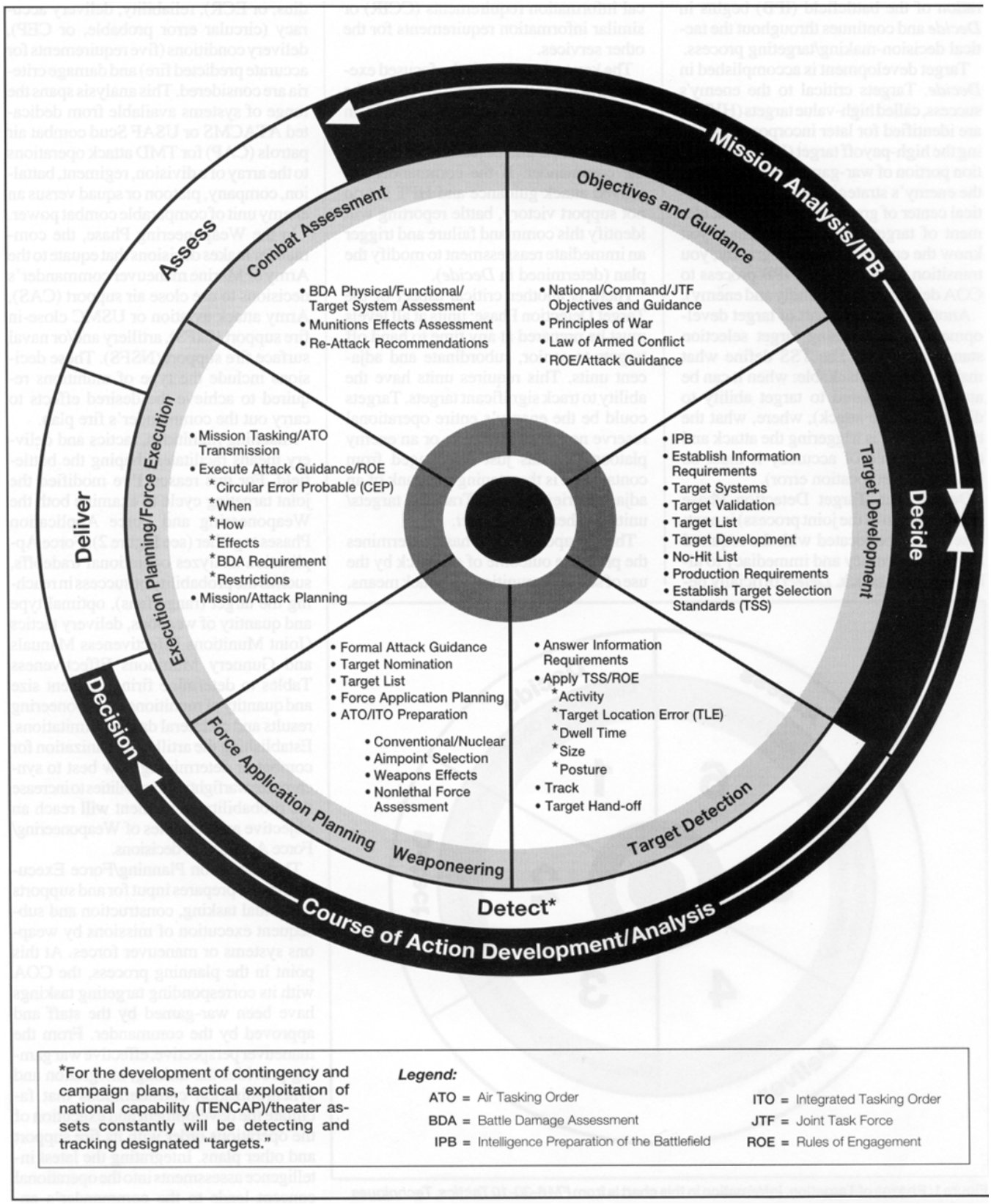


Figure 2: Joint Targeting Cycle. This cycle was modified from *Joint Pub 2-01.1 Tactics, Techniques and Procedures for Intelligence Support to Targeting* (Third Draft) and Joint Pub 3-09.

Another portion of joint targeting—Force Execution—is part of *Deliver*.

Deliver. Dissemination of the plan leads to the *Deliver* function of D^3A and to the flow of post-attack information into *Assess*. (Obviously, *Deliver* can begin when a target becomes attackable during *Decide*, based on the rapid dissemination of TSS and ROE.)

At the *Deliver* stage, the attack guidance is executed. The superior execution of combat operations usually indicates a near seamless integration of timely intelligence with the *Decide* and *Deliver* functions.

For sustained combat, the friendly forces need accurate battlefield assessments to make decisions about subsequent combat operations. This is accomplished by either dedicating acquisition assets to observe and report on a critical HPT after it has been attacked or assessing the viability of the attacked target after contact with our main force. Battle damage assessment (BDA) requires timely combat reporting; BDA on targets should be identified as priority intelligence requirements (PIRs) in appropriate cases.

BDA includes the assessment of physical damage (number of tanks destroyed, etc.), functional damage (e.g., how long it will take the enemy to re-establish the continuity of its integrated air defense system/its maneuver units' new culminating point) and target system damage (e.g., WMD production sites destroyed, eliminating them as an option in the enemy arsenal). Functional and target system assessments usually are part of the sustained mission analysis in extended combat operations. Additionally, munitions effectiveness must be assessed against a particular target or target set (to include delivery tactics), verifying the original Weaponeering/Force Application decisions.

All this information provides *Assess* a launch point into *Decide* to reexamine the execution decisions for potential modification in the continuous targeting cycle.

Conclusion

The joint targeting process and D^3A are related and similar methods of tactical decision making and must be incorporated into all staff actions. Failure to fully integrate the targeting methodology into COA development within the decision-making process will degrade the rapid execution and synchronization of operations—whether they are single service or joint operations.

One final note: information and enemy activity determine the flow of targeting. The targeting process is not a static, inflexible one—it is dynamic. We teach it sequentially, but we must apply it fluidly. For example, as we *Detect* a new weapon system, we may need to adjust the sequence of the targeting cycle to flow *Assess, Deliver* (applying the commander's intent), *Assess* and then *Decide, Detect, Deliver,* etc.

As we move toward the 21st century, we must not get bogged down in service parochialisms over terminology for processes supporting joint operations. We must use clear, accurate combat terms understood by all on the "purple" battlefield or risk wasting American and coalition lives.

Eventually, we must eliminate the concept that there are separate targeting processes and fully integrate the methodologies into a complete battlefield operating/functional system decision-making process. Until that time, D^3A and joint targeting methodologies, successfully integrated and thoughtfully applied, will ensure force protection.

Major Robert F. Kluba, US Marine Corps, until recently was Chief of the Targeting Branch in the Warfighter Division of the Fire Support and Combined Arms Operations Department at the Field Artillery School, Fort Sill, Oklahoma. Currently, he is a Watch Officer in the Command Center of Headquarters, Marine Corps, Washington, DC. Other assignments include serving as Fire Support Coordinator (FSCOORD) for the Sixth Marines, 2d Marine Division, Camp Lejeune, North Carolina; Commander of Battery D, 2d Battalion, 10th Marines, 2d Marine Division during Operation Desert Storm; and Commander of a Provisional Rifle Platoon in Battery H, 3d Battalion, 10th Marines, 2d Marine Division, during Multinational Force Operations in Beirut, Lebanon (1982). Major Kluba also has been an Instructor at the USMC Staff NCO Academy and The Basic School, both at Quantico Virginia.

WO 131A Targeting Transitioning Course

Warrant officers in modified table of organization and equipment (MTOE) units are being assigned as targeting or counterfire officers when they haven't been trained for the positions. All warrant officers in grades three through five who are serving as targeting or counterfire officers at the division artillery, brigade or corps levels must have either completed the Targeting Course as part of their basic or advanced training or the two-phase 4C-F47 Target Acquisition (TA) Technician Targeting Transition Course. The Targeting Course now offered as part of the Warrant Officer Basic and Advanced Course (WOBC and WOAC) at the Field Artillery School, Fort Sill, Oklahoma, qualifies the more junior warrant officers for the targeting and counterfire positions.

For the more senior warrant officers (those who graduated from WOBC and WOAC before December 1992) to qualify, they must complete the two-phase Targeting Transition Course. In the first phase, warrant officers must complete the 49 subcourses of the 061 W21 Interim Transition Targeting Course listed in DA Pam 351-20 Army Correspondence Course Program (ACCP) Catalog. After completing the subcourses, a warrant officer is eligible to attend the Phase II resident TA Technician Targeting Transition course at the Field Artillery School, applying through normal channels. The resident TA Technician Targeting Transition Courses scheduled for the remainder of FY 96 are Course 3-96 offered from 21 April to 10 May and Course 4-96 offered from 9 to 27 September.

Warrant officers are failing to complete the ACCP subcourses before applying for the resident course, which makes them ineligible for attendance. Training seats are going vacant or entire courses are being canceled because of ineligible applicants. With budget cuts, the course is in danger of elimination for lack of qualified students. The Radar Branch of the TA Division, part of the Fire Support and Combined Arms Operations Department (FSCAOD) at the Field Artillery School estimates that 25 percent of the population requires the targeting transition training.

If you have questions or problems, call CW5s Joseph A. Stephens or Stewart L. Ellis, Jr., of the Radar Branch: DSN 639-2408 or 4925 or commercial (405) 442-2408 or 4925.

Raymond Bernard, JRTC

Targeting—

A Force XXI Combined Arms Concept

by Colonel Paul H. Herbert, IN

A light infantry battalion task force was conducting search and attack operations against the elusive guerrillas of the Cortinian Liberation Front. The task force had little to show for its several days of effort and dozens of US casualties. Soldiers baked in the merciless heat at checkpoints and security perimeters and on dispersed reconnaissance patrols. Among them were the men of an M1A2 Abrams tank platoon, securing the battalion tactical operations center (TOC).

Raymond Bernard, JRTC

Suddenly, urgent voices over the TOC's radios punctuated by background gunfire announced significant contact with the enemy. A rifle platoon was in an ambush. Confused reports followed: "...mortar and small arms fire....pinned down....11 casualties, including the company commander."

The TOC battle captain summoned the tank platoon leader—"Move now to this location. Talk to Romeo Six Sierra on this push. Bail them out!"

The four tanks roared to life. In minutes, they were on the scene. Well protected from the Cortinian's weapons and accurately directed by the infantrymen on the ground, their main guns and machineguns decisively tilted the balance. Six Cortinian guerrillas lay dead while several others fled into the surrounding woods. The rifle platoon secured a hasty perimeter and began evacuating its casualties.

This incident actually happened in a rotation at the Joint Readiness Training Center (JRTC) at Fort Polk, Louisiana. The incident illustrates an important dimension of tactical planning that needs considerable emphasis in the Army: targeting. Things would have gone much better for the task force had the platoon been similarly employed in more of the task force's contacts. That, of course, would have required some anticipation of battlefield events and some contingency orders to the platoon, the command post and the rest of the task force.

Such readying of combat power to attack selected enemy elements in anticipation of likely battlefield events is exactly what targeting attempts to do with fires. Although poorly understood and executed by many combined arms leaders, targeting has the potential to be a powerful doctrinal driver of our Force XXI Army in a joint environment.

To realize that potential, the Army must overcome important problems of doctrine and branch culture. We must accept targeting as a core combined arms concept on a par with more familiar concepts, such as the forms of maneuver and types of offensive operations. Targeting is one means by which we can prepare officers intellectually for the future while properly employing the technologies of today.

Targeting Defined

"Targeting is the process of identifying enemy targets for possible engagement and determining the appropriate attack system to be used to capture, destroy, degrade or neutralize the target in question"

(*FM 6-20-10 Tactics, Techniques and Procedures for Targeting*, Page 1-1). It is a decision cycle described in doctrine by the shorthand terms *decide, detect, deliver* and (the recently added) *assess*. These mean that, first, one must *decide* what parts of an enemy force are to be attacked, to what effect and generally where, when and by what means. Next, these targets must be *detected* so they can be engaged. Then the friendly force must *deliver* the combat power that achieves the effects desired on the target. Finally one logically *assesses* the attack damage—information that leads to *deciding* which part of the enemy to attack and so on. This cycle is repeated continuously throughout a combat operation.

Targeting is thus an important procedural link between our concept for defeating the enemy on the one hand and our synchronization of combat power on the other. It allows us to use fires and other assets proactively through anticipation, rather than reactively, as when targets appear and generate calls-for-fire. Theoretically, targeting so applied greatly reduces the inherent friction of engaging the enemy with the right combination of combat power at the right time and place. It gives us both agility and the initiative.

Unfortunately, targeting is not done well at the JRTC, even when it is narrowly applied to the synchronization of indirect fires with maneuver. There are two key reasons. First, the doctrine is compartmentalized in the Field Artillery, whose officers become apostles to their sometimes skeptical maneuver bosses; second, and related to the first, maneuver branch officers do not provide the guidance needed for the targeting process to work. This is especially true of the maneuver commander's concept of the operation, which is the indispensable foundation of successful targeting. These difficulties betray larger problems of doctrine and branch culture that we must overcome.

Although targeting is described well in fire support manuals, it is not contained in the maneuver doctrine by which infantrymen and tankers are trained. Targeting may well be implicit in our capstone *FM 100-5 Operations*, which declares maneuver and firepower to be "inseparable and complementary dynamics of combat power" whose synchronization is "critical to the successful prosecution of combat operations." But targeting, per se, is not discussed as a dimension of fire support or maneuver or synchronization (Pages 2-10 and 2-13). Likewise, *FMs 7-30 The Infantry Brigade* and *7-20 The Infantry Battalion* do not mention a targeting process— nor do their respective mission training plans (MTPs) specify a targeting task to be performed.

Just as important, our doctrine for the planning process, formally articulated in FM 100-5 and informally updated through *Student Text 100-9 The Command Estimate Process* (published by the Command and General Staff College at Fort Leavenworth, Kansas), does not show how targeting fits into the sequence of producing an order or controlling a combat operation. This doctrinal contradiction plays itself out in dozens of TOCs on many simulated battlefields at our Combat Training Centers. Most maneuver staffs have an internal planning procedure based on ST 100-9. Rarely do these show how the targeting process fits into the planning or controlling functions of the staff and TOC, despite the claim in FM 6-20-10 that "targeting is an integral part of the planning process" (Page 1-1).

Consequently, two ideas compete for the time and attention of the battle staff. The first is some form of the military decision-making process driven by the commander, executive officer or S3 and the other is the targeting meeting driven by the fire support officer (FSO). Frequently, targeting is not included as an inherent part of either war-gaming or building a synchronization matrix. Instead, it is a separate demand on the time of the staff *after* the core maneuver work has been done. It usually involves the FSO and representatives of some of the other staff sections. That neither event produces the synchronization called for in our doctrine should not surprise us.

Even if we resolved these procedural problems (and they have been to a degree in some TOCs), effective targeting still would suffer from the incomplete guidance that most commanders give to their staffs. Too often, maneuver commanders are unskilled in the art of envisioning the battle and giving good guidance to their staffs, despite a clear doctrinal responsibility to do so.

"Synchronization....takes place first in the minds of commanders and then in the actual planning and coordination of movements, fires and supporting activities," declares our capstone doctrine. FM 7-30, FM 7-20 and the targeting manual concur. The latter asserts, "The maneuver commander is responsible for the targeting effort" (Page 1-4).

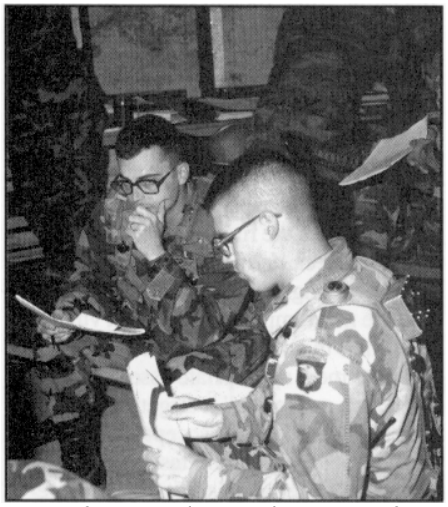
The maneuver commander's concept of the operation, based firmly on a vision of the enemy and how to defeat him, is the indispensable but often missing foundation of effective targeting. The maneuver commander develops his mental image of the synchronized fight through his mission analysis, intent, command estimate and concept; all are founded on a thorough intelligence preparation of the battlefield (FM 100-5, Pages 2-8 and 6-6).

Even when conscientious commanders make an effort to meet this requirement, the results too frequently fall short. The guidance too often is restricted to purely maneuver concepts, such as the type of operation and resourcing guidance (e.g., priorities of effort). Rarely will a commander demonstrate a conceptualization of the enemy as a system of interdependent systems with key vulnerabilities in time and space that can be defeated by the coordinated effort of his task force.

Changing Our Ways

The consequences of compartmentalized doctrine and weak commander's guidance are poor targeting, unsynchronized application of combat power and operations that lack agility. The solutions to these problems are within our means. Our doctrine and leadership are good enough that marginal adjustments should bear major improvements. The biggest challenge will be to adjust the thinking of maneuver arms leaders within branch cultures while retaining their indispensable core values and competencies.

Making targeting a core concept is the critical first step. As long as targeting remains narrowly cast as a fire support procedure, it will not realize its full potential. Somewhat paradoxically, fire support targeting points the way toward targeting as a core concept.



Raymond Bernard, JRTC

Too often, targeting meetings occur after the core maneuver work has been done.

The doctrinal basis for the fire support function is the fact that much of the combat power available to maneuver commanders comes "not from within their chain of command but from external resources" (FM 100-5, Page 2-13). As technology advances and joint contingency operations become the norm, this is more and more the case. The line infantry and tank units of a battalion or brigade task force account for a smaller proportion of the total combat power available to the task force commander. Much of the combat power available to him resides in other-than-ground-maneuver forces. These do not execute the forms of maneuver or types of offensive operations. A different concept of employment is required, and that concept is targeting.

With certain adjustments, targeting is equally applicable to all joint combat and combat support assets available to the commander, including his own subordinate maneuver forces.

Targeting's applicability to maneuver forces is clearly illustrated by the introduction to this article: the infantry battalion task force on the unconventional battlefield. The challenge is to operate on a 360-degree battlefield and find and destroy an elusive enemy who presents only fleeting targets, to employ lethal means selectively and precisely against those targets to minimize collateral damage, and to support one's operation with a host of non-lethal means. The latter include civil affairs and psychological operations, which may constitute one's main effort.

To meet this challenge, one employs the appropriate maneuver doctrine, called "search and attack." It is characterized by the terms "find, fix and finish," in which infantry forces reconnoiter to find the enemy; conduct ambushes and other combat tasks to fix him in position; and (or) employ artillery, mortars, close air support (CAS) or direct assault to finish him (FM 7-20, Pages 3-18 to 3-23).

The logic underlying search and attack also underlies the fire support doctrine of *decide, detect, deliver*. In both cases, we are attempting to decide what enemy assets are most important and most vulnerable, find them and attack them quickly with the most appropriate asset.

"Search and attack" is targeting applied to maneuver forces. It accepts the notion of the infantry battalion task force as an extended target acquisition and engagement system in which infantry can play a variety of roles. The maneuver commander who grasps this concept and makes his targeting meeting the centerpiece activity for his battle staff every day and includes every available element of combat power among the assets to be harnessed by targeting has taken a significant step toward effectiveness against a paramilitary enemy force.

That commander should be no less inclined to think in targeting terms when faced with a more conventional enemy. Such an enemy still must be considered broadly in time and space. His key vulnerabilities must be detected and attacked throughout the battlefield with the most appropriate systems so we have the relative advantage at the decisive place and time. The logic and procedures of targeting are entirely applicable as a key link between all enemy vulnerabilities and all elements of combat power at our disposal.

Making this broadened concept a reality requires modification of our doctrine. Targeting must be written into FM 100-5 as a core combined arms concept. Then, the various manuals can be updated to reflect consistency across the force, especially among the 7-, 17-, and 71-series of manuals that describe the roles of maneuver headquarters.

The other key piece is our staff planning doctrine in *FM 101-5 Command and Control for Commanders and Staffs*. This must describe targeting as both planning and control functions; show clearly the relationships of intelligence, maneuver and other combat functions in the targeting process; and place targeting clearly in the military decision-making process.

Getting the doctrine right is the first step toward developing leaders and training staffs who can apply targeting readily. Maneuver officers must be trained to think of their organizations as the key integrating mechanisms for all combat power available. This is especially important for the future Army, which may well consist of multiple task forces dispersed throughout the battlespace, each on its own 360-degree battlefield, harnessed together by high-technology information links and shared situation data. The vision is not unlike the 360-degree battlefield described earlier. Targeting will apply.

The Army and its maneuver branches must come to grips with the cultural changes this implies. The maneuver arms culture derives from technology that requires one to mass large numbers of armed men in close proximity to the enemy to bring decisive combat power to bear. The culture causes officers to envision the battlefield in terms of maneuver forms required to position men and weapons: area or mobile defense; frontal attack, envelopment, turning movement; and movement-to-contact, hasty or deliberate attack, exploitation or pursuit.

These forms are indispensable but incomplete. As technology gives us more and more combat power that is not dependent on such forms, we must adapt our doctrine and our culture to account for it. Otherwise, our culture will become a barrier to greater combat power.

Deep battle and battlespace are exemplary concepts in the right direction. So is targeting. It carries the potential to transform our TOCs from strictly hierarchical command and control headquarters of maneuver formations to tactical integrating centers (TOCs acting like land force airborne warning and control systems, or AWACs) for the entire panoply of joint combat power.

Adopting targeting as a core concept, integrating it into our doctrine and developing our officers accordingly is positive growth. It is the sort of intellectual change relevant to our present that prepares us for physical change to come.

Force XXI maneuver headquarters must be skilled at targeting—not just as a means of managing indirect fires, but also as a central concept for synchronizing joint combat power. Employing such a concept, we can win with fewer Americans having to decide the issue at the point of a bayonet, a value that even the hardiest among us can support.

Colonel Paul H. Herbert, Infantry, until recently was a Senior Task Force Observer/Controller at the Joint Readiness Training Center at Fort Polk, Louisiana. Currently, he's a Marshall Fellow in the College of Strategic Studies and Defense Economics at the Marshall Center in Germany. Colonel Herbert commanded the 1st Battalion, 27th Infantry, part of the 25th Infantry Division (Light) in Hawaii, and two companies, one in the 2d Infantry Division in Korea and one in the 1st Armored Division in Germany. He's a graduate of the Army War College, Carlisle Barracks, Pennsylvania, and holds a Doctorate of in American Military History from Ohio State University. He is the author of Leavenworth Paper 16, "Deciding What Has to Be Done: General William E. Depuy and the Writing of *FM 100-5 Operations,* 1976," published by the Combat Studies Institute at Fort Leavenworth, Kansas.

Digital Counterfire *Before* AFATDS

by Chief Warrant Officer Three Millard Lowry, Jr.,
and Captain Ransford A. Reinhard II

Courtesy of Codar

For years, AN/TPQ-37 Firefinder radars reported digitally directly to the brigade fire control element (FCE) or by voice to the target production cell (TPC) in the 18th Field Artillery Brigade (Airborne), Fort Bragg, North Carolina. This configuration tended to overload the brigade FCE. In addition to radar reports, the FCE directed fire mission messages to the division artillery (Div Arty) and general support (GS) artillery battalions, received mission-fired reports from the battalions and processed messages-of-interest (MOIs) to and from the Div Arty.

The "Old" Process. The TPC, with the brigade fire control officer (FCO) and counterfire officer (CFO), were restricted to voice input and had to manually track counterfire targets. A radio call from the radar operator initiated action at the TPC. The information received over the voice radio net was logged, transferred to a target card, plotted on the current situation map board and handed off to the FCO/CFO for evaluation. After clearing the target, the FCO/CFO would identify the delivery unit—Div Arty, GS battalion or multiple-launch rocket system (MLRS)

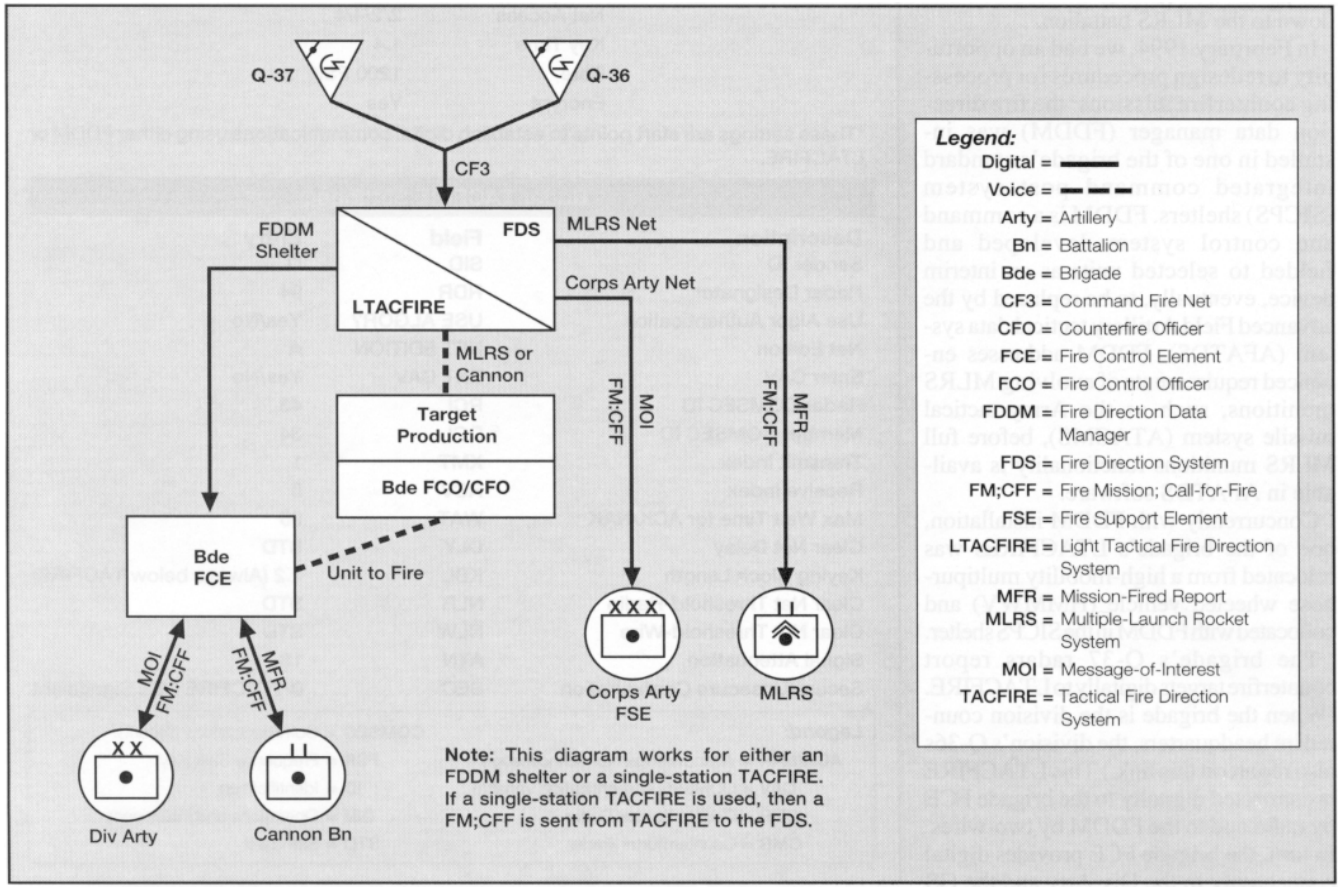


Figure 1: 18th Field Artillery Brigade's Digital Flow for Counterfire Operations

battalion—to engage the target. Once the delivery unit had been added to the target card, the brigade FCE lightweight tactical fire direction system (LTACFIRE) operator entered the information into the system and transmitted it digitally to the appropriate unit.

Extreme care had to be taken to ensure that no transposition errors occurred each time target coordinates were recorded, transferred to the target card and entered into LTACFIRE. This process—from receipt of radio call through transmission of the fire mission message from the brigade FCE LTACFIRE—took approximately two and one-half minutes.

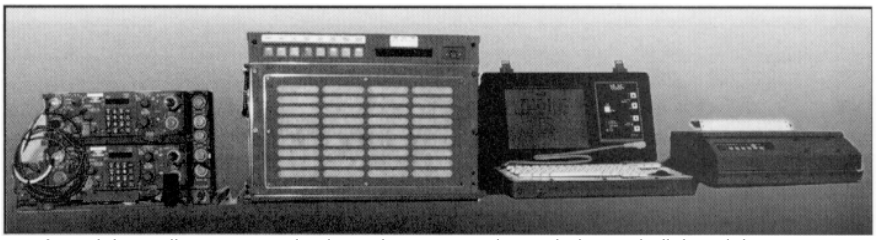
Streamlining Counterfire. The MLRS, with its rapid response time, large footprint and high volume of fire, is a superb weapon for counterfire missions. In tactical and training standing operating procedures (SOPs), the 18th FA Brigade has MLRS as the weapon of choice for counterfire missions. With MLRS the primary weapon and Q-37 radars to identify counterfire targets, the biggest task facing the brigade CFO is to streamline the process of getting the fire mission down to the MLRS battalion.

In February 1994, we had an opportunity to redesign procedures for processing counterfire missions: the fire direction data manager (FDDM) was installed in one of the brigade's standard integrated command post system (SICPS) shelters. FDDM is a command and control system developed and fielded to selected units as an interim device, eventually, to be replaced by the advanced Field Artillery tactical data system (AFATDS). FDDM addresses enhanced requirements of evolving MLRS munitions, such as the Army tactical missile system (ATACMS), before full MLRS munitions functionality is available in AFATDS software.

Concurrently with FDDM installation, one of the brigade's LTACFIREs was relocated from a high-mobility multipurpose wheeled vehicle (HMMWV) and collocated with FDDM in the SICPS shelter.

The brigade's Q-37 radars report counterfire targets digitally to LTACFIRE. (When the brigade is the division counterfire headquarters, the division's Q-36s also report on this link.) This LTACFIRE is connected digitally to the brigade FCE by radio and to the FDDM by two-wires. In turn, the brigade FCE provides digital connectivity to the Div Arty and the GS artillery battalion while the FDDM provides digital connectivity to the corps arillery fire support element (FSE) FDDM and the MLRS battalion.

Figure 1 (on Page 11) shows the digital flow for counterfire processing in the 18th FA Brigade. With digital connectivity to all elements, the brigade TPC uses the voice net only to support special situations. Figure 2 shows a sample subscriber table for effected elements. This new configuration has worked well for the 18th FA Brigade on many exercises during the last year and has repeatedly proved its worth.



Courtesy of Codar

Left to right: radios, communications data processing unit (CDPU), lightweight computer unit (LCU) and printer. Adding a communications security device (not shown) completes the FDDM.

Element	Logical Name	Device	Address
Brigade FCE	_/_/_/18/Bde	TACFIRE	A
Brigade O&I (Single)	_/_/_/18/OI	TACFIRE	B (34-DCI)
Brigade FDDM	_/_/_/18/CFO	FDS	C
AN/TPQ-37	C/B/R/94/—	TACFIRE	D (43-RCI)
AN/TPQ-36	C/M/R/91/—	TACFIRE	E

LTACFIRE Net Settings

Net	CF3 (or Any Common Net)*
Net Access	2/2/4/4
Key Time	1.4
Rate	1200 FSK
Encrypt	Yes

*These settings are start points to establish digital communications using either FDDM or LTACFIRE.

Radar TACFIRE Settings

Description	Field	Entry
Sender ID	SID	D
Radar Designator	RDR	94
Use Algor Authentication	USE ALGOR?	Yes/No
Net Edition	NET EDITION	A
Enter CAV	ENT CAV	Yes/No
Radar COMSEC ID	RCI	43
Member COMSEC ID	DCI	34
Transmit Index	XMT	1
Receive Index	RCV	0
Max Wait Time for ACK/NAK	WAT	05
Clear Net Delay	DLY	STD
Keying Block Length	KBL	1.2 (Always below TACFIRE)
Clear Net Threshold-Radio	NLR	STD
Clear Net Threshold-Wire	NLW	STD
Signal Attenuation	ATN	18
Secure/Unsecure Configuration	SEC	0/1 TACFIRE FCE Significant

Legend:

ACK/NAK = Acknowledge/Nonacknowledge
CAV = COMSEC Authentication Variable
CBR = Counterbattery Radar
CMR = Countermortar Radar
COMSEC = Communications Security
FSK = Frequency Shift Key
ID = Identification
O&I = Operations and Intelligence
STD = Standard

Figure 2: Sample Subscriber Tables for Digital Communications in Counterfire Operations

Figure 3 shows the brigade tactical operation center (TOC) set up with the FCE, S2, FDDM and TPC. When a radar reports a target, the LTACFIRE operator verbally alerts the TPC and calls out the six-digit grid coordinates of the target. Responding to the call, the target is plotted on the current situation map board; the brigade FCO/CFO clears the target for engagement and calls either "MLRS" or "cannon." The LTACFIRE operator then transmits the target message to the appropriate system—FDDM or brigade FCE LTACFIRE. The length of time from receipt of the target message from the radar until the message is transmitted out of the SICPS averages 10 seconds—a considerable improvement over two and one-half minutes under the old configuration.

An objective of the XVIII Airborne Corps at Fort Bragg is to enhance communications to link long-range sensors rapidly with long-range weapons, such as ATACMS. As part of this endeavor, the corps asked the MLRS Project Office to provide baseband interface adapters (BIAs) and TACFIRE interface devices (TIDs) to support FDDM.

In January 1995, BIAs and TIDs were installed in the FDDM SICPS shelters of the XVIII Airborne Corps Artillery and the 18th FA Brigade. In March, BIAs and TIDs were installed with the FDDM already in the fire direction center (FDC) M-577 of 3d Battalion, 27th Field Artillery (MLRS).

With BIA and TID, FDDM interfaces through the mobile subscriber equipment (MSE) system. This MSE interface enhances the combat net radio system by adding packet switching, circuit switching and high-speed data rates.

Conclusion. While reducing the time required to direct a counterfire mission is important, the most significant benefit of the configuration is direct digital connectivity. The coordinates generated by the radar are the coordinates received by the fire unit—without the possibility of operator transposition errors.

Through LTACFIRE, the brigade TPC also has digital access to the sensors rather than having to rely on the voice net to direct employment and track targets from the sensors.

With the work load reduced and the brigade FCE able to focus on shooting fire missions, the 18th FA Brigade leads the way in streamlining fire support processing.

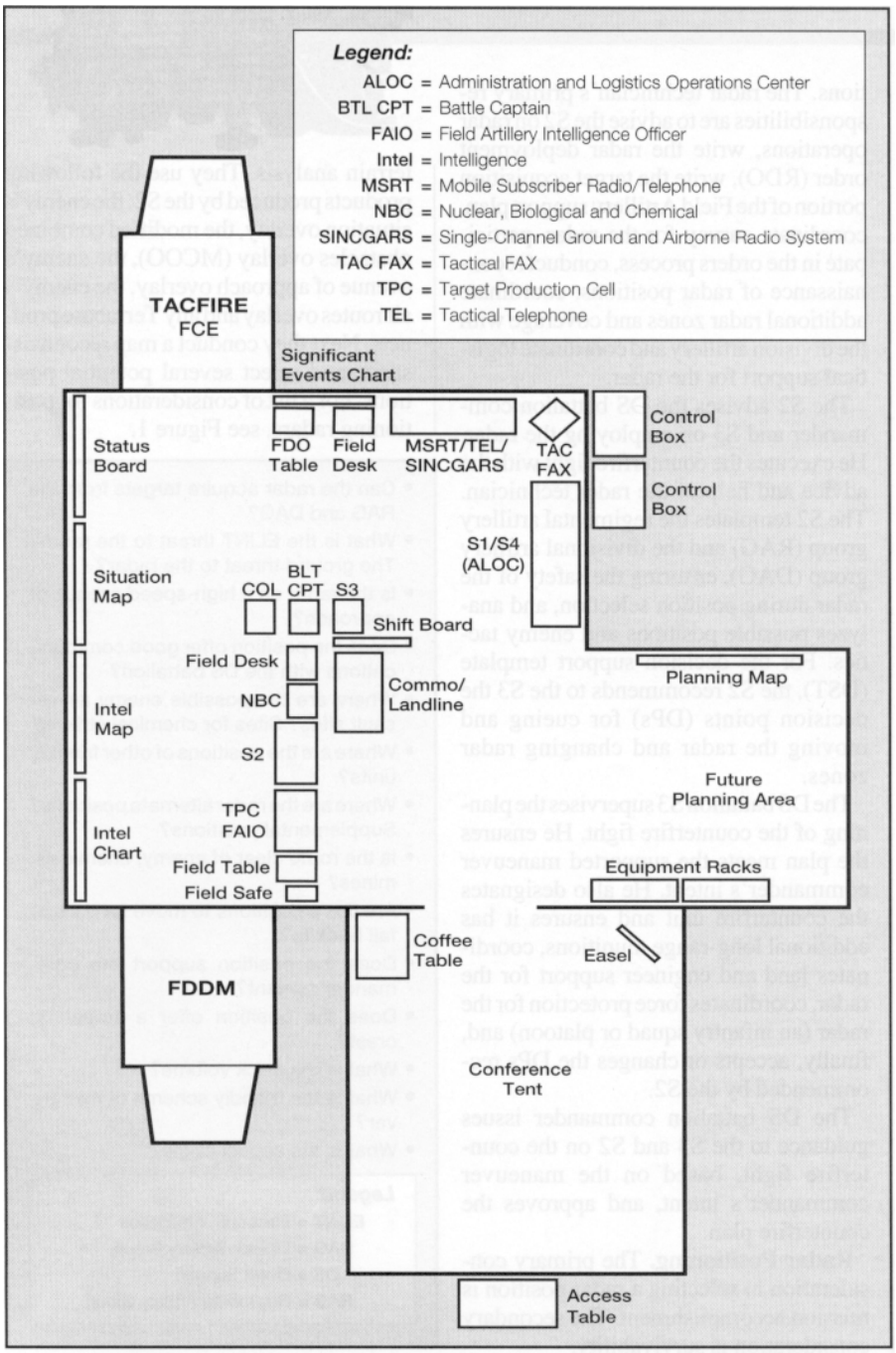


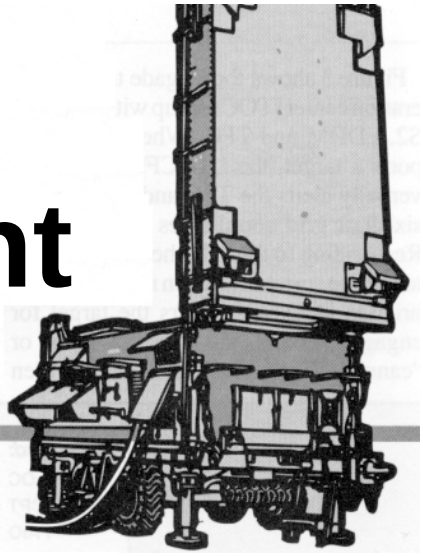
Figure 3: Brigade Tactical Operations Center (TOC)—Relationship of the FCE, S2, FDDM and Targeting Section

Chief Warrant Officer Three Millard Lowry, Jr., is the Counterfire Targeting Officer for the 18th Field Artillery Brigade (Airborne), Fort Bragg, North Carolina. He also has served as a Radar Technician for more than 10 years, including for the 2d Infantry Division, Korea; and 10th Mountain Division (Light Infantry), Fort Drum, New York.

Captain Ransford A. Reinhard II until recently was the Counterfire Officer for the 18th Field Artillery Brigade at Fort Bragg. Currently, he's the S4 of the 5th Battalion, 8th Field Artillery, also part of the 18th Field Artillery Brigade. His previous assignment was with the 2d Battalion, 32d Field Artillery, 41st Field Artillery Brigade, in Germany, where he served as the Battalion Maintenance Officer, Battery Operations Officer, Ammunition Platoon Leader and Firing Platoon Leader.

TTP for Winning the Counterfire Fight

by Chief Warrant Officer Two Keith A. Derrick and
Captain Davis L. Butler



This article describes tactics, techniques and procedures (TTPs) for the artillery battalion to plan and execute counterfire—to win the counterfire fight. The TTP was refined by the 2d Battalion, 82d Field Artillery—a direct support (DS) battalion in the 1st Cavalry Division, Fort Hood, Texas—during a recent rotation at the National Training Center (NTC), Fort Irwin, California. Although in this article we describe a counterfire fight against an enemy using the "Krasnovian" phases of fire, the TTP can be modified to fight an enemy that uses conventional tactics.

DS and general support (GS) battalion S2s face a challenge in fighting the counterfire battle. Unfortunately, not many articles or few manuals address the counterfire fight with any degree of detail. To win, you must understand the responsibilities of key personnel, considerations in positioning the radar, the war-gaming process, radar zone management and considerations in moving and cueing the radar. You also must thoroughly rehearse the plan and then execute it to meet the commander's intent.

Personnel Responsibilities. The key counterfire personnel in the tactical operations center (TOC) are the radar technician and the DS battalion S2, S3 and commander.

The radar technician's role is changing today, Currently, the modified table of organization and equipment (MTOE) states the targeting officer in the S2 section is a radar technician. The mission training plan (MTP) recommends sending the targeting officer to the brigade fire support element (FSE). Therefore, a void exists in radar management in the DS battalion TOC.

During our most recent NTC rotation, we used the radar technician from the radar section in the DS battalion TOC to assist and advise the S2 on radar operations. The radar technician's primary responsibilities are to advise the S2 on radar operations, write the radar deployment order (RDO), write the target acquisition portion of the Field Artillery support plan, coordinate survey for the radar, participate in the orders process, conduct reconnaissance of radar positions, coordinate additional radar zones and coverage with the division artillery and coordinate logistical support for the radar.

The S2 advises the DS battalion commander and S3 on employing the radar. He executes the counterfire fight with the advice and help of the radar technician. The S2 templates the regimental artillery group (RAG) and the divisional artillery group (DAG), ensuring the safety of the radar during position selection, and analyzes possible positions and enemy tactics. For the decision support template (DST), the S2 recommends to the S3 the decision points (DPs) for cueing and moving the radar and changing radar zones.

The DS battalion S3 supervises the planning of the counterfire fight. He ensures the plan meets the supported maneuver commander's intent. He also designates the counterfire unit and ensures it has additional long-range munitions, coordinates land and engineer support for the radar, coordinates force protection for the radar (an infantry squad or platoon) and, finally, accepts or changes the DPs recommended by the S2.

The DS battalion commander issues guidance to the S3 and S2 on the counterfire fight, based on the maneuver commander's intent, and approves the counterfire plan.

Radar Positioning. The primary consideration in selecting a radar position is mission accomplishment. The secondary consideration is survivability.

Radar position selection starts with the S2 and the radar technician's conducting terrain analysis. They use the following products produced by the S2: the enemy's situation overlay, the modified combined obstacles overlay (MCOO), the enemy's avenue of approach overlay, the enemy's air routes overlay and any Terrabase products. Next they conduct a map reconnaissance and select several potential positions. For a list of considerations for positioning radars, see Figure 1.

- Can the radar acquire targets from the RAG and DAG?
- What is the ELINT threat to the radar? The ground threat to the radar?
- Is the radar on a high-speed avenue of approach?
- Does the position offer good communications with the DS battalion?
- Where are the possible enemy air assault sites? Sites for chemical strikes?
- Where are the positions of other friendly units?
- Where are the radar alternate positions? Supplemental positions?
- Is the route clear of enemy, chemicals, mines?
- Are there positions to move forward or fall back to?
- Does the position support the commander's intent?
- Does the position offer a screening crest?
- What is the track volume?
- What is the friendly scheme of maneuver?
- What is the aspect angle?

Legend:

ELINT	=	Electronic Intelligence
DAG	=	Division Artillery Group
DS	=	Direct Support
RAG	=	Regimental Artillery Group

Figure 1: Considerations for Positioning Radars

As the S2 and radar technician analyze positions on the map, they reduce the number to the best possible sites. They select three (primary, alternate and supplemental) sites and recommend the positions to the S3, who accepts or rejects the positions before the war game. The S3 coordinates the radar's positions with the maneuver unit S3.

The radar technician reconnoiters the sites to select the best one, ensuring it supports the mission. If the primary position proves unsuitable, the radar technician proceeds to the alternate position. He then recommends his choice to the S3. For maximum survivability, the radar occupies the site after dark.

- What is the counterfire unit? (Unit designated by the S3 on the FDO's recommendation, considering range, munition and position.)
- What will happen if multiple target acquisitions occur simultaneously?
- What is the standard fire order? (The FDO recommends the standard fire order for S3's approval, ensuring it meets the commander's guidance.)
- What are the DPs on when to move the radar? (The DPs are based on the phases of fire or accumulated cue time.)
- What are the DPs to change the radar zones? (The DPs are based on the phases of fire or maneuver unit's advance.)
- What are the DPs on when to start cueing?
- Are radar zones planned throughout the depth and width of the battlefield, anticipating enemy and friendly movement?
- When does the S3 want the RAG to move?
- Does the plan account for overwhelming success? For catastrophic failure?
- How many tubes must be destroyed to meet the commander's intent?
- Can the CFFZs be pre-cleared with the FSOs?
- What are the DPs on massing the battalion on the RAG?
- What is the cueing schedule during the different phases of fire?
- What is the methodology to track the destruction/force ratio of the enemy artillery?

Legend:

DPs	=	Decision Points
CFFZs	=	Call-for-Fire Zones
FDO	=	Fire Direction Officer
FSOs	=	Fire Support Officers
RAG	=	Regimental Artillery Group

Figure 2: Checklist for Planning Counterfire during War Gaming

War Gaming. The S2 and radar technician plan, coordinate and synchronize the counterfire fight during the war-gaming process. The S2 recommends call-for-fire zones (CFFZ) and DPs, based on the enemy's situation template. He coordinates with the fire support officers (FSOs) to receive their critical friendly zones (CFZ). See Figure 2 for a list of considerations for planning counterfire during war gaming.

There are several critical DPs discussed in the war-gaming process. One of the most critical for the DS battalion is forcing the RAG to move, which allows the radar and the counterfire unit to move. The only way to force the RAG to move is to neutralize (10 percent) or destroy (30 percent) it.

Another critical decision arises when target acquisitions occur simultaneously; the counterfire unit can become overwhelmed quickly. There are several options available when the radar receives dual acquisitions.

The best option is for the DS battalion to engage one target and pass the other to the division artillery. This allows the battalion and division artillery to mass on two separate targets.

Option two is for the DS battalion to engage the targets with organic assets (battalion and mortars). Option two also allows for massing on two separate targets; however, one must be within range of the mortars.

Option three is to pass the targets to the division artillery. This is the least desirable option because the division artillery may not fire on both targets, particularly if it's involved in a heavy counterfire fight with the DAG.

War gaming determines the DPs and triggers for cueing and moving the radar and changing the radar zones. This information should be listed on the DST. Based on the results of the war game, the S2 and radar technician make the CFZ and CFFZ overlay, listing the phase of fire associated with each zone, and then write the RDO.

Radar Zone Management. The S2 and radar technician base radar zone management on friendly maneuver units' locations, the mission and the enemy's phases of fire. The S2 templates the RAG. The radar's primary azimuth of search orients on the RAG, which may be split into two CFFZs.

The most difficult zones to manage are CFZs. The challenge is to manage these zones when the maneuver units move. The CFZs come from the maneuver commander who is responsible for force protection. He decides what critical assets he needs to protect to succeed. Therefore, he decides which assets receive radar coverage.

Unfortunately, many maneuver commanders don't understand the radar's capabilities. Therefore, the fire support coordinator (FSCOORD) or FSO must advise

C Battery of 2d Battalion, 82d Field Artillery conducts a tactical move in a battalion external evaluation—a train-up for the NTC.

the maneuver commander and help him select CFZs.

During Phase I fires in both the offense and defense, the enemy division commander attempts to shape the battlefield for his regimental commanders. The DAG shoots Phase I fires. Generally, the DS battalion's Q-36 radar won't acquire targets from the DAG due to range. Therefore, the radar technician coordinates with the division artillery's Q-37 radar for coverage of Phase I fires.

The division artillery will assign the battalion one to three coverage zones, depending on whether or not the DS battalion's maneuver unit is the main effort. Because the division artillery is already trying to locate the DAG, the DS battalion uses its zones for force protection (CFZs). The S2 gives the division artillery a specific time for the coverage to begin (i.e., "NLT_____"). The S2 should coordinate additional Q-37 CFZ coverage when he anticipates the Q-36's moving—the division artillery may or may not be able to support the request.

The S2 advises the FSO on the number of CFZs available and recommends CFZs, based on the different enemy phases of fire. The FSO advises the maneuver commander on the number of CFZs available, who then decides which zones receive coverage, based on the enemy's phases of fire and the friendly scheme of maneuver. Figure 3 lists the types of targets engaged by the enemy in the different phases.

The S2 changes the radar's zones of coverage as the phases change. The FSOs or targeting officers must give the S2 copies of their maneuver graphics with the axis or route of advance, breach site and maneuver positions with the approved CFZs marked so he can manage the radar coverage.

Radar Movement. The S2 and targeting technician move the radar based on the enemy's phases of fire and accumulated cueing time. Moving the radar at a critical time in the battle may cause the supported unit to take heavy losses.

The radar should move when the RAG is silenced or moving. The best way to anticipate the RAG's moving is to force it to move with counterfire, ideally during its most important phase of fires. During the war-gaming process, the battalion S2 and S3 decide when they want the RAG to move or when accumulated cueing time can cause radar detection; they include these events as DPs on the DST.

During the enemy's offense, the most important fires occur at Phase II. At the start of this phase, the radar is set with no accumulated cueing time. The radar section must try not to use all the cueing time during this phase, saving some for Phase III. Hopefully, the enemy attack will be defeated before Phase IV. However, if the attack succeeds, moving the radar at that point could be dangerous.

During the enemy's defense, the RAG starts shooting in Phase II. Therefore, the S2 should position the radar as far forward as possible with no accumulated cueing time. The most important phase during the defense is Phase III fires, so the radar section uses the remaining cueing time during this phase. The DP to move the radar should be during Phase III fires. The S2 section should move it forward to maintain maximum coverage and have it set prior to Phase IV. The radar should not move during Phase IV or Phase V.

Finally, timing the movement of the radar is difficult. The S2 section should force the RAG to move with the appropriate volume of counterfire. If no acquisitions are made within five to 15 minutes after the last counterfire mission, then it is safe to move the radar.

Any time the radar moves, coverage must be coordinated with the division artillery.

Radar Cueing. Cueing consists of two parts: cueing agents and the cueing schedule. Cueing agents are individuals or units designated to cue the radar. Authorized cueing agents may be the maneuver commander, DS battalion commander, S3, S2 and lead maneuver unit. The number of authorized cueing agents should be limited to prevent unnecessary cueing; the radar should cue for only one minute of accumulated time. The radar section should ask the cueing agent how much time is needed to avoid wasting cueing time.

The most important of the two parts of cueing is the schedule. The cueing schedule informs the radar how long to radiate. Several factors affect the cueing schedule: the electronic intelligence (ELINT) threat to the radar, the enemy's phases of fire, proactive cueing and reactive cueing.

If the ELINT threat is high, the radar should cue no more than 15 to 30 seconds "on" and 15 to 60 seconds "off." Decreasing the cueing time reduces the probability of ELINT detection.

During the enemy's most important phase of fire, the cueing time should increase to 30 to 45 seconds "on" and 5 to 15 seconds "off." This increases the probability of the radar's detecting the RAG during the phase it will be shooting the most.

Proactive cueing is difficult. It requires the S2 to predict when the enemy artillery will start shooting. If he's correct, the radar starts cueing just before the RAG shoots, so friendly assets can attack the RAG immediately. Managing accumulated cueing time is critical during proactive cueing.

The other type of cueing is reactive. Once friendly units receive fire from the enemy artillery, the radar starts cueing. Reactive cueing requires a quick-voice net.

Rehearsing Counterfire. A critical part of counterfire is rehearsing. The rehearsal synchronizes the counterfire fight with the scheme of maneuver and the sensor-to-shooter link. The S2 and radar technician rehearse the counterfire plan with the radar and the S2 sections. They rehearse

Offensive Phases of Fire	
Phase I:	MLRS, Cannon Artillery, C^3I, Attack Reserves, Reserves, Logistics, Attack Helicopter FARPs
Phase II:	Battle Positions, Cannon Artillery, CP, Communication Centers
Phase III:	Battle Positions Hindering Advance, Observers, Mortars
Phase IV:	ADA, Counterattack Routes, Anti-Tank Weapons, Cannon Artillery, CP, Mortars

Defensive Phases of Fire	
Phase I:	Artillery
Phase II:	1st Echelon Maneuver Units, ADA, CP, Engineers, Choke Points
Phase III:	Breach Site, Massed Troops (Assault, Breach or Support Forces), Engineers, ADA, CP
Phase IV:	Same as Phase III
Phase V:	Targets are the same as those listed in the first three phases of the Offensive Phases of Fire.

Legend:

ADA = Air Defense Artillery
C^3I = Command, Control, Communications and Intelligence
CP = Command Post
FARPs = Forward Area Rearm/Refuel Points
MLRS = Multiple-Launch Rocket System

Figure 3: The Enemy's Targets by Phases of Fire. The S2 changes the radar's zones of coverage as the phases change.

the radar zones during the different phases; use of the radio nets (digital and voice); times to be ready to radiate, prepare to march order and report accumulated cueing; DPs for movement and to start cueing; cueing schedule; and use of the code words.

Finally, the S2 and radar technician participate in the brigade fire support rehearsal. They rehearse DPs for the zones' becoming active and changing, radar's moving, starting cueing, passing targets and massing the battalion.

Counterfire Fight. The following scenario explains the counterfire fight. The interaction among the S3, S2 and radar technician is the most important factor in synchronizing the counterfire fight.

During the battle, the radar technician manages the counterfire fight and radar zones for the S2. He calls the division artillery to ensure the CFZs coordinated with it receive division artillery coverage as the first DP for Phase I fires approaches. The S2 tells the radar technician when the phases of fire begin changing.

As the time approaches for the DP to cue the radar (Q-36) for Phase II fires, the S2 analyzes the targets the enemy is shooting and tells the S3 when the phases of fire change. He also recommends changing the radar zones.

After changing the zones, the radar acquires two targets. The radar passes the targets to the S2 and radar technician for analysis: Does the location of the targets confirm or deny the templating is correct? Do the zones need to be moved?

The S2 informs the S3 of the acquisitions and the location of the targets, confirms the RAG is firing and recommends attacking the targets. The S3 tells the FDO to engage one target with a battalion mass mission and passes the other to the division artillery.

A DP to change the zones approaches. Once again the S2 analyzes the targets the enemy is shooting and recommends the S3 change the zones. After the zones change, the radar technician alerts the S2 that the DP to move the radar is reached; the S2 makes a recommendation to the S3 on whether or not to move the radar as determined by the situation.

The TTP in this article proved effective during our recent NTC rotation. This information is a start point to help the DS/GS battalion S2 develop a plan for and then execute a counterfire fight that allows the maneuver commander to concentrate on fighting the enemy's maneuver forces—not the enemy's artillery.

Chief Warrant Officer Two Keith A. Derrick is a Target Acquisition Warrant in B Battery, 26th Field Artillery, part of the 1st Cavalry Division, Fort Hood, Texas. Among other assignments, he was a Section Chief of a Lance Assembly and Transporter Team for 2d Battalion, 377th Field Artillery in Germany and an Instructor at the Lance Missile Branch of the Gunnery Department, Field Artillery School, Fort Sill, Oklahoma.

Captain Davis L. Butler is the S2 for the 2d Battalion, 82d Field Artillery, part of the 1st Cavalry Division. His previous assignments include tours as a Targeting Officer in the Aviation Brigade and then Reconnaissance Survey Officer for the 6th Battalion, 37th Field Artillery, both in the 2d Infantry Division, Korea; and battery Fire Direction Officer and Platoon Leader in the 3d Battalion, 35th Field Artillery, 72d Field Artillery Brigade, Germany.

Leadership Vignette: Meeting the Standard

When I was a young private in the 82d Airborne Division, approximately 15 years ago, I had as my first squad leader a hard-nosed NCO named Sergeant Rogers. He had a very basic philosophy: do what I say when I say and complete it to my standards.

It didn't take me long to figure out he was serious. Within two weeks, I had improved my push-ups tenfold. For a while I thought my name was changed to "Drop." It seemed like every time I turned around, Sergeant Rogers was there, and I was doing something other than what I was supposed to be doing.

He made it a point to know everything about me—my family, where I was from, how I did in school, my hobbies and even all about my checking account (which he inspected twice a month). I thought he had a special interest in my room, for every morning at 0515 he would blast into it and identify enough gigs to bring my team leader to the verge of a stroke.

I knew that four years of this would ultimately kill me, so I devised a plan to elude the wrath of Sergeant Rogers. I started spit shining my boots and starching my uniform. Immediately after work, I squared my room away. I anticipated daily missions and completed them before I was told to do so. Throughout the day, I maintained the personal appearance and military bearing expected of airborne personnel.

Soon the push-ups were coming fewer and further apart, Sergeant Rogers' morning blasts into my room were uneventful and I was performing more missions with less supervision. I thought I had finally broken away from Sergeant Rogers' grip. Imagine my surprise when I figured out that in eluding the wrath of Sergeant Rogers, I had inadvertently become a squared-away airborne soldier.

I didn't understand what was happening until I received my counseling statement. It stated I was performing in an outstanding manner, showing initiative, pride and maturity. The statement ended with a "You're doing a great job, Airborne. Keep up the great work."

The art of leadership is defined as "The ability to influence soldiers in such a manner as to accomplish the mission." As a leader, Sergeant Rogers was tough and set high standards, accepting nothing less—mission first, people always. He accomplished this by discovering everything there was to know about his soldiers, then individually and unbeknownst to the other squad members, drew them from their shells and molded them into airborne soldiers.

Sergeant Rogers' squad consistently performed above and beyond the company's standards. His ability to guide, supervise and instill a sense of discipline and pride in all of his soldiers was the key to his leadership style.

Through his leadership, I realized the true meaning of taking care of soldiers. Sergeant Rogers' example has aided me through the ranks from private, to staff sergeant and to my present rank.

CPT Patrick W. Maloney, FA
FA Officer Advanced Course 1-95

Lightweight Laser Designator Rangefinder (LLDR)

Future Watch:
Target Acquisition and Precision Attack Systems

by Lieutenant Colonel Robert M. Hill

Field Artillery combat developments is at a truly pivotal juncture in its history. Spurred by tremendous advances in technology, it is hurtling toward the 21st century at an amazing rate, leveraging every conceivable information-age capability to transform its aging fleet into a force that is not just new, but Better—with a capital "B." In combat developments, many changes that were once evolutionary are now revolutionary. We need look no further than Crusader, our 21st century cannon system, to understand the truth of this statement.

But the more things change, the more they stay the same. For all the benefits we'll achieve from quantum advancements in technology in terms of lethality, survivability, mobility and sustainability, we still will need to stick to the basics—or rather, the basics will need to stick to us.

No matter how much faster we can move, farther we can shoot or more precisely we can engage targets, we will, for the foreseeable future, still need to account for the five requirements for accurate, predicted fire: accurate battery or gun location, accurate weapon and ammunition data, accurate computational procedures, accurate meteorological data and accurate target location.

Developing combat systems to ensure we satisfy three of the five requirements is the responsibility of the Target Acquisition and Precision Attack Division of the Directorate of Combat Developments, part of the Field Artillery (FA) School at Fort Sill, Oklahoma. The division carries a grandiose title, but one that fits, considering it is responsible for developing the fire support team vehicle (FISTVs), FIST mission equipment, laser designators/range finders, Firefinder radars, meteorological (Met) systems and position and navigation systems. The first four of these contribute to the accurate location of targets. The last two contribute to the precision with which these targets are attacked; they locate our weapon systems and then account for the effects of the atmosphere on our projectiles to ensure hits first time, every time.

In this article, I update developments in FA target acquisition (TA) and precision attack (PA) systems. I also offer a brief vision of the future of these systems and their role in Force XXI fire support.

FIST Systems

If Operation Desert Storm made one thing clear for the FA, it was that our FISTs need better equipment. For heavy forces, M981 FIST vehicle (FISTV) mobility and sustainability problems hampered our FISTs' ability to keep pace with maneuver. For light forces, the inflexibility and weight of the ground/vehicular laser locator designator (G/VLLD) made rapid acquisition of targets nearly impossible. To overcome these deficiencies and others, the FA School developed requirements to field new and improved TA and fire support coordination systems, highlighted by the development of the Bradley FIST (BFIST) and the lightweight laser designator rangefinder (LLDR).

BFIST. In May 1995, United Defense Limited Partnership was awarded the contract to develop the BFIST, the successor fire support system to the current M981. With the BFIST, the FA takes a significant step toward achieving required Force XXI fire support TA precision, lethality and survivability, as well as greatly enhanced fire support coordination.

As currently envisioned, the BFIST will replace most, if not all, the M981 FISTVs in the active force. There are two models of the system: the XM7, which integrates current FIST mission equipment with an M2A2 Operation Desert Storm Bradley chassis; and the XM7E1, which integrates upgraded FIST equipment with a digitized M2A3 Bradley chassis. Both versions will have the same mobility, survivability, signature and night-vision capabilities as the maneuver forces they support and will require common repair parts. First unit equipped (FUE) for the XM7 is expected in December 1999 and for the XM7E1 in 2004.

The XM7 will incorporate some FIST mission equipment taken directly from the displaced M981, such as the G/VLLD, AN/TAS-4 night sight and forward entry device (FED). The remainder of the equipment, to include the north-seeking gyroscope (NSG) and targeting station control and display (TSCD), will be new or improved.

Features in the XM7 incorporated from the Bradley chassis include the 25-mm gun, precision lightweight global positioning system (GPS) receiver (PLGR), eye-safe laser rangefinder and driver's thermal viewer. The battlefield combat identification system (BCIS) also will be integrated onto the platform.

In addition to the features of the XM7, the XM7E1 will have two second-generation, forward-looking infrared (FLIR) sight devices and a core electronic architecture that will link vertical fire support and horizontal maneuver systems on the digitized battlefield. Both the XM7 and XM7E1 will have improved processing capacity that will make these platforms as robust in fire support coordination capability as in TA.

LLDR. In addition to improving FIST platforms and equipment, the FA School has been aggressive in attempting to improve its laser range finders/designators. While the G/VLLD and the Marine Corps modular universal laser equipment (MULE) remain effective targeting devices, they are far too cumbersome and unwieldy to support scouts and dismounted forward observers (FOs) in our light forces, and neither have an eye-safe training capability.

The LLDR seeks to overcome these deficiencies by capitalizing on state-of-the-art technologies to provide a single soldier-portable, day/night, eye-safe system. The LLDR also will be able to self-locate and merge this information with targeting data to automate fire requests.

Currently, the LLDR is unfunded. The Program Manager, Night Vision/Reconnaissance, Surveillance and Target Acquisition (PM-NV/RSTA) is developing an LLDR demonstrator that will undergo user evaluation and testing. Hopefully, this evaluation period will translate into greater support for the objective system and, ultimately, funding.

The LLDR, once developed, also has the potential to replace the G/VLLD. Able to support a variety of missions from heavy and light platforms, this "universal" laser/designator will dramatically improve targeting accuracy and speed, as well as FIST survivability.

Firefinder Radars

Firefinder radar technology is 30 years old. Yet despite their age, the AN/TPQ-36 and -37 radars remain remarkably robust and durable systems that continue to perform reliably. However, as our indirect weapon systems improve and as threat capabilities simultaneously advance, these radars are insufficient in range and processing power. Planned improvements to both radar systems are helping to offset these emerging deficiencies.

Q-36 Firefinder. Recently, the Q-36 completed the first in a succession of upgrades (termed versions) that make it more mobile, transportable and capable. Version Seven downsized the radar configuration for Active Component units to three high-mobility multipurpose wheeled vehicles (HMMWVs) and two M116A2 trailers. The radar is drive on/drive off capable and can be transported in two sorties by C-130 and larger aircraft. It includes a modular azimuth positioning system (MAPS) for self-survey. The Q-36 crew size has been reduced from eight to six.

Version Eight, to begin fielding in the first quarter of FY 98, is an electronics upgrade that will dramatically improve the radar's overall performance. Using a processor the size of a shoe box, the Version Eight Q-36 will have increased memory, faster access to data and the ability to process up to 20 targets a minute, classified by weapon type, with enhanced probability of detection.

Q-37 Firefinder. The most significant improvements to the Firefinder fleet are planned for the Q-37 radar. These improvements will occur in two phases.

Phase I, referred to as Enhanced Firefinder Block I, consists of many improvements. Among these are the ability to load the radar on C-130/141 aircraft without the use of special loading equipment; greater mobility through the addition of a medium track suspension system; increased target detection range; self-survey capability with MAPS; reduced false alarms in an active aircraft environment; improved reliability, availability and maintainability (RAM); and the use of the Version Seven Q-36 HMMWV-mounted shelter. Phase I, funded for 26 systems, will begin fielding this quarter.

While the changes in Phase I are evolutionary and designed to overcome deficiencies identified during Operation Desert Storm, the changes envisioned in Phase II will be revolutionary, bringing the Firefinder radar to the threshold of 21st century technology. Phase II is more commonly referred to as the Q-37 P^3I (for pre-planned product improvement) and is scheduled for initial fielding in 2002. As the system requirements in the figure indicate, the Q-37 P^3I will not only significantly improve countermortar and counterbattery TA, but also allow the FA to be a key participant in theater missile defense (TMD).

Position/Navigation Systems

Knowing our location accurately at all times is a critical element of accurate predicted fire. This is obvious, but for all who have tried to accomplish this task using current position/navigation systems, the task is not necessarily simple or easy.

- Provide continuous responsive TA throughout all phases of combat operations.
- Detect, locate and classify artillery, mortar and missiles up to 300 kilometers.
- Tailor itself to the tactical mission—i.e., counterbattery versus theater missile defense (TMD).
- Track, classify, process and transmit up to 50 firing locations per minute; process and transmit targets while on the move.
- Provide friendly fire "did-hit" data while simultaneously performing hostile TA.
- Integrate combat identification and self-survey sub-systems.
- Interoperate with the advanced FA tactical data system (AFATDS).
- Roll on/roll off C-130 and larger aircraft without disassembly.
- Automatically execute TA planning and friendly conduct of fire missions while simultaneously scanning for and locating targets.
- Incorporate survivability capabilities to minimize vulnerability to anti-radiation missiles (ARM) and direction-finding equipment.
- Operate on two digital nets and one voice net, communicate with multiple subscribers on multiple nets simultaneously and interface directly with all air defense artillery, TMD and intelligence nets.

Q-37 P^3I System Operational Requirements

How often have we had to trade accuracy of location for our ability to provide responsive fires?

GPS. Advancements in GPS technology have made our jobs a lot easier. Most of our major systems have incorporated or are incorporating GPS. This is especially true of our self-propelled force, where both Paladin and the multiple-launch rocket system (MLRS) are complementing their inertial navigation systems with GPS. Rather than having to update their inertial position over a survey control point (SCP), each of these systems will use GPS to constantly update and correct its location. The result will be more responsive and, simultaneously, more accurate indirect fires.

But what about our towed and non-Paladin self-propelled howitzers? Although research and development efforts are ongoing to produce an on-board GPS-aided navigation system for these howitzers (particularly towed howitzers), fielding to units, especially light forces, is unlikely to occur until after 2000.

GLPS. The FA School has developed the gun-laying and positioning system (GLPS). This is a tripod-mounted positioning and orienting device operated by a 13B Cannon Crewman that will give the battery commander an organic survey capability. The system integrates a gyroscope, GPS and eye-safe laser rangefinder. Lightweight and mobile, it establishes an orienting station, allowing it to rapidly and accurately position and orient a battery's howitzers.

The GLPS proved exceptionally effective during Warrior Focus, the light advanced warfighting experiment (AWE) at the Joint Readiness Training Center (JRTC), Fort Polk, Louisiana. Although funded, full production of GLPS will not begin until 2000.

Gun-Laying and Positioning System (GLPS)

PADS Follow-On. One reason GPS increases responsiveness is that it dramatically reduces a battery's reliance on the position and azimuth determining system (PADS). PADS, rapidly approaching the end of its life cycle, is unreliable and extremely expensive to maintain. But despite these facts and our increasing reliance on GPS, PADS (or PADS follow-on) remains essential.

GPS is susceptible to jamming, masking and spoofing. When GPS becomes unavailable, inertial systems default to their present-day limitations—they drift over time and distance and require a means to update position and orientation. Thus, the FA must maintain the capability to emplace SCPs to ensure these updates can occur.

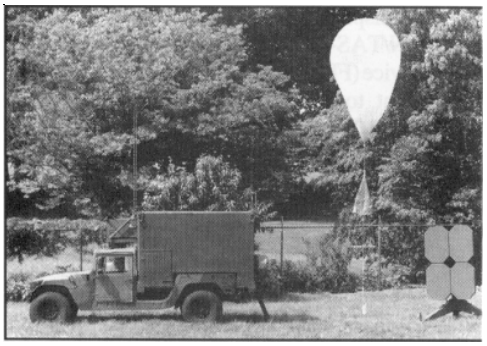
The FA School is developing requirements for an improved PADS. Like many of the other systems discussed in this article, it remains to be seen whether PADS can vie successfully for ever more constrained procurement dollars.

Meteorological Systems

Like many of our systems, Met systems have benefitted greatly from advancing technology. Today these once cumbersome, labor-intensive systems are smaller, lighter and significantly more capable.

MMS. During the first quarter of this year, initial units were fielded the AN/TMQ-41 meteorological measuring system (MMS), which will go to all active Army FA units. The Q-41 MMS is a follow-on to the Q-38 MMS that was fielded to light and airborne units in 1993. With the fielding of MMS to the active force, Reserve Component units can expect to receive displaced meteorological data systems (MDS).

The Q-41 is a mobile, non-radiating artillery Met system that measures atmospheric parameters of temperature, pressure, relative humidity and computes wind speed and direction from the earth's surface to an altitude of 30 kilometers. It can provide new Met data hourly using radio direction finding (RDF) or navigational aid (NAVAID) tracking. It's also fully interoperable with the initial fire support automation system (IFSAS) and advanced FA tactical data system (AFATDS). The system consists of three HMMWVs, a lightweight RDF antenna and a trailer-mounted, five-kilowatt generator. It is operated by six personnel.



Meteorological Measuring Set (MMS) AN/TMQ-41

ETG Hydrogen Generator AN/TMQ-42

Q-42 HG. Paired with the MMS, although not fielded simultaneously, is the AN/TMQ-42 hydrogen generator (HG). The system will generate hydrogen gas more rapidly and safely than current techniques, producing up to 150 cubic feet of gas per hour and storing up to 300 cubic feet. Initial fielding is expected in the third quarter of this year.

MIP. Despite improvements realized by the MMS in Met accuracy and reliability, the FA and Army still lack the capability to collect the most meaningful Met data—Met in the target area. We need target area Met to achieve first-round fire-for-effect precision and ensure smart munitions are effective within their footprint. To acquire this capability essential to Force XXI success, the FA School has developed the "profiler" as part of its Met improvement plan (MIP).

The MIP will be accomplished in two phases or blocks. Block 1 will upgrade the MMS with a computer-assisted artillery meteorological (CAAM) program, allowing one MMS to obtain Met messages from other Met sensors, combine the data and produce a "best Met" solution. In other words, instead of using a single set of data, CAAM uses multiple sets to produce a solution weighted for time and space and tailored for a specific firing unit.

Block 1 also will include a surface Met sensing package (MSP) to measure surface conditions and extrapolate data to an altitude of four kilometers—in short, a hasty Met capability. This should be welcome news for units that currently depend on piball to provide hasty Met. A value engineering change contract has been awarded to implement Block 1.

Block 2 is the profiler, which will include a more complex implementation of CAAM using input from the battle-scale forecast model (BFM). The model is being developed by the Battlefield Environment Directorate of the Army Research Laboratory.

This block will supplement current Met systems with a new suite of sensors to include Met satellites, Met dropsondes from unmanned aerial vehicles (UAVs), and the profiler, which eventually will obviate the need for balloons and Met satellites.

At present, only Block 1 is funded. Because of the importance of the MIP to future battlefield success, the FA School is pursuing a number of innovative funding strategies to bring the profiler portion of the MIP to reality.

2020 and Beyond

By the year 2005, we'll have fielded or be in the midst of fielding the funded systems described in this article. In most cases, these turn-of-the-century systems will be correcting deficiencies that exist today—that is to say, they won't represent the kind of quantum advancements in technologies and capabilities we'll realize with Crusader.

It's also true that, given an average life cycle of 20 years, these systems will still be in use in 2020. In about 2010 (unless acquisition reform has dramatically compressed acquisition time lines), the FA School will begin to develop requirements for the next generation of TA and PA systems. What should those requirements look like?

The easiest, but also the most accurate answer is: it depends. It depends on how rapidly technologies advance. It depends on the results of the AWEs planned over the next few years. It depends on how doctrine and organizations evolve. And, of course, it depends on our ability to fund these new requirements. The reality of combat developments is that we must constantly compete against another system for funding. For example, by the time we're able to secure funding for a new system, the technology has leapt ahead, dangling before us a cheaper, more capable system.

But for the moment, let's assume unconstrained resources permit us to develop whatever we need. So the question then becomes, what lies beyond the BFIST, the Q-37 P^3I and the MMS?

It's becoming quickly evident that every platform on the digitized battlefield will be capable of serving as a target acquirer. Given this fact, some are already questioning the need for the BFIST. They fall victim to defining the role of the FIST too narrowly. It's imperative that we both define future FIST requirements carefully and educate others about why the FIST remains vital to battlefield success.

The BFIST carries forward the dual mission of TA and fire support coordination. Thus, both TA and target processing sub-systems are being upgraded. But this year during Force XXI AWEs we'll experiment with consolidating FOs at the brigade level, effectively leaving the FIST responsible solely for target processing and coordination. The divergence will continue until there's a complete separation of the two functions. This means that the successor to the BFIST must concentrate on enhancing data processing and coordination by incorporating state-of-the-art computers, flat-screen displays and communications equipment.

Even more important, the FIST will process more targets than just from its FOs—targets from every other available terrestrial and airborne sensor. The proliferation of data requires we develop fusion centers to process, filter and disseminate the information. The XM7E1 digitized BFIST (and its follow-on) is an ideal candidate for such a fusion center. The FA should rapidly embrace this important future function.

As radar technology advances, it's likely that a single radar will provide both short-and long-range TA, either simultaneously or multi-mode (requiring the flip of a switch). The characteristics of this future radar are outlined in Brigadier General Leo J. Baxter's "Field Artillery Vision 2020" (December 1994). Called "Distant Eyes," the radar will be totally passive, non-line-of-sight and have less than 50 meters circular error probable (CEP), increased range up to 500 kilometers, and an ability to identify the types and calibers of enemy weapons.

Distant Eyes will do more than simply provide counterbattery and countermortar TA. Today, much of the data collected by our radars is processed out as "noise." With Distant Eyes, this information won't be discarded but processed through smart filters and sent to appropriate nodes.

For example, radars can collect Met data; in the future, radars will be one of the many Met sensors contributing to ever more precise Met solutions.

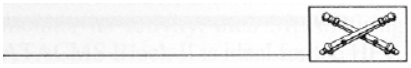
By 2020, Met will be obtained through a suite of compact, mobile and adaptable sensors, such as radars, dropsondes off UAVs, profilers that scan the atmosphere vertically to derive Met data, antennas attached to our tactical vehicles for hasty Met and small radar dishes that will collect satellite Met data. Balloons will be a thing of the past.

By 2020, all our platforms and most of our munitions will have embedded GPS, which will be far more robust. Inertial systems also will continue to improve by traveling much greater distances without the need for update. Like balloons, aiming circles will be long gone, and PADS will be in its death throes.

Like so much science fiction, today's visions are tomorrow's realities. Think it so, and it can be. Such a mindset is at the core of Force XXI.

The greatest challenge facing TA and PA systems is their lack of visibility. Look back at the October 9th *Army Times* with its cover story "Field of Fire: The Artillery Revolution and You." It summarized developments in our cannon, rocket and command and control systems. Not one TA/PA system was mentioned.

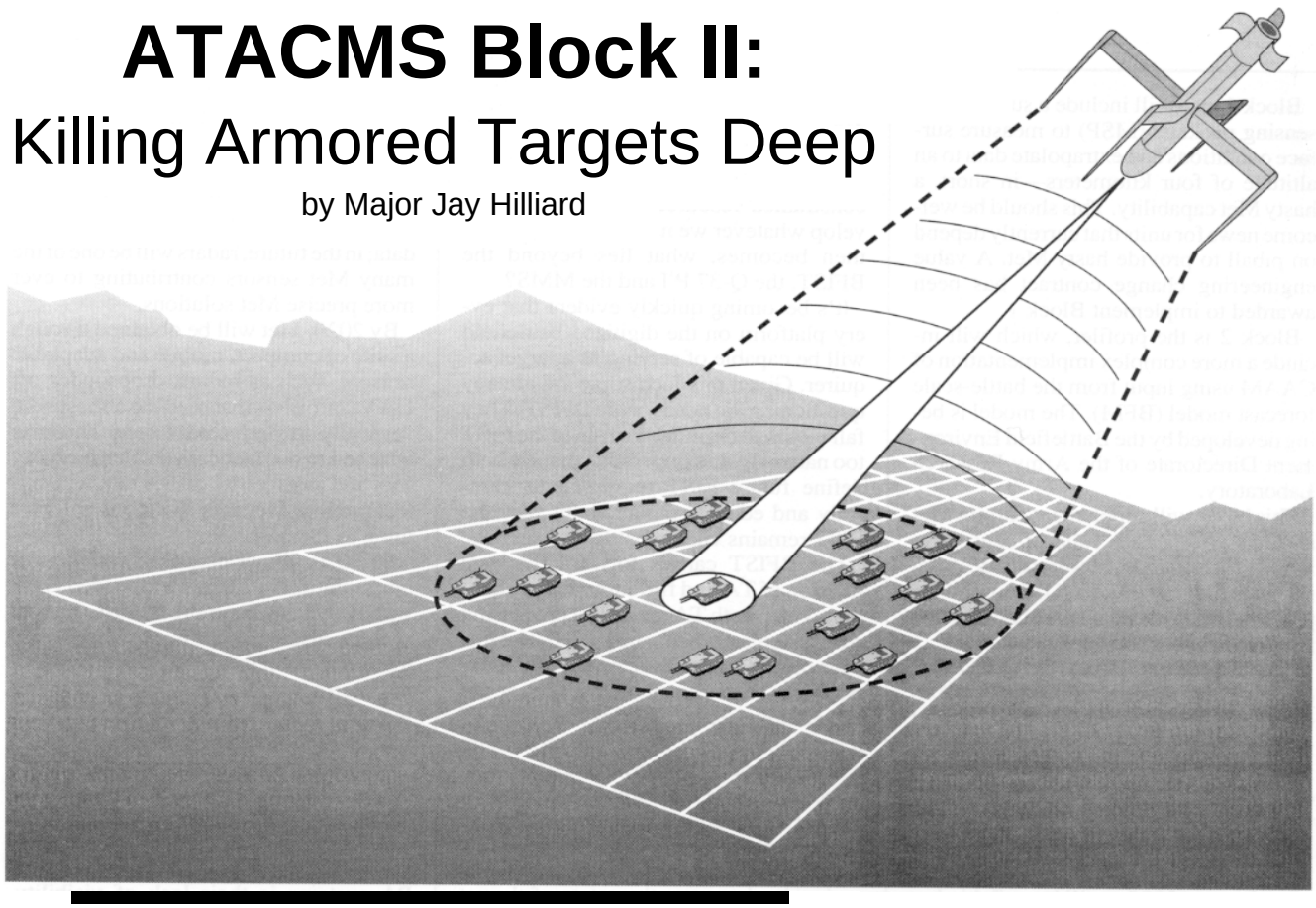
I would argue that the TA/PA "horseshoe nail" programs are vital to our future and cannot be ignored. Doing so puts them and our ability to deliver timely, accurate fires in peril.



Lieutenant Colonel Robert M. Hill was the previous Chief of the Target Acquisition and Precision Attack Division, Directorate of Combat Developments, Field Artillery School, Fort Sill, Oklahoma. He currently is assigned in his functional area (Public Affairs) as an intern with Turner Broadcasting System in Atlanta, Georgia. Previous assignments include serving as Editor of *Field Artillery* and S3 of 6th Battalion, 27th Field Artillery, 75th Field Artillery Brigade, both at Fort Sill, Oklahoma. He commanded A Battery, 2d Battalion, 37th Field Artillery, 212th Field Artillery Brigade, also at Fort Sill.

ATACMS Block II:
Killing Armored Targets Deep

by Major Jay Hilliard



The early entry force's time-phased deployment list is front-loaded with multiple-launch rocket system (MLRS) launchers (M270) and Apache helicopters. As the force lands, it detects an armored threat at operational depth. Ideally, the force would destroy that moving armored threat at depth without risking precious Apaches. And, in the not too distant future, that early entry force will be able to—with the Army tactical missile system (ATACMS) Block II.

The ATACMS Block II is an inertial guided, global positioning system (GPS)-aided, ground-launched, surface-to-surface missile containing 13 BAT or pre-planned product improved (P^3I) BAT submunitions. Both the BAT and P^3I BAT are anti-armor, top-attack submunitions with acoustic and infrared seekers working in tandem. Scheduled for fielding in 2001, BAT will be used in the deep attack mission against moving motorized rifle and tank battalions and has a range of 35 to 140 kilometers.

When fielded in 2004, P^3I BAT will replace the base BAT as Block II's submunition. The P^3I BAT's target set will expand to include "cold" stationary tanks and armored combat vehicles and other high-value or high-payoff targets (HPTs); these targets include surface-to-surface transporter erector launchers and heavy multiple rocket launchers for destruction in theater missile defense (TMD) operations. Block II will deliver BAT or P^3I BAT to a predetermined point and dispense BATs over a large target area. Because they are "brilliant," the submunitions will autonomously seek out and kill moving armored or stationary targets in the area.

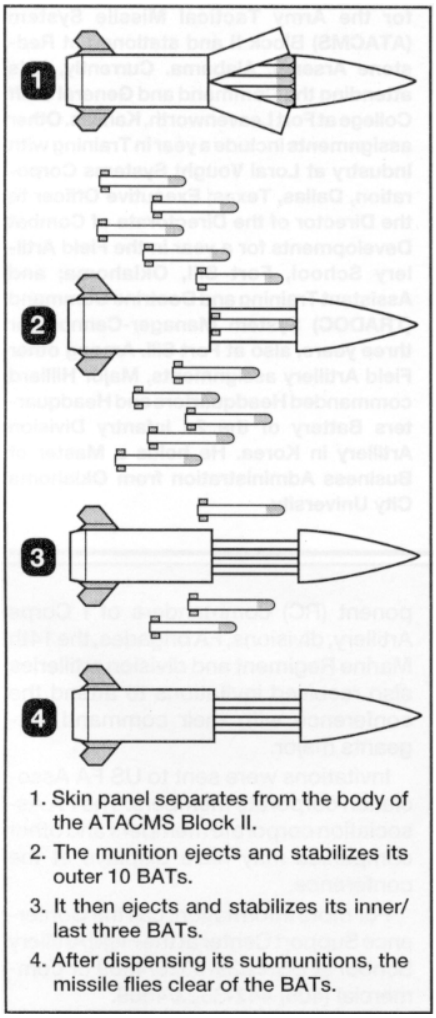
Aircraft have been the commander's only viable means of attacking highly mobile armored targets in the deep battle area. Soon the commander will have a highly survivable, near all-weather, 24-hour, cost-effective tactical missile to attack mobile armored targets at operational depth. With Block II, a Field Artillery fire support plan will include the capabilities to delay, disrupt or destroy moving armored forces at operational depths. ATACMS Block II will facilitate the ground component commander's (GCC's) ability to synchronize his forces.

ATACMS Block II is transported, handled and stored in the same manner as the MLRS family of munitions (MFOM) ammunition. The missile is compatible with standard transportation vehicles and the M270 firing platform. The guided missile launch assembly (GMLA) is visually similar to all other MFOM containers. Crew firing procedures also will be similar to those for other MFOM munitions.

The missile has three main sections: dispenser, propulsion and guidance. The dispenser section contains the 13 BAT or P^3I BAT submunitions, electronic-safe

arm device and the dispense subsystem. The propulsion section contains the rocket motor and control section required to propel and interpret guidance and implement guide cues to move the missile along the proper trajectory. The guidance section contains the improved missile guidance set with an embedded GPS receiver. The dispenser section is a new design (see the figure). The propulsion and guidance sections are from the ATACMS Block IA (extended range).

Command and Control. ATACMS Block II will most often be employed from the corps general support (GS) or general support reinforcing (GSR) MLRS battalions. Because of its long-range, lethal payload and the relatively small number of missiles available, ATACMS Block II normally will be controlled by the corps artillery in support of the deep battle or by a Field Artillery brigade in support of a lodgment defense or similar independent operations. Control at these echelons facilitates integrating target and intelligence information from all available sensor systems and coordinating and deconflicting to ensure the most effective and efficient attack of targets at operational depths. In immature theaters, ATACMS Block II will support joint task force (JTF) operations and remain under the control of the GCC for mission planning and execution or the theater commander for TMD and force projection.



ATACMS Block II Dispensing 13 BATs

Mission Sequence. The following describes the sequence of an ATACMS Block II mission, beginning with the missile's moving from storage and culminating with its hitting the target.

The ATACMS Block II GMLA is in a corps or theater storage location. The software required to plan and execute a mission is collocated with the fire direction system (FDS) and MLRS launchers.

The mission begins with the corps or theater commander's concept of the operation. Staff analysis of that concept leads to decisions to deny the enemy the ability to influence the friendly course of action (COA). Staff planning factors in information gained during the intelligence preparation of the battlefield (IPB) process and by intelligence assets' continuously tracking and reporting enemy activities. The planning and tasking requirements are included in the fire support annex of the operations order (OPORD) and air tasking order (ATO).

Upon receipt of the OPORD, the corps fire support element (FSE) begins planning to attack the target, including the use of ATACMS Block II. The G2, in conjunction with G3 Plans and FSE personnel, determine when, where and how the enemy should be attacked. When Block II is selected as the weapon of choice, fire mission planning is conducted to refine targeting and sensor tasking requirements. The staff starts coordinating Army and joint airspace.

The sensor selected to monitor the enemy's activities receives the monitoring locations and times: targeted areas of interest (TAIs), named areas of interest (NAIs) and trigger events. The target acquisition ground station operator selected to initiate the mission receives the criteria.

The corps G4 uses the OPORD to begin moving ATACMS Block II GMLAs from the corps or theater storage locations to the deep attack MLRS battalions in accordance with the controlled supply rates (CSR). When intelligence concerning threatening enemy activities is received, the FDS operator refines the mission data.

If the enemy continues to exhibit threatening behavior, a launcher is tasked to move to a platoon reload point and upload the required GMLAs and proceed to a hide area. When the trigger event occurs, the Block II flight information and BAT mission critical data is transmitted to the MLRS launcher selected to fire the mission. The launcher moves to the firing point, computes the firing data and launches the missile.

ATACMS Block II then flies the computed trajectory and prepares the BATs to dispense. At the selected point, the missile dispenses the BATs over the target. The BATs search and find the target array, home in on selected vehicles and destroy them.

Targeting. An efficient targeting effort is critical to successfully employ ATACMS Block II. The targeting procedures for the weapon follow the outline provided in *FM 6-20-10 Tactics, Techniques and Procedures for the Targeting Process.*

The process focuses on those actions necessary to accomplish the mission and protect the force. The *decide-detect-deliver-assess* targeting methodology is continuous, requiring the commander and his staff to develop primary and alternate COAs, manage and process the collection of target and other battlefield information, position friendly forces and fire support assets where they can most effectively accomplish the mission and assess the effects of the attack.

The *decide* function results in the commander selecting his preferred COA and issuing priority intelligence requirements (PIRs). The commander approves the HPT list, target selection standards (TSS) and attack guidance matrix (AGM). If the analysis conducted during the *decide* phase determines one of the HPTs is an armored unit of battalion-size or larger deep in the enemy rear area and if target acquisition assets are available to locate the target and monitor its activity, then MLRS firing ATACMS Block II is ideal for the HPT.

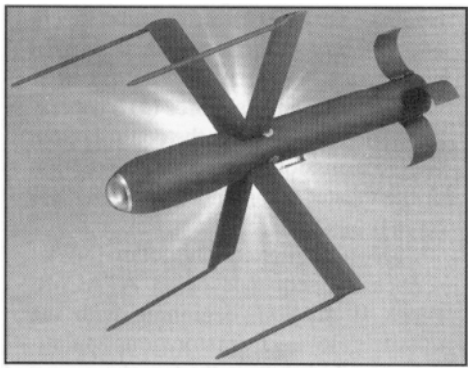
ATACMS Block II's primary training and operations impact will be on the fire direction and fire support personnel who must plan for, target and employ the missile. The targeting process for Block II emphasizes the IPB, AGM and timely fire mission execution. Fire support planners must understand the capabilities and limitations of ATACMS Block II with its BAT submunitions to most effectively and efficiently employ it. Early on, planners must exercise enough control of the targeting process to preclude firing the missile on poorly located or ill-defined targets.

To attack moving targets at operational depth using a tactical missile, the coordinates must be the target's predicted location at a specified time. BAT will compensate for large target location errors (TLEs), but accurate predicted location is still important. NAIs should be placed at road junctions along the target's expected routes to confirm the enemy is proceeding as predicted. The attack point within the TAI should be selected to support the concept of the operation and maximize the capabilities and effectiveness of BAT.

Once the attack point within the TAI is selected, likely avenues of approach into the TAI should be identified. These avenues of approach normally will be road networks. The last NAI before the target reaches the TAI must be far enough from the TAI to equal the target's movement time plus the estimated fire support reaction time and missile time of flight. This NAI will have a decision point (trigger) that, based on the attack criteria, will cause the sensor to initiate a fire mission using ATACMS Block II at the attack point within the TAI.

Logistics. ATACMS Block II will be in a theater or corps area for bed-down storage until a decision is made to use the weapon. A built-in-test (BIT) check will be conducted periodically to monitor the serviceability of the missile and submunitions. Missiles or submunitions failing BIT will be classified as "Not Mission Capable" and be transported to the depot for replacement.

Based on the all-up round concept, the missile will require minimum preventive maintenance checks and services (PMCS). No organizational, direct support (DS) or GS maintenance is required. The PMCS will be limited to visual inspection and corrosion control in the storage area. A special repair activity at the depot will be able to repair malfunctioning missiles and recertify them at selected intervals.



The base BAT will be replaced by the P^3I BAT in 2004.

The ATACMS Block II conforms to standard handling and employment procedures for the M270 launcher, the future improved fire control system (IFCS) launcher and future improved mechanical launcher system (IMLS). The missile launch pod container is a transport, storage, and launch container all in one. The Block II GMLA is compatible with existing transportation, ammunition supply and materiel handling equipment, including the heavy-expanded mobility ammunition trailer (HEMAT). It also is compatible with the palletized load system (PLS). The GMLA is moved in accordance with standard MLRS ammunition handling procedures.

Program Status. The missile is being developed as a product improvement to the current ATACMS Block IA missile. During this phase of its development, Loral Vought will improve and test the missile extensively in conjunction with Northrop-Grumman's development of BAT. The test flight for the first missile is scheduled for late FY 96. The first unit equipped (FUE) with ATACMS Block II will be in 2001.

ATACMS Block II will help the GCC control and shape the battlefield by enhancing his ability to kill an armored threat moving deep. The missile will allow the Field Artillery to influence the battle at operational depths. It will prove to be such a decisive combat multiplier that the maneuver commander will "never leave home without it."

Major Jay Hilliard, Acquisition Corps, until recently was the Deputy Product Manager for the Army Tactical Missile System (ATACMS) Block II and stationed at Redstone Arsenal, Alabama. Currently, he's attending the Command and General Staff College at Fort Leavenworth, Kansas. Other assignments include a year in Training with Industry at Loral Vought Systems Corporation, Dallas, Texas; Executive Officer to the Director of the Directorate of Combat Developments for a year in the Field Artillery School, Fort Sill, Oklahoma; and Assistant Training and Doctrine Command (TRADOC) System Manager-Cannon for three years, also at Fort Sill. Among other Field Artillery assignments, Major Hilliard commanded Headquarters and Headquarters Battery of the 2d Infantry Division Artillery in Korea. He holds a Master of Business Administration from Oklahoma City University.

Senior Fire Support Conference: *Joint Fires for Force XXI*

The Senior Fire Support Conference will be 11 to 15 March 1996 at the Field Artillery School, Fort Sill, Oklahoma. The conference theme is "Joint Fires for Force XXI." Presentations and discussions will center around the role of fires in Force XXI and fire support issues in doctrine, materiel, training, force development and joint operations.

Invitations have gone out to all active duty Army and Marine FA general officers and selected retired general officers, corps/Marine expeditionary force and division commanders, Training and Doctrine Command (TRADOC) commandants, corps artillery commanders and FA brigade/regiment and division artillery commanders to include their command sergeants major. Reserve Component (RC) commanders of I Corps Artillery, divisions, FA brigades, the 14th Marine Regiment and division artilleries also received invitations to attend the conference with their command sergeants major.

Invitations were sent to US FA Association corporate members. The FA Association corporate members and other companies may have displays at the conference.

For more information, call the Conference Support Center at the Field Artillery School at DSN 639-3323/4509 or commercial (405) 442-3323/4509.

Digital Sensor-to-Shooter Links

Interoperability of digital systems gives the commander the ability to better tailor fire mission routing to meet a variety of needs. Applique should provide a basic call-for-fire capability. (The applique is a Task Force XXI digital system designed to provide situational awareness across the battlefield operating systems.) This allows the commander to link any observer to any fire support command and control node. He also will be able to eliminate layers of traditional fire support coordination as a means to gain responsiveness—in effect, set up a digital quick-fire channel.

This digital quick-fire channel will be similar to the conventional quick-fire channels discussed in *FM 6-20-40 Tactics, Techniques and Procedures for Fire Support for Brigade Operations (Heavy)*. There are two means of establishing digital quick-fire channels. One is a link directly from applique-to-AFATDS, selectively eliminating fire support nodes. For example, an applique-equipped tank platoon leader could send a digital call-for-fire directly to the task force fire support officer (FSO). The other link is to establish parameters in the advanced Field Artillery tactical data system (AFATDS) to speed up fire mission processing.

Regardless of the link established, the digital quick-fire channel would be used to process fire missions for specific targets for specific purposes. Immediate suppression missions from lead elements during a movement-to-contact is one example that calls for a digital quick-fire channel. Another example is mission processing for fires in response to detections from a Firefinder radar monitoring a critical friendly zone (CFZ).

Applique-to-AFATDS Link. When implementing quick-fire channels, commanders must weigh the increase in responsiveness against the information management functions lost with each node that's eliminated. Examples of such functions are fire mission tracking responsibilities and positively clearing fires at each level. The requirement to positively clear fires remains—regardless of the number of nodes involved in fire mission processing. Units should establish standing operating procedures (SOPs) to decentralize the execution of fires while ensuring fires are positively cleared, are within the commander's intent and support the scheme of maneuver.

Executing decentralized fires calls for detailed planning, coordinating and rehearsing. For example, logical address management is critical in establishing a link between an applique observer and a fire support command and control node.

AFATDS Quick-Fire Channel. Previous fire support digital systems such as the tactical fire direction system (TACFIRE) and the initial fire support automation system (IFSAS) were designed so a human interface was required at each node in the fire mission thread. In other words, a request-for-fire stopped at each node in the fire support system and required the operator/decision maker to take action on that request before it was sent to the next node.

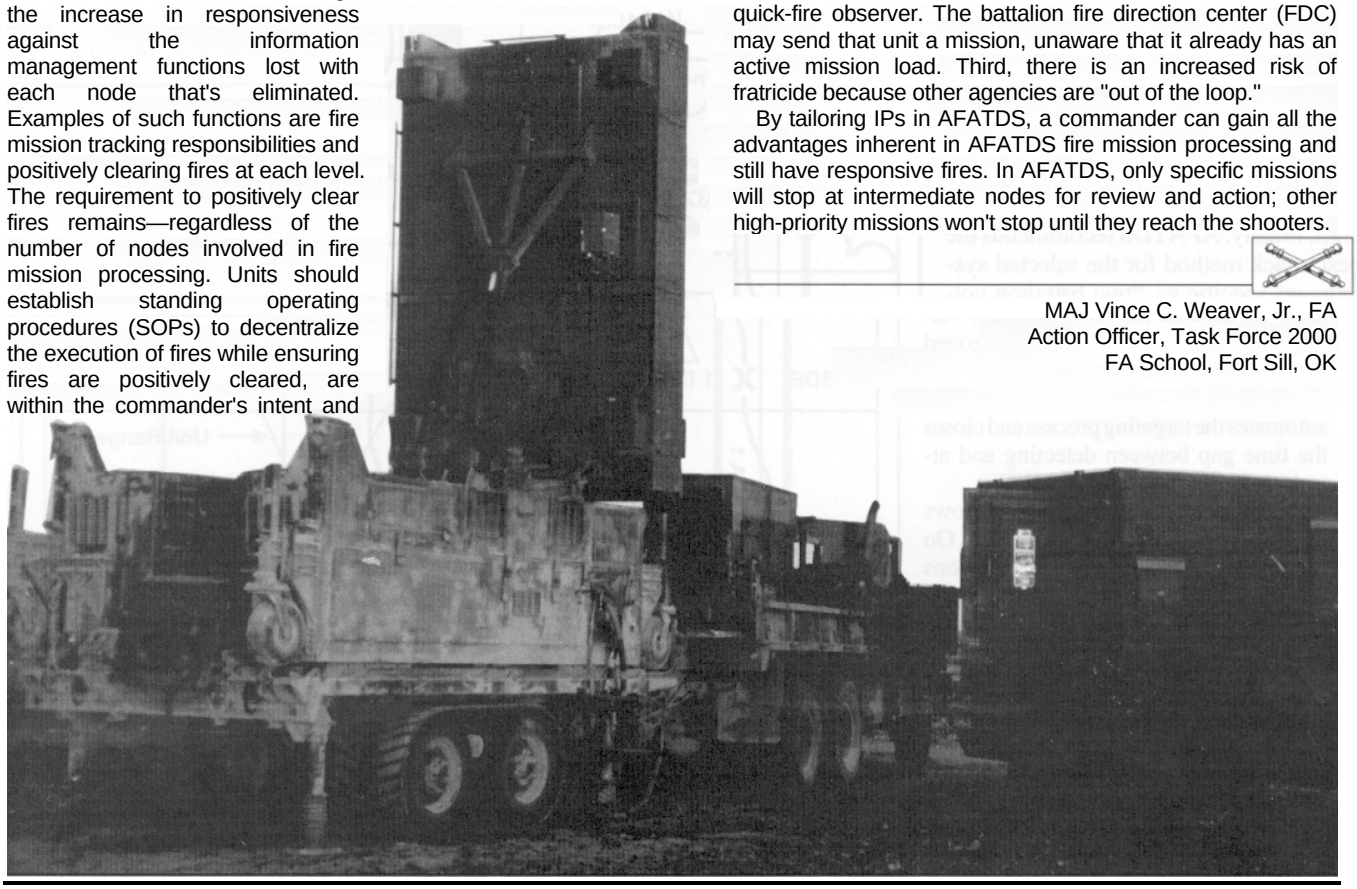
The AFATDS' design is a departure from that. AFATDS allows the commander to establish parameters (target values, priority of fires, etc.) that automate the processing of a request-for-fire from the sensor to the shooter. The decision in AFATDS is at what point and for what reasons does the commander want a "man in the loop" on a request-for-fire.

AFATDS offers the commander tremendous flexibility in how centralized or decentralized his missions are processed. He can design "filters" in AFATDS, called intervention points (IPs), to specify which missions he wants to stop, for example, in the task force fire support element's (FSE's) AFATDS and which he wants automatically processed directly to the firing units. He can tailor these IPs in a number of ways—type of target or mission, attack option, assigned mission value, etc. (For more information, see the article "Targeting via AFATDS" by Captains Henry M. Hester, Jr., and Marc F. Mann in this edition.)

Tailoring IPs is an alternative to establishing an applique-to-AFATDS quick-fire channel and is just as responsive. It also offers distinct advantages. First, quick-fire channels make it more difficult to resolve duplication if another observer is attempting to engage the same target. Second, there is little "visibility" that a firing unit is processing a mission for a quick-fire observer. The battalion fire direction center (FDC) may send that unit a mission, unaware that it already has an active mission load. Third, there is an increased risk of fratricide because other agencies are "out of the loop."

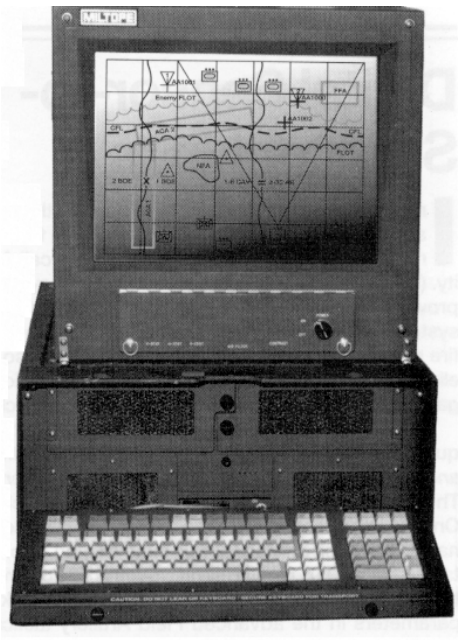
By tailoring IPs in AFATDS, a commander can gain all the advantages inherent in AFATDS fire mission processing and still have responsive fires. In AFATDS, only specific missions will stop at intermediate nodes for review and action; other high-priority missions won't stop until they reach the shooters.

MAJ Vince C. Weaver, Jr., FA
Action Officer, Task Force 2000
FA School, Fort Sill, OK



Targeting via AFATDS

by Captains Henry M. Hester, Jr., and Marc F. Mann



The quest to automate—and, thereby, speed up—the *detect* and *deliver* functions of the *decide-detect-deliver-assess* targeting methodology has had limited success. The tactical fire direction system (TACFIRE) and initial fire support automation system (IFSAS) have automated much of the tactical and technical decision process. However, a significant automation gap still remains.

The advanced Field Artillery tactical data system (AFATDS) provides a quantum leap in targeting capabilities. It uses detailed targeting guidance and attack criteria and employs sophisticated decision aids to fully automate fire mission processing.

For example, it automatically screens and filters mission requests and recommends denying those missions that do not meet the established commander's guidance. It prioritizes multiple missions to ensure the most important missions are processed first. It also checks incoming fire missions against fire support coordinating measures (FSCMs) and unit zones of responsibility. If a violation occurs, AFATDS notifies the operator and electronically requests clearance from the unit that established the control measure.

AFATDS can decide which fire support asset to use to engage a particular target: FA, mortars, naval gunfire (NGF) or aircraft. Finally, AFATDS recommends the best attack method for the selected system—as specific as, "two battalion volleys of DPICM [dual-purpose improved conventional munitions] from 'x' FA unit."

This article discusses how AFATDS automates the targeting process and closes the time gap between detecting and attacking high-payoff targets (HPTs).

Situational Awareness. Figure 1 shows a typical situation screen in AFATDS. On it, you track friendly and enemy locations and display range fans, FSCMs, target overlays and battlefield geometry. You can tailor the situation graphics using up to seven separate overlays. By clicking on a target, a commander can review all mission and target information and digitally track the status of each mission.

Commander's Guidance. The task of translating a maneuver commander's intent for fires into targeting guidance remains unchanged with AFATDS. The key to exploiting AFATDS' capabilities is integrating that guidance into the AFATDS data base.

Targeting guidance tells AFATDS which targets to process or deny. AFATDS does that by employing filtering and screening guidance.

• *Filtering Guidance*. Filters tell AFATDS what targets not to attack. Fire support is not an infinite resource; we must be prudent about which targets we choose to attack.

One filter is target decay time, which defines how long a target type is suitable for engagement after it's acquired. This highlights for the commander those targets with short-dwell times and prevents firing on targets that may have moved.

The target duplication filter allows fire supporters to specify the distance (in meters) that separates targets or similar targets to determine if they are to be considered duplicates. This prevents different sensors or observers from firing separate missions on the same target. If two missions violate target duplication, AFATDS

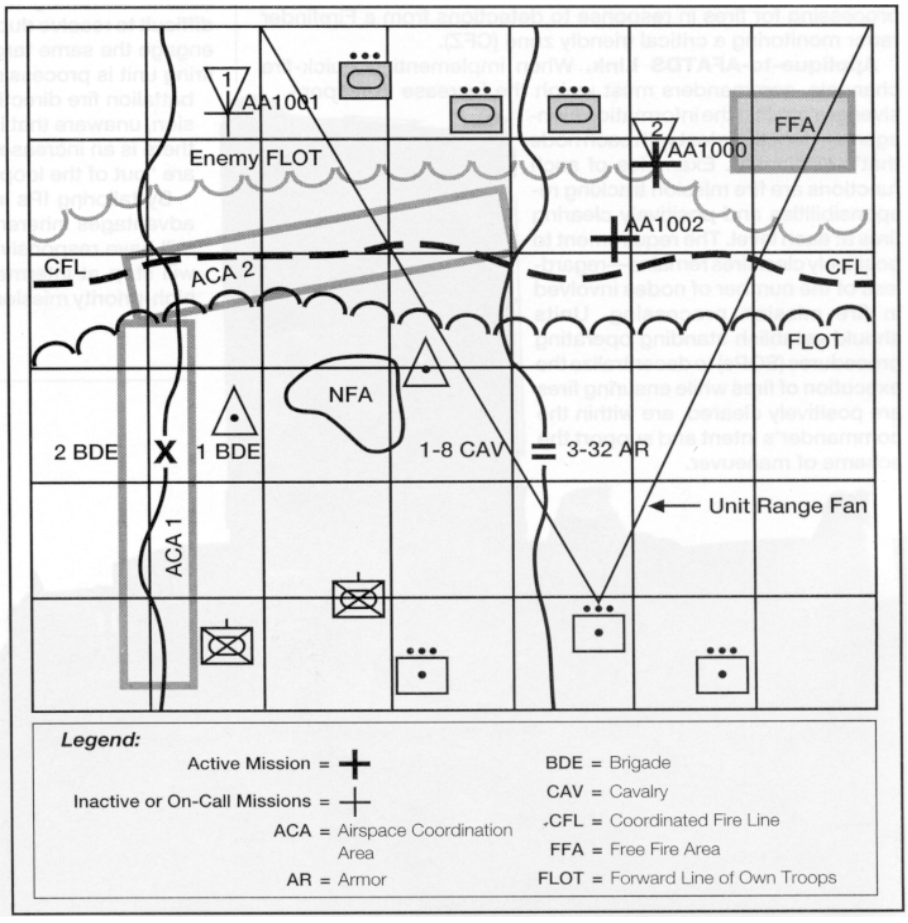


Figure 1. AFATDS Situational Awareness Screen

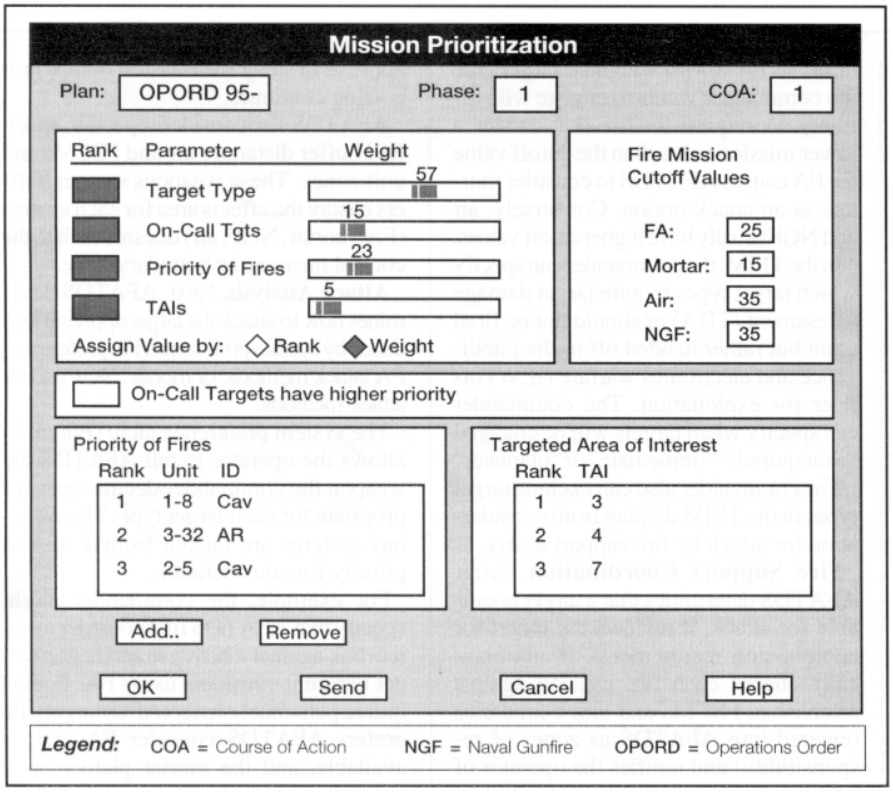


Figure 2. Mission Prioritization Window

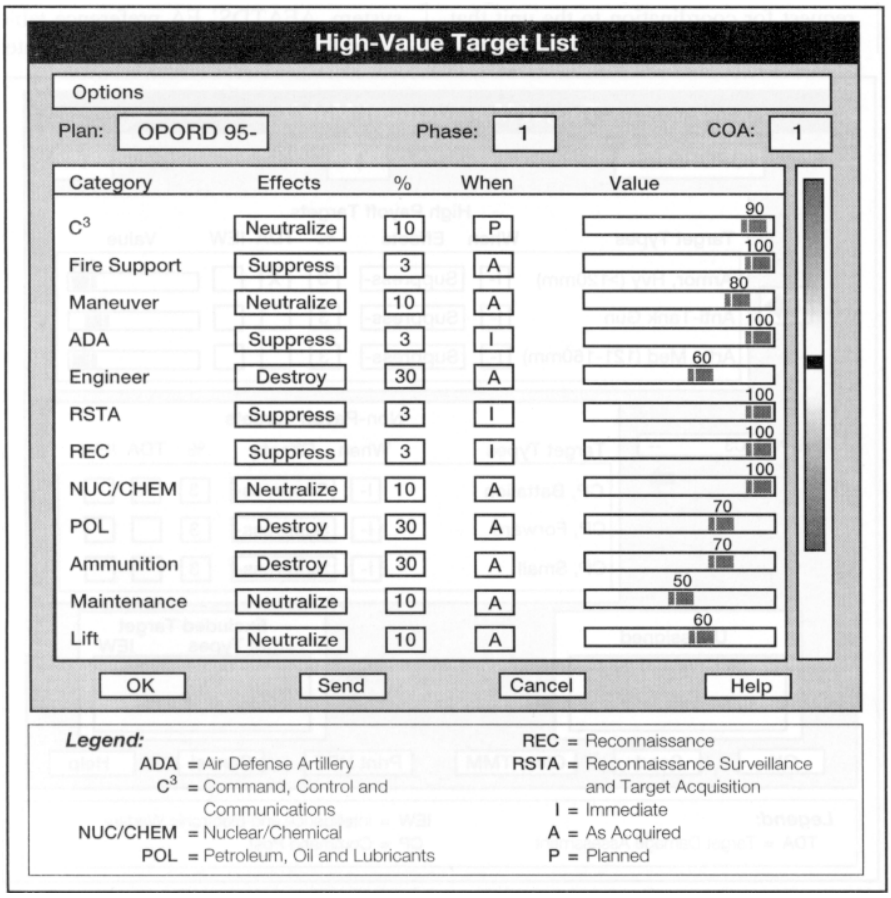


Figure 3. High-Value Target (HVT) List

will process the first mission and recommend denial on the second.

The target build-up area filter allows the commander to specify the number of targets within an area that must be identified before engagement. This is particularly useful for counterfire elements that want to focus on developing a templated enemy area before attacking it.

The target exclusion filter, part of the target management matrix (TMM), allows the commander to specify targets he does not want fire support to consider for attack.

AFATDS' target selection standards (TSS) displays the same information normally used in a TSS matrix; it allows the commander to specify the target location error (TLE) for potential sensors. This filter is generally used for intelligence reports and specifies a report age to prevent firing on targets that are too old.

• *Screening Guidance*. After a target clears the filters, AFATDS screens the mission to assign a mission value. This focuses fires by ensuring the most important targets are engaged first. In AFATDS, this screening guidance includes mission prioritization, the high-value target list (HVTL) and TMM.

The AFATDS mission prioritization window is shown in Figure 2. AFATDS prioritizes missions by assigning each a "mission value," of 0 to 100. Four weighted criteria determine this mission value: on-call targets, priority of fires, target areas of interest (TAIs) and target types. These criteria are ranked 1 to 4 or weighted 0 to 100 and determine the overall mission value.

On-call precedence allows the commander to decide that targets from the fire plan (stored in the on-call target list) have a higher priority than a target of opportunity. (A commander may not want targets of opportunity to disrupt the execution of pre-planned, rehearsed targets in specific TAIs or engagement areas.)

The second criterion, priority of fires, enables the commander to establish a preference among a pool of potential sensors/observers.

The third criterion for mission prioritization is TAIs. If a target falls within a TAI, AFATDS will increase its mission value.

The fourth is target type. AFATDS can weight targets based on their relative importance to the maneuver commander's mission. The target type value is identified in the HVTL and TMM.

The HVTL screening window used in AFATDS is shown in Figure 3. HVTs are

those targets important to the enemy commander to accomplish his mission. The HVTL screen applies guidance to 13 broad target categories

A commander can define the desired effects in the HVTL for each target category by specifying effects or any percentage of destruction from 0 percent to 100 percent. He also can assign a weighted value from 0 to 100 to each of the 13 categories. This is one of the target values that AFATDS uses to compute an overall mission value.

The HVTL is a starting point for the development of the HPT list (HPTL) and is a component of the TMM. HPTs are HVTs we must attack to achieve success during friendly operations. The HPTL in the TMM applies additional guidance to weight the target types.

The TMM used in AFATDS (Figure 4) provides the same information normally seen on an attack guidance matrix (AGM). It separates HPTs types from non-HPTs types (up to 96 types). A commander can define the effects for each HPT type or any percentage of destruction up to 100 percent. He also can weight the value of each HPT type from 0 to 100. This is a second target value (but for HPTs only) that AFATDS uses to compute an overall mission value.

The target value for a HPT is determined by adding the highest value found in the HVTL to the value determined in the TMM and dividing by two. The target value for a non-HPT is determined by dividing the HVTL category value by two. As the fourth criterion in mission prioritization, this target value is factored in with the other three criteria (on-call targets, priority of fires and TAIs) to determine the overall mission value.

As a result of mission prioritization, each target is assigned a mission value. Cutoff values (shown in Figure 2) set the minimum thresholds that targets must attain to be considered for attack by certain fire support assets. The commander assigns these to tell AFATDS which weapon systems to consider (and not to consider) as attack options for certain targets.

One technique used to set cutoff values is for the operator to process "dry" missions against several target types on the TMM. For example, he can process a mission against a notional platoon of "armor, medium" and determine the mission value. This becomes the cutoff value for FA because, in this case, "armor, medium" is the lowest weighted target type the commander wants to engage with artillery. A request-for-fire that carries a lower mission value than the cutoff value for FA causes AFATDS to consider mortars as an attack option. Conversely, air and NGF usually have higher cutoff values.

In the TMM, the commander can specify which target types require target damage assessment (TDA) or should not be fired upon but rather handed off to the intelligence and electronics warfare (IEW) officer for exploitation. The commander can specify when targets will be engaged "as acquired," "immediate" or "planned."

The commander also can exclude target types in the TMM display from consideration for attack by fire support assets.

Fire Support Coordination. After AFATDS determines that a target is suitable for attack, it reviews the target for coordination requirements. It automatically checks each fire mission against established FSCMs and unit boundaries (entered into AFATDS as zones of responsibility) and notifies the operator of any violations. If a violation occurs, the AFATDS automatically submits a digital request for coordination to the unit that established the measure. That unit must approve or deny the mission before processing continues.

AFATDS also considers operator-specified buffer distances around FSCMs and unit zones. These weapons system buffers ensure the effects area for each system (FA, mortar, NGF, air) doesn't violate the control measure or boundary/zone.

Attack Analysis. Next, AFATDS determines how to attack the target applying guidance by system preference; FA preference; FA attack methods; or mortar, NGF and air attack methods.

The system preference table (Figure 5) allows the operator to tell AFATDS the weapon the commander deems most appropriate for each target type. The weapons systems are ranked from 1 to 4 in priority for consideration.

For example, the commander might specify that AFATDS first consider using mortars against a heavy machinegun target before it considers using FA. For armored personnel carrier (APC) targets, he prefers AFATDS consider FA first, if available, and the mortar platoon as a second option.

Once FA is selected as the delivery system, AFATDS' FA preference table helps the battalion fire direction center

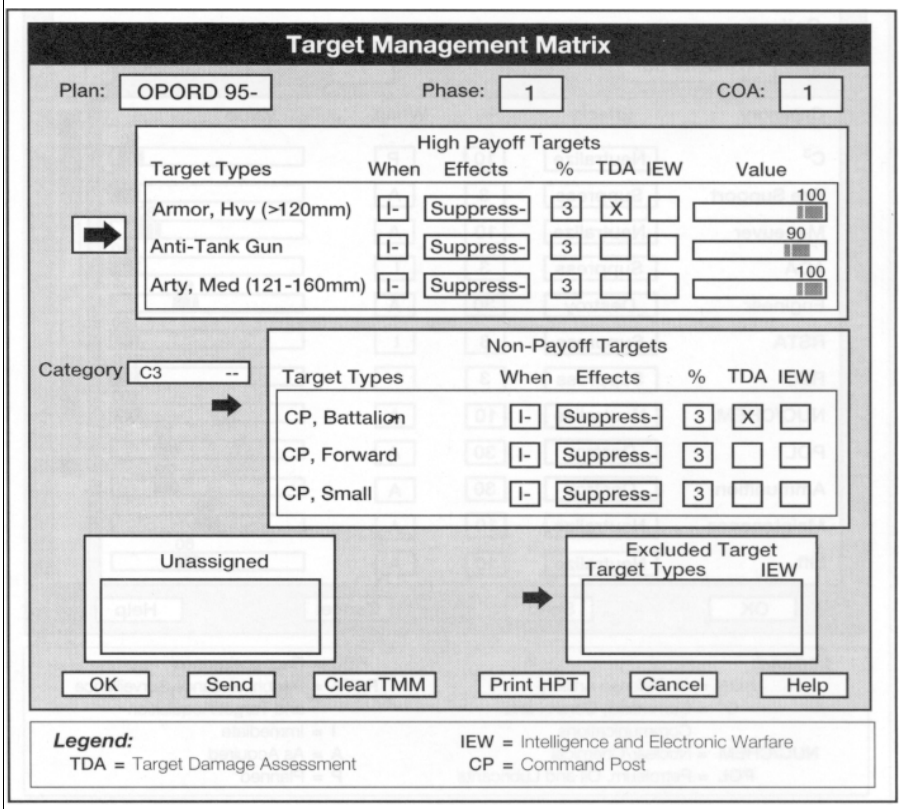


Figure 4. Target Management Matrix (TMM)

(FDC), select the best delivery unit. All firing platoons can be entered and given a precedence for each target type.

When AFATDS determines who to give a mission to, it considers the FA preference table, any operator-specified units, the number of missions already assigned to each firing unit (mission load) and the unit next in line to receive a fire mission (flow control). In addition, the distance from a target may be a criterion in fire unit selection.

The FA attack methods table allows the commander to specify the shell/fuze combination and number of volleys for each target type of each target category. AFATDS will consider and apply the table if it provides adequate effects for the guidance specified in the TMM or HVTL. If not, AFATDS then applies the updated joint munitions effectiveness manuals (JMEMs) to provide an attack option.

The mortar, NGF and air attack methods tables are similar to the FA attack methods table.

Multiple Plans. A commander can design targeting guidance for different missions and mission, enemy, terrain, troops and time available (METT-T) models and store it in the AFATDS data base as a plan. This gives him tremendous flexibility to "cut and paste" his guidance from any plan into new plans. He also can quickly refine his guidance and transmit it to other AFATDS nodes to implement.

Fire Mission Processing. Another powerful capability AFATDS offers is the ability to eliminate the traditional mission delays associated with processing fire missions through multiple layers of fire support coordination. Not every mission needs to stop at every fire support node in the mission thread (digital route). By tailoring AFATDS intervention points (IPs), the commander can specify which missions stop for review (human intervention) at intermediate fire support nodes (task force and brigade fire support elements, or FSEs) and which automatically process through the fire support system to a firing unit for rapid response.

For example, the commander may want all fire missions for "armor, medium" or "missile, heavy" targets to process rapidly without human intervention—a decision based on the type of target. He may want to control IPs of fire missions based on the mission value—have every request-for-fire against a target type with a value of less than 50 stop for human review. A commander may want to specify IPs by types of missions; for example, he may want to screen adjust fire or illumination missions before they are processed. A commander may decide he wants all fire missions AFATDS assigns to the mortar platoon to be processed automatically without human intervention—a decision by attack option.

The commander may want only fire missions that violate his filtering or screening guidance to have an IP. This adds a human review of an AFATDS decision before a mission is denied or coordination is requested. If the commander does not want a computer denying a maneuver commander's request-for-fire, he can establish an IP in AFATDS to review all missions the system recommends be denied.

Designing IPs in AFATDS offers tremendous flexibility. Tailoring IPs may be an alternative to quick-fire channels and has the potential of offering near real-time sensor-to-shooter capabilities.

As commanders and staffs become more comfortable with manipulating the guidance in AFATDS, they'll become more confident in allowing the software to take over some of the processing and decision-making tasks, increasing their mission processing efficiency and speed.

AFATDS is the "automation bridge" to close the gap between *detect* and *deliver*.

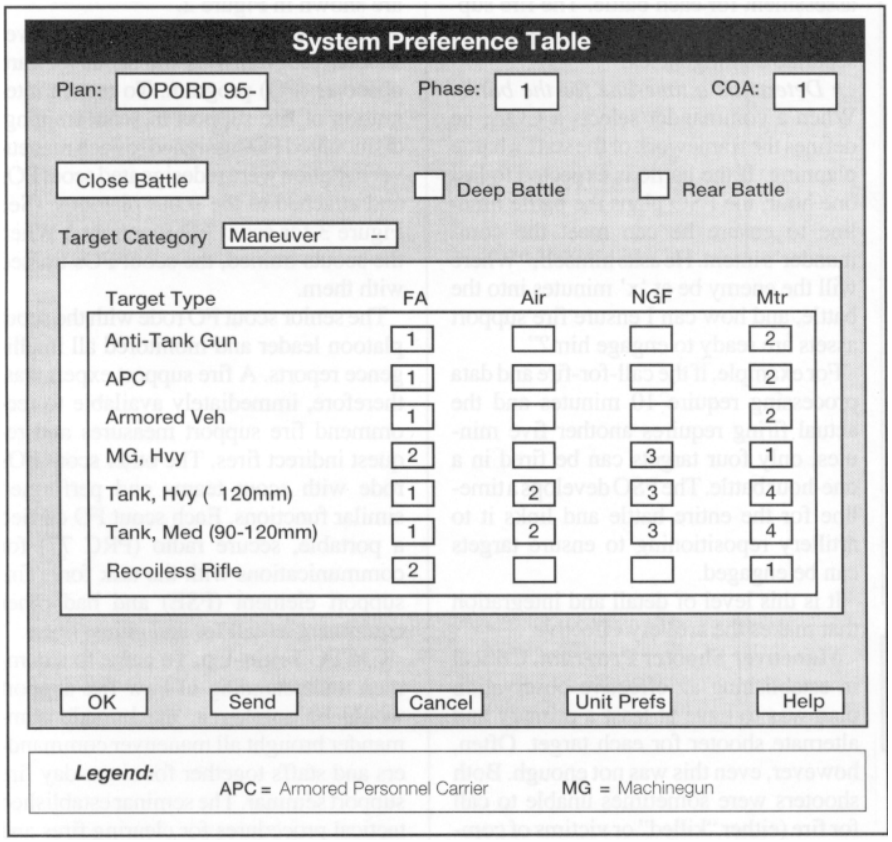
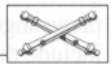


Figure 5. System Preference Table



Captain (Promotable) Henry M. (Chip) Hester, Jr., is an Action Officer in Task Force 2000, part of the Field Artillery School, Fort Sill, Oklahoma, currently writing tactics, techniques and procedures for the Advanced Field Artillery Tactical Data System (AFATDS). He commanded Headquarters and Headquarters Battery, 3d Battalion, 1st Field Artillery in the 3d Infantry Division (Mechanized), Germany, and served as Fire Support Officer for both Task Force 4-69 Armor, 3d Infantry Division, and Task Force 3-32 Armor, 1st Cavalry Division, Fort Hood, Texas.

Captain (Promotable) Marc F. Mann until recently was the Officer-in-Charge of the AFATDS Training team at the Field Artillery School. Currently, he's a Fire Support Observer/Trainer in the Battle Command Training Program at Fort Leavenworth, Kansas. He has served as Fire Support Officer for Task Force 1-30 Infantry and Commander of C Battery, 3d Battalion, 1st Field Artillery, both in the 3d Infantry Division. Captain Mann also was a Battery Executive Officer and Fire Support Team Chief, among other jobs, in the 24th Infantry Division (Mechanized) Artillery at Fort Stewart, Georgia.

Exploiting the Effects of Fires:

Synchronized Targeting and Execution

by Colonel David C. Ralston and Captain Rodney L. Lusher

This article explains how one heavy brigade refined fire support training to more effectively fight with fires at the Combat Maneuver Training Center (CMTC) in Hohenfels, Germany. Fires must be lethal throughout the depth of the battlefield to set the conditions for success. During our CMTC rotation, the success of fires was the result of the maneuver commander's synchronizing fire support with other battlefield operating systems (BOS).

The brigade's training strategy emphasized two areas: synchronizing targets with all systems and training maneuver shooters. The results were impressive: fire support kills increased by 101 percent over the previous rotation.

Targeting. *FM 6-20-40 Fire Support in Heavy Operations* defines a planned target as "a target upon which fires are prearranged." This definition does not include the most important aspect of targeting, which is the synchronization of targets with other BOS. To emphasize this, the brigade defined *synchronized* targets (see Figure 1). A synchronized target is a planned target with the CMTC's six essential elements. It meets the commander's intent and is inexorably tied to the reconnaissance and surveillance (R&S) plan, the obstacle plan and the scheme of direct fires and maneuver—targets that are totally integrated into the combined arms fight.

Within the context of the *decide, detect, deliver* and *assess* targeting methodology, the brigade followed three simple rules: maintain a manageable number of targets, focus those targets on the enemy's most likely course of action (COA) and develop a time-line for the battle.

❑ Purpose	❑ Commo Net
❑ Location	❑ Trigger
❑ Observer	❑ Rehearsal

Figure 1: Synchronized Target. A synchronized target is one that meets the commander's intent, has the six essential elements listed and is integrated into the overall battle.

• *Maintain a manageable number of targets*. The commander must resist the impulse to have many targets. The observation plan limits the number of targets one can cover. Each target requires at least a primary and alternate shooter; a 10-target list requires 20 dedicated observers. This ratio may not always be two-to-one as an observer may have responsibility for two targets, but a well-defined observation plan directly affects target planning. The key is to plan fewer targets so each can be fully *synchronized*.

• *Concentrate your limited number of targets on the enemy's most likely COA*. The battalion S2 must commit to this assessment for each battle. The fire support officer (FSO) uses hasty fire plans for separate contingencies.

• *Determine a time-line for the battle*. When a commander selects a COA, he defines the framework of the staff's battle planning. If the battle is expected to last one hour, the FSO plans the battle timeline to ensure he can meet the commander's intent. He asks himself, "Where will the enemy be at 'x' minutes into the battle, and how can I ensure fire support assets are ready to engage him?"

For example, if the call-for-fire and data processing require 10 minutes and the actual firing requires another five minutes, only four targets can be fired in a one-hour battle. The FSO develops a timeline for the entire battle and links it to artillery repositioning to ensure targets can be engaged.

It is this level of detail and integration that makes the artillery effective.

Maneuver Shooter Program. Critical in establishing an effective observation plan was to have at least a primary and alternate shooter for each target. Often, however, even this was not enough. Both shooters were sometimes unable to call for fire (either "killed" or victims of communications failure), leaving no one to observe the target. Frequently the problem was an insufficient number of trained observers. To correct this, the brigade expanded its maneuver shooter program.

A maneuver shooter program trains tank and Bradley commanders, scouts, engineers and air defense scouts to call for and adjust fires. The program trains every leader in the task force to be an observer.

It began with a one-day program of instruction (POI) taught by the brigade's FSO and fire support NCO (FSNCO) at the Training Set, Fire Observation (TFSO) simulator. The POI taught the skills needed to execute a fire mission and then tested them during simulation exercises—Janus and simulation network (SIMNET)—that focused on indirect fires.

Maneuver shooters were then certified during maneuver exercises. More than 200 maneuver shooters were certified during our CMTC train-up.

The communications net the maneuver shooter should use became a much debated issue. After trying several options, the primary net for maneuver shooters became the company command net to the company fire support team (FIST). The company FIST then relayed the mission to the tactical fire direction system (TACFIRE) on the artillery command fire (CF2) net. Primary and alternate nets are shown in Figure 2.

One initiative to enhance the maneuver shooter program was the scout forward observer (FO) program. To ensure integration of fire support in scout training, dismounted FOs assigned to each maneuver battalion were redesignated scout FOs and attached to the scout platoons. (See Figure 3 for scout FO functions.) When the scouts trained, the scout FOs trained with them.

The senior scout FO rode with the scout platoon leader and monitored all intelligence reports. A fire support expert was, therefore, immediately available to recommend fire support measures and request indirect fires. The other scout FOs rode with scout teams and performed similar functions. Each scout FO carried a portable, secure radio (PRC 77) for communications with the task force fire support element (FSE) and had other equipment to call for and adjust fires.

CMTC Train-Up. To come to a common understanding of how fire support would be employed, the brigade commander brought all maneuver commanders and staffs together for a one-day fire support seminar. The seminar established tactical procedures for clearing fires and setting priority of fires. It set the requirements

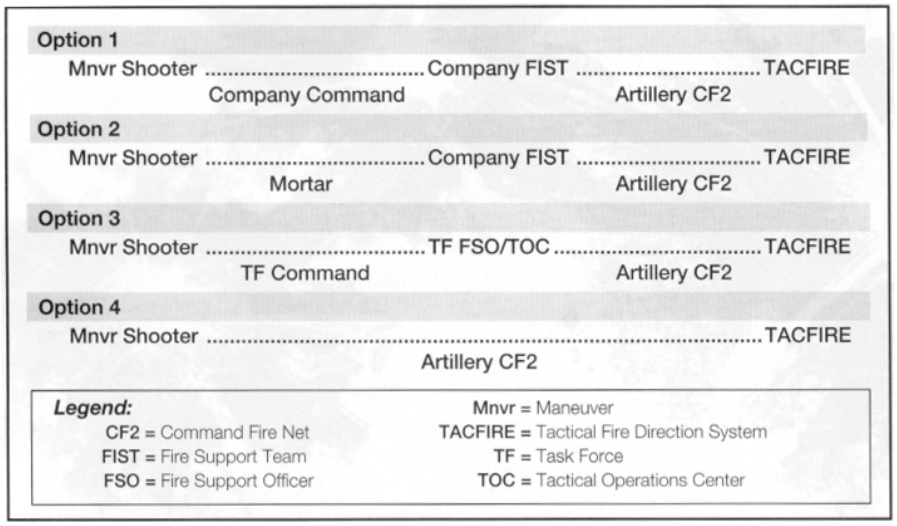


Figure 2: Maneuver Shooter Communications Nets. The nets are listed by primary and alternate options.

of a synchronized target, the formulation of the commander's intent, and the execution of a combined arms rehearsal. It established the location of FSOs on the battlefield and the communication nets for maneuver shooters. When the seminar closed, the brigade team had a common understanding of how the commander intended to fight with fires.

Simulations. The brigade trained on Janus and SIMNET exercises extensively. The brigade commander's intent for fires dictated that maneuver exploit the effects of fires. Therefore, during the first iteration of the simulation, units had to fight with fires only. Maneuver was then added to the following iterations. This training approach required commanders to think fires first, then decide how maneuver could exploit those fires. As a result, the commander's intent for fires developed into detailed products that synchronized direct and indirect fires.

Right Seat Rides. Another initiative to improve artillery warfighting abilities was the right seat ride program that allowed individuals to go to CMTC and ride with an observer/controller (O/C).

The coaching provided by the O/Cs was invaluable. From the artillery battalion alone, we sent 92 officers and NCOs in one year to strengthen their skills. We then followed up with officer professional development (OPD) seminars to discuss and maximize the lessons learned.

- ❑ Advise the scout platoon leader on employing fire support.
- ❑ Train the scouts on calls-for-fire and fire support integration.
- ❑ Provide the task force fire support element (FSE) intelligence.
- ❑ Link the scouts directly with the artillery.

Figure 3: Scout Forward Observer Functions

Combined Arms Exercise. Once leaders developed fire support skills and understood the systems, the brigade planned a combined arms exercise (CAX): FireStarter. FireStarter was conducted in two phases, both specifically designed to exploit the effects of fires. It was also the first step in certifying maneuver shooters.

Maneuver battalions conducted the first phase in local training areas. This was the first effort at executing the six elements of a synchronized target in a field environment. It was a free-play exercise organized as a company-level situational training exercise (STX) lane attacking a dug-in enemy platoon. Companies rotated as attacker and defender. After each STX, the task force commander and S3 conducted an after-action review (AAR) that concentrated primarily on fires. The company then could apply the observations during subsequent runs.

A high-mobility multipurpose wheeled vehicle (HMMWV) exercise conducted at the CMTC was the second phase. This was a unique opportunity that allowed us to focus on the synchronization of fires (e.g., timing, triggers, the observation plan, etc.). Companies attacked and defended against the opposing force (OPFOR). CMTC O/Cs coached the companies and conducted AARs. For continuity, these were the same O/Cs the units later had for their rotation.

FireStarter trained the maneuver leaders at the company and platoon levels to own fires as an asset to be integrated into the fight. They practiced how to request fires, how long it took to get fires and how to adjust them. This training was extremely effective for both maneuver and fire supporters.

The Results. When the brigade arrived at the CMTC for its rotation, it was trained and combat ready.

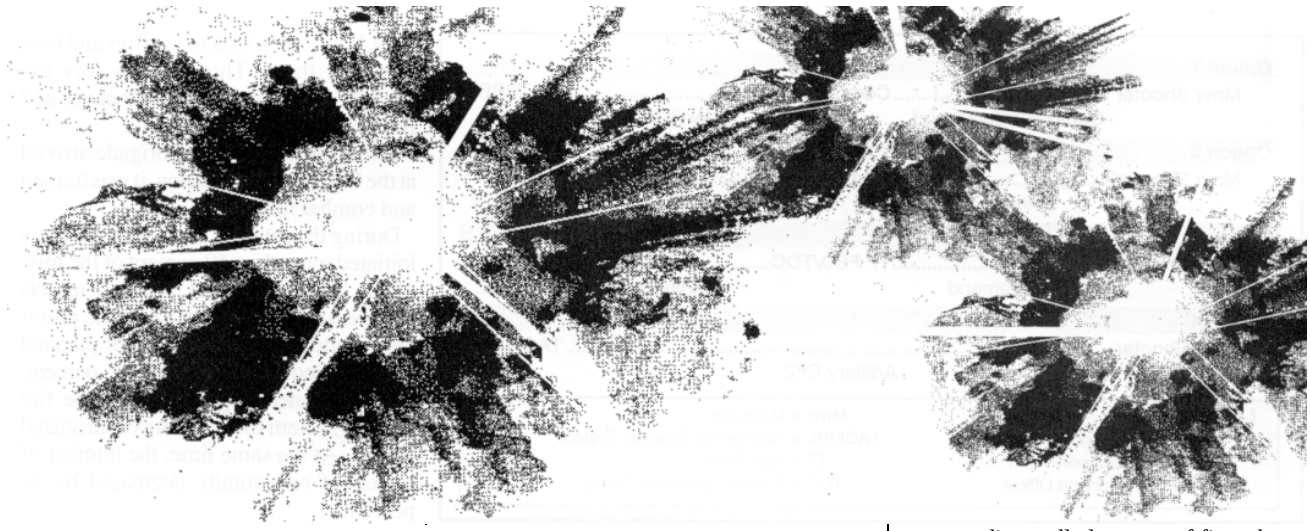
During the rotation, maneuver shooters initiated more than 50 percent of the missions. The number of planned targets decreased by 20 percent from the previous rotation, but the number of planned targets fired increased by 32 percent. Fewer planned targets enabled the fire support system to focus on synchronized targets. At the same time, the number of targets of opportunity decreased by 54 percent.

Overall, the artillery fired 21 percent fewer missions but doubled the number of enemy combat vehicle kills. Fewer targets were planned, but they were planned more efficiently and were effectively *synchronized* with the R&S and obstacle plans and the scheme of maneuver. Clearly the disciplined, systematic engagement of synchronized targets was the key to success in fighting with fires

To exploit the effects of fires, maneuver commanders must ensure synchronized targeting and execution. A common understanding of how the brigade commander intends to fight his fires along with a solid training program will prove effective in fighting with fires.

Colonel David C. Ralston is the Deputy Director of Officer and Enlisted Personnel Management in the Office of the Secretary of Defense at the Pentagon. He commanded the 3d Battalion, 1st Field Artillery, in direct support to the *Spartan Brigade*, part of the 3d Infantry Division (Mechanized) in Germany. He also has served as Executive Officer of the 1st Cavalry Division Artillery at Fort Hood, Texas, and S3 of the 3d Battalion, 3d Field Artillery, 2d Armored Division, also at Fort Hood. Colonel Ralston is a graduate of the Army War College and was a National Security Fellow at Harvard University.

Captain Rodney L. Lusher is a student at University of Central Florida working on an MA in Simulations. He commanded B Battery, 3d Battalion, 1st Field Artillery, part of the 3d Infantry Division (Mechanized), and was the task force Fire Support Officer for the 2d Battalion, 70th Armored, *Spartan Brigade*. He is a graduate of the Field Artillery and Armor Officer Advanced Courses at Fort Sill, Oklahoma, and Fort Knox, Kentucky, respectively.



TTP for Clearing
Brigade Fires

by Major Samuel R. White, Jr.

Experiences at the National Training Center (NTC), Fort Irwin, California, reveal most heavy brigades do not employ procedures that positively clear fires. In fact, in our doctrine, we have no standardized clearance-of-fire procedures for a brigade.

Units try a variety of methods to clear fires at the NTC. The three most common are as follows:

In the first method, the brigade fire support element (FSE) consults the brigade S3 battle captain, who looks at the S3 situation map. If no friendly "sticky" icon is present at the grid, the battle captain pronounces the grid "clear." This is the most common technique brigades use to clear fires.

The second method units use to clear fires is to have the task force (TF) fire support officer (FSO) call the observer and ask if he can positively identify the target as enemy. If the answer is "Yes," the grid is declared "clear."

In the third method, the brigade FSE calls the FSE responsible for the zone or sector within which the fires plot and requests clearance. The subordinate FSE then either consults its situation map or consults the TF S3's map. Again, if no "sticky" icon is posted at the grid in question, the mission is declared "clear."

None of these procedures are effective. During the past year, ineffective clearance of fires has yielded an average of seven fire support "fratricide" incidents per rotation, resulting in the "loss" of combat systems and 31 soldiers. Additionally, on an average, 25 artillery fire missions per rotation are determined to be "close to friendly"—that is, less than 500 meters from friendly soldiers. Although no casualties were sustained in the close-to-friendly missions, the large number indicates a lack of positive clearance-of-fire procedures. On another battlefield, with live munitions, the casualty count could be tragically higher.

There are a number of steps units can take to protect the force against fratricide. To ensure fires are effectively cleared, units need to employ maneuver control measures, use fire support coordinating measures (FSCMs) correctly, pre-clear fires (in limited circumstances) and train soldiers in a clearance-of-fire battle drill so they can execute the procedures rapidly.

Maneuver Control Measures. The first step in effective clearance of fires is ensuring units use maneuver control measures. Fire supporters must remind both task force and brigade S3s of the effect on clearing fires when S3s don't give subordinate maneuver units zones or sectors—when units have no established boundaries. Because boundaries serve as permissive and restrictive measures, the decision not to employ them profoundly affects timely clearance of fires at the lowest level possible. The higher headquarters (probably brigade) then has to coordinate all clearance of fires short of the coordinated fire line (CFL)—a very time-intensive process.

Whenever possible, boundaries should be used as they allow the unit that owns the ground to engage targets quickly, requiring coordination and clearance only within that organization. Boundaries also neatly divide up battlespace and clearly define responsibility for clearing fires.

An important point on maneuver control graphics: staffs must be knowledgeable regarding the different maneuver control measures and their impact on clearing fires. For instance, boundaries are both restrictive and permissive, corridors are restrictive, while routes, axis and directions of attack are neither.

Fire Support Coordinating Measures (FSCMs). The next step in clearing fires is to properly use FSCMs. Judicious recommendation to the division FSE on the placement of the CFL within the brigade zone or sector is extremely important. The CFL should be as close to the forward line of own troops (FLOT) or forward edge of the battle area (FEBA) as the brigade can track.

In other words, the CFL should be placed just beyond the last point on the ground that the FEBA/FLOT can accurately be located. Forces beyond the FEBA/FLOT and, therefore, beyond the CFL—combat observation/lasing teams (COLTs), scouts, etc.—should be protected by no-fire areas (NFAs). If forces beyond the FEBA/FLOT cannot be accurately tracked (so that NFAs can be established), the CFL must be pushed beyond the point these assets would reasonably be expected to be. Note: CFLs only apply to surface-to-surface fires.

It is doubtful if the corps fire support coordination line (FSCL) will be shallow enough to facilitate close air support (CAS)

attacks for the brigade or task force; therefore, all CAS missions, regardless of whether they are long or short of the CFL, must be cleared by the unit owning the ground.

NFAs should be established on all forces forward of the CFL, and these NFAs should be sent to higher, lower and adjacent headquarters. NFAs should be established on assets short of the CFL if that asset is not task organized to the force in whose zone or sector it is positioned (for example, brigade COLTs in TF 1-1's sector. TF 1-1 scouts in TF 1-2's sector, etc.).

Pre-Clearance. Next, units determine which fires short of the CFL will be considered pre-cleared. In some *very specific* instances, fires can be cleared during the planning phase (pre-clearing). These instances are as follows:

- Fires into a planned call-for-fire zone (CFFZ) resulting from a radar acquisition in that planned CFFZ. The CFFZ must have been planned in advance and published in the radar deployment order (RDO). The CFFZ also should have been rehearsed in advance.

This pre-clearing does not apply to fires resulting from a violation of a critical friendly zone (CFZ) because, unlike a CFFZ that targets a specific enemy artillery formation at a specific location, a CFZ generates a fire mission regardless of the location of the enemy artillery and is, therefore, impossible to predict.

- Fires on a preplanned target with a definable trigger, against a specific enemy and in accordance with the scheme of fire support. In other words, when executing the fire support plan, that specific target can be considered pre-cleared. When shifting from a target or known point, these fires must be positively cleared.

Prior to pre-clearing any fire missions, the maneuver commander must assess the fratricide risk to determine if his unit is trained to a level that will allow pre-clearing fires. Because pre-clearing fires is not positive clearance of fires, it is absolutely vital that commanders, not fire support officers (FSOs), decide to employ this technique.

Clearance-of-Fires Battle Drill. Even though units employ all the measures already outlined in this article, there will be times when they must clear fires. This procedure must be a battle drill in all command posts (CPs) and tactical operations centers (TOCs).

Before outlining the battle drill, one caution: *Fires cannot be cleared off situation maps*—the maps are never accurate enough. No matter how much we pride ourselves on battle tracking and situational awareness, our maps will be wrong or considerably behind reality.

A call must go out on radio nets requesting clearance to fire on a particular grid from the force on the ground. This radio call must be a two-pronged attack: a call on the fire support net simultaneous with a call on the command or operations and intelligence (O/I) net. The command net is preferred because more stations monitor that net, but reality says it will more than likely be the O/I net.

A sample scenario: if a brigade COLT wants to fire an unplanned fire mission short of the CFL in TF 3-19's zone, the call would go out on the brigade O/I *and* brigade fire support nets: "TF 3-19 FSE [or TOC], this is brigade FSE [or TOC], request clearance on grid NK395176," Within TF 3-19, the process is repeated on the task force command or O/I nets and the heavy mortar net: "Guidons, this is TF 3-19 FSE, request clearance on grid NK395176." This request received at the company CP and the company FSO's fire support team vehicle (FIST-V) is quickly answered and sent back to the task force FSE/TOC and then back to brigade as a cleared fire mission. The entire process takes surprisingly little time *if* it is treated and trained as a battle drill.

There are several scenarios that require clearance of fires.

- Fires across one task force boundary into the zone/sector of another task force require clearance. The most effective method to clear fires in this instance is for the brigade to authorize direct clearance of fires between task forces. That is, TF 3-19 can call TF 2-19 directly to clear a fire mission. This is best done on the brigade O/I and brigade fire support coordination (FSC) nets. The brigade TOC monitors the action and gets involved only to facilitate coordination (i.e., communications between task forces are poor, etc.).
- Fires by a brigade observer—COLT, Q-36 Firefinder radar, military police (MPs), target acquisition and reconnaissance platoon (TARP), etc.—short of the CFL and into a task force zone/sector require clearance. Use the same clearance procedures explained in the previous example.
- Any fires by anyone short of the CFL if task force zones/sectors are not established (as in a defense from a battle position mission) require clearance. This is best accomplished as outlined previously, except the brigade announces a guidons call to the force as a whole. Obviously, this method takes time and highlights why every effort should be expended to use boundaries and FSCMs and to pre-clear fire missions.

Final Thoughts. Maneuver commanders clear fires. Certainly, they may delegate coordination responsibility to their FSEs, but the final "Yes" or "No" must come from commanders.

Fire supporters at all levels must assist their supported maneuver commanders and maneuver staffs in developing battle drills to clear fires. The tactics, techniques and procedures presented here are effective and work—a start point for a brigade or task force clearance-of-fires battle drill in your unit.

Major Samuel R. White, Jr., until June of this year, was a Brigade Fire Support Trainer at the National Training Center (NTC), Fort Irwin, California. He had been assigned to the NTC since October 1991 and also served as the Service Battery and then Firing Battery Combat Trainer and Fire Support Analyst. Currently, he's a student at the Command and General Staff College, Fort Leavenworth, Kansas. During Operations Desert Shield and Storm, he commanded the Howitzer Battery of the 2d Squadron, 2d Armored Cavalry Regiment out of Bamberg, Germany, the same in which he served as the squadron Fire Support Officer (FSO). Among other assignments, Captain White was a troop FSO in the 3d Armored Cavalry Regiment at Fort Bliss, Texas.

The Artillery S2's *Intelligent* Preparation of the Battlefield

by Captain Ralph A. Patelli, MI

If you ask what area the artillery battalion S2s have the greatest difficulty with at the National Training Center (NTC), Fort Irwin, California, the answer is easy: the intelligence preparation of the battlefield (IPB) process. Often, the difference between the success and failure of an artillery operation is due to either the S2's failure to perform the IPB or his inability to perform it to standard.

"Artillerizing" this intelligence process is critical to performing the IPB correctly. Several products in the Field Artillery tactical orders process will fail if the IPB is not done correctly. These include mission analysis, course of action (COA) development, the decision support template (DST) and any synchronization or execution matrices. Field Artillery rehearsals (technical and fire support) and radar planning, employment and cueing also are affected.

In all military operations, preparation before the battle sets the stage for success. The IPB process really begins during pre-deployment operations.

Pre-Deployment Preparations

The intelligence section must check its load plans like any other organization. Often key references are overlooked. The following are the minimum references needed to perform artillery IPB properly: *FM 34-130 Intelligence Preparation of the Battlefield* (July 1994); *FM 34-81-1 Battlefield Weather Effects* (December 1992); *FM 6-20-1 Tactics, Techniques and Procedures for Field Artillery Cannon Battalions* (November 1990); *FM 6-121 Field Artillery Target Acquisition* (September 1990); and *FM 34-3 Intelligence Analysis* (March 1990). You also need the appropriate doctrine and tactics manuals for the threat you face. The Training and Doctrine Command (TRADOC) Pam 350 series are the standard for the level of detail needed.

While reviewing these references with your section, determine the strengths and weaknesses of your section. Focus your training on the following areas (not listed in priority).

• *Terrain and Weather*. Current information is critical in developing the foundation product of IPB: the modified combined obstacles overlay (MCOO). The better you know the terrain, the weather conditions and their effects on ballistic solutions and firing battery positioning, the more pertinent your analysis will be to planning and execution.

• *Enemy Task Organization*. As the artillery S2, you must know the enemy's artillery organization from the division-level down to the company level. You focus on numbers and types of armored and (or) mechanized equipment. The artillery S2 must be an expert on threat equipment capabilities and limitations in both day and night operations.

• *Doctrine*. You must know the enemy's rates of march as well as formations: depths and widths of the division, brigade (or regiment), battalion and company in both the offense and defense. It's vital to understand how the enemy adjusts his formations in respect to friendly force deployment and actions.

• *Artillery-Specific Information*. As the artillery battalion S2, you're expected to be the subject matter expert on enemy artillery and tactics. At a minimum, you must know artillery types and calibers in use; the number of tubes in a battery, battalion and groupings; munitions used by type and their ranges (conventional as well as extended ranges); disposition of firing units in relation to maneuver forces in the offense and defense; conduct of fire support in both counterfire and direct support (DS) roles; the intentions the enemy artillery fires telegraph (e.g., phases of fires); and the counterfire assets the enemy has and their capabilities and limitations.

• *Air Defense Artillery (ADA)-Specific Information*. This includes the enemy's equipment capabilities and limitations, employment and doctrinal considerations and the composition of ADA platoons and batteries as well as their locations on the battlefield in the offense and defense.

• *Intelligence Threat Against Artillery and Countermortar/Counterbattery Radars*. You must understand what collection systems and agencies are positioned to target friendly artillery systems. That includes what electronic intelligence (ELINT) systems and reconnaissance units can detect, report and destroy one of your most valuable intelligence/targeting systems, the Q-36/37 Firefinder radar. You must know what countermortar/counterbattery radars the enemy has to detect your battalion, how many he has, what their capabilities are and where they are positioned doctrinally on the battlefield. The local military intelligence (MI) unit, division artillery and (or) the MI battalion liaison officer (LNO) at the brigade tactical operations center (TOC) can answer these questions.

The IPB Process

IPB is a continuous process consisting of four steps.

Step 1: Define the battlefield environment. For the most part, this step is done for you. The brigade or higher headquarters defines your area of operations (AO) and area of interest (AI), which focus the firing units' reconnaissance and surveillance (R&S) efforts and radar deployment order (RDO). The critical pieces of information you need to identify are what the outer limits of the brigade zone are and how far your radar will have to move forward

to "see." In the realm of R&S, the width of the battlefield and your flank security issues will determine whether you have a wide or narrow front.

Last, you need to know when the brigade line-of-departure (LD) or defend-no-later-than (NLT) time is. This tells you how long you have to develop an operations order and, to a greater extent, how long you have to produce IPB products. This information also aids you in providing guidance for the warning order (WARNO) and forward positioning of the radar.

Step 2: Describe the battlefield's effects. This includes weather analysis; MCOO; observation, cover and concealment, obstacles, key terrain, and avenues of approach (OCOKA); and artillery-specific considerations. The defining product in this step is the MCOO. It must be produced at home station and updated after you arrive in the deployment area. Time and mission demands won't allow you to develop a detailed MCOO in the "war zone."

The MCOO. This product depicts the battlefield's effects on military operations (see Figure 1). Note the symbols for the various forms of the avenues of approach are specific in the figure (air avenues, mobility corridors, etc.). Too often, units use large, sweeping arrows on their overlays to represent the avenues of approach, which are less informative and obscure the subtleties of the terrain.

The MCOO normally shows all obstacles to mobility, modified to include—

• Artillery-specific considerations, such as sight-to-crest, intervening crest, cant, intervisibility lines (discussed later), mask angles, track volume, mobility corridors, ground and air avenues of approach and possible position areas (PAs).

• Special areas that will cause problems for firing units or affect firing computations (low- and high-angle fires) and radar observation.

• Areas through the AO that can support firing battery, TOC, radar and combat service support (CSS) sites. These survivability positions are identified by looking for areas of intervisibility.

• Key terrain features. These are features that afford either friendly or enemy forces a clear advantage—good observation over battle positions, position areas or objectives; chokepoints along the routes of march; or critical manmade or natural logistics areas.

• Likely ground and air avenues of approach and mobility corridors. Figure 1 illustrates the minimum requirements to produce the "artillerized" MCOO.

Steps in Producing the MCOO. As the artillery S2, you produce the MCOO in several steps.

• Determine the terrain features affecting artillery. First, you highlight areas on the map that can cause problems for firing units. You look at the battlefield differently than armor or infantry S2s. For example, they view restricted and severely restricted terrain from the aspect of negotiating it. The artillery S2 also must see that terrain from the fire direction officer's (FDO's) point of view: range-to-target, elevation-to-target and terrain or ridges that will cause problems with sight-to-crest, etc.

In addition, the artillery S2 must see terrain features and PAs from the radar technician's point of view, determining optimum mask angles and if there is enough track volume to follow the enemy artillery rounds both on ascending and descending arcs.

After you visualize the unique challenges of the terrain, you address any gun-to-target issues that can arise. These steps can prevent many fire direction center (FDC) ballistic computation problems as well as identify the minimum quadrant and elevation problems for the batteries early.

You graphically depict the terrain features on the map much as you would "Restrictive" and "Severely Restrictive" terrain, but you focus on variations in elevations. You just adjust the legend on the MCOO to reflect which features cause sight-to-crest or other problems. Finally, you identify built-up areas as well as bodies of water that will cause trafficability problems.

This first critical analysis of the terrain starts the IPB process out on the right foot. It sets the stage to provide the commander information that directly affects the mission and satisfies the "So what?" test.

• Determine observation and concealment locations. In this step, you locate areas on the map that indicate an intervisibility line. This is an area were terrain masks your unit from enemy ground observation. Wadi systems, fingers and gentle slopes in the terrain will cause intervisibility lines. These lines become survivability enhancers for the enemy as well as friendly units.

Artillery units can capitalize on intervisibility lines by using them for PAs. Additionally, fire support teams (FISTs) can predict observing or lasing problems when enemy forces occupy terrain on the other side of such a line.

With a single line on the map, you indicate the crest line of the terrain causing the intervisibilty. You can verify your analysis through a local engineer terrain team's or the brigade S2 shop's Terrabase

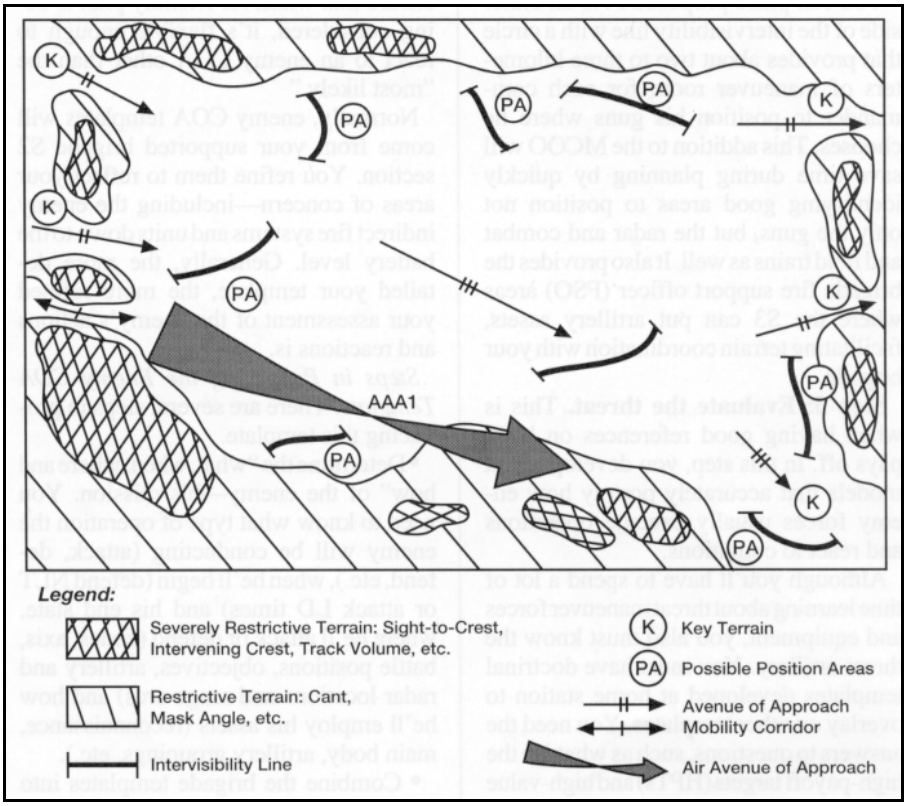


Figure 1: Sample Modified Combined Obstacle Overlay (MCOO)

program or with a more detailed, smaller scale map—a 1:24,000 scale map as opposed to the 1:50,000 scale map of your MCOO.

• Determine ground and air avenues of approach. Don't fall into the trap of using your higher headquarters' ground avenue of approach without refinements. Your focus needs to extend down to the regiment-, battalion- and company-level mobility corridors. Also, use standard symbology.

• Identify key terrain features. The mission and AO/AI dictate key terrain and decisive features. Using standard symbols, indicate chokepoints, road intersections and commanding terrain features. During mission analysis, you determine decisive terrain features and indicate them on the MCOO with a circled "D."

• Analyze the terrain. This is critical to the executive officer (XO), S4, S3, radar technician and the battery commanders in terms of determining the best PAs. Your terrain analysis combined with intervisibility lines provides a unique picture of potential sites for battalion subunits. Your overlay shows where units can shoot most effectively (intervening crest, cant, etc.) and where terrain will obscure batteries from direct observation.

You can place proposed PAs on either side of the intervisibility line with a circle that provides about two to three kilometers of maneuver room for each commander to position his guns where he chooses. This addition to the MCOO will save time during planning by quickly identifying good areas to position not only the guns, but the radar and combat and field trains as well. It also provides the brigade fire support officer (FSO) areas where the S3 can put artillery assets, facilitating terrain coordination with your brigade.

Step 3: Evaluate the threat. This is when having good references on hand pays off. In this step, you develop threat models that accurately portray how enemy forces usually execute operations and react to conditions.

Although you'll have to spend a lot of time learning about threat maneuver forces and equipment, you also must know the threat artillery. You must have doctrinal templates developed at home station to overlay on other templates. You need the answers to questions, such as what are the high-payoff targets (HPTs) and high-value targets (HVTs) for both friendly and enemy forces? How will the artillery grouping, target acquisition systems and electronic intelligence (ELINT) systems array themselves based on enemy objectives and maneuver? What phase of fire will the enemy use based on friendly maneuver force actions? To which areas can the enemy artillery and mortars range with conventional and rocket-assisted projectiles (RAP)? Where will the enemy artillery, mortar units, ELINT and counterfire acquisition assets reposition? At what point will the enemy firing units need to resupply?

Doctrinal templates for both the offense and defense produced at home station are ready for you to overlay onto your MCOO and weather analysis.

Step 4: Determine threat COAs. There are two products developed in this step: the enemy COA template (formerly called the situation template) and the event template. These products are critical during COA development and the war-gaming portions of the tactical orders process. The overlays show the enemy's strengths, weaknesses and the timing of his plan.

The most important aspect of these products are that they show the S3 and fire support coordinator (FSCOORD) the "least likely," "most likely" and "most dangerous" enemy COAs. The key here is to ensure that whatever friendly plan is being considered, it's flexible enough to react to an enemy COA other than the "most likely."

Normally, enemy COA templates will come from your supported brigade S2 section. You refine them to reflect your areas of concern—including the enemy indirect fire systems and units down to the battery level. Generally, the more detailed your template, the more refined your assessment of the enemy's actions and reactions is.

Steps in Producing the Enemy COA Template. There are several steps in producing this template.

• Determine the "what, when, where and how" of the enemy—his mission. You need to know what type of operation the enemy will be conducting (attack, defend, etc.), when he'll begin (defend NLT or attack LD times) and his end state, where he'll attack or defend (zones, axis, battle positions, objectives, artillery and radar locations and range arcs) and how he'll employ his assets (reconnaissance, main body, artillery groupings, etc.).

• Combine the brigade templates into one overlay. The differences among the COAs can be narrowed down to one or more, as determined by certain considerations. In the offense, you analyze the enemy's avenues of approach to his objectives and his formations per COA (one up and two back, two up and one back, column formation, etc). In the defense, you analyze the alternate battle positions around a kill sack, potential positions for enemy reserve forces along friendly avenues of approach, obstacle belts reflecting either a forward or reverse slope defense, etc.

• Refine the templated artillery groupings into battalion and battery locations. These groupings include regimental and divisional artillery groups (RAGs and DAGs) and mortars. You must be sure to template primary and alternate positions.

You also correlate the artillery range fans and the particular phases of fire they support. You depict on the overlay the range fan for each weapon system (e.g., 120-mm mortars, 2S1s, 2S3s, 2S5s, BM-21s, etc).

All this information should be readily available in your section enemy database. At this point, you're developing information critical for managing a radar plan.

• Depict on your overlay the ground and air avenues of approach and the enemy's immediate and subsequent objectives (regiment and division). You should annotate on the overlay the enemy's indirect phases of fire throughout the width and depth of your AO—including your maneuver forces' objective areas.

• Depict reconnaissance and special operations units' likely insertion sites (if the brigade omitted them from its overlays). These sites will have a critical effect on batteries, combat and field trains as well as the radar. The information will come in handy when you begin working on the event template.

• Depict special munitions, such as likely family of scatterable mines (FASCAM) and nonpersistent and persistent strikes (if not on a brigade overlay). You should review these with the chemical officer to see how much down-wind hazard would exist per strike. Also, you review the templated FASCAM minefields with the brigade FSO to determine the type and duration of the minefield(s).

Showing more than one COA on an enemy COA template saves time and acetate yet clearly shows the enemy's options. If you're really in a time crunch, depict only the "most likely" and "most dangerous" COAs. But ensure that at least the five aspects of the enemy are represented in

each COA: enemy mission, artillery grouping (phases of fire), avenues of approach, reconnaissance and special munitions. Some aspects may not change from one COA to another.

After you've completed the enemy COA template, you have the information to produce the final IPB product, the event template. It's important to note that the event template is the foundation document for the decision support template (DST), a template developed during the targeting process. Additionally, the event template drives your input into the various battalion rehearsals.

Steps in Producing the Event Template. There are several steps in developing the event template.

• Determine your named areas of interest (NAIs). Copy all the pertinent information from the brigade's event template, including NAIs you're tasked to cover. Next, add the NAIs you generate, based on your analysis of the enemy forces and their proximity to your subunits.

• Conduct time-phase line (TPL) analysis. You do this by using the lines on your overlay to "walk the enemy" through the AO (during the enemy's offense) or "walk the friendly forces" through the AO (during the friendly offense). All S2s perform this function during this phase of the IPB process.

The difference between the artillery and infantry or armor analyses is that you measure your TPL in 5- to 15-minute increments, not 30- to 60-minute increments. You're interested in the amount of time the enemy can move per kilometer. In the offense, you track the friendly force movements. Based on OCOKA and doctrinal movement rates, you draw a line on the overlay for each time increment from the tactical assembly area (TAA) to the objective. You must factor in the effects of the time of day, weather conditions, terrain constraints, obstacles and mission of the unit you're analyzing (reconnaissance, security forces, main body or counterattack forces). FM 34-130 has charts with march rates and other useful information.

• Next, you annotate on the overlay the enemy's phases of fire (based on whether he's in the offence or defense). Also, you annotate the TPLs and the templated enemy artillery positions, which define vital information for the cueing schedule and the RDO.

As you can see, the RDO becomes more concrete as time goes on and your information is further refined. You solidify where the radar is positioned, what its cueing schedule is per phase of fire and when it repositions. You put the radar zones on the event template. From the brigade FSO, you get the radar's critical friendly zones (CFZs) that satisfy the commander's intent for force protection. In this step, the battalion R&S effort and battalion perimeter defense plan also are solidified.

The bottom line in developing an event template is not only to have graphics that tie an enemy event to a location, but also show what triggers fires, thereby, helping to synchronize fires on the battlefield. The template allows you to gauge the pace and tempo of the battlefield and identify targets (type and number) that will present themselves.

The IPB and Friendly COA Development

The graphic nature of IPB products aids the staff planning process. The graphics eliminate wasted efforts and facilitate accurate, knowledgeable decisions—time is always short.

The IPB process should take no more than three to four hours. This assumes all members of the S2 section are contributing. Figure 2 shows a sample time line of

Orders Process	Time	S2 Products/Actions Required
Receive order from the brigade headquarters (LD time in 24 hours).	H-24	• Receive products from the brigade S2: – Refine enemy COA/event templates. – Combine most dangerous and most likely COAs. – Add NAIs, TAIs, CFFZs and CFZs.
ssue warning order.	H-23.5	Include radar initial location based on artillery enemy COA template (enemy artillery/mortar locations).
Analyze the mission.	H-23	• MCOO (done earlier). • Enemy COA template (refined). • Event template (brigade's copy).
)evelop COAs.	H-21	Refine and consolidate enemy COA/event template (COAs 1,2,3).
Conduct decision briefing.	H-19	• Enemy COA and event templates. • Prepare the RDO.
ssue second warning order.	H-18	Issue RDO to radar section (verify feasibility from current site).
Prepare order.	H-17	• Write/graphic matrix, the intelligence annex, R&S plan and RDO.
Reproduce order.	H-16	Make copies of products for all batteries, radar and R units.
Brief order.	H-14	• Brief MCOO, enemy COA/event templates, R&S plan and RDO to the DS or R battalion chains of command.
Conduct FA rock drill.	H-8	With the final enemy COA/event templates, brief the enemy scheme of maneuver and the corresponding phases of fire. Include the numbers/types of enemy systems the FOs can expect to engage for each CFST. The radar WO should review the RDO and the movement plan.
Rehearse fire support.	H-6	

Legend:

CFST =	Critical Fire Support Tasks	**MCOO** =	Modified Combined Obstacles Overlay
CFZs =	Critical Friendly Zones	**NAIs** =	Named Areas of Interest
CFFZs =	Call-for-Fire Zones	**TAIs** =	Targeted Areas of Interest
COAs =	Courses of Action	**R** =	Reinforcing
DS =	Direct Support	**RDO** =	Radar Deployment Order
FOs =	Forward Observers	**WO** =	Warrant Officer
LD =	Line of Departure	**R&S Plan** =	Reconnaissance and Surveillance Plan

Figure 2: Sample IPB Time Line in the Tactical Orders Process

the tactical orders process with the IPB products needed for each step.

The meat of the tactical orders process is COA development. The following paragraphs show the usefulness of IPB products during COA development.

MCOO. This product helps the battalion quickly determine locations for positioning critical nodes and firing units as well as the radar. It helps the FDO determine low- and high-angle positions and the charge requirements for various missions.

The MCOO helps the S3 determine ideal locations for positioning batteries, based on their critical fire support tasks (CFST) and future positioning requirements, and the battery commander determine areas that have sight-to-crest and intervening crest problems. There are many uses for the MCOO in the operations order (OPORD) team. The bottom line is that, used correctly, the MCOO can eliminate errors early on in the process.

Enemy COA Template. You can deconflict the projected PAs on the MCOO with the enemy positioning on the enemy COA template, ensuring you look carefully at both enemy and friendly range fans.

You also examine the avenues of approach. Are the battalion's critical nodes and firing units in harm's way? If so, are those acceptable risks? The battalion XO, S4 and S1 should look at the overlay to see if their elements are forward enough or too far forward. Is the main supply route (MSR) on the enemy's avenue of approach—what are the risks?

The radar technician should consider areas where the enemy would have to fire high-angle shots, facilitating acquisitions. Is the radar positioned far enough forward to acquire phases II and III fires? Are the appropriate censor zones established?

The S3 validates the Field Artillery support plan based on the refined enemy COA template and the operations graphics (PAs taken from the MCOO). This ensures he can range or reposition assets to satisfy the CFST.

Event Template. One area in which the event template helps is with unit movement planning. It allows planners to see how they can move assets through the battlefield while still maintaining an accurate, timely and consistent volume of fire to support the commander's guidance. The template identifies where the critical enemy formations will be in time and event increments (kilometers/minutes). Knowing the CFST, you can "see" missions and identify where your firing and acquisition assets need to be. The S2 then can identify when pauses and breaks in action will be as well as the culminating points. It will not be easy to identify when pauses will occur, but at least the staff will have some idea as to when risks will probably be highest for moving and repositioning firing batteries.

In conclusion, this article has presented a "thumbnail sketch" of the IPB process for the artillery S2. The most important thing you and your section can do is to produce the intelligence products in harmony with the tactical orders process—to stay relevant. Remember, while you're toiling at your map, each product you develop must pass the "So what?" test.

Captain Ralph A. Patelli, Military Intelligence, was the Fire Support Division's S2 Trainer at the National Training Center (NTC), Fort Irwin, California, for 13 months. Recently, he became a G2 Planner in the Plans and Operations Division of the NTC Operations Group. His previous assignments include serving as S2 for three years in the 2d Battalion, 39th Field Artillery (later 6th Battalion, 41st Field Artillery), part of the 3d Infantry Division (Mechanized) in Germany; and Armor Brigade S2 and Electronic Warfare Company Commander in the 24th Infantry Division (Mechanized) at Fort Stewart, Georgia. Captain Patelli is a graduate of the Military Intelligence Advanced Course, Fort Huachuca, Arizona.

Strike/Reconnaissance Team

The STRIKER concept being tested in the Army's advanced warfighting experiments (AWEs) relooks the "eyes" of the heavy force close fight and calls for doctrinal and organizational changes in forward observation to conquer tomorrow's battlefield. STRIKERs are dynamic, mission-adaptive target acquisition/execution teams the heavy brigade commander can allocate to any unit or location on the battlefield.

In the STRIKER concept, all forward observers (FOs) and combat observation lasing teams (COLTs) are organized into two STRIKER platoons, each with six teams, and consolided at the brigade or battalion level; each three-man team is headed by a staff sergeant or one of the platoon sergeants or platoon leaders. The teams operate in pairs to provide continuous operations and security. Their success comes largely from the stealth provided by their high-mobility multipurpose wheeled vehicles (HMMWVs) that are mission-tailored with the latest FO and communications equipment.

STRIKERs allow fire support elements (FSEs) and company fire support officers (FSOs) to concentrate on planning, coordinating and clearing fires—plus advising the maneuver commander on how to fight the battle. The STRIKER platoon headquarters executes critical fire support tasks (CFSTs) and coordinates team movements and also coordinates with other sensors to collect and report information. STRIKER employment is centralized or decentralized, based on the mission.

STRIKERs can be task-organized to give the commander the flexibility to concentrate his "eyes" on the battlefield where and when he wants. For example, a battalion task force commander with three STRIKER teams from brigade can allocate two teams to his overwatch company and one to his assault company. During defensive operations, the commander can allocate all three teams to protect high-speed avenues of approach. This flexibility allows the scouts to concentrate on intelligence collection and the STRIKERs on target acquisition and engagement.

COLTs have evolved into the "deep eyes" of the brigade with the lasing mission secondary. Likewise, the STRIKERs' primary mission is detection and attack while also providing lasing.

Ground observation in the 21st century will remain a necessity. If approved, STRIKER teams will allow the commander to tailor his ground observations assets to his best advantage.

CPT Salvatore J. Petrovia, FA
Action Officer, Task Force 2000
FA School, Fort Sill, OK

The Artillery S2—

Passing the Commander's *"So What?"* Test

by Captain Ralph A. Patelli, MI

If you were to ask what areas battalion S2s have the greatest difficulty with at the National Training Center (NTC), Fort Irwin, California, the answer would overwhelmingly be the process known as the intelligence preparation of the battlefield (IPB). (See the article "The Artillery S2's Intelligent Preparation of the Battlefield" in this edition.) If you were to ask what the next greatest problem area for S2s is, the answer would be analysis and reporting procedures.

The irony is that these two areas are cornerstone capabilities of any intelligence section, at any unit, at any level. For the Field Artillery, these two capabilities significantly impact targeting—the ability to uses fires effectively to support the commander's intent.

The analysis and reporting challenge for many is to participate in a process that's probably the least scientific and most artistic of any of the intelligence procedures. Analysis and reporting isn't scientific because it requires the S2 to think abstractly—there are no formulas or tables to which you can refer for the answer. You must truly *see* the battlefield, *see* your own forces and *see* the enemy. Then you must tell the commander what's *going* to happen—answer his "So what?" test.

This article briefly outlines a procedure to help the artillery S2 pass the commander's test. It tells how to prepare an enemy critical events template, helping you predict what the enemy will do with enough lead time to be proactive.

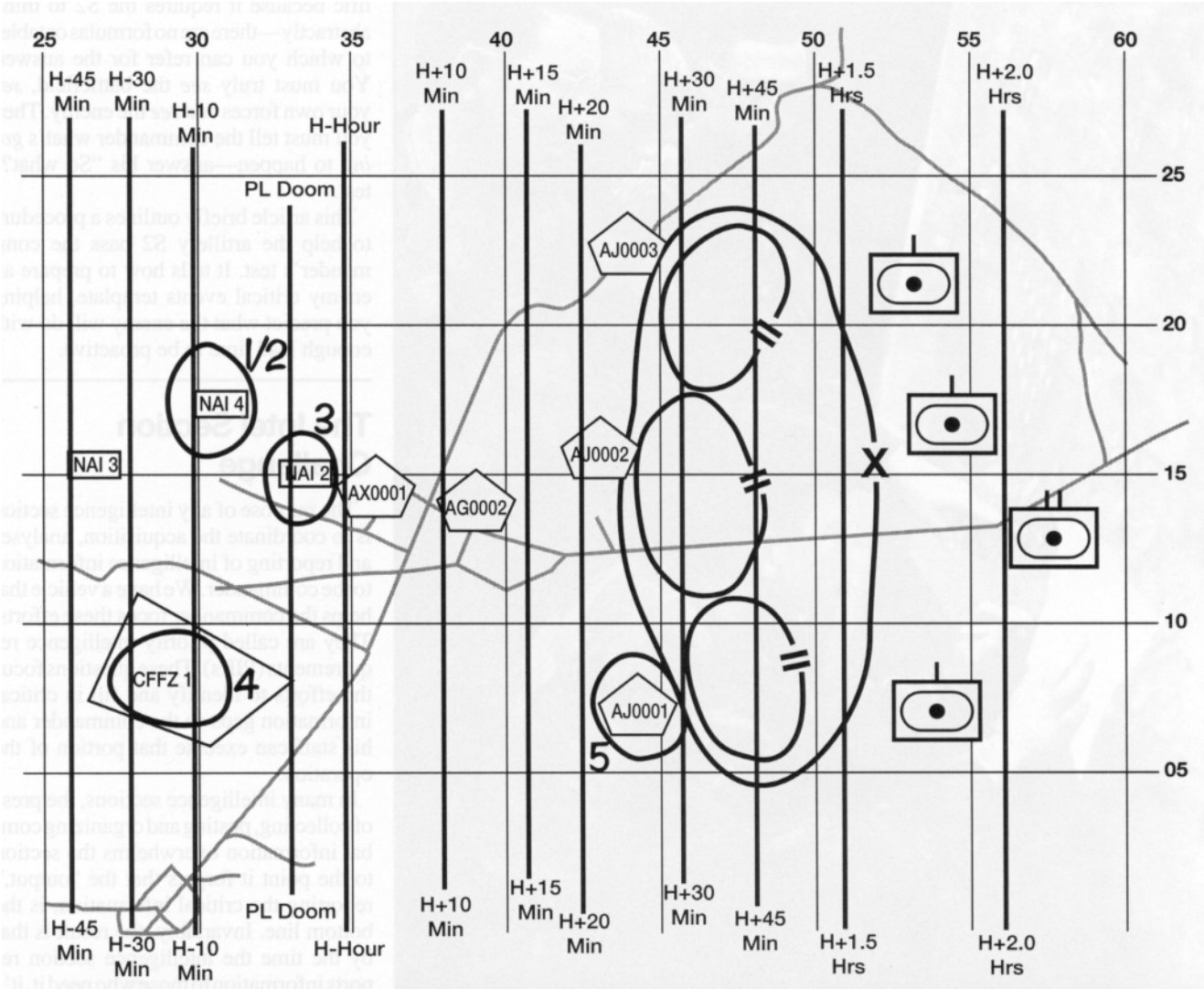
The Intel Section Challenge

The purpose of any intelligence section is to coordinate the acquisition, analyses and reporting of intelligence information to the commander. We have a vehicle that helps the commander focus these efforts. They are called priority intelligence requirements (PIRs). These questions focus the efforts to identify and fill in critical information gaps so the commander and his staff can execute that portion of the operation.

In many intelligence sections, the press of collecting, posting and organizing combat information overwhelms the section to the point it forgets that the "output," reporting the critical information, is the bottom line. Invariably, the result is that by the time the intelligence section reports information to those who need it, it's either history or what is happening now—not in the future. Intelligence, by definition, must be predictive. It must expose to the consumer what the enemy's intentions, vulnerabilities and strengths are and, based on that information, what will happen.

In some sections, it's not collecting and posting information that's the problem but deciding what's important to the consumer. So the section reports everything, filling the airways with information that's either trivial or lost to the listener.

We have vehicles to tell the consumer what's going on—to help us decide what's important. We use pre-formatted reports, intelligence summaries (INTSUMs) and periodic intelligence reports, called (PERINTREPs). The INTSUM is published on a scheduled basis (for example, every four to six hours), and PERINTREPs are sent out when significant enemy activity warrants an update. Both these reports have one thing in common: each assesses or concludes what the enemy



No	PIR/IR/CFST/DP	Enemy Event	Target No. NAI/TAI	Actions/Reports Required
1	Fire FASCAM @ Bde obstacle.	Enemy CRP at NAI 4, MRR 45 min from Bde obstacle.	AG0002, NAI 3	Alert FSCOORD, S3, FDO, Bde FSO; send PERINTREP to Bn.
2	Will enemy use chem on BP?	Enemy Phase II/III fires on BP.	NAI 4	Alert FSCOORD, FSOs; check RDO; warn chemo and Bn.
3	Mass the Bn on lead MRB.	Lead MRB @ PL Doom (10 min from target area).	AX0001, NAI 5	Alert FSCOORD, S3, FDO, Bde FSO; send out PERINTREP.
4	Mass the Bn on the enemy's RAG.	Beginning of Phase II fires (CRPs within visual range of BP).	CRP @ NAI 4	CFFZ 1 in effect? Who is available to mass? Can Div Arty help?
5	When will the firing batteries be in jeopardy from enemy direct fire?	1st echelon MRB begin to breach the southern comp BP (45 min warn).	TF FPF, AJ0001	Alert the FSCOORD, S3, battery commanders; send out PERINTREP.

Legend:

Bde = Brigade
Bn = Battalion
BP = Battle Position
CFST = Critical Fire Support Task
CFFZ = Call-for-Fire Zone
CRP = Combat Reconnaissance Patrol
DP = Decision Point
FASCAM = Family of Scatterable Mines
FDO = Fire Direction Officer
FSCOORD = Fire Support Coordinator
FSO = Fire Support Officer
IR = Intelligence Requirement
MRB = Motorized Rifle Battalion
MRR = Motorized Rifle Regiment
NAI = Named Area of Interest
PERINREPs = Periodic Intelligence Reports
RAG = Regimental Artillery Group
RDO = Radar Deployment Order
PIR = Priority Intelligence Requirement
PL = Phase Line
TAI = Targeted Area of Interest
TF FPF = Task Force Final Protective Fires

Enemy Critical Events Matrix on the Event Template

will be doing "x" hours from now. This verifies for the commander and staff that their course of action (COA) is good, needs adjustment or needs to be scrapped.

What is absent from many S2 sections is the mechanism to perform this critical analysis and reporting, to glean the right information in a timely manner. The system to help the artillery S2 organize incoming intelligence and report only the enemy activities that would affect friendly plans is the enemy critical events matrix. You build the matrix on the bottom of the events template (see the figure on Page 40).

Before your intelligence section can complete such a matrix, it must have basic equipment and knowledge. First, it must have the appropriate intelligence field manuals (FMs). Next, it must understand the IPB process and have well-organized and informative map boards and graphics. Third, it must understand and be able to execute its mission training plan (MTP) tasks. And last, it must clearly understand the commander's PIRs as well as the critical fire support tasks (CFSTs).

The Enemy Critical Events Matrix

The key overlays intelligence sections must meticulously manage are the enemy situation map (SITMAP) and the events template. The SITMAP is how you track the various reports flowing into the section.

The events template is the overlay that illustrates the timed-phased analysis of the enemy's COAs. This overlay is where you identify the named areas of interest (NAIs), targeted areas of interest (TAIs) and various lines indicating how long it will take the enemy to move from one area of operations to another. Normally, decision points (DPs) from a synchronization matrix or decision support template (DST) are placed on this overlay to track critical decisions the commander must make.

You build an enemy critical events matrix on the bottom portion of the events template and use it as a guide to tell you what intelligence information is important and when (or if) you must report it to whom. On the bottom unused portion of the events template, draw a rectangle with five columns as shown in the figure. Then insert the following information into the five columns.

- **Item Number.** This column lists a number for each event in the next column. (You write these numbers on the overlay to indicate the location of the events.)
- **PIR/CFST/DP.** In this column, name the PIRs and (or) IRs, CFSTs and DPs in chronological order.
- **Enemy Events.** The enemy action that triggers an answer to each PIR or IR goes in this column. This information warns the chain of command early enough to make a decision at a DP or execute a CFST and other critical events.
- **Target Number.** In this column, you match the battalion target number to the appropriate enemy event. (Some rows in this column will be blank.)
- **Actions/Reports.** This column is where you indicate what to do when each critical enemy event occurs. It ensures that everyone in the section knows who needs that information. The column also can direct reports be generated and tell who needs to receive them.

After the matrix is complete, on either the SITMAP or the event template, you place a symbol with a number that corresponds to those in the first column of your matrix. (In the figure, each is circled on the events template and then numbered to match the first column.) When positioning the symbol on the map, ensure it's far enough back from the enemy's progression on the map—allows enough time before the actual event—so the section can inform the commander, S3, fire support officer (FSO) or fire direction officer (FDO) and still leave him time to be proactive. For example, if it takes the battalion 30 minutes to employ a family of scatterable mines (FASCAM) minefield in the target area, your symbol, the trigger, must be placed on the map 30 minutes back from the enemy's arrival at the target area.

While tracking the battle and confirming and denying your predicted enemy COA, the matrix will focus your reporting efforts and anticipate what critical information your consumers need next. So when you report the information gathered on your enemy critical events matrix, you know the information is important and predictive—useful to the commander and his staff. You know that information will satisfy the commander's "So what?" test.

Captain Ralph A. Patelli, Military Intelligence, was the Fire Support Division's S2 Trainer at the National Training Center (NTC), Fort Irwin, California, for 13 months. Recently, he became a G2 Planner in the Plans and Operations Division of the NTC Operations Group. His previous assignments include serving as S2 for three years in the 2d Battalion, 39th Field Artillery (later 6th Battalion, 41st Field Artillery), part of the 3d Infantry Division (Mechanized) in Germany; and Armor Brigade S2 and Electronic Warfare Company Commander in the 24th Infantry Division (Mechanized) at Fort Stewart, Georgia. Captain Patelli is a graduate of the Military Intelligence Advanced Course, Fort Huachuca, Arizona.

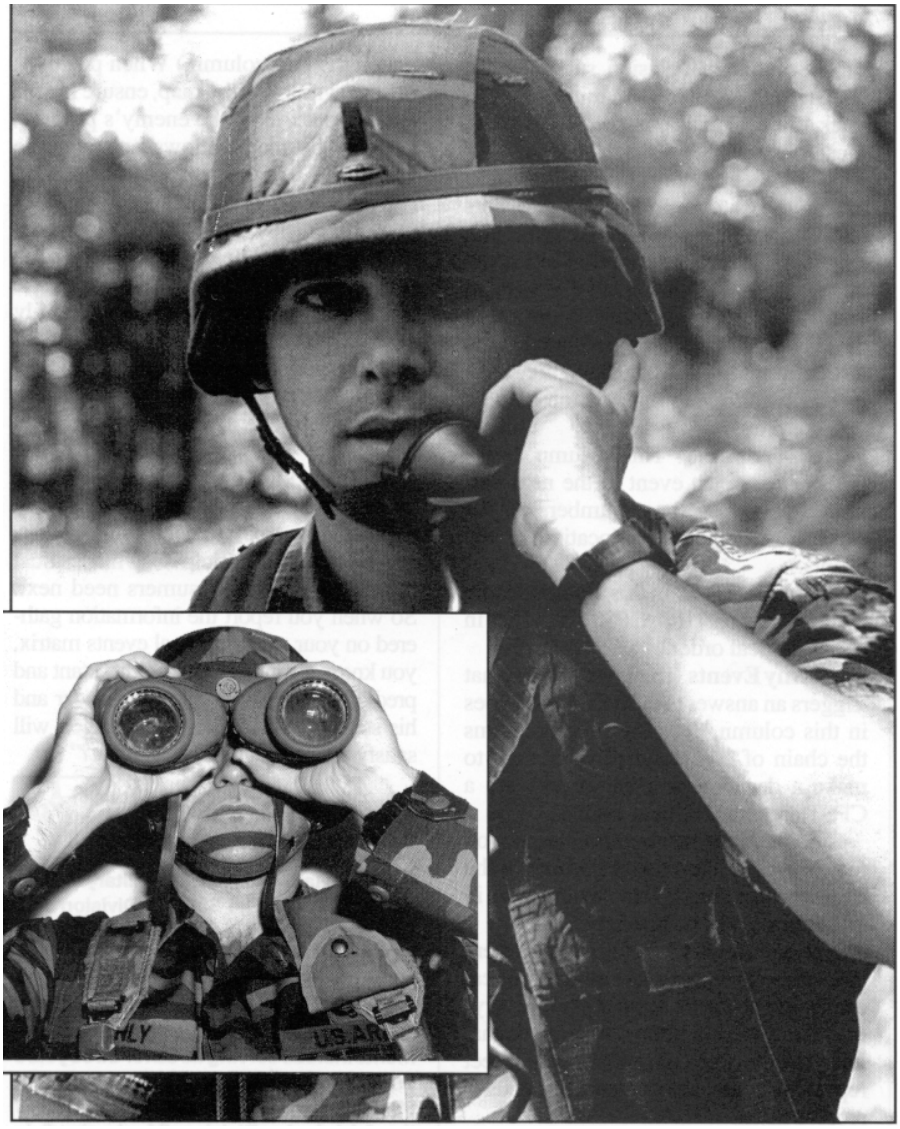
New Targeting FM Coming

The new FM 6-20-10/MCRP 3-1.6.14 *Tactics, Techniques and Procedures (TTP) for the Targeting Process* is is due to be distributed in April 1996. You must ensure your publications account is current to receive it.

The new FM is a significantly improved, comprehensive and usable manual. It focuses on TTP for the *decide, detect*, *deliver* and *assess* (D^3A) targeting methodology for the task force through joint operations at the corps level. The manual is compatible with Army warfighting doctrine and consistent with joint and combined arms doctrine.

Based on the amount of input and participation in the development process by many individuals, units from the field, all the Training and Doctrine Command (TRADOC) schools and the other services, this new manual is an authoritative, comprehensive targeting reference.

CW3 David M. Gilley, FA
Instructor, Targeting Branch
Fire Support and Combined Arms
Operations Department
FA School, Fort Sill, OK



Quick-Fire Net—

Nonstandard Tactical Mission, Force Structure Alternative or Something Else Entirely?

by Lieutenant Colonel Sammy L. Coffman

The name "quick fire" implies highly responsive fires over a specified radio net, but what is it really? Recent Combat Training Center (CTC) experience, especially Battle Command Training Program (BCTP), suggests the quick-fire net (channel or link) is being used regularly for many purposes.

We, in the fire support community, need to carefully review the use of the quick-fire net in terms of fire support principles. First, we must decide if the quick-fire net has relevance on the future battlefield. If it does, then we either must incorporate the quick-fire net doctrinally, modify its definition or expand the inherent responsibilities associated with the standard tactical missions to accommodate it. In any case, the time has come to alleviate some of the confusion over what it is/does or drop it from our lexicon.

In the course of our review, we may find the quick-fire net is a symptom of a greater problem that is much more difficult to solve. The bigger problem may be that there are an inadequate number of cannon battalions in artillery brigades supporting heavy divisions as resourced by the objective force structure. That structure calls for two multiple-launch rocket system (MLRS) battalions and only one cannon battalion. We are transitioning our total Field Artillery to this structure. Altering this transition would require some very high-level decisions in the near term.

The Problem. A lack of doctrinal underpinning or a common definition for the quick-fire net are causing a lot of the confusion. A review of our fire support literature shows that various fire support publications have different contexts within which quick-fire net is used. A historical review of *FM 6-20 Fire Support in the AirLand Battle*, our only doctrinal manual, reveals the quick-fire net was dropped as a term with the publication of the 1988 version. In the 1984 version of FM 6-20, it was employed as a means of providing responsive fires for an artillery unit with a general support reinforcing (GSR) mission.

FM 6-20-2 Tactics, Techniques and Procedures for Division Artillery, Field Artillery Brigade and Field Artillery Section (Corps) (HTF) addresses the quick-fire net as part of organization for combat. FM 6-20-40/50 Fire Support for the Brigade Operations (Heavy) and (Light) places the term in the context of responsiveness by designating an observer for a selected weapon system, usually Field Artillery. *FM 6-60 Tactics, Techniques and Procedures for the Multiple-Launch Rocket System Operations* discusses the quick-fire net to provide responsiveness when an FA brigade is general support (GS) or GSR to a division artillery. The quick-fire net seems to have become like a traveling medicine man's magic elixir— an unknown substance designed to cure whatever ails. If the fire support community can't define it, the quick-fire net can be presented for use in almost any context in combined arms operations.

FM 6-20 provides the doctrinal basis for allocating adequate Field Artillery to support maneuver forces through the process of organization for combat. That process has supporting relationships (standard tactical

An FA Unit with a Mission of—	Direct Support (DS)	Reinforcing (R)	General Support Reinforcing (GSR)	General Support (GS)
• Answers calls for fire in priority from—	1. Supported unit. 2. Own observers. 3. Force FA headquarters (HQ).	1. Reinforced FA 2. Own observers. 3. Force FA HQ.	1. Force FA HQ. 2. Reinforced unit. 3. Own observers.	1. Force FA HQ. 2. Own observers.
• Has as its zone of fire—	Zone of action of supported unit.	Zone of fire of reinforced FA.	Zone of action of supported unit to include zone of fire of reinforced FA unit.	Zone of action of supported unit.
• Furnishes fire support team (FIST) or fire support element (FSE)—	Provides temporary replacements for casualty losses as required.	No requirement.	No requirement.	No requirement.
• Furnishes liaison officer—	No requirement.	To reinforced FA unit HQ.	To reinforced FA unit HQ.	No requirement.
• Establishes communication with—	Company FSOs, FSOs and supported maneuver unit HQ.	Reinforced FA unit HQ.	Reinforced FA unit HQ.	No requirement.
• Is positioned by—	DS FA unit commander or as ordered by force HQ.	Reinforced FA unit or as ordered by force FA HQ.	Force FA HQ or reinforced FA unit if approved by force FA HQ.	Force FA HQ.
• Has its fires planned by—	Develops own fire plan.	Reinforced FA unit HQ.	Force FA HQ.	Force FA HQ.

Figure 1: Field Artillery Standard Tactical Missions

missions) and inherent responsibilities that have remained the same for many years (Figure 1).

FM 6-20-2 provides the most expanded discussion and only real definition of the quick-fire net. It's defined in the context of organization for combat as "a special nonstandard mission that may be used when the standard tactical missions are insufficiently responsive or when unique requirements exist. This technique may require the delivery system to dedicate already limited communications assets to the quick-fire mission." There are two important points here—insufficiently responsive fires and dedicated communications. I believe we're habitually using the quick-fire net for reasons other than to gain more responsive fires over dedicated communications nets.

FM 6-20-2 goes on to state, "A quick-fire net is normally not established between artillery units because it would, in effect, be a reinforcing mission." The manual also requires that a division obtain corps approval before establishing a quick-fire net with battalions of an artillery brigade. Exercise experience suggests that units are not aware of or sometimes choose to ignore this restrictive requirement.

- ❑ Approval—a nonstandard mission requires force FA approval.
- ❑ Priorities in which calls-for-fire are to be answered.
- ❑ Duration.
- ❑ Degradation of the tactical mission.
- ❑ Loss of communications assets.
- ❑ Agreement on which net to use.
- ❑ Amount of support that must be dedicated to quick-fire nets.

Figure 2: Considerations for Establishing a Quick-Fire Net

FM 6-20-2 lists the major considerations for establishing a quick-fire net (Figure 2). None of the other manuals mentioned provide parameters for establishing a quick-fire net, and they don't discuss restrictions. This lack of a definition raises several issues.

The Issues. Figure 3 illustrates a corps concept of operations as a general scenario in which to contrast some of the potential issues with the use of quick-fire nets. This concept has a corps conducting an attack with division-sized elements as main (45th Armored Division) and supporting (22d Mechanized Division) efforts to seize objectives in the corps' zone. We'll assume the corps order did not authorize the 22d Division to sub-assign missions to the battalions of the 150th FA Brigade assigned the mission of reinforcing the 22d Division Artillery. Corps chose to task organize this way to provide the division supporting fires for the counterfire threat while retaining the flexibility to quickly change the artillery

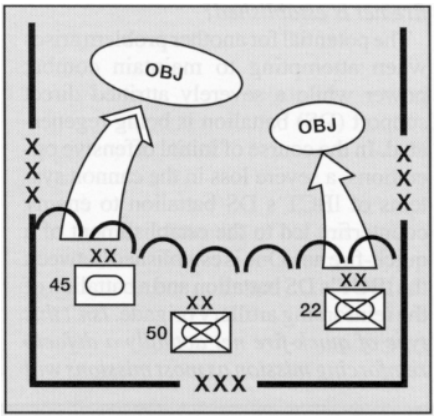


Figure 3: The Scenario—a corps operation with two division-sized elements in main (45th Armored Division) and supporting (22d Mechanized Division) attacks.

brigade's mission in anticipation of future operations. The corps intentionally restricted the assignment of tactical missions beyond that given to the artillery brigade.

The 22d Division's scheme of maneuver calls for main and supporting attacks by its heavy maneuver brigades with an attached light brigade having a follow and support mission behind the main effort: the 1st Brigade Combat Team (1BCT). The corps plan presents the division the problem of how to weight its main and supporting attacks with additional fires, given the restriction on sub-assigning missions. The division organized its artillery for combat

as shown in Figure 4. (As always, you certainly can argue the tactics of this organization for combat. I took this one from an actual exercise and just changed the unit designations.)

We'll assume the corps granted the authority to establish a quick-fire net by fragmentary order (FRAGO) after the corps order was produced. However, exercise observations suggest the quick-fire net is often established without corps permission.

The quick-fire net in this context raises some issues. First, supporting counterfire is an issue. The division commander articulated that counterfire was his most critical fire support task. As the artillery brigade orchestrates the counterfire fight, it must contend with the potentially competing demands caused by the quick-fire net. *Who decides the priority when all the battalions of the artillery brigade are engaged in counterfire missions and a mission comes in from the artillery battalion of the division with which the quick-fire net is established?*

The potential for another problem arises when attempting to maintain combat power while a severely attritted direct support (DS) battalion is being regenerated. In the course of initial offensive operations, a severe loss in the cannon systems of 1BCT's DS battalion to enemy counterfire led to the establishment of a quick-fire net. One is established between the 1BCT's DS battalion and a battalion of the reinforcing artillery brigade. *Isn't this type of quick-fire net actually a defacto reinforcing mission as most missions will require additional support in terms of volumes of fire? If the level of attrition of the DS battalion is very severe, won't this almost become a pseudo DS mission?* (This is even more likely if the battalion of the artillery brigade with which the net is established is a cannon unit.)

Div Arty:	**150 FA Bde:**
1-1 FA (155 SP): DS 1BCT	R 22 Mech Div Arty
2-1 FA (155 SP): DS 2BCT	1-141 FA (MLRS)
1-145 FA (105 T): DS 1 Bde 50th ID	1-142 FA (MLRS)
A/75 (MLRS): GSR 1-1 FA 0/0 GS	2-95 FA (155 SP) (QFN 2-1 FA)

Legend:

BCT	=	Brigade Combat Team
Div Arty	=	Division Artillery
DS	=	Direct Support
GS	=	General Support
GSR	=	General Support Reinforcing
ID	=	Infantry Division
Mech	=	Mechanized
MLRS	=	Multiple Launch Rocket System
QFN	=	Quick-Fire Net
R	=	Reinforcing
SP	=	Self Propelled

Figure 4: FA Organization for Combat for the Scenario

Another potential issue arises in using the quick-fire net to reduce sensor-to-shooter times in counterfire. In such cases, one or more such nets are established between the FA brigade's battalions and the division's Firefinder radars. Reduced sensor-to-shooter times is a desired outcome, so what's the problem? *Isn't there is a potential duplication of target acquisitions being passed?* Targets acquired in critical friendly zones or call-for-fire zones generate priority one and two messages, respectively, via digital communications.

Resolution of multiple acquisitions, duplications and already fired targets are handled by the division artillery target processing section (TPS), working in either the division artillery or FA brigade tactical operations center (TOC). While this process is ongoing, a quick-fire voice net may be working concurrently with the artillery brigade battalions, usually MLRS. The desire for responsiveness may cause the required analysis by the TPS to be overcome. This is plausible in a period where Firefinder acquisitions are occurring very rapidly. *Doesn't this present the potential for a needless expenditure of ammunition, an enhanced risk to survivability and fires being unavailable for other priorities?*

Conclusion. By no means have I discussed all the potential issues associated with establishing a quick-fire net—only some of the ones that occur frequently in exercises. For those who say our TTP is prescriptive enough, I hope I've raised some points for thought. If the quick-fire net is relevant, then we need to lay out a common doctrinal basis for it. We certainly need more than TTP if we decide the quick-fire net has a relationship to the organization-for-combat process. Establishing doctrinal principles also, hopefully, will clarify some of the ambiguity that exists among the discussions in the various fire support manuals as currently written.

But we also must explore alternatives for satisfying the need for additional cannon fires for the division. The recent Army Science Board recommendation that we have two artillery brigades supporting committed divisions and the Department of the Army decision to change the allocation rule certainly helps. (See the article "Army Science Board: How Much Artillery is Enough?" by John J. Todd and Lieutenant Colonel James M. Holt in the June 1995 edition.)

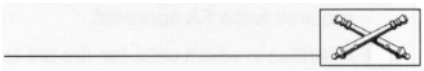
But perhaps there are other doctrinal fixes that would help. One way would be to expand the discussions on task organizing with limited assets in upcoming rewrites of corps and division operations manuals. Another would be to advocate greater flexibility in letting the division commander work within the corps commander's intent, using the end state as his guide on the use of higher headquarters assets rather than the prescriptive rules as written. A more conservative approach would be to simply advocate wider flexibility in permitting the sub-assignment of tactical missions in a greater variety of situations.

The Field Artillery School at Fort Sill, Oklahoma, is in the process of updating FM 6-20. The time seems right to straighten out what a quick-fire net is or is not. We have a chance to clarify a concept that's being widely used or abused.

The Field Artillery community also should review the objective force structure mix for FA brigades supporting heavy divisions. The Army is considering eliminating the only three 155-mm self-propelled cannon battalions in the active force outside those of the division artilleries.

If the objective mix is often inadequate in exercises, then these proposed eliminations surely will make the situation worse for tailoring deploying FA brigades. The eliminations will limit our ability to rapidly tailor an FA brigade for a contingency requiring an FA brigade with one or more cannon battalions.

The bottom line: we need to address the quick-fire net clearly in fire support doctrine while relooking other doctrinal and force structure alternatives.



Lieutenant Colonel (Promotable) Sammy L. Coffman until recently was the Chief of the Initiatives Group, Office of the Chief of Field Artillery at the Field Artillery School, Fort Sill, Oklahoma. Currently, he's a student at the Air War College at Montgomery, Alabama. Among other assignments, he commanded Task Force 2-2 Field Artillery, part of the 30th Field Artillery Regiment supporting the Field Artillery School at Fort Sill.

TA Tactics in the **34th ID**

The 34th Red Bull Division Artillery (Div Arty), Army National Guard, with its headquarters in Minnesota, faced a difficult mission during a recent Battle Command Training Program (BCTP) Warfighter exercise. The mission challenged us to relook our radar tactics. To add to the difficulty, we had less time to plan as a National Guard division and a voice-only, non-tactical fire direction system (non-TACFIRE) tactical operations center (TOC) to execute the plan. With a lot of hard work, our target acquisition (TA) experiments achieved an 88 percent overall acquisition rate.

The 34th's mission was to defend in depth against a heavy combined arms army only slightly attritted by corps and Air Force assets. The army had at least a two-to-one advantage in artillery. Our division was task organized with an additional FA brigade, a corps TA detachment and other corps assets and had to defend 80 to 100 kilometers from the battle hand-over line to our main defensive positions.

The depth of the battlefield made us position our Q-37 Firefinder radars to "see" the entire battlefield yet survive to fight the next battle. In our initial plan, the Div Arty TOC fought the deep battle, retaining control of the Q-36 radars for targeting and developing intelligence. The FA brigade TOC was the counterfire headquarters and retained the corps TA detachment. Targeting data was passed via eavesdropping on each other's radio net. This plan proved to be unworkable in short order. The logistics of sharing data in a non-digital environment is mind-boggling.

Centralization was the key to our second plan. We centralized control of the Q-37 radars and target processing at the Div Arty TOC and passed missions, as needed, to our FA brigade. This plan had merit early when we used terrain and kill sacks in the defense. But as the battle progressed, our counterfire mission began to overwhelm the TOC while the FA brigade was underutilized.

This led to our final configuration: as the enemy approached our main defensive line, the Div Arty target processing section moved to the FA brigade TOC. This counterfire cell responded quickly to radar data from four Q-37s and passed intelligence to the Div Arty S2 via summarized reports.

Although command and control was centralized, the execution was decentralized. All radar sections, including the Q-36s, reported current statuses and locations to the target processing section so we could cross-level personnel and equipment as needed and track fuel and other supplies. Using this simple reporting system, we easily scheduled planned movements and radar coverage. (Survivability moves, position reconnaissance and maintenance were the responsibility of the radar section.)

Radar cueing schedules and zones allow the maneuver commander to prioritize the battlefield into areas and times of differing importance. We attempted to "sell" these processes as "gun sites and triggers" to our fire support agencies, using zones to "sight in" areas to safeguard or target and decentralized cueing as the "trigger" to cause the general support (GS) artillery to fire.

In several preparatory exercises, decentralized cueing and zoning driven by the maneuver plan was tried and evangelized. Varying degrees of success finally drove us to a new approach: a cueing matrix (see the figure). Using this matrix, decentralized and scheduled cueing can be mixed to support the operation. Units can manage their counterfire cueing times except when continuous coverage is necessary (for example, H-hour or crossing a linear danger area). We augmented the plan with periods of TOC-driven cueing to locate enemy artillery, especially early in the battle. The important point is that *events on the battlefield drove cueing*.

We further experimented with TA tactics by creating an MLRS/Q-37 task force to find and kill hostile artillery within a brigade sector during a counterattack. First, we placed censor zones on the friendly units on the right and left of the task force to reduce target duplication and the potential for friendly fire incidents. Next, we adjusted the common sensor boundary for the Q-36 and Q-37 radars to take advantage of the systems' different ranges and eliminate duplication of efforts.

In this experiment, we doubled the number of kills achieved previously in the same time. What this relationship loses in centralization, it more than makes up for in effects on targets.

The keys to effective TA are real-time cueing from designated agents based on battlefield events. Decentralizing radar assets makes response times faster by eliminating layers of agencies needed to fire the target. Decentralized TA is becoming even more important on the Paladin/MLRS battlefield where artillery assets are spread over a wider area.

Phases and Section Cueing	Phase I (Cross LD)	Phase II (PL Bronze)	Phase III (Objective Gold)
Section 1	Cue H-Hour for 5 Minutes	1-94 Cavalry FSO and A Troop FSO	66th Brigade FSO
Section 2	Cue H-Hour for 2 Minutes, then Move to Position M-3	1-136 Infantry FSO	1-136 Infantry FSO

Legend: **FSO** = Fire Support Officer **LD** = Line of Departure **PL** = Phase Line

Sample Cueing Matrix. This example of a cueing matrix allows scheduled cueing to be mixed with decentralized cueing.

CPT Gregory A. Mader, FA
Cdr, E/151 FA (TA)
34th IN Div (Mech), MNARNG