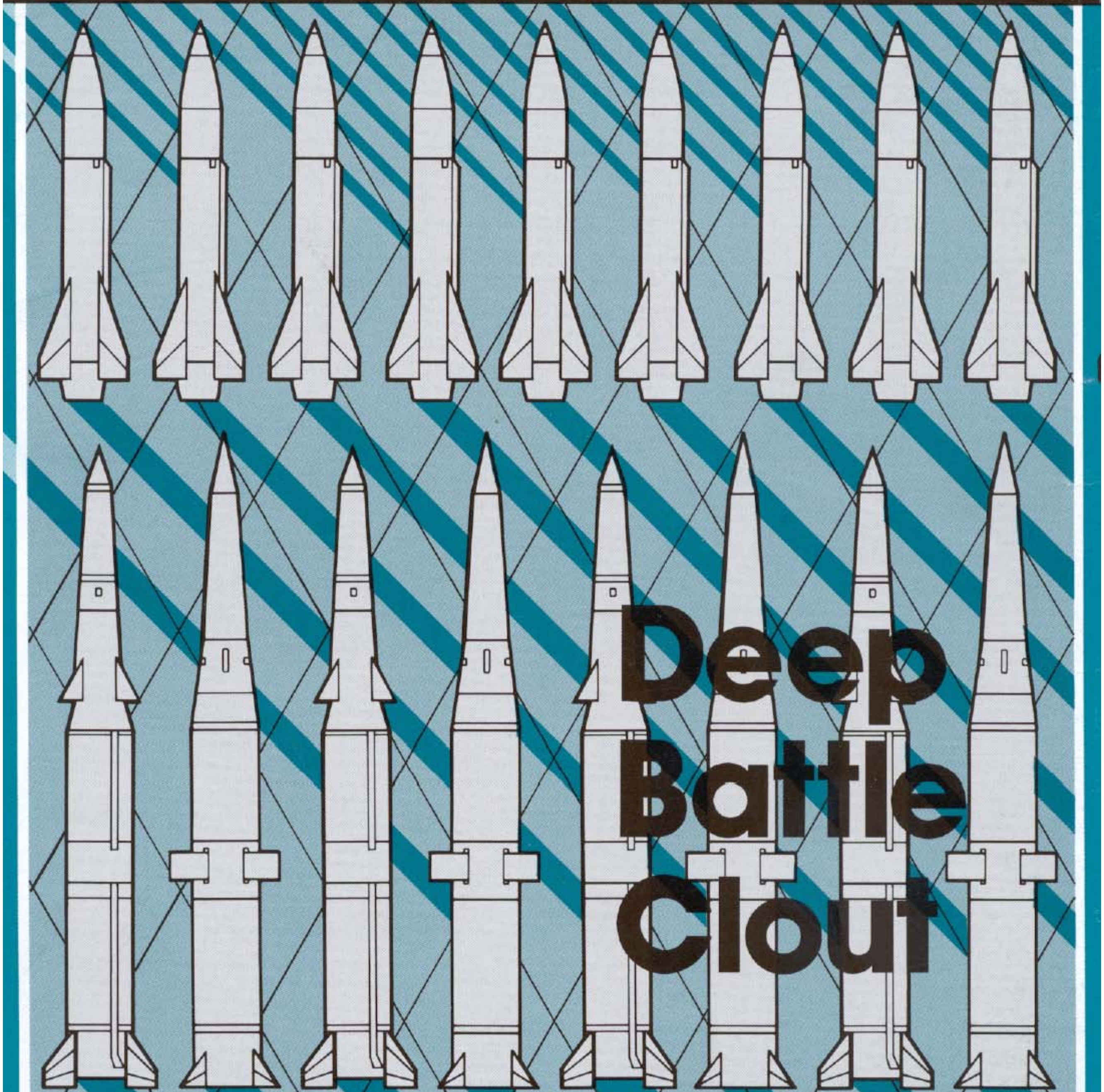
Field Artillery

A Professional Bulletin for Redlegs August 1987 PB 6-87-4 (TEST)



Deep Battle Clout

Field Artillery

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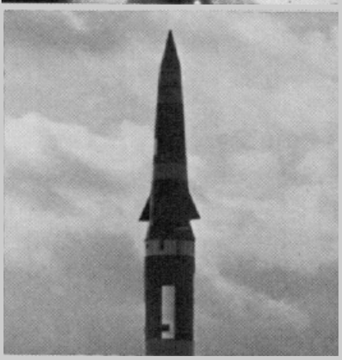

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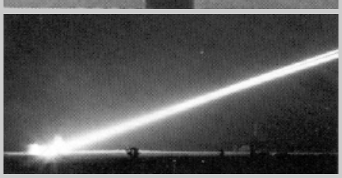

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ARTICLES

FEATURES

The ***Field Artillery Bulletin***—A Professional Bulletin for Redlegs—(ISSN 0191-975x). Unless otherwise stated, material does not represent official policy or endorsement by any agency of the US Army. Approved for public release; distribution is unlimited.

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

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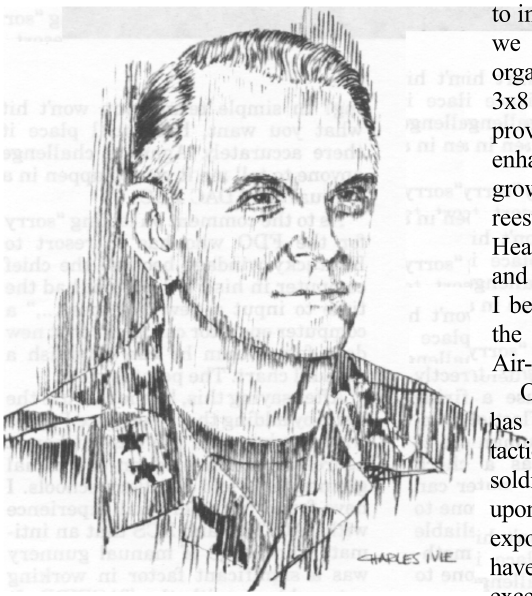
On the Move

MG EUGENE S. KORPAL



Prior to press time, Major General Eugene S. Korpal, Commanding General, US Army Field Artillery Center and Fort Sill, and School Commandant since 4 June 1985, announced his planned retirement on 17 August 1987. General Korpal's successor will be Brigadier General (P) Raphael J. Hallada, who at the time of this writing is serving as Assistant Division Commander, 82d Airborne Division, Fort Bragg, North Carolina.

For more than 2 years I have had the distinct honor and privilege to serve as Chief of the Field Artillery. During this time I have reported to you on important developments and issues affecting the continued vitality of our branch as a member of the Combined Armed Team. And now, as I step aside for the passing of colors to your new Commandant, I would like to reflect briefly on some of the strides the Field Artillery has made towards achieving the goals set forth by senior Army leadership at Department of the Army, TRADOC and Fort Sill.

Doctrinally, the Field Artillery School has aggressively and significantly improved fire support to our maneuver commanders by publishing several key manuals reflecting the latest changes in doctrine and materiel development. We have focused on the "how to" of fire support business addressing both heavy and light operations. Equally important to improved documents and publications, we have implemented needed organizational changes to include the 3x8 cannon transition program to provide increased firepower and enhanced survivability with very little growth in structure. And we reestablished the III Corps Artillery Headquarters and Headquarters Battery and the battlefield coordination element. I believe such changes are essential for the Corps commander to execute Air-Land Battle doctrine.

Our training goal is now, and always has been, to produce technically and tactically proficient Field Artillery soldiers who can fight and win if called upon. In both our institutional and exported training programs, our students have achieved a higher level of excellence in their courses than ever before. Here at Fort Sill we have increased "hands-on" and performance-oriented training for officers as well as integrating more field exercises into existing 13B, 13E and 13F courses. Additionally, new training programs such as the Aerial Fire Support Officer Course, Nuclear/Chemical Target Analysis Course, Nuclear Warhead Detachment Course, expansion of the existing "light leader" instruction and improved training device developments will greatly enhance our ability to support the maneuver arms.

Fort Sill clearly leads the way in force modernization through an updated Field Artillery Azimuth which continues to be used Army-wide to explain where the Field Artillery is headed and why. Recently many major Field Artillery systems have successfully crossed critical Department of the Army and Department of Defense decision points and fielding and developmental milestones. Systems such as search and destroy armor (SADARM), remotely piloted vehicle (RPV), howitzer improvement program (HIP), and advanced Field Artillery tactical data systems program (AFATDS) all continue to progress taking full advantage of existing technology. Perhaps the best evidence of our total involvement in force modernization is the Field Artillery Board's participation in more than 35 tests of Field Artillery concepts and weapons systems during the last 2 years.

Turning to leader development, I am proud to report that Fort Sill continues to produce mature, competent, confident officers and noncommissioned officers who understand and can exploit the full potential of the AirLand Battle Doctrine. For officers, there is increased joint and combined arms training as well as a restructured battalion/brigade/division artillery precommand courses to meet the demands of the modern battlefield. For our noncommissioned officers, we reorganized Fort Sill's NCO Academy to provide our inspiring junior leaders the best possible training in today's Army. And too, we have not forgotten our lifeblood, the cannoneer. We restructured the career reclassification plan for all of the 13 MOS series to provide well-trained, disciplined, tactically proficient soldiers.

But with all these important strides in developing doctrine, training programs and technologically superior hardware, none is as vital to the future of our branch as our advances to improve the quality of life for our soldiers, civilians and their families. Redlegs worldwide have proved they care by demonstrating strong yet compassionate leadership; by accepting new ideas and setting the highest standards of honesty and integrity; and by fostering harmonious working environments for the betterment of all. First and foremost in my tenure as Chief of the Field Artillery, I take pride in knowing that leading and caring has been our number 1 priority.

And so to Field Artillerymen everywhere, I thank you for your support and say that it has been a pleasure serving in the Army and working with you. I leave knowing we have done our best, and after all what more could a soldier ask.

Incoming

LETTERS TO THE EDITOR

Old Thoughts

Response to "In With the Old"

After reading the September-October 1986 edition of the *Field Artillery Journal,* I once again faced a subject that causes great emotion and concern. Second Lieutenant Czechowski writes in "In With the Old" of his "concern" over the lack of manual gunnery taught in the US Army Field Artillery School and the use of computers to compute firing data.

My concern stems from personal experience and background. I spent 18 months as an instructor at the US Army Europe tactical fire direction system (TACFIRE) school and an additional 18 months as a battalion S3 in Germany. During that time, my battalion experienced the complete cycle of TACFIRE fielding and training. The training began at the USAFAS TACFIRE course and ended with a live-fire exercise at Grafenwoehr under supervision of the new equipment training team (NETT). In addition, the battalion underwent an external Army training and evaluation program 4 months after the completion of TACFIRE fielding.

As an instructor at the TACFIRE school, I constantly faced attitudes similar to those expressed by Lieutenant Czechowski. Battalion commanders expressed concern over the potential ramifications of the new systems (TACFIRE and the battery computer system BCS). Additionally, personnel who had previous experience only with manual systems (or FADAC) were skeptical of the new system's ability. After completion of both institutional and NETT fielding, the level of acceptance ranged from total acceptance to none at all, with the majority of opinions falling somewhere in between.

As a battalion S3, I enjoyed the unique opportunity of using the concepts and techniques that were taught in a school environment. I came away from that experience with my basic beliefs about TACFIRE and BCS relatively intact. The system is workable. However, the question remains about whether or not a computer system is viable.

Our experience constantly reinforced the idea that TACFIRE and BCS are stern mistresses. They do not tolerate any lack of attention and are very jealous of the time not spent with them. The entire system is not user friendly because operators must exercise the system constantly. When, as Lieutenant Czechowski states, "a smart fire direction officer (FDO) will use a check chart to ensure that his data is accurate and reliable," he is applying outmoded ideas incorrectly. Why would I want to use a firing chart, pins, a range-deflection protractor (RDP), and the human eye to determine firing data as a check against the solution a computer can give me? I would challenge anyone to derive a more accurate or reliable gunnery solution using manual methods. I would also challenge anyone to derive that same accurate and reliable solution in a more timely manner. Safety is the only valid purpose for maintaining a check chart in a fire direction center (FDC).

Lieutenant Czechowski's other reasons for not deleting manual computations focus on human error. What if operators place incorrect data in the computer, or omit data? My response is that the same problem would exist in a manual FDC. The key to any system is training and supervision by the unit's leaders. TACFIRE and BCS are like any computer where the word GIGO (garbage in-garbage out) applies. If data is entered and not checked before computation of firing data, the final result will be very accurate but inaccurate data. Meaning? In simple terms, you won't hit what you want, but you'll place it there accurately. Again, I challenge anyone to tell me it won't happen in a manual or FADAC FDC.

As to the comment on feeling "sorry for the FDO who has to resort to Kentucky windage because the chief computer in his FDC has not had the time to input a new data base...," a computer operator can input that new data faster than he can establish a manual chart. The point is moot.

After saying this, let me confuse the issue by adding that in essence I agree with the intent of the letter when it addresses the instruction of manual gunnery in Field Artillery schools. I have found from personal experience with TACFIRE and BCS that an intimate knowledge of manual gunnery was a significant factor in working out problems with the TACFIRE. It helped me understand what was happening with the computer and what was needed on the gun line to help solve that problem.

My concern rests with the practical impact of all this. Because the Field Artillery School reduced the amount of instruction in manual gunnery, many commanders began training programs within their units to teach manual gunnery to all FDC personnel. There are exceptions to what I am about to say, but I would challenge anyone to tell me that the exception can be turned into the rule in most Field Artillery battalions. Time spent on manual gunnery training detracts from time needed to maintain TACFIRE skills. With training distractors that exist in units, no one can honestly claim that they have mastered the computer and can then find time to work on manual gunnery skills. If a commander trains his unit to a certain expertise on the computer and then concentrates on manual gunnery skills, he is the exception.

There comes a time when we must move on. We no longer teach crew drill on muzzle-loading artillery pieces because we no longer employ them. Shouldn't we apply the same rationale to manual gunnery skills? Designers built redundancy and backup into the TACFIRE system. If the combination of these systems provide us the means to accomplish our mission, then it is time to take a cold, hard look at the present doctrine—and that includes instruction at the Field Artillery School. If the combination is sufficient, then perhaps it is time for commanders at all levels to accept the system and ensure that their soldiers can employ it to its maximum capability.

Richard D. Koethe III
CPT, FA
Huntsville, AL

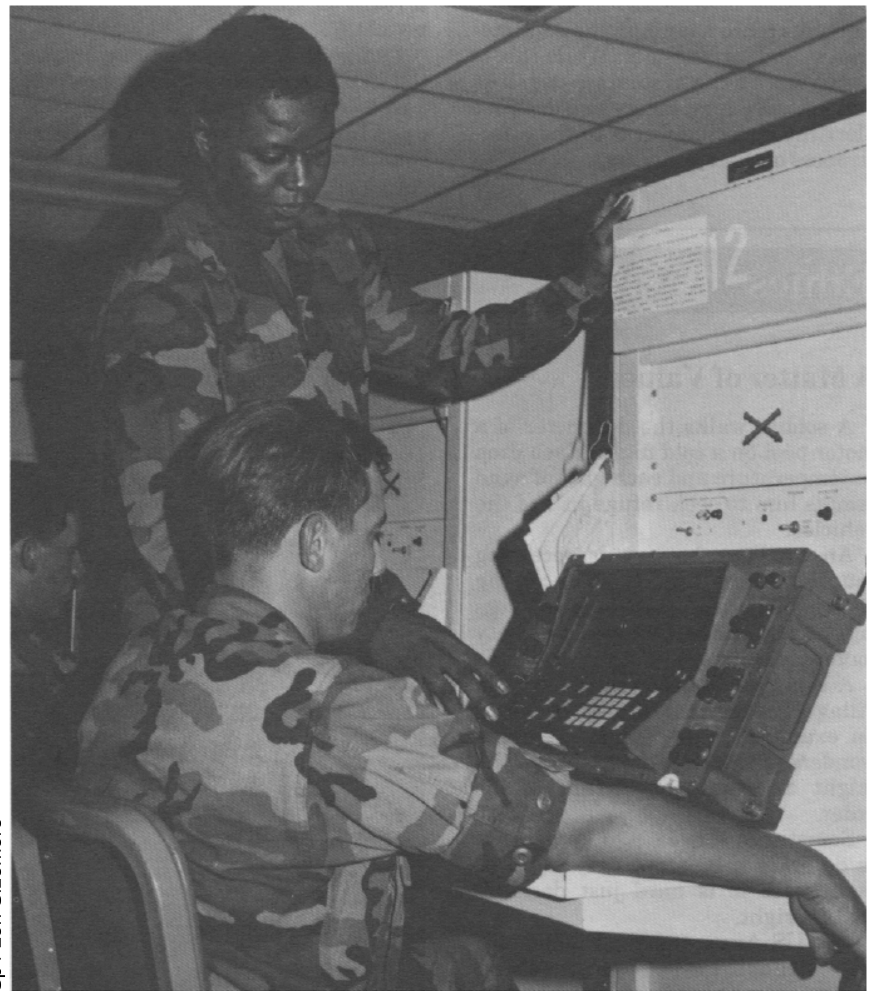
Response to "NCOs Make It Happen"

The recent article by Sergeant Major of the Army Glen E. Morrell titled "NCOs Make It Happen" solidifies the concept that the success of the Army Safety Program rests squarely on the shoulders of NCOs.

Leading by example at the soldier level can accomplish wonders in the area of accident prevention. In most instances, the NCO's attitude toward safety is evident in those young soldiers he is charged to lead. The young men and women who make up today's Army are anxious to perform well. Every job-related task a soldier performs can be done safely, provided the training and day-to-day supervision he receives gives proper emphasis to safety. Unless the task is performed safely, it isn't performed well. A field exercise that injures a soldier or damages equipment is not a successful exercise.

Commanders almost without exception are sensitive about their responsibility for the safety of their soldiers. It is absolutely essential that NCOs give total support to assist commanders in carrying out this responsibility. NCOs ***can*** make it happen.

George Ernest Cook
Installation Safety Director
Fort Sill, OK



Sp4 Lori Sizemore

Comments on "Looking Over the Edge"

I appreciate Captain Voss' comments concerning our method of switching frequencies by using a masking matrix. However, the solutions to the problem that he suggested, while doctrinally sound, are not feasible on a fast moving, rapidly changing battlefield.

Captain Voss suggested that we use "wire, messenger, or another radio net" to alert stations of the change in frequency. The first 2 of these are not feasible. The battles at the National Training Center are too fast and cover too much ground to make wire communications possible. In the defense, some stations were out of the wire net. Those people who are moving around the battlefield, i.e. the battalion executive officer, survey, and the battalion motor officer, would not get in the net. It would also exclude the field trains or the unit maintenance collection point (UMCP) because of the distance involved.

The second option—messengers—takes too long. Because of the short duration of most of the battles and the distance between all elements of the Field Artillery battalion, the action would be over before the messenger got to all elements.

His suggestion of using another radio net has merit. Firing batteries and fire support officers could get the word through the tactical fire direction system (TACFIRE) and support elements could hear it on the administrative and logistics net. While this is not as fast as the system we use, it is undoubtedly more secure and does not alert the opposing forces to the effectiveness of their jamming.

Captain Voss' second point of establishing a dummy net will work if the radio asset is available. Most artillery tactical operation centers (TOC) use every radio they have. There are no other radios that can be in the area of the TOC at all times. A typical artillery battalion is already struggling to keep the required number of radios operational. I suspect that few battalions can afford the luxury of having a radio on standby to use as a dummy net.

I agree that our system may not be the most secure and that it does not agree with current doctrine concerning electronic counter-countermeasures. However, the system is easily understood, fast, and reaches all elements in the battalion at the same time. Other methods such as wire, messenger, and other radio nets take time and may not reach all parties concerned. Time is critical, especially when the task force or brigade commander wants fire support and he wants it now. Time spent getting everyone on the same frequency could be better used getting steel on target!

Thomas B.L. Stanford
MAJ, FA
Fort Carson, CO

Ethics

A Matter of Values

A soldier walks the perimeter of a motor pool on a cold night. Each drop in temperature and each gust of wind tempts him to seek refuge in 1 of the vehicles.

An artillery battery is receiving counterbattery fire. Each incoming round makes the mission seem less significant and withdrawal to safety more important.

A commander receives fire from a village. His temptation is to level it as an example to the enemy. Then he wonders about noncombatants who might die, innocent victims of his order.

Sometimes it is easy to know what to do, even if it is not easy to do it. Sometimes it is hard just deciding what is right.

The US Army and the Field Artillery School have been teaching leaders how to make decisions for a long time. We are masters at calculating the most effective means of accomplishing tasks. We draw decision matrixes and design flow charts to assist our reasoning and to present our solutions to others. We have come to the point when pressing buttons tells us how to put "steel on target."

Throughout history there have been those who asked questions in addition to Who? What? When? Where? and How? They asked, Is it right? Will it enhance life? Is it the best that we can do?

The time has come for all of us to ask both sets of questions. The world has become too small and the weapons of war too great for us to assume that history will cover our mistakes. Civilized man has come to realize that life is precious, so precious that even though we may recognize the need sometimes to sacrifice life, we can never justify wasting it. This means we must all become philosophers.

As philosophers we may face important decisions such as how to achieve goals and whether the goals and the means we select are moral. As Americans and members of the United States Army we should further ask ourselves if the goals and methods we select are in harmony with the ideals and standards of our society and our service.

The values of the US Army—loyalty, duty, integrity, selfless service, courage, candor, competence, and commitment—are described in Army regulations, field manuals, and training circulars. The US Army Field Artillery School teaches these values to soldiers in basic training and in officer training.

The national values and the Army values are of little use unless they are alike. Neither democracy nor courage has significance unless it is practiced. Neither freedom nor candor has meaning unless it governs lives.

This then is our challenge: To make the values of the nation and of the Army guides for our actions.

This means that we make and act on decisions based on universal principles and national and Army values. And, perhaps more important, it means that we train our subordinates so that they will be not only efficient but moral as well.

General Wickham, the former Army Chief of Staff, spoke of the need for leaders to be mentors. Senior people teach junior people the ropes. They do this in the motor pool, in the field, and at the foot locker. The content of this counseling should be not only how but also why.

These discussions about why should involve groups of soldiers as well as individuals. Even though we don't fully understand the learning process we do know that people learn values, develop the ability to reason about them, and build the strength of character to live by them when they are members of close knit groups that actively discuss moral issues and encourage ethical behavior.

It is this moral reasoning and strength of character that will keep a soldier guarding his post when his body screams to get out of the cold. Strength of character is more effective than fear of punishment. A moral commitment is more enduring than a threat.

It is this strength of character, seen as commitment to the Army and the nation, that makes the commander and each soldier in a threatened battery resolve to stand fast. Moral courage is a better form of motivation than fear of one's superiors.

It is the ability to reason about moral issues that enables a commander who has taken fire from a village to make the right decision—a decision he can live with, a decision that allows him to accomplish his mission, a decision of which the Army and the nation can be proud.

Aaron D. Michaelson
Chaplain (LTC)
Fort Dix, NJ

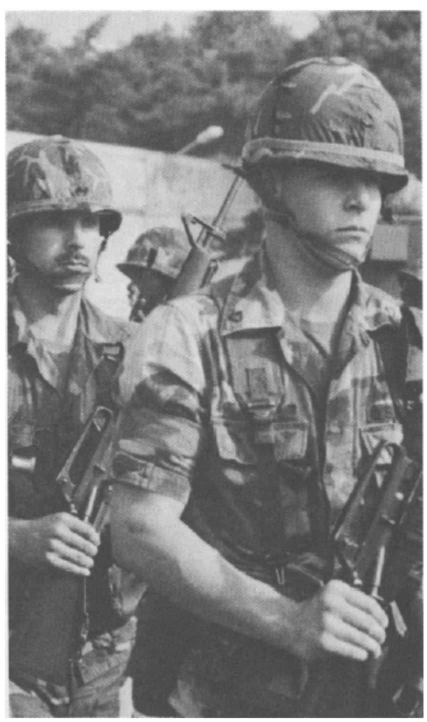
The Warrior Spirit

General Douglas MacArthur once wrote: "The soldier, above all other people, prays for peace for he must suffer and bear the deepest wounds and scars of war." Yet when war is inevitable, the soldier must be prepared to spring into action. Shakespeare observed:

In peace, there's nothing so becomes a man
As modest stillness and humility;
But when the blast of war blows in our ears,
Then imitate the action of the tiger.

At the free world's Field Artillery Center for Fire Support, we are interested in bringing out the tiger in our newly assigned personnel. We see this as a 3-step process—developing commitment, a "warrior spirit," and professionalism in our young soldiers.

Our first task in the Field Artillery School is to foster commitment. The great



George Washington understood the necessity of individual commitment. He exhorted his leaders to "impress upon the mind of every man the importance of the cause and what it is they are contending for." In the United States Army, fostering commitment is a relatively easy thing to do. We have a magnificent cause—the preservation of freedom and human rights. And every soldier in the Army has already taken the first step toward developing a deep commitment to that cause by taking an oath "to defend the Constitution of the United States against all enemies, foreign and domestic." In the School we build upon this initial step towards commitment by teaching our soldiers the reasons behind the oath, namely—

- We seek to defend the Constitution not because it grants us freedom, but because it recognizes and seeks to preserve what the founding fathers recognized as God-given freedoms and inalienable rights. These noble concepts put to rest the age-old belief in the divine right of kings and the notion that freedom is a commodity dispensed (or retracted) by governments.

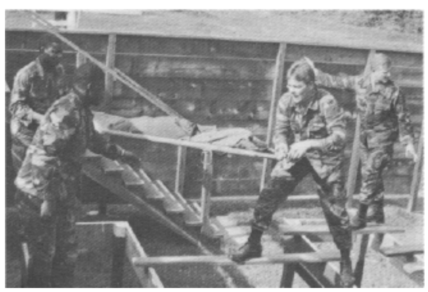
- The United States Army has the responsibility to deter war or, should war become inevitable, to fight and win. (FM 100-5)
- The objective of any warring nation is victory immediate and complete.
- In the prevention of total war, whatever means are chosen, the state will continue to rely heavily upon the military professional. Neither a working system of arms control nor an effective state of general disarmament is possible without him.

We believe that by expounding on these and other principles related to the cause we can build commitment in our soldiers and establish a base for developing the warrior spirit.

A committed soldier has a natural desire to put his commitment into action. We refer to that desire or motivation as the warrior spirit. The warrior spirit is similar to the motivation that drives any professional to achieve excellence in his field. But while motivation is a general term, the warrior spirit is a specific one used to describe the motivation unique to professional soldiers. It is a motivation tempered by the importance of the cause, the peril of the work, and the required level of commitment. In today's troubled world and with the constant threat of war looming over us, the professional soldier must be prepared to fight. The warrior spirit drives him to prepare.

Since the warrior spirit is born of a fiery dedication to the cause, it goes without saying that those who possess the warrior spirit do so because they understand the cause and feel a deep commitment to it. In fact, the deeper the commitment, the greater the initial manifestation of the warrior spirit. But once the warrior spirit flares up, it needs a direction to burn in, and that direction is military professionalism.

Since a warrior, by definition, is engaged or experienced in warfare and shows great vigor, courage, or aggressiveness, it follows that soldiers possessing the warrior spirit would evolve into the supreme warrior. But nurturing the warrior spirit is the responsibility of both the individual



and his leaders. Nurturing the warrior spirit causes a chain reaction in the life of a soldier leading towards full professional maturity. The young soldier imbued with the warrior spirit is impatient to learn and anxious to try his skills at every opportunity. He is self-disciplined. He is energetically preparing for action.

He prepares for action even while attending classes in military institutions. William Manchester notes that when MacArthur was a West Point cadet, for example, he covered his windows with blankets after lights out and studied into the early hours of the morning. His manifest warrior spirit as a cadet led him to great exploits on the battlefield. William Manchester said of him: "In short, his was a warrior's mind." Richard Nixon documents that Pershing called him a fighter—a fighter—a fighter." As evidenced in MacArthur's life, the warrior spirit is neither a simple synonym for aggression nor is it merely one of the tools of leadership. Indeed, it is the source of professionalism, the catalyst that precipitates true military professionalism.

Our ultimate responsibility in the School is to develop professionalism in our young men and women. In so doing, we help mold them into combat leaders who will face the rigors and challenges of the AirLand Battlefield with undaunted courage, supreme fighting skills, and bold initiative. We seek to develop professionalism and to channel the energy of the warrior spirit by giving our soldiers a variety of combat skills and leadership theories. In the area of leadership, for example, we teach the 9 leadership competencies—decision making, planning, technical and tactical proficiency, and so forth. But we also emphasize that professionalism has the traits of great leadership—leadership by example; courage, candor, competence and commitment; constant presence; integrity; selfless service; and so forth. We teach that mastery of these traits requires a lifelong, or at least a career-long, personal pursuit of leadership excellence. We do the same in the technical skills arena. We introduce them to the rudimentary combat skills—at a somewhat brisk pace—and then emphasize that mastery of those skills

is their personal and professional responsibility.

Of course, classroom training is only part of the professional development process. The School also emphasizes realistic combat training to show practical application of theory. The School's combat training includes a rigorous physical training program, road marches, land navigation and rappelling exercises, a 4-day "war" for all basic course and designated advanced course officers, and a variety of terrain walks, gunnery shoots during which students man both the hill and the fire direction center, and hands-on maintenance training. We do our part in the School to introduce students to combat training and then pass on to the gaining unit the responsibility to continue this and all other aspects of professional development.

The warrior spirit is important to us because it is the step in the process that we can observe and key on. Inner commitment and heartfelt dedication in and of themselves are difficult, perhaps impossible, to discern. Full professionalism is still too far down the road. But the first fruits of commitment—the growing warrior spirit that hints of professionalism—is as visible as the soldier's uniform. It enables us to know whether or not the new soldier has left behind the comforts of civilian life and thrown himself headlong into the pursuit of military excellence. Our assessment of the strength of the individual's warrior spirit helps us tailor our counseling, instruction, and discipline to help deepen commitment and boost performance. We believe this is important because those who possess a strong warrior spirit will be the ones who eventually grasp the reins of military leadership and in combat "imitate the action of the tiger."

Wendell D. Jepson
CPT, FA
Fort Sill, OK

New Thoughts

Sound Doctrine?

The Field Artillery just passed a critical crossroad and it may be time for more serious discussions about paths we've taken.

After attending a brigade staff officer's refresher course in February 1986 and the battery computer system (BCS) reserve component course in April 1986, I am very alarmed about the changing doctrine of the Field Artillery, our mission, and the equipment we use.

I attended advanced individual training (AIT) at Fort Sill in 1968 and have been around the Field Artillery a long time. I am now with an Army Reserve unit as the full-time battalion fire direction officer and assistant S-3.

First, I want to address the doctrine. Spreading out howitzers for survivability is tactically sound doctrine. However, sending a roving howitzer out with an onboard fire direction center causes some serious problems, especially in the logistics and security area. A roving howitzer becomes an indirect fire tank without the capability to defend itself. Also, if howitzer batteries are spread too far, they could lose the ability to mass fires.

Second, I want to discuss our mission of providing fire support to the ground gaining arms. If we are firing suppression of enemy air defense (SEAD) missions for the Air Force, Copperhead for the armor, and counterbattery for ourselves, what priority do we give to the infantry?

Third, I am concerned about the equipment. The tactical fire direction system (TACFIRE), BCS, and the backup computer system (BUCS) all seem to be good pieces of equipment. They are impressive to work with and give us a first-round accuracy only dreamed of in the past. However, the combat ability of these items may be affected by electromagnetic pulse (EMP) from a nuclear battlefield. The complete disregard for manual gunnery is probably the most disturbing development I've seen. I think that we should maintain a certain expertise in manual gunnery but the level needed is debatable.

The Canadian Army teaches 51 percent manual gunnery and 49 percent computer-assisted solutions. Certain people feel it is impossible to destroy the 12 computers (1 TACFIRE, 3 BCSs, 6 BUCS, for cannons, 2 BUCS, for survey) in the TACFIRE system. They argue that you won't need manual gunnery because you will never be without a computer to do gunnery computation. Anybody who has worked with any electronic equipment like a typewriter, copying machine or a computer knows that they frequently are inoperable. And this down time may increase with prolonged use in the field. I don't want to have to tell an infantry commander that I can't provide artillery support because my computers are broken!

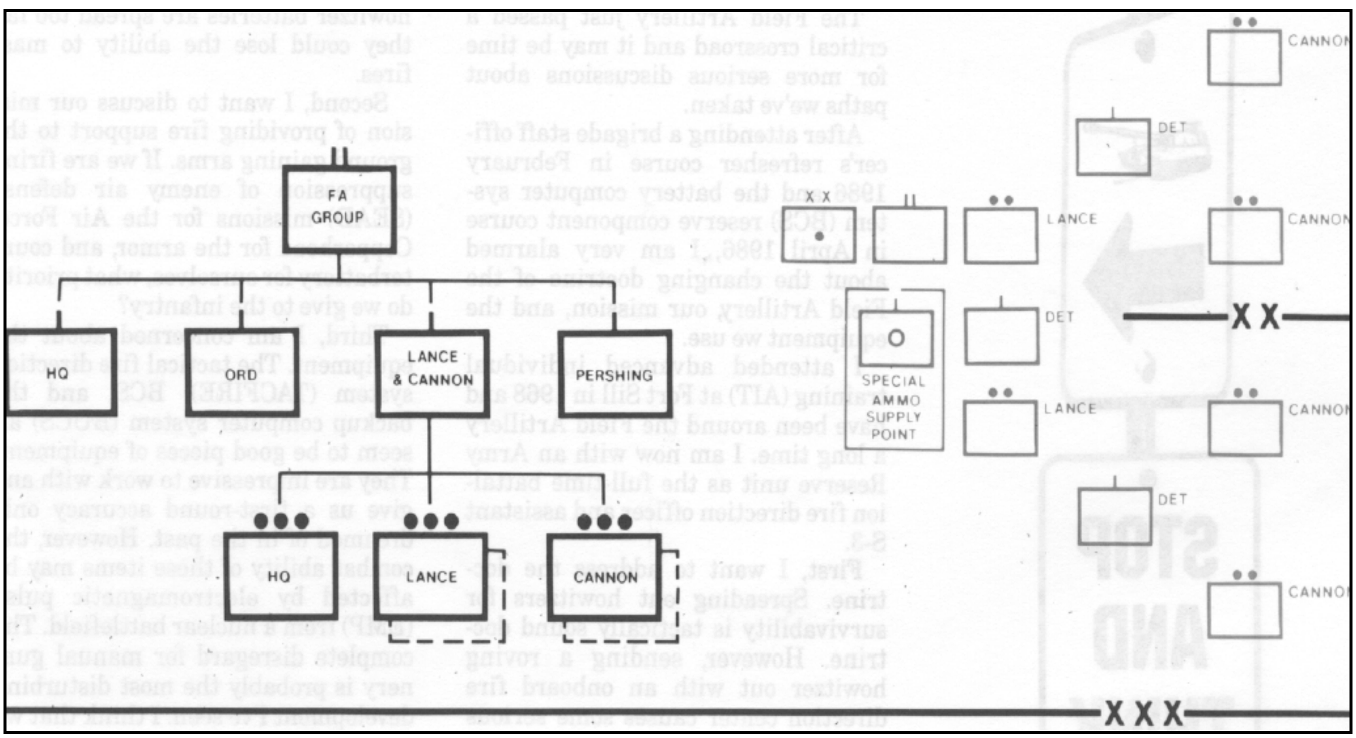
Leon D. Vaupel
CPT, FA, USAR
Chicago, IL

Is It Time To Change The FA Detachment?

Almost everyone has a different idea of what a detachment is, and that includes those who have served at a "det." This is because there is little formal training on the organization of detachments, and no 2 detachments have the same mission. In the Field Artillery there is no established standard definition for a detachment. In fact, many different unit organizations claim the term "Field Artillery detachment." I believe it's time to look at the missions and composition of these units with an eye toward reorganization and standardization.

Most Field Artillery detachments are in Germany and serve as part of the 59th Ordnance Brigade. The 59th provides direct and general support to the US Army Europe and non-US NATO forces north of the Alps. This includes ammunition, major end items, repair parts, and maintenance for the Pershing, Lance, and cannon artillery special weapon systems. The brigade has 3 ordnance battalions, a headquarters troops battalion, and 6 artillery groups. Five of these battalion-sized groups support Field Artillery units. The sixth group works with NATO air defense artillery units. The Field Artillery groups span Germany from the Swiss border in the south to the Danish border in the north. Each of these groups is responsible for providing special ammunition support to its associated NATO unit, usually at the corps level. The subordinate Field Artillery detachments provide US custody, accountability, maintenance, and assembly for assigned munitions in host nations. Cannon detachments are most common and are typically associated with a regimental-sized NATO artillery unit.

The specific mission of each detachment varies according to its organization. Pershing detachments are the largest. They have more than 200 personnel and support elements



Current Organization

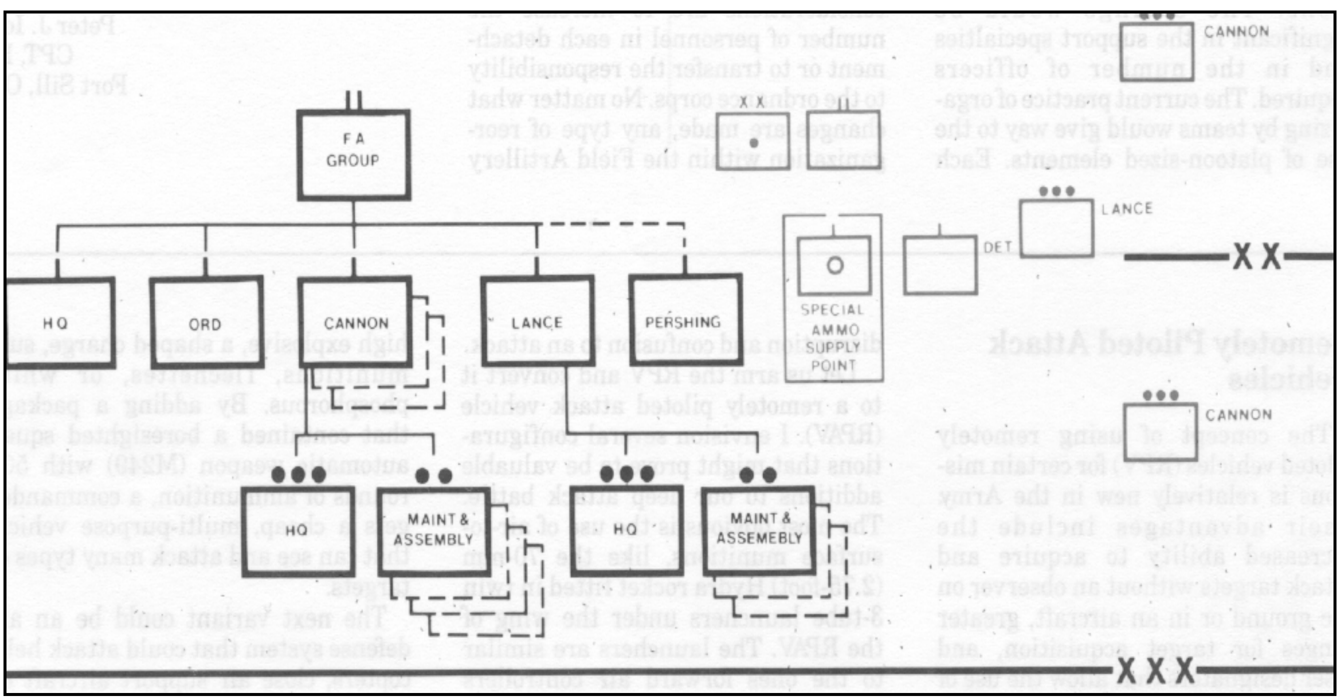
of the German Air Force. Detachments supporting cannon artillery weapons are the smallest, with approximately 40 persons assigned. Lance support units tend to be slightly larger than cannon detachments. But both the cannon and Lance detachments are battery level commands normally led by Field Artillery captains.

The detachment commander provides his supported NATO artillery commander with technical and tactical assistance in nuclear munitions employment. He accomplishes this mission through small sub-elements called maintenance and assembly teams. The NATO artillery commander then scatters these teams through the division support area, while the detachment headquarters locates with the command element. As a result there is often a great distance between units of all levels and their controlling headquarters.

Such separations complicate the wartime and peacetime missions of the detachments. Limited communication assets and the transfer of detachments to the operational control of the NATO unit make command and control difficult at all levels. Wartime logistics and administrative support channels are nonstandard or nonexistent. The small size of cannon and Lance detachments coupled with their method of deployment limit the unit's ability to conduct continuous operations. What's more, many detachments are quite removed from US community support facilities. So the detachment commander becomes the de facto leader of a small isolated US community and has to wrestle with an overwhelming variety of problems. We can solve many of these tactical, operational, logistical, and administrative shortcomings if the cannon and Lance detachments were to reorganize, consolidate, and reposition at the Field Artillery group headquarters location as shown below.

There are many positive factors we can derive from a change and repositioning of the detachment organization:

- This concept provides the group commander and the NATO corps artillery commander with better command and control over this nuclear support detachments.
- With the detachment under the operational control of his corps, the corps commander can ensure nuclear packages support the corps concept of operations.
- As a corps asset, the detachment should receive transportation and security support from the NATO corps itself. This change would free security units at the division for alternate missions or assimilation into the corps' manpower pool.
- US assembly teams, with corps transportation support, would deliver weapons to designated rendezvous points or to actual firing locations as required. This action eliminates the need for firing units to convoy to a field storage site and return with weapons.
- In many cases, team members would conduct preliminary technical operations prior to movement so the only requirement at the release point would be the rapid transfer of custody.
- Relocating field storage locations farther to the rear will increase their degree of protection from enemy indirect cannon and short range rocket fire.
- With a reduced number of storage sites we would provide our enemy with fewer high payoff targets.
- The detachment would receive better logistical and administrative



Proposed Organization

support as a result of its location near the group headquarters.

- This method of nuclear support and delivery to firing units parallels the US concept of employing centralized warhead support platoons to support a corps.

Although the benefits are numerous, this proposal has some negative considerations. Relocating the detachment from the division to the corps area will decrease the number of weapons storage locations in the European theater. Therefore each remaining site becomes a more important target for terrorist or unconventional forces. Detachment commanders can compensate for this by increasing and maintaining security precautions. Many security improvement programs are under consideration or are in progress. Field storage locations in the corps, rather than division, area will increase the ground convoy time needed to transport weapons to the firing unit. This problem would be slightly less significant because the assembly units would learn of their missions earlier than under previous systems of organization.

The new detachment organization will reduce the total personnel requirements and improve the unit's overall capability to perform its mission. The key is to eliminate much of the duplication of personnel now needed by dispersed multiple locations. The savings would be significant in the support specialties and in the number of officers required. The current practice of organizing by teams would give way to the use of platoon-sized elements. Each platoon would provide support to the element formerly supported by a detachment. Of course, as the number of tactical locations falls, so too will the requirement for officers. Under this proposed table of organization, detachment sergeants would become platoon sergeants and each battery-sized detachment would have a first sergeant. The larger pool of manpower at fewer locations would enable the unit to withstand personnel turbulence without significant impact on mission accomplishment or continuous operations.

In addition to the tactical benefits there are many other positive factors to consider. The group headquarters locations, replete with ordnance companies, are already larger than those of current cannon or Lance detachments. Because of their size, the group locations have consolidated soldier support services and typically are sub-communities which receive appropriated funds for family programs. Our overall support of required programs would be more effective if outlying units consolidated and relocated near the existing community of the group. This move would benefit all the soldiers and accompanying dependents of the community because of the economies of scale that apply.

This is not the only proposal for changing the organization of the Field Artillery detachment. Other notable considerations are to increase the number of personnel in each detachment or to transfer the responsibility to the ordnance corps. No matter what changes are made, any type of reorganization within the Field Artillery groups or detachment of the 59th Ordnance Brigade will require cooperation from our NATO allies. The tactical considerations of the different supported armies are not identical, nor are their abilities to provide extensive support. Host and user nations give detachments many types of support such as housing and transportation.

All of the support comes from longstanding service-to-service agreements. Although many of these agreements may appear dated, they appear to work and changing them would generate considerable initial expense. Joint planning groups would need to determine the feasibility of any such actions from an economic perspective before anything changes.

Before choosing any method of reorganization for the 59th Brigade's Field Artillery detachments we must consider the special tactical, technical, and personnel requirements of this unique NATO mission. As technology and doctrine change so will mission execution. If we expect the Field Artillery detachment to continue as a part of that mission then we need to develop an organization that will allow for successful mission accomplishment well beyond the 1990s. To remain effective and respond to future demands we must attempt to standardize ourselves now while we have the luxury of doing so.

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Remotely Piloted Attack Vehicles

The concept of using remotely piloted vehicles (RPV) for certain missions is relatively new in the Army. Their advantages include the increased ability to acquire and attack targets without an observer on the ground or in an aircraft, greater ranges for target acquisition, and laser designators that allow the use of precision guided munitions (PGM). However, there appears to be another use for RPVs that can cause even more disruption and confusion to an attack.

Let us arm the RPV and convert it to a remotely piloted attack vehicle (RPAV). I envision several configurations that might prove to be valuable additions to our deep attack battle. The most obvious is the use of air-to-surface munitions, like the 70-mm (2.75-foot) Hydra rocket fitted in twin 3-tube launchers under the wing of the RPAV. The launchers are similar to the ones forward air controllers used in Vietnam to mark enemy positions for aircraft attack. The warhead could be a standard 10 or 17 pound high explosive, a shaped charge, submunitions, flechettes, or white phosphorous. By adding a package that contained a boresighted squad automatic weapon (M249) with 500 rounds of ammunition, a commander gets a cheap, multi-purpose vehicle that can see and attack many types of targets.

The next variant could be an air defense system that could attack helicopters, close air support aircraft or cargo carriers. A version to carry 4 or 6 sense and destroy armor (SADARM) antiarmor munitions dropped or

launched by small compressed air charges may be a smart use of such munitions. This would allow both a more selective distribution of munitions on a single target and the attack of certain high-value targets that are not in ground observer view. This concept can also be used for various cluster bomb or bomblet munitions against thin-skin targets.

We might also consider a somewhat more radical use of RPAVs: rear area combat operations (RACO). As we all know, RACO is an on-order mission for all but the military police. "Fire Support for the Rear Battle" by Lieutenant Colonel Treolo (Jan-Feb 1986 *Field Artillery Journal*) points out the need for adequate levels of committed fire support assets in the corps rear operations area. The rear battle commander is going to have several problems facing him that the front-line commanders won't have:

- He lacks a dedicated, mobile force to commit to RACO operations.

- He lacks the authority to compel commanders to do certain defensive things (clear the roads, harden your positions, etc.) until the problem is at hand.

- Because few dedicated aerial assets will be available for the reaction force and the military police units are not (currently) equipped with armored fighting vehicles, force mobility is limited.

- His tactical area of responsibility is very large and the problems of Level I and II attacks can appear at any location.

- He probably will not have a dedicated mobile air defense artillery force that can attack enemy cargo carrying aircraft, especially if they are not attacking specific targets in the rear. The number of missile batteries may not be near what the commander desires.

It might be a very good idea to have a light howitzer battalion dedicated to RACO. But we should also have the firepower to neutralize larger areas than a 105-mm battery can cover. The use of RPAVs to support the rear battle captain (RBC) for both combat operations and command and control efforts could be invaluable. In many cases, the RPAV could destroy a platoon-sized element without additional assets by using the squad automatic weapon (SAW), flechette rockets, and anti-personnel munitions.

By coupling the RPAVs with a light artillery battalion, we almost have the best of both worlds. But 1 more step could give us nearly total rear area coverage: mount several multiple launch rocket system (MLRS) pods on a simple turntable on standard trailers. A central computer at the light battalion headquarters could compute data and send it to the launcher(s) involved.

Siting these roving MLRS launchers in the rear area increases coverage dramatically. The roving MLRS also gives the corps commander a means of saturating a breakthrough area without robbing the front-line units of their MLRS basic load.

It would be nice to have a light howitzer mounted on a light assault vehicle chassis for better all-around ground mobility and protection. This would allow for the distinct possibility that aerial assets might not be available to move the guns over barriers that had been created or caused by the fighting. I am specifically concerned with the water barriers in West Germany. If the MP reaction forces are on the wrong side of a water barrier, they can't be as effective as we need them to be. MP reaction forces fight from light armored vehicle (LAV)-type vehicles for speed, mobility, protection and firepower; their supporting artillery should travel the same way.

The RPAV concept gives Field Artillery the edge it needs to support the ground-gaining arms or RACO forces in a mid-to-high intensity environment. With some imaginative use of existing weapons systems, the Field Artillery can remain the King of any Battle.

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Lance: Two New Concepts for Modern Fire Support Doctrine

by Lieutenant Colonel Thomas G. Wilson

As the Army's AirLand Battle doctrine evolves and the Field Artillery Community searches for better ways to get quick and devastating fire support to the battlefield, 1 fire support system may get overlooked. The Lance missile system is a mobile, accurate, long-range fire support system available to corps commanders. But as other new systems reach the fire support inventory, fire support planners tend to overlook the lethal capabilities of Lance. Two employment concepts under examination here may provide renewed interest in Lance—they are the hot platoon concept and the use of Lance in support of the rear area battle.

The Hot Platoon

A major criticism of Lance is the lack of timeliness of fire. The maneuver as well as the Fire Support Community believe that Lance units take too long to engage a target, and that this excessive time lapse is inherent to the system. Fortunately, Lance units in VII Corps are continually improvising and employing innovative techniques that reduce the time required to fire. One of the techniques we use is the hot platoon. The objective is to ensure that each Lance battalion has a firing platoon that can engage a target within 15 minutes of receiving fire missions.

Each battalion is experimenting with different techniques using the hot platoon. Units have demonstrated that they can fire within 10-12 minutes during annual service practices at Crete and White Sands, New Mexico. And soldiers and leaders in the 2d Battalion, 42d Field Artillery are refining their operation to be able to provide Lance missile fires within 10 minutes of receiving their mission.

The process begins in the battalion tactical operation center (TOC) where firing platoons occupying the hot firing point become the hot platoon. TOC staffers select hot firing points according to fairly rigid criteria. They need concealment on all sides and they must have partial overhead cover from forests. Although these firing points are somewhat difficult to find, each firing battery normally locates 3 such points for each battery location. In Europe the firing points may be trail junctions or tree nurseries. Admittedly, this hole-in-the-woods concept is not new but when combined with other techniques of the hot platoon concept it helps reduce the time required to fire Lance.

Platoons occupy the hot point by pulling over the firing stake on a general azimuth of fire provided by the battalion fire direction center (FDC). The FDC computes the general azimuth of fire by locating the platoon so that their interior limit of traverse intersects near the forward line of own troops (FLOT). Using the nonnuclear warhead, the platoon now can engage targets within 400 mils on either side of center traverse. This gives hot platoon coverage for the battalion's portion of the Corps sector (figure 1).

Once they pull up over the firing stakes the platoon begins to prepare for action, and does everything except the actual laying operations. Then the platoon conducts local security operations and preventive maintenance checks and services (PMCS) on the vehicles while waiting for a fire mission. Depending on environmental conditions, platoons will not remain in the hot status for extended periods. For instance, in winter the platoon normally will not be in hot status for more than 4 hours because there are no messing operations and soldiers can't rest in this high state of readiness. As the time approaches to bring a platoon off hot status, or if the hot platoon is completing a fire mission, the battalion FDC selects another platoon to move to a hot firing point to assume status.

Although an argument arises about the firing platoon's vulnerability while the launcher over the firing point is left open for extended periods, this is really not the case. There is a slight increase in the vulnerability, but the hole-in-the-woods concealment protects the firing platoon from just about everything but a hovering helicopter. In addition to the hot platoon concept, Lance battalions in VII Corps are looking at more efficient methods to communicate targets down to the firing platoons. Streamlined communications procedures coupled with the hot firing platoon concept will make Lance fires even more responsive.

Employment of Lance in Support of the Rear Area Battle

Since its introduction, the Lance system has been the sole weapon available to the corps commander to strike deep at the enemy's second echelon. However, we habitually think only in 1 direction. As doctrine evolved into the covering force battle, the main battle area, and the rear battle, the 1 which presented the most difficulty was the rear area battle. The fire support community faces many issues, but a basic question is how to keep artillery units close enough to support the rear battle without taking them out of the main battle area. Lance answers that question. In VII Corps, the Lance battalions can hit most potential rear area combat operations (RACO) targets, beginning at their local dispersion areas and continuing through their final battle positions.

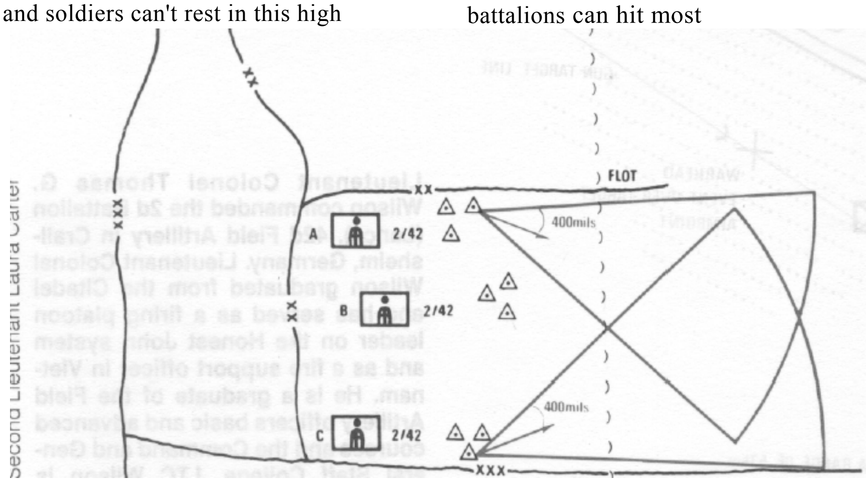


Figure 1. The nonnuclear Lance hot platoon can cover the battalion's portion of the corps sector.

The idea of attacking rear area targets with Lance is somewhat unattractive to many planners—primarily because they are not familiar with the characteristics of the system. The accuracy, or circular error of probability (CEP) of Lance, like the range of the system, has been another of the system's greatest assets. At a range of 55 kilometers the CEP for the system is 132 meters, then the CEP increases proportionally with range. This allows corps-level planners to consider different options of providing fire support for the rear area battle. Then the shorter range cannon and multiple launch rocket systems (MLRS) units engage targets in the main battle and covering force areas, and the corps commander can use the longer range Lance fires to engage rear area targets from their positions in the main battle area.

The accurate Lance fires, combined with the footprint or burst-radius of the nonnuclear warhead, makes the Lance an extremely suitable weapon to attack soft area targets. The nature of the potential RACO targets—airborne and airmobile forces—makes them ideal for attack with the nonnuclear Lance warhead. The M74 fragmentation incendiary grenades, the submunition for the M251A1 warhead, are particularly well suited for attacking personnel and light equipment of the threat airborne and airmobile forces. Additionally, because airmobile forces need 60 minutes to clear the landing zone, and airborne soldiers need up to 180 minutes to clear the drop zone, these targets are within the engagement time for Lance whether they are in a hot status or not.

Even after considering the obvious advantages of Lance in attacking rear area targets, many planners have reservations about using the system because of potential collateral damage. This damage results from the unburned liquid fuel propellants that impact beyond the intended target. The amount of liquid fuel propellant remaining after the warhead detonates depends on the range to the target, so that a short range produces a large quantity of fuel and a long range produces little or no fuel. What planners must realize is that they can calculate the secondary impact of the unburned liquid fuel. They can use this data to inflict damage on the target. For example, if the rear area target was an airborne battalion or regimental size drop zone, fire planners would analyze the target using the Lance burst footprint to determine the number of rounds required for the desired coverage (figure 2).

In analyzing the target, fire planners would also consider the impact of the unburned fuel propellants. Their analysis should focus on 2 considerations: first, will it happen on or in the vicinity of the target? And, if the secondary impact does not occur in the target area, does the potential collateral damage preclude the use of a particular Lance firing platoon? (If so, planners should consider other firing platoons because a change in firing platoons will change the gun target line, which in turn changes the point of secondary impact in the target area.) When planners realize they can calculate the secondary impact, there is no reason to fear collateral damage from the unburned liquid fuel.

When intelligence indicates that threat forces attack in the rear area is imminent, the hot platoon concept described here is especially appropriate for RACO targets. For example, a Lance battalion could have 3 hot platoons with 2 oriented toward the FLOT and 1 oriented to the rear; or a battalion could have only a rear area support mission with 2 hot platoons oriented on the corps rear area. Located at hot firing points, the platoons oriented to the rear set their interior limits of traverse to intersect in the vicinity of the division rear boundary or any other appropriate control measures. Then the platoon's long-range fires could engage RACO targets within 15 minutes or less in the battalion sector of the corps rear area (figure 3).

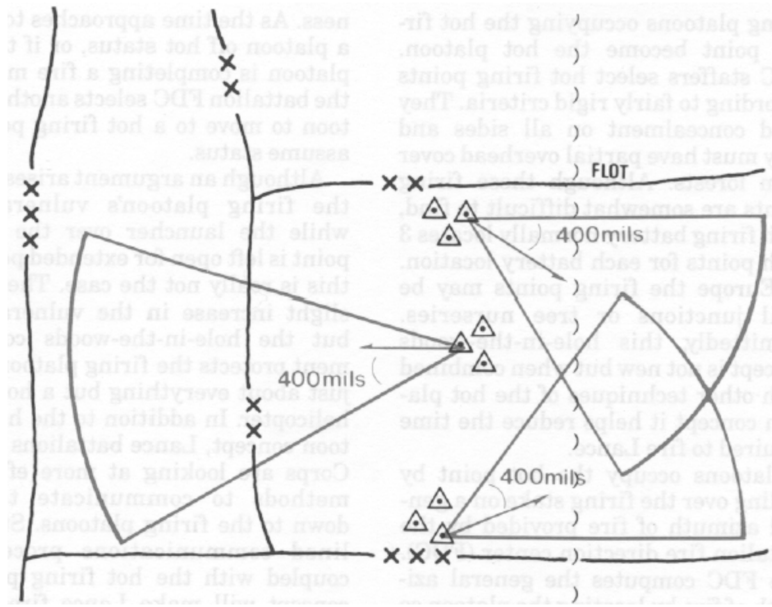


Figure 3: The hot platoon can engage RACO targets within 15 minutes or less.

Testing the Concepts

Recently, during exercise Certain Sentinel (REFORGER 86), Lance battalions firing in support of Blue Forces exercised both the hot platoon concept and the engagement of rear area targets and achieved good results. In a general support role Lance engaged several targets and achieved hits on a division command post, Field Artillery brigade command post and a division support command, resulting in heavy personnel and equipment loss. In the rear area battle Lance destroyed 23 helicopters during an airmobile insertion. By the end of the exercise it was evident that Lance played a significant role in the artillery battle during REFORGER 86.

In summary, the Lance system will be with us through the mid-1990s, and Lance battalions worldwide will continue to seek more innovative methods to employ Lance fires. Fire planners at all levels must be cognizant of the lethal capabilities of the Lance system and strive to integrate the Lance into our evolving fire support doctrine.

"Strike Deep!"

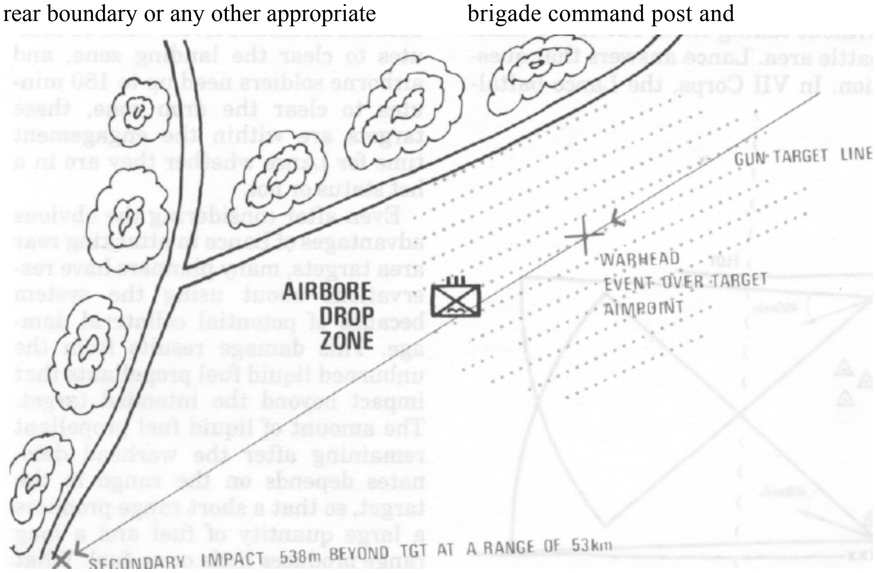


Figure 2. Fire planners analyze the target using the Lance burst footprint to determine the number of rounds required for the desired coverage.

Lieutenant Colonel Thomas G. Wilson commanded the 2d Battalion (Lance), 42d Field Artillery in Crailsheim, Germany. Lieutenant Colonel Wilson graduated from the Citadel and has served as a firing platoon leader on the Honest John system and as a fire support officer in Vietnam. He is a graduate of the Field Artillery officers basic and advanced courses and the Command and General Staff College. LTC Wilson is serving at the Pentagon Inspector General Office.

Deep Battle Lance: A Nonnuclear Doctrinal Primer

by Captain Jim L. Claunch

Army leaders writing targeting doctrine have to start with weapons capabilities. While that is true of any weapon system it is especially critical for nonnuclear lance (NNL)—a system with no targeting doctrine. As leaders both in the field and at the US Field Artillery School collaborate to fill the doctrinal void, they must not forget that the NNL bomblets can't penetrate armored vehicles. Therefore they are incapable of direct interdiction against armor or mechanized forces.

There is simply no target effect significant enough to warrant the expenditure of NNL ammunition (and the possible expenditure of a LANCE firing platoon) against these types of targets. This generally overlooked fact causes confusion about which targets NNL can and cannot attack, and misunderstanding about its deep battle role.

That confusion subsides with the realization that NNL can attack "soft" targets such as unarmored vehicles, radars, and helicopters (figure 1). Attacking these targets may not be interdiction in the classic sense (the destruction or disruption of enemy forces moving towards the main battle), but can produce interdiction-like effects.

The targets listed in the table are the basis of NNL deep operations doctrine, and are in general order of priority for attack. The fire support coordinator (FSCOORD) establishes the specific attack priority based on the supported force operations and the commander's deep battle objectives.

The Deep Battle Role

These targeting limitations necessitate a deep operations role that is more subtle than attacking armored or mechanized forces. There are 3 facets to this role.

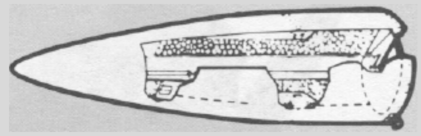
The primary role of NNL is attacking nuclear delivery systems and associated sites, such as surface-to-surface missiles (SSM), SCUDs and SS-21 missiles. The objective is to destroy the enemy's capability to wage tactical nuclear war before it starts.

The secondary deep battle role of NNL is an indirect form of interdiction. Nonnuclear Lance can separate follow-on or reserve forces from first echelon or main defensive belt forces by attacking enemy army and division tactical operations centers (TOC). Destroying or disrupting such TOCs can affect their ability to control these forces, slowing their momentum toward the forward line of own troops (FLOT), and achieve interdiction objectives. Other indirect interdiction targets include artillery TOCs, river crossing sites, and logistical installations, particularly those with large amounts of fuel.

The third role of NNL is the attack of air defense artillery (ADA), close-air support (CAS) assets and aircraft ground control radars. While other fire support assets generally do not execute long-range suppression of enemy air defense (SEAD) programs well, NNL can suppress the relatively immobile, high-altitude air defense systems. This helps clear the skies so our fliers can provide battlefield air interdiction (BAI) and CAS to the units on the ground.

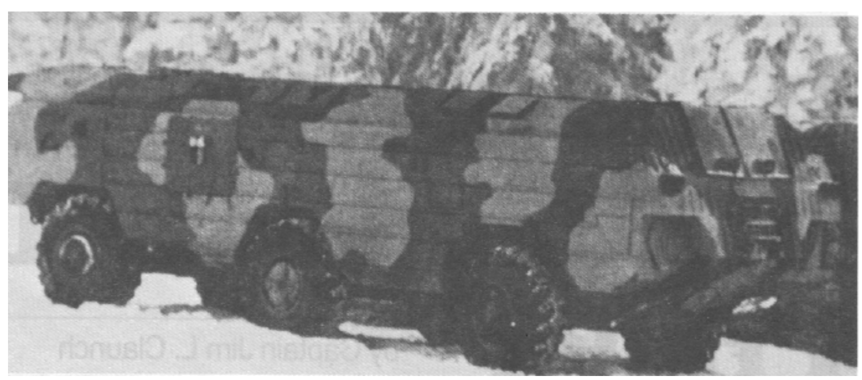
Attacking targets like ground control radars can reduce the enemy's CAS sortie rate and can enhance the corps' overall air defense capabilities.

The fourth category of targets are not classified as deep battle targets, but they influence the battle at the FLOT. These include artillery command and control and logistical targets, such as helicopter



Nonnuclear Lance Targets	Target Category	
Nuclear delivery systems and associated sites	1	Category 1 Nuclear
Division and Army TOCs and headquarters	2	Category 2 Interdiction
Air defense missiles and ADA fire control radars	3	Category 3 ADA/CAS
ADA ground control intercept and early warning radars	3	
Forward airfields and CAS ground control radars	3	
Bridging/pontoon and river crossing sites	2	
Army and Division artillery TOCs	2/4	Category 4 FLOT
Logistical installations (especially with fuel)	2/4	
Attack helicopter forward area rearm & refuel points	4	

Figure 1. Nonnuclear Lance Targets.



Nonnuclear Lance must concentrate on its primary mission of attacking nuclear delivery systems and associated sites, and the SS-21 is a high priority target.

forward area rearm and refuel points (FARRP). Though normally vulnerable to cannon and MLRS fires, conditions may warrant targeting them with NNL.

These 4 groups of targets define the deep battle role of NNL—a target dependent role that doesn't change with the tactical situation. Because its role remains fixed on targets, NNL targeting procedures are vital.

Nonnuclear Lance Targeting

Effective NNL targeting requires a synchronization of target acquisition and attack assets which only the corps fire support element (FSE) can accomplish. Two organizational changes can enhance the FSCOORD's targeting guidance and the overall procedures.

The first change entails moving a fire support officer (FSO) from the corps FSE to the corps all source intelligence center (ASIC). The ASIC is the source of targeting information for the corps and the FSO can speed the target acquisition process by "mucking around" within the ASIC, developing and refining targets and quickly passing them to the FSE.

The ASIC's fire support liaison must be familiar with target acquisition capabilities and learn how to make use of the target intelligence they provide. He must examine all available intelligence, refine target data with the assistance of the ASIC's experts, and develop an attackable target which is sent to the corps FSE.

The corps FSCOORD makes the actual attack decision within the corps FSE. If he decides to attack with NNL, he passes the target to the appropriate Lance battalion liaison officer (LNO) for execution.

The second organizational change positions Lance battalion LNOs within the corps FSE. Their primary function is to communicate between the FSE and the battalion, and they are the primary means of sending fire missions to the battalions. The LNOs also transmit tactical and intelligence information to the battalions, and provide expertise on LANCE tactical operations and capabilities to the FSE.

Command and Control

Because Lance launchers are a fixed, nonreplenishable asset, the command and control of Lance fires resides with the corps FSE. This has the potential to reduce the corps' ability to conduct nuclear operations. Launchers lost during nonnuclear operations will not be available for nuclear operations. This means that corps planners have to conserve at least some firing platoons for nuclear operations.

In addition, the transition to nuclear operations can reduce the corps' ability to conduct nonnuclear fire missions, because launchers loaded with nuclear rounds are not available for NNL missions.

Instead of merely slowing follow-on or reserve forces, nuclear Lance can isolate them from first echelon or

ment of Lance battalion response postures (figure 3) absolutely critical to the success of both nuclear and nonnuclear operations. This transition will be successful only if controlled by a single headquarters—the corps FSE.

Target acquisition capabilities also affect control of Lance fires. Because only the corps FSE has access to those target acquisition and target intelligence collectors capable of detecting the entire spectrum of NNL targets, it is

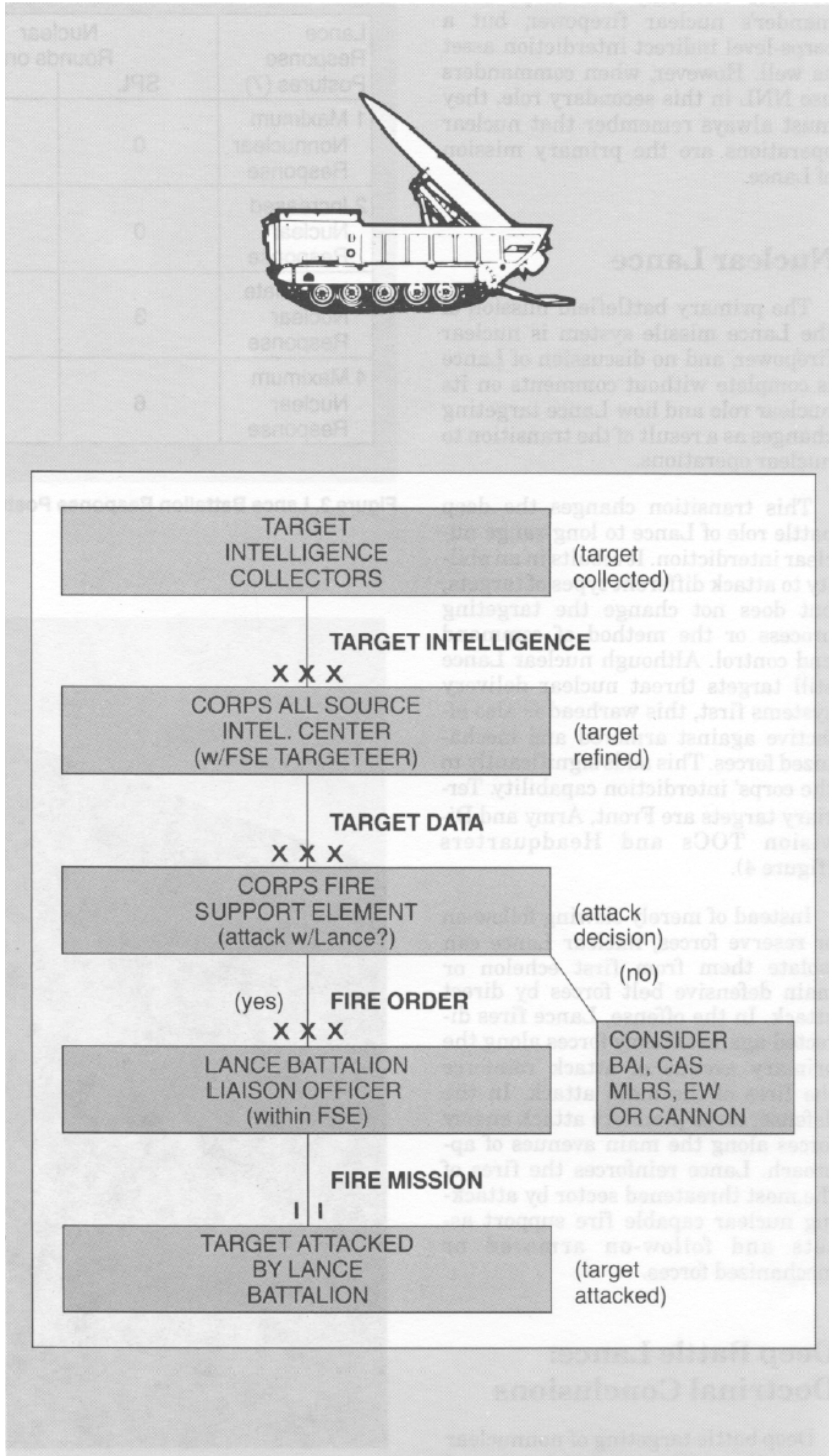


Figure 2. The NNL Targeting Process.

the corps FSE that must plan and control all Lance fires.

So the corps FSE must control all Lance fires, both nuclear and nonnuclear, more directly than it does for cannon artillery. As a result, Lance becomes not only the corps commander's nuclear firepower, but a corps-level indirect interdiction asset as well. However, when commanders use NNL in this secondary role, they must always remember that nuclear operations are the primary mission of Lance.

Nuclear Lance

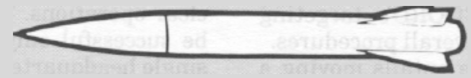
The primary battlefield mission of the Lance missile system is nuclear firepower, and no discussion of Lance is complete without comments on its nuclear role and how Lance targeting changes as a result of the transition to nuclear operations.

This transition changes the deep battle role of Lance to long-range nuclear interdiction. It results in an ability to attack different types of targets, but does not change the targeting process or the method of command and control. Although nuclear Lance still targets threat nuclear delivery systems first, this warhead is also effective against armored and mechanized forces. This adds significantly to the corps' interdiction capability. Tertiary targets are Front, Army and Division TOCs and Headquarters (figure 4).

Instead of merely slowing follow-on or reserve forces, nuclear Lance can isolate them from first echelon or main defensive belt forces by direct attack. In the offense, Lance fires directed against enemy forces along the primary avenue of attack reinforce the fires of the main attack. In the defense, corps planners attack enemy forces along the main avenues of approach. Lance reinforces the fires of the most threatened sector by attacking nuclear capable fire support assets and follow-on armored or mechanized forces.

Deep Battle Lance: Doctrinal Conclusions

Deep battle targeting of nonnuclear Lance is a mixture of alchemy and "educated guesses." Army leaders need to establish clear Lance targeting

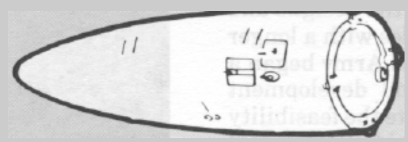


Lance Response Postures (7)	Nuclear Rounds on		Nonnuclear Rounds on	
	SPL	L-T	SPL	L-T
1 Maximum Nonnuclear Response	0	0	6	12
2 Increased Nuclear Response	0	6	6	6
3 Immediate Nuclear Response	3	6	3	6
4 Maximum Nuclear Response	6	12	0	0

Figure 3. Lance Battalion Response Postures.

A Lance crew prepares the system to perform its battlefield mission.

Lance missile systems are mobile enough to reinforce the main attack or to defend along the enemy avenue of approach.



Nuclear Lance Targets	Attack Priority
Nuclear delivery systems and associated sites	1
Armored/mechanized reserve and follow-on forces	2
Front and Army TOCs and headquarters	3
Division TOCs and headquarters	3

Figure 4. Nuclear LANCE Targets.

doctrine based on warhead effects. This target effects approach leads Redlegs to 3 basic tenets of NNL targeting.

● First, nuclear operations are the primary battlefield mission of Lance. Corps planners should use its nonnuclear fires only after its nuclear mission is not needed. Furthermore, they should target Lance battalions against the enemy's nuclear delivery units.

● Second, NNL is not an effective direct interdiction weapon. Target selection and the entire targeting process depends on the warhead's ability to affect targets. And the only targets NNL can attack effectively are soft, relatively stationary targets. This limitation necessitates a more subtle approach to NNL's employment and targeting as an interdiction weapon—an approach which achieves interdiction-like effects by attacking specific targets vulnerable to the effects of the Lance nonnuclear warhead.

● Third, the corps FSE controls all nuclear and nonnuclear Lance missile fires. Only the corps FSE has access to the necessary target acquisition assets, and only the corps FSE can coordinate the critical transition from nonnuclear to nuclear fires. As a result, only the corps FSE can employ Lance effectively.

These 3 tenets give a concise description of the Lance missile system's doctrinal deep battle role. There is much more that corps artillery targeteers must understand (such as the operational limitations of the system), but the doctrine is simple—attack the enemy's nuclear delivery capability; indirectly interdict follow-on and reserve forces; and control all Lance fires at the corps level.

Captain Jim L. Claunch has twice commanded Battery B, 1st Battalion, 32d Field Artillery (Lance) at Hanau, Germany. His other assignments were fire support officer at V Corps Artillery, and Commander, Headquarters Headquarters Battery, 3d Battalion, 9th Field Artillery (Pershing) at Fort Sill.

History of the Army's Nuclear Capable Rocket Program

by Mr. James N. Gibson

Of all the missiles and rockets in the Army's inventory, none are as powerful as the ones that carry the Army's nuclear warheads. When World War II ended the Army was by far the most important US armed service. Not only did it have more than 8 million men under arms, it had sole control over the production and deployment of nuclear weapons and direct access to the V2 scientists housed at Fort Bliss. However, along with these honors the Army accepted a great responsibility to investigate what threat these weapons could pose to the nation if they were developed by unfriendly powers. When US debriefers discovered the designs and calculations for missiles with a longer range than the V2, the Army began a series of research and development programs to investigate the feasibility of such weapons. By mid-1946 several million dollars had gone to research, and construction began on the first test missiles.

The False Start, 1945-1947

Although the Army was researching the feasibility of long-range guided missiles, the federal government was more concerned with cutting military spending. With the cessation of hostilities at the end of World War II, Congress began progressively cutting military spending as well as the size of the armed services; by the end of 1946 every armed service was one-fifth to one-tenth wartime size. Then when the first postwar strategic nuclear war studies (the Pincher series) concluded in 1947, a majority of government men became convinced that the best national defense was approximately 200 Fatman bombs and enough bombers to carry them. This conclusion would give Congress further reason to cut the budget—especially in the areas of conventional forces.

In April 1947 the Army revealed that, due to the complexity of the weapon and production problems, the nation barely had 7 assembled nuclear bombs and 20 bombers to carry them. Furthermore, none of the bombers were intercontinental. Because the defense policy rested on this force, it caused enough of a stir in the upper levels of government that in June Army leaders ordered the conversion of more aircraft to the nuclear standard. Additionally, researchers began development on a bomb that would be easier to produce and deploy. However, this action also stipulated that the program would get no additional funding. As a result, the Army finally had to curtail and even cancel a number of its guided missile research studies in 1947.

The final irony came on 18 September 1947, when Congress created the Air Force as a separate service. Not only did this action make the Army the only nonnuclear service—the Navy had just received its first nuclear capable bomber—it took away the Army's long range strategic missile programs. Thus the US Army, the most powerful service at war's end, began 1948 with no nuclear weapons, no missile programs other than defensive or short range weapons,

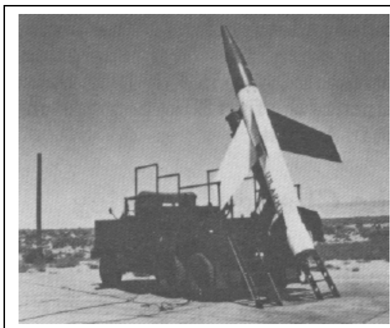
and barely 400,000 men under its command.

The Beginning, late 1947 to 1949

While losing the Air Force was detrimental to both the Army's prestige and its capabilities, it may have been the best thing to happen to the Army's guided missile program. The Army had to determine whether artillery or guided missiles could be used for delivering nuclear warheads. Artillery was reliable, well developed, and respected; but it could not carry the large nuclear weapons of that era. Guided missiles could carry very large payloads, and this led the Army to propose to Congress and the Joint Chiefs of Staff that it continue to develop an independent nuclear force using guided missile programs. At that time those programs consisted of the Corporal missile, initiated in 1944 as a counter to the V2s; the Hermes project, an Americanized V2; and the initial studies for the LaCrosse missile (only Hermes had the capability to carry a large nuclear warhead).

But as late as the summer of 1949, Congress still believed that the nation's reliance on the Navy and Air Force's strategic nuclear weapons made America invulnerable. Furthermore, Congress and the Joint Chiefs both felt that nuclear weapons were too powerful for tactical battlefield use.

Corporal guided missile on transporter.

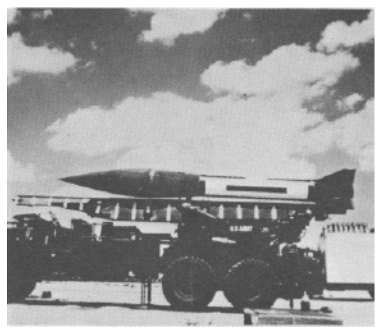


The LaCrosse missile.

Congress rejected the Army's guided missile programs.

Congress Grants Permission, Late 1949, 1950

On Aug 29, 1949 the Soviet Union detonated its first nuclear weapon. With its nuclear monopoly gone, the US government abruptly increased military spending for all the armed services. The Army's ballistic missile program was not exempt from this change in view and, although the government still withheld permission to develop tactical nuclear warheads, they authorized funds for feasibility



A test version of the Honest John.

The Redstone Rocket.

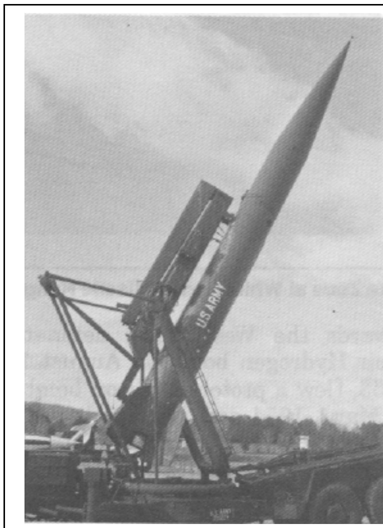
studies on the Honest John rocket in 1950. Then in April the Army activated the Redstone Arsenal in Alabama, marking both the creation of the Army's missile research center and the beginning of the Redstone missile program.

The Korean War finally convinced the US government that there was a need for tactical nuclear weapons. Congressional leaders authorized the national buildup, approved the development of small tactical nuclear warheads, and issued research and development contracts for both the Corporal missile and the Honest John rocket. By late December, they gave permission for the Corporal to carry nuclear warheads.

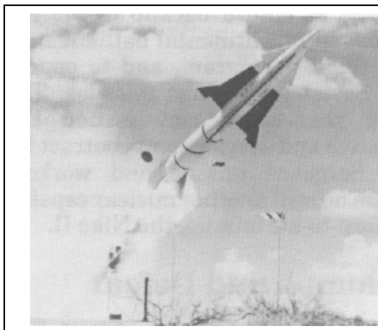
The Atomic Army

In January of 1953, the Army had 3 nuclear systems in production: the Corporal, which they tested in August 1952; the Honest John; and the developing atomic cannon. Later that same year the Army's missile program expanded even more. First the Army began feasibility studies for the Sergeant missile (the Corporal missile replacement) and then the Army started research for Nike B, a nuclear capable surface-to-air missile to replace the Nike 1 (Nike Ajax).

Although the Korean war ended on October 26, 1953, superpower hostilities continued. The Soviets maintained a large military force in Eastern Europe poised to strike



The Sergeant missile.



The Nike Zeus.

Nike Zeus at White Sands Missile Range.

towards the West. They detonated their Hydrogen bomb on August 12, 1953, flew a prototype Bison bomber on May 1, 1954, and continued a series of reports of long range rockets—all seeming to emphasize their military power.

The Army countered this threat by completing the missile programs it began in 1950 and began development of an intermediate range ballistic missile as both a backup to the Air Force's intercontinental ballistic missile (ICBM) program, and to oppose the Soviet long range missiles. The next year the Army issued the research and development contract for the Sergeant missile and workers began on still another nuclear capable surface-to-air missile, the Nike II.

Triumph and Defeat

In January 1956, the Army launched the first Sergeant missile and acquired its first true long-range solid-fuel rocket. Several technological advances later that year marked it as an important era: the Army formally commissioned feasibility studies on the Little John and the Pershing missiles, they deployed the improved Corporal II missile, and on 20 September an Army Jupiter C test missile successfully traveled 650 miles up and 3,400 miles down the Atlantic missile range. These developments and the Army's work on the Jupiter intermediate range ballistic missile (IRBM) threatened the Air Force's control over long-range missiles. On November 27, 1956, Secretary of Defense Wilson announced that the Air Force would be responsible for all ground-based missiles with a range of more than 200 miles.

The Wilson memorandum was a major setback for the Army's ballistic missile program. Not only was the Army's Jupiter IRBM now an Air Force weapon, but the Pershing and the Nike II (now like Zeus) could only fly a maximum of 200 miles. Additionally, the order moved the Jupiter to the Air Force and threw the research into chaos. After this, 1956 became known as a year of triumph and defeat and the next 9 months were no better. Although work continued (the deployment of the first Corporal IIs in Europe, the first Lacrosse missiles came off the production line on March 26, formal development of the Little John began, and the final testing of the Nike Hercules (Nike B) was complete) the end of the long-range research seemed to end the whole program.

The Bear Comes to the Rescue Again

On October 4, 1957 the Soviet Union launched Sputnik, the world's first satellite. As they had inadvertently changed the Army's direction in 1949, the Soviet Union's launch of Sputnik changed the direction of our Federal government. Of course, most of the new funding went to the Air Force and the Navy, but when the Navy's Vanguard launch vehicle failed on 6 December, defense leaders lifted the restrictions on the range of Army weapons and returned control of the Jupiter C missiles to Redstone Arsenal. By January 1958 the 400 mile-range Pershing missile was born and on 31 January 1958 a Jupiter C launched the first US satellite.

Later that year the 101st Airborne Division evaluated the first Little John missiles, the first Redstone unit went to Germany, and the first Nike Hercules missiles reached the field. Finally, 2 Army Redstone missiles made history as the first US missiles launched with nuclear warheads. Known as the Tak and Orange shots from Johnston Island, these missiles delivered their warheads successfully to altitudes of 250,000 and 125,000 feet. Researchers detonated them as a test of the effects of high altitude nuclear detonations. The decade ended with the first operational Lacrosse missiles in July 1959 and the launch of the first Nike Zeus test missile in August.

The Change in Policy

In January 1960 the Army launched the first Pershing missile and in February the first 2-stage Nike Zeus A took flight. The rest of the year saw the deployment of the improved

MGR-1B Honest John rockets, the launching of Nike Zeus B, and the flight of the first 2-stage Pershing. However, the situation began to change at the end of the year. With the election of President John F. Kennedy the nation embarked on a new military policy called flexible response. Under this new policy the US would not respond to aggression with a massive nuclear strike, but with weapons and manpower appropriate to the threat. This meant that both conventional and multipurpose weapons received the bulk of defense dollars and interest. For the next 20 years this policy would affect the nuclear programs of the Air Force, the Navy and the Army.

After deployment of the Sergeant missiles in the summer of 1962, the Army's missile programs felt the first effects of this new policy. On 1 November 1962, the Army began working on the Lance missile. It had both the range of the Honest John and the airborne capability of the Little John, thus it could replace both. It also had

The Lance system.

the first variable nuclear warhead, allowing field commanders to tailor the impact to the need. The new policy also reoriented the Nike Zeus program to include a high velocity, short-range interceptor missile and phased array radars, an action that President Eisenhower had considered in 1959.

In March 1963 the Army issued a research and development contract for the Sprint, the Army's fastest missile. In February 1964, the Army retired the LaCross missile because the program did not get the funding for needed improvements. This made it the first missile system withdrawn by Army leaders without replacement.

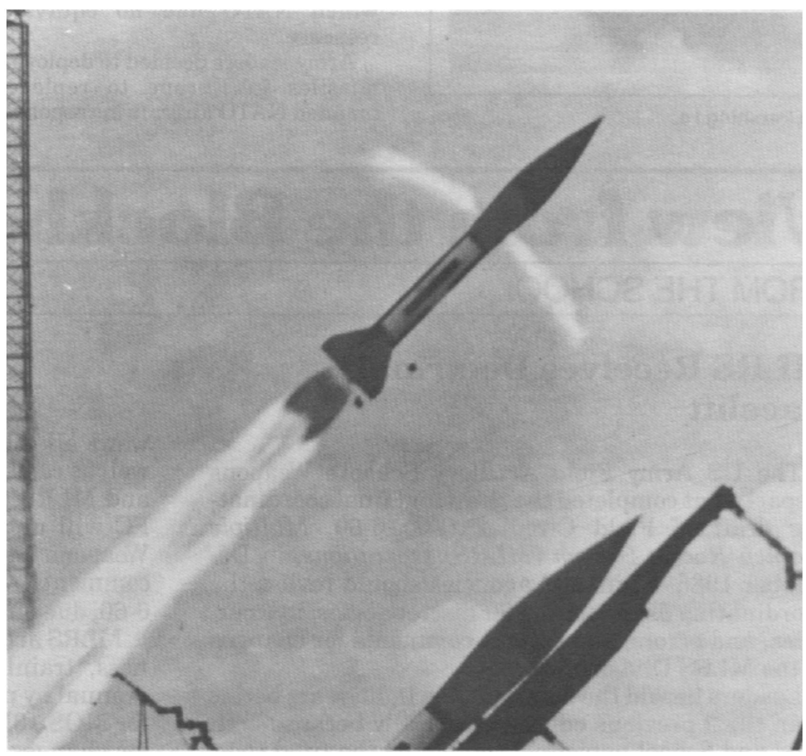
The Sprint missile.

Three years later the Army decided to extend the range of the Lance's system so it could replace the Sergeant. Since the missile achieved a string of successful launches from a lightweight launcher and a mobile launcher, and since it survived a parachute drop, this new direction delayed the plan to use Lance to replace the Honest John and Little John missiles. However, on 20 August 1964, the Little John retired from the US Army arsenal of missile systems following the first

Meanwhile, Army leaders deployed the Pershing missile in 1964 and in 1965 gave those units a quick reaction alert mission. By 1966 there were 250 Pershing launchers in Europe, but when the Army fielded new launchers in 1969, they only sent 108 traders to units in Europe. The Nike-X program began in January of 1963 and the program looked very promising. However, by 1967 DOD reoriented the program from a large system of antiballistic missiles (ABM) around cities to a thin ABM defense of 10 to 15 missile sites deployed on the northern perimeter of the country. And when Richard Nixon took office in 1969, the Army had not begun production and construction of an ABM system.

The Era of Detente

President Nixon's policy of detente led him to order the Sentinel system thinned into a token force of 4 AMB sites around the nation's northern ICBM sites (Safeguard). He also pursued the Strategic Arms Limitation Treaty (SALT 1) to limit ABM systems. The political atmosphere of the 1970s also affected deployment of the Lance system. Because Lance was so far advanced than the Honest John



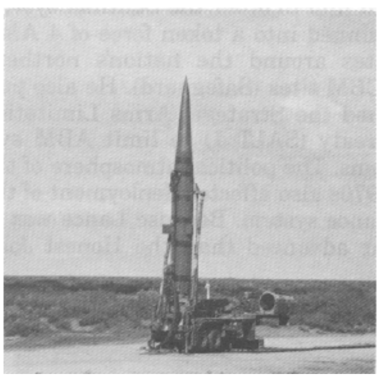
The Honest John Missile.

and Sergeant missiles, and because of the policy to reduce America's dependence on the nuclear battlefield, the Army deployed only 48 launchers initially, then in 1976 raised the number to 100.

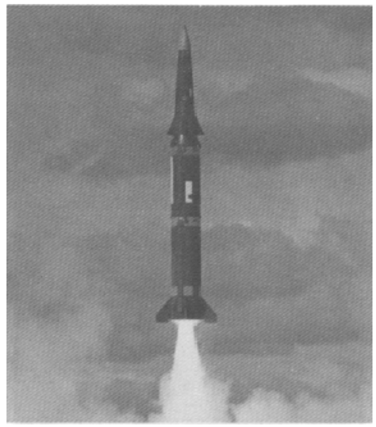
Pershing II

By the late 1960s, population expansion in Europe and the increasing speed of modern mechanized forces had made the use of the Pershing Ia's large warheads almost impossible because of the risk of injury to friendly units and civilians. The Army began to research a smaller and more accurate warhead, and in January of 1972 the government approved the development of an improved version of the Pershing called Pershing II.

Originally the Pershing II program focused on the development of a special



The Pershing I a.



Pershing II.

self-guided maneuvering reentry vehicle. In April 1974, the Army issued the contract to Martin Marietta to develop the guidance system. Three years later they launched Pershing 1a with the new system, and it landed within 80 feet of its target. However, the Soviet deployment of the SS-20 in 1977 prompted a change in the Pershing II program. The SS-20's multiple warheads, greater accuracy and range, and solid fuel propulsion gave Soviet leaders tremendous flexibility and firepower. Because they could be dispersed widely, and could be reloaded and refired at a faster rate, they represented a threat for which NATO had no equivalent response.

Army leaders decided to deploy new missiles in Europe to replace a manned NATO aircraft in response to the SS-20. The first of these was a land-based version of the Navy's Tomahawk cruise missile. The other was a totally new missile with a range of 1,000 miles using the developed Pershing II reentry vehicle.

The Present and the Future

The Pershing force is now a true long-range strategic missile force but the battlefield missile force has continued its 1964 decline. In 1980 the production of Lance ended with the delivery of the 2,133 missiles. In 1984 the Army halted the core support weapon system, the planned replacement for Lance, to develop a Lance-sized missile launched from the MLRS platform. This new missile has the potential for stopping large armored assaults without using a nuclear warhead.

Though the nuclear program grew out of the 1950s to make up for the inefficiency of conventional weapons, time and technology have now made the conventional weapons both more practical and more effective than nuclear missiles.

Mr. James N. Gibson, currently studying mechanical engineering at California State University, is a longstanding student of military history. He is working on a book detailing the history of the US Arsenal.

View from the Blockhouse

FROM THE SCHOOL

MLRS Receives Doctrinal Facelift

The US Army Field Artillery School's Weapons Department completed the third and final coordinating draft of Field Circular (FC) 6-60, *Multiple Launch Rocket System (MLRS) Operations,* in December 1986. Units and agencies should review the coordinating draft looking for discrepancies, inaccuracies, and errors, and submit comments for changes to the MLRS Division.

Leaders herald the newest FC as light-years better than the 2 previous editions, partially because both field and School personnel completed the final coordinating draft. The School specifically directed it toward alleviating the previous FC's deficiencies as well as combining the doctrine for the MLRS battery and MLRS battalion into 1 document. The current FC will undergo a final revision process after the Weapons Department receives all field and School comments. The result will be the first MLRS FM 6-60, due out in December.

MLRS artillerymen will receive a new Army readiness, training, and evaluation program (ARTEP) manual by mid-summer, as well as the new task lists for MOS 13M. Units can expect both minor and major changes throughout the MLRS doctrinal literature family.

MLRS Commander's Conferences

Multiple launch rocket system (MLRS) battery and battalion commanders from United States Army Europe (USAREUR), Forces Command (FORSCOM), and Korea, and the MLRS program manager (PMMLRS) and industry representatives—LTV and FMC—attended MLRS Commanders' conferences recently in West Germany and Fort Sill. The United States Army Field Artillery School's Training and Doctrine Command Systems Manager for Rockets and Missiles Systems, and the Weapons Department's MLRS Division, sponsored these conferences. They provided an excellent forum for MLRS Redlegs from the school and the field to exchange ideas and information.

Participants raised a number of issues, to include the critical importance of communication channels from the corps fire support element (FSE) to MLRS battalions and the future employment of the Army tactical missile system (ATACMS) in the deep battle.

They also discussed the first deployment of MLRS at the National Training Center (NTC). Lessons learned emphasized the need to increase the Field Artillery Community's knowledge of MLRS operations, and also amplified concerns about the maintainability and reliability of the system in a high intensity environment.

Separate MLRS battery commanders from USAREUR and FORSCOM indicated that commanders at all levels need to improve the communication between units and direct support maintenance. Field units also provided excellent input on how to increase the responsiveness of MLRS fire support. The School of Fire Support is incorporating these ideas into the new coordinating draft of FC 6-60 which went to the field for review in January 1987.

The conferences were an unqualified success and will continue on a periodic basis. These conferences will help the School make sure our system fixes are on track early and moving in the right direction. This renewed emphasis on opening up the channels of communication between the "schoolhouse" and line units is key in integrating this system to the combined arms team.

Masking Data Clarification

Recently, the Weapons Department's multiple launch rocket system (MLRS) division conducted a study of masking data processing during fire missions. The result of the study indicated that rocket trajectories may be affected by masks as much as 100 mils below the firing elevation. The following information is necessary to conduct fire missions with masking data:

a. Comparison of the firing angle to the top of the mask will not ensure that the fire mission is safe to perform. The fire control system (FCS) adds a safety margin to the top of the mask (when generating the no-fire zone). This safety margin grows as the distance to the mask grows; because of this, there is no set angle to add to the top of the mask to assure a successful fire mission. There may be a temptation to compare a ballistic solution QE (quadrant elevation) with an angle-to-mask, but Redlegs must avoid this temptation. Operators should enter masking data and follow the FCS GO-NO GO decision.

b. Based on the safety margin determined by the fire control system during mission processing, operators should enter any mask over 100 mils into the fire control system.

c. If the operator selects the high QE option during FCS start-up, the FCS will not perform missions with masking data that have a range-to-mask of more than 2,000 meters. The FCS will abort the fire mission and display "no solution error" on the fire control panel (FCP). If the operator doesn't select high QE option during start-up, the FCS will accept range-to-mask distances of more than 2,000 meters.

d. The normal QE method to deal with masking data makes the fire control system add "no fire zones" to the firing template. If the ballistic solution violates this no fire zone, the FCS will cancel the mission and "no solution error" prompt will appear on the FCP. In this case, crews have to move the launcher so that the offending mask is no longer between the firing point and the target. Operators must request or reenter the firing data to the FCS.

When the operator doesn't select high QE option, the fire control system gets certain limited options in dealing with masking data. If the operator enters masking data, and the standard ballistic solution violates the mask generated no-fire zone, then the FCS will begin a series of solutions at higher QEs until:

- The QE is high enough to clear the mask (within the limits of the launcher no fire zone).
- The height of burst increase (resulting from the higher QE) degrades accuracy to a predetermined limit. If it can't find an acceptable solution, it displays a no solution error on the FCP and aborts the fire mission. If the FCS finds an acceptable solution, the fire mission will continue with no special prompt to the operator.

Version 4 software lets crews fire over masks that they couldn't solve in version 3 software. The ability to arrive at ballistic solutions with higher than optimum QE results in an increased warhead event altitude and an associated loss of accuracy. The use of the high QE option can result in some decreased accuracy. The ballistic solutions for version 3 and version 4 software are the same. In rare cases, the version 4 software could stop a mission when the operator selects high QE that would have proceeded with version 3. The change is minor, affects certain masks at minimum range, and does not represent any restriction in MLRS capability. In fact, because version 4 is more realistic in treating masking information and because it considers the normal drop of the rocket as it moves along its trajectory, there will be an improvement in safety factors.

New Technology Improves Copperhead Round

New advances in microcomputer technology, already in wide use in the civilian sector, are now available to various high-tech weapon systems to include the artillery-delivered Copperhead round. There are currently 3 product improvement projects (PIP) underway to apply computer age technology to the Copperhead system. In addition, the Army has called for a joint North Atlantic Treaty Organization (NATO) research program to develop an autonomous precision guided munition (APGM) version of the projectile, according to Dick McKean, Weapons Specialist for the Directorate of Combat Developments at Fort Sill.

Because its terminal guidance system uses a laser beam for target designation, it limits the present Copperhead's combat effectiveness. It requires a forward observer to continue designating the target until the projectile impacts. The 3 PIPs in progress include a roll rate sensor and a microprocessor modification of the Copperhead I and an infrared seeker for the Copperhead II.

The roll rate sensor is a result of current state-of-the-art improvements in nonelectrical control and sensing systems. These advancements can produce a more stable projectile at longer ranges at a reduced cost of $858 per round. The second improvement of the Copperhead I is the incorporation of a Navy-designed gyro assembly and microprocessor-based electronics into the round's guidance package. It further reduces production cost by eliminating the need for 2 of the 8 printer circuit boards in present models. It improves the Copperhead's electro-optical countermeasure hardening capabilities against enemy detection systems. It would also promote commonality of components with the Navy's 5-inch and Hellfire guided projectile systems. "The roll rate sensor and microprocessor [PIPs] have nothing to do with the Copperhead II; they'll be there when Copperhead II comes out," McKean said.

The product improvement project currently under study for the Copperhead II shell would combine an infrared seeker with fire-and-forget capabilities in place of the semiactive laser seeker used in present rounds. The seeker would receive signatures from moving and stationary armored targets and process them through digital data stored in the seeker assembly. It would distinguish false targets from real ones due to computer age advancements in digital processing capabilities. However, it would not be able to choose its target selectively, so it is planned as a complement to, not a replacement for, the semiactive laser round. Army leaders scheduled a production decision for sometime in the early 1990s with the goal to field the first unit in 1992 at a cost of more than $80 million.

In addition to the improvements and proposals currently in progress, the development of an autonomous precision guided munitions Copperhead round is also under study. The program is a result of the Nunn Amendment which allocated $250 million for the development of smart weapons in cooperation with 8 other NATO countries. In addition, the administration's budget allots $60 million for new projects.

The APGM program challenges defense contractors in 9 NATO countries to form research groups chaired by the United States for the purpose of developing a smart Copperhead projectile. The round would be compatible with NATO delivery systems.

A smart artillery shell is one that could locate and discriminate between different types of thermal, audio, and electronic signals and process these various signatures in its "brain," a tiny built-in computer called a microprocessor. This microprocessor would enable the round's guidance and sensor systems to distinguish and select targets through complex mechanical computations, or algorithms. It is these algorithms that allow technicians to compress vast amounts of data from powerful computers into microchips and implant these chips into the sensory device of an artillery shell. The APGM round would also have the fire-and-forget seeker, which would allow the round to seek out and hit targets under its own power without any human help and with increased accuracy. The APGM "will be the successor to the Copperhead II," McKean said.

The United States has invited defense contractors in the United States, Canada, France, Great Britain, Italy, the Netherlands, Spain, Turkey, and West Germany to participate in the development of this highly advanced projectile. The United States Army Field Artillery School at Fort Sill is an advisor to the technical committee in charge of research, and is currently concentrating on end-product requirements and testing methodology.

Solving Pershing SIMOS Problems

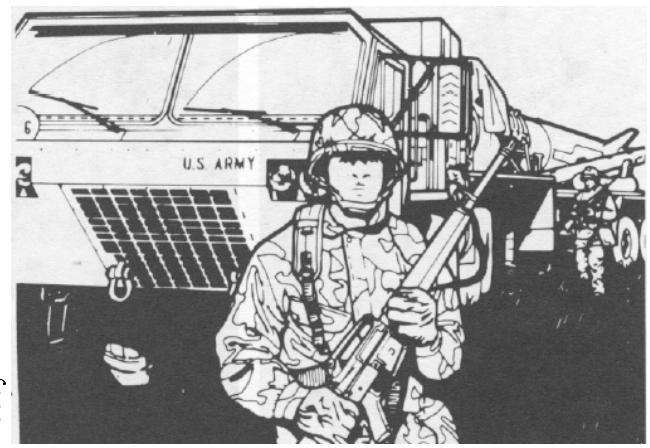
The Pershing Study Implementation Team recently traveled to Fort Sill and Germany to brief the Redleg leadership on a management program designed to ease the problems of Pershing Space-Imbalanced MOS (SIMOS) soldiers. The program ties accession, distribution, reenlistment and assignment policy into a comprehensive system which optimizes soldiers' assignments while enhancing cohesion, stability, and soldier morale. On 1 May, Department of the Army began managing the 4 Pershing MOSs under a test program. The program closely defines the Army's requirement for enlistments in Pershing and then assigns soldiers to their units based on the length of their enlistment. Because more than 70 percent of the Pershing positions are overseas, nearly all 2 and 3 year Pershing enlistees will go overseas. Continental US (CONUS) units fill their personnel slots with soldiers returning from overseas, and with 4 year enlistees. The 4-year enlistee initially will go to CONUS with reassignment to a unit overseas prior to his 24th month of service.

The assignment policy focuses on balancing overseas assignments by using DROS (date returned from overseas) to determine who will fill an overseas requisition. The soldier who has been in CONUS the longest will generally go overseas first. The Pershing Study Implementation Team discovered that some CONUS-based soldiers in SIMOS stayed in CONUS for up to 60 months while other soldiers of the same MOS and grade were going back to Europe after only 12 to 18 months in CONUS. MILPERCEN also will monitor CONUS stabilization requests.

The reenlistment policy will keep the most eligible soldiers on overseas assignments and decrease the number of excess Pershing soldiers at Fort Sill.

Several parts of the program are already in effect. Turnaround time, Pershing soldiers' perceptions of tour equity, and use of Pershing soldiers returning from Germany is improving as more Pershing soldiers are working as drill sergeants, recruiters and instructors.

The Office of the Deputy Chief of Staff for Personnel and the Military Personnel Center are evaluating the various elements of the test program to determine their applicability Army-wide. The initial results are encouraging and, if accepted for the management of all SIMOS, may lead to improvements in the quality of life for all SIMOS soldiers. This test program grew out of a 1986 Field Artillery Proponent initiative to address the extreme SIMOS problems of the Pershing force.



Bobby Hill

Field Artillery Notes

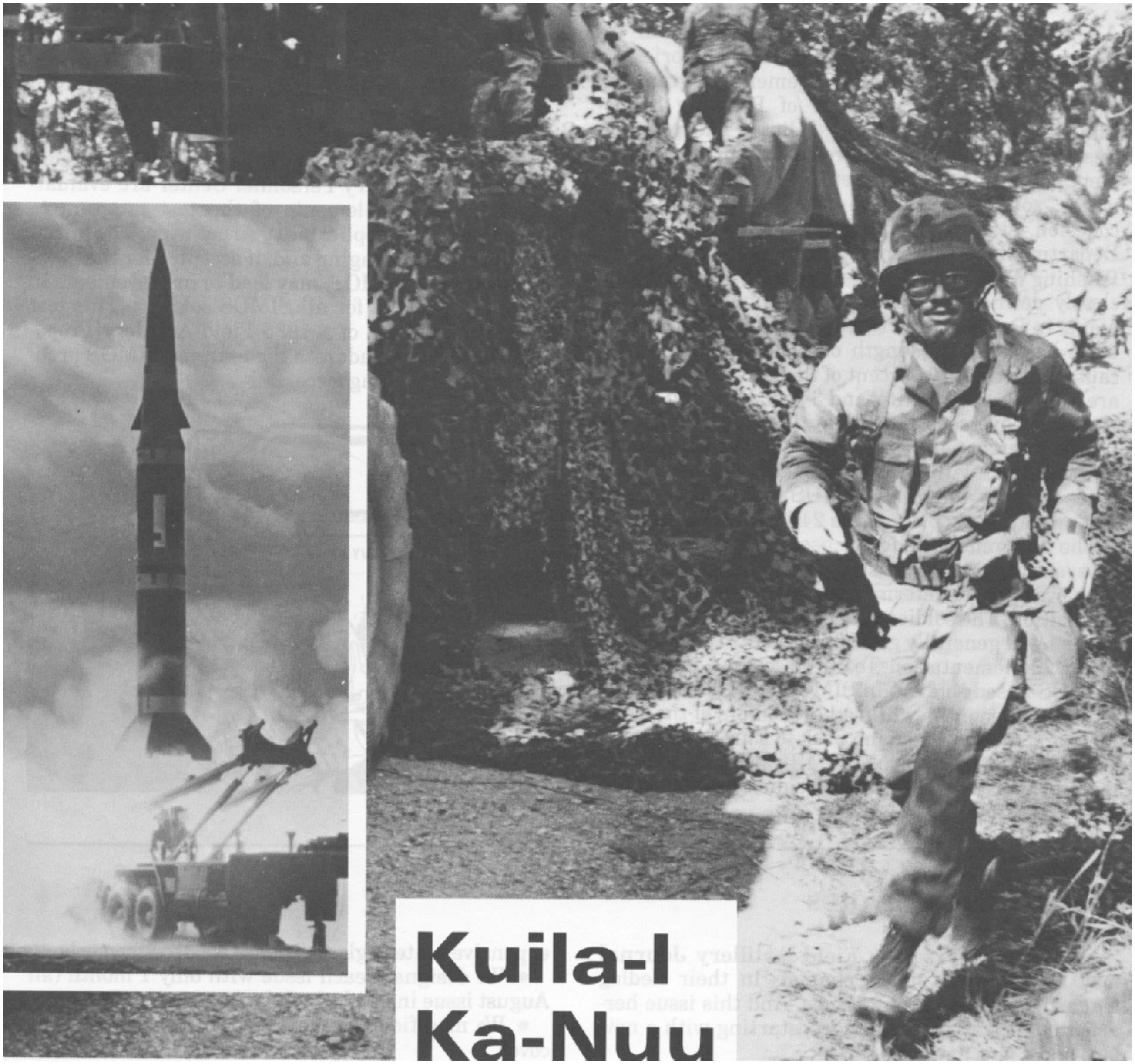
Loyal readers of the **Field Artillery Journal** may have noticed subtle changes in their Redleg magazine over the past 2 issues. And this issue heralds the most striking changes, starting with a new logo and a new name.

Reports published in mid-November 1986 indicated that the **Journal** was 1 of 41 magazines that the Army Publications Review Committee recommended for elimination. However, the commanding general for Training and Doctrine Command (TRADOC) decided to retain the publications in a more economical bulletin format.

The staff of the new **Field Artillery** professional development bulletin has made some changes to comply with the new TRADOC professional bulletin policy:

- The cover of the bulletin reflects the new logo and name that define our renewed mission to foster professional development for Redlegs.
- We use uncoated paper stock instead of the more expensive coated "glossy" pages we used formerly.
- We designate each issue with only 1 month (an August issue instead of a July-August issue).
- We modified the masthead on the inside front cover.
- We also have eliminated some kinds of command information and editorial content not specifically related to the new training-and-doctrine professional bulletin mission.

Throughout this period of regulated modification, the staff of your professional development bulletin hasn't lost sight of our overriding purpose: to give Redlegs the necessary resources to become competent tacticians, committed technicians, and caring leaders.



Kuila-I Ka-Nuu

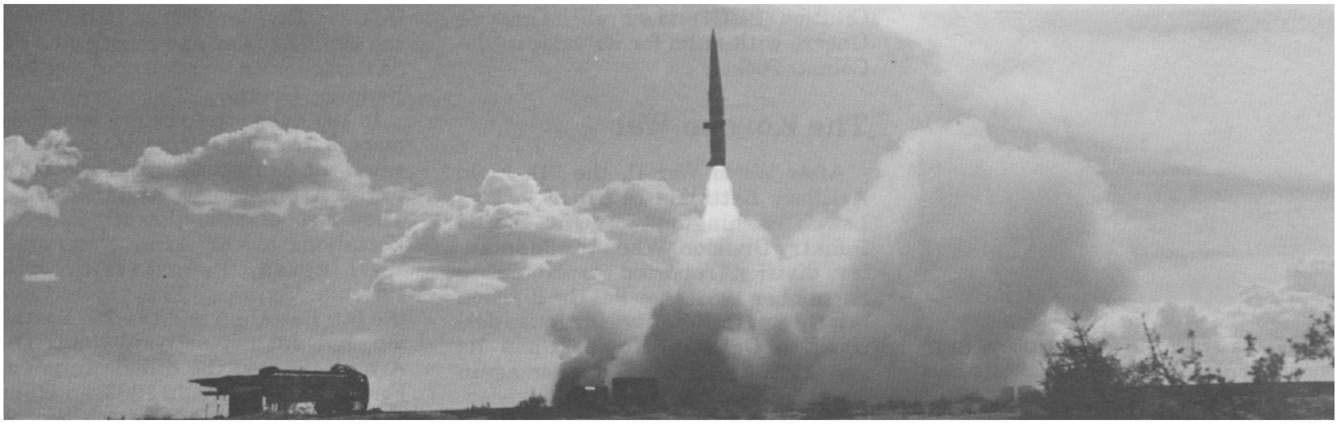
by Second Lieutenant Richard W. Wilde

"All pre-fire checks are complete and the ball-lock pins have been removed."

The last 2 Pershing II crewmen leave the erector launcher (EL) and head for protective cover. Soon the silence is replaced by a deafening roar as the Army's only intermediate range missile launches skyward to its intended target.

Members of the 9th Field Artillery Regiment are the only soldiers in the US Army privileged to fire these missiles. Under the new regimental system, the 9th Field Artillery Regiment consists of 5 battalions:

- The 1st Battalion (Pershing), formerly 1st Battalion, 81st Field Artillery of Neu Ulm, Germany.
- The 2d Battalion (Pershing), previously the 1st Battalion, 41st Field Artillery at Schwaebisch Gmuend, Germany.
- The 3d Battalion (Pershing), located at Fort Sill, Oklahoma.



A Pershing I a missile fired in 1971.

● The 4th Battalion (Pershing), formerly 3d Battalion, 84th Field Artillery at Heilbronn, Germany.

● The 7th Battalion of Pamona Beach, Florida.

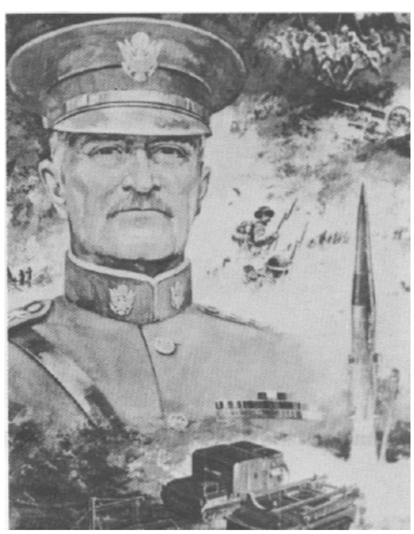
Prior to its reorganization in January 1986, the 9th Field Artillery Regiment had only 2 active battalions—the 3d and the 7th. The 3d Battalion, the only continental US (CONUS)-based Pershing unit, served as a training and sustaining base for the 56th Field Artillery Command in the US Army Europe (USAREUR). The 7th Battalion, the only non-Pershing unit in the regiment, is a US Army Reserve (USAR) 8-inch howitzer unit. Although the 3 new battalions in the 9th Field Artillery did not join the regiment until 1986, their long standing close relationship grew out of their mutual fielding of the Pershing Ia system in 1971. The 9th Field Artillery proudly served the nation in 3 wars.

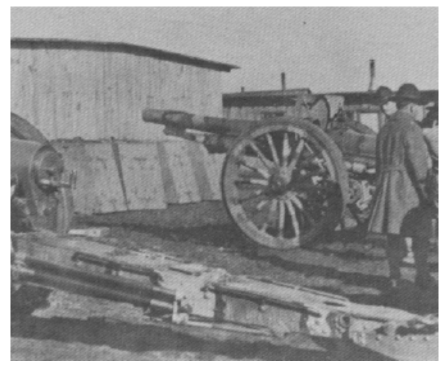
History of the 9th Field Artillery

Cadre from the 1st Field Artillery formed the 9th Field Artillery Regiment in August 1916 at Schofield Barracks, Territory of Hawaii. The new regiment immediately garnered 2 distinctions: it was the only Field Artillery regiment ever formed overseas, and it was the first regiment of artillery to mechanize its forces. General Order #22 of the National Defense Act of 1916 authorized 4 batteries of 4.7 inch cannons and 2 batteries of 6 inch cannons for the regiment. After its organization, the 9th Field Artillery left Hawaii and moved to Fort Sill, Oklahoma. Although the unit trained extensively for combat, it saw no action in World War I and Army leaders deactivated it in September 1921.

But just a year later, the 9th Field Artillery returned to active duty when members of the 3d Field Artillery Regiment activated the 1st Battalion at Fort Des Moines, Iowa, and members of existing units activated the 2d Battalion at Fort Sill, Oklahoma. When leaders deactivated 2d Battalion 3 months later, it began an 11-year period of activations, deactivations, assignments and reassignments for the 9th Regiment.

In March 1923, the 9th Field Artillery went to the 7th Division and then to the 9th Division in August 1927. One month later, the 1st Battalion merged with the 2d Battalion, 18th Field Artillery, and the new unit kept the latter designation. A new 1st Battalion occupied inactive status. Once again, the "Mighty Ninth" went into hibernation which was to have lasted until April 1930. While on inactive status the Regiment went to the 4th Division, and divisional leaders





Battery C, 9th Field Artillery at Fort Sill about 1918.

activated the 3d Battalion in January 1930 and the 1st Battalion in April at Fort Lewis, Washington.

After 3 years of service with the 4th Division, the 9th Field Artillery moved on to the 3d Division in October 1933. This assignment lasted 44 years, and it was a period of dedicated and mutually enhancing service. The 2d Battalion rejoined the regiment at Fort Lewis, Washington and less than a year later the regiment became the 9th Field Artillery Battalion under a new organization.

World War II

A month prior to Japan's attack on Pearl Harbor, the 9th Field Artillery Battalion, the 3d Division's only medium artillery, started to train on landing operations against a theoretical enemy. With the outbreak of war, the battalion geared up its training, and in 1942 moved to Camp Pickett, Virginia—the 3d Division staging area for movement overseas. On 24 October 1942 the division left Camp Pickett enroute to French Morocco.

Howitzers of the 9th Field Artillery Regiment at France's Vosges Mountains near Les Rouges Eaux.

This 9th FA Regiment piece is well camouflaged near Bourgonne in the Vosges Mountains.

Two weeks later, the Mighty Ninth landed on foreign soil for the first time. At 0700, November 10, 1942, Battery A, 9th Field Artillery Battalion landed near the city of Casablanca and began firing at designated targets. The battery immediately came under counterbattery fire. This was the first taste of combat for the Mighty Ninth.

On July 10, 1943, the 1st Battalion, 7th Infantry, landed on Red Beach near the city of Licata. The 10th Field Artillery and Battery A, 9th Field Artillery Battalion, gave fire support. The artillery was extremely effective, hitting enemy mortars, infantry, an enemy gun battery, several machinegun nests, and an observation post.

Although this was the Mighty Ninth's first taste of combat, it certainly wasn't its last. The 9th Field Artillery participated in 10 campaigns during World War II: Algeria-French Morocco, Tunisia, Sicily, Naples-Foggia, Anzio, Rome-Arno, Southern France, the Rhineland, Ardennes-Alase, and Central Europe. The Battalion received a French Croix de Guerre for its outstanding service during World War II, and they earned a Presidential Unit Citation (PUC) and a French Croix de Guerre with Palm for its valor in the Colmar Pocket.

The Korean War

After World War II, the 9th Field Artillery Battalion returned to Fort Lewis, Washington, to go to the 3d Infantry Division. When the 3d Infantry division reported to Korea in September 1951, they left the division briefly. But the Mighty Ninth was destined to fight in Korea. Upon its arrival in Korea, the Battalion again went to the 3d Infantry Division. While in Korea, the 9th fought bravely in every major campaign, twice earning the Republic of Korea PUC for the valor and service of its fighting men. The first PUC came in 1953 for its participation in the Uijonbu Corridor; the second PUC for its participation in the Iron Triangle. The battalion also received the Chryssoun Aristion Andrias—Bravery Gold Medal of Greece—in recognition of the close ties it maintained with its Greek allies.

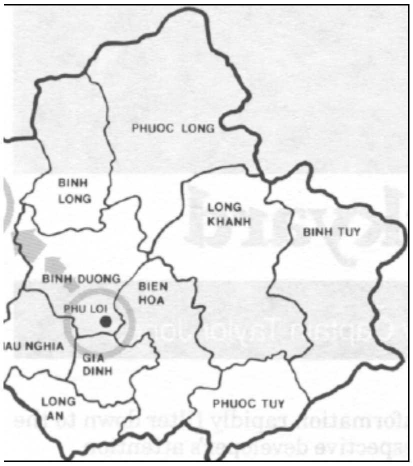
Following the war, the 9th Field Artillery Battalion left the 3d Division and became the 9th Artillery, a parent regiment under the Combined Arms Regimental System (CARS). As part of the reorganization, the 9th Artillery had 3 battalions. The 9th assigned the 1st Battalion to the 3d Infantry Division; the 2d Battalion to the 10th Division; and constituted the 3d Battalion on inactive status at Fort Benning, Georgia.

In 1959, the 9th Artillery received 4 more battalions. Army leaders activated the 3d Battalion and allotted it to the Army Reserve at Lima, Ohio. They also allotted the 4th and 5th Battalions to the Army Reserve at Washington, Pennsylvania and Phoenix, Arizona. They constituted the 6th Battalion and the 7th Battalion, but did not activate then. The Army activated the 6th Battalion at Fort Sill, Oklahoma in 1963, and then activated the 3d and the 4th Battalions; in 1966 they activated the 7th Battalion at Fort Irwin, California.

The Vietnam War

The 9th Artillery sent 2 battalions to Vietnam: the 2d and the 7th Battalions. The 2d Battalion served as a towed 105-mm howitzer battalion operating near Pleiku throughout its tour in Vietnam. Upon its arrival in Vietnam it served as the direct support (DS) artillery for the 25th Infantry Division's 3d Brigade. In 1967, it became the DS battalion for the 4th Division's 3d Brigade. While in Vietnam, the Battalion received 3 awards of the Republic of Vietnam Cross of Gallantry with Palm for outstanding service. The battalion also

Gunners of the 9th Artillery on duty with 105-mm howitzers in Vietnam.



The 7th Battalion, 9th Artillery areas of operations in Vietnam, 1966-1969.

received the Republic of Vietnam Civil Action Honor Medal First Class for its public service to the Vietnamese people. In addition to these honors, C Battery, 2d Battalion, 9th Artillery received the PUC for its outstanding performance at Dong Ap Bia Mountain.

The 7th Battalion, 9th Artillery, a towed 105-mm howitzer battalion, arrived at Phu Loi, Vietnam, in November 1966. It moved to Bear Cat under the control of the 54th Artillery Group of the II Field Force. In August 1969, the battalion moved to Tay Ninh and came under the control of the 54th Artillery Group of the II Field Force. In August 1969, the battalion moved to Tay Ninh and came under the control of the 23d Artillery Group. While in Vietnam, the Battalion received the Republic of Vietnam Cross of Gallantry and the Republic of Vietnam Civil Action Medal First Class. Battery B, 7th Battalion, 9th Artillery also earned a PUC for its valor at Ap Bau Bang.

After the US withdrawal of troops from Vietnam, the Army inactivated the 2d and 7th Battalions. Eight months later, leaders reactivated the 2d Battalion and assigned it to the 25th Infantry Division at Schofield Barracks, Hawaii. In 1971, the 9th Artillery became the 9th Field Artillery and went through several changes. The 3d Battalion went to Fort Sill, Oklahoma, and became the first Pershing Battalion of the regiment. The 7th Battalion went to the Army Reserve at Fort Tilden, New York. In 1972, leaders inactivated the 1st and 2d Battalions, leaving only the 3d, 6th, and 7th Battalions on active status. The Army inactivated the 6th Battalion in 1983, and in 1986 they reactivated the 1st, 2d, and 4th Battalions.

Crew members from the 9th Field Artillery Regiment work in the platoon control center of the Pershing II system.

The 9th Field Artillery Today

The 9th Field Artillery Regiment, as custodian of the Army's most devastating weapon system, assumes an international peacekeeping role. The Pershing II missile system is a great deterrent to the Warsaw Pact nations. Since the initial fielding of Pershing, the troops of the Mighty Ninth have devoted themselves to the preservation of peace. Using the combat alert sites located throughout the Federal Republic of Germany, the 1st, 2d, and 4th Battalions maintain continual target coverage with Pershing II.

Meanwhile, back in the States, the 3d Battalion conducts tactical training with the Pershing system, developing new doctrines and deployment procedures. Every year, Pershing battalions in Germany come back to the United States to conduct live firings of the Pershing II missile at Cape Canaveral, Florida, or White Sands Missile Range, New Mexico. These Redlegs continue the spirit of Kuila-I-Ka-Nuu—strive to reach the summit!

Second Lieutenant Richard W. Wilde, FA, received his commission through the ROTC program at Norwich University, Vermont. He was a fire control officer, Pershing platoon leader, a battery operations officer, and the assistant adjutant in the 3d Battalion, 9th Field Artillery.

Training in the User's Backyard

A Need to Communicate

by Captain Taylor Jones

High-tech, low-density weapon systems have a tendency to isolate their crews and leaders from the planning and development life cycle of the Army Materiel Command (AMC). Information flow to and from these elements may suffer from inaccuracy and lack of timeliness. The combat developer, otherwise known as the user's representative, often gains input from experienced personnel passing through the US Army Training and Doctrine Command (TRADOC) centers and schools. However, the distance between using units and AMC locations further hampers materiel developers. Given inadequate information exchange, users may be unaware of the materiel developer's mission. They accumulate readiness reports and maintenance data at organizational level for seemingly unknown reasons. They may believe that industry generates modifications at random. Ultimately, this lack of communication may impair the efficiency of a weapon system. Yet users, developers, and industry are all working towards the common goal—readiness.

Establishing the Net

The Pershing II missile system creates a complex mix of state-of-the-art design and highly skilled soldiers. Its political nature restricts it to certain geographical areas, yet the shooters and acquisition managers are closing ranks at the US Army Field Artillery School. In the Pershing officer's course (POC), research and development (R&D) officers from US Army Missile Command's (MICOM) Pershing project management office (PPMO) now experience the operational intricacies of the missile system alongside their Field Artillery counterparts. Instructors conduct most operations outside in a realistic environment.

The Course—Good Communications

Perception and performance are keys to developing the technical skills required. Officers must understand the missions, firing roles, command-control functions, and supporting organizations of Pershing II missile units. Continuous changes in the tactical nuclear force climate have altered many of these studies in midcourse. And system end items are not exempt from the effects of Pershing's turbulent environment. Developers seem to announce major equipment modifications just as the student grasps the current configuration. Attendance at the POC allows the AMC leaders to gain an appreciation for the complex task of acquiring knowledge of Pershing-peculiar equipment.

Messages Received

Research and development officers return to PPMO with the same knowledge that their Field Artillery classmates will use at 56th Field Artillery Command in Germany or at III Corps Artillery at Fort Sill. And training in the user's backyard gives research and development officers the experience of trade concepts like reliability, availability, maintainability and transportability. They also see firsthand application of human factors engineering and they will retain this input long after developmental and operational test documents elapse.

What's more, the officers train together as teams and form impressions during the learning process. Officers can identify equipment and concepts that don't meet operational requirements. These exchanges of information rapidly filter down to the respective developer's attention.

Just as this training exposes the research and development officer to a new arena of operational training, the Field Artillery officers meet the fellow officers involved in the acquisitions process. MICOM students can provide a better understanding of their parent command and may explain the detailed stages of materiel acquisition. When they learn more about the complex route of budget, testing and contracting, Redlegs may understand the delays they attribute to apathy or inefficiency in distant commands.

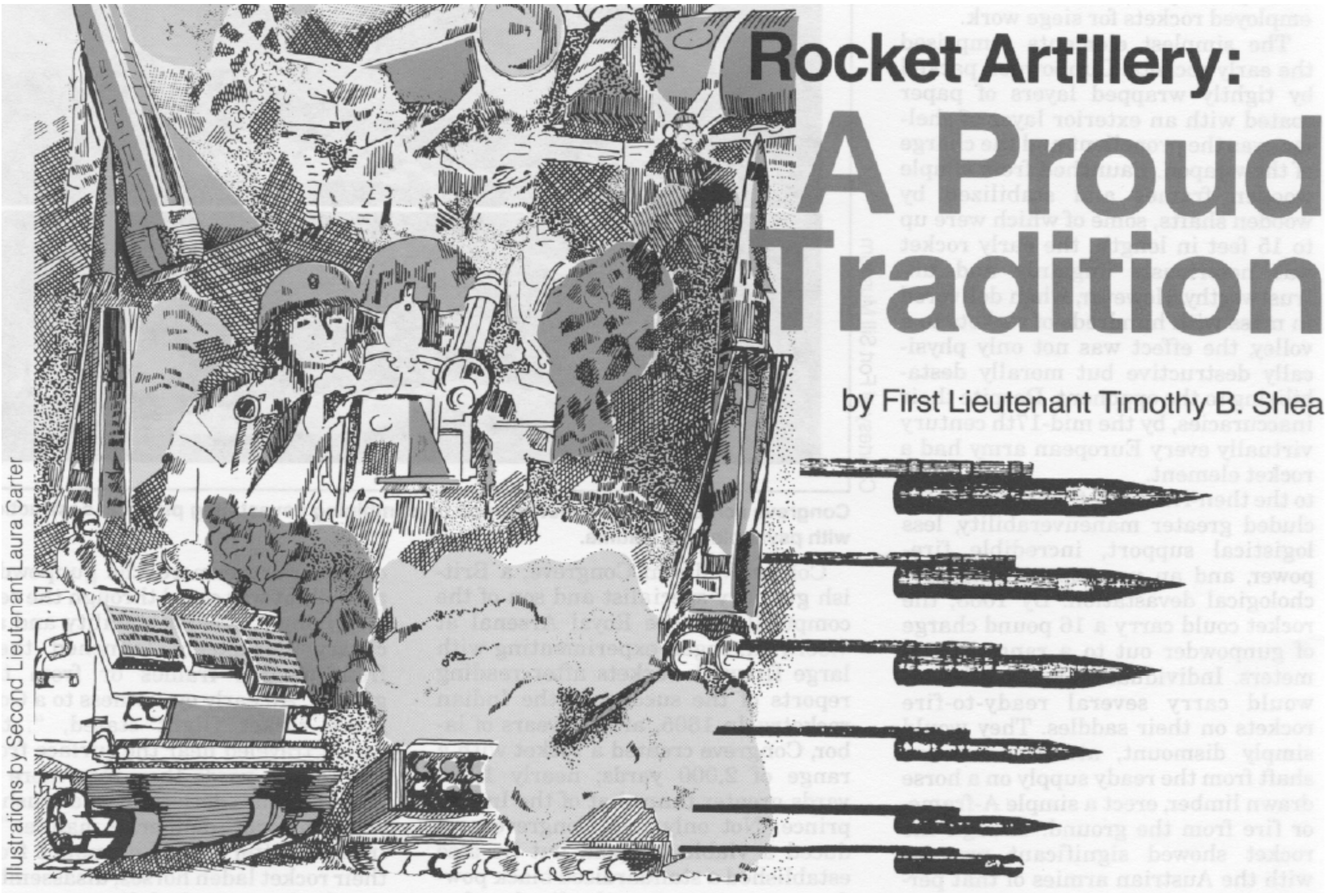
Conclusion

While officers exchange problems, knowledge and ideas, they strengthen the communications net. Traffic between these students may decrease after graduation, but the communications channels will remain open between widely separated members of the diverse Pershing II family.

Captain Taylor Jones, OD, graduated from Auburn University and received his commission from OCS. He attended the tank and automotive ordnance officers basic course at Aberdeen Proving Ground, Maryland and the missile and munition ordnance officers advanced course at Redstone Arsenal, Alabama. He attended training with industry at Hercules Aerospace Incorporated, Utah. He served as the commander of the direct support/general support missile maintenance company of the 5th Infantry Division, and is now the executive officer for the Pershing Project Management Office at the US Missile Command, Redstone Arsenal.

Rocket Artillery: A Proud Tradition

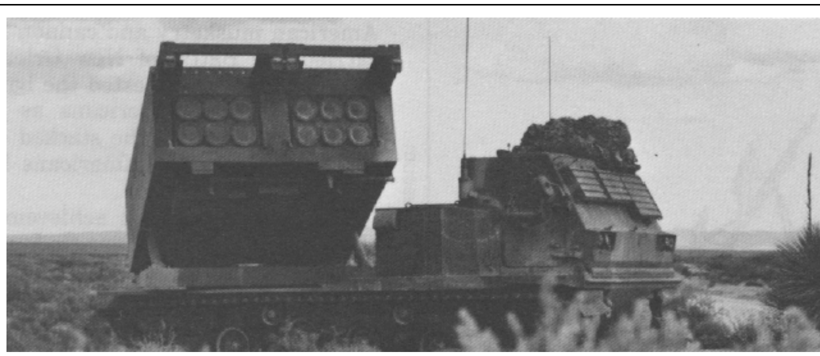
by First Lieutenant Timothy B. Shea



Illustrations by Second Lieutenant Laura Carter

Nearly 200 years ago, Field Artillery's greatest adherent, Napoleon Bonaparte said: "In battle as in siege, skill consists in converging a mass fire upon a single piece. After the combat has started, he who has the skill to bring a sudden concentration of artillery upon a selected point is sure to capture it." This statement clearly defines the tactical concept of the Army's most powerful conventional weapon, the multiple launch rocket system (MLRS).

MLRS gives the modern AirLand Battle commander the capability to suppress, neutralize and destroy threat elements at ranges up to 32 kilometers. The epitome of the surface-to-surface non-target seeking tactical rocket, MLRS offers a delivery system for ordnance such as submunition shaped charges, preset self-laying antitank mine fields, and laser guided antitank munitions. Capable of destroying hundreds of square meters with a single rocket, the system presages even more remarkable developments in the artillery arsenal. A review of the rich history of rocket artillery illustrates that the rocket, as the King of Battle's "Bastard Prince," has affected battlefields for hundreds of years.

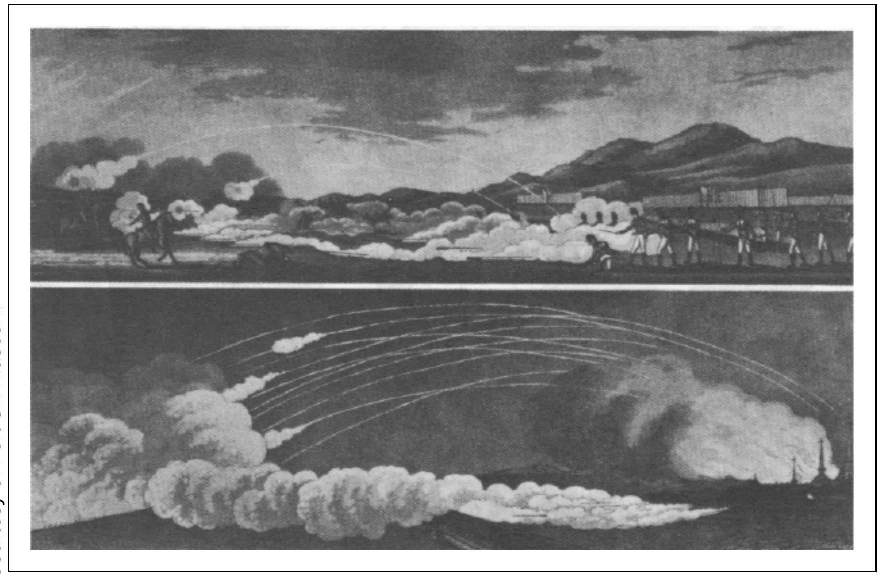


The multiple launch rocket system gives the commander the capability to suppress, neutralize and destroy threat elements at ranges up to 32 kilometers.

The first recorded use of rocket fire was in 1232 as the citizenry of the Chinese city of K'ai-Feng used "arrows of flying fire" to defend against the invading Mongols. Gunpowder and not manpower propelled these projectiles. It is interesting that this use of gunpowder for indirect fire preceded the advent of the firearm by 90 years. Therefore, rocket artillery really can claim to precede all tube artillery, much to the chagrin of some gunners.

As with any novel military weapon, armies readily adapted the rocket and passed it on. Historians record rocket use on the Iberian Peninsula in 1249, and by the year 1380 the Venetians employed rockets for siege work.

The simplest elements comprised the early rockets. Gunpowder, packed by tightly wrapped layers of paper coated with an exterior layer of shellac, was the propellent and the charge of the weapon. Launched from simple wooden frames and stabilized by wooden shafts, some of which were up to 15 feet in length, the early rocket was notoriously ungainly and untrustworthy. However, when delivered in mass with hundreds of rockets to a volley, the effect was not only physically destructive but morally destabilizing to the opponent. Despite their inaccuracies, by the mid-17th century virtually every European army had a rocket element.
to the then-fledgling tube artillery included greater maneuverability, less logistical support, incredible firepower, and an uncompromising psychological devastation. By 1668, the rocket could carry a 16 pound charge of gunpowder out to a range of 500 meters. Individual rocket artillerists would carry several ready-to-fire rockets on their saddles. They would simply dismount, attach a wooden shaft from the ready supply on a horse drawn limber, erect a simple A-frame, or fire from the ground. Though the rocket showed significant promise with the Austrian armies of that period, advances in cannon artillery forced the rocket into neglect until the mid-1700s. Not until Indian Prince Hyder Ali used metal encased rockets against British cavalry in 1792 and 1799 at the Battles of Seringapatem did the weapon return to the forefront of the battlefield. The metal cylinders greatly enhanced the destructive burst of the flying munition and decimated the massed charges by the British. In fact, the United States owes Prince Hyder Ali credit for introducing the rocket to its shores.



Courtesy of Fort Sill Museum

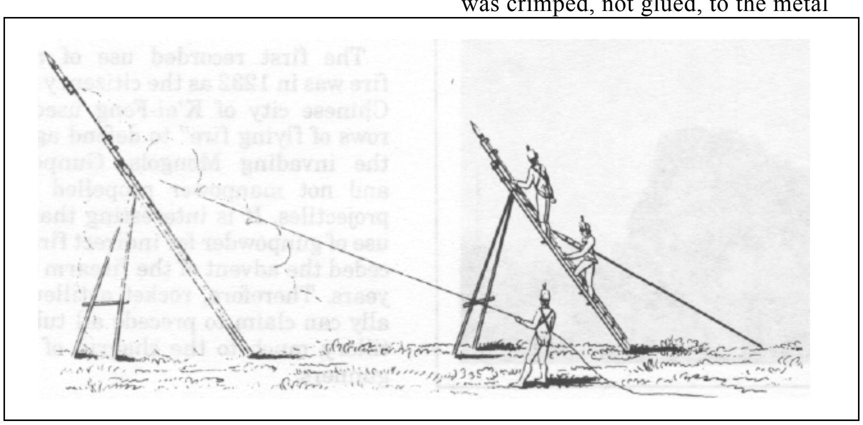
Congreve achieved the perfect weapon by combining devastating physical destruction with psychological trauma.

Colonel William Congreve, a British gunnery specialist and son of the comptroller of the Royal Arsenal at Woolwich, began experimenting with large firework rockets after reading reports of the success of the Indian rocketry. In 1805, after 4 years of labor, Congreve created a rocket with a range of 2,000 yards; nearly 1,500 yards greater than that of the Indian prince. Not only had Congreve produced a viable weapon, but he also established a standardized black powder composition, standardized rocket construction, and improved production techniques. His design principles allowed the commander to choose either incendiary or explosive warheads; and because the explosive warhead was separate from the main propellant, the commander could achieve effective airbursts by trimming the warhead fuse length before firing.

The Congreve rocket still used a flight-stabilizing stick, but the stick was crimped, not glued, to the metal casing. Furthermore, the gunpowder propellant was cored through the center giving it greater stability and accuracy. Rocketeers launched them from wooden frames or from the ground. An early eyewitness to a Congreve rocket flight stated, "...the rocket traveled near the surface from 100 to 150 yards then rose more or less, became deflected and rushed about in a more deliberate manner." A trained battery could dismount from their rocket laden horses, disassemble the limbers, and deliver massed, deadly, volley fire within 30 seconds—a feat that today's artillery would be hard pressed to duplicate.

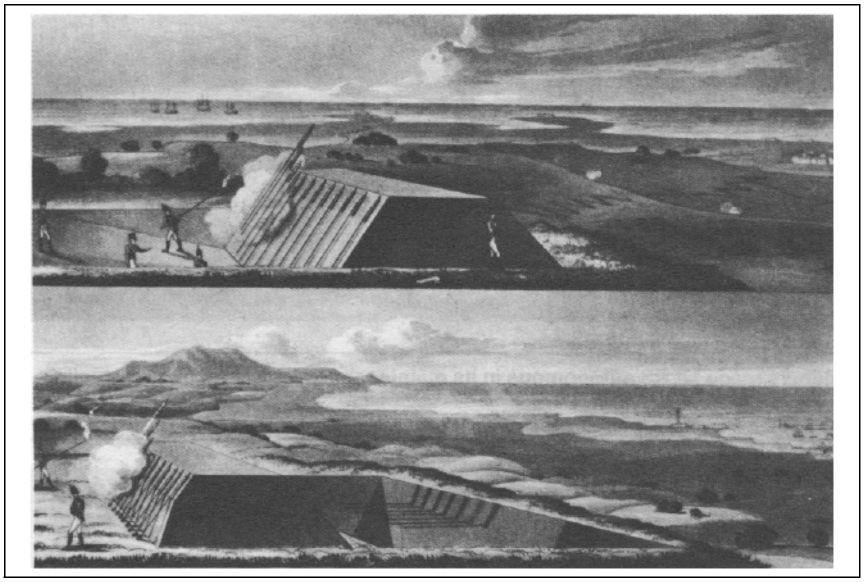
The battlefield effectiveness of the Congreve rocket caused Revolutionary War American General Jacob Brown to withdraw from a superior position at the Battle of Lundy's Lane. Suffering from the shock of an 8-foot rocket stick, General Brown ordered withdrawal. Andrew Jackson admonished his boys, "...not to fear rockets; they are mere toys with which to amuse children." Only superior American musketry and cannon fire carried the Battle of New Orleans. The British rockets tested the battle positions of the Americans as the rocket fire set afire the stacked cotton bales where the Americans laid in wait.

The most significant achievement of the Congreve rocket was on August 24, 1814 when the American Capital fell to the British largely due to rocket artillery fire. After repeated volleys of Congreve rockets, 3 American regiments fled in panic. At the battle for Washington, that first rocket looked like a "comet low in the sky."



Courtesy of Fort Sill Museum

Rocketeers launched the Congreve rocket from wooden frames or from the ground.



Courtesy of Fort Sill Museum

In 1805, Colonel William Congreve created a rocket with a range of 2,000 yards.

"It cleared the treetops, seemed to hang there for an instant before it plunged downward in its fiery arc. A man couldn't see a bullet coming; if his number wasn't on it, he heard only the hum of its passing. But this swooping thing was dreadfully personal. It appeared to be darting directly at each watching soldier, making him shake in his boots, turning his knees to water. Only when he saw it strike the ground some distances in front could he believe it was not headed straight for him. Even then the menace of the thing with a pointed iron head and a scorched eight-foot stick was not ended. Smoking and sputtering, it writhed through the grass like a serpent. Then a time fuze burst its black powder charge with a sharp report and a spurt of acrid smoke."

Congreve achieved what some consider the perfect weapon by combining devastating physical destruction with psychological trauma. When pressed, infantrymen, cavalrymen and artillerymen won't hesitate to stand beside their weapons and defend against personal assault. However, the fear from these weapons fired from an enemy as much as 2 miles away drove even the most hardened veteran from the battlefield. The same emotions that stirred panic on the battlefield caused Francis Scott Key, an artilleryman, to immortalize the sight of "the rocket's red glare."

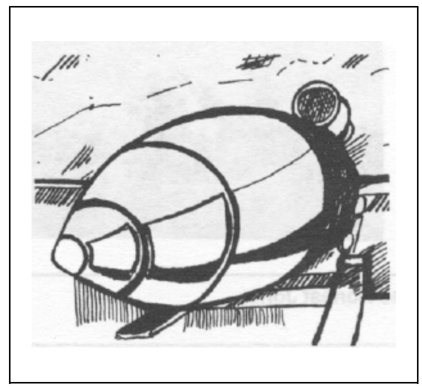
Following the War of 1812, virtually every major nation in the world used Congreve rockets. But improvements to the rockets didn't stop as long as there were battles to be won and artillery to be shot.

In the mid-19th century, William Hale, another British artilleryman, eliminated the necessity of the flight-stabilizing stick by employing jet vents on the body of the rocket itself. By venting the propellant gasses, Hale imparted a stabilizing spin to the rocket. The first true forerunner of the free flight spin and fin-stabilized rocket, it significantly increased the battlefield rocket's performance and ease of handling. Following the success of Hale rockets by the Austrians, the United States military forces were sufficiently impressed to purchase 2,000 of them to use in the Mexican War (1846-1848). The US Ordnance Manual of 1862 lists 16-pound Hale rockets having a range of 2,000 meters (1.25 miles).

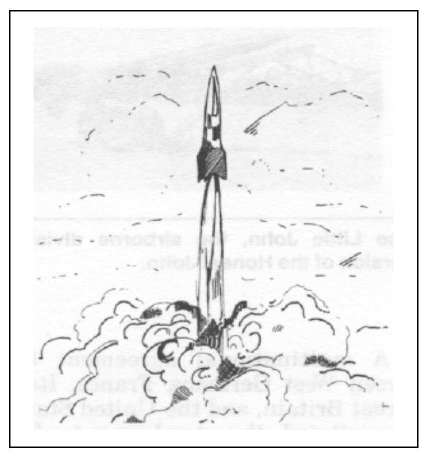
The American Civil War showed once more that rocketry could not compete with the inevitable advances in cannon artillery. The rifled cannon, with its increased ranges and greater caliber, forced a decline in rocket artillery. The decline lasted until World War II. Although used for signalling purposes and briefly in trench warfare for clearing wire entanglements, the rocket played an insignificant role in World War I. The rocket seemed doomed to the legacy of the past.

Tremendous advances in rocket technology by such scientists as American Robert H. Goddard, Russian Konstantin E. Tsiolkovsky, and German Werhner von Braun thrust the rocket into the forefront of military technology in the 1940s. Because of the advent of the armored tank, the individual fighting man was incapable of holding the battlefield. Goddard's research gave the infantry a fighting chance in the form of a 3.5 pound, 20-inch-long rocket. Fired from the bazooka, a shaped charge was rocket propelled up to 600 yards to deliver a devastating blow to Axis tanks. A 4.5 inch rocket, mounted on the Sherman Tank chassis and ripple fired from 60 tube racks, could achieve a maximum range of 1,100 yards and deliver important area cover fire for maneuver elements. The most notable of the World War II tactical rockets was the Soviet Katyusha. Still in use in some areas of the world today, some military scholars credit the Katyusha for the relief of Stalingrad.

The Reichswehr developed the most significant rockets of the Second World War, and in doing so took the rocket out of the tactical range into the strategic confrontation. With the



The V1 rocket.



The V2 rocket had a range of 320 kilometers.

V1 and V2 rockets, Germany successfully demonstrated that man was not destined to fight at limited ranges. The V2 rockets that bombed Ireland and England from mainland Europe had a range of 320 kilometers and delivered a conventional payload of 2,000 pounds. Not only did free flight rockets peril the Allied advances, but rocket-assisted projectiles fired from cannons successfully engaged the US Third Army at a range of more than 65 miles. The "arrow shell" fired from the German 21 centimeter field piece had a range up to 151 kilometers.

With the developments of the Honest John rocket and its airborne division equivalent, in the 1950's, Little John, commanders had the ability to fire single rockets with incredible conventional payloads. Digressing from the development of Lance and Pershing—which for the purposes of this article have been relegated to echelons above division roles—there were no significant tactical rocket developments by the United States until the genesis of MLRS—the King of Battle's lord.

The Honest John.

The Little John, the airborne division version of the Honest John.

A multinational agreement between West Germany, France, Italy, Great Britain, and the United States precipitated the development of a rocket weapon system that could provide effective fires for the maneuver elements. In 1981, the 1st Infantry Division at Fort Riley, Kansas, fielded the first MLRS battery. With several MLRS batteries already fielded in the US, Korea, and West Germany, the US Army is ready to meet any threat, anytime, anywhere.

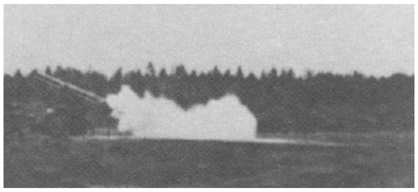
Designers made MLRS autonomous in its maintenance, vehicle recovery, refueling, and ammunition supply.

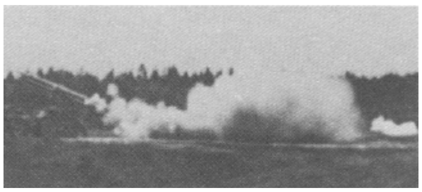
Officers and NCOs of the MLRS battery go through classroom and field training together.

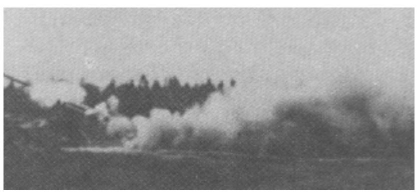
Incorporating lessons learned from the past 700 years of rocket artillery history, MLRS offers several distinct differences to the cannon artillery approach. MLRS is not bound to the terrain as cannon units are. When the battery displaces it uses terrain and movement capabilities to its advantage. MLRS gunners coordinate fire missions with state-of-the-art digital communications and they conduct battery training from the recruit's initial entry to the fielding of the MLRS battery. The officers and NCOs of the battery go through classroom and field training together. The battery itself undergoes an intense 2-month concurrent training phase at Fort Sill, Oklahoma.

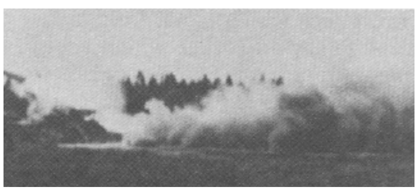
Not only is the weapon distinct in its training and its firepower, the MLRS battery is a showcase for organization. Designers made MLRS autonomous in its maintenance (minus welding capabilities), vehicle recovery, petroleum, oils, and lubricants (POL) refueling, and supply and ammunition resupply. Clearly, the division commander on today's battlefield has awesome fire support superiority due to the combined characteristics of firepower, munitions, and survivability of the multiple launch rocket system.

First Lieutenant Timothy B. Shea graduated from Kansas State University and received his commission from Officers Candidate School. He has served as MLRS firing platoon leader and MLRS fire direction officer-operations officer. Lieutenant Shea is a graduate of the Field Artillery officer basic course and is attending the FA officers advanced course.









MRL Around the World

by Mr. George T. Norris

When the US Army fielded the multiple launch rocket system (MLRS) we acquired a capability that was missing for several years—the ability to deliver large volumes of artillery fire beyond the 24 kilometer range of the M110A2. One aspect of the MLRS which is not well-publicized, probably because it would not be popular, is that its 30 kilometer range is still shorter than many other artillery rocket systems. As artillery leaders discuss the future of the MLRS, it's important to look at what is available in artillery rockets around the world and consider if they carry a message for American Redlegs.

There are 2 points that merit special consideration. First, what range do users need, and can a relatively inexpensive rocket reach it? Second, and perhaps most importantly, what volume of fire we can deliver at that range? An answer to both of these questions may arise by looking at a very small number of multiple rocket launchers (MRL) around the world.

The Brazil ASTROs offers a choice of 127-mm, 180-mm, or 30-mm rockets.

The Israeli LAR 160 light rocket system may have been a contender for the US Army's light MLRS.

Recent news reports show that Brazil is 1 of the newest powers in the world's arms market. They achieved this distinction by offering quality products at very competitive prices. According to *Jane's Weapons Systems,* their wide range of MRL weapons includes 2 systems that can outrange MLRS. The 180-mm MRL X20 has 3 launch rails that mount the system on a tracked chassis or tow it behind a truck. Although it only fires a 35 kilogram warhead, the X20 reaches a maximum range of 35 kilometers. The long-range Brazilian rocket is the 300-mm MRL X40. It also has 3 launch rails and delivers a 146 kilogram warhead to a range of 68 kilometers. These rockets may be part of the artillery saturation rocket system (ASTROS) which offers a choice of 127-mm, 180-mm, or 300-mm rockets fitted with either high explosive or cluster warheads. Cluster warheads may be some form of improved conventional munition (ICM) bomblet. *Jane's* reports that Iran is among the foreign customers for the ASTROS.

The Israeli Military Industries have developed 2 MRL systems that may have about the same range as the MLRS. The LAR 160 light artillery rocket system is a 160-mm MRL that customers can adapt to a wide variety of specifications—some industry followers even believe that 1 of its variants was a contender for the US Army's light MLRS. It is a modular system which allows various configurations of rockets depending on the type of vehicles used to carry them. The disposable launch pod containers are made of fiberglass launch tubes set in a polyurethane foam matrix. Users can transport 2 launch pod containers of 25 rockets on a tank chassis. A battery volley from 6 such launchers delivers as many as 300 rockets to a range of 30 kilometers and, because users can load these

The LAR 160 fires a battery volley that can deliver 300 rockets 30 kilometers downrange.

rockets with almost anything that would fit in a 155-mm howitzer projectile, the warhead options are varied.

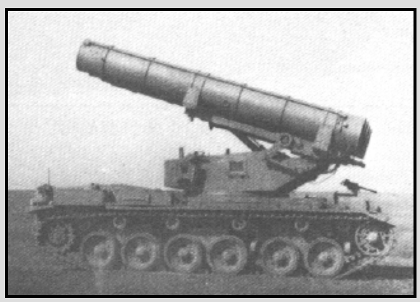
The other Israeli MRL is the 290-mm MAR 290. While very few details are available, even to the publishers of *Jane's Weapon Systems,* analysts estimate it to have a range of at least 25 kilometers with 4 launch tubes mounted on a modified Chieftain tank chassis. Like the Brazilian X40, it probably has a warhead which weighs more than 100 kilograms. Even if it were only a unitary high explosive (HE) warhead, it could have a lethal radius of at least 100 meters for each rocket.

The largest producer of rockets in the world is the People's Republic of China, with at least 9 different MRL systems advertised for sale, ranging in caliber from 107-mm to a new 273-mm MRL. Only the latter outranges the MLRS, but it is an interesting system if the publicity surrounding it is accurate. Introduced at last year's Asian Defense Exposition (ASIANDEX) in Beijing, both *Jane's Defence Weekly* and *Military Technology* magazine have discussed the system. According to the *Military Technology* article (presumably written with Chinese assistance), the 273-mm 4-round self-propelled MRL Type 83 will deliver HE bomblets and scatterable mine warheads to a range of 40 kilometers.

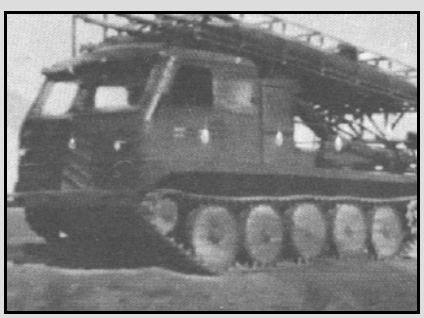
Two European systems also bear examination. A developmental system from France known as the Rafale fires 18 147-mm rockets to a reported maximum range of 32 kilometers. While it only has a 22 kilogram warhead, some say it has both antipersonnel and antitank improved conventional munition (ICM) warheads as well as a possible scatterable mine warhead. The Italians have developed a 122-mm 40-round MRL, the FIROS 25. While it only reaches 25 kilometers, it fires HE, preformed fragmentation HE, white phosphorous, antitank and antipersonnel mines and ICM.

Rounding out the list is the Soviet Union. The BM27 has a reported range of 35-40 kilometers for its fragmentation HE, chemical and scatterable mine warheads. It is accompanied by a resupply vehicle which can reload its 16 rockets in an estimated 20 minutes.

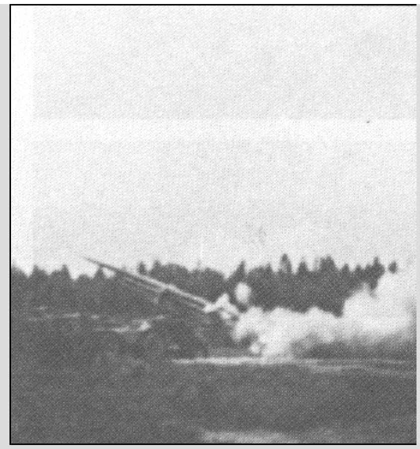
While none of these systems are capable of autonomous operations like the MLRS, the Brazilian ASTROS rocket launchers use a dedicated radar for fire control. The Swiss Contraves FIELDGUARD radar is a projectile-tracking radar which allows soldiers to deliver artillery fire (including rockets) by conducting a registration with a single round—and that doesn't even have to impact and warn the enemy. While the Astros is the only system which currently employs FIELDGUARD, it is adaptable to any rocket system.



The Israeli MAR 290 has 4 launch tubes mounted on a modified Chieftain tank chassis.



The Chinese 275-mm 4-round self-propelled MRL will deliver its bomblets to a range of 40 kilometers.



The Soviet BM 27.

One clear message in this discussion of MRLs is that any system which fires only 2 kinds of warheads is probably not competitive. MRLs can and must deliver a wide variety of munitions. While the development of smart munitions such as terminally homing submunitions will multiply the effect of the MLRS, that represents an extravagance which is not fully justified. A follow-on rocket which could deliver simple warheads to greater ranges would represent a cost-effective alternative. US Army leaders should demand a range of 45-50 kilometers and the warhead options do not need to be sophisticated. If the aim is to slow the arrival of Soviet tanks at the main battle area, a simple minefield can delay traffic on roads until the obstacles are cleared—and we already have the mines. If the aim is to kill vehicles at extreme ranges, large dual purpose ICM warheads—while not a guaranteed kill—could offer a cost-effective probability of a kill, and we already have the bomblets.

Fire support units must deliver fires, and we should remember that the most sophisticated bullet in the world may not be a match for 100 simple bullets. The MLRS is a system without equal, but it can be even better if we improve its rockets. The US Army needs the MLRS; but we also need to look at all of our options before we spend our dollars on high-tech answers.

George Norris is a frequent contributor to the *Field Artillery Journal*. He is currently employed at the US Army Foreign Science and Technology Center.

Development of Soviet Multiple Rocket Launchers

By Mr. Gerald A. Halbert

One of the biggest shocks the German Armed Forces faced during World War II was the Soviet use of multiple rocket launchers (MRL) in the early stages of the war. Actually, imperial Russia developed and used rockets as early as the 19th Century, but Russian Army leaders phased out the rocket systems in 1897 as cannons improved.

At the beginning of World War II, the German Army possessed MRLs that smoke troops operated, but they only fired chemical or smoke warheads. In addition, there were not very many of these systems in the German Army inventory. When a Russian MRL first attacked a German unit in 1941, pandemonium also struck the German soldiers. While they eventually grew to expect MRL attacks, they certainly did not like to face its fire. Because MRLs generally deliver more rounds on target in 30 seconds than does a normal gun battalion, it is dramatically more effective in producing shock, disruption and demoralization of a receiving unit.

German Army leaders had even more surprises in store. For instance, they did not know of the Soviet T34 medium tank and KU1 and KU2 heavy tanks. Their response was the development of better antitank guns and the Panther and Tiger II tanks. Even armed with high-explosive rounds, the smoke troops still were no match for the Katyusha or Stalin Organ (as the Germans called the MRLs).

MRL Development

The Soviet MRL was no accident. After their bitter civil war, a group of imaginative officers in power had to answer many questions about developing a new army to ensure the survival of communism. The early leaders of the Red Army had many extended arguments over how the new military force should be trained, organized, led and equipped. They were open to new ideas and investigated several new types of weapons. For example, prior to World War II, the Soviet Union had produced more tanks than the rest of the world combined and they were the first country to organize large parachute units in quantity.

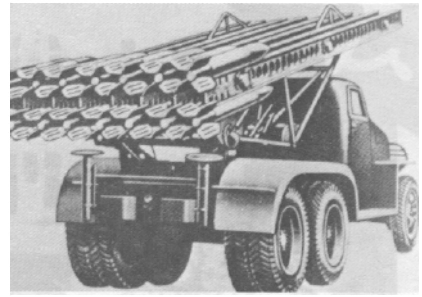
The Soviets initiated the theoretical and experimental research to produce solid fuel, smokeless rockets in 1920. On 1 March 1921 leaders established the "laboratory for the development of N.I. Tikhomirov's inventions" in Moscow, where work concentrated on the development of a smokeless powder for a solid fuel rocket. In 1923, the military requested that work begin on rocket-assisted projectiles, and 1 year later workers were developing an experimental model. During 1924 they fired a total of 21 modified projectiles (probably mortar projectiles) with rocket motors at the main artillery range in Leningrad. The projectiles registered an increase of 10 times the normal range. Just 4 years later, the Soviets launched the first rocket projectile from a site near Leningrad to a range of 1,300 meters.

The group responsible for this research became the Gas Dynamics Laboratory (GDL) in July 1928. By 1930, they created the first experimental 82-mm and 132-mm rockets with a range of 5 and 6 kilometers respectively. Between 1929 and 1933 the GDL had built the first electrothermic (ion) rocket engine and several liquid fuel rockets. Their success mandated expansion, and between 1931 and 1933 the staff grew from 77 to 200. By 1932 they had sections specializing in liquid and solid-fuel rockets and a group investigating the use of solid-fuel rockets on airplanes and solid-fuel production. Another group was also working on jet propulsion. The Jet Propulsion Study Group (GRID), formed under the Central Council of the Society for Cooperation in Defense and Aviation-Chemical Construction, successfully launched the first modern Soviet rocket in August 1933.

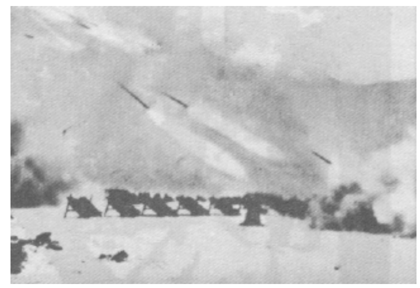
Marshal of the Soviet Union (MSU) M. Tukhachevsky was responsible for many of the visionary developments of the Red Army. As early as 1931, MSU Tukhachevsky clearly understood the application of rocket motors to artillery weapons. On September 21, 1933, he organized the Scientific Research Institute of Jet Propulsion (RNII) by merging the existing GDL and the GRID. They began a project of mounting 82-mm and 132-mm rockets on Soviet aircraft, and in 1935 they launched RS82 and RS132 rockets from 115, 116 and SB aircraft. These rockets were noticeably more accurate than when the same rockets were fired from ground launchers. On 20 August 1939 Soviet armed forces made the first rocket attack from aircraft. Five 116 aircraft attacked a group of Japanese fighters at the Khalkhin-Goi River and destroyed 2 enemy aircraft. There were 4 air battles in which Soviets destroyed 13 enemy airplanes.

In October 1938 the Soviets built a prototype for the first ground mount, multiple 24 projectile rocket launcher mounted on a ZIS-5 truck. Firing tests conducted between October 1938 and February 1939 revealed the launcher was unstable, the rockets could not reach the desired range, and the rockets dispersed too widely. Although this first attempt failed, it showed the vast potential for the system. Soviet designers reworked the projectile and changed the launcher vehicle to a ZIS-6 and created a 16-projectile launcher. In April 1939, the technical council of the institute approved this design and new launchers rolled off the production line and into range testing by September. The Chief Artillery Directorate (GAU) approved the launcher in December 1939 and ordered the manufacture of an experimental lot. The RNII constructed 6 launchers in the summer and fall of 1940, then later built another 5 making a total of 11 by early 1941. Final test firings held on 17 June 1941 cleared the way for the decision to order serial production on 21 June 1941. The Soviet Union entered World War II on the next day. The RNII remained responsible for research and development, but soon a newly established design bureau, the Special Design Bureau (SKB) began to manufacture MRLs at the "Kompressor" works in Moscow. Later, the "Diname" plant, also in Moscow, began to manufacture the MRLs. In August 1941 they constructed the first 82-mm BM8 MRLs and began large scale manufacture of the BM13 in August 1941.

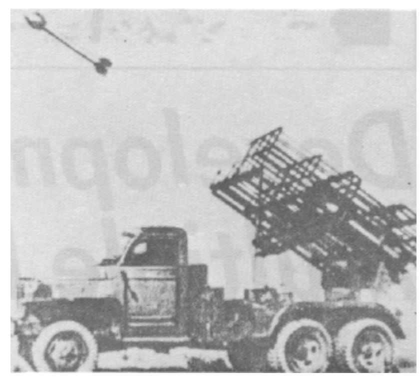
BM13.



BM13-16.



M30.



M31.

MRL in Combat

The first BM13s began their combat showing on 14 July 1941, in an experimental unit called the separate experimental multiple rocket launcher artillery battery. Commanded by Captain I.A. Fierov, the unit opened fire near the railway station of Orsha in the western Soviet Union. The battery fired a salvo of 122 rockets from 7 launchers that landed within 7 to 8 seconds. The targeted German unit broke under the attack. This success led Soviet Army leaders to form additional units and deploy them to the front.

Initially the new experimental rocket battery had a headquarters platoon, 3 firing platoons, an ammunition supply platoon and a ranging platoon equipped with a 122-mm howitzer. In addition it had a support unit which included maintenance, medical, refueling and mess subunits. The battery had about 50 ammunition trucks and more than 100 trucks to transport the battery and equipment. Civilian technicians from the RNII trained the new rocketmen. Units that deployed later in the war were not so lavishly equipped.

Eventually the Soviet Army standardized the MRL regiment with 24 launchers, BM13-16 (holding 16 132-mm rockets), or BM8-48 (holding 48 82-mm rockets). By December 1, 1941 there were 8 regiments and 42 separate battalions with more than 500 BM8 and BM13 MRLs. The units were designated guards mortar units (GMCh) to disguise the true nature of the weapons. And instead of the artillery controlling the weapons, a separate organization established in September 1941 controlled MRLs. This main directorate for armament for GMCh (GUVGMCh) was responsible for procuring the MRLs and preparing units for assignment to the front. In April 1943 the GUVGMCh deactivated and all responsibility for MRLs passed to the artillery.

The designations RS82 and RS132 referred to aircraft-launched rockets and gave the widest diameter in milimeters. The M8 and M13 ground-launch rockets derive their names from their 82 and 132 milimeter-wide girths. The designation BM stands for rocket launchers. A BM8-36 would be a ground rocket launcher for the M8 rocket, with 36 launch rails.

The initial success of the BM13 led to further improvements in the rockets and their launchers. The 82-mm M8 rocket underwent a series of improvements from 1942 to 1945. (See figure 1 for data on the rockets.) The explosive charge grew from 375 grams to 581 grams, and finally to 640 grams. At the same time the maximum range extended from 5 to 5.5 kilometers. The Soviets also improved their 132-mm rocket through the development of a specialized unit for destroying defensive installations. The 132-mm M20 seen in July 1942 had 18.4 kilogram of explosives out of a total weight of 57.6 kilograms; crews could fire it only from the upper rails of the BM13 launcher. In March 1943 a new 132-mm rocket entered production. The BM-13UK (improved accuracy) added spin stabilization and drastically reduced dispersion. The density of rockets in the desired target area increased by a factor of 3 due to the reduced dispersion.

The launchers also improved with more research and development. There were several versions of the 82-mm launcher, including units that mounted on light tank chassis. The launchers could elevate from -5 to +45 degrees. (See figure 2 for data on the launchers.) The number of launch rails varied from 8 to 48. Soviet designers also improved the 132-mm launchers including the development of a tracked launcher but they left most of the launchers as truck-mounted and developed a launcher with 72 rails for use on trains. The development of several types of 132-mm launchers complicated production and maintenance. The improved 82-mm and 132-mm rockets and launchers delivered an impressive volume of fire that was highly effective against personnel in the open, but they were not very effective against fortifications or personnel under cover. Soviet rocketmen needed more powerful rockets.

Designation	Diameter (MM)	Projectile Weight (KG)	Bursting Charge (KG)	Maximum Range (M)
M8	82	8.0	0.64	5,485
M13	132	42.5	4.5	7,900
M20	132	57.6	18.4	5,000
M30	300	72.0	28.9	2,800
M31 UK	300	92.4	28.9	4,325

Figure 1. Soviet Rocket Characteristics

Designation	Caliber (MM)	Number of Launch Rails	Type Vehicle	Length of Time to Launch All Rockets(S)
BM8	82	48	ZIS-6	
BM13	132	16	ZIS-6	15-20
BM31-12	300	12		

Figure 2. Soviet Multiple Rocket Launcher Characteristics

They developed the M30 rocket in May 1942 and it went into production in June 1942. It was a 300-mm rocket that weighed 28.9 kilograms. The special frames that fired 4 rockets from the ground rather than motorized launchers increased the deployment time over a self-propelled launcher. While this arrangement was satisfactory, there was considerable room for improvement. At the end of 1942 the Soviets modernized the M30 and developed the M31. They retained the warhead from the M30 but reduced the rocket motor and rest of the body's weight from 23.5 to 10.8 kilograms. In December 1943 the Soviets fielded an 8-rack launcher but because it wasn't self-propelled it had limited mobility. By June 1944 Soviet leaders produced a motorized launcher, the BM31-12. This reduced the deployment time for large rocket launchers from 8-10 hours to several minutes. The M31 had a range of 4 kilometers and an explosive charge of 28.9 kilograms.

BM13UK.

A recurring question is whether the Soviet secret police controlled the first rocket units. Rumor at the time indicated that it did. However, the GAU, a military organization responsible for developing artillery systems, apparently funded and directed the first testing of the rockets. Captain Fierov, the first rocket unit commander, was a graduate of the Artillery Academy. All evidence indicates that although the rocket units were SECRET, the Army controlled them, not NKVD units.

The success of the MRLs was so great that during World War II the Soviet Army produced more than 10,000 self-propelled launchers and 12 million rockets. In early 1945 there were 519 battalions of MRL in the Red Army. While the Soviet MRLs were not a weapon that won the war, they increased the effectiveness of Soviet artillery fire and had a demoralizing effect on targeted units. Potential targets probably agree that they would rather be elsewhere.

Mr. Gerald A. Halbert is a retired Army officer currently employed by the US Government. He was commissioned in 1967 through OCS and served in the 82d, 101st Airborne and 9th Division Artilleries. Mr. Halbert's work has been published in "Armor," and the "Marine Corps Gazette."

Illustrations by Second Lieutenant Laura Carter

MLRS Tactical Options: Shoot, Scoot and Survive to Shoot Again

by Captain Robert Powl Smith, Jr.

During World War I, artillery conquered and infantry merely occupied. At that time, artillery employment concentrated on putting lots of steel on target—just like we do today. The realm of the cannon artilleryman is still roughly the same. The cannons pull into position, lay, and begin pounding their targets. Yet, while the King of Battle still wields his scepter, threat forces have advanced their methods considerably since the Great War. This is especially true in the target acquisition capabilities now available, the difference in the air attack threat, and the threat of ground attack.

Putting lots of steel on target is still the primary concern of the artilleryman, but now survival must consume an equal portion of his planning and execution. The multiple launch rocket system (MLRS), the King's new shoot and scoot weapon system, provides both firepower and survivability.

The designers incorporated the newest technology to give it tremendous mobility. However, the system will not survive on the battlefield unless the artillerymen who use it maximize the system's potential. Shoot and scoot is a simple formula for success, yet it requires detailed planning and intensive training for proper execution and survival. Fresh and innovative tactics and employment options are available to MLRS leaders from platoon to battalion level. The tactics and options are so new and flexible that they appear almost alien to the traditional cannoneer.

Platoon Tactics

The first echelon of tactics is at the platoon level. Each platoon leader gets a "goose egg" of 9 square kilometers located about 5 to 15 kilometers from the battery headquarters. Although relatively little of this large area, he uses the platoon leader needs all of it for proper scooting and survival. After all, it does no good to scoot 300 meters when the enemy can saturate the area for 500 meters around the firing point with counterfire. This platoon operations area (OPAREA) belongs to the platoon leader. He decides how he will use it. The only guidance he receives is the general OPAREA boundaries and the number of hot launchers.

The first lesson the MLRS platoon leader learns is dispersal within his OPAREA. He uses the platoon wedge template to allow 500 to 1,000 meters between elements (figure 1). Terrain features may introduce new dimensions to the wedge concept. In fact, terrain may force MLRS leaders to position their unit beyond the enemy's templated counterfire. The more random and unconventional the employment, the less chance the unit will be a target. These OPAREAS normally hold:

- Nine firing points (FP)—or 3 per launcher.
- Three reload points (RL).
- Three survey control points (SCP).
- One ammunition holding area (AHA).
- The platoon command post (CP).
- An alternate CP.

In a normal scenario for the OPAREA, a launcher uses the FP only once, moves to its assigned RL to upload rockets, then proceeds to a hide area (HA) near its next FP. When the platoon leader chooses the FPs, he should keep these points in mind:

- Firing points must be 500 meters apart and 700 meters from the RL, SCP, AHA, and CP.
- The platoon must train as it will fight—so leaders should not re-use FPs.
- Limit the unit's exposure and conceal its signature whenever possible. Leaders can do this by maximizing cover and concealment for the launchers as well as the CP, AHA, RL, SCP, and HAs; by using hard-surface roads and avoiding scarring the ground; and by developing and implementing a sound traffic plan.

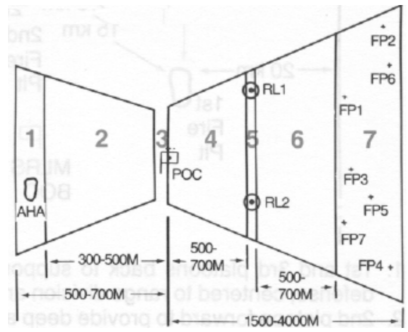
MLRS crewmen can achieve the best traffic flow by using common sense and practical planning. They can locate HAs and FPs on roads that network to and around the RL, and they can ensure the RL is large enough to maneuver the 55-foot long heavy expanded mobile tactical truck (HEMTT). They can also locate the FP on a road that runs perpendicular to the probable azimuth of fire and select an RL that lies in the same direction of travel as the launcher's heading. Further, they can locate the PADS-surveyed SCP at the RL to limit the launcher's exposure on roads; or they can locate the SCP at the platoon CP where leaders can update the "cold war" before they move out to their first hide area.

Ammunition Resupply

Located 300 to 500 meters from the command post and astride the main access route into the area for entry control and protection, the 4-6 HEMTT with heavy expanded mobility ammunition trailers (HEMAT) of the supporting ammunition section are difficult to conceal effectively. Platoon leaders must locate the AHA on or near a main supply route for access to the battery AHA and close to the reload points. In Europe, the village and town streets are so narrow that platoon leaders and NCOs must conduct a careful reconnaissance to ensure trafficability. However, such urban locations are quite often ideal for the HEMTT's all-weather traffic-ability and road-net needs. Often these towns have a few buildings large enough in which to hide the huge rigs.

NOT TO SCALE

Numerical distances expanded from original FC 6-60 version.



(FLOT can be in any direction. Rockets can be fired over other elements without harm, as long as surface danger zone immediately around M270 is avoided.)

1. Ammo Area Zone
2. No Elem.
3. Platoon Operations Center (POC) Zone
4. No Elements
5. M270 Reload Points (RL—Zone
6. No Elements
7. Firing Point (FP) Zone

Figure 1. The Firing Platoon "Wedge".

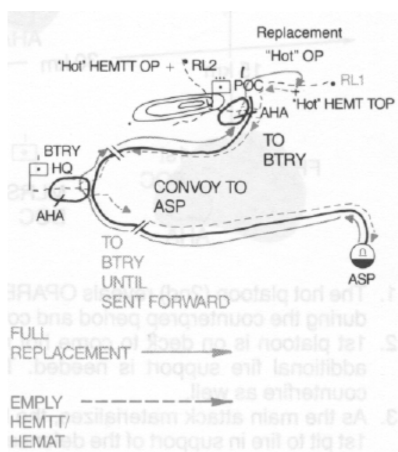


Figure 2.
Ammunition Resupply Operations

Leaders have several ammunition resupply options as well. Normally, each of the 3 ammo sections deploys 4 of its 6 vehicles forward with the platoon it supports. The remaining 6 trucks and trailers of the ammo platoon stay at the battery AHA and may go forward to replace an emptied HEMTT/HEMAT. The firing platoon leader controls 4 rigs at the platoon, and the ammunition platoon leader controls the last 6 at battery. This allows them to send empty trucks to the battery while a full replacement goes forward. When enough empty HEMTT/HEMAT's arrive at the battery, the ammo platoon leader dispatches them to the MLRS ammunition supply point/ammunition transfer point (ASP/ATP) in the division or corps rear area.

The 2 main resupply options are known as hot HEMTT forward and unguarded reload. The latter method allows crewmen to leave at least 2 launch pad/containers (LP/C) either on the ground for easy concealment or on the HEMAT for faster displacement. On the other hand, hot HEMTT calls for the crew to remain in the HEMAT's prime mover at the RL to monitor the fire point for enemy activity. When the launcher has expended all of its LP/Cs, the HEMTT/HEMAT returns to the platoon ammunition holding area and then moves on to the battery AHA. Meanwhile, the platoon command post sends a replacement HEMTT/HEMAT to the RL.

Operations

The MLRS battery operations center (BOC) is a miniature battalion tactical operations center (TOC), exercising tactical and limited technical fire direction control over the far-flung firing platoons (figure 3). Depending on the threat, the commander can split the BOC and trains elements like the standard battalion TOC. When split, each element's security and defense capabilities are reduced dramatically. However, this separation may be the best way to achieve the altitude to maximize the

BOC communications to its platoons. In fact, locating the trains portion of the battery headquarters in a village or town is usually ideal. The urban area should provide all-weather main supply routes, buildings for cover and concealment, automotive repair facilities, bakeries, restaurants, telephones, electricity, and water.

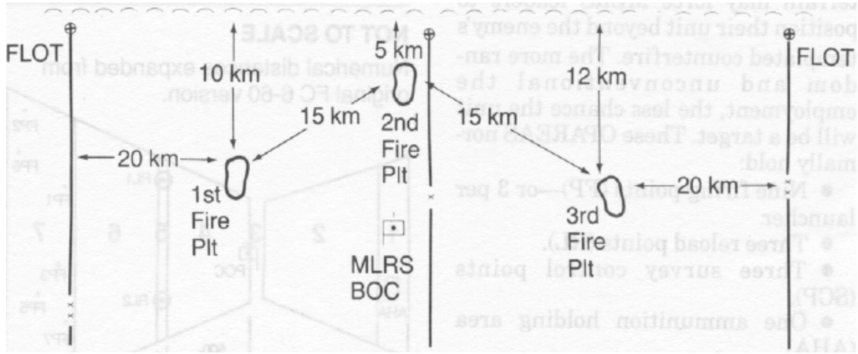
An alternative employment concept is the "mobile BOC" technique. It is useful under conditions of negligible ground threat and when the FDC's whip antennas are adequate for communication with all stations. Using this method, the FDC simply jumps around within support range of the remainder of the headquarters, processing missions and exercising command and control. This technique prevents the BOC's large communications signature from betraying the entire headquarters location, as well as its own.

Commanders may employ their MLRS assets using either the hot platoon or the leapfrog concepts. The hot platoon uses 1 platoon at a time to respond to fire missions (figure 4). This deployment limits the commander to engaging targets within that platoon's range. However, because this method exposes only 1 goose egg, it may be preferred in a high counterfire threat environment. The remaining 2 platoons can redeploy, rest, and perform maintenance until they are called on to go hot.

If the mission calls for a surge in fire missions, the remaining platoons can hit the road in about 10 minutes. This tactic allows continuous redeployment so platoons can shift with the charging forward line of own troops (FLOT).

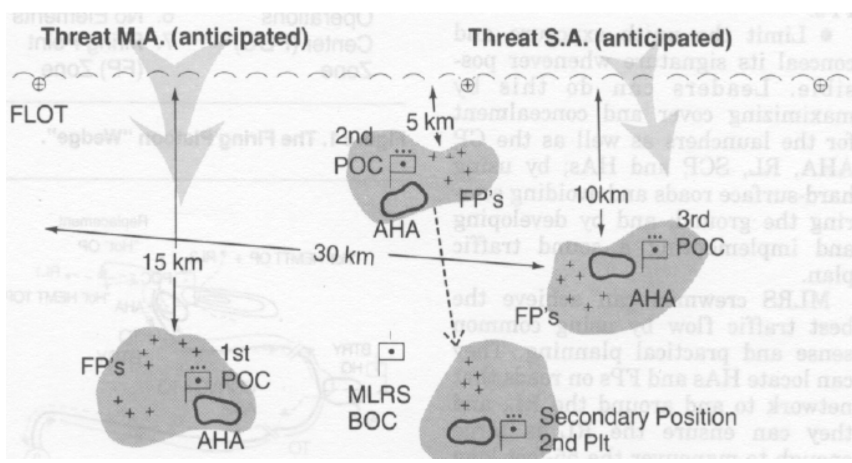
However, if the FLOT is moving so fast that platoons are displacing constantly, commanders may opt for the leapfrog concept (figure 5). Each launcher has an attendant HEMTT/HEMAT and a SCP and up to 4 firing points in a miniature goose egg. As the FLOT moves, launchers leapfrog forward or back and continue to supply fire. Ideally, platoon leaders have 3 launchers forward to range deep targets, 3 in the middle to range the FLOT, and the last 3 in a traveling or maintenance status.

This concept requires exceptionally well-qualified section chiefs who can redeploy on their own and excellent communication capabilities linking the FDC to each launcher, the CP, and the force Field Artillery headquarters.



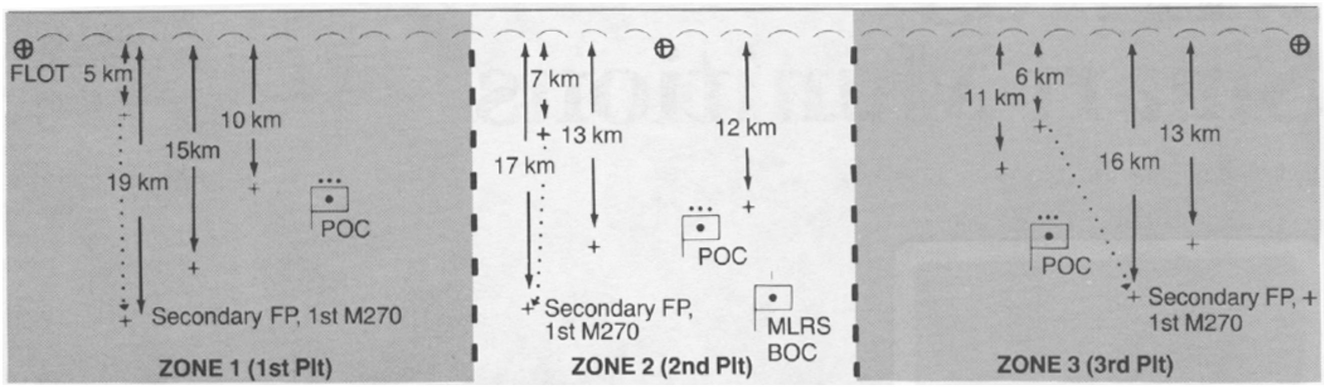
1. 1st and 3rd platoons back to support the maneuver brigade areas in the defense, centered to range division and brigade boundaries.
2. 2nd platoon forward to provide deep attack fires, up to 25 km behind FLOT.
3. It is not necessarily wise to position all 3 platoons within 5 km of the FLOT to range deeper targets. During defensive operations, this area is usually within or very close to the covering force area of battle, an area for a maneuver force's fighting withdrawal. All 3 platoons will be forced to displace quickly, probably within hours of occupation, and having all firing assets on the road simultaneously prevents their maximum use at a critical phase of the battle.

Figure 3. A Standard MLRS Battery Deployment.



1. The hot platoon (2nd) reveals OPAREA to enemy as it engages deep targets during the counterprep period and covering force battle.
2. 1st platoon is on deck to come hot next if 2nd plt uses all of its FP's, or if additional fire support is needed. This reveals their OPAREA to enemy counterfire as well.
3. As the main attack materializes, the hot plt can withdraw (2nd) allowing the 1st plt to fire in support of the defense, engaging immediate follow-on forces. 3rd plt can be hot now, as well, to supplement cannon DS fires against the MA. Or it can wait, unexposed, until the displaced 2nd plt has redeployed.
4. The withdrawn plt can displace to support either the left or right sector, depending upon which is threatened. The 3rd plt is now firing, the 1st preparing to displace away from the on-coming FLOT.
5. If possible, only one platoon should be firing at one time, and only one platoon should be displacing at a time.

Figure 4. The "Hot Platoon" Concept.



+ Denotes an M270 with 1-3 FPs and 1 HEMTT/HEMAT for immediate resupply. An SCP is also established at or near these points for updating the SRP/PDS

Figure 5. The "Linear Battery" Concept.

Conclusion

You may notice that the platoon leader is more of a tactician than a technician like his cannon counterparts. With computerized technology reducing the fire mission cycle to a relatively simple routine, the platoon leader's most time-consuming and arguably most important mission is the reconnaissance. Reconnoitering a goose egg of 9 square kilometers is not a simple task, considering that it requires exacting detail in order to maximize the terrain's potential. At the end of his recon he should know every unmapped road, building, bridge capacity and overhead clearance, and the quality of all the roads. He should also have an idea of how all this will change with the weather. In essence, a successful MLRS platoon leader will have developed reconnaissance to a high art form, and he'll be the best in the business at it. Figures 6-9 show some authentic examples of platoon deployments in various types of real European terrain.

One of the beauties of the MLRS is that there are so many possible tactical variations. The high-tech components of the MLRS give it the ability to shoot and scoot at all levels of employment, but it is the men who use the system, who maximize its potential, and who will survive to shoot again.

Note:
Figure 6-9. *Realistic Platoon OPAREA's in European Terrain. (FLOT is Northeast, toward upper right corner)*

FPs are numbered in order of planned usage, which is sent to FDC. M270s automatically go to the next intended FP after completing a fire mission. All FPs are located next to hide areas (HA; forest or barn) on roads nearly perpendicular to the firing azimuth. POCs are typically located on the back-side of hills for terrain commo masking.

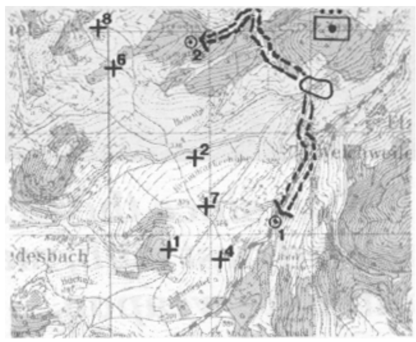


Figure 6. Platoon 'Wedge' Fitted to Terrain.
Both the POC and AHA are located in buildings or built-up areas. HEMTT/HEMAT's are invariably too long to put into buildings, but driveways between close houses provide good flank cover and concealment. RL 2 is located on a shaded parking-lot for a local soccer field.

Figure 8. The MLRS "Split Platoon".

Here, the ammo resupply route to RL 1 is a seemingly indirect one, necessitated by the soft, swampy areas of the farm road where it crosses the stream. Again the POC is located behind both a ridge-line and a high-power line for masking.

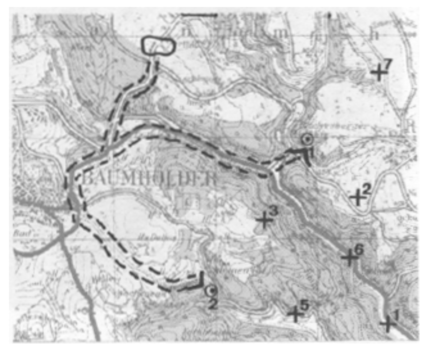


Figure 7. Tafficability and Ammo Resupply.
Here, the high ground-threat environment led the platoon leader to co-locate his AHA with his POC in an isolated and defensible group of trees at the hill top. With an all-around field of view and M270s FPs all around the base on the major access routes for further OP security.

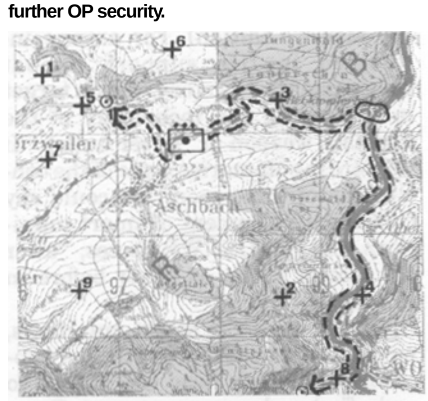
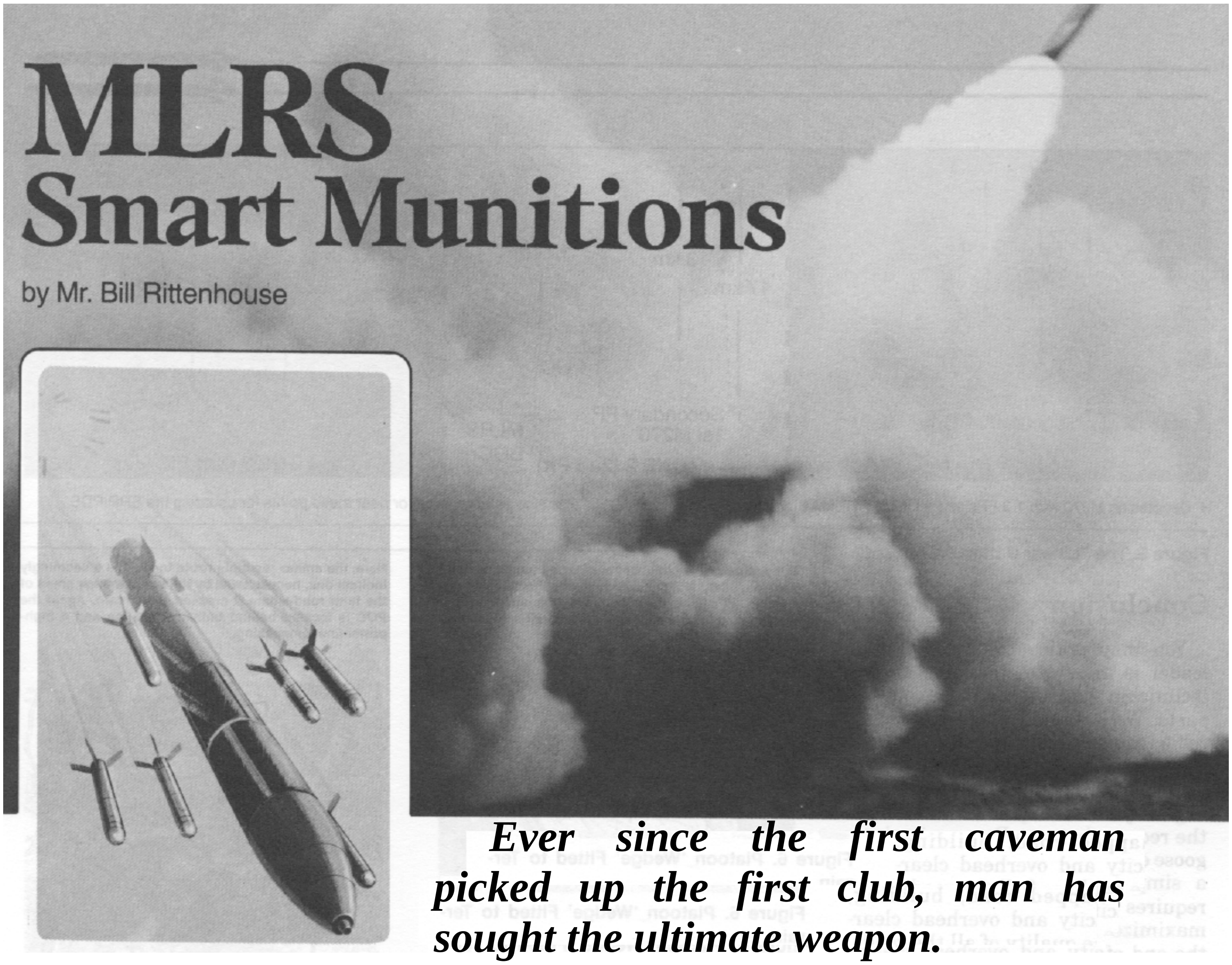


Figure 9. Hilltop Laager.

Captain Robert Powl Smith, Jr., is Chief of the Doctrine and Tactics Section of the Multiple Launch Rocket System Division, Weapons Department, USAFAS. He is a graduate of the United States Military Academy and Field Artillery officers basic and advanced courses, NCTAC and the MLRS Cadre Course. Past assignments include platoon leader and Operations Officer/Executive Officer of C Battery, 3d Battalion, 16th Field Artillery (8'/MLRS Composite), Baumholder, FRG.

MLRS Smart Munitions

by Mr. Bill Rittenhouse



Ever since the first caveman picked up the first club, man has sought the ultimate weapon.

With these words, *U.S. News and World Report* recently introduced an excellent cover story on our efforts to develop smart munitions (16 Mar 87 edition). For anyone interested in fire support combat developments, the story was on target in presenting the technology of the ultimate weapon or "silver bullet." If we were to summarize some of the conclusions of this report, we could say that the development of smart munitions will, as USNWR states, "alter the face of battle as never before in history."

When we refer to smart munitions, we mean warheads, projectiles or submunitions which have the ability to seek, find and engage a target. Some can even alter their flight paths so that Redlegs can attack targets more effectively. Technology forecasts tell us that someday we will expand the versatility of smart weapons to the point that they may perform myriad functions on the battlefield. We'll have munitions that can distinguish between specific targets or target types, distinguish friend from foe, peer through foliage, and have an all-weather, 24-hour capability. In terms of sheer "smartness," these munitions will be as brilliant as the 2 projectiles depicted in figure 1. (R2's cartoon-figure 1).

Still, with all of the advances in the area of smart munitions, we need to keep the concept of the ultimate weapon in a realistic perspective. In fact, we aren't even close to developing a universal brilliant munition, or the long sought "silver bullet." However, we are well on track in producing a family of specialized smart munitions for the Field Artillery.

Field Artillery Smart Munitions

Within the coming decade, we'll see different types of smart munitions for our cannon, rocket, and missile systems. These munitions will give us a balanced ability to attack different target sets. We have already begun fielding a type of smart munition in our 155-mm howitzer units. The Copperhead is actually a semismart weapon because it requires a laser

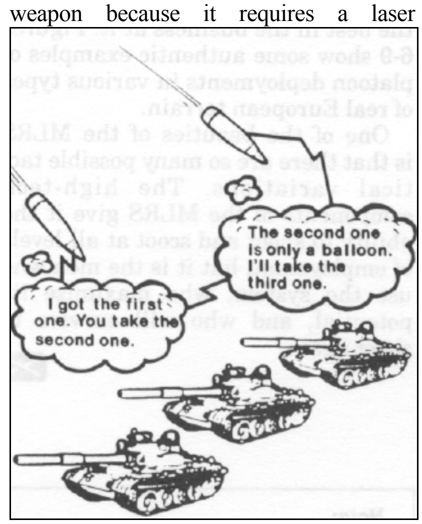


Figure 1. New smart munitions will give us the ability to attack different target sets.

beam for command guidance. A laser designator *paints* the target, providing a spot of light on which the projectile homes. True smart munitions won't need this sort of active guidance because their onboard seekers and microprocessors will enable them to home in on recognizable targets. This is why smart munitions are sometimes referred to as "fire-and-forget" munitions. When we combine these lethalities with the extended range and firepower of the multiple launch rocket system (MLRS), we get a formidable weapon system that increases our ability to execute the deep and close operations of AirLand Battle.

The TGW large footprint munition.

MLRS Smart Rockets

There are several key points concerning the use of MLRS smart munitions. First, MLRS smart munitions like the 155-mm system fall into 2 categories. Second, it is important to know why we need more than 1 type. And finally, there are some important employment considerations for MLRS smart munitions.

The categories of MLRS smart rockets derive from the size of the munition's "footprint." A footprint is the area on the ground, around a ballistic aimpoint, where the munition or submunition can detect and engage a target.

The first category of MLRS smart weapons uses a shaped-charge submunition which descends towards the target along a nearly horizontal glide path. The length of this flight path gives the munition a large area of authority. The large footprint munition delivered by MLRS is called the terminally guided warhead (TGW), and it is a joint development effort with several of our NATO allies. TGW has at least 3 submunitions in every rocket. At a point in the rocket's flight, it ejects the submunitions to begin their descent and this enables the munition's seeker to establish its footprint. The large area within the footprint, plus the excellent penetration capability of the munition, make TGW especially effective against moving armored combat vehicles (e.g., APCs, tanks).

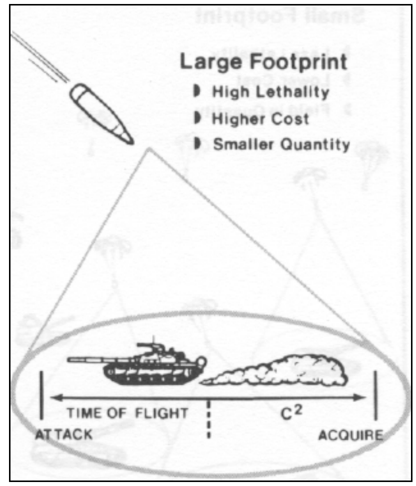
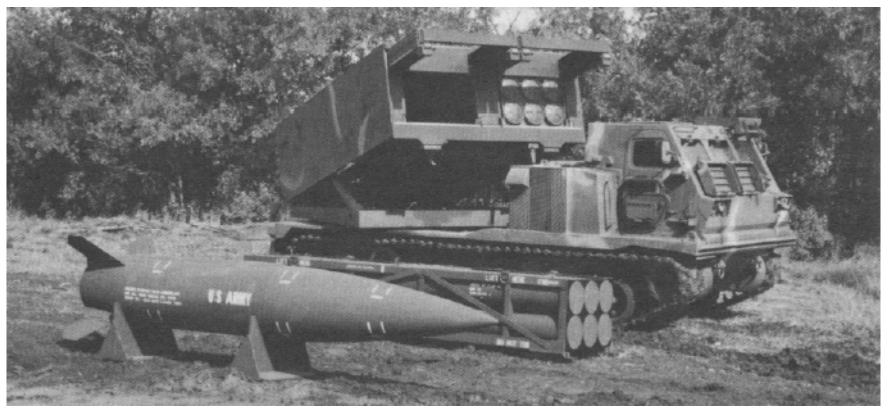


Figure 2. Smart munitions attacking moving targets.



A follow-on development block for ATACMS may include smart munitions to deliver larger payloads to greater ranges than MLRS.

The second category of smart munitions produce a small area of authority and are called small footprint munitions. The Army is developing 1 that can enhance the counterfire effectiveness of Field Artillery cannons and MLRS, and it is the sense and destroy armor (SADARM). MLRS SADARM consists of a rocket containing 6 submunitions dispensed over a general target area. Each submunition descends in a spiraling motion on a small parachute. This relatively vertical descent provides the submunition's seeker with a small footprint. When the seeker finds a target, it will continue to fall to an appropriate altitude when the submunition fires an explosively formed fragment onto the top of the target. The penetration capability of SADARM is not as great as that of the large footprint TGW, but it is an ideal weapon to attack enemy self-propelled howitzers which are especially vulnerable to a top attack.

Army tactical missiles may also deliver MLRS smart munitions. A follow-on development block for the Army tactical missile system (ATACMS) may include several types of smart munitions. Each missile will have the capability to deliver a significantly larger payload than an MLRS rocket. The ATACMS missile will also achieve significantly greater ranges than MLRS rockets.

One type of ATACMS large footprint munition is similar to the MLRS rocket TGW. The ATACMS missile will dispense these munitions in large quantities. Each munition or submunition will begin its downward horizontal glide with its seeker covering a large footprint. The increased range and lethality of the ATACMS-launched smart munitions provides the corps commander with a greatly improved capability to influence the deep battle by fire.

Another ATACMS munition involves the use of smart mines.

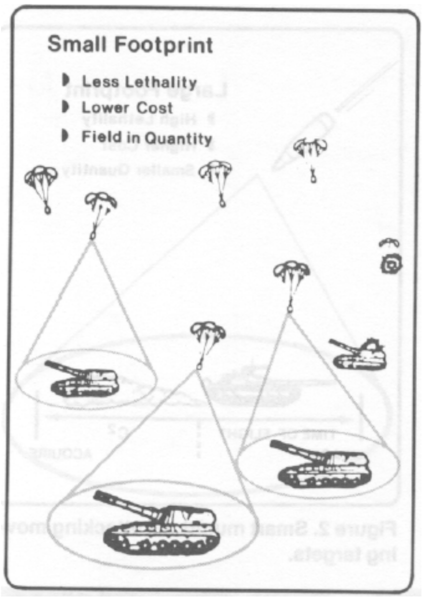


Figure 3. Commanders can use small footprint munitions against sitting targets.

Smart mines initially will consist of a mix of anti-tank and anti-personnel mines. Once on the ground, each smart mine will establish a footprint and will begin searching for targets. The smart mine will engage tanks, other armored combat vehicles, wheeled vehicles, and personnel. After acquiring a possible target, the mine fires a type of small footprint into the air. The submunition then activates a seeker which allows it to sense the target and to attack from the top with an explosively formed penetrator. Eventually, ATACMS-delivered smart mines could have the combined capability to use top attack submunitions and bottom attack submunitions.

MLRS launched smart munitions add a third dimension to the AirLand Battlefield. This fills the gap between conventional munitions, which require multiple rounds and a long time to achieve a given level of effects, and nuclear weapons, which achieve great effects in a short period of time. Smart munitions enable the commander to influence the battle using rapidly employed, highly lethal systems without being forced to a nuclear decision.

Until we can develop a universal brilliant munition, we will need to be able to attack targets with a mix of large and small footprint munitions. MLRS rockets and tactical missiles will need large footprint munitions to destroy moving armored targets. These targets may be tanks which are closing fast in the vicinity of the forward line of own

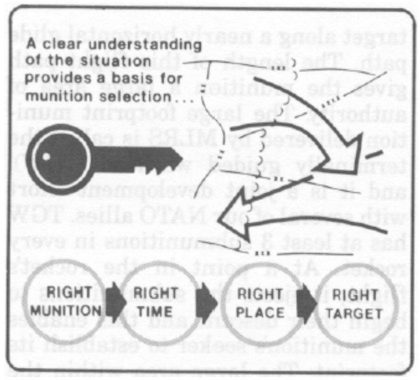


Figure 4. Smart munitions will select targets based on the commander's input.

troops (FLOT), or moving battalion-sized columns of armored vehicles which are still far from the FLOT. Similarly, we'll require the special function of the small footprint SADARM and possibly ATACMS-delivered mines to attack lighter armored vehicles. These targets may be enemy fire support assets such as artillery and air defense weapons, or command and control (C^2) facilities. At greater ranges, small footprint munitions will attack assembly areas, and in coordination with large footprints, will channelize and disrupt the movement of follow-on forces to defeat the opposing commander's plan of commitment.

Employing Smart Munitions

There are 2 important employment considerations for smart munitions. Leaders must make the decision to employ large footprint munitions in consideration of cost constraints. Large footprint munitions are the most efficient munitions in terms of lethality, but they will be costly and available only in limited numbers. For this reason, Redlegs must control TGW and ATACMS munitions carefully. On the other hand, smaller footprint munitions will cost less and should be available in larger numbers than large footprint weapons. The key to success with MLRS smart munitions is being able to choose the right munition for the right targets, at the right time and in the right place. The destruction of these targets will give us the highest payoff in terms of

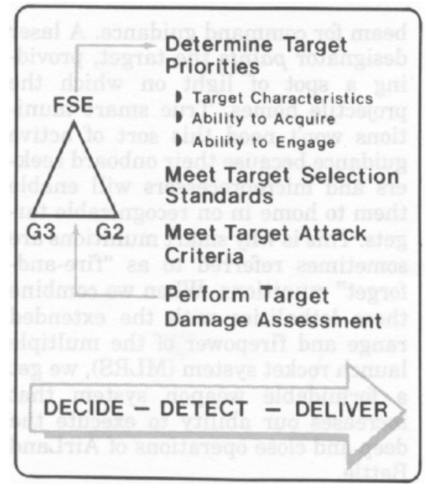


Figure 5. Smart munitions use the decide, detect, deliver approach to targeting.

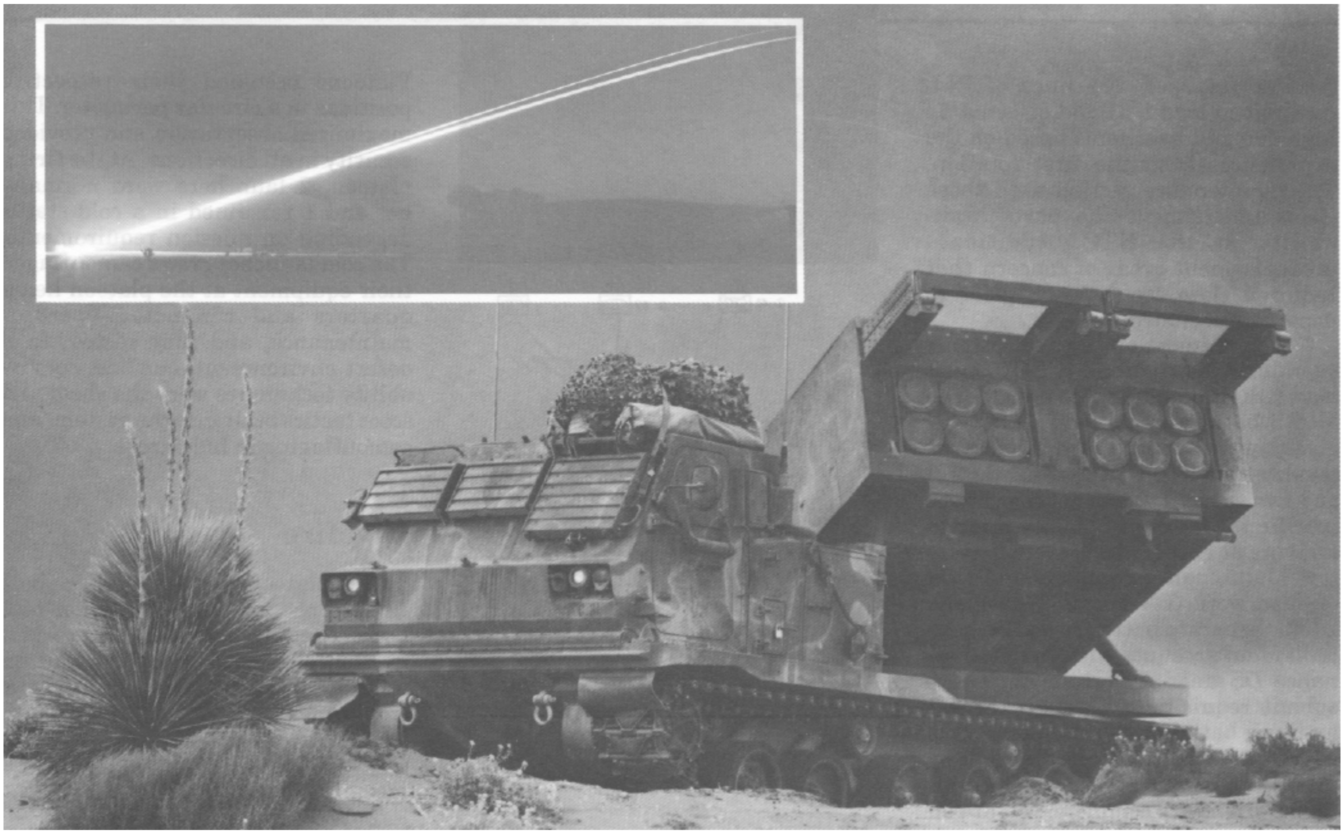
degrading the enemy's capacity to execute his plan.

A method of targeting for smart munitions is the *decide, detect, deliver* approach. The decision stage involves selecting the most relevant enemy targets based on a given situation; deciding who can best locate and acquire these targets; and then determining how to conduct the target attack. The detection process involves the allocation and tasking of target acquisition systems such as the remotely piloted vehicle (RPV), and the joint surveillance and target attack system (JSTARS), Finally, the delivery stage includes the actual attack of the target and an assessment of the results of that attack. The effective use of this methodology allows the commander to retain his smart resources until the critical moment when he can play his "ace."

Conclusion

We recognize that the search for the ultimate weapon is far from over because we may never find the silver bullet. However, we are convinced that a family of MLRS smart munitions brings a leverage to the battlefield that has not been available short of nuclear weapons. The combination of smart munitions and MLRS gives the Field Artillery the capability to attack and kill more threat systems with fewer launch platforms, in a shorter time, using less ammunition, than ever before.

Mr. Bill Rittenhouse is a Field Artillery concepts specialist in the Concepts and Studies Division, Directorate of Combat Developments at the US Army Field Artillery School at Fort Sill, Oklahoma. He is a major in the USAR, and he is a graduate of the Command and General Staff College.



MLRS in the Desert

by Captain Calvin J. Turner

On 20 October 1986, Field Artillerymen from Battery A, 92d Field Artillery (MLRS), 2d Armored Division began supporting the maneuver forces at the National Training Center (NTC) with an artillery punch capable of engaging targets deep behind enemy lines.

Another platoon from Battery A returned to the National Training Center to support the March-April 1987 rotation exercise DEEPSTRIKE 87. Using the lessons learned from both deployments, the NTC has become a catalyst for improved home station training and for integrating general support fires into the overall fire support system.

Organization

Although only 1 firing platoon was deployed for the 1987 exercise, the battery committed a major portion of its headquarters platoon to sustain the firing platoon for the duration of the exercise. Representatives from the following sections participated in DEEPSTRIKE 87.

- Maintenance
  - 27M missile maintenance contact team (E Co. 124 Spt Bn)
  - Automotive maintenance contact team (D Co. 124 Spt Bn)
  - Recovery (M88A2)
  - Float Launcher
- Supply
  - Mess
  - Petroleum, oil, and lubrication (POL—class III bulk and packaged)
  - Ammunition
- Survey/PADS
- Air defense artillery (ADA) stinger team (2-5 ADA Bn)
- Battery fire direction center (FDC)(FDS)

The battery headquarters platoon provided command and control over the firing platoon and combat service support (CSS) sections. The headquarters' responsibilities also bilities also included establishing close coordination with the division artillery (DIV ARTY) tactical operations center (TOC) and providing a digital communications link with the direct support (DS) artillery's fire direction center (FDC).

Preparation

The NTC artillery package (1 DS battalion, 1 DS battalion operations and intelligence (O&I) section, 1 reinforcing battalion O&I section, a DIV ARTY TOC cell and the MLRS battery) conducted several command post and field training exercises at Fort Hood to solidify standing operating procedures. They also conducted crew drills to build a well-coordinated artillery team for the NTC. Prior to deployment they performed thorough checks and services on all launchers to ensure they would be ready for 2 weeks of hard use in the California desert. Additionally, the battery commander reviewed 201 lines of PLL (prescribed load list) and selected 54 high demand line items based on the experiences from the first rotation. The maintenance section used these items to augment the parts availability at the NTC. Additional predeployment areas of concern that required close coordination prior to departure included:

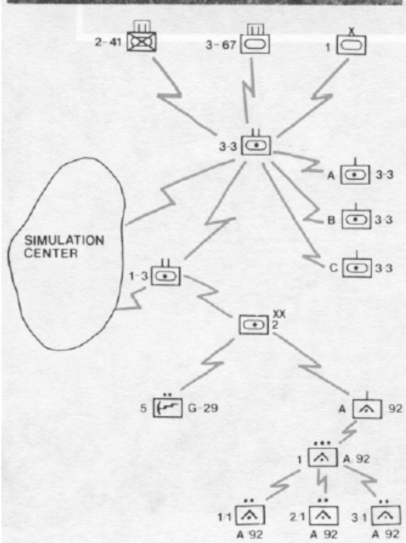
- Communication and electronic operator's instructions (CEOI) must have 2 digital and 2 voice nets for the MLRS battery or platoon. NTC will give you a standard gun battery or cavalry squadron CEOI with 1 digital and 1 voice net if you do not coordinate specific MLRS requirements prior to arriving at Fort Irwin.
- Maintenance channels and flow of paperwork (DA Forms 2765-1 and 2406). Separate batteries do not have individual accounts with the maintenance DS unit at Fort Irwin. Units submit requisitions through the DS artillery battalion maintenance shop which requires close coordination by the MLRS motor sergeant. Once all preparations are complete, you are on your way. A highly motivated tactically proficient opposing force, a professional team of observers-controllers, and a vast desert of realistic distances and challenging terrain await you at the National Training Center.

Force on Force

Force-on-force operations are the most realistic, all-out training exercises you can imagine! The platoon supported a movement to contact, defensive operation, and a counterattack in a general support role firing 27 fire missions. The DIV ARTY TOC was the controlling authority for the MLRS battery FDC and firing platoon. It also established a communications link with the NTC fire support officer (FSO) at the simulation center. The operation exercised the following concepts of employment:

Reconnaissance

The advanced parties of both the headquarters and firing platoon conducted individual ground reconnaissance selecting positions 5-10 kilometers apart. During the first rotation, the selected launch areas did not help firing due to intervening crests and masking limitations. Proper position selection during advance party operations is very important and leaders should emphasize it when training. The advance party based their operation on Field Circular 6-60, but 1 platoon leader included a launcher with his advance party to exploit the MLRS range capability and to engage several deep high-payoff targets early in the attack. This idea paid off when the self-propelled launcher-loader chief received a fire mission when the crew was about 8 kilometers from the platoon position. With survey control updated, the launcher conducted an emergency fire mission firing 6 rockets with multiple aim points on the target with extensive damage.



Force-on force communications channels

Survivability

The most noted limitation of the system in a desert environment was survivability. In selection of a firing platoon position, the commander must carefully analyze the terrain to maximize reverse slopes and slight inclines, and to minimize masking. The unit's practice of camouflaging hide areas as well as all support vehicles while maintaining as much dispersal as possible assisted in avoiding detection. In the battery headquarters platoon position, the first sergeant used the M88A2 to dig fighting positions for all vehicles and personnel. This enhanced overall survivability and hardened the position.

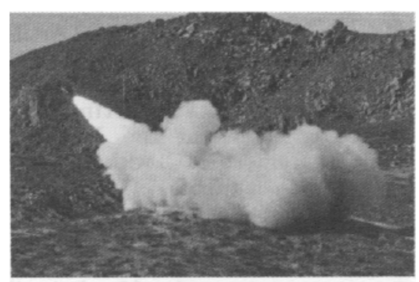
Platoons occupied their respective positions in a circular perimeter. This maximized observation and provided security in all directions. At the firing platoon, 2 launchers were normally hot and 1 remained in a cold status depending on mission requirements. The cold launcher crews camouflaged their equipment at the platoon headquarters and conducted operator maintenance, and they rested. In a desert environment, our best survivability techniques were the shoot and scoot tactics built into the system, and camouflaging in hide areas.

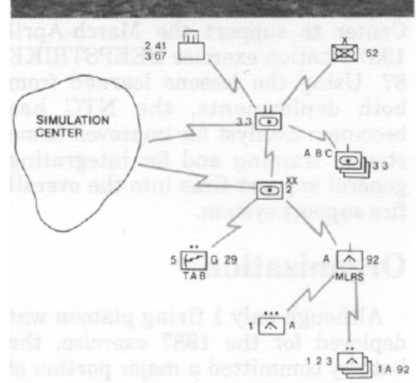
Livefire

The platoon participated in both livefire phases, 1 per battalion task force. They fired a total of 18 rockets in support of each task force and the unit used the following concepts of employment.

Safety

The only livefire training simulation the unit experienced was the prohibition on overhead firing. When they used Field Circular 6-60 safety procedures at the first deployment, operations proved to be slow and cumbersome. During the second rotation, the NTC brigade FSO established revised safety parameters which allowed the platoon to fire into safety boxes or target areas of interest (TAI).





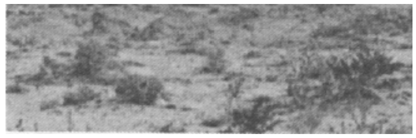
Live fire communications channels.

This significantly increased the unit's responsiveness by permitting them to precompute safety data. The battery FDO posted the TAIs. The check launcher computed the safety data to each appropriate TAI and the FDC made a safety-T for each launcher section chief. This increased the responsiveness of the system immensely.

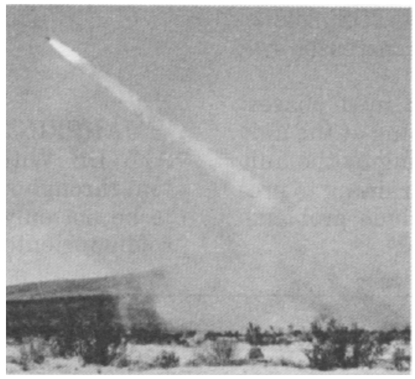
Positioning

During the first rotation, poor position selection resulted in launchers that could not fire over frontal masks. To preclude a recurrence of this problem, leaders stressed position area requirements in training. During the second rotation, the platoon leader relayed the firing point locations to the battery FDC before the main body arrived. The fire direction officer then conducted a down range mask check. These procedures eliminated further masking problems. MLRS battery leaders positioned their crews well forward to exploit their extended range throughout both exercises.

During the night defense the platoon leader coordinated a rearward passage of lines with the maneuver task force scout platoon leader. The requirement to coordinate closely with maneuver units in the live-fire area reinforced a good understanding of the complexity of fire support coordination from both maneuver and artillery viewpoints.



The headquarters platoon in a circular defensive position.



An MLRS launcher engaging targets during day-defensive phase of live fire.

Missions

The platoon participated with both task forces in the day and night defense operations and counterattack, firing a total of 30 rockets. Normally, the operation called for MLRS in the counterfire and deep target role. However, during the second counterattack exercise, the platoon massed fires with the DS artillery battalion to add weight to the fires and to help blunt the opposing forces attack. The DIV ARTY intelligence officer aggressively templated OPFOR maneuvers derived from his own predictions as well as from reports of company FSOs on the battlefield. They established timelines and enemy rates of march which permitted FSOs to trigger operations.

Conclusion

This has been an overview of Battery A, 92d FA's first and subsequent deployments to the National Training Center. With these invaluable experiences, A-92 is anxious to deploy with HELL'S FIRES during DEEPSTRIKE '88. With the awesome firepower and mobility of the multiple launch rocket system providing both depth to the battlefield and high bomb damage, the Field Artillery's punch against the OPFOR is devastating.

Captain Calvin J. Turner, FA, is the commander of Battery A, 92d Field Artillery (MLRS), 2d Armored Division, Fort Hood, Texas. Captain Turner received his commission from ROTC at Prairie View A&M University. He graduated from the Field Artillery officer basic and advanced courses. His previous assignments include battalion ammunition officer, fire direction officer, battery executive officer, and fire support officer. He also served as the operations and plans officer, S-3, and commanded an M110A2 firing battery.

Fragments

FROM COMRADES IN ARMS

Manprint and AFATDS

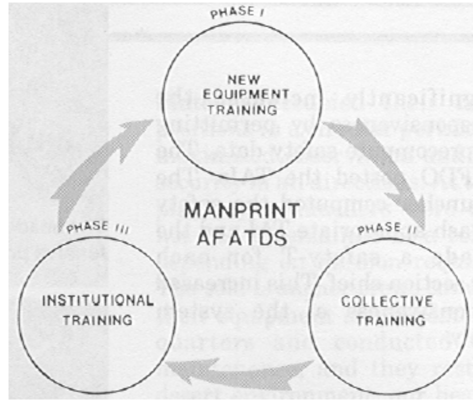
The advanced Field Artillery tactical data system (AFATDS) is the projected replacement system for the tactical fire direction system (TACFIRE). Although still in the conceptual stages of its development, AFATDS will profit by a new program that ensures the system meets the Army's needs—rather than Army's needs meeting the system capabilities. These new analysis packages are known as manpower and personnel integration or MANPRINT, and Hardware versus Manpower or HARDMAN.

MANPRINT is a program designed to identify and address the human side of system development. It seeks to deal with human factors, manpower, personnel, training, system safety, and health hazard considerations throughout the material acquisition process. The net result should be that equipment does what it is supposed to do when placed in the hands of soldiers. HARDMAN is basically a comparability analysis that uses similar existing systems to project the impact on manpower, personnel, and training of proposed systems,

The initial MANPRINT assessment suggests that AFATDS will decrease the manpower required within the Field Artillery structure. Most artillery commanders will use smaller command posts but fire support elements at brigade and higher levels will increase in size. Maintenance and other support requirements will not change the existing maintenance structure. The HARDMAN analysis generates some significant human factor goals. AFATDS will provide simple operations through easily used input features such as:

- Menus and prompts.
- Automatic precedence override and alert features.
- Accessible operator controls. With all of the human engineering associated with AFATDS, soldier performance should improve and this increases system effectiveness.

Soldiers will train for the system in 3 phases: Phase I includes new equipment training at the unit level. Phase II is unit collective training by the unit itself. Phase III will be institutional training to provide individual sustainment to preclude problems from personnel turnover.



MANPRINT is having a tremendous impact on AFATDS. With this continuous analysis of the system throughout its development, AFATDS promises to be not only technologically advanced but also a soldier-oriented system that will do the complete job.

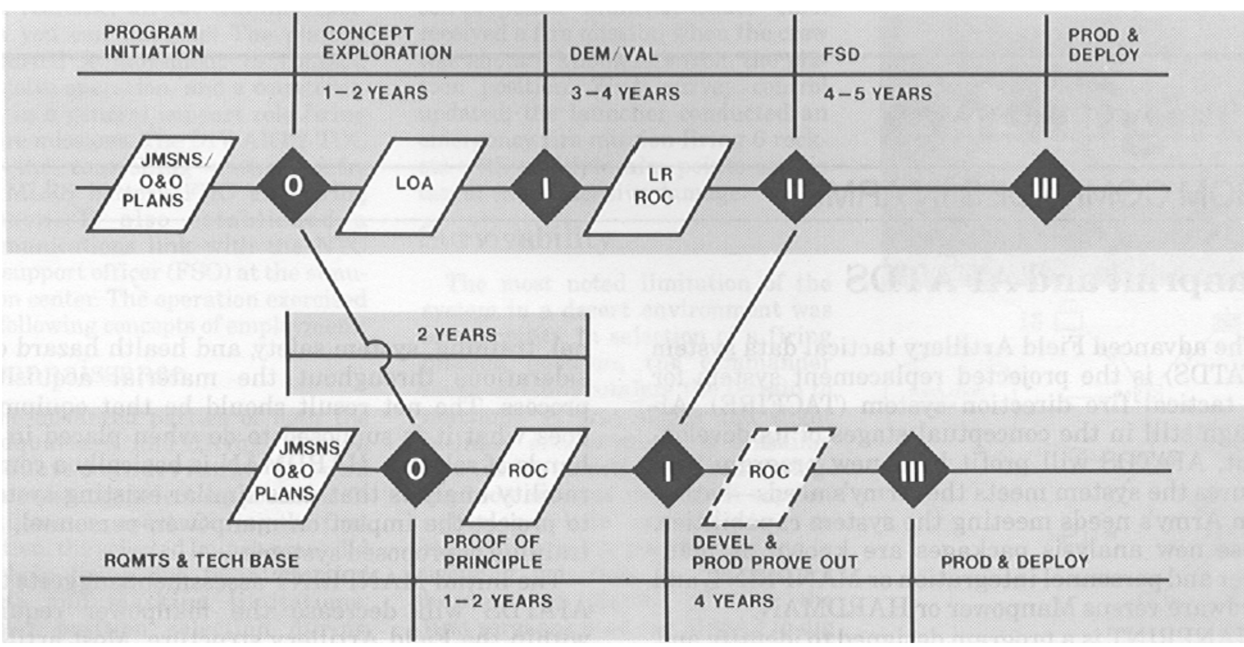
Army Materiel Command Acquisition Initiatives—The Tailored Development Cycles

The Army Materiel Command (AMC), recently instituted a promising new acquisition initiative that will have an impact on the Field Artillery. The Tailored Development Cycle program seeks to streamline materiel acquisitions and identify critical technologies which can give the US Army a winning edge on future battlefields.

The Tailored Development Cycle really is not new, but it is a new idea to apply it across the board for all acquisition programs. The AMC's goal is to complete all development efforts in 4 years. The Command's leadership also seeks to reduce dramatically the time from definition of need through initial fielding.

The US Army Training and Doctrine Command (TRADOC) selected Fort Sill as the testbed for the process. The information gathered at Fort Sill helped refine the process and prompted TRADOC's leaders to set an objective date of May 1986 for command-wide implementation of the overall program.

All systems currently in development at Fort Sill fall under the tailored development process. The diagram below depicts the old and new systems. Of particular significance is the condensation of the old concept exploration and demonstration validation phases into a single proof of principle step. This act alone significantly reduces development times and gets equipment into the hands of Redlegs sooner.



Acquisition process comparison chart.

Advanced Medium Range Air-to-Air Missile

The advanced medium range air-to-air missile (AMRAAM) program began in November 1975 when personnel in the US Air Force, US Navy, and US Marine Corps formed a requirement working group. A threat study determined the requirements of the next generation, radar-guided air-to-air missile which would replace the AIM-7 Sparrow. Under a NATO agreement of April 1978, the US is responsible for developing the AMRAAM, while the United Kingdom, Germany, and France (in special observer status) are developing the advanced short-range air-to-air missile (ASRAAM, AIM-132). The AMRAAM will replace the AIM-9 Sidewinder.

Crews of the F15, F16, F14, F18, Tornado and other developmental aircraft will use the AMRAAM. It is an all-aspect, all-weather, look-down, shoot-down air-to-air missile.

AMRAAM's combat superiority comes from its new guidance system, a combined command homing process. The crew in the launching aircraft feed the target's coordinates into the missile. The missile guides itself to the target, but the pilot can update the target's location by data link. Once the missile gets close, it relies on its inertial guidance system as its active seeker guides it to the target. The length of each phase, type of guidance used, use of the active or home-on-jamming mode, and the selection of targets is determined by the missiles themselves. Crews can launch up to 8 missiles simultaneously at multiple targets. The AMRAAM's active radar seeker allows the launching aircraft to "fire-and-forget" and maneuver away, if necessary. AMRAAM can pick its own targets and ensure no other missile has the same target when fired at a target cluster. Additionally, its active radar seeker can detect some stealth targets such as cruise missiles.

Current plans call for 24,504 missiles for the Air Force and Navy at a cost of $10.5 billion. The per-round cost, $473,000, has been a major problem with the program, but successful testing continues to move the program ahead.

FOGM Testing

CANOGA PARK, CA—Hughes Aircraft Company's Missile Systems Group (MSG) has developed a new type of solid state infrared (IR) sensor, believed to be the first such device packaged for a tactical missile seeker.

Because of its built-in simplicity, this pioneering IR sensor which uses a focal plane array (FPA) promises to lead the way to a second generation of lower-cost IR missile seekers for US armed forces.

The IR seeker, the Army's first infrared missile seeker that can fly, will undergo testing as part of the US Army Missile Command's (MICOM) fiber optic guided missile (FOG-M).

The IR seeker uses a sensor of a single platinum silicide hybrid FPA chip consisting of 65,536 tiny IR detectors in a mosaic of 256 across and 256 down. The individual detector signals are multiplexed into a video signal that is displayed to the FOG-M gunner on a standard TV display.

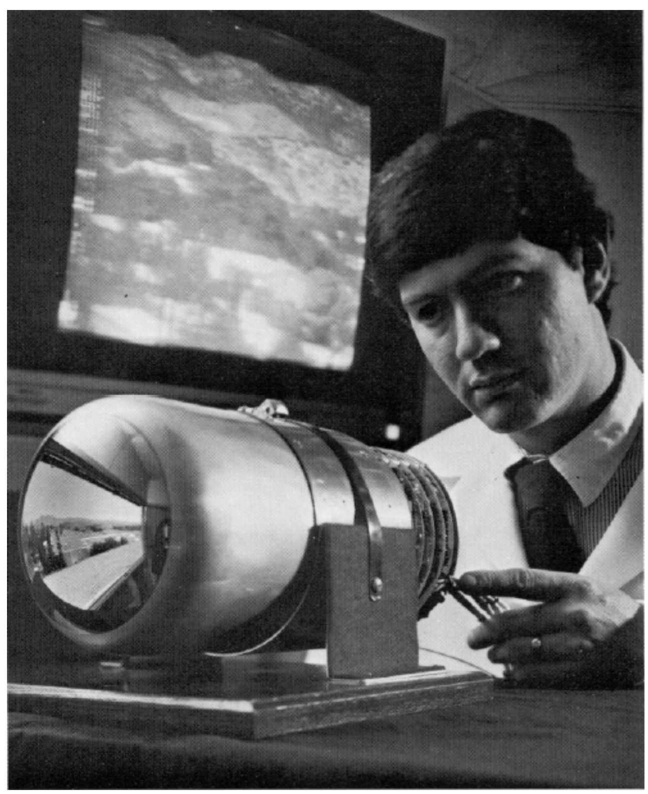
"A change to solid-state scanning of the IR imagery is a major reason for anticipated cost reductions in the next generation seekers," said R.A. Aguilera, MSG's FOG sensor program manager.

"Current IR sensors use an optical scan mirror to allow a small number of considerably larger infrared detectors to sample incoming scene information," Aguilera explained.

"With the help of Hughes' Industrial Electronics Group, we have developed a single large-scale integrated (LSI) circuit, called an FPA, with more than 65,000 detectors.

"This LSI chip allows us to simplify the signal processing electronics and the sensor's optical system by eliminating the scan mirror. This means fewer parts, and, therefore, lower costs in production," Augilera said.

MSG provided the IR sensor package to Southern Research, which put it into an existing TV seeker gimbal that was developed by the research institute for an earlier FOG-M version. MICOM will install the completed seeker in the FOG-M by MICOM.



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