FIELD ARTILLERY JOURNAL

January-February 1976

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The *Field Artillery Journal* is published bimonthly at the US Army Field Artillery School for the same purpose stated in the first *Field Artillery Journal* in 1911:

> ***"To publish a Journal for disseminating professional knowledge and furnishing information as to the field artillery's progress, development, and best use in campaign; to cultivate, with the other arms, a common understanding of the powers 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."***

Funds for the printing of the publication were approved by the Department of the Army, 1 September 1973.

All articles and information submitted are subject to edit by the *Journal* staff; footnotes and bibliographies will be deleted from text due to limitations of space.

All letters and articles should be addressed to Editor. *Field Artillery Journal*, PO Box 3131, Fort Sill, OK 73503. AUTOVON 639-5121 or Commercial (405) 351-5121.

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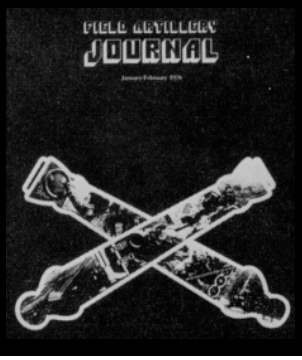

This month's cover was designed by SP5 Linda Jeleniewski nee Hensley, the Journal "cover girl." We got the idea from the 14 November 1975 issue of the Berlin Observer, the authorized, unofficial newspaper of the Berlin Command and the Berlin Brigade. Our thanks to them and their fine publication.

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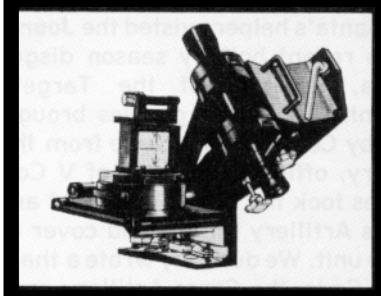
Articles

Features

pg. 27



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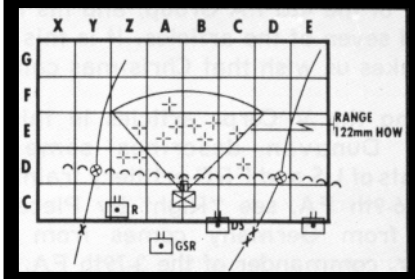
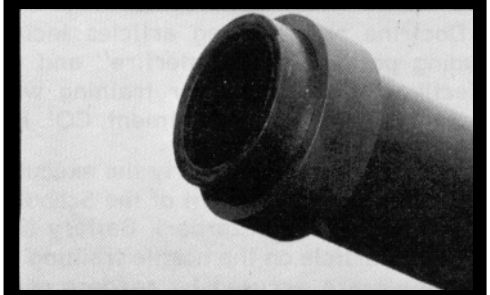


pg. 32

pg. 46



pg. 54

a word from the editor

One of Santa's helpers visted the **Journal** staff early during the recent holiday season disguised as COL Don Rhea, Director of the Target Acquisition Department. The bag of goodies brought back from Germany by Colonel Rhea came from the real Santas of this story, officers and men of V Corps Artillery. The goodies took the form of some 13 articles written by V Corps Artillery literati and cover many aspects of that fine unit. We dutifully wrote a thank you note to BG Alfred Cade, the Corps Artillery commander, but we also owe thanks to COL Dwight Wilson, commander of the 42d FA Group, and his men who contributed seven of the articles. It is this kind of spirit that makes us wish that Christmas came every day.

Among the V Corps articles in this issue, CPT Robert Dunavan describes some interesting highlights of US and FRG artillery training conducted by the 6-9th FA, see "Right By Piece." The other article from Germany comes from LTC Wilson Shoffner, commander of the 3-79th FA, a Lance battalion. His article "The Time Has Come," includes an interesting view of Lance tactics.

The Lance is also the subject of MAJ Richard Stroud's article, "Green Ball." Rick, the executive officer of FAMSEG (See May-June 1975 **Journal**), discusses the new Lance sight under development.

The editor of the FRG publication **Soldat und Technik** has given us permission to reprint an article of theirs on the new 155 howitzers being developed by the FRG, Great Britain and Italy. The article was translated by LTC Dobbert, the German Liaison Officer to USAFAS.

Doctrine and training articles include the concluding portion of "Counterfire" and an article on effective forward observer training written by the head of the Gunnery Department, COL Paul Pearson.

CPT Lee Baxter, formerly the executive officer to the assistant commandant of the School and now the commander of the Razorback Battery (A/1-17th FA), wrote the article on the hostile training environment. Before we are accused by readers of living in the "ivory tower" of field artillery academia, we know that stating that the training environment is hostile will not come as a surprise to Redlegs serving in troop units. We are planning to follow Lee's article with a series of articles written by FA commanders who have managed to overcome the hostile environment and conducted meaningful training.

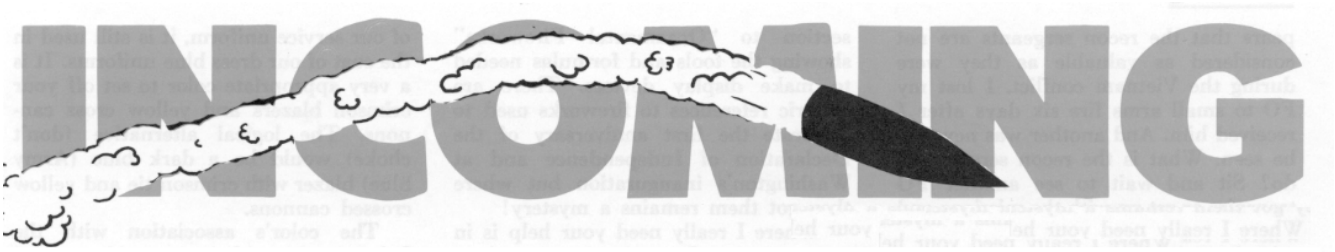
COL (Ret) R. O. Embree, recently retired from the Army Wide Training Support Department, brought Mr. Fred K. Vigman's article "Field Artillery After WWI" to our attention. As the letter from the then commandant indicates, it was at one time required reading within the School. It accompanies our continued monograph series in the historical vein.

The Field Artillery School was the recent recipient of a bicentennial artillery plate sent by COL Bill Schneider, commander of the 25th Division Artillery.

The plate was designed by Mrs. Peter J. Hino and the manufacturing and production was arranged by Mrs. William E. Carlson. Both women are wives of former 25th Div Arty commanders. Twelve inches across, the plate has the appearance of pewter but is stronger and more durable. Redlegs interested in obtaining a bicentennial artillery plate may do so by writing "The Friends of the Tropic Lightning Museum," a nonprofit organization. The price of the plate including shipping costs is 15 dollars and checks or money orders should be made out to the Tropic Lightning Museum, Schofield Barracks, Hawaii, APO San Francisco 96558.

Enjoy your **Journal!**

editor



letters to the editor

Rebuttal

It was kind of you to reprint my article about the Yom Kippur war in your most interesting *Journal.* I hope it may have proved stimulating for your readers.

However I would like to stress that the views expressed were not my views, as you suggest in your editorial remarks. They were Israeli views. I wrote as a reporter of those views and deliberately made no comment on those opinions. I hoped that I had made that plain in the test.

For what it's worth my own views are that Artillery has two roles. They are:

a. In defence to destroy the impetus of the enemy's attacks before he can come to grips — the Archers at Agincourt; Mercer at Waterloo; the guns at Gettysburg; FPF today: light, medium and heavy regiments and regiments of Air Defense. This may call for concentrations at the expense of absolute close support.

b. In attack to prevent the enemy from bringing his weapons to bear — any war you like, rapid impromptu support, counter bombardment and smoke to taste. This must call for intimate and close support.

Thus the two roles each call for a slightly different response. Artillery must however be just as capable of both responses as any army must be capable of both roles.

I hope that this will reassure your readership that I am, in truth, quite a respectable artilleryman after all.

T. L. Morony, O.B.E.
MG, Director Royal Artillery
Woolwich, England

The editorial remarks General Morony refers to are contained in the editor's page of the September-October issue. We indicated that the "author takes somewhat differing views. . . ." Presents would have been a more accurate word than takes.—Ed.

Greatest Gun

I have found your article on "The Greatest Gun" (May-June 1974) and letters pertaining to this article of great interest. I would like to confirm the information you obtained from the Morris Swett Library which attributed the photo's to a Major Busbe. His full name was Charles M. Busbee Jr., who is now deceased. At the time of the photos in early 1948, he was assigned to the 91st Field Artillery Battalion in Weiden, Germany, very close to Grafenwoehr. His wife also appears in the photos. Busbee was assigned to the Field Artillery School following his return from Germany. He attained the grade of colonel prior to his death.

I enjoyed every issue of your fine publication and I am impressed with the variety of interesting articles appearing in each issue.

Richard C. Tuck
COL, USA
HQDA

Recon Sergeants

I am writing in the behalf of the lost generation of recon sergeants. Interesting? Not nearly as much as it is to sit back and watch the Field Artillery progress so tremendously fast that the recon sergeants of the forward observer teams have been lost in the shuffle.

I spent two consecutive tours in the Republic of South Vietnam and a four-year tour in Europe as a recon sergeant. I was a graduate of the Fort Sill Artillery Combat Leadership Course in 1969. This was the last time that I was to come in contact with a course designed to teach the intricacies of recon sergeant duty. Time and again I have heard the muffled pleas of the forward observer, ". . .if I only had a trained recon sergeant."

Today's artillery is vast and technical and the branch qualifications of the forward observer are many. They remain an observer for a very short time and usually only during the very beginning of their careers. Some of us 13Es have spent years working out the best systems to make an FO team the best that we have to offer with little or no school training behind us.

In going through a battalion ORTT with my unit in October 1975, I found that everyone was surprised to find out that the recon sergeant could do anything that the forward observer could do. And I had already accumulated over six and a half years of experience doing just this one thing.

You ask, "What is there for a recon sergeant to do?" Let me emphasize that observations are not the only function of an OP. There is intelligence gathering, construction of alternate OPs, blocking fires to plan with the supported commander, defensive targets, illumination of enemy positions and self-illumination for an attack, communications, map reading, small weapons, maintenance of equipment and many other areas.

When I talked with several officers and OICs of the school system, it appears

Our apologies to LTC James B. Lincoln, the commander of the 1st Battalion, 6th Field Artillery at Fort Bragg. We managed to misspell his name three times in a letter in our November-December issue. LT Dave Long (still in the front leaning rest) wanted to know if he could make up in consistency what he lost in accuracy. We doubt it.

Also to the spooks in the Kremlin Order of Battle Section who have been tearing their hair and working overtime to locate the 818th Pershing Battalion (see "Right By Piece" November-December) you can forget it, that was also a misprint. It should have been the 81st FA. —Ed.

that the recon sergeants are not considered as valuable as they were during the Vietnam conflict. I lost my FO to small arms fire six days after I received him. And another was never to be seen. What is the recon sergeant to do? Sit and wait to see another FO transpire or get on with the missions and provide the fire support capability that schools and OICs are forever talking about during indoctrination exercises?

I guess that I, too, must fade from the picture but when the next conflict arises I'll bet I'm one of the first to be found and brought to the FO team to work out. But what about all the other FOs? Where will their trained recon sergeants come from? Who will give them the training that can only be taught from the experience factor?

The recon sergeant isn't dying in the Field Artillery — HE'S DEAD!

James S. O'Loughlin
Recon SGT
2d Bn, 18th FA
Fort Sill, OK

Fireworks!

For many months I've been doing some extensive research on a very elusive subject. . .the history of fireworks in America! Although the evolution of pyrotechnics in Europe has been covered in a number of books, no coherent story on the subject has ever been written about the art and tradition in our own country.

Since fireworks were unknown to our native Indians, it's obvious that fireworks reached America through the early explorers and settlers, but no one knows when. The best evidence indicates that early displays seen on our shores were provided by the military as was the custom in England long before private manufacturing began. From about 1572 to 1856, it was the custom to have the ordinance department provide victory and ceremonial displays and it is said that Siemienowitz's *Great Art of Artillery* (translated into English in 1729) served as an instruction manual for fireworks specialists known as firemasters, fireworkers, master-gunners, etc.

The earliest record of a fireworks display in America was in 1702 in the Virginia colony put on by "men from the warships." Later ordnance manuals published here about 1860 devoted a section to "Ornamental Fireworks" showing the tools and formulas needed to make display devices. There are historic references to fireworks used to celebrate the first anniversary of the Declaration of Independence and at Washington's inauguration but where they got them remains a mystery!

Where I really need your help is in trying to prove that ordnance manuals in use in America before and after the revolution included some instructions for making and displaying such items as rockets, candles, fountains, flares, etc., for peaceful displays. Can you possibly help me by identifying the earliest manuals in use by our military forces or suggesting a source for more data on this? Many thanks!

The Field Artillery Museum suggests dropping a note to the US Army Military Research Collection, Carlisle Barracks, PA, 07013.—Ed.

Ray H. Anderson
Barrington, RI

Review

The opportunity of contributing a book review to the Field Artillery Journal is very much appreciated. Hopefully, the enclosed review of *From Crossbow to H-Bomb* is acceptable.

Since 1975 has been declared the "Year of the NCO" in many commands, I am indeed pleased to render this review. The *Journal* is a forum for all ranks; all ranks should in turn offer their talents to your effort to disseminate professional knowledge.

If in the future you have more books than reviewers, I would be happy to review other books.

Robert R. Cordell
SSG, USA
NATO Liaison Office
Turkish General Staff

See book review, page 59.—Ed.

More Ties

If you will permit a user of your branch's services to comment on your artillery tie controversy of the September-October, January-February and May-June 1975 issues, I would like to offer the following observations. Dark blue is the "national color" used in both the uniforms of the Army and of the Navy from the Revolutionary War down to today. While it is no longer the color of our service uniform, it is still used in the coat of our dress blue uniforms. It is a very appropriate color to set off your crimson blazers and yellow cross cannons. The logical alternative (don't choke) would be a dark blue (Army blue) blazer with crimson tie and yellow crossed cannons.

The color's association with the Infantry is with our guidons and organizational colors. Dark blue was used here since the infantry regiment was originally the only color-bearing organization of our Regular Army — artillery and cavalry (dragoons) being originally organized as separate companies. If your tie were white or light blue your readers might have a case for irritation, but dark blue has a longer heritage with all elements of the Army than it does with the Navy.

Your magazine is excellent and, while I'm many times removed from being an original recipient, I find it professionally well done and informative.

Donald M. Buchwald
LTC, INF
Commanding
1st Bn, 1st Inf
West Point, NY

FA Indirect Influence

These days we rely on the computer more and more for answers — answers to all kinds of questions. People have begun to call computer-generated numbers "hard data," and any conclusion or judgment not supported by hard data is termed a "gut feeling." Computerized studies are being used more often to decide what kind of weapons to build and what kind of tactics to use. Computers, and the people who operate them, can be a great help in speeding-up the arithmetic of weapon design or war-gaming. But unlike the computer, war is by nature unpredictable, confused and horribly inefficient. When interpreting the predictions resulting from a computer war-game, it is important to remember what the numbers do represent — and what they do not represent.

In the past few years I have seen many reports of those formal studies. All of them narrowed the scope to make the problem manageable and many ignored some very important parameters which could not be comfortably quantified. One such parameter might be called "the indirect influence of field artillery," which deserves a short discussion.

The direct influence of field artillery is the obvious effect of an exploding shell; if it hits close enough it tears up equipment and kills or wounds people. That is a positive, direct and very real threat — both to the individual soldier and to the unit.

The indirect influence of field artillery is the impact that this threat has on enemy tactics. Simply stated, it causes the enemy to disperse — to spread out. In basic training, recruits are admonished to "Spread out! One shell would get all of you!" That threat, that influence, is common to artillery, mortars and air power. All three make it advantageous to disperse units, personnel and equipment within the unit, so that it would take phenomenal expenditures of artillery (or mortar or Air Force) munitions to cause significant casualties or damage. Thus a commander tends to disperse his forces to lessen the effect of artillery weapons which can achieve a devastating surprise attack, blanketing an area the size of several football fields.

The effect of infantry and armor weapons is virtually the opposite. The need to "mass" or concentrate forces at the critical time and place is a basic tenet of war taught to virtually all soldiers. That is, to win a battle or achieve a breakthrough requires a commander to achieve a greater mass, concentration or density of infantry and armor weapons than his opponent, all other factors being equal. The dilemma is obvious. The commander must, on the one hand, disperse his forces to survive the artillery fire. On the other hand, he must concentrate his forces to overwhelm the infantry and armor in order to win the battle. That dilemma is not new; it has confounded commanders continuously, in varying forms, since the time of Sun Tsu, and likely will continue.

It may be said that the greatest value of artillery is its ability to prevent the enemy from massing an overwhelming force — perhaps without firing a shot. That influence exists due to the enemy commander's perception of the threat of destruction. The threat must therefore be demonstrated to him occasionally. It is prudent to arrange the demonstration as an integral part of a significant battle.

There are many types of artillery missions which provide a demonstration (kill people) and also influence a battle (disperse and disorganize the enemy). A representative list of missions taken in sequence would be: interdiction (of the approach march), attack of assembly areas (suspected or confirmed), blocking fires (on axes of attack) and final protective fires (to include the barrage). If these missions were rated strictly on the number of casualties or extent of damage caused, they wouldn't be worth firing. In most cases the primary value of every one of those missions is to degrade the enemy's ability to mount a coordinated, organized attack — his ability to mass his forces. The pedestrian barrage is a devastating killer when employed against a dismounted assault. Yet the most important feature of the barrage is that it disorganizes and dissipates the assault; instead of an entire enemy squad approaching each foxhole simultaneously, it is dispersed, arriving in twos or threes. The same effect is seen on a larger scale using blocking fires to choke off an axis of attack before the enemy can get his entire force through; that is, to delay the second platoon or company for as long as possible, even if only a few minutes.

Field artillery has an awesome capacity for incapacitating people and equipment. Infantry and armor have an even greater potential within a division or corps area. Perhaps the main job of the field artillery is to use its own influence judiciously, making it easier for the infantry and armor to win.

It is not possible to accurately predict how well we will accomplish that job for any given battle — however, this influence will continue to be a primary consideration by field artillerymen in the planning and execution of fires; therefore it must be taken into consideration in weapon design and war-gaming.

Wayne Morehead
MAJ, FA
Department of Combat
Development
USAFAS

Permission Granted

This is written confirmation of permission granted to the *Field Artillery Journal* by telephone to reprint the article mentioned in your letter of 25 September 1975, namely "The Theoretical Evaluation of Artillery After World War I," by Fred K. Vigman in *Military Affairs*, Vol. XVI, No. 3, Fall 1952. You will, of course, give full attribution of source in your reprint.

As I am retired from my office at the National Archives I do not have custody of all my former active records and, moreover, am not physically able to go to the archives and research information, so I cannot satisfy your request on biographical data concening Mr. Vigman. My recollection is that he was a civilian who had formerly served in the US Navy and at the time of our correspondence in the 1950s he was persuing his hobby of writing on military topics.

Incidentally, I have noticed over the course of some 40 years that once-individual technical journals become enmeshed in a merger craze and they are merged with other technical journals in the same overall subject area, thereby losing their identity. Years later the cream is skimmed off by the merging group, interest wanes and the individual technical journals creep out of the woodwork to reassert their primary mission — the advancement of the technology concerned. I have in mind the instance of *Army* magazine, formed by the merger of the *Infantry Journal,* the *Field Artillery Journal* and the *Coast Artillery Journal.* The latter was my own service arm, and I was a contributor to and a free lance correspondent of the *Coast Artillery Journal.* I disliked to see it lose its identity, then the *Antiaircraft Journal,* so I am now pleased to see that the Field Artillery is reasserting its own manhood, its own well-earned machismo.

All good wishes for your success.

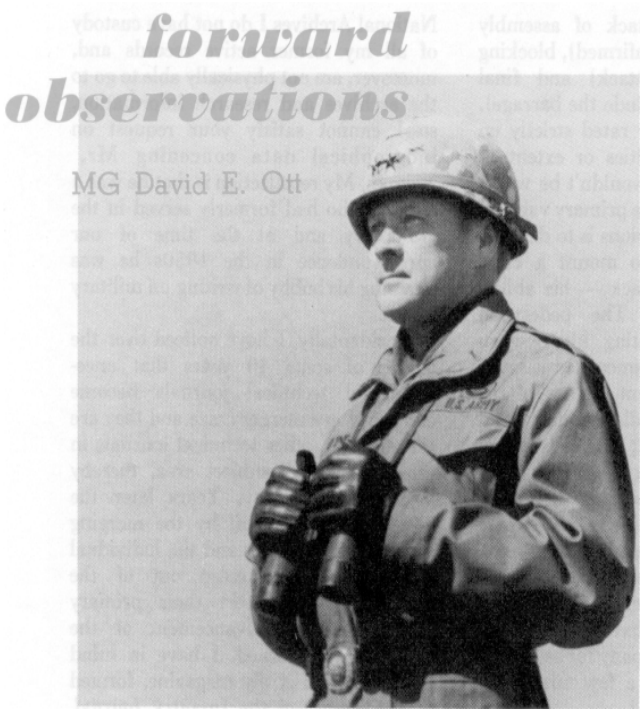
Victor Gondos Jr., Ph.D
COL (Ret), USA
Institute Editor
American Military Institute
Washington, DC

Subscription

I'd hereby like to express my appreciation for your *Journal.* Would you please pass on my name and address to your subscription service in order to place me as a member and let me know the subscription rate.

BG B. Bouman
Commander
1st (Netherlands)
Corps Royal Artillery

Your comments are gratefully acknowledged. Your name and address have been forwarded to the Field Artillery Historical Association.—Ed.



Some time ago, in the *Field Artillery Journal* (see "View from the Blockhouse," May-June 1975) extensive revisions to the FA Officer Advanced Course were announced. Beginning with FAOAC 1-76 in October 1975, the course was reduced to 26 weeks to be conducted in two phases; a technical proficiency phase of 22 weeks and a four-week applicatory phase. In addition, it was announced that a qualification examination would be administered during inprocessing to determine the student's level of proficiency in several critical areas. Those officers failing to meet minimum standards and receiving an unfavorable recommendation from an academic review panel would receive a deferment from the class until the next advanced course.

These changes were necessitated by the nature of the modern battlefield and the resulting need for highly competent battle captains. The current and pending reductions in troop strength, coupled with an austere training environment, were also factors in the above mentioned course revisions.

With the Advanced Course shortened and the continuing requirement for qualified, professional graduates, it was deemed necessary to establish requisite entry level skills for all students. The purpose of these requisite entry level skills was to establish a common starting point for instruction presented in the course.

Field artillery officers scheduled to attend FAOAC 1-76 were notified in advance of the Qualification Examination and afforded the opportunity to order study packets in the following subject areas: communications and electronics, gunnery, target acquisition, tactics and weapons. We were gratified to note that over 98 percent of the incoming students made use of the study packets to verify their entry skill levels.

The results of the Qualification Program and the Qualification Examination implemented and administered to FAOAC 1-76 are in and final. There were 222 US officers tested and all except five officers qualified for attendance. Those who failed to meet the entry level standards have been deferred to the next class and reassigned to other units at Fort Sill.

There was much praise by the members of the class for the study packet. Many officers had been away from the sound of the guns, coming from nonartillery assignments. According to student interviews, the average time devoted to the study packets was 55 hours, indicating that conscientious self-application enabled the students to do well on the examination.

The preceding is now history and we are preparing for the next Field Artillery Officer Advanced Course (FAOAC 2-76). Starting in December, each designee to the class received a welcome letter containing the entry level skills for which he will be required to demonstrate proficiency on the Qualification Examination. The study packet will be automatically mailed to each officer in an effort to attain an even higher level of competency as the students report in for their advanced course.

The positive reaction of FAOAC Class 1-76 to the Qualification Program and the examination stands as an excellent example and standard which we hope future students will choose to emulate, if not exceed.

in search of the illusive green ball

by MAJ Richard M. Stroud

*L*ance missileers, particularly gunners, are about to be relieved of one of their biggest headaches — the frustrating, time-consuming search for the illusive green ball of light. For those whose recollection of their Lance instruction is somewhat hazy, locating the green ball of light reflected by the cant axis mirror of the gunner's sight unit (GSU) with the theodolite telescope is the first of some 75 intricate and lengthy steps involved in laying the Lance missile for direction and elevation.

Thanks to a good deal of research and development, a new, much simplified gunner's sight unit has been proposed. While the old sight unit does the job, the biggest problem is that it was designed to make use of a maximum number of items already in the Army inventory, i.e., the T-2 theodolite and the gunners quadrant. The advantages gained in reduced costs are more than outweighed by the complex procedures resulting from using instruments for purposes which they were not originally designed. (Invention being the mother of necessity, so to speak.) The beauty of the new gunner's sight unit is that it was designed specifically for the Lance system.

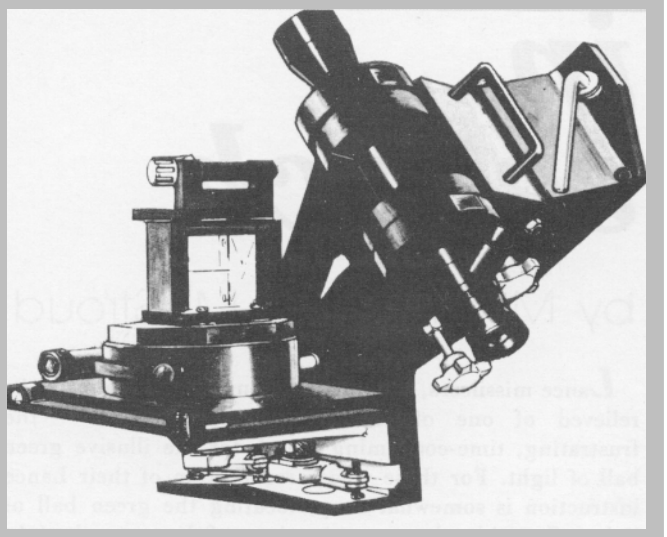
Recalling earlier instruction, we remember that the Lance missile is reciprocally laid for direction like any other indirect fire weapon. Boresighting must also be accomplished; that is, aligning the optical axis of the sight with the longitudinal axis of the missile. This is where the problems begin with the old sight. Because the telescope (theodolite) of the old sight unit rests on a moveable base, the telescope must be aligned with the pivot line or cant axis of the sight unit through a laborious process known as autocollimation beginning with "finding the green ball of

light." Once this has been accomplished, the whole sight unit is aligned with the missile axis, using another mirror, the forward mirror bracket. Once this is accomplished, the forward mirror bracket is removed, the missile elevated and the whole process checked once more using the cant mirror. Now you are ready to begin laying the missile for direction! If you don't think this process is time-consuming and complicated, ask your local Lance gunner.

The proposed new sight unit retains the basic concept for laying (reciprocal lay), but, as mentioned earlier, is designed specifically for the Lance.

On the GSU, a boresighting telescope and a prism are used instead of a theodolite. The unit is designed so that the cant axis coincides with the optical axis of the fixed telescope. The search is over! No cant mirror — no illusive green ball! Because the telescope is fixed, at least part of the reflected image from the forward mirror bracket will always be in the field of view. A quick adjustment of the two sight unit alignment screws will autocollimate the telescope. Also, with the optical axis and cant axis the same, any movement will rotate around that axis during elevation or any other operation and boresighting will be undisturbed. Simply put, autocollimate once, pull the forward mirror bracket and continue the mission with no more checks concerning boresighting. The whole boresighting operation only takes about 40 seconds even with an inexperienced gunner. The laying operation is accomplished using the remote theodolite (RT) and a prism on a rotatable table with a direct reading scale. The micrometer scales of the old GSU theodolite are thus eliminated in favor of an easier-to-read scale. The ordered deflection is placed on the scales by rotating the prism. The gunner then traverses the missile until he is lined up on the RT using a small sighting aid on top of the prism. The rough alignment will put the RT operator's reflected image in his field of view. The RT operator by voice or hand signals orders the gunner to traverse the missile until the RT reflected wedge target image and reticle are superimposed. This procedure is known as autoreflection as opposed to autocollimation where reticles are superimposed. The hand or voice signal to the gunner is not as cumbersome as it sounds. The RT operator is looking at his reflected image; thus, the optical distance is double the measured distance between the two instruments. Therefore, the RT can be placed as close as 17 meters to the launcher and retain the accuracy of the required 35 meters distance from one telescope to the other. Additionally, it is rare for the laying operation to take more than two deflection angles before zero mils.

The simplicity of the new sight unit has additional advantages for several other important operations of the Lance battalion. First and foremost is the fact that reaction time will be reduced. The firing platoon will not have to spend as much time on the firing point to complete the fire



Proposed sight and laying unit is designed specifically for the Lance.

mission. The time for the azimuth lay portion with the proposed sight is slightly less than half the time of the present system. Because of the simplicity of the new sight unit more Lance crewmen can be qualified as gunners, another plus for the unit. It presently takes a capable individual who is willing to work about 80 hours of training to qualify as a Lance gunner. During a recent training session, a Fort Sill Lance unit, 1st Battalion, 12th Field Artillery, was able to train a gunner on the new sight unit with four hours of instruction. This individual had not mastered the operation of the present sight unit and was not used as a gunner prior to working with the new sight unit. These are important improvements and tend to overshadow the fact that the new sight unit is only slightly over half the weight of the present sight; therefore it is easier to handle and is more rugged. This ruggedness allows a further reduction of time at the firing point because the sight is more stable than the present unit. Using the old sight, all movement on the launcher must stop to aid the gunner in finding the green ball of light during boresighting. Using the new sight, movement on the launcher does not disturb the gunner. This allows simultaneous operations during missile preparation not possible now.

The alignment procedural steps have been reduced by 69 percent, the operator adjustments reduced by 68 percent and the corrective adjustments eliminated. The check that must be accomplished is to insure that the boresighting telescope and the prism with the scales on the zero mark are parallel. One additional piece of test equipment is required: a small check prism that will fit a machined surface on top

of the forward mirror bracket. After installing the bracket and placing the check prism on its machined surface, the sight unit is boresighted in the normal manner. While the boresighting operation is being accomplished, the remote theodolite is set up behind the missile so the sight unit prism and forward mirror bracket with the check prism are in the field of view. After boresighting, the gunner sets the sight prism scales to zero by rotating the prism. The theodolite operator then autoreflects on the check prism simply by rotating the telescope vertically down until he is looking at his image in the sight prism. If he is autoreflected on the sight prism, then the prism zero line and the boresight telescope axis are parallel. Should the eheodolite not be autoreflected when looking at the sigh prism, the gunner simply rotates the prism until the theodolite is autoreflected. The scales are then read and the reading must be within 0.15 mil of the 0.00 mil reading. Sights which are outside the tolerance are turned-in for calibration, simpler than the present GSU, considerably.

There are numerous other benefits of the new sight which do not directly assist the gunner in sighting and laying but nevertheless allow a faster operation. For instance, on the present sight unit there are four levels and associated adjustments, two on the sight bracket and two on the theodolite. On the new unit there are no redundant levels or adjustments, thus eliminating the potential for using the wrong ones.

Following the week of training and testing by the 1st Battalion, 12th Field Artillery, a formal demonstration of the sight unit for the field artillery Lance community was presented. The new sight was enthusiastically endorsed by all Fort Sill Lance activities. Testing is continuing and fielding of the new sight is expected in 1978. From the standpoint of the Lance gunner, it's a sure bet that the arrival of the new Gunner's Sight Unit will not be a minute too soon.

MAJ Richard M. Stroud, FA, is Executive Officer, FA Missile Systems Evaluation Group, 9th Missile Group, III Corps Artillery, Fort Sill.

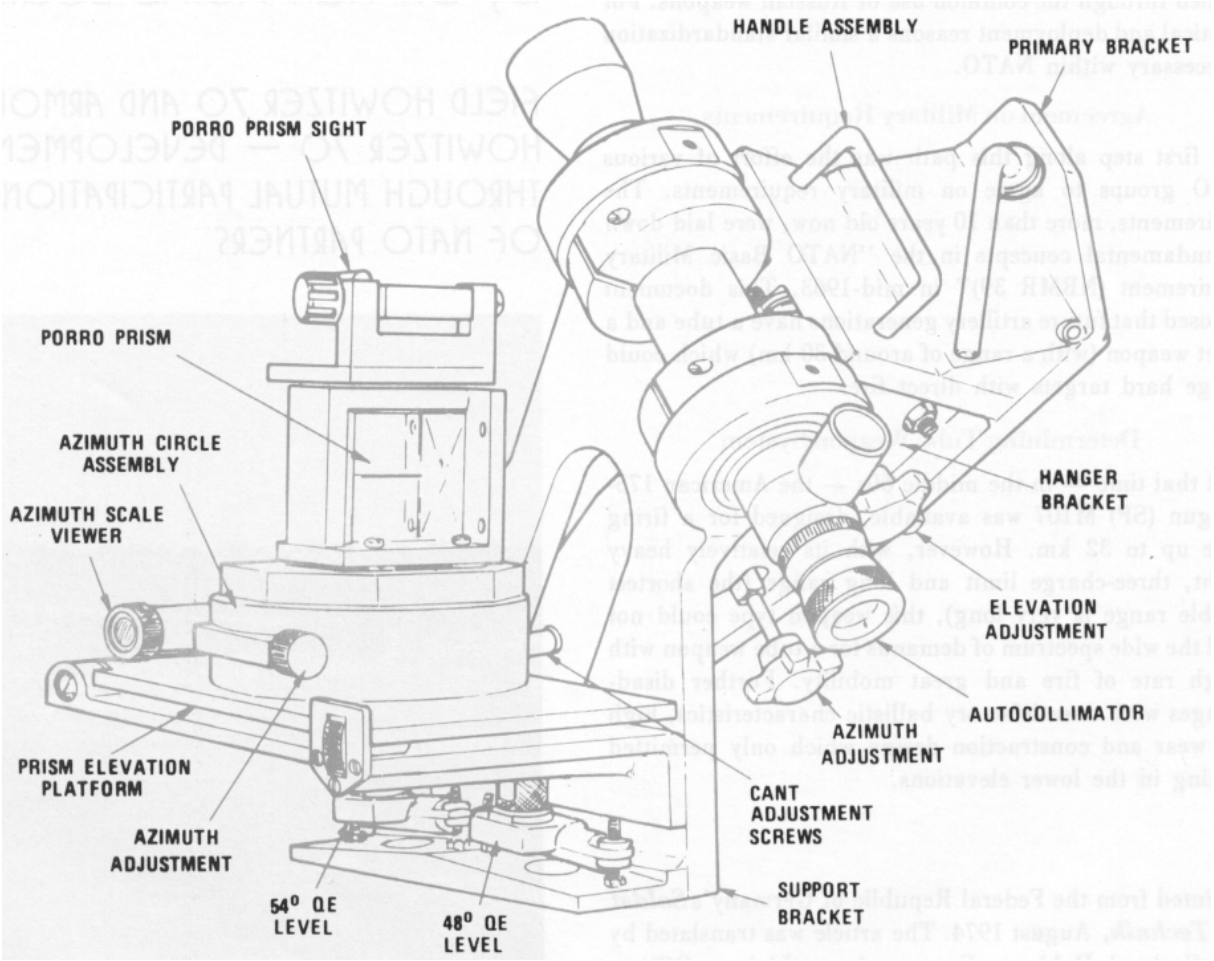


Diagram of the proposed unit.

ARTILLERY PROJECTS OF THE FUTURE

by Dr. Karl Heinz Bodlien

FIELD HOWITZER 70 AND ARMORED HOWITZER 70 — DEVELOPMENTS THROUGH MUTUAL PARTICIPATION OF NATO PARTNERS

In the last few years within the sphere of the NATO Alliance, a series of studies and developmental projects has been initiated in the area of artillery, including tube (artillery) as well as rocket weapons. These projects had become necessary since within the NATO sphere the current artillery weapons systems are considerably inferior to those of the East Block, especially in regard to range. In addition, the weapons are in large part obsolete, requiring high maintenance costs, and by the end of the 70s or early 80s must be withdrawn from service. A further disadvantage is that, because of the variety of weapons available in the West and the very dissimilar weapons and calibers as well as varieties of ammunition, a complete standardization would be difficult to achieve. For the countries of the Warsaw Pact this standardization is, however, largely fulfilled through the common use of Russian weapons. For logistical and deployment reasons a similar standardization is necessary within NATO.

Agreement on Military Requirements

A first step along this path was the effort of various NATO groups to agree on military requirements. The requirements, more than 10 years old now, were laid down in fundamental concepts in the "NATO Basic Military Requirement (NBMR 39)" in mid-1963. This document proposed that future artillery generations have a tube and a rocket weapon (with a range of around 30 km) which could engage hard targets with direct fire.

Determining Tube Weapon System

At that time — in the middle 60s — the American 175-mm gun (SP) M107 was available, designed for a firing range up to 32 km. However, with its relatively heavy weight, three-charge limit and long range (the shortest possible range is very long), this weapon type could not fulfill the wide spectrum of demands for a tube weapon with a high rate of fire and great mobility. Further disadvantages were unsatisfactory ballistic characteristics, high tube wear and construction design which only permitted shooting in the lower elevations.

Reprinted from the Federal Republic of Germany's ***Soldat Und Technik,*** August 1974. The article was translated by LTC Gerhard Dobbert, German Army Liaison Officer, USAFAS.—Ed.

In addition to the 175-mm gun, the 155-mm howitzer was introduced in the middle 60s. The 155-mm howitzer possessed the necessary flexibility in the trajectory; however, it had an unsatisfactory maximum range and additional inadequacies which could only partially be corrected through constructive changes and modifications. For example, the armored howitzer 155-mm M109G available in the Bundeswehr (West German Army) with its range of 18 km is essentially inferior to most of the 122-mm and 130-mm Russian weapons with ranges up to 27 km. From this standpoint, this inadequacy applies to all tube weapons of the NATO artillery.

In working up the detailed individual requirements (operational characteristics) for NBMR 39, the NATO group established the 155-mm tube artillery as the standard caliber. This was not a completely satisfactory solution — as was later demonstrated. The decision was, however, essentially dictated by the large ammunition supply already on hand and by its suitability for nuclear employment. Also, a common caliber was essential for future developments.

Since the available 155-mm ammunition was to be shot from the future 155-mm tube weapons along with the more effective new ammunition family to be developed, standardizing internal ballistics was absolutely essential. Even though at this time this has not been accomplished, one can still assume that with the introduction of the new weapons and new ammunition family the total interchangeability of 155-mm ammunition within the NATO sphere is assured. Also, this would result in uniform firing tables.

In contrast to ballistics and ammunition, however, NATO partners could not agree on a common artillery piece, because of different tactical requirements. Both versions of the 155-mm caliber (the wheeled and the self-propelled) were needed — for a field piece and for an armored howitzer.

Only after completion of national studies by the individual partners — on the basis of these results and with the aid of their own wooden models — could cooperation within the European NATO sphere begin for the development of a new 155-mm field howitzer; this occurred initially between Great Britain and the Federal Republic of Germany. In 1970 Italy joined as the third and equal partner in the project Field Howitzer 70 (FH70), which in the meantime had been designated a NATO project. This trilateral cooperation proved successful and later included further studies and developmental projects in army areas.

The Field Howitzer 70

Of the artillery projects to be discussed, the development of field howitzer 70 is the farthest along; for this reason, the work on the FH70 will be reported in more detail. In contrast to the howitzers now available in NATO, the FH70 has the following critical advantages:

- A greater range, 24 km with a conventional projectile and 30 km with a rocket-assisted projectile or a subcaliber projectile;

FH70 may be moved short distances at 10 to 12 km/h, powered by a Volkswagen engine. The engine also may be used in rough terrain as an aid to the prime mover.

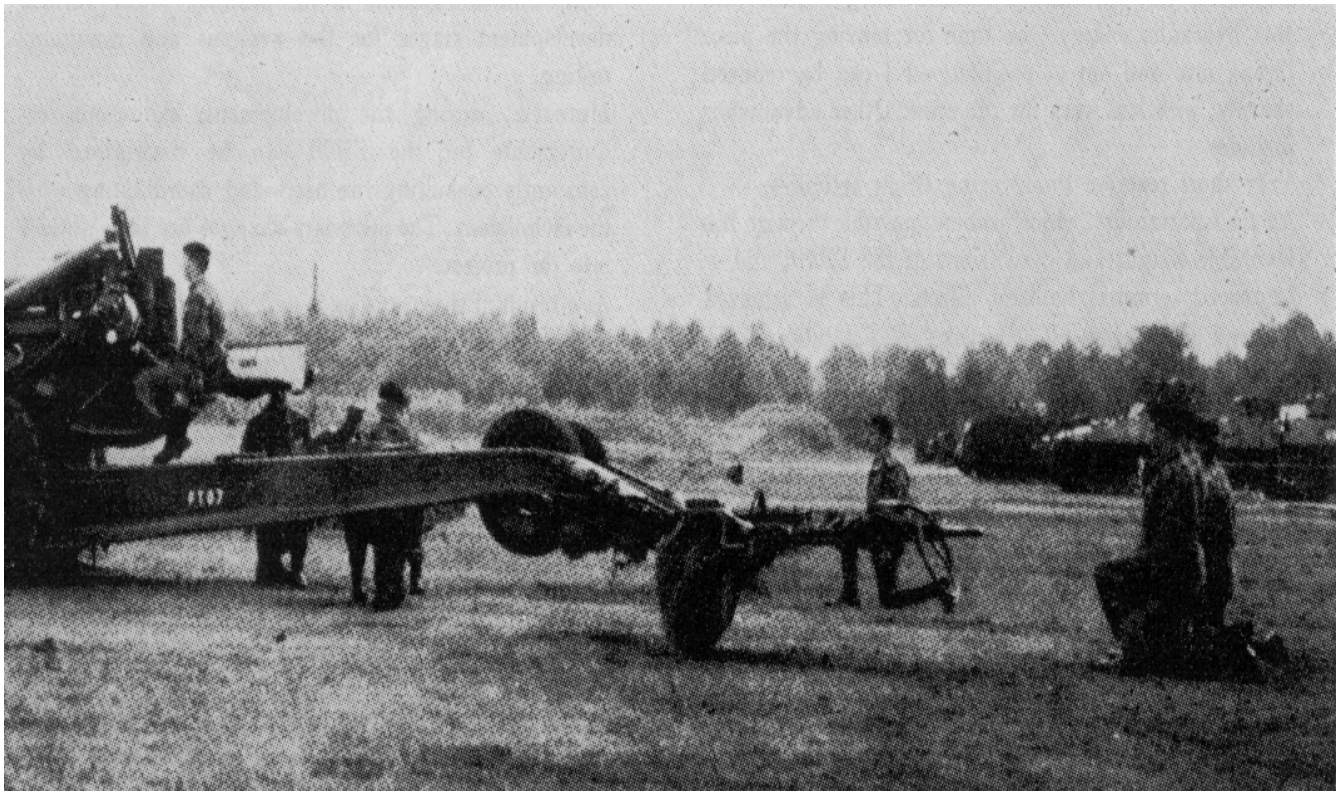


Table 1

		150-mm Field Howitzer 40 Germany	150-mm Cannon 39 Germany	155-mm Field Howitzer M1A2 USA	155-mm Field Howitzer M2 USA	155-mm Field Howitzer 70 Great Britain/Germany/Italy	155-mm Field Howitzer XM198 USA
Max range	meters	15,700	24,800	14,600	23,100	24,000	24,000
Max Range (RAP)	meters	—	—	—	—	30,000	30,000
Min range	meters	1,500	7,000	1,200	7,500	2,500	2,500
Greatest muzzle velocity	m/sec	595	865	564	853	827	827
Rate of fire (normal sequence)	rds/min	4	2	3	2-3	8	4
Volley (in 20 sec)	rds/20 sec	—	—	2 in 30	—	3 in 15-20	—
Weight in firing position	tons	5.7	12.2	5.8	12.3	8	6.5
Weight with supplemental motor	tons	—	—	—	—	8.8	—
Performance factor	mt/t	147/4	145	120/8	127/8	189/7 (without HA) 172/2 (with HA)	232
Occupation of position	min	approx. 15	approx. 20	4	10	2	4
Elevation	degrees	—1/ + 70	—3/ + 46	—2/ + 65	—5/ + 63	—6/ + 70	—4.8/ + 71.6
Number of charges		9	3	7	2	8	8

- An increased rate of fire which makes it possible to shoot a volley of three rounds in 15 to 20 seconds;
- A greater area of aiming in traverse and elevation; and
- A considerably improved mobility through a supplementary motive power. The supplementary motive power (1600-VW motor, 50 horsepower) fully integrated into the weapon system permits changing positions in the terrain under its own power (10 to 12 km/h). The supplementary motive power can also be used in rough terrain as an aid to the prime mover; it is particularly important for providing hydraulic energy. Also, with this hydraulic energy, the time for moving the piece (going into and out of position, etc.) can be reduced sharply, with less work for the crew. Other advantages include:
- Very short reaction time during firing activities;
- Air transportability, which becomes possible through the favorable weight and dimensions of the FH70; and
- Improved terminal ballistic effects. This is achieved through good target hit accuracy (great stability of the weapon) and through the development of a new ammunition family. This new family of ammunition includes a wider selection of projectiles for different employment conditions with improved effect on the target. Further improvement includes a propellant system (eight charges) with which short and long ranges can be achieved with good overlapping.

Besides these improvements in construction, special effort was made during the trilateral development to achieve a weapon system that would completely satisfy all partners. Among other things, the following precautions and procedures were considered:

- The development, divided into construction groups, is being conducted in "overlapping phases" to permit experiences gathered with the first prototypes to be included in improved equipment of later design. Thus, only a small amount of trial equipment is needed for each phase. The equipment used in the previous phase can be reequipped or improved to the extent necessary for the planned special tests. In this manner the total number of prototypes in the trilateral development can be kept relatively small. Nevertheless, enough test equipment is available to the partners in the various development stages for the weapons and munitions testing.
- Moreover, during the development, the troop requirements for the FH70 can be determined by constantly consulting the users and coordinating with the technicians. The necessary changes are then worked into the project.

As a result of these studies, a very modern howitzer will be available in the European area in the future. Besides its high mobility, the howitzer can deliver precise individual fire or volleys. And, on the basis of its range, massing the fires of artillery units spread over wide areas has become possible.

Complete agreement could not be reached among the NATO partners during the determination of the military requirements for the field howitzer. For example, the USA did not put so much value on great mobility and high rate of fire as they did on other deployment stipulations. Therefore, the USA is conducting the parallel development of a field howitzer, the 155-mm field howitzer XM198, which will have the same internal ballistics as the FH70.

Through relinquishment of the high rate of fire and mobility, which are so important for the European partners, and with a somewhat smaller traverse capability, the XM198 is around two tons lighter, which is very important for helicopter transport, and will cost less to produce. It is understandable that the supplemental motive power (its weight alone is around 0.8 tons) of the FH70 as well as the necessary semiautomatic equipment to fulfill the rate of fire adds additional weight and cost. However, the higher weight and construction cost are balanced, as already mentioned, by considerable advantages for tactical deployment and the gun crew.

Data on the FH70 and the XM198 are compared in Table 1. The table also contains corresponding values of modern weapon developments of WWII to include the 155-mm artillery pieces (howitzers and cannons). This comparison shows that the FH70 combines the characteristics of a powerful cannon with those of a howitzer having a high rate of fire and very good mobility with a relatively favorable weapon weight; this is also expressed by the performance factor which is defined as the quotient of muzzle energy: equipment weight (mt/t).

The Armored Howitzer 70

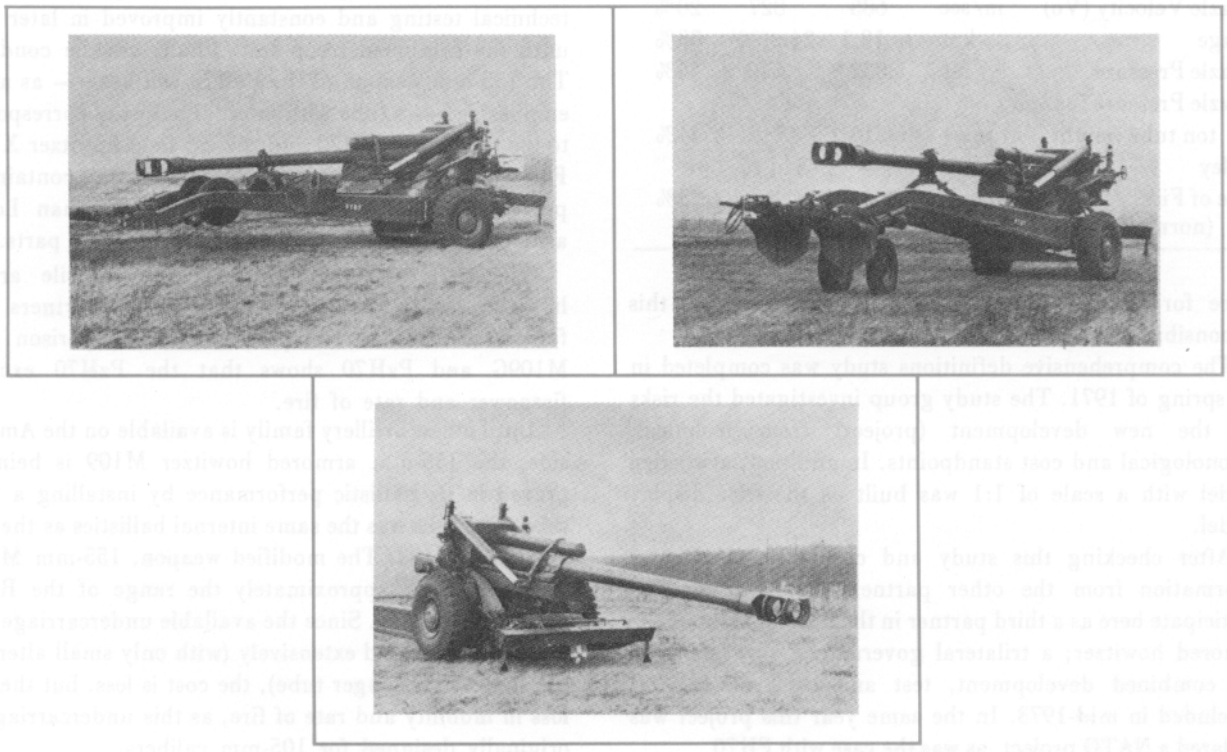
In addition to the field howitzer, the users requested a relatively simple armored self-propelled howitzer which could swiftly follow armored units, could be easily stored in a depot and issued to reserve units as required. This armored, self-propelled weapon (PzH70) would have the same internal ballistics as the FH70 and would replace the 155-mm armored howitzer M109G in the early 80s. The USA, Great Britain and the Federal Republic of Germany agreed on many aspects for such an artillery weapon; however there was no genuine collaboration for the entire system PzH70.

Because of the good experiences with the already successfully running project FH70, the Federal Republic of Germany and Great Britain decided to work together on the PzH70 project. Toward this end a common definitions study was conducted as follows:

- The internal ballistics would be the same as FH70.
- The armored howitzer must also be able to shoot the existing 155-mm caliber ammunition as well as the newly-developed ammunition types.
- Construction groups of the German armor family would be used as a basis in order to maintain the logistical relationship of weapons systems within the same areas of deployment.

The many experiences gained in the FH70 project could be utilized. The total project was again divided (among the participating countries) in subsystems to save work and money. The major critical point (that is, where the separate projects came together) was at the trunnions or at the turret ring.

Whereas the British partners were the coordinating



Different views of FH70.

155-mm self-propelled PzH70.

		M109G	PzH70	Improvement
Muzzle Velocity (Vo)	m/sec	685	827	20%
Range	km	18.1	24m(30)	33%
Muzzle Pressure	mt	1,032	1,510	46%
Muzzle Pressure for one ton tube weight	mt/t	516	743	44%
Volley	Rds in sec	—	3 in 15	
Rate of Fire (normal)	Rds/min	6	8	25%

office for the FH70, the German side was given this responsibility for the PzH70 system.

The comprehensive definitions study was completed in the spring of 1971. The study group investigated the risks for the new development (project) from technical, chronological and cost standpoints. In addition, a wooden model with a scale of 1:1 was built as the first display model.

After checking this study and considering extensive information from the other partners, Italy decided to participate here as a third partner in the development of the armored howitzer; a trilateral government agreement on the combined development, test and construction was concluded in mid-1973. In the same year this project was declared a NATO project, as was the case with FH70.

The development of the PzH70 is also being conducted in stages. In the same manner as the FH70, the first prototypes are being examined carefully in factory and technical testing and constantly improved in later stages until the combined troop tests finally can be conducted. The 155-mm weapon of the PzH70 will have — as already emphasized — a tube with internal ballistics corresponding to the tube of the FH70 and the US field howitzer XM198. For logistical reasons, the undercarriage contains important construction groups from the German Leopard armor family, allowing interchangeability of parts.

The PzH70, a modern and very mobile armored howitzer, will be available to the NATO partners in the foreseeable future. The performance comparison of the M109G and PzH70 shows that the PzH70 excels in firepower and rate of fire.

Until a new artillery family is available on the American side, the 155-mm armored howitzer M109 is being improved in its ballistic performance by installing a longer tube. The tube has the same internal ballistics as the FH70 and the XM198. The modified weapon, 155-mm M109A1 (SP), will have approximately the range of the Russian principal weapons. Since the available undercarriage of the M109 is being used extensively (with only small alterations dictated by the longer tube), the cost is less, but there is a loss in mobility and rate of fire, as this undercarriage was originally designed for 105-mm calibers.

As an additional development in the 155-mm caliber

area, the French armored howitzer 155-mm GCT (see *"Grande Cadence de Tir,"* November-December 1974 *Journal*) must be mentioned. It was shown the first time at the French Army Show in Satory in June 1973. A principal objective of this development was to construct an artillery piece that would shoot faster than the French 105-mm and 155-mm howitzers introduced up to that time. Through the development of completely burnable cartridges and an automatic loading system (at present with the prototypes), a rate of fire of four rounds in 25 seconds and six rounds in 40 to 50 seconds is being achieved. The muzzle velocity for the largest charge of the seven-part charge is 810 meters per second (m/sec) which corresponds to a maximum range of about 23,500 meters.

The undercarriage of the French tank AMX30 is being used for the 155-mm PzH GCT. In addition, through French-German firms' cooperation, the French howitzer and turret have been placed on the undercarriage of the Leopard tank as another prototype. Through the use of available construction parts, a productive, if not quite homogeneous, solution for a new armored howitzer has been found.

Even though the East Block has a large abundance of artillery weapons as compared to NATO, it is estimated that the coming generation of NATO weapons will possess the ranges of the principal Russian calibers.

Rocket Launchers

The "catching up" program does not apply completely for the rocket launchers which fire ballistic (unguided) rockets. The very modern light artillery rocket system (LARS), introduced in the Federal Republic a few years ago, with its range of about 15 km, is inferior to some of the Russian rocket launchers. On the other hand, this multiple rocket launcher, considering its 110-mm caliber, essentially can no longer be improved in its range. With that, the common military requirement of NATO, the NBMR 39, which demands for the future a range of 30 km for tube and rockets, is not fulfilled up to now in respect to ballistic rockets.

For that reason, considerations have been underway for some time within the separate national areas and within the framework of NATO to close this gap with a rocket system of a larger caliber. It is certain that there are still many problems to be solved in this area. Before the development of such a complex weapon system with such range can be started, the risks must be carefully analyzed. To name just a few examples, there are various alternatives for weapon and ammunition to be examined on the basis of cost comparisons, time and financing plans to be established and questions of logistics to be clarified. It becomes apparent that such costly development, testing and production, along with the numerous other undertakings, can no longer be borne by one nation. In recognition of the military requirements for a medium rocket system, Great Britain, Italy and the Federal Republic of Germany have joined together on this project (the RS80). In March 1973 a government contract was drawn up for conducting a joint definitions study for this weapon system.

NATO Partners Cooperate

As a result of the intensive cooperation of the NATO partners, an important step has been taken in the direction of fewer, more capable standarized weapon systems multinationally created, developed and produced. In addition, further important advantages are demonstrated in this cooperation, of which only a few should be mentioned:

- The entire development and the later production of an item are divided among the partners; for each partner, that means essentially more limited costs for this development and testing.
- Furthermore, before and during the actual development — including components for which he is not responsible — each partner can offer his constructive contributions or recommend improvements. In this way, the "wide scope" of technical inputs and collected wealth of experience, which was often won under very different conditions in the constructive and industrial sector, benefits each partner and improves quality for the good of the entire development project.
- A particularly important point is the combined testing of the equipment and the combined troop tests with the complete weapon system. Each nation is able to influence the conditions of the test.
- Joint cooperation for the various components of the complete system makes it possible to reduce costs.

Along with the many advantages, however, there are some disadvantages of a multi-national development project. One disadvantage is the form in which the projects are managed. No "pilot nation" and no "combined industrial firm" were created so that the national autonomy in the management structure could be extensively maintained. Except for the one nation which has coordinating responsibilities to fulfill, the motto "equal rights for all" applies. For that reason, every important decision has to be agreed on. This costs more time, and coordination is magnified by the different organizational forms among the partners, the distance separations, the different languages, etc. In spite of these difficulties, the past experiences have always resulted in a "gentleman's agreement" satisfactory for all partners even in cases of difficult problems.

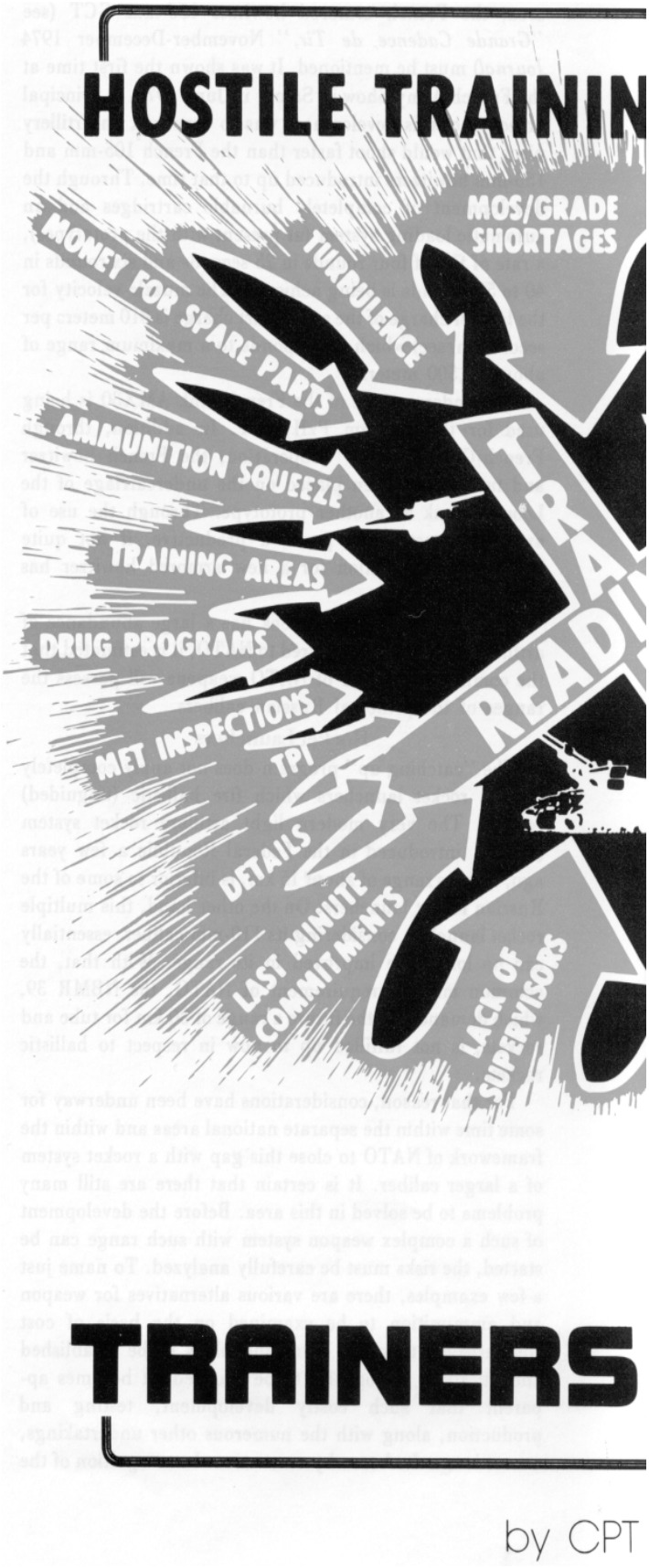
In the course of the last 10 years, a super-national partnership has come out of the trilateral work groups. The participating technical, economic and military representatives of three nations belong to this partnership. This team will certainly achieve for the future a better standardization in the NATO sphere and create more capable tube and rocket weapons for the NATO artillery.

There are many officers and men who entered the Army some years back prepared for the life of a soldier. Strict regimentation, attention to detail, physical fitness and absolute combat readiness were traits they expected to find in an Army which had succeeded so many times before. They were ready to join the skilled, professional, trained team of fighters promised by their recruiters and TAC officers. The challenge was there.

Now, several years, assignments and frustrations later, they've suddenly, yet surely, realized that their Army is *not* the Army they signed up for. They expected rigorous training, not guaranteed education; combat ready units, not flag details. The expectation of youth and the image of the Army created for them simply "ain't so."

Each and every one of us took an oath to uphold and protect the constitution of the United States. Since we take our orders from the President and are paid by the taxpayer, it's a foregone conclusion that our real and foremost obligation is to the man on the street. This year, that guy will pay nearly 25 billion dollars to guarantee that he, his family and his country will be safeguarded by an Army that is trained to fight and win wars. That man doesn't care if the Army's shiny, if it marches well or if its soldiers have college degrees. He only cares if they win. It's his personal and very expensive insurance policy. Title 10 of the US Code specifies rather clearly what the Army must do. That mission shall be the ". . . preparation of land forces for the effective prosecution of war . . . and organizing, training and equipping for prompt and sustained combat." Think about it . . . prosecution of war and prompt, sustained combat. From those simple words it becomes apparent at once what the sole mission of the peacetime Army is to be; it is to train and train and train — to prepare our forces to fight — to prepare our forces for *war.* In October of 1973 at Fort Bragg, the late GEN Creighton Abrams said, "No matter what size the Army, we must be physically, psychologically and professionally ready to fight — and win!" At the same time these words were being spoken, a war — the Arab-Israeli War of 1973 — half-way around the world was emphasizing and punctuating every word that the general was saying. Let's take a quick look at what that war should have taught us and what we must do to learn its lessons:

- We will be outnumbered and outgunned in future wars, and winning will require a unique combination of leadership, courage, motivation and innovation. The odds against us are great. We must *train*.
- The battlefield of the future will be far different than anything the American soldier has seen in the past. Technology has progressed. Increased lethality of friendly and Warsaw Pact weapons systems portends a nightmare of violence on the battlefield. The threat of electronic warfare, jamming and intercept techniques



may completely stifle effective communications. Improved target acquisition systems will cause destruction of any unit that can be seen, and any unit that moves will likely *be* seen. The impact of such an environment on mobility and logistics is unquestioned. Resupply operations may be slowed and even stopped. To overcome these dilemmas, we must *train*.

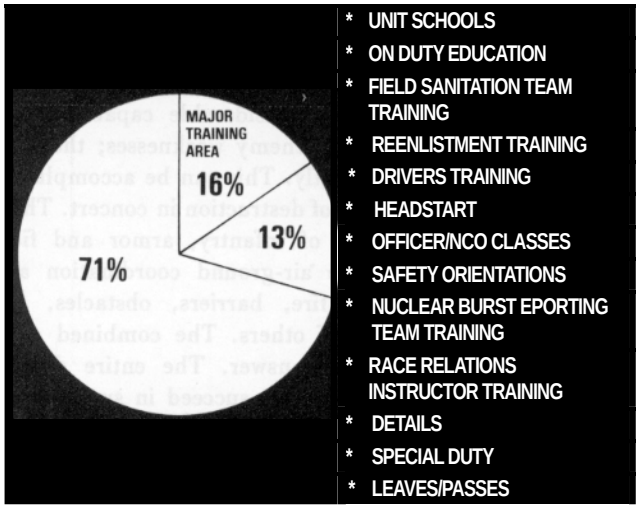
- We must minimize our obvious vulnerabilities by ingenious planning *and* execution. This includes proper unilization of cover and concealment, suppressive fires, speedy movement, faster fires and a myriad of new, improved tactics and techniques designed specifically for the environment likely faced. This takes time, and we must *train.*
- We must maximize our considerable capabilities by seeking out and creating enemy weaknesses; then, we must exploit them violently. This can be accomplished only by using *all* means of destruction in concert. These include the interaction of infantry, armor and field artillery units, effective air-ground coordination and integration, naval gunfire, barriers, obstacles, fortifications and a host of others. The combined arms team, alone, is not the answer. The entire defense structure will be involved. To succeed in such an endeavor, we must *train*.

The obvious point is that, if we are to win the next one, we must train. To do so, the Army must chip away the barnacles of bureaucratic embellishment surrounding our training mission. We must reduce the proliferation of functions currently being performed by the peacetime Army and we must convert ineffective garrison time to effective training time. The Army is making some progress in this area.

Emphasis on interaction by the members of the combined arms team has never been greater. The doctrine developers at our service schools enjoy a relationship perhaps unequalled in their histories. The armor, infantry and field artillery are talking and listening to one another with an uncharacteristic lack of parochialism. New doctrine in the form of training circulars, bulletins and manuals is rolling off the presses at an impressive rate. The new Army training and Evaluation Programs (ARTEPs), while not yet an effective tool for collective training of the combined arms team, are surely a major step in that direction. The standards required by the ARTEPs are higher than ever before and require a strong, effective training program by the commander to insure success.

The day surely will come when the maneuver forces and the field artillery will be tested together in a live-fire environment — as they will fight. So the spirit is there, the doctrine is there and the desire for success in future wars is there — but something just as important is missing. The atmosphere for effective training is missing. The emphasis

on training required at the very highest levels of the Army is missing along with the fundamental rewards for the well-trained unit. Our priorities are misplaced, misoriented and mistaken. The taxpayer who shells out the $25 billion for a fighting Army is paying for a tentacled monster of gigantic proportion that has grasped the Army's ability to train and is rapidly choking it into submission. The arms and legs of this monster are a diversity of narrow-based Army programs, administrative drawbacks of bureaucratic regulations and the sheer enormity of conflicting commitments and personnel turnover that beset the small unit commander. Individually, these programs may seem



beneficial and the implementation problems minor. Collectively, they eat up the ability of the commander to train and they destroy the effectiveness of his unit to perform as a team. Who can argue that human relations is not vital, that congressmen or VIPs are not entitled to see this Army they guide, that reserve components need not be ready, that maintenance inspections are not critical to combat readiness, that on-duty education, if properly administered, is not a boon to recruiting or that personnel

INEFFECTIVE DAYS FOR TRAINING

WEEKENDS & HOLIDAYS	116
TPI PREPARATION (4 TIMES)	40
PAYDAYS	12
CHRISTMAS (½ DAYS)	12
AGI PREPARATION	10
MAINTENANCE EVALUATION TEAMS	5
TRAINING HOLIDAYS	4
KASERNE CLEANUP	2
TOTAL	201 (55%)

OTHER COMMITTED DAYS (REQUIRED SPECIAL SUBJECTS)

WEAPONS, FIRST AID, NBC, COLD WEATHER, INTELLIGENCE, SAFEGUARDING INFORMATION, SOVIET ORIENTATION, CODE OF CONDUCT, HAGUE, GENEVA CONVENTIONS, UCMJ, SERVICE/DISCHARGE BENEFITS, RACE RELATIONS, DRUG/ALCOHOL ABUSE, PHYSICAL TRAINING, MAINTENANCE

turbulence should not be expected in a 785,000-man Army? *None* of us *can* or *wants* to argue with that. But these training distractors, and others like them, comprise the "hostile training environment" that is destined to smother us if it is not stopped — and soon.

PERSONNEL TURBULENCE
JANUARY 1974 - FEBRUARY 1975

DUTY POSITION	NUMBER HOLDING POSITION
Key Positions at Bn	
Bn XO	3
Bn CSM	3
S2	4
Mtr Off	4
Maint WO	2
PBO	2
PSNCO	4
Opns SGT	3
Bn Supply NCO	3
Bn Mtr SGT	4
Readiness NCO	2
Bn Survey Chief	2
Key Positions at Btry	
XO	6
1st SGT	11
CFB	10
Mtr SGT	8
Section Chief - Rotations too numerous to record	

A recent analysis of a division artillery in USAREUR demonstrates the point. Seventy-one percent of that unit's available time, 258 of 365 days, is *unavailable* for unit training; 258 days that the taxpayer is not getting what he pays for. Of particular note is the inordinate preparation time (40 days) for the Technical Proficiency Inspection (four times per year) designed to insure nuclear readiness *only* and the 57 days of required special subjects that the soldier probably received in basic training. Perhaps we ought to return to the six-day week? Let's look a little further. Of the 29 percent available time remaining, only 16 percent (roughly 18 days) was spent at the major training area, while 13 percent was devoted to the items listed. USAREUR has no corner on the training problem market; the schedule of activities for III Corps Artillery units at Fort Sill looks frighteningly similar. While the picture will change with each unit in CONUS and overseas, the problem is essentially the same. Priorities must be reoriented and the percentage of training time drastically increased if we are to win.

The next major area contributing to the hostile training environment is that of personnel turbulence. The information in the figure is directly from a CONUS based battalion. While the battalion level turnover is most discouraging, the turnover of NCOs in key positions in the battery is incredible. Rotation of 10 chiefs of firing battery and six executive officers in 13 months destroys a continuous

and viable training program of any caliber! Key personnel shortages only add fuel to the fire. (The division artillery of that battalion was short 44 percent of its enlisted personnel.) A unit with only 55 percent of its assigned enlisted strength cannot be expected to train efficiently. Given the personnel shortages of the CONUS div arty, coupled with limited training periods and higher training standards, it is difficult to imagine an Army trained to win in combat. Are we not kidding ourselves (and the taxpayer) with our C-1 readiness ratings?

We've looked at available training time and personnel shortages as two of the tentacles that are strangling the trainer. Let's look at some other detractors: *On-Duty Education:* The premise, I'll grant, is good — at least for an Army that must recruit, not draft, soldiers. However, a six-week cycle twice each year where soldiers are dedicated solely to improving individual education is a price the taxpayer, as well as the Army trainer, can ill afford to pay. The obligation to educate the soldier is one which we, as an Army, have *assumed.* The mission to train is one with which we are *tasked.* Let's educate the soldier on his own time.

Administration: A 1974 company administration study conducted at Fort Benjamin Harrison shows that the administrative burden on the small unit commander is greater than ever. To quote the study, "On the average, company commanders are devoting approximately 60 percent of their 10-hour days to company administration. The range was from 40 to 95 percent. In most cases, the company executive officer is devoting his full time to company administration, and the first sergeant spends about the same amount of time or a little more on administration than does the company commander." The solution to this problem is questionable, but, as a collective unit, we must attack the bureaucracy, reduce the reports and get back to the mission. Paper work be damned!

Unit Schools/Quotas: The current system of unit schools is well intentioned. Within the TRADOC system, it is becoming increasingly apparent that the formal training role of the unit versus the service school training is increasing. Diminishing financial resources dictate that. However, such unit schools as Self-Help School, Tire Inspection and Classification School, Nuclear Burst Reporting Team School, Field Sanitation Team School and PLL Clerk School serve to splinter an already overtaxed unit and reap few *practical* benefits for the Army. The quota system is a case of the cart before the horse. Units, because of pressure from well-meaning higher headquarters, are forced to fill mandatory quotas merely to fill quotas and sustain the system. And beware of any shortfall! This system must be revised; quotas to fit unit needs — not quotas for their own sake or to prove that we're "training" our soldiers.

Details/Unforeseen Commitments: Nothing interrupts a well-planned day, week, month or year like the numerous details and unforeseen commitments which nickle and dime us to death. Head count at the mess hall, special duty for an E4 at the gym, swimming pool or legal section, school bus monitor for the E7 in Europe, funeral details, flag raising details, flag lowering details, soldiers to set up chairs for the 4th of July picnic, soldiers to take down chairs for the 4th of July picnic, reserve component evaluators, human relations instructors, test teams for other units — all add up to personnel chaos for the commander, and personnel chaos means training chaos.

Inspections: We have inspections of all sorts for every occasion; that for the AGI certainly being the most time consuming. In the elaborate preparation, all else must be cast aside to insure success, lest the commander fail. We have METs, COMETs, roadside spot checks, TAVs, TPEs, TSIs, arms room inspections, CBR inspections, etc., etc., etc. Call them what you will, they take time and people. They detract from valuable training time and contribute little to real readiness. Do away with them? No. Control them, reduce them to the minimum and concentrate them on areas directly related to improving the things that count in the unit.

Live Fire Safety Regulations: Regulations controlling safety on our ranges are huge deterrents to effective live fire combined arms training. These regulations are well intentioned and designed to prevent major training accidents.

TWO APPROACHES TO COACHING A FOOTBALL TEAM

WITH EMPHASIS ON THE INDIVIDUAL	WITH EMPHASIS ON THE TEAM
CARPET IN LOCKER ROOM	WIND SPRINTS
NAMES ENGRAVED ON LOCKERS	FUNDAMENTALS OF BLOCKING & TACKLING
PRIVATE DRESSING AREAS	PRACTICE RUNNING, PASSING, PUNTING
DRUG SEMINARS	LEARN THE PLAYS
EDUCATION PROGRAM	RUN THE PLAYS
STEAK & ICE CREAM TO ORDER	SCRIMMAGE, SCRIMMAGE, SCRIMMAGE
INDIVIDUAL SHOWER STALLS	PERFECT THE OFFENSE
RACE HARMONY SEMINARS	VARY THE DEFENSE
SAUNA BATHS	KNOW THE OPPOSITIONS STRENGTHS & WEAKNESSES
FANCT HOTELS ON ROAD TRIPS	CONTACT DRILLS
X-RATED MOVIES	DESTROY THE OPPONENTS WILL TO WIN
LOVE THY NEIGHBOR	

"Winning isn't everything, it's the only thing"
Vince, the winner

However, they must be changed. The Army must be willing to accept some element of risk, i.e., personnel casualty, to achieve the greater goal of realism in training. Lest I be

misunderstood, we surely cannot negligently risk the lives of our soldiers in peacetime, but we must take some chances in peace if we are to succeed in war.

People Programs: People are the heart and soul of our Army. We have a responsibility to them which must never be relegated to unimportance. "Taking care of your people" is an idiom as old as leadership itself. Perhaps it's become trite. But the *real* way to take care of our people is to have them completely prepared for battle. If we don't, they may die. Then, the race relations/human relations instruction, the on-duty education, the drug/alcohol abuse classes and the rest are really not very important. We show our soldiers we *really* care when we train them to fight. In the area of people programs, we have become overcentralized and overcontrolled. It's virtually impossible for the commander and first sergeant to keep track of the rules anymore. Variable reenlistment bonuses, reenlistment prerequisites, promotion criteria, contract options for recruiting and personnel elimination procedures all seem to change with the wind. The commander loses his flexibility because of such overcontrol, and his administrative burden again increases. Each "people program" has merit. Collectively, they take a big bite out of the training apple. These two disparate views, those of the G3 and G1, may be viewed as two approaches to coaching a football game. The team approach, that satisfies the most basic needs of the individual soldier, which are to survive and win, is the one I prefer. If we don't go onto that battlefield as a trained team, ready to fight and win, we'd better stay home. The problems inherent in the hostile training environment will *not* be solved at lower levels. However, they may be subdued and coped with. There are several ways; Jean Larteguy, the French author, suggested one:

We need *two* armies:

One for display, with lovely guns and shiny tanks, little soldiers, fanfares, distinguished and doddering generals and dear regimental officers deeply concerned over their generals' pleasures and their colonels' piles — an Army that would be shown for a modest fee on every parade ground in the country.

The other would be the real Army, composed entirely of young enthusiasts in fatigue battle dress and camouflage helmets, who would never be put on display but from whom impossible results would be asked, and to whom all would look with pride. That's the Army in which I should like to fight.

But, alas, that's not a feasible solution. What's needed to *change* the hostile training environment is a radical reorientation at the highest levels in the Army. Training must become our number one priority. Somebody has got to fall on his saber over that. Recent research indicates that battalion level commanders are relieved for the following reasons:

- TPI failures.
- Poor maintenance records.
- Unfavorable statistical showings (AWOL, crime, accident).
- Safety-connected accidents.
- Right time and place incidents (parades, guards, etc.).
- Administrative short falls (AGI failure, supply accountability, etc.).

"Narry" a single relief for a poorly-trained unit; simply because command pressure is not placed on training, the commander is not *made* to train and he can max an OER without training. We don't seem to think training is important enough to the success of the Army to fire the guy that fails in his training. Until the right man, in the right place, dictates that training becomes number one, the hostile training environment will never change — it will only worsen. However, the little guy, the battalion and battery commander, *can* cope with it, *can* live with it and can *beat* the hostile training environment. But he must proceed carefully lest the tentacles of the monster encompass him. How does he do it?

The commander must have a burning desire to have a trained unit. He must be willing to sacrifice to satisfy that desire and must continually overcome, bypass, hurdle and scoot around the obstacles presented by the hostile training environment. He must stretch his own credibility and be willing to take his OER lumps, if necessary, to do what he knows is right for the Army and the country.

The commander must short-circuit the bureaucracy. Any time, any way he can, the commander must take the necessary steps to get the job done. If it takes a little finagling, so be it. Regulations are designed for appropriate interpretation by persons in positions of responsibility. Use that to your advantage in getting things done. Don't become a slave to the system!

The commander must drive for combined arms, live fire training. If you accomplish combined arms training, it will likely be on a small scale level; but do what you can. Talk about it — discuss it with the boss — make it seem like it was his idea. He might decide it's a good one.

The commander must have training standards and goals. Make these standards and goals attainable, and let nothing deter you from them. Make them for the short term; i.e., "I will achieve ARTEP standards for my FDC in its portion of the test by 1 January." Then, translate the goal into a plan, and execute. Let nothing deter you from that goal!

The commander must understand the dynamics of the battlefield and how to win against a well-trained, well-equipped, numerically superior enemy. The commander must realize, for himself, the criticality of the situation and the vital necessity of the training he and his unit must accomplish — the commander, as always, is the key to a successful, well-trained unit.

Overcoming the hostile training environment is a tough task, but it can and must be done.

The time has come to start a training revolution.

Trainers, rise up!

CPT Lee Baxter, FA, executive officer to the USAFAS Assistant Commandant at the time this article was written, is now Commander, A Battery, 1-17th FA.

The Artillery Center
Office of the Commanding General
Fort Sill, Oklahoma
8 April 1953

Foreword

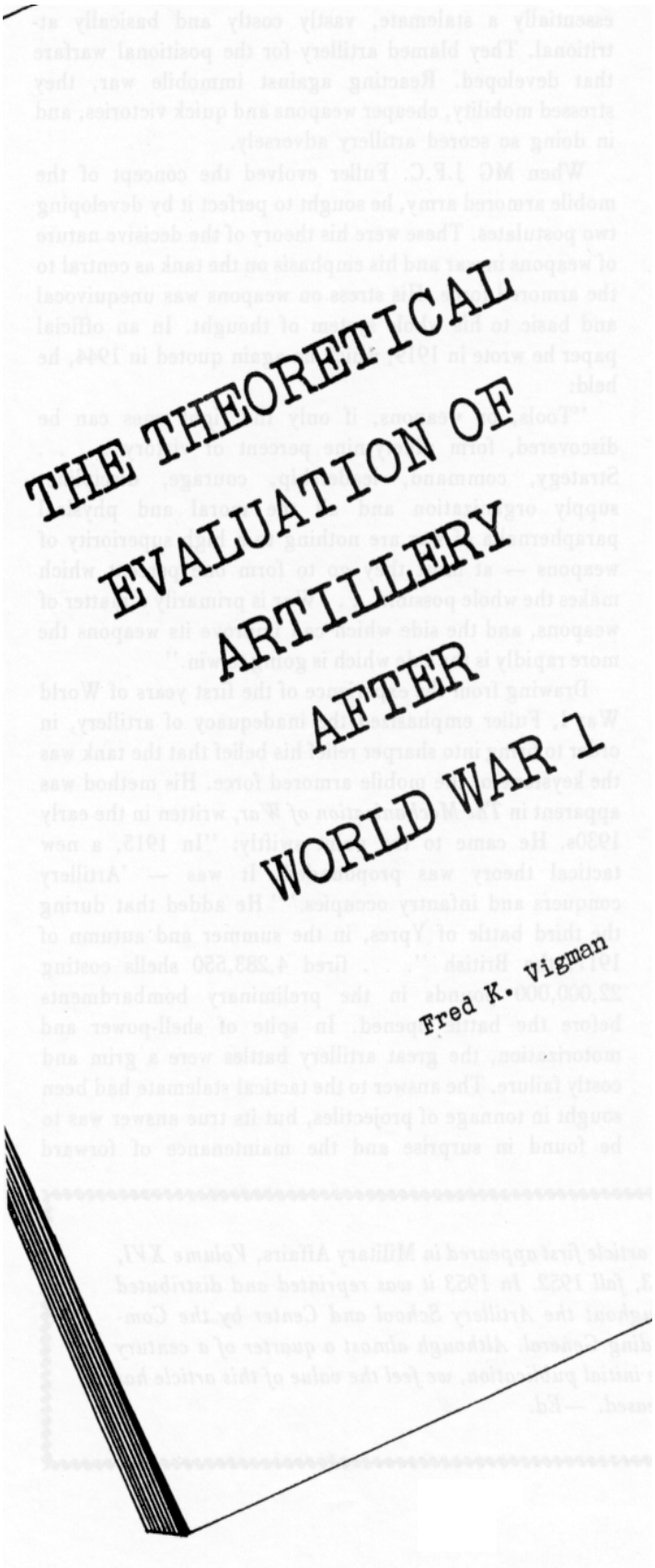
I have had this article reproduced for distribution, as it has two significant manifestations for the professional officer:

(1) The tendency to search for and accept a "one weapon" concept for easy victory. I watched the growing lack of appreciation of the artillery with great regret during the period following World War I, right up to 1943 approximately. The Russians alone maintained their confidence. Strangely enough, a similar disparagement was manifested post-World War II until Korea again, and as usual, renewed and forced recognition.

Thus beware of the glib tongue which so readily seeks to channelize military weapons and tactics along academic and theoretical lines.

(2) All artillerymen must insist, in the interest of our nation's security, that the great role of the artillery, properly employed and adequate in quantity of tubes and ammunition, be recognized.

A. M. Harper
Major General, USA
Commanding



The theoretical derogation of artillery in the post-World War I period, derived, in the main, from the concepts of British writers, particularly Fuller, Hart and Wintringham. These thinkers agreed that the great war was essentially a stalemate, vastly costly and basically attritional. They blamed artillery for the positional warfare that developed. Reacting against immobile war, they stressed mobility, cheaper weapons and quick victories, and in doing so scored artillery adversely.

When MG J.F.C. Fuller evolved the concept of the mobile armored army, he sought to perfect it by developing two postulates. These were his theory of the decisive nature of weapons in war and his emphasis on the tank as central to the armored force. His stress on weapons was unequivocal and basic to his whole system of thought. In an official paper he wrote in 1919, which he again quoted in 1944, he held:

"Tools, or weapons, if only the right ones can be discovered, form ninety-nine percent of victory . . . . Strategy, command, leadership, courage, discipline, supply organization and all the moral and physical paraphernalia of war are nothing to a high superiority of weapons — at most they go to form one percent which makes the whole possible . . . . War is primarily a matter of weapons, and the side which can improve its weapons the more rapidly is the side which is going to win."

Drawing from the experience of the first years of World War I, Fuller emphasized the inadequacy of artillery, in order to bring into sharper relief his belief that the tank was the keystone of the mobile armored force. His method was apparent in *The Mechanization of War,* written in the early 1930s. He came to the point swiftly: "In 1915, a new tactical theory was propounded: It was — 'Artillery conquers and infantry occupies.'" He added that during the third battle of Ypres, in the summer and autumn of 1917, the British ". . . fired 4,283,550 shells costing 22,000,000 pounds in the preliminary bombardments before the battle opened. In spite of shell-power and motorization, the great artillery battles were a grim and costly failure. The answer to the tactical stalemate had been sought in tonnage of projectiles, but its true answer was to be found in surprise and the maintenance of forward movement . . . . Had the cost of the 4,283,550 shells fired at Ypres been spent on tanks, 17,134 machines could have been produced. At the battle of Amiens only 415 of these machines were used, and with decisive results."

Tom Wintringham, writing in the 1940s, reached a like conclusion in his study of the great artillery battles of 1918. ". . . The result was that at great cost of lives some square miles of swamp was gained; this swamp had been made impassable for guns and tanks by our own shells and almost impassable for troops. Artillery had become the dominant weapon, but not the decisive weapon . . . a 'decisive weapon' is more important. It achieves decision, the end of the battle, victory. The machine-gun, not the field piece or the howitzer, governed the shape of 1914-18 . . . the tank is a device for combining the fire of machine-guns (and weapons able to root out machine-guns) with movement through machine-gun fire."

> "...renown awaits the Commander who first in this war restores Artillery to its prime importance upon the battlefield...."

This, of course, was a variant of CPT B. H. Liddell Hart's theory of the machine-gun as the decisive weapon. The tank logically became the central weapon because it was both the machine-gun carrier and the machine-gun killer.

An evaluation of the role of artillery in World War I from a less particularist and more objective viewpoint gave it a preponderant value. The consensus was that the weight of Allied artillery ground the Germans to a stop and stabilized the fighting into positional or trench warfare.

- From the German side (albeit unofficially) this was noted by Hermann Foertsch and Ludwig Rehn. The former observed ". . . the fact was that the effect of the enemy's fire was greater than anyone had anticipated . . . . The Artillery had gained in importance to a degree never dreamed of." Rehn wrote that ". . . after the Battle of the Marne, the Allied Powers began to make up their artillery backwardness very rapidly and by the end of the war were superior in artillery to Germany."
- The evaluation by an American historian, Irving M. Gibson, was even more emphatic. "When the Germans renewed their large-scale offensive on the Western Front in 1916 at Verdun, it was the newly created French heavy artillery which beat them back and saved the country."

The Fuller thesis of the mobile versus the positional, the tank versus artillery, found a response since it was in

This article first appeared in Military Affairs, *Volume XVI, No. 3, fall 1952. In 1953 it was reprinted and distributed throughout the Artillery School and Center by the Commanding General. Although almost a quarter of a century since initial publication, we feel the value of this article has increased.—Ed.*

rapport with the post-war search of all governments for economy in military establishments. Fuller's computation of the cost of artillery in terms of thousands of tanks carried the appeal of a cheaper and, presumably, a superior armament. The association of artillery with long drawn-out attrition and its fearful costs also lost it friends.

The Germans were especially susceptible to the Fuller thesis since they assessed their experience with artillery rather low. At Verdun they had nearly 200 batteries of heavy-caliber pieces which opened the battle on February 21, 1916. The ensuing cannonade was perhaps the greatest of all time, and the disappointment in the outcome was in inverse ratio to their complete dependence on heavy and heaviest caliber, an all-or-nothing attitude given a negative cast by the Allied victory of 1918.

Haunted by the remembrance of unsuccessful attritional warfare, the Nazis chose the mobile-and-armored-force concept. Artillery was belittled, as MAH Erwin Lessner pointed out in his study of German war preparations, despite the warning of artillerists that such a policy would reduce their firepower below that of their designated enemies.

Their figures, later borne out by the facts, showed that the weight of metal thrown by all firearms of a German unit within a certain time was to that thrown by a Russian one as 5:7, the greatest sacrifice of firepower being of the heaviest pieces. Goering and other strategists, according to Lessner, counted on a superior mobility to make up for their artillery deficiency. The *blitzkrieg* was hence a necessity, since the Reich had neither the men, machines nor raw materials to deal properly with the artillery shortage. Another student of *blitzkrieg* warfare noted that ". . . the new weapon, the dive-bomber, was developed partially to replace the great masses of artillery which were a feature of the last World War."

Nazi successes during the first two years of the war seemed to have vindicated the policy of by-passing artillery. Success inviting imitation, the Allied powers sought to catch up with German arms and abandoned artillery as the central weapon on the battlefield. Churchill, in his recently published memoirs, revealed the extent to which the Allied leaders believed that the power of the field piece had been nullified. His first belief that the antitank gun and field gun could frustrate or break up tanks was shaken, he wrote, when ". . . the Hitler inrush of a vast offensive, led by spearpoint masses of cannonproof or heavily armored vehicles, breaking up all defensive opposition, for the first time in centuries, and even perhaps since the invention of gunpowder [rendered cannon] impotent on the battlefield."

Churchill was to undergo a change of heart and policy as a result of the experience of Imperial troops in desert fighting. Paradoxically, the German all-purpose 88-mm gun was to be the influencing factor. In his continuing memoirs Churchill quoted a memorandum distributed October 7, 1941, holding that ". . . renown awaits the Commander who first in this war restores Artillery to its prime importance upon the battlefield, from which it has been ousted by heavily armoured tanks . . . our guns must no more retreat on the approach of tanks than Wellington's squares at Waterloo on the approach of hostile cavalry."

The deadly efficacy of the German 88s at the debacle of Knightsbridge Box, Black Saturday June 12, 1942, in

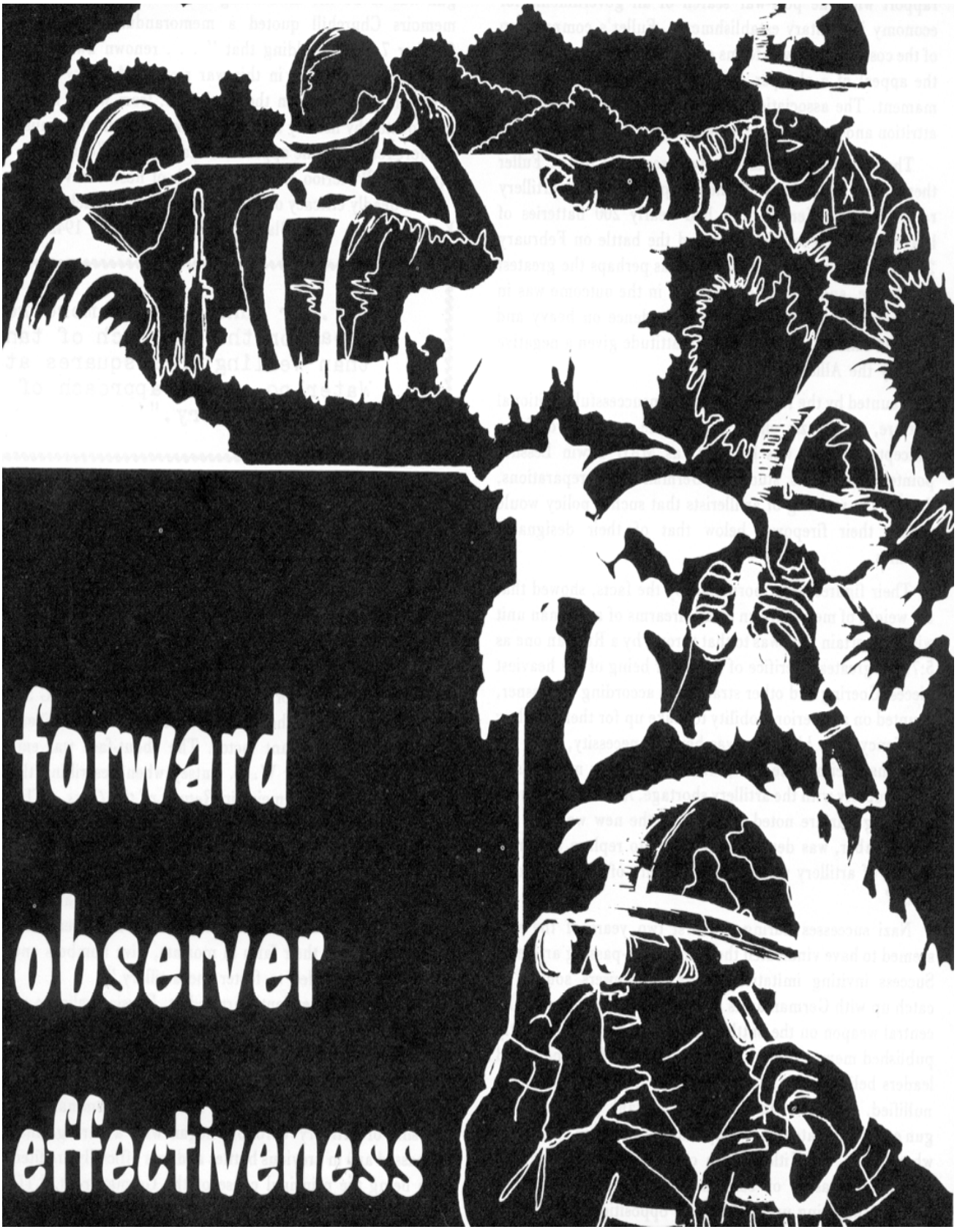
"...our guns must no more retreat on the approach of tanks than Wellington's squares at Waterloo on the approach of hostile cavalry."

which 230 tanks (of the 300 that sallied forth that morning) were destroyed or badly shot up (with almost no enemy casualties), caused a fundamental reorientation in arms. The crisis was resolved by a change in command and by restoring artillery to a central place in the battle formation. This was indicated by the great counteroffensive that began at the battle of El Alamein, which was opened October 23, 1942, with 832 twenty-five pounders and 753 six pounders. In explaining the factors of Montgomery's victory, MG Sir Francis De Guingand held that the massive use of artillery was the most important factor. The about-face was emphasized by Brigadier W. C. Antsey when describing the turn in the tide at Alamein, in *Return of the Guns.* "This return to the guns to a major role on the battlefield, carried further in Sicily and, be it noted, duplicated in Russia, is remarkable. The need of infantry for all the firepower that can be given them was foreseen by the Germans and was met by their development of the mortar. But there they stopped. Placing their faith in mortars, dive bombers and the tank, they failed to foster the artillery."

Although independently arrived at, Russian reliance on artillery followed closely on British experience. The victory at Stalingrad clinched the central position for artillery in the Soviet Army. The Russian counter-offensive which opened November 19, 1942, under the command of Marshal of Artillery Voronov, began with a barrage that surpassed any in previous battles and was officially credited with being the principal cause of the German rout. LTG Ignati Prochko asserted that artillery was the weapon which stopped the Germans after their initial victories and stabilized the front before Leningrad and Moscow.

The Germans suffered their first heavy defeat near Moscow in the autumn of 1941. In this rout of the enemy,

(*continued on page 38*)


forward
observer
effectiveness

In November 1974, an article in this *Journal* discussed the many steps that were being taken, both at the Field Artillery School (FAS) and in field units, to improve the effectiveness of our forward observers (FOs). New streamlined procedures were developed, taught and exported to the field in training circulars. More demanding requirements were placed in the new Army Training and Evaluation Programs (ARTEPs) to encourage the rapid assimilation of new techniques. Training of FOs at the FAS came to feature moving observation posts with observers either walking or riding tanks and APCs. Bunker shoots were reinstituted for the experience gained from adjusting close-in fires. Immediate suppression missions became routine in conjunction with hasty fire planning and priority targets. New procedures were designed and are now practiced for more responsive delivery of smoke and ICM.

In spite of obvious progress, it remained apparent that the FO was still the least responsive part of the gunnery system. An extensive data base tells us that FOs locate themselves with an average error of 350-400 meters. They locate targets with an average target location error (TLE) of 450-500 meters! Additionally, FOs have been driven by grading procedures and ORTTs/ATTs to be conservative in their adjustment of fire. In spite of our rhetoric, there has been little payoff for being bold and aggressive when the chips are down in the training environment. With this kind of gaping hole in the front end of the system, we must admit that our cherished goal of first round fire-for-effect remains unreachable and that field artillery is often unresponsive. The Gunnery Department, in conjunction with the Target Acquisition Department and field units, has continued to work on this problem. Training techniques have been developed which hold real promise for cutting the problem down to manageable size. Recent Officer Basic Course (OBC) classes have produced major gains in target location accuracy and fast, bold adjustment of fire.

Map-Terrain Association

For months the two departments have gradually tightened the screws in this area. Common sense tells us that associating the abstract map with the real terrain is the most important single skill an FO can develop. The related skills of distance estimation and determination of direction are also important. Emphasis has shifted from the theoretical to the practical. Map reading instruction, which has been increased, is done almost entirely out on the terrain with repetitious drills in map-terrain association. The student locates himself, then locates several targets, then moves and repeats the process over and over again. This practical approach is continued in initial observed fire classes. Students are no longer placed in classrooms for discussion of the fire request, bracketing techniques and adjustment of fire (blackboard slappers). They are kept out in range shacks where these subjects can be covered while the map-terrain association drills continue. Subsequently, on all observed fire shoots, continuing stress is placed on map and terrain analysis.

Hasty Adjustment Technique

The adjustment of observed fire has always been taught at FAS with two conflicting ideas being stressed. The first, and dominant, idea is to establish a bracket, split it down and fire-for-effect when the 100-meter bracket is split. The second idea, often talked about but never effectively pushed, is to be "bold and aggressive." After initial training in traditional bracketing methods, the hasty adjustment technique is now introduced in an attempt to get the best of both worlds. The observer gives a correction designed to bring the second round onto the observer-target line in the opposite sensing (over or short) from the first round. Having established this initial bracket, he then moves directly to the target by proportionately estimating the required range and deviation corrections.

Observer Motivation

More is required than repetitious drills and academic discussion of adjustment techniques. If we want observers who are both bold *and* accurate, a new *state of mind* must be created. The individual observer must be motivated, in the training environment, to develop his competence and boldness to near the same level that he would naturally develop in combat. He must start now to realize that targets rarely remain static or soft for long — especially when they perceive that field artillery fire is being adjusted on them. Our experience thus far indicates that the pressures which motivate observers to increase their accuracy and speed can be created in the training environment by grading procedures in the school and ARTEPs requirements in the field.

New Grading Procedure

A new observed fire grading procedure was implemented in June 1975 with OBC 14-75 and has been continued. The minimum requirements are that the student determine target location and begin transmitting his fire request within 45 seconds; that his initial target location be within 200 meters of the actual adjusting point location; that he enter fire-for-effect not later than his third subsequent correction; and that his fire-for-effect rounds be within 50 meters of the target. The student has a maximum of 10 seconds after a round impacts to begin transmitting his correction. If more than four rounds are used, each additional round costs the student heavily. Sizeable bonuses are given for firing-for-effect with the second or third

by COL Paul F. Pearson

round. Students quickly realize that success in this environment depends more on a good initial target location than anything else. Motivation in this area has increased to the extent that weekend student beer parties out on the Fort Sill ranges are common. The students spend the afternoon improving their map-terrain association competence, which is exactly what every FO, everywhere and all the time, should be doing. Overall, the combination of emphasis on map-terrain skill, hasty adjustment and new grading procedure has produced some very encouraging results which are shown in figure 1.

Additionally, students are very sensitive to the number of rounds they are using to accomplish their missions and the amount of time they are taking to bring effective fire on the targets. Missions are completed much faster and ammunition expenditure has been reduced by over 20 percent.

Student Reaction

Student reaction to the increased pressure has been positive and enthusiastic, mainly because the pressure makes sense. Today's lieutenant-FOs and NCO-recon sergeants know we are up against a smart, tough enemy who is not going to sit still in an exposed posture while some mathematician imbued with the religion and beauty of intricate gunnery procedures slowly refines his 800-meter bracket and finally fires-for-effect 10-15 minutes later. It is better to get a battery volley within 200 meters quickly and shift the fire-for-effect as required. We believe the emphasis is shifting in student minds toward combining those interrelated factors of boldness, skill, speed and accuracy to partly close that open (FO) end of our gunnery system.

Future Developments

The ultimate answer to first round fire-for-effect lies in new equipment. At the FO end of the gunnery system, two important items will enter the inventory within five years. The GVS-5 laser rangefinder will provide accurate observer-target distance and a real one-round adjustment capability. The Digital Message Device will permit the observer to enter a TACFIRE-Battery Computer system which is digitally linked all the way to the guns — a major improvement in responsiveness. The most important longer-term development in the observer area is the FO vehicle. This armor-protected vehicle will have an onboard position and azimuth determining system linked to a distance and direction measuring device. The combination will provide continuous observer location and instant target location which will be digitally transmitted to the fire direction center computer and converted to fire commands. The fire commands for each individual piece will be digitally transmitted and displayed at each gun. The entire system response, from the time the observer sees a target until the lanyard is pulled, will be 15-30 seconds, depending on advance preparation in the firing battery. Career field artillerymen with more than five years remaining to serve will finally see the era of the first round FIRE-FOR-EFFECT!

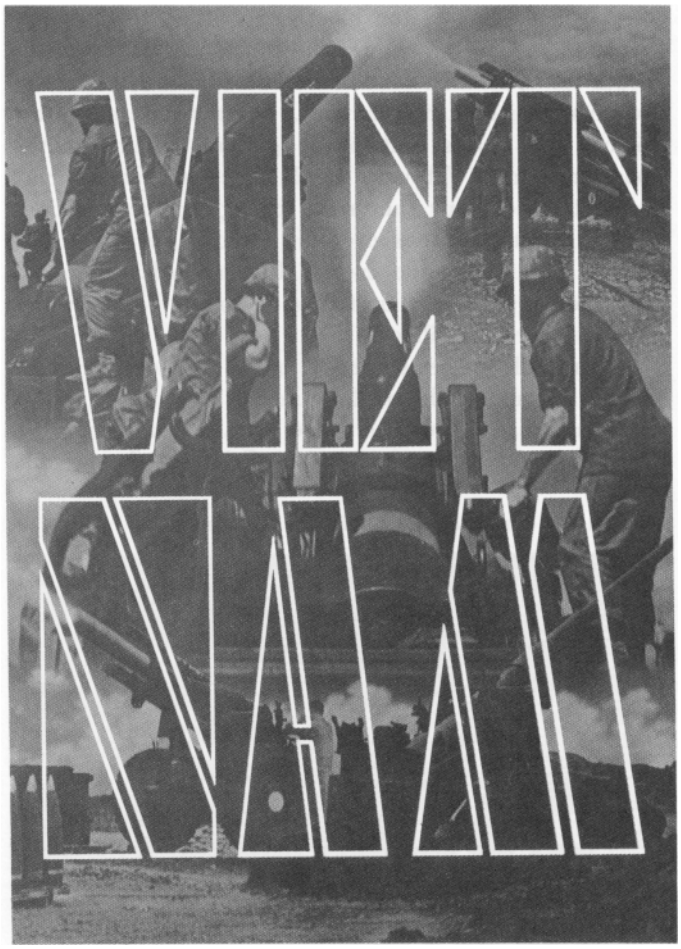
Figure 1

Radial Distance (Meters)	OBC 5-75 thru 14-75 Target Location Error Percent	OBC 14-75* Target Location Error Percent	OBC 1 & 2-76* Target Location Error Percent
0-200	31.8	40.1	51.3
201-400	20.4	25.9	21.9
401-600	15.0	14.2	12.6
Over 600	32.8	19.8	14.2

*New training and grading procedures

COL Paul LF. Pearson, FA, is Director of the Gunnery Department, USAFAS.

Part V The Hot War



1968

The TET Offensive

by MG David E. Ott
Commandant, USAFAS

The Viet Cong and the North Vietnamese Army in late 1967 launched several costly attacks. On 29 October the Viet Cong attacked the South Vietnamese district capital of Loc Ninh, ran up the flag of the National Liberation Front and tried to hold the city. United States and South Vietnamese forces responded with massive air and artillery bombardment, but the enemy continued to press the attack despite heavy losses. Similarly, in early November four North Vietnamese Army regiments fought US and South Vietnamese troops near Dak To. The US command deployed the equivalent of a full division from the heavily populated coastal lowlands to the battle area. Again, as at Loc Ninh, the enemy sustained heavy casualties. A captured enemy document listed four objectives for the 1967 campaigns. These included encouraging units to improve, in combat, the technique of concentrated attacks to annihilate relatively large enemy units and effecting close coordination with various battle areas throughout South Vietnam to achieve timely unity. The activity of late 1967 was a prelude to *Tet* 1968. A high-level prisoner later revealed that the assault on Loc Ninh had been ordered to test mass formations and inexperienced troops in preparation for the 1968 offensive.

Tet, the festival of the Asian lunar new year, usually was the occasion for a formal cease-fire. In 1968, however, the North Vietnamese Army and the Viet Cong, using reserve forces and the larger supporting weapons, launched a series of massive coordinated attacks in what became known as the *Tet* offensive. As revealed by captured enemy sources, the strategy for the offensive was based on the belief that the war would culminate in 1968 and that large-scale continuous attacks, in conjunction with a general uprising of the people, would precipitate the withdrawal from Vietnam of US forces and the collapse of the South Vietnamese government, which would then be forced to accept a coalition government dominated by the National Liberation Front.

Tet 1968

Political and military targets of the *Tet* offensive included provincial and district capitals, the government in Saigon and its agencies, such as the Regional Development Cadres, the National Police and the Republic of Vietnam Armed Forces. The enemy believed that, if widespread attacks were successful, the inability of the government to protect the people would become obvious and the credibility of that government would be undermined. Installations and facilities that were essential to the conduct of the war and difficult to defend became tactical targets. In preparation for the *Tet* offensive, the enemy went to unprecedented lengths to assemble supplies and weapons and to infiltrate the cities. In Saigon, funeral processions concealed the movement of arms and ammunition. In Hue and Saigon, enemy troops in civilian dress escaped detection. In

provincial centers, such as Quang Tri, Da Nang, Nha Trang, Quin Nohn, Kontum City, Ban Me Thuot, My Tho, Can Tho and Ben Tri, the enemy infiltrated in strength.

The offensive began at 0015 on 30 January at Nha Trang. The same night 11 other cities in I and II Corps zones, as well as several military installations and airfields, came under attack. Enemy documents later revealed that these attacks were premature; the forces operating in these areas had not received the order for a one-day postponement of the offensive. The main attack took place on the following night, 30-31 January, when enemy forces hit 18 cities throughout the country. The allies cleared most of the cities within hours. However, in a few cities, particularly Saigon and Hue, the fighting continued for days.

The attack on Hue commenced at 0340 on 31 January. Elements of the 800th, 802d and 806th Battalions, 6th North Vietnamese Army Regiment, and the 804th Battalion, 4th North Vietnamese Army Regiment, initiated a rocket, mortar and ground assault on the city. Forces of the 4th Regiment soon occupied all of southern Hue except the Military Assistance Command compound. Meanwhile, to the north, two battalions of the 6th Regiment moved into the citadel, an old French fortress near the center of the city. By morning the flag of the National Liberation Front had been mounted on the flag pole of the citadel, and the enemy controlled all of the fortress except the South Vietnamese Army 1st Division headquarters.

The allies acted immediately to relieve the pressure on the Military Assistance Command and South Vietnamese Army compounds. While US and Vietnamese marines, along with the 1st Division, bore down on the enemy forces to the south and within the city itself, the 3d Brigade, 1st Cavalry Division, sealed off Hue to the north and west. Each of the maneuver forces fought exceptionally well, but the actions of the 3d Brigade, 1st Cavalry Division, were the most significant from a fire support aspect. The 3d Brigade blocking force was comprised of the 2d Battalion, 12th Cavalry, and the 5th Battalion, 7th Cavalry. The 1st Battalion, 7th Cavalry, 3d Brigade, was committed to base camp defense and did not join the rest of the brigade until 19 February. On that day the 2d Battalion, 501st Airborne, 101st Airborne Division, newly arrived from III Corps, also joined the 3d Brigade. The 3d Brigade direct support battalion, the 1st Battalion, 21st Artillery, established a fire support base at a South Vietnamese Army compound northwest of Hue.

On 3 February the 2d Battalion, 12th Cavalry, detected a large North Vietnamese force positioned near Que Chu, west of Hue. The battalion, supported by indirect artillery fire, aerial rocket artillery, and helicopter gunships, attacked the well-fortified enemy position. By 5 February the 2d Battalion controlled the high ground in the Que Chu area overlooking the surrounding plans and, with precise artillery fire, was able virtually to stop all enemy movement.

Beginning on 9 February, while the 5th Battalion, 7th Cavalry, maintained the blocking position, the 2d Battalion, 12th Cavalry, entered the village of Bon Tri to the south of Que Chu and encountered a well dug-in, regimental-size enemy complex. For three days US artillery, air strikes and naval gunfire pummeled the positions. On 12 February the 2d Battalion had to break contact without any substantial change in the situation. The 5th Battalion took over the assault, but it too was unable to dislodge the enemy. It remained for the 2d Battalion again to pick up the assault on 21 February and finally secure the village.

Meanwhile the remainder of the 3d Brigade, joined by the 1st Battalion, 7th Cavalry, and the 2d Battalion, 501st Airborne, had begun its move toward Hue from the northwest. On the morning of 21 February the brigade

1-77th FA during a high angle fire mission.

crashed into a strong enemy defensive position in the Ti Ti woods, approximately five kilometers northwest of the city. Tube artillery, along with naval gunfire and aerial rocket artillery, enabled the brigade to breach the enemy positions.

The advance of the 3d Brigade toward Hue necessitated close fire support coordination. Elements of the 1st Battalion, 30th Artillery (155-mm), and 1st Battalion, 83d Artillery (8-inch self-propelled), had been situated at Landing Zone NOLE since 20 February. From that position these elements had been supporting the Vietnamese and Marine units in and around Hue. With the approach of the 2d Brigade, coordination requirements became more exacting to avoid shelling refugees and friendly forces. On 21 February the South Vietnamese 1st Division commander requested a field artillery liaison party from the 1st Cavalry Division to assist in the coordination of fire support. The liaison party, which was dispatched the next morning, contributed to the success of the operation.

At 0730 on 24 February, US and South Vietnamese forces breached the southwest wall of the citadel and met only light resistance. An intense artillery preparation the night before had killed 161 enemies. The citadel secured, the battle of Hue was officially over. The National Liberation Front flag which had flown from the citadel tower since 1 February came down. The recapture of Hue had involved four US Army battalions, three US Marine Corps battalions and 11 South Vietnamese battalions. Ten Viet Cong and North Vietnamese Army battalions had been committed in an attempt to hold the city.

COL Richard M. Winfield Jr., 1st Cavalry Division Artillery commander, in summarizing the actions and problems of the artillery, emphasized the conventional quality of the operation and concluded with a description of clearance activities and their consequences:

"In the battle for Hue, the brigade was operating four battalions in the most conventional type of conflict that this division had ever been faced with. The brigade had their normal supporting artillery — three direct support batteries, a medium battery and, during the latter periods of the attack, an 8-inch battery. Those units, from the 3d to the 26th of February, fired 52,000 rounds. In addition, 7,670 rounds of 5-inch to 8-inch naval ammunition and 600 tons of Air Force-delivered munitions were expended in the area. In the last stages of the operation, the division commander and I went into Hue and worked with the commanding officer of the 1st ARVN forces. We took whoever was needed for fire control and clearance so that we wouldn't have any major accidents against US Army, ARVN or Marine units or civilians who were all converging on Hue. This required tight and rigid fire control, which was exercised by both the GS battalion commanders, by myself and by the senior officer whom I had placed in Hue to control those fires. We had 11 fire support agencies in Hue. Now, this of course, had an effect on our infantry units, which are use to operating when they want to shoot — they call for fire and the fire is there. When we have all these clearance requirements and you have to have minimum safe distances all around you, the fire becomes slow because of the clearance and becomes restricted both in the caliber of weapons and in the number of rounds you can fire. I would say that the fire support was adequate. It was tough to get, but it was certainly adequate."

US plans in the III Corps tactical zone for early 1968 envisioned only 14 allied battalions remaining within a 29-mile radius of Saigon. Since early December 1967, defense of the capital itself had been the responsibility of the South Vietnamese command. The 5th Ranger Group, with a US 105-mm howitzer battalion (2d Battalion, 13th Artillery) in direct support, was responsible for providing the necessary security. US forces thus released from the defense of Saigon were incorporated into plans for assaults on enemy base camps in the Cambodian border region. Thirty-nine battalions were to operate against these camps.

As the US plans were set in motion, however, General Weyand, commanding II Field Force, became concerned over the results. Enemy resistance along the Cambodian border was weak. This weakness, coupled with the large volume of enemy radio transmissions near Saigon, convined him of the necessity for redeployment. He conveyed his conclusions to General Westmoreland. The result was a shifting of forces. By the time of the *Tet* attacks in the III Corps area, 27 US maneuver battalions were in the capital area and the remaining 25 outside.

The operational plan of the enemy in the III Corps tactical zone included:

- Seizing the Bien Hoa-Long Binh complex. Key targets: Bien Hoa Air Base, II Field Force headquarters, III Corps headquarters, prisoner-of-war camps between Bien Hoa and Long Binh, Long Binh ammunition storage area.
- Attacking targets in the Hoc Mon area northwest of Saigon while blocking allied reaction by interdicting Route 1 between Saigon and Cu Chi; maintaining readiness to exploit successes in the northern Saigon area,
- Blocking any attempted reaction by the US 25th Infantry Division from the Cu Chi-Dau Tiang region.
- Attacking district and government installations in Thu Duc and destroying the Newport bridge over the Saigon River between Saigon and Long Binh.
- Containing the 1st Infantry Division in the Lai Khe area and cutting off Highway 13 at An Loc.
- Seizing Tan Son Nhut Air Base and possibly the adjacent vice-presidential palace; taking over the presidential palace along with the US and Philippine embassies;

holding or destroying installations of the government of Vietnam, such as the National Police stations and power plants. Success here would cause the government and the United States to lose face and would propel a move to the conference table, where the National Liberation Front would negotiate from a position of strength.

- Controlling Cu Chi, Duc Hoa (including the South Vietnamese 25th Division headquarters), Ba Ria, Xuan Loc (18th Division headquarters), My Tho, Ben Tre and Phu Loi-Phu Chang.

In the III Corps area the *Tet* offensive began at 0300 on 31 January in the Long Binh-Bien Hoa complex with a rocket and mortar attack on headquarters of the 199th Infantry Brigade and II Field Force. By 0321, Saigon and Tan Son Nhut were also receiving heavy fire. In order to control combat units in the Capital Military District (Gia Dinh Province), General Weyand ordered his deputy commander, MG Keith Ware, and a small staff to Saigon to take operational control of all US units. Task Force WARE, the operational headquarters, situated at Capital Military District headquarters, was operational by 1100 that same day and remained so until 18 February.

At the outset of the *Tet* offensive, only one US infantry battalion and four 105-mm howitzer batteries operated in Gia Dinh Province. Three of these batteries were in direct support of the South Vietnamese 5th Ranger Group. General Westmoreland, for political and psychological reasons, had refrained from maintaining US maneuver units in Saigon and several other large cities. Once the *Tet* attacks began and American maneuver battalions arrived in the Capital Military District, division and field force artillery units relocated and supported the relief of the district.

Fire support for American units in the Capital Military District, particularly in Saigon, posed serious problems for the artillery. Numerous homes and shops and heavy concentrations of people within the city limited the area where artillery could be fired. When artillery could be employed, it was slow to respond because of difficulties in obtaining clearance to fire. Vietnamese military units in the city and the city government had not been placed under a single control headquarters. As a result, no centralized clearance activity was established. Artillery liaison officers were required to obtain clearance locally from the national police station in their area of operations. The situation was corrected in June 1968 when the Army of the Republic of Vietnam established a single military governor in the Capital Military District. Artillery support was further limited in Saigon because buildings and other structures restricted the views of forward observers. Gunships and tactical air proved more adept at providing support because the pilots had better views of the target area. As a result specific enemy locations could be pinpointed and damage held to a minimum. For these reasons most of the major field artillery engagements in the Capital Military District during the *Tet* offensive and counteroffensive occurred in the outer edges of Saigon and in other areas of the zone.

Particularly impressive during *Tet* was the fire support

Thanksgiving Day 1969 — Charlie Battery, 1-30th FA, cut the holiday meal short when called for a fire mission in support of troops who had made contact with the enemy.

provided to the 1st Infantry Division in III Corps tactical zone. The division killed over 1,000 enemy troops. The "Big Red One" estimated that artillery and air strikes

Caliber	Daily Average Prior to *Tet*	Daily Average During *Tet*
105-mm	2,376	5,616
155-mm	925	1,459
8-inch	200	235
4.2-inch	1,100	1,570
Total	4,601	8,880

accounted for 70 percent of these enemy losses. The volume of field artillery fire increased substantially during the *Tet* offensive. The 1st Infantry Division recorded rounds fired:

The most significant engagement during *Tet* for units of the 1st Infantry Division Artillery and the 23d Artillery Group began on 1 February. The division had shifted its artillery south along Highway 13 to meet increased enemy activity between Lai Khe and Saigon. On the morning of 1 February, elements of the division engaged units of the 273d Viet Cong Regiment at An My, approximately 4,000 meters north of Phu Loi. The artillery began by providing blocking fires. Then at 1330 the artillery placed destructive fires upon enemy forces entrenched in the village. Throughout the day 3,493 rounds hit the northern half of the village and caused approximately 20 secondary explosions. A survey of the area before dark confirmed 201 enemy killed and evidence supporting estimates of more than twice that number. Once darkness set in, the artillery again provided blocking fires. The next morning, the 1st Infantry Division found the remainder of the 273d Regiment still entrenched in An My. The action resumed at 1030 with the artillery continuing to provide blocking fires. When rounds were fired on the village, numerous secondary explosions again resulted. After several hours of bombardment, friendly elements swept and secured An My and found 123 Viet Cong killed. Prisoner reports later confirmed the report of the encounter. The 273d Regiment was moving south when it met the 1st Infantry Division at An My; the ensuing battle rendered the 273d ineffective before it could reach its assigned objective and contribute to the *Tet* offensive.

The performance of the field artillery in III Corps tactical zone during *Tet* caused General Weyand to observe that the field artillery was instrumental in blunting or defeating many of the assaults in the zone: "Timely response, especially in the moments of fluid uncertainty during the initial phase of the attacks and in spite of clearance handicaps, contributed to the successes of the infantry and armored units."

Numerous smaller but significant field artillery actions occurred throughout Vietnam during *Tet.* For example, the 25th Infantry Division was plagued by enemy bunkers near the highway between Cu Chi and Saigon. Fires from the bunkers prevented free movement between the two locations. Numerous attempts to reduce the bunkers with artillery, air strikes and infantry assaults were unsuccessful. An 8-inch howitzer, delivering assault fire, finally eliminated the bunkers. Also noteworthy were the actions of units of the 54th Artillery Group which prevented the collapse of the Xuan Loc base camp. On 2 February Xuan Loc came under heavy attack. The quick, devastating fire of Battery C, 1st Battalion, 83d Artillery, saved the post. Battery C fired thirty-five 8-inch rounds and killed 80 of the attackers. During the period 1-18 February similar missions supported the defense of Xuan Loc. The 2d Battalion, 40th Artillery (the direct support battalion of the 199th Light Infantry Brigade), was one of the first artillery units to respond to enemy attacks in III Corps. An observer detected the enemy launching rockets on II Field Force headquarters and shifted fire onto the launching sites. Several of the firing points were neutralized before the enemy had fired all his rounds. The enemy suffered more than 50 killed.

In IV Corps tactical zone, the enemy offensive included attacks against My Tho and Vinh Long. On 31 January 1968, the Mobile Riverine Force was placed under operational control of the senior adviser in IV Corps. The riverine force initially was moved to the vicinity of My Tho, and two of its battalions conducted a three-day operation north of the My Tho River in response to a multibattalion Viet Cong attack on the provincial capital. Then, on 4 February, the riverine force moved to the provincial capital of Vinh Long and engaged three enemy battalions trying to seize the city. The 3d Battalion, 34th Artillery (105-mm towed), was in direct support of the Mobile Riverine Brigade. One battery was equipped with airmobile firing platforms, and two batteries were mounted on barges. The artillery battalion effectively delivered 8,158 rounds in support of the My Tho campaign. At one point a barge-mounted battery was required to make an airmobile deployment. The battery was provided a 1/4-ton jeep and a 3/4-ton trailer for a fire direction center. The barges were beached, and the pickup was made directly from them. This type of movement opened possibilities for deeper penetration into the Mekong Delta.

Finally, in I Corps area on 12 February 1968, Battery C, 1st Battalion, 40th Artillery (105-mm), while in support of a South Vietnamese unit, became the first US Army artillery unit to fire improved conventional munitions in combat. The target was 40 to 50 North Vietnamese troops in the open. The battery fired 54 rounds of the new ammunition, resulting in 14 enemy killed. The round was a controlled, fragmentation-type ammunition similar to the Air Force cluster bomb unit. FIRE CRACKER became the code word used when a forward observer wanted improved conventional munitions.

COUNTERFIRE!

A simple, rapid, graphical data storage and processing system is necessary to merge a lot of seemingly unrelated information into counterfire and other targets in sufficient time for them to be attacked effectively. Personnel in the targeting element of the div arty TOC must be well-versed in the enemy's tactics, equipment and capabilities, as well as our own. Each must be capable of immediately assessing one or more target indicators and deciding whether there is a target or if additional information is required. Based on the timeliness and reliability of the information received, all target data will be classified as target indicators or targets. This part outlines the target production system.

The basic tools of the target production system include:

Tactical situation map depicts the scheme of maneuver and the location of friendly artillery and logistics support elements. It is used by the operations duty NCO and planning officer in selecting artillery positions and in planning artillery movements to support the maneuver forces, counterfire and other general support efforts. **Counterfire order-of-battle map,** maintained by MI personnel, shows order-of-battle information associated with enemy indirect fire systems. Although the primary emphasis is on the development of counterfire targets, general targets may also be produced. The primary sources of information are MI agencies above and below the division artillery level. Order-of-battle (OB) workbooks and files maintained by the div arty MI element are also used to correlate and produce targets and target indicators. This map should be used in conjunction with the target indicators map. Firm targeting data may be produced by the addition of information and activities from both the counterfire OB map and the target indicators map. For example, an ASA report indicates the presence of an emitter habitually associated with a 130-mm field gun battery and the target indicator map shows a crater analysis ray that extends through the plotted location of the emitter. The minimum action called for would be to orient an AN/MPQ-4A radar on that location to confirm the presence and exact location of the battery. Additional action could include a request for a photo reconnaissance, SLAR or IR mission of that area. **Target indicators map** shows current friendly fire control measures, location of target acquisition devices and all enemy targets and target indicators. It is used by the targeting element of the div arty TOC to visually correlate target indicators to produce targets and should be physically located next to the counterfire OB map for the reasons stated above. The target indicators map is the best tool for orienting and positioning target acquisition devices and intelligence agencies that are capable of obtaining the necessary additional information to produce targets. The visibility or electronic coverage capabilities of the target acquisition devices should be portrayed on an overlay,

PART TWO

which can be set aside when not required. Target indicators from grid-producing sources are plotted with a tick mark on the indicators map as shown in figure 1. For accuracy and discernibility, plotting should be with a soft-lead pencil on acetate.

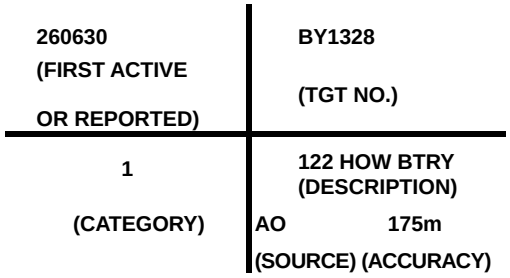


Figure 1

Target indicators from such sources as shell reports are plotted on an overlay and labeled as shown in figure 2.

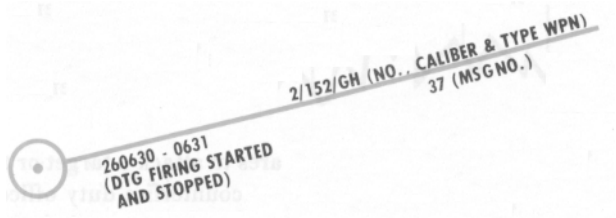


Figure 2

When it has been determined that a target does exist and that its location is accurate enough to permit firing or including the target in plans for firing, the location is plotted on the target/counterfire map. However, the tick mark will remain on the indicators map until the target has been fired or until there is no longer any reason to believe the target is still there. Leaving the target on the indicators map will facilitate immediate correlation of new indicators of this target reported to the div arty TOC.

Target/counterfire map is the primary tool of the fire control element in planning and controlling counterfire and other artillery firings. It will depict all the current targets developed from information shown on the counterfire OB and target indicators maps and from information received from other sources within the targeting system, as well as current friendly artillery positions and control measures.

Targets, with the exception of source and accuracy, are plotted on this map in the same manner as on the target indicators map.

It is from this map that target lists are developed and sent to all firing units within range of the target. Targets may be attacked immediately or units may be directed to maintain current firing data on the target(s) in preparation for firing when the situation dictates.

Target categories simplify information processing within the div arty TOC and facilitate the order to fire on specific targets when counterfire is required. The seven categories that have been established and the type of targets included in each category are shown in figure 3.

CATEGORY	TARGETS
1	Cannons
2	Mortars
3	Rockets
4	Arty COP'S
5	Radars
6	Air defense wpn systems
7	General

Figure 3

Counterfire reference grid consists of a series of five-kilometer squares covering the entire division zone. Each grid line will be given a letter, and the grid will be read as any map is read. Overprinted on acetate, the reference grid will be placed on the OB map, the target indicators map and the target/counterfire map. Additionally, artillery battalion fire direction centers, radars, sound and flash platoons and the FSE will have the reference grid on their situation maps. This grid will provide the div arty TOC a rapid means to direct counterfire and target acquisition coverage of specific areas on the battlefield.

Assume, for example, that the div arty TOC is responding to a request for counterfire in a particular area. One artillery battalion might be directed to fire all category 1, 2 and 4 targets in the counterfire grid reference BRAVO ECHO; another battalion, in counterfire grid reference ALPHA-ECHO. At the same time, certain target acquisition devices, such as the AN/MPQ-4A radar, would be oriented (by means of the grid) in the direction of the hostile firing units.

The grid has many other uses; for example, it might be used in directing search and rescue missions or in establishing flight paths and no-fire areas. The FA support plan will contain labeling instructions and frequency of change.

Target cards are used for recording all targets and target indicators associated with a grid. Each card lists all data necessary for evaluation of enemy activities from a specific location. The target card provides the most accurate grid associated with a target at any given time as well as a record of target engagement and damage assessment. An example is shown in figure 4.

Target card file will enhance the div arty TOC's ability to produce targets, direct fire on them and maintain a record of damage assessment. The file is divided into

targets and target indicators, which are further divided into target categories. When two or more cards are correlated, data should not be copied onto one card; rather the cards should be stapled together, acted on and refiled or disposed of as appropriate. Cards stapled together should reflect only one target number.

Evaluation and purging system — systematic evaluation and purging of targets and target indicators is mandatory for efficient operations. Charts, maps and target card files cluttered with outdated and extraneous data hinders rapid target production. The frequency of reevaluation of targets and indicators must be based on experience, the mobility of the target, the tactics of the enemy and guidance of the commander. If, for example, 122-mm batteries have been found to move every four hours, then these targets should be reevaluated approximately every four hours. For this reason, the information contained in the fourth quadrant of the target tick mark should be accurate. Target cards for targets that have been fired on should be removed from the file and either destroyed or retained in an inactive file, depending on the availability of damage assessment information.

Attacking Counterfire Targets

Counterfire targets which are not attacked when developed are sent to all artillery battalions within range and the div arty TOC will direct when these targets are to be engaged. When targets are no longer valid, the div arty TOC will direct firing units to delete them from their lists.

The div arty TOC can increase responsiveness in engaging counterfire targets by assigning counterfire missions to those cannon battalions supporting the division as a whole. The div arty TOC can assign these "counterfire responsive" battalions primary responsibility for selected counterfire reference grid squares and selected categories of targets within those grids as priority targets. For example: 1st Battalion, 82d FA, has been assigned responsibility for grid squares AE and BE, priority targets category 1. The

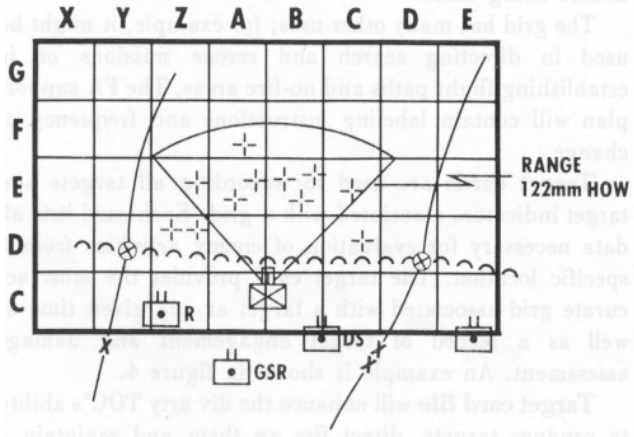


Figure 4

FDC will compute data for all targets in the primary grid squares, the batteries will prepare ammunition for priority targets and, when not otherwise engaged, will be on current firing data to reduce response time. (Apply the same general procedures as outlined in Training Circulars 6-40-1 and 6-50-1 for planned counterfire missions.) Similarly, the div arty TOC can request the FSE to preplan on-call close air support, target surveillance or jamming activities on specified targets as appropriate.

TARGET CARD

AREA	TGT NO	CATEGORY	FIRED		GRID
H-C	BY1328	1	Yes	No	36189180

ITEM#	TIME	GRID	DESCRIPTION	SOURCE/Acc
275	260631	36209175	122 H Btry	POW - 1000M
287	260722	36189175	122 H Btry	RO - 100M
288	260728	1/82 - Btry	(2) ICM	
292	260820	362918	Btry Displaced, 4TRKS Burning, Secondary Expl.	

When the div arty TOC prepares to attack a target or to initiate a counterfire program, the counterfire duty officer must carefully consider the following factors and decide HOW to engage the targets.

- The available assets.
- The target locations and descriptions.
- The target's effect on our forces.

Targets will be determined by the fire control element using the target/counterfire map either to extract the desired target or to plot the impacting hostile fire (friendly unit location) in the case of a request and extract appropriate enemy targets within range. At the same time, all friendly units that can range the target/target area will be extracted from the map.

Counterfire efforts are integrated in the following manner. The targeting element will check target indicators in the area and cue appropriate division target acquisition devices to search for hostile targets. In addition, the artillery intelligence officer (AIO) will request appropriate intelligence agencies to search for hostile targets in the area and collect damage assessment. The targeting element will also pass newly generated targets to the fire control element for engagement.

The counterfire duty officer will reevaluate all target indicators in the area and consider engaging them as targets.

The fire control element will direct the engagement of all appropriate targets in the area with artillery — using in priority — artillery battalions with GS or GSR missions and

field artillery battalion/groups reinforcing the division artillery (these units are most responsive to counterfire requests); direct support battalions and their reinforcing artillery battalions; and, field artillery of adjacent commands (with prior coordination by div arty LNO).

The FSE can request the TASE to both scramble on-call sorties and divert sorties engaging targets, as needed, to seek out and destroy hostile indirect fire units in the target area. The aircraft can attack counterfire targets with napalm, 500-pound bombs, CBUs or missiles. The Air Force can also be tasked to employ the WILD WEASEL or other antiradar (seek and destroy) systems. Air Force pilots can assess damage from their own strikes and from our field artillery counterfires. Reconnaissance pilots and FACs can also adjust counterfire.

The AIO can request the Army Security Tactical Support Element to locate and jam active hostile artillery communications nets or stations and counterbattery/target acquisition radars in the suspect area. Counterfire assets to be used for a specific mission will be selected by the div arty TOC to coordinate combined attacks. The div arty TOC will direct artillery battalions to engage a target by sending target numbers or target category and counterfire reference grid designation.

The div arty TOC will, based on the commander's guidance, the available assets and experience, designate the volume of fire and method of attack. If possible, the div arty TOC will attack with the volume of fire and shell/fuze combination needed to destroy the personnel associated with the target. Destruction fires impair an indirect fire system so badly it cannot continue the battle but frequently require a large expenditure of ammunition.

When sufficient assets to destroy a target are unavailable, select the best volume of fire and shell/fuze combination on the basis of the commander's guidance, the severity (or potential severity) of enemy fires, the number and size of targets to be attacked and the ammunition on hand in available firing units.

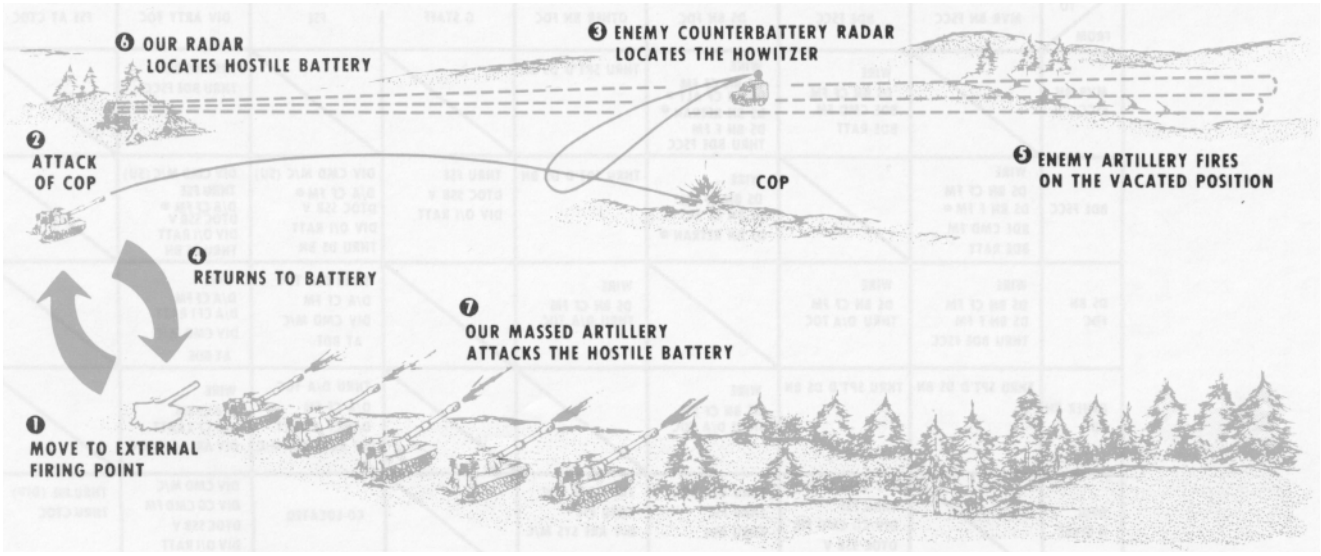
The damage we can inflict on the enemy will vary with the availability of counterfire assets. When few assets are available (e.g., the div arty TOC must support maneuver forces and counterfire simultaneously), suppressing rather than destroying may allow us to engage counterfire targets and free artillery to support the maneuver force. Suppressing a target takes relatively few rounds and few firing units but only temporarily degrades the enemy's ability to deliver effective indirect fires. Suppression must be periodically refired (thus exposing our units to acquisition and attack) until no longer needed.

Method of Attack

The div arty TOC can insure that counterfire will achieve maximum effect by considering the following before determining the method of attack: known vulnerabilities (equipment and personnel) of the target, enemy deployment within the target area, hardness of the target and the results of previous counterfire missions.

Large targets can be attacked easily by use of multiple aiming points, range or deflection spreads or other special corrections. If massed fires cannot be employed, and planning time is limited, zone and sweep or a similar technique may be most effective. Point targets, if accurately located, should be attacked with a converged sheaf (see TC 6-40-1 for details).

Both the size of the target and the accuracy of the target location influence the method of attack. Figure 5 provides a guideline until sufficient experience through damage



Note; The M109A1 is best suited for deceptive firing techniques because of its mobility and crew-protecting armor.

assessment can be gained to more effectively attack counterfire targets.

Figure 5

Target size	Location error (meters)	Method of attack
Point	0-100 (accurate) 100-150	FFE, converged sheaf FFE, normal sheaf
Area	0-150 (accurate) 150-250	FFE, normal sheaf FFE, normal sheaf

Targets not accurately located may not be destroyed by counterfire. If the error in target locations is greater than those in the table, the location should be further refined before the target is engaged. As always, the div arty TOC must exercise good judgment in attacking poorly located targets in response to counterfire requests. If poorly located targets must be attacked, the div arty TOC can coordinate with the TACP for tactical air (pilots can see the target) or with ASA for jamming. This will decrease the exposure of our artillery to detection and attack.

The div arty TOC must consider the enemy's ability to deliver effective counterfires before deciding on a method of attack. The use of roving guns or batteries, weapons in alternate or supplemental firing positions or units about to displace to deliver counterfires will minimize our vulnerabilities and may prompt the enemy to reveal his radars, COPs and firing units. These techniques may deceive the enemy as to the location and number of our firing batteries and cause him to waste ammunition.

Accurate surprise fires achieve the greatest effect with a given amount of ammunition. The div arty TOC must employ the best available predicted fire techniques or sound-on-sound adjustment procedures in the attack. Target acquisition devices must be cued prior to firing. Remember that any target div arty acquisition device (except the AN/TPS-25A radar) can adjust fire onto a target it has located even if the device has not been surveyed in. This technique enhances our survivability by decreasing the time required for adjust and, thus, decreasing our exposure to location and attack.

After choosing the best method of attack with artillery, the div arty TOC can vastly multiply effectiveness and decrease vulnerabilities by using a coordinated attack with artillery, tactical air and radio and radar jamming. Jamming defeats enemy target acquisition radars and disrupts communications between enemy COPs and firing batteries. Tactical air can destroy poorly located targets and any emitting radar. Artillery can defeat well-located targets and can further disrupt the COPs by suppressing them with ICM or obscuring/screening smoke.

The enemy's ability to locate quickly and return large volumes of fire against batteries that fire multiple volleys from the same position is another factor that bears on

Figure 6
COUNTERFIRE
COMMUNICATIONS CHANNELS

TO / FROM	MVR BN FSCC	BDE FSCC	DS BN FDC	OTHER BN FDC	DTOC G STAFF	DTOC FSE	DIV ARTY TOC	FSE AT CTOC
MVR BN FSCC		WIRE DS BN CF FM BDE CMD FM BDE RATT	WIRE DS BN CF FM DS BN CF ALT * DS BN RETRAN * DS BN F FM THRU BDE FSCC	THRU SPT'D DS BN			THRU DS BN THRU BDE FSCC	
BDE FSCC	WIRE DS BN CF FM DS BN F FM * BDE CMD FM BDE RATT		WIRE DS BN CF FM DS BN CF ALT * DS BN RETRAN *	THRU SPT'D DS BN	THRU FSE DTOC SSB V DIV O/I RATT	DIV CMD M/C (SU) D/A CF FM * DTOC SSB V DIV O/I RATT THRU DS BN	DIV CMD M/C (SU) THRU FSE D/A CF FM * DTOC SSB V DIV O/I RATT THRU DS BN	
DS BN FDC	WIRE DS BN CF FM DS BN F FM THRU BDE FSCC	WIRE DS BN CF FM THRU D/A TOC		WIRE DS BN CF FM THRU D/A TOC		THRU D/A TOC D/A CF FM DIV CMD M/C AT BDE	WIRE D/A CF FM D/A CF1 RATT DIV CMD M/C AT BDE	
OTHER BN FDC	THRU SPT'D DS BN	THRU SPT'D DS BN	WIRE DS BN CF FM THRU D/A TOC			THRU D/A TOC D/A CF FM D/A CF 2 RATT DIV AREA SYS M/C	WIRE D/A CF FM D/A CF 2 RATT DIV AREA SYS M/C	
DTOC G STAFF		DIV CMD M/C THRU FSE DIV CG CMD FM DTOC SSB V DIV O/I RATT	THRU D/A TOC THRU FSE THRU BDE	THRU D/A TOC THRU FSE DIV ARE SYS M/C		CO-LOCATED	DIV CMD M/C DIV CG CMD FM DTOC SSB V DIV O/I RATT THRU FSE	THRU FSE (DIV) THRU CTOC

NOTES:
* REQUIRES RADIO SET FREQUENCY CHANGE.

method of attack. We can maximize effectiveness and minimize our vulnerabilities by using massed surprise fires.

Massed fires minimize the vulnerability of each battery by flooding enemy radar and sound systems for very short periods of time and, therefore, decrease the risk of both detection and attack.

Damage Assessments

During the conduct of a counterfire mission, the div arty TOC obtains damage assessments from the FSE, the FO or FSO of the unit to evaluate counterfire effectiveness. On the basis of information received, the div arty TOC redirects, intensifies, decreases or stops fires, as necessary.

SOPs for expeditious delivery of immediate counterfires must be established. The following procedures should be in usable SOP form: requesting/approving procedures, target acquisition coordinating procedures and attack coordinating procedures.

Communications

Rapid, responsive counterfire depends on good, reliable communications. Existing means — FM, AM/SSB, and multichannel VHF and wire assets and messengers — are sufficient to support the total counterfire efforts of the division.

Sole-user multichannel circuits between the brigade FSCC and the division FSE, between the division FSE and the corps FSE, and between the division FSE and the div arty TOC expedite the flow of counterfire information and requests. Adjacent div arty TOCs can coordinate fires through the corps multichannel system or over the corps arty FD net (SSB-RATT).

An SB-22 switchboard is required in the FSE to provide direct communications between each brigade FSCC and the div arty TOC for counterfire. This switchboard can also be used to reroute counterfire traffic as required, provide a direct link between the FSE/CTOC and the div arty TOC when needed and monitor counterfire wire traffic.

As a backup for the sole-user multichannel circuits, the brigade FSO can contact the div arty TOC on the div arty command/FD net (FM). His transmissions would also be monitored by the FSE.

Primary and alternate means of communications are shown in figure 6. Using this matrix, each member of the counterfire team can determine how to route his traffic. For example, a brigade commander may request countersuppression over either the division TOC net (SSB, voice) or the division operations/intelligence net (SSB-RATT), if he cannot use his normal wire or radio fire support channels through the DS artillery battalion.

Future Trends

Improved organizations and equipment now in planning stages will greatly increase our future counterfire capabilities.

A target acquisition battery is being made organic to each division. The battery will provide sufficient target acquisition devices to insure multiple-system coverage across the division zone, and the battery processing section

COUNTERFIRE COMMUNICATIONS CHANNELS (CONTINUED)

TO / FROM	MVR BN FSCC	BDE FSCC	DS BN FDC	OTHER BN FDC	DTOC: G STAFF	DTOC: FSE	DIV ARTY TOC	FSE AT CTOC
FSE AT DTOC	THRU BDE FSCC	DIV CMD M/C (SU) DIV CG CMD FM DTOC SSB V DIV O/I RATT THRU D/A TOC	THRU D/A TOC D/A CF FM THRU BDE FSCC	THRU D/A TOC D/A CF FM D/A CF 2 RATT	CO-LOCATED		DIV CMD M/C (SU) D/A CF FM D/A CF 2 RATT THRU DTOC	CORPS CMD M/C (SU) THRU DTOC
DIV ARTY TOC	THRU DS BN THRU BDE FSCC	DIV CMD M/C (SU) THRU FSE DTOC SSB V DIV CG CMD FM DIV O/I RATT THRU DTOC	WIRE D/A CF FM D/A CF 1 RATT	WIRE D/A CF FM D/A CF 2 RATT	DIV CMD M/C DTOC SSB V DIV CG CMD FM DIV O/I RATT THRU FSE	DIV CMD M/C (SU) D/A CF FM D/A CF 2 RATT THRU DTOC		THRU FSE (DIV) THRU DTOC
FSE AT CTOC					THRU FSE (DIV) THRU CTOC	CORPS CMD M/C (SU) THRU CTOC	THRU FSE (DIV) THRU CTOC	

LIST OF ABBREVIATIONS:

DS BN CF FM ..... DIRECT SUPPORT BATTALION COMMAND/FIRE DIRECTION NET (FM)
DS BN CF ALT ..... DIRECT SUPPORT BATTALION COMMAND/FIRE DIRECTION ALTERNATE (FM)
DS BN RETRAN ..... DIRECT SUPPORT BATTALION RETRANSMISSION FREQUENCY (FM)
DS BN F FM ..... DIRECT SUPPORT BATTALION FIRE DIRECTION NET 1, 2, OR 3, (FM)
BDE CMD FM ..... BRIGADE COMMAND NET (FM)
BDE RATT ..... BRIGADE RADIOTELETYPE NET (SSB)
D/A CF FM ..... DIVISION ARTILLERY COMMAND/FIRE DIRECTION NET(FM)
D/A CF 1 RATT ..... DIVISION ARTILLERY COMMAND/FIRE DIRECTION NET 1, RADIOTELETYPE (SSB)
D/A CF 2 RATT ..... DIVISION ARTILLERY COMMAND/FIRE DIRECTION NET 2, RADIOTELETYPE (SSB)
DIV CG CMD FM ..... DIVISION COMMANDING GENERAL COMMAND NET (FM)
DIV O/I RATT ..... DIVISION OPERATIONS/INTELLIGENCE NET, RADIOTELETYPE (SSB)
DTOC SSB V ..... DIVISION TOC NET, VOICE (SSB)
DIV CMD M/C ..... DIVISION COMMAND MULTI-CHANNEL SYSTEM
DIV AREA SYS M/C ..... DIVISION AREA MULTI-CHANNEL SYSTEM
CORPS CMD M/C ..... CORPS COMMAND MULTI-CHANNEL SYSTEM
(SU) ..... SOLE USER CIRCUIT

will add sufficient personnel to fully man the div arty TOC.

TACFIRE, to be fielded in mid-1978, will increase counterfire responsiveness with its computational, transmission and storage capabilities. It will aid the div arty TOC by more accurately and quickly performing many time-consuming and repetitive tasks. TACFIRE will develop, store, retrieve and transmit target data and fire plans. It will also maintain ammunition status and capabilities of fire units and transmit fire missions (see Jul-Aug 1975 *Journal*).

The TACFIRE system can store and process up to 1,300 targets and analyze vast amounts of data; thus, it will greatly expand the capability of the targeting and fire control elements of the div arty TOC.

Artillery and mortar locating radars (AN/TPQ-37 and -36) will be operative in the 1980s. These radars will be able to simultaneously and automatically locate multiple indirect fire weapons over a wider horizontal sector and at longer ranges than current radars. Both new radars will provide accuracies that will permit first-volley counterfire.

Dual purpose and random delay improved conventional munitions (ICM), as well as artillery-scatterable mines, will improve our counterfire effectiveness by greatly increasing the lethality of our fires. The dual purpose ICM, effective against both materiel and personnel, will improve the lethality of our counterfire and decrease both ammunition expenditures and exposure. Similarly, random delay ICM, by extending the period we can suppress an enemy with a single volley of fire, will decrease our need to reinitiate fires and, thus, will reduce our exposure to enemy target acquisition. Finally, by use of artillery-delivered scatterable mines, we can restrict enemy movement and make position areas unsuitable for enemy occupation.

(*continued from page 23*)

the Soviet artillery played a decisive part. Stubborn battles between German tank divisions and the Soviet artillery ended in victory for the Russian gunners. More than 1,500 tanks — 13 tank divisions — attacking Moscow were destroyed on the outskirts of the capital; and the majority were lost as a result of artillery fire. By the summer of 1944, the Germans had lost seventy thousand of their tanks on the Soviet-German front. Those losses came as a result of the power of Soviet artillery.

American arms-component concepts were similar to those of our European Allies. They called for attainment of parity with the Germans in the tank and plane team, which team was considered the spearhead of the armored force. But the series of victories over the Germans, after El Alamein, caused a revaluation and the "Field Service Regulations," June 15, 1944, conceded that no one arm wins battles. A cautious qualification crept in the section on artillery, "Concentrations of artillery fire are regulated to bring the greatest possible volume to fire on objectives of decisive importance at the critical moments of the attack."

Actual combat experience further modified the noncommittal stand on naming a decisive weapon. MG John A. Crane, a senior artillery officer, said, "With the campaigns in Poland and France in 1939 and 1940 came a huge expansion of our armored force. *Blitzkrieg* was the password, and prosaic, conventional artillery was 'streamlined' down and cut to the bone. We learned the hard way. We learned that it took artillery and still more artillery to counter tanks and enemy artillery."

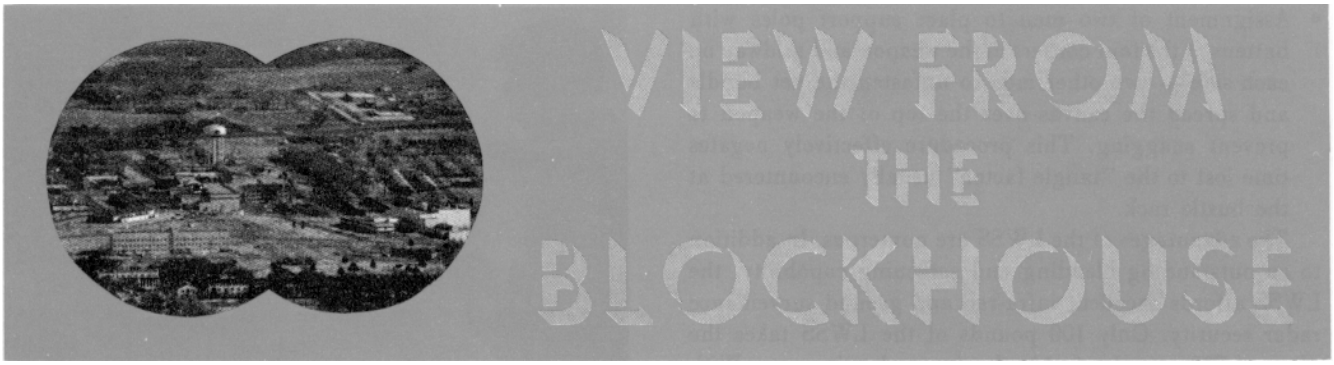
As the Western campaign progressed, the role of artillery was stepped up. LTG J. Lawton Collins wrote to BG W. B. Palmer of the VII Corps Artillery, summing up American experience in the crisis of the Battle of the Bulge. "The great superiority of our artillery gave us a tremendous edge on the Germans . . . . This was true throughout the campaign, but especially during the deadly fighting about Aachen in the critical days of September, October and November 1944, when the VII Corps was extended over a wide front and vulnerable to enemy attacks from three sides."

BG G. M. Wells singled out the 155-mm cannon (the M1) as the outstanding piece, indeed as the prime weapon on the Western front.

The Germans paid a belated tribute to artillery in recounting their experiences on the Eastern Front. One Captain von Schonau, writing in the *Artilleristische Rundschau*, May 1944, contended that ". . . artillery has shown itself, especially in defense, to be the backbone of the front."

Such evaluation, pragmatic rather than theoretical, served to restore the concept of artillery as the capstone in the arms-component on the battlefield. But only one of the British writers mentioned above publicly recognized the fact. Captain Hart admitted his failure properly to appreciate the role of artillery, "Contrary to my anticipation, the ordinary field gun has continued to play a very large part in this war — helped by the fact that it now fires a somewhat heavier shell and is generally motor-driven."

Notes from the School



GFT Determination of Range Probable Error

The USAFAS Gunnery Department recommends that fire direction centers use a GFT to determine whether the Range Probable Error equals or exceeds 25 meters when conducting precision (ABCA) registrations. This information must be provided the forward observer. It can be determined quickly by checking the location of the Range Probable Error Gagepoint on the GFT. The gagepoint is printed, where applicable, on the GFTs for all weapons except the M109A1 (GFT 155AM1) and it is being added to future GFTs for this weapon. In the interim, fire direction personnel in M109A1 units are encouraged to construct the gagepoints on their GFTs. The gagepoint is a black triangle located above the Delta FS scale (see paragraph 17-11j, FM 6-40).

Muzzle Brakes And LWSS

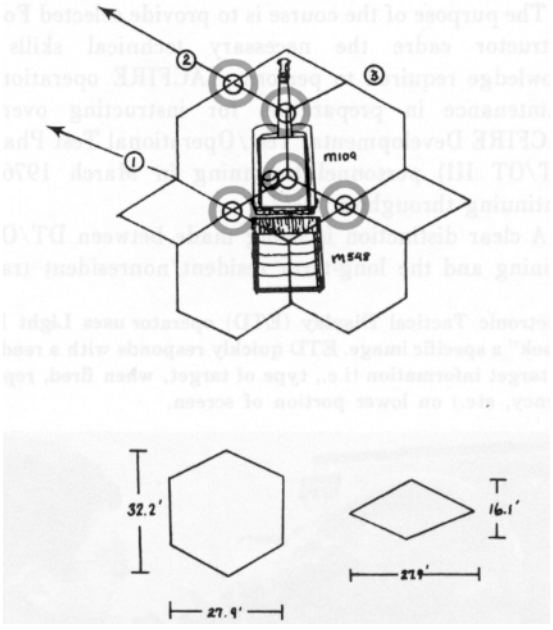
M109A1 units at Fort Sill and in Germany have reported a slight problem with the Army's new lightweight camouflage screening system (LWSS). Though the LWSS was designed and is issued for a two-year life expectancy, few are surviving beyond 10 rounds of live fire. With the system now approaching extinction in several supply organizations, the Field Artillery School's Tactics Department suggests a new method of LWSS net erection.

More often than not, LWSS damage (an assortment of gaping holes throughout the net) can be attributed to erection techniques which leave the net vulnerable to the tremendous muzzle brake blast thrown to the sides and rear of the tube. The new method involves dropping the net clear of the muzzle brake area and to the ground prior to fire.

"Drop time" requires only 10 seconds with the new-method and non-adjusting battery pieces remain fully concealed until fire-for-effect data arrives via land line. . .an obvious improvement over methods which call for premature exposure in the interest of responsiveness.

Factors which facilitate the speed and effectiveness of the new method are:

- Assembly of the net in the desired configuration in garrison.
- Leaving the net assembled and folded after panel assembly.
- Packaging the net in salvage canvas or the ammo tarpaulin issued to the gun section.
- Tagging the package to indicate the front of the net.
- Transportation of the net on the M109A1's cab or between the trunnions of other self-propelled or towed howitzers.
- Storage of support poles and spreader battens in easy-access areas.



Suggested LWSS erection technique [connector pins designated by colored circles]. — Crewman 1 pulls lanyard at edge of net, disengaging forward connecting pins and dropping front of net. Snags on howitzer's left side are removed immediately and net is flattened onto the ground. — Crewman 2 pulls lanyard in same manner as 1, ensuring that net forward of howitzer is clear of muzzle and on the ground. — Crewman 3 clears snags on right side of vehicle and flattens net onto the ground.

- Assignment of two men to place support poles with battens at the four corners of the weapon and midway on each side — two other men to unfasten the net bundle and spread the canvas over the top of the weapon to prevent snagging. This procedure effectively negates time lost to the "tangle factor" usually encountered at the bustle rack.

The advantages of the LWSS are numerous. In addition to an outstanding blending and screening capability, the LWSS affords excellent infra-red and ground surveillance radar security. Only 100 pounds of the LWSS takes the place of 700 pounds of older burlap and twine nets. With proper erection of the LWSS, few should be nostalgic for the old days.

TACFIRE Graduates First Class

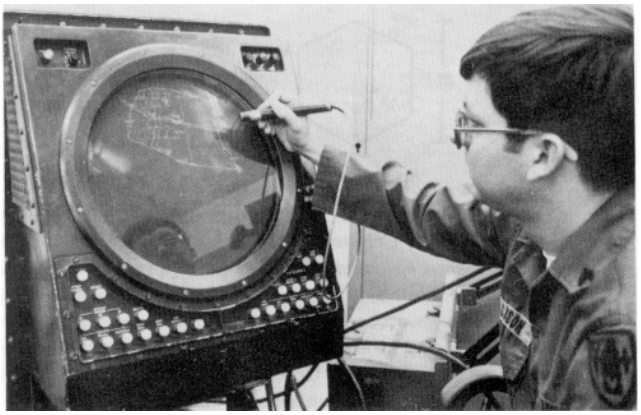
Graduation ceremonies were held at Fort Sill in mid-October for Class 1 of the TACFIRE Operator and Organizational Maintenance Course. COL Bruce Hennessy, chief of the TACFIRE Team, Department of Combat Development, USAFAS, addressed the 15 graduates who had completed an intensive eight-week course of instruction by the Data Systems Division of Litton Industries. A second course began in late October and ended in mid-December.

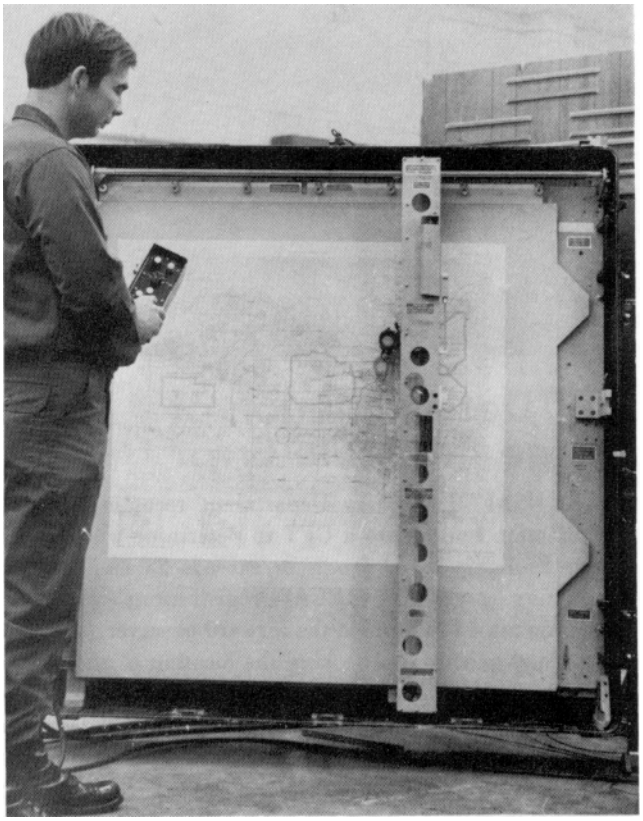
The purpose of the course is to provide selected Fort Sill instructor cadre the necessary technical skills and knowledge required to perform TACFIRE operation and maintenance in preparation for instructing over 600 TACFIRE Developmental Test/Operational Test Phase III (DT/OT III) personnel beginning in March 1976 and continuing throughout 1977.

A clear distinction is being made between DT/OT III training and the long-term resident/nonresident training programs. While several training innovations involving self-paced instruction (ETV, slide-audio, etc.) will be explored on a noninterfering basis during DT/OT III training, execution will be undertaken only after conclusive evidence indicates that they are superior to our existing training approaches.

During the conduct of Operational Test III, the performance of unit personnel trained by USAFAS will be monitored and evaluated as a basis for validation of the TACFIRE program of instruction. The DT/OT III training concepts and programs will then be revised and refined based upon OT III results and will serve as a basis for development of the full-scale resident instructional program to support system deployment.

Electronic Tactical Display (ETD) operator uses Light Pen to "hook" a specific image. ETD quickly responds with a readout of all target information (i.e., type of target, when fired, reporting agency, etc.) on lower portion of screen.





Operator prepares to activate Digital Plotter Map which displays existing or planned tactical situations on standard Army topographic maps or overlays.

Aquila Ready for Testing

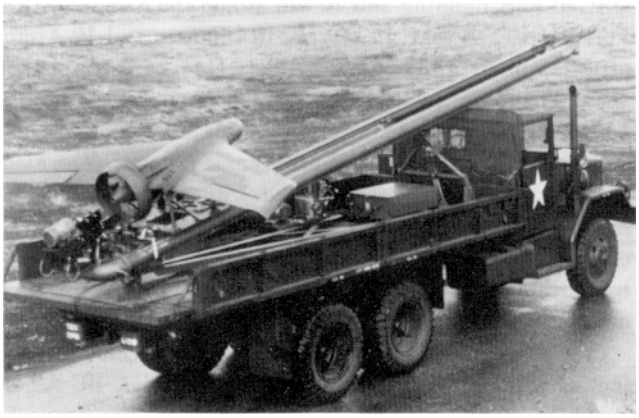
The School's Remotely Piloted Vehicle (RPV) task force, Project Seeker (see "Mini-RPV's," July-August 1975 *Journal*) and Lockheed Missile and Spacecraft have produced a technology demonstration RPV system for investigatory tests during 1976. The experiments will

evaluate the system's capabilities for missions such as reconnaissance, target acquisition, artillery fire adjustment and LASER target designation.

The basic test system includes the XMQM 105 "Aquila" RPV, a vehicular-mounted ground control station (GCS), a launcher mounted on the rear of a long-bed 2 1/2-ton truck and specially designed netting equipment for RPV recovery.

Weighing between 120 to 140 pounds, the Aquila is propelled by a highly modified 11-horsepower McCollugh two-cycle engine. The vehicle's framework is covered with "Kevlar," a resin-impregnated fabric used in the manufacture of armored vests.

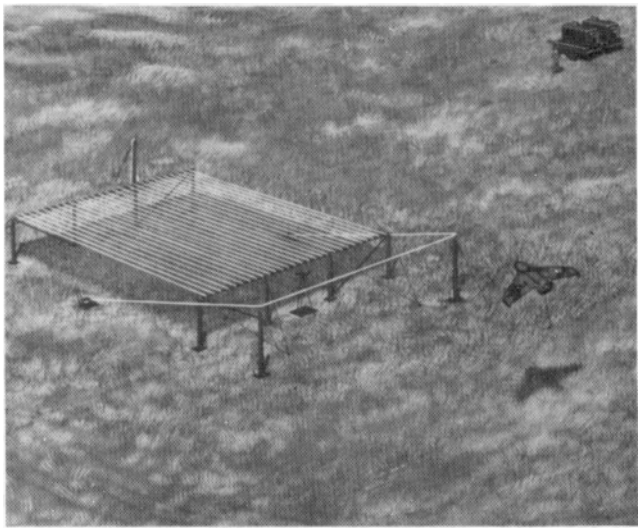
Flight control of the XMQM 105 originates from the GCS which houses the RPV sensor and operating consoles. Though actual flight of the RPV is computer controlled, a variety of displays and instruments monitor air speed, mission time, engine RPM, altitude and other relative flight data. Television monitor screens (black and white) are located at each operator's position on the control console. Two XY map plotters are located in the middle of the console and provide continuous, simultaneous display of the RPV's location on two different scale maps. The RPV sensor camera's angle of view is controlled with the "joystick" located at the sensor operator's position.



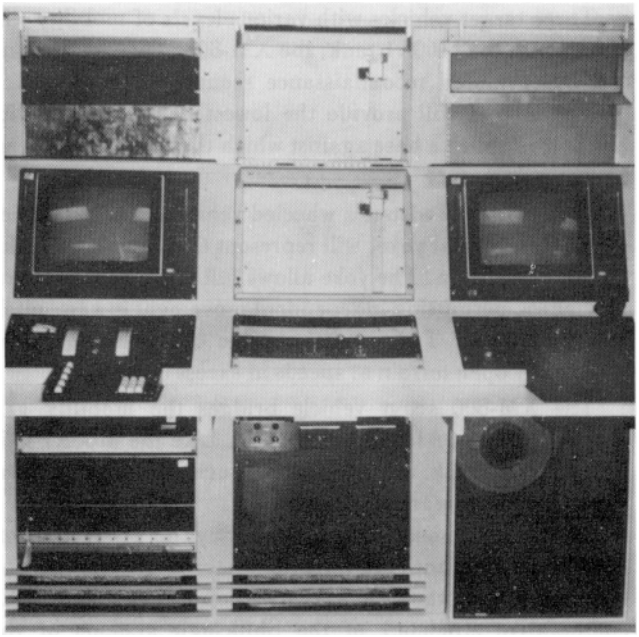
XMQM 105 launcher mounted on rear of long bed 2½-ton truck.

During flight, the sensor operator may lock and track targets of interest and, if necessary, study them in detail through activation of the vehicle's automatic loiter mode. A zoom lens on the sensor camera enables the sensor operator to select the field of view most appropriate to the mission — a wide field of view for area observation and target detection or a narrow field of view for target recognition and identification. The RPV's LASER rangefinder, coupled with the GCS computer, provides rapid readout of target grid coordinates and, as recently demonstrated at White Sands Missile Range, NM, may perform as a target designator for LASER-guided weapons. During that exercise, a similarly-equipped RPV located an M-48 target tank from an altitude of 1500 feet and guided a CLGP round to a precise turret hit at a range of eight kilometers.

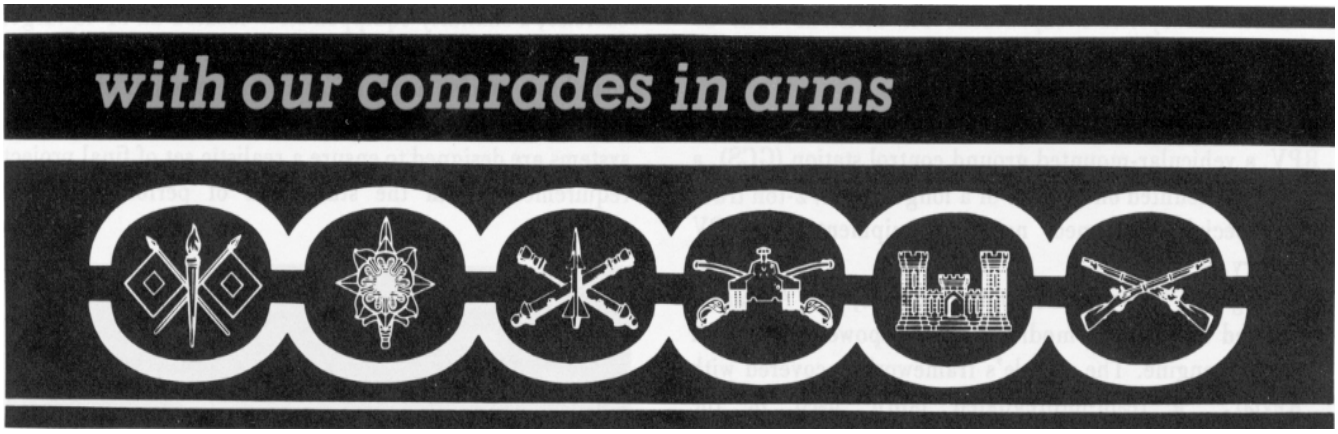
Upcoming tests of the XMQM 105 and its related sensor systems are designed to ensure a realistic set of final project requirements from the standpoint of performance and reliability.



Aquila approaches recovery net. Hook hanging beneath the RPV's tail snags forward arresting line and vehicle drops into net.



RPV flight is controlled and monitored from the computerized Ground Control Station. Joystick on left of console controls angle of view transmitted by airborne vehicle's sensor camera.



Antitank Missile Test

How well an antitank gunner can track an evasively maneuvering target is one of the questions being asked by the US Army Combat Developments Experimentation Command (CDEC) in the Antitank Missile Test. The experiment is being conducted on the 166,000 acres of CDEC's scientific field laboratory at Hunter Liggett Military Reservation and is part of a continuing evaluation of the TOW, Dragon and Shillelagh antitank weapons systems. Data gathered during the test will be analyzed to determine the extent of performance loss caused by each target's evasive maneuvers.

Three target vehicles with various levels of mobility will be utilized: the M60A1 tank, the XM-808 'Twister' and the XM-800 armored reconnaissance scout vehicle.

The M60A1 will provide the lowest degree of mobility and will establish a base against which the other targets can be compared.

The XM-808 Twister, a wheeled vehicle with two bodies joined by a pivotal yoke, will represent the upper end of the mobility spectrum. The yoke allows full movement between the bodies, permitting independent movement in yaw, pitch and roll. The Twister is capable of traveling over reasonably open terrain at speeds in excess of 55 mph.

The XM-800 scout vehicle bridges the mobility gap between the M60A1 and the Twister. Like the M60A1 it is an armored track vehicle but is much lighter and considerably more maneuverable.

The target vehicles will be tracked by the TOW, Dragon and Shillelagh antitank missile systems as well as the standard M60A1 tank. Special attention will be given to the comparative efficiency of the Shillelagh systems of the M551 "Sheridan" and the M60A2, considering the effects of differing optics, turret drives and gunner environments. All tracking systems will be colocated during the trials and will track a single target during a given period.

The entire experiment is being conducted as part of CDEC's unique blend of military and civilian scientific professionals, dedicated to the development of the Army of the future.

Combat Arms OAC Exchange Program

An agreement has been reached among the branch chiefs in the Company Grade Combat Arms Division of US Army Military Personnel Center (MILPERCEN) to formalize a quota exchange for officer advanced courses (OAC). Essentially, 10 FA officers will attend the Infantry OAC at Fort Benning and 10 will attend the Armor OAC at Fort Knox each year. In return, 10 Infantry and 10 Armor officers will attend the Field Artillery OAC at Fort Sill each year. The program is to be implemented fully with the advanced courses starting after 1 July 1976.

The idea for an exchange program is not new. The Field Artillery School has participated with the Infantry and Armor Schools in an exchange program for advanced course students for some time. However, the participation by officers from the three combat arms branches has been on an infrequent, unstructured basis.

To provide the infantry and armor officers an even footing with their field artillery contemporaries, BG Albert B. Akers, Assistant Commandant, USAFAS, has proposed that the Field Artillery School conduct a three-week preparatory course for the exchange officers. After completion of this instruction, the armor or infantry officers will have the entry level skills necessary to qualify them to enter the Field Artillery Officer Advanced Course. The majority of the instruction in the preparatory course will be on gunnery and field artillery weapon systems.

The exchange program will broaden the combat arms officers' understanding of the integration of maneuver and fire support in order to fight as a combined arms team. Now, more than ever before, it is imperative that the relationship between the maneuver and fire support arms be strengthened in preparation for combat on the modern battlefield.

3d Brigade In "Grosse Rochade"

Some 4,300 members of the 1st Armored Division's 3d Brigade joined German, Canadian and French soldiers in the field recently for the "Grosse Rochade" field training exercise conducted with an objective of furthering NATO solidarity.

The exercise, named after a defensive chess move, lasted one week and took place in the southeastern portion of West Germany.

The primary aim of the FTX was to exercise troops, commanders and staff in conducting combined arms operations in cooperation with allied air and land forces as well as German territorial forces.

The special objectives of the exercise included emplacement of barriers and barrier combat operations, night combat operations, general antitank and air defense operations, air-threatened operations and combat operations under chemical warfare conditions.

The 3d Brigade was teamed with the 1st German Airborne Division, the 10th German Panzer Division and the 3d French Hussar Regiment. These units made up the Blue forces.

The 3d Brigade was reinforced for the Grosse Rochade with the 1st Battalion, 78th Field Artillery of Division Artillery; C and D Troops of the 1st Squadron, 1st Cavalry;

A scout from the 1st Armored Division's 1st Squadron, 1st Cavalry, examines the terrain during the Grosse Rochade field exercise. Approximately 4,300 1st Armored Division soldiers joined German, Canadian and French soldiers during the exercise. (US ARMY PHOTO by Rick Badal)

C and E Companies of the 16th Engineer Battalion; A Battery of the 2d Battalion, 59th Air Defense Artillery; B Company, 141st Signal Battalion; C Company, 123d Maintenance Battalion; and elements of the 501st Supply and Transport Battalion.

In addition to the personnel involved, the 3d Brigade utilized approximately 1,000 vehicles and 19 aircraft.

The Red forces were composed of the 4th German Jaeger Division and the 4th Canadian Mechanized Brigade Group.

The Grosse Rochade was part of NATO's Autumn Forge Exercise Series with the objectives of increasing the interoperability concept among NATO forces.

The exercise began with Red forces attacking westward across the Danube River. The Red player objectives included combat attacks across river lines and delay and defense of bridge heads.

The Blue player objectives were defense, counterattack, relief in place, airborne operations and delay and withdrawal.

The 2d Brigade of the 1st Armored Division also took an active part in the Grosse Rochade by supporting the umpire requirement for the exercise. (*Ironsides*, 1st Armored Division.)

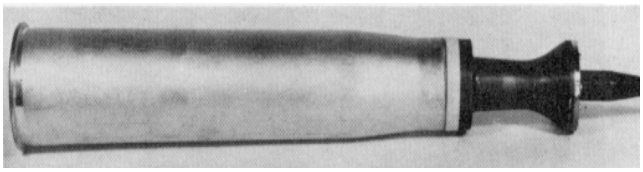
New Sabot Round

Enemy tankers are seeking hull defilade as word spreads of the development of an improved Sabot tank round. Tested successfully during the recent Tripartite (US, Britain and West Germany) tank gun-ammunition trials, the new cartridge is being considered for integration into the standard NATO inventory following further research.

The new design, designated the XM774 Armor Piercing Fin Stabilized Discarding Sabot (APFSDS) round, compares favorably with its spin-stabilized predecessor, the M392 Armor Piercing Discarding Sabot (APDS). Though each round relies on the force of kinetic energy for penetration, the XM774 utilizes a tungsten alloy core subprojectile in an ideal length-to-diameter configuration to achieve a reduction in weight, a higher level of penetration and an increase in effective range.

During the trials, the new cartridge matched or surpassed the accuracy of competing spin-stabilized projectiles

XM 774 Armor Piercing Fin Stabilized discarding Sabot (AFPSDS) round.



and exceeded the predetermined Tripartite effective range requirements by more than 50 percent.

Contingent on final agreement and acceptance, the XM774 provides an inexpensive means of up-gunning the large portion of NATO forces dependent on the existing inventory of 105-mm guns and ammunition. The round may also serve as a viable option for the main armament of the US XM1 main battle tank.

Sensor Receives Patent

Maurice Ryan of Rock Island Arsenal and Morton Barron of Harry Diamond Laboratories were named co-holders of a patent recently issued for the Mortar Realignment Device. Conceived in 1970 and now awaiting program funding, the sensor provides a close-in realignment capability which eliminates the need for aiming posts and lights with only slight modification to the original sight unit.

The sensor can be set up in seconds and consists of a light beam in the center of the display, reflecting a pointing cross to a reflector on the sight unit. "Fine tuning" of the firing tube and sensor requires placing the reflected pointing cross in the source cross on the display.

Harry Diamond Labs and Mr. Barron developed the concept in 1972 by building a working model of the sensor. In subsequent competition with aiming posts the model showed promise and has undergone testing at the Infantry School at Fort Benning.

Sensor in use with mortar. Device receives reflected pointing cross from reflector, and through adjustment of aiming controls, is aligned with alignment cross on sensor.

Dragon operator tracks a target vehicle downrange. Data collector to his rear monitors operator's performance and feeds incidental information into the computer.

CDEC Conducts Suppression Tests

The USA Combat Developments Experimentation Command (CDEC), Fort Ord, CA is involved in a series of suppression field trials. For the purpose of this program, suppression is defined as the degradation in performance of an individual soldier or a military unit resulting from an actual or expected threat from enemy weapons systems.

The CDEC program consists of six related experiments designed to assess the suppressive effects of a variety of direct fire weapons systems.

Suppressive effects of weapons systems in combat will be evaluated in two ways: by collecting subjective opinions of the suppressiveness of various patterns, volumes and proximities of fire; and, by measuring the degradation in task performance of soldiers exposed to both live and simulated fire.

Two suppression exploratory experiments, Degradation Under Controlled Stimuli (DUCS) and Small Arms Suppression Evaluation I (SASE I) have been conducted by CDEC at Hunter Liggett Military Reservation. Both experiments provided data to assist in initial evaluations of methodology for future suppression experiments while providing initial data on the relative suppressiveness of selected small arms.

Data generated in the SASE I trials indicated a "threshold effect" of suppression. The suppressive effects appeared to be reduced dramatically beyond a given miss distance. This threshold effect will be investigated further in later related testing.

M48A5 Becomes A Reality

The preliminary results of eight weeks of tests at Yuma Proving Ground, AZ, show that the M48A5 tank is prepared to take its place beside the M60A1.

The test vehicles were among the first tanks to be converted from M48A3 models to the M48A5 as part of the Army's program to upgrade the capabilities of 1953- to 1959-era tanks and bolster the dwindling armor inventory. The major modifications involved in the conversion process include replacing the older 90-mm with 105-mm guns and the installation of modern fire control systems.

The Yuma exercises were conducted by the Army Test and Evaluation Command and the Operation Test and Evaluation Agency. Firing a total of 2,000 rounds, tests included day and night firing, long range firing and a grueling 750-mile road march in temperatures up to 140 degrees. The M48A5 stood up well and performed impressively.

Through the conversion of these 20-year-old tanks, the Army makes good use of existing hull and turret castings. The castings are critical components and are in short supply as a result of the limited production capacity of the industrial tank base. The tanks are being converted at Anniston Army Depot, AL. Production began in October 1975 with a goal of 100 by December 1975. More than 1,200 will be converted by March 1978.

"The best seats in the house." — Tankers of the 4th Infantry Division (MECH) are joined by Assistant Secretary of the Army Harold L. Brownman and MG Chester M. McKeen, commander of the US Army Tank-Automotive Command, during firing tests of the M48A5 at Yuma Proving Ground.

"A flick of the FLASH, anyone?" — SGT Bruno Urbaniak of A Company, 1-48th Inf, 3d Armored Division, demonstrates the M202A1 FLASH, the latest in flame weapons. Firing encapsulated rounds at fortified positions and vehicles up to 750 meters, the four-tubed weapon is replacing the standard portable flamethrower in USAREUR infantry battalions.

the time has come...

by LTC Wilson A. Shoffner

What is the role for Lance? The Army is now in the position that it must demonstrate what the Lance field artillery missile will do. The demonstration must be made convincingly and it must be believable — not only to the US Army, Department of Defense and Congress but also to the Soviet and Warsaw Pact planners and decision makers as well.

Throughout the development and procurement phases of Lance the question was often raised concerning the 2-for-1 replacement of Honest John and Sergeant systems with Lance. "How does one justify replacing nine battalions of divisional and corps Honest John and three Sergeant battalions in Europe with six Lance battalions (half the number of battalions with only two-thirds the total number of launchers)?" The justification was always in the future tense, alluding the improved characteristics of speed, accuracy, ruggedness, simplicity and reliability. The justifying arguments frequently related to revised national nuclear policy and the NATO strategy which clearly articulate such a requirement and how the field commanders could use Lance to meet that need. Realism was added to the argument with the equipment performance characteristics demonstrated during engineering and service testing. The future tense now has caught up with us — we must now make good the argument; we must demonstrate the role to which we have alluded. But the keystone of the argument is missing. We are now operating with doctrine and tactics developed for Honest John and Sergeant which have been overtaken by events. We must re-examine the role for Lance and demonstrate sound doctrine and tactics. We must now show what we can do — there has been enough talking. The role of Lance, as well as all other tactical nuclear capable systems in US Army Europe, must be examined in light of current policies and force structures. The strategy for the use of tactical nuclear weapons in Europe has undergone a considerable shift since tactical nuclear weapons were first deployed. The weapons were initially introduced in large quantities to redress an unfavorable imbalance in conventional capabilities. During the period when the US dominated the world's strategic nuclear capability, these tactical nuclear forces in Europe provided a direct and explicit link from conventional combat to strategic nuclear warfare and were deployed principally for their utility as a deterrent against a large-scale Warsaw Pact attack. The concept for employment was related to a strategy of massive retaliation. Doctrinal concepts and targeting procedures were likewise developed, although somewhat tangentially from other considerations of general purpose forces. The employment of tactical weapons was generally designed to totally obliterate an enemy target on a "nuclear battlefield." The problem of how one made the transition from conventional to nuclear battlefield has yet to be answered. In the strategic arena, we developed an advanced repertoire of targets and targeting techniques. Great efficiency was achieved in targeting weapons against strategic targets. As our inventory of weapons grew, so did our efficiency to use them. Each iteration of a plan became more efficient than the last. The capabilities of computers and data processing were thoroughly exploited to provide an employment scheme to support a strategy of massive retaliation. The same type of isolated, precise planning used by the strategic planners was emulated by the tactical planners, who became somewhat removed from the field commanders' problems

The operations outlined in this article are being demonstrated in the field under realistic deployment locations and distances. They are the norm for training by the 3d Battalion, 79th Field Artillery, stationed at Ciessen, Cermany.

– Author.

of target acquisition, coordination, survivability of forces and integration of fires with conventional operations. Although detailed and precise, the concepts and procedures lacked practicality and did not offer believable, viable alternatives. While we were advancing our ability to support a strategy of massive retaliation, an emerging Soviet strategic nuclear capability gradually modified the equation. The Soviet launch of Sputnik brought the relative strength into focus. As the strategic arms race ensued and each major power developed an awesome nuclear capability, it became apparent that a strategy which offered an all-or-nothing response was no longer acceptable. The strategy for defense of NATO was realigned in 1967 when a plan of flexible response was adopted. The role of tactical nuclear forces in a strategy of flexible response has gradually come into agreement. The role has shifted away from deployment of these weapons principally for deterrent value, with their use as the trigger for a strategic exchange. The current strategy requires that deterrence derive from a credible war-fighting capability. Although coupled to the strategic forces through a spectrum of options and capabilities, the tactical nuclear forces are not inextricably linked to the strategic nuclear forces. Targeting techniques are being reviewed with a view toward simplified procedures and realistic, acceptable damage levels. Employment concepts, which address the entire problem from the field commander's viewpoint, are being examined.

Lance is the first tactical nuclear system to be deployed since major shifts in strategy and force postures have occurred. It is necessary therefore that the role for Lance be forward-looking and consistent with current national policies and objectives. In a recent message to Congress the Secretary of Defense identified improvements for theater nuclear forces which must be achieved if they are to remain effective. The improvements demand, among other things, that the commander have at hand ". . .the capability for selective, carefully controlled nuclear options that will enhance his ability to deal with a major penetration of an allied sector and achieve a quick, decisive reversal of the tactical situation." The necessity for this vital capability is the *raison d'etre* of Lance in support of the corps.

Achieving a quick, decisive reversal of the tactical situation is a battlefield problem. The field commander must decisively deal with the situation. Because of the enemy's overwhelming conventional numerical superiority he can, by properly massing and employing his forces, effect a penetration in a sector at a time and place of his choosing (figure 1). If he is willing to accept the heavy losses which will be inflicted on him, he has the capability to continue the thrust. The resources, responsiveness and detailed coordination necessary to bring about a battlefield solution of this magnitude dictates that the problem be solved at corps level. Whenever a tactical situation has deteriorated to the extent that a quick, decisive reversal is a vital requirement, the commander must have a viable option to employ his tactical nuclear resources. These resources must be committed decisively, not piecemeal, and must be committed so the enemy's tactical advantage is clearly eliminated.

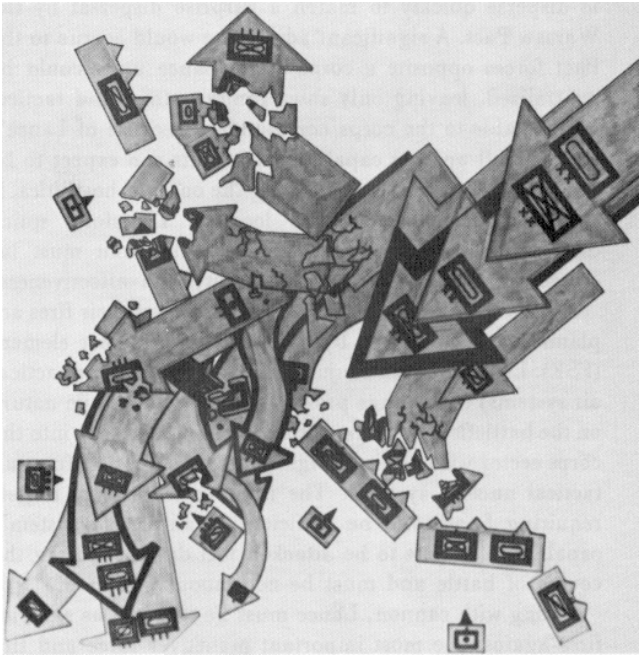


Figure 1 — An Overwhelming Conventional Capability. By properly massing and employing his forces, the enemy can effect a penetration in a sector at a time and place of his choosing. If he is willing to accept the heavy losses which will be inflicted upon him, he has the capability to continue the thrust.

The nuclear resources available to the corps commander to deal decisively with a penetration consist of cannon artillery, tactical aircraft and the Lance field artillery battalions of the corps. Each of the systems has certain inherent advantages. Cannon are best used against targets in the vicinity of maneuver forces; their existing conventional fire direction and control capabilities are vital in coordinating a schedule of fires. Tactical aircraft offer a unique capability to strike targets deep in the enemy zone as well as those targets which may not be well defined. Because of Lance's range, all-weather effectiveness, invulnerability to countermeasures and high assurance of a target kill, Lance is the veritable strength of the corps commander's resources. However, due to the high cost and limited numbers available, it must be used selectively and be employed in concert with cannon and tactical aircraft, thus forming an integral part of a selective, carefully controlled tactical nuclear option tailored for decisive defeat of battlefield targets.

To meet this challenge, Lance must have the capability

to disperse quickly to match a surprise dispersal by the Warsaw Pact. A significant advantage would accrue to the Pact forces opposite a corps if the Lance units could be neutralized, leaving only short range cannon and tactical air available to the corps commander. Because of Lance's decisive, all-weather capability, the units can expect to be attacked by the Pact forces during the onset of hostilities, if they can be identified and located. Therefore, quick dispersal is essential. Once dispersed, the unit must increase its survivability, controllability and effectiveness.

Lance units respond directly to corps, and their fires are planned and controlled by the corps fire support element (FSE). Lance (used in conjunction with cannon and tactical air systems) will engage priority targets of a mobile nature on the battlefield. Dealing with a major penetration into the corps sector will require a significant contribution from all tactical nuclear systems. The number of priority targets requiring Lance will be sufficient to stress the system's capability. Targets to be attacked will develop during the course of battle and must be continuously refined.

Along with cannon, Lance must be targeted as surprise fires against the most important maneuver force and fire support targets and those which are easily "spooked." Lance should engage those targets posing the greatest threat to the successful reversal of the tactical situation and will assume priority targets not killed by other designated means. A number of back-up, on-call missions are envisioned; the extent of follow-up missions will depend on factors such as air superiority, reconnaissance capability and fresh targets.

The demands of executing a carefully controlled tactical nuclear option against battlefield targets to achieve a quick reversal will set pacing requirements for target acquisition, command and control and delivery systems. Only the requirements placed on the delivery system are considered here. However, the other areas are vital to success and must be addressed. Time will be the critical factor in the reversal of the tactical situation. The majority of damage to a target on the battlefield is achieved during the first onslaught of fires. Surprise fires must be focused on vulnerable, priority targets because, as fires continue and the enemy hardens his posture or disperses, the effectiveness of fires is decreased. A quick, decisive schedule of fires designed to clearly reverse the tactical situation might be similar to this illustrative schedule of fires:

Schedule of Fires

Time	Type of Fires	Delivery Systems
H Hour	TOT	Cannon & Missile
H + 1 to H + 15	Prep	Cannon
H + 15 to H + 30	Prep	Tac Air
H + 30 to H + 60	Prep	Cannon & Missile

Cannon would be directed to engage close-in targets, and tactical air would strike deeper targets. Lance would be employed on priority targets throughout the zone and provide a back-up for priority targets assigned to other systems. Other considerations in the schedule include the normal time-space considerations of targeting cannons and the use of tactical air. Tactical air must be given an open "window of" time and space in which to work. Note that Lance must fire twice during this schedule. The maximum contribution that a Lance battalion can make to such a schedule of fires would be to fire a six-missile TOT at H-Hour followed by a second set of six missiles during the H + 30 to H + 60 "SALVO window." Execution of these 12 missions capitalizes on the full potential of the Lance battalion and fully taxes the battalion's operational capabilities. This illustrative schedule (with its constraints of time, coordination and the number of targets to be engaged) outlines a vital requirement of the corps.

To make its maximum contribution to the corps commander's plan to counter a major penetration, the Lance battalion must be able to do three things. First, it must *survive* a build-up of hostilities and a period of conventional warfare — it must remain unidentified and unlocated. Second, the Lance battalion must be able to *execute* promptly the assigned missions when called upon. The decision to authorize the first use of tactical nuclear weapons will be made only under grave circumstances. When the decision has been made, there will be no time for delay and deliberation. The battalion must be prepared to deliver a high volume of fires within a short period of time. Third, the Lance firing elements must be capable of *sustained operations* after completing assigned missions. After the initial strike, the firing elements of the battalion must prepare for and conduct follow-on missions and survive any enemy counterfire. The corps commander must maintain the capability to restrike the elements of the penetration.

The advantages which accrue to an opponent capable of destroying Lance (before it can be employed) in a period of conventional warfare must be assessed. The corps commander, facing a numerically superior conventional force, has several means to deliver tactical nuclear weapons which, individually or in concert, could shift the balance of combat power. His cannon delivery means are of comparatively short range and would not deter the enemy from massing behind an attacking force, second echelon forces with which to exploit a penetration. Air-delivered weapons can deter the enemy from massing in such a manner; however, delivery effectiveness is seriously impaired if the enemy maintains air superiority or if the weather is unfavorable. Lance, on the other hand, provides the corps commander a delivery means of sufficient range and options to deter the enemy from massing behind the FEBA

Figure 2 — Camouflage for Lance. Nets are erected on a priority basis immediately upon occupying a position. All vehicles are covered by nets and all missle-handling operations involving exposure of missiles or missile containers are accomplished under nets.

and assures a high probability of success, regardless of weather or enemy air defense capability. Accordingly, an enemy that could neutralize Lance would deprive the corps commander of his most effective option in tactical nuclear delivery means. If this could be done with conventional weapons, the enemy would gain a significant advantage with little risk.

The Lance battalion then, during a period of conventional warfare, will be one of the enemy's highest priority battlefield targets. Prior to the initial use of tactical nuclear weapons, the major threat to the battalion will be enemy tactical aircraft. Given the high reward for successful neutralization of the corps commander's Lance capability, the enemy can be expected to expend a substantial conventional effort attacking any known Lance position. Accordingly, one should operate under the premise that, if the enemy can identify and locate a Lance unit, he will attack with all conventional resources available. Although this threat comes principally from enemy tactical aircraft, a secondary threat would develop from para-military units operating in the corps area. This threat would become more significant in direct proportion to the length of hostilities. The enemy can be expected to make maximum use of all target acquisition means available to him. Aerial reconnaissance, both manned and drone, will provide him with information from a variety of sensors; e.g. infrared, conventional and camouflage detection photography, as well as airborne radar systems. He will also utilize data gathered by COMINT means in addition to that gathered from symphathizers and agents throughout the corps area.

The Lance battalions must take maximum precaution first to avoid detection and second, if detected, to avoid identification as a Lance unit. The Lance unit must not display characteristics distinguishable from the many other units located in the corps rear area. This will be accomplished principally through passive defense measures.

Maximum use is made of existing cover and concealment. Camouflage nets are erected on a priority basis immediately upon occupying a position either night or day (figure 2). These new nets provide a degree of protection against radar and infrared detection means, as well as against conventional photography; no identifying characteristic of Lance is discernible through them. All load-carrying vehicles must operate with canvas on at all times, thus precluding the enemy from positively determining the status of weapons, location of SASPs or relating the vehicle to a Lance battalion.

Lance units must move frequently during a period of conventional warfare. The principle is not to remain in one location long enough to be positively identified, targeted and attacked. The frequency of movement should be geared to the estimated ability of the enemy to react to intelligence data. Current estimates are that a Lance unit generally would not remain in the same position for much more than two days. Should conditions be extremely quiescent and detection probability quite low, a unit might stay more than 48 hours. However, if a position has been compromised, a commander should consider moving as soon as possible. The new positions should be 8-10 km from the previous ones. Movement will not necessarily be in any specific direction — some positions may be used again after the unit has occupied several intervening ones. The batteries will most often move at night, and daylight moves, when made, will be executed by infiltration. Small groups of vehicles traveling over different routes at different times and entering a new area from different directions help preclude compromise of the new position area.

Communications security must be maximized. Secure communications are used whenever possible. All AM RTT communications, UHF voice communication to the FSE and all FM voice communications over the fire direction nets should be secure. Only the Command/Fire and the Admin/Log nets should operate unsecure, and clear traffic on these nets should be restricted insofar as possible. Due to the normal distances between batteries, FM radio relay is always required.

Position area defense must make maximum use of the limited resources available. A Lance unit cannot conduct operations and defend itself simultaneously. An augmentation of security personnel is authorized by TOE; however, with the current force posture it is not likely that any infantry platoon would join for security duty. Keys to

defense of the position area are warning time and a reaction force. A reaction force is designated from those personnel remaining in the battery area. The battery first sergeant is directly responsible for defense of the position area. During periods when the firing teams depart for mission execution, the number of personnel remaining in the battery area are so limited that only the vital area can be defended. This will consist of taking the available crew-served weapons and personnel (mechanics, FDC personnel, cooks and a few others) to establish a defense around the vital area, i.e. the A&T exclusion area, FDC and AM RTT complex. During defense of the battery area from ground attack, additional support must come from armed air cavalry helicopters or Air Force tactical aircraft combat air support. Key personnel who will most likely be in the battery area should be able to work effectively with armed helicopters or high-performance aircraft.

While the survivability phase of Lance field operations stresses a quiescent operation and passive defense, the execution phase must be marked with deliberate, expert planning and swift, sure delivery of a high volume of fires in a short period of time. The corps commander with a major penetration into his sector will be faced with grim alternatives. He may have committed his conventional reserve forces or determined that his conventional resources are inadequate to cope with the situation. When approval to use tactical nuclear weapons is received, the corps commander's fire support plan must be executed rapidly. The employment of tactical nuclear weapons must be carefully tailored to defeat the enemy attack without escalating to a strategic exchange. The corps commander must strike suddenly and decisively, hitting many military targets simultaneously and without warning. Attacking the battlefield targets before they can assume a more protected posture or have an opportunity to disperse decreases the number and yield of weapons required. Care must be exercised to minimize unwanted damage to non-military elements. The target planner must continuously up-date the target list with new information. Many of the targets will be "mobile" in the sense that they may not remain in position for more than a few hours or half a day. Since the engagement of moving targets is not feasible with Lance, the target planner will wait until the latest possible time before assigning specific weapons to each target. It is in this context that the corps must be prepared to execute a high volume of fires in a short period of time. Such execution provides the Lance battalion with its most stressing requirement; however, the mission can be accomplished as follows:

During the initial stages of conventional warfare, the Lance battalion concentrates on remaining undetected and unidentified. Six missiles would be mated in each of the three firing batteries of the battalion — two mated missiles are loaded on each loader/transporter vehicle and one mated missile is loaded on each self-propelled launcher. The remaining components of the nuclear load are maintained in their containers on 5-ton trucks. The bulk of the battalion prescribed nuclear load (PNL) is kept in firing batteries, thus increasing survivability of PNL and improving responsiveness. The Lance firing battery has been reorganized into two firing teams constituted from the two TOE furing platoons and the one assembly and transport platoon (figure 3). Each team consists of a launcher, a loader/transporter, two 1/4-ton vehicles with AN/VRC-46 (radio) and 16 personnel under the leadership of a

REORGANIZATION OF PRESENT MTOE

INITIAL ORGANIZATION

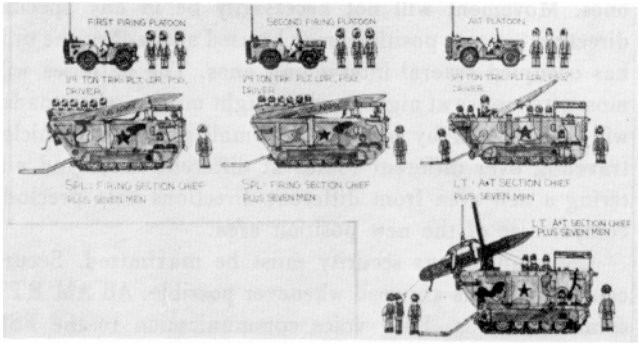
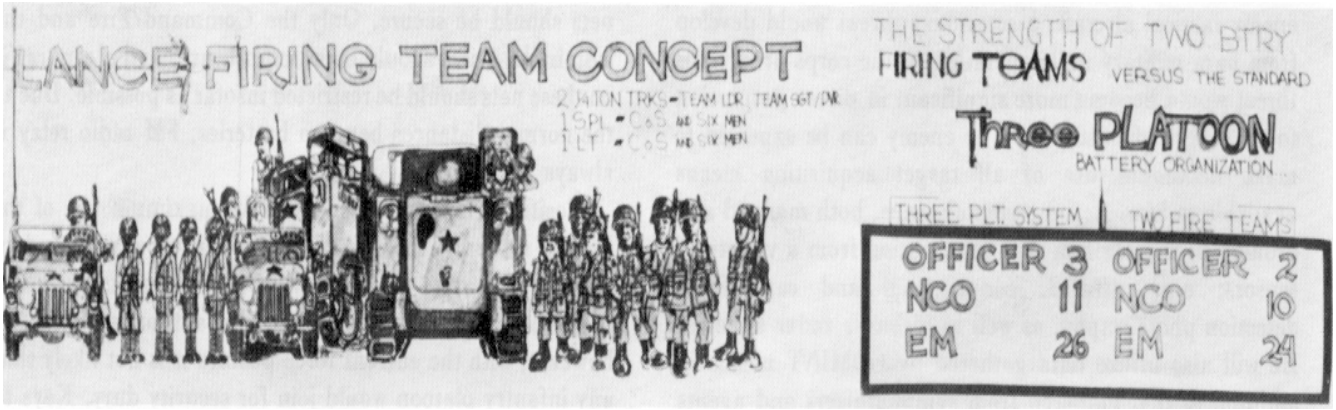


Figure 3 — Lance Firing Team. The firing battery is organized into two firing teams. The team forms the nucleus for all firing operations and is capable of performing any required technical operation.



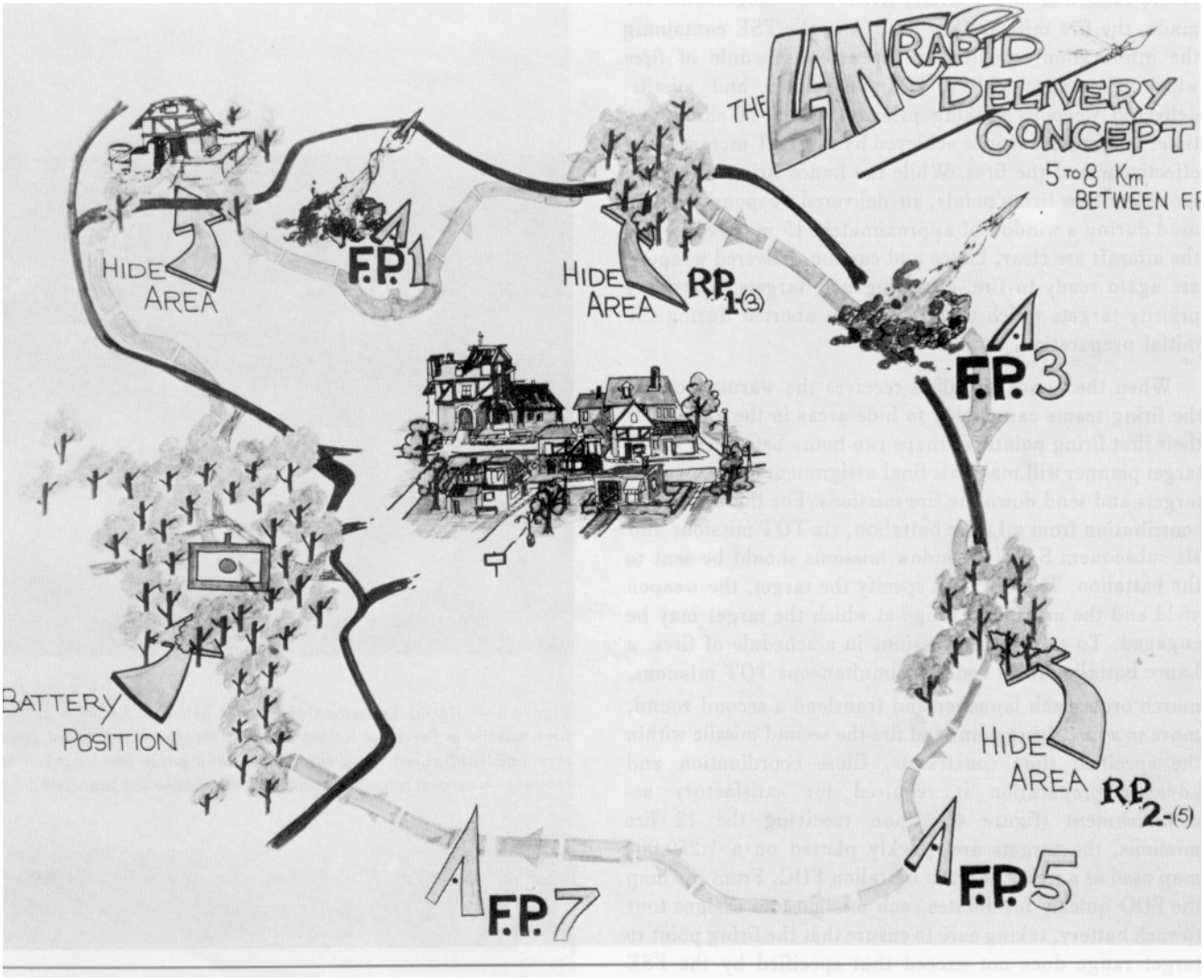


Figure 4 — Rapid Delivery of Lance Fires. The sequence of events for one of the battery's two firing teams is shown. The team moves to a hide area adjacent to the first firing point (FP-1) to be used for the TOT mission. Following a fast march order a rapid transload is conducted at a rendezvous with the LT and the second missile is fired from a new firing point (FP-3). The firing team then repairs to a new hide area adjacent to a firing point (FP-5) where a missile is loaded and the team awaits a possible additional mission.

lieutenant and sergeant first class. The firing team is capable of performing any required operation, either assembly and mating or firing operations; however, both A&T and firing platoon functions cannot be performed simultaneously with the limited number of personnel. During the period of conventional warfare, the Lance battalion remains in a mobile configuration — moving frequently, at least once every two days. The battery survey parties establish firing points associated with each new location. The firing points for the battery are established in pairs. The points are selected with special consideration for rapid access. Between the two firing points comprising a pair, a rendezvous point is selected for transload. These pairs of firing points and associated rendezvous point are pre-selected and recorded in the battery and battalion FDC. Eight firing points are required for each battery position area.

As the corps commander forwards his request for selective use of tactical nuclear weapons, an alerting message provided to the Lance battalion assures adequate time for final review of firing points, rendezvous points and hide areas, as well as preparation of equipment and missiles. Upon notification of approval of the request, corps FSE will provide an authenticated warning order to the Lance battalion to execute fire missions as an integral part of the corps fire plan. Specific weapon assignments will be made against priority targets by the corps FSE a brief time

before execution of the strike. After final assignments are made, the fire missions are sent from the FSE containing the information essential to execute a schedule of fires which commence with a TOT of cannon and missile-delivered weapons striking priority targets of short stay time. Maximum surprise achieved by the TOT increases the effectiveness of the fires. While the Lance firing teams are moving to new firing points, air-delivered weapons could be used during a window of approximately 15 minutes. When the aircraft are clear, Lance and cannon-delivered weapons are again ready to fire, engaging new targets or striking priority targets which may have been aborted during the initial preparation.

When the Lance battalion receives the warning order, the firing teams can deploy to hide areas in the vicinity of their first firing points. Perhaps two hours before TOT, the target planner will make his final assignment of weapons to targets and send down the fire missions. For the maximum contribution from a Lance battalion, six TOT missions and six subsequent SALVO window missions should be sent to the battalion. The FSE will specify the target, the weapon yield and the maximum range at which the target may be engaged. To execute 12 missions in a schedule of fires, a Lance battalion must conduct simultaneous TOT missions, march order each launcher and transload a second round, move to a new firing point and fire the second missile within the specified time constraints. Close coordination and advance preparation is required for satisfactory accomplishment (figure 4). Upon receiving the 12 fire missions, the targets are quickly plotted on a 1:250,000 map used as a firing chart in battalion FDC. From the map the FDO quickly formulates each mission and assigns four to each battery, taking care to ensure that the firing point to target range does not exceed that specified by the FSE target analyst. The missions are passed to the firing batteries by secure FM voice means and AM RTT.

Each firing team, in its hide area, performs the same actions upon receiving the firing data and TOT. The loader/transporter is dispatched to the rendezvous point (RP1-3) where the crew prepares one of its two missiles for transload. The launcher proceeds to the firing point (FP1) to occupy it approximately 20 minutes prior to the TOT. As soon as the first missile is fired, the launcher is march ordered rapidly and proceeds to RP1-3 as fast as possible where the loader/transporter has been moved to an open area and configured for a rapid transload. At the rendezvous point, a second missile is quickly loaded on the launcher (figure 5). At the same time, the lieutenant and the instrument operator proceed directly to the second firing point (FP-3), locate the survey monuments, set up their instruments and lay out the general azimuth of fire. Once the rapid transload is complete, the firing team chief

Figure 5 — Rapid Transload of Second Missile. As soon as the first missile is fired the loader transporter is moved to an open area and configured for a rapid transload while the launcher is enroute. A second missile is quickly loaded onto the launcher.

leads the launcher to FP-3. The launcher drives immediately over the firing point, the missile is prepared and the salvo mission is fired within the prescribed window of time in the schedule of fires. The loader/transporter joins the rest of the firing team at the second firing point and assists in local security. Because of coordination with Tac Air, care must be taken that the second missile is not fired before the time the SALVO window is open.

Upon completion of the second mission, the firing team march orders its equipment as soon as possible and proceeds in radio silence to another hide area (RP2-5) adjacent to a third firing point (FP-5). The team still has one missile remaining on the loader/transporter and it is transloaded to the launcher in the hide area. The team remains in radio silence. The remaining six missiles with fire teams waiting in hide areas are available for ASAP/on-call missions or, if required, could provide additional missiles in a schedule of fires at H + 90. The team will hide for a short period to determine if the battery area will receive counterfire. Should the battery be destroyed, the firing team can join another firing battery or service battery and be able to continue firing operations. The firing team represents the smallest element capable of conducting fire missions and forms the nucleus for constituting a Lance capability. If, after an hour or so, the team has not been given a mission or the battery has not received counterfire, the firing team will return to the battery area. Once there, the team will mate two more missiles, load them on the loader/transporter and be prepared to accept more missions as required.

Command and control, particularly in fire direction operations, is critical to the successful accomplishment of this mission. Simultaneous missions require close coordination of fires and detailed information on the firing operations at the controlling level. Direct communications are required with the firing teams. The Lance battalion can achieve this by concurrent operation on all fire direction nets in the secure mode. Effective command and control of the firing elements is not feasible at levels above the Lance battalion. Under this concept corps FSE would provide the Lance battalion the target data, weapon to be used and the accuracy desired by specifying a maximum launcher to target range. The Lance battalion provides technical fire direction, a capability corps does not possess, and exercises command and control by specifying unit to fire and firing point locations. Corps FSE maintains data on firing battery position area locations.

The stressing requirement for the battalion to fire six TOT missions and six SALVO missions requires a number of changes in current Lance operations. These changes are highlighted here.

- Through a high volume of fire in a short period of time, Lance becomes a vital capability to provide the corps commander the ability to effect a quick, decisive reversal of the tactical situation.
- The firing team concept is the most functional and flexible mode of firing operations. The firing team must be recognized as the nucleus of firing operations.
- Survivability must be stressed as a vital part of Lance operations. The corps commander must be provided with the assurance of a continuing Lance capability.

Some TOE changes are required. For the most part these changes are limited to reorganization of existing assets; however, the following necessary additions to the current TOE can be identified: (a) The battalion FDC will require the addition of two FM radios with a secure capability; (b) Battalion communications must operate a secure retrans capability; and, (c) Within the firing battery the need for four additional KY-38s/KY-8s (secure) and one 1/4-ton truck is substantiated.

Lance training will also be affected. Training will be directed at taking maximum advantage of the system's capabilities. The ORTT must be changed to test the needs identified by the stressing requirement. This means: (a) Survivability will receive increased emphasis during the conduct of ORTTs; and, (b) Simultaneous missions will become a standard means of testing.

Lance provides a vital capability to the corps commander. It is the key to his ability to deal with a major penetration of his sector and achieve a quick, decisive reversal of the tactical situation. This contribution of Lance is maximized when utilized to meet the stressing requirement described herein. This requirement must become the standard for Lance organizations, training and testing. Accomplishment of this requirement assures an inherent capability to accomplish other missions. The firing team concept is the best way to meet this stressing requirement. However, the effectiveness of Lance and other tactical nuclear systems of the corps depends on a corresponding emphasis on fire planning, target acquisition and command and control.

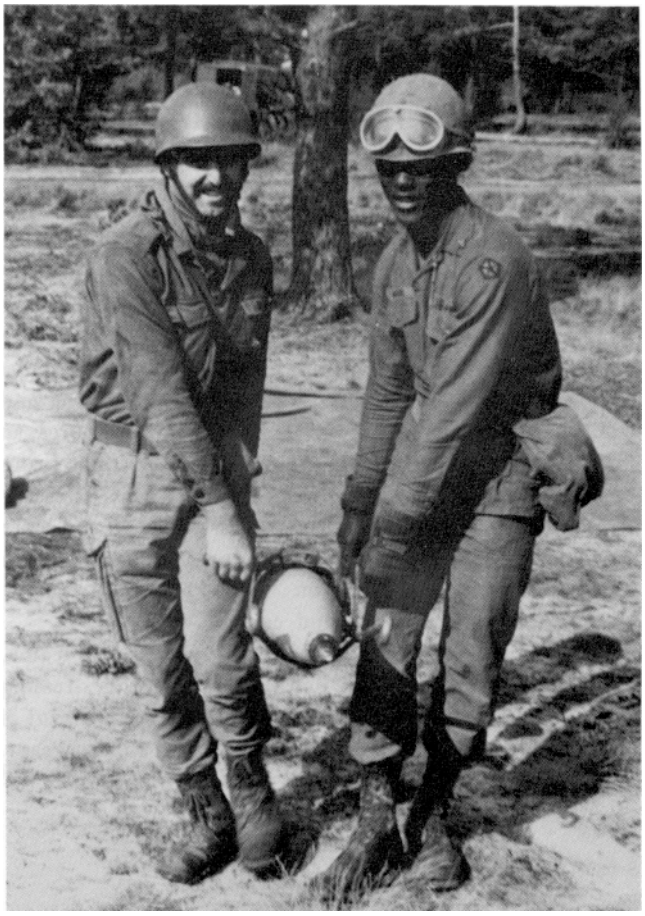
Organizing and training a battery into the firing teams, and training and testing the battalion to meet this stressing requirement, demonstrates the rationale of the argument of the 2-for-1 trade off of Lance for Honest John and Sergeant.

LTC Wilson A. Shoffner, FA, is Commander of the 3d Battalion, 79th Field Artillery, Giessen, Germany.

RIGHT BY PIECE

Project Partnership

GIESSEN — "Project Partnership" has long been recognized as an excellent technique for promoting goodwill and understanding between German and American military units through a variety of social events such as dances, picnics, *Volksfests* and organization days. The commanders of the 6th Battalion, 9th Field Artillery, Giessen, Germany, and Panzerartilleriebattalion 21 seriously considered this primary social function of the program and promptly opted for a different approach. A careful study of the goals of partnership identified the need to establish a strong bond between the two units. It was decided that this bond could best be established through a mutual understanding of professional duty and accomplishment — a plan for a modest, multi-national training program was quickly developed.



Partners working together.

Problems involving language were judged to be unworthy of long consideration. Both battalion commanders were convinced that young soldiers, left to their own devices, would find their own ways to negate the language barrier and that such problems would be minimal.

The economics of the program were also examined. As the US unit was scheduled for cyclic training at Grafenwoehr and the Bundeswehr battalion was scheduled for training at Munster later in the year, it was decided that combined training at either site would involve little additional cost. Commanders also agreed to schedule normal training together at local training areas.

Finally, a check was made to determine the existence of any official reasons which could impede or prohibit the implementation of the program — there were none. The objectives of the program were approved and the authority was readily granted at German and US higher headquarters.

In the first training session, the 21st Battalion's Second Battery (175-mm) traveled to a local US training area to participate in shooting the M31 (14.5-mm) Field Artillery Trainer. Though the German Army also uses the 14.5 trainer it was obvious that the German soldiers had never seen the device mounted inside the 175-mm gun (the German Army utilizes the 14.5 trainer in a tripod configuration). Point one was scored for an important exchange of knowledge. The session in the local training area eventually proved a good "ice breaker" with each battalion eagerly anticipating the next opportunity to work together.

Within the month the 6th Bn, 9th FA, departed for Grafenwoehr to prepare for battery tests. Approximately one week prior to the tests, the German Second Battery joined the Americans in a status of "attached for training." German soldiers were assigned to live and work within US sections and appointed to various positions within the American batteries — "partnership" was achieving a new dimension. The growing bonds of friendship, understanding and mutual respect were put to the test with the announcement that the integrated sections would be taking a scheduled ORTT together. The result surprised few as all

American chief of section with his German gun crew.

batteries were certified as combat ready at the ORTT outbriefing. German and American soldiers were commended individually and collectively for an outstanding performance.

Soon thereafter, the men of the 9th Artillery Battalion prepared for the arrival of the 21st Battalion at Munster. All told, the exercise proved even better than the Grafenwoehr experience. Many American soldiers were assigned to leadership positions within the German unit as chief of gun section, motor sergeant and communications chief.

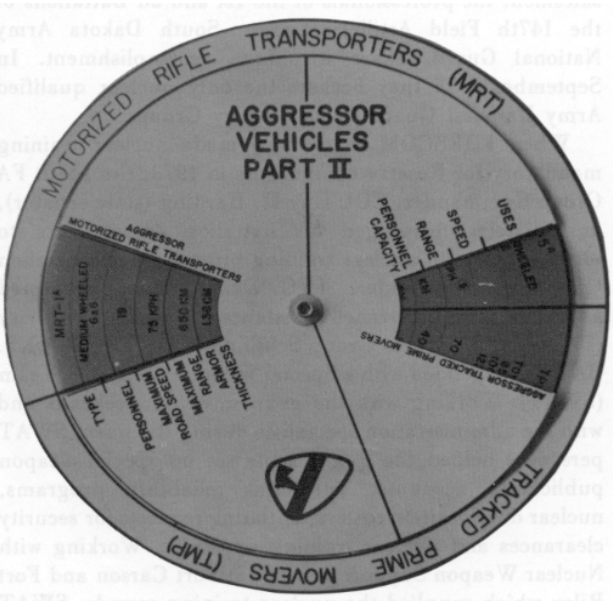
Partnership has a new meaning for the men of these two battalions: living and working as NATO partners and as professional artillerymen with a common goal.

Dial An Enemy

FORT HOOD — Given the diversity of weapons and equipment to be found on the modern battlefield, knowing *what* you're shooting at may be as important (and frequently dictate) the method of engagement. Under the supervision of LTC Donald W. Blascak, former Division G2, personnel of the 1st Cav's G2 Operations Section set out to condense "aggressor" force identification and materiel data into one easily accessible, quick-reference source.

The effort culminated in the birth of the aggressor "whiz wheel," a pocket-sized intelligence briefing which categorically exposes the military might of an imaginary nation with the turn of a dial. (Whiz wheel data was extracted from FM 30-102, *Handbook on Aggressor.*) Though proven extremely useful during later aggressor-type field exercises, mass production of the wheel was considered cost-prohibitive and only a few were made at the expense of many man-hours. Enthusiasm prevailed for the basic idea but the whiz wheel seemed doomed to early retirement.

Noting the wheel's possibilities, however, the Field Artillery School's Target Acquisition Department revived the concept on the "threat" format. A new whiz wheel will appear for Army-wide distribution by July, comparatively listing the air defense, artillery, antitank guns and mortars, maneuver force equipment and target acquisition gear of the US and Soviet Union.



The aggressor "whiz wheel" of the 1st Cav's G2 Operations Section.

Son Rises To Become "Old Man"

BAUMHOLDER — "I think it was more coincidence than fate," said LTC Richard S. Sundt, the new CO of 1st Battalion, 2d Field Artillery, when asked about being assigned to the same unit "he was born in."

The story begins in Panama with the birth of a son, Richard, to then 2LT Harold S. Sundt. The young lieutenant was just beginning a two-year term of duty in the Canal Zone with the 2d Field Artillery (a pack artillery unit at that time).

Right By Piece

Father and son are both West Point graduates from the classes of '32 and '59 respectively. Both are field artillerymen and both have served in Germany — the elder in WWII and the son now.

COL Harold Sundt retired in 1962 after 30 years of military service. In Baumholder, Germany, while attending the change of command ceremonies in which his son was assuming command of "the old pack artillery unit," he reminisced about his military career. "It's great to be back with the old pack artillery unit that I enjoyed so much in Panama. However, I do miss my two polo ponies."

147th Goes Nuclear

SOUTH DAKOTA — From accountants to pet shop owners, from farmers, students and teachers to firemen and salesmen, the professionals of the 1st and 2d Battalions of the 147th Field Artillery Group, South Dakota Army National Guard, share a unique accomplishment. In September 1975 they became the only nuclear qualified Army National Guard Field Artillery Group.

When FORSCOM regulations made nuclear training mandatory for Reserve components in 1973, the 147th FA Group Commander, COL Guy H. Harding (state senator), immediately encouraged his battalion commanders to initiate their own nuclear training programs. 1st Battalion (155-mm) Commander, LTC Dean Mann, requested assistance from the Branch Assistance Team, Field Artillery (BAT FA), Readiness Group Schilling Manor, Salina, KS. BAT FA responded with a Special Weapon Assistance Team (SWAT). Working with the guardsmen on weekends and with the administration specialists during the week, SWAT personnel helped the guard units set up special weapon publication accounts, personnel reliability programs, nuclear duty position rosters, initiating requests for security clearances and nuclear training schedules. Working with Nuclear Weapon Support Sections at Fort Carson and Fort Riley which supplied the nuclear training rounds, SWAT taught technical operations to the firing battery assemblers.

The 1st Battalion took a Courtesy Command Evaluation by the Sixth Army team in October 1974 and was complimented on the training level they had obtained in less than a year. Under the dynamic leadership of Lieutenant Colonel Mann, the nuclear training program continued to improve until the battalion took the first formal National Guard Command Evaluation in Sixth Army during summer camp in June 1975. During the inspection, the 1-147th's citizen-soldiers accomplished all tasks in an outstanding manner and received the highest evaluation score possible.

During the same summer camp the 2d Battalion's (8-inch) commander, LTC Hebert Teske (state secretary of transportation), watched his men successfully take their first Courtesy Command Evaluation. With final touches of SWAT training assistance, the 2d Battalion passed its formal Command Evaluation in September 1975, making the 147th Group the first and only Army National Guard Field Artillery Group with nuclear qualified 155-mm and 8-inch battalions. Readiness Group personnel quickly learned that the citizen-soldier is every bit as "professional" as his active Army counterpart. With the attitude of "professionals teaching professionals," the Readiness Group enjoyed seeing the results of "One Professional Army."

NCOs Test Div Arty

Selected NCOs experienced a first during the 3d Armored Division's Field Artillery testing at Grafenwoehr recently.

"We chose successful, dedicated and technically proficient NCOs to replace officers as umpires in this year's testing," reported MAJ John Dooley of the div arty training office.

Any conflict of NCOs evaluating officers and their men was not present during the testing period.

3d Armored Division Artillery testing at Grafenwoehr during a simulated gas attack. [Photo by SP4 Katy Murray.]

"I feel that the NCO has a better grasp of the basics involved in his career field because of his experience," reported 2LT Michael McCaffey of the 2d Battalion, 27th Field Artillery. "Because of the NCO's continual contact with the troops, his explanations are short, simple and to the point."

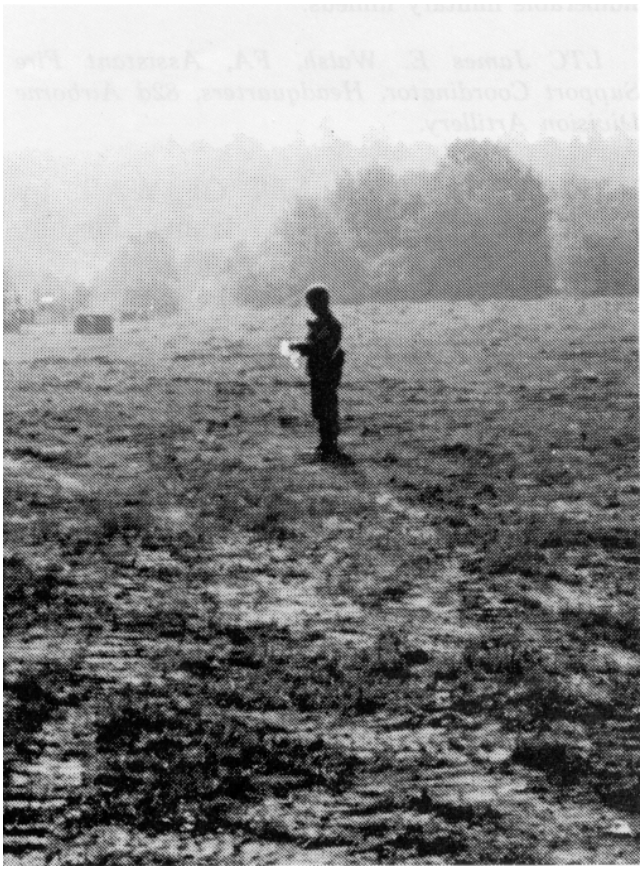
The eight NCO umpires used for testing were from div arty headquarters and had from 11 to 27 years of experience in the Army and their career fields.

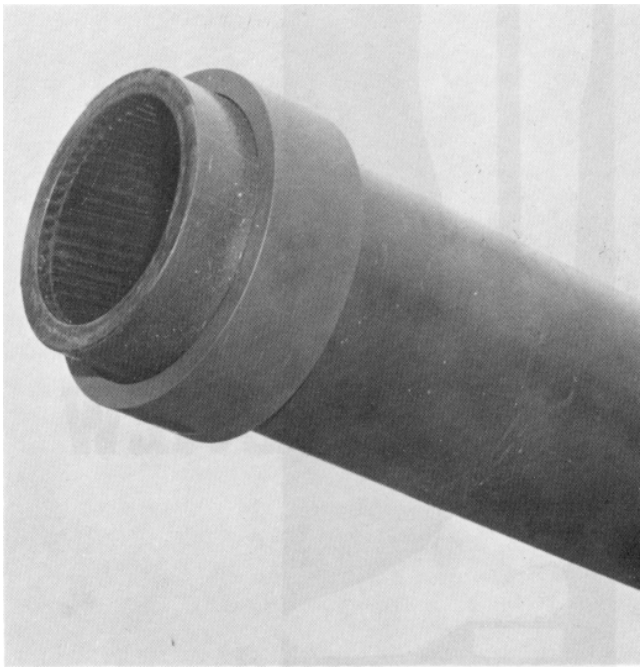
"I think that the NCO is stricter on testing because he has specialized in that field for so long," revealed SSG Darvin Hagen, the communications umpire.

"Placing the responsibility where it belongs is the key in our situation," stated SSG Ottoway McGee, the mess umpire. "The NCO has the experience and know-how to carry out the testing, leaving the officers free to analyze and evaluate the training that will be needed in the future." (*Spearhead*, 1st Armored Division.)

Strain-Gage Velocimeter Introduced

PICATINNY ARSENAL — The number of registration rounds required for precision fire may be substantially





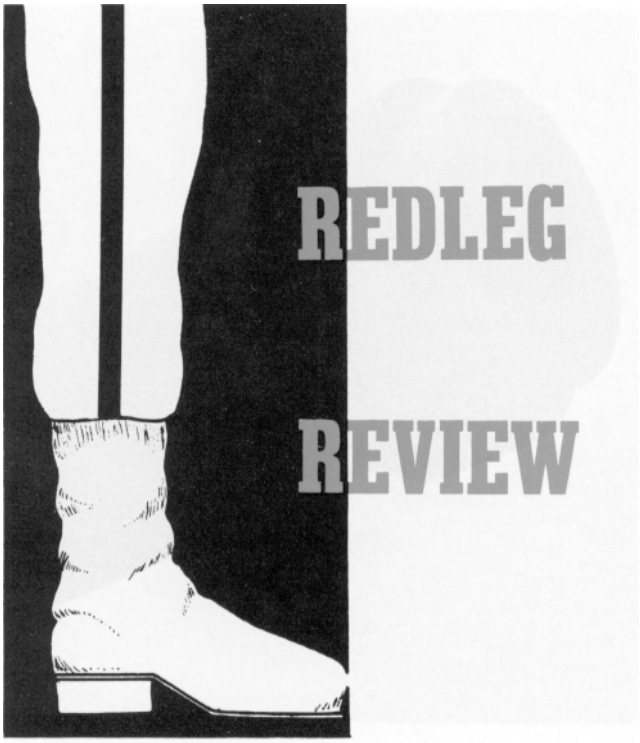
Prototype muzzle velocimeter developed at Picatinny Arsenal can be retrofitted in the field as a collar on the end of a gun tube.

reduced with the advent of Picatinny Arsenal's tube-mounted, strain-gage velocimeter.

Though many methods involving the use of radar, sky screen and velocity coils have been applied toward effective velocity measurement, all have shared the basic technique of recording the time differential between two points of known distance. A study by the instrumentation experts at Picatinny, however, revealed the availability of improved measurement in the concept of the strain-gage velocimeter.

The device is a self-contained unit capable of transmitting velocity data by radio for immediate recording by a transmitter-transducer. Requiring no maintenance or batteries (gun recoil powers radio transmissions) and lowering logistical costs, the instrument measures the time differential between two strain-gages. The gages are permanently encased at a specific interval within a collar which is fitted over the end of the gun tube. The radio signals are activated by hoop strain in the gun tube wall produced by the spin of a projectile's rotation band.

The strain-gage system was tested at Fort Sill in June 1972 and at Aberdeen Proving Ground, MD, in February 1975. A prototype system which can be retrofitted in the field is being fabricated by Picatinny's instrumentation experts at Dover, NJ. The package is a cylinder measuring 2½-inches long and ½-inch thick and is fitted over the end of the gun tube. It is anticipated that the strain-gage system could be permanently embedded with the gun tube during future manufacture of artillery larger than 40-mm.



OUT OF THE BLUE: US ARMY AIRBORNE OPERATIONS IN WORLD WAR II, by James A. Huston, Purdue University Studies, West Lafayette, IN, 1972, 372 pages, $10.

The author, dean of Lynchburg College, VA, has provided a well-documented compendium of facts on the development and use of airborne forces in World War II by the United States. In the preface, Dr. Huston discusses the relevance of WWII airborne warfare concepts and strategic doctrine to today's military environment. The author entrusts determination of this relevance to the reader.

Out of the Blue provides a good summary of the US airborne experience throughout the war, weighing the significance of individual operations as well as the overall airborne contribution. Dr. Huston introduces the reader to the airborne story through the greatest airborne operation ever conducted — the air invasion of Holland in September of 1944. In succeeding chapters, he discusses topically the development of doctrine, command and control, concluding the developmental phase with a summary of logistical and personnel requirements. These are followed by sequential discussions of WWII airborne assaults, including operations in North Africa, Sicily and Italy. Chapters are devoted to the invasion of France, operations in the European theater and the Pacific area to include the Far East.

The work is concluded with a summarizing chapter, a fine appendix, a highly-documented section of footnotes and a well-organized index. Maps and photographs enhance the reader's understanding of the complexities of airborne operations as discussed in the book's narrative portions.

The tactical, logistical and strategic considerations that were important in WWII are, in many ways, similar to those which must be considered today. Students of warfare, particularly those interested in the use of airborne forces, would be well-served by reading this book. I must emphasize, however, that the period covered by Dr. Huston ends in 1945. The essentials of airborne warfare as planned for the present, while fostered and nurtured during WWII, are vastly superior to those discussed by the author. Technical innovations and improvements in all fields have greatly altered techniques and tactics during the past 30 years.

Out of the Blue does provide an excellent base for understanding the early history of the airborne, but cries for a sequel to realistically discuss the degree of relevancy this prior experience has in today's innumerable military milieus.

LTC James E. Walsh, FA, Assistant Fire Support Coordinator, Headquarters, 82d Airborne Division Artillery.

HISTORY OF THE ART OF WAR, by Hans Delbrück, English translation by Walter J. Renfroe, Jr., Greenwood Press, Westport, CN, 1975, 572 pages, $25.

This volume was originally published in 1900 and was followed by two other editions, one in 1908, the other in 1920. Now for the first time an English translation of the 1920 edition has been made.

Hans Delbrück was both a historian and a politician. As a former officer in the Franco-German War, Delbrück writes as one acquainted with military life first-hand. For a while he was secretary to the great historian Von Ranke and then professor of modern history at the University of Berlin from 1885 to 1919. He has several other works, all military, but this is considered to be his best contribution.

This volume ends with Caesar and is a history of the ancient period. The major wars of the era are covered from the Persian Wars through Alexander the Great's campaigns to the Roman conquest of the

known world. There are over 40 chapters, half of which are devoted to specific naval and land battles. Other chapters cover such topics as tactics, troop discipline, political considerations and strategy.

To gleen the most from this fine translation it is necessary to have a basic understanding of the period. Since there is no connection between chapters, the book presents an obvious choppy progression.

The author used original Greek and Latin sources as well as all major works available in 1920. After each chapter there is an *excursus* usually on source material or variations in interpretation. Each chapter also has its footnotes, both explanatory and bibliographical. There are too few maps (six) for the amount of material covered but there is an index which allows this work to serve as a reference book as well as enjoyable reading for the student of military history.

I would recommend this study as a basic volume for students of the ancient period — especially those who are interested in the development of the war.

Dr. L.L. Sims, Department of Tactics, USACGSC.

FROM CROSSBOW TO H-BOMB, by Bernard and Fawn M. Brodie, Indiana University Press, Bloomington, IN, 1973, 308 pages, $8.50.

This volume presents the contribution, influence and application of science on the evolution of military weaponry and strategy from the time of Archimedes through the Vietnam era.

Obviously a rather monumental undertaking within the space of 300 pages, depth and detail suffer at the expense of historical trends and scope. The serious history scholar, his appetite whetted for amplification, will be keenly disappointed.

On the other hand, the book as a whole is a commendable effort when viewed as a general survey of the total scientific contribution to warfare. Well written, it serves as an excellent introduction to the history of weapons for the reader who lacks the time needed for serious study.

SSG Robert R. Cordell is the NCOIC, NATO Liaison Office, Turkish General Staff, Ankara, Turkey.

Commanders Update

Brigadier General Charles F. Gorden
III Corps Artillery

Brigadier General Alfred J. Cade
V Corps Artillery

Brigadier General James M. Wroth
VII Corps Artillery

Brigadier General Robert B. Hankins
56th Field Artillery Brigade

COL Robert C. Forman
1st Armored Division Artillery

COL Thomas H. Spence
1st Cavalry Division Artillery

COL Isaac D. Smith
1st Infantry Division Artillery

COL Walter C. Phillips
2d Armored Division Artillery

COL Harold M. Davis
2d Infantry Division Artillery

COL Edward A. Dinges
3d Armored Division Artillery

COL William L. Hauser
3d Infantry Division Artillery

COL John H. Richards Jr.
4th Infantry Division Artillery

COL Isaac R. Jones
5th Infantry Division Artillery

COL Robert Hammond
7th Infantry Division Artillery

COL William W. Berry
8th Infantry Division Artillery

COL Charles D. Franklin
9th Infantry Division Artillery

COL Nolan Sigler
XVIII Airborne Corps Artillery

COL Ben Walton
24th Infantry Division Artillery

COL William Schneider
25th Infantry Division Artillery

COL Carl E. Vuono
82d Airborne Division Artillery

COL Warren A. Samouce
101st Airborne Division Artillery

COL Niles Fulwyler
9th FA Missile Group

COL Charles Hoenstine
41st Field Artillery Group

COL Dwight Wilson
42d Field Artillery Group

COL Frederick Schleusing
72d Field Artillery Group

COL Vincent E. Falter
75th Field Artillery Group

COL Redmond Forrester
210th Field Artillery Group

COL David Blackledge
212th Field Artillery Group

COL Boris Pogoloff
214th Field Artillery Group

COL James Holley
4th Missile Command

COL Bernard Quedens
USAFATC
Fort Sill

COL Clarence W. Hannon
558th Artillery Group

COL Robert M. Balzhiser
528th Artillery Support Group

COL Clarence L. Stearns
5th Special Forces Group

COL Charles W. Bagnal
101st Aviation Group

LTC Francis J. Burke
2d Battalion, 1st Field Artillery

LTC Richard Sundt
1st Battalion, 2d Field Artillery

LTC Robert W. Cook
2d Battalion, 2d Field Artillery

LTC Marc A. Cisneros
1st Battalion, 3d Field Artillery

LTC Rhoss Lomax
2d Battalion, 3d Field Artillery

LTC John L. Gardella
2d Battalion, 4th Field Artillery

LTC Raymond Burrell
4th Battalion, 4th Field Artillery

LTC Bruce A. Martin
1st Battalion, 5th Field Artillery

LTC Robert A. Cooper
2d Battalion, 5th Field Artillery

LTC James B. Lincoln
1st Battalion, 6th Field Artillery

LTC Jamo C. Powell
2d Battalion, 6th Field Artillery

LTC Roscoe Swann
3d Battalion, 6th Field Artillery

LTC James W. Doukas
1st Battalion, 7th Field Artillery

LTC John A. Seitz
1st Battalion, 8th Field Artillery

LTC William Breen
2d Battalion, 8th Field Artillery

LTC Robert W. Salley
3d Battalion, 9th Field Artillery

LTC T. R. Gordon
6th Battalion, 9th Field Artillery

LTC Albert Spaulding
1st Battalion, 10th Field Artillery

LTC Paul Makowski
2d Battalion, 10th Field Artillery

LTC Allan Irwin
6th Battalion, 10th Field Artillery

LTC David J. Lynch
1st Battalion, 11th Field Artillery

LTC J. H. Binford Peay III
2d Battalion, 11th Field Artillery

LTC John E. Hayes
1st Battalion, 12th Field Artillery

LTC Roderick Carmichael
1st Battalion, 13th Field Artillery

LTC Robert Clewell
3d Battalion, 13th Field Artillery

LTC Robert D. Chelberg
1st Battalion, 14th Field Artillery

LTC Charles C. Mitchell
6th Battalion, 14th Field Artillery

LTC William A. Warnock
1st Battalion, 15th Field Artillery

LTC Alan R. Borstorff
1st Battalion, 16th Field Artillery

LTC Gordon E. Saul
3d Battalion, 16th Field Artillery

LTC Richard D. Beltson
1st Battalion, 17th Field Artillery

LTC Harold Briggs
2d Battalion, 17th Field Artillery

LTC Darel S. Johnson
3d Battalion, 17th Field Artillery

LTC Gilbert W. Crowl
1st Battalion, 18th Field Artillery

LTC Arthur Johnson
2d Battalion, 18th Field Artillery

LTC David L. Dunham
3d Battalion, 18th Field Artillery

LTC Hardy L. Griffen
1st Battalion, 19th Field Artillery

LTC Frederick McConville
2d Battalion, 19th Field Artillery

LTC Edward Stein
2d Battalion, 20th Field Artillery

LTC Andrew J. McVeigh
1st Battalion, 21st Field Artillery

LTC Richard Roundsville
2d Battalion, 21st Field Artillery

LTC Noel Gregg
1st Battalion, 22d Field Artillery

LTC Paul T. Wickliffe
1st Battalion, 25th Field Artillery

LTC Paul A. McGowan
1st Battalion, 27th Field Artillery

LTC Colonel B. Jones
2d Battalion, 27th Field Artillery

LTC Frank Westmoreland
2d Battalion, 28th Field Artillery

LTC Darryl R. Hawn
1st Battalion, 29th Field Artillery

LTC Charles L. Williams III
1st Battalion, 30th Field Artillery

LTC Phillip T. Yamaguchi
1st Battalion, 31st Field Artillery

LTC Henry L. Harrison
1st Battalion, 32d Field Artillery

LTC James W. Rice
2d Battalion, 33d Field Artillery

LTC Harold Baumeister
6th Battalion, 33d Field Artillery

LTC John C. Tompson
2d Battalion, 34th Field Artillery

LTC Frank Partlow
3d Battalion, 34th Field Artillery

LTC Larry D. Struck
1st Battalion, 35th Field Artillery

LTC William Howerton
3d Battalion, 35th Field Artillery

LTC Edward T. Stokke
1st Battalion, 36th Field Artillery

LTC John Kraus
1st Battalion, 37th Field Artillery

LTC Richard M. Bronson
2d Battalion, 37th Field Artillery

LTC Joseph Nagel
3d Battalion, 37th Field Artillery

LTC Richard O. Roemer
6th Battalion, 37th Field Artillery

LTC William Muhlenfield
1st Battalion, 38th Field Artillery

LTC Frank E. Hines
1st Battalion, 39th Field Artillery

LTC James V. Slagle
2d Battalion, 39th Field Artillery

LTC John J. Welker
1st Battalion, 40th Field Artillery

LTC Stanley S. King
1st Battalion, 41st Field Artillery

LTC Randal A. Perkins
2d Battalion, 41st Field Artillery

LTC Lamar A. Stroud
1st Battalion, 42d Field Artillery

LTC John K. Solomon
2d Battalion, 42d Field Artillery

LTC Donald T. Christensen
1st Battalion, 73d Field Artillery

LTC Edward J. Bunn
1st Battalion, 75th Field Artillery

LTC William L. Hughes
2d Battalion, 75th Field Artillery

LTC Michael Mosbrooker
1st Battalion, 76th Field Artillery

LTC Bob Fairweather
1st Battalion, 77th Field Artillery

LTC J. T. H. Denney
4-77th Aerial Field Artillery Battalion

LTC August M. Cianciolo
1st Battalion, 78th Field Artillery

LTC Michael McAdams
2d Battalion, 78th Field Artillery

LTC Kevin J. O'Neil
1st Battalion, 79th Field Artillery

LTC Wilson A. Shoffner
3d Battalion, 79th Field Artillery

LTC Courtney Prisk
1st Battalion, 80th Field Artillery

LTC Bruce Holmberg
6th Battalion, 80th Field Artillery

LTC Stanley Zagalak
1st Battalion, 81st Field Artillery

LTC Robert N. Morrison
2d Battalion, 81st Field Artillery

LTC Michael Gilmartin
3d Battalion, 81st Field Artillery

LTC Donald Hammel
1st Battalion, 82d Field Artillery

LTC Wilburt L. Jenkins
1st Battalion, 83d Field Artillery

LTC William T. Zaldo
2d Battalion, 83d Field Artillery

LTC John Shalikashvili
1st Battalion, 84th Field Artillery

LTC Stephen E. Rash
3d Battalion, 84th Field Artillery

LTC Phillip Speairs
1st Battalion, 92d Field Artillery

LTC Lee C. Smith
2d Battalion, 92d Field Artillery

LTC Ralph A. Udick
1st Battalion, 94th Field Artillery

LTC J. E. Walsh
1st Battalion, 319th Field Artillery

LTC George H. Thompson
3d Battalion, 319th Field Artillery

LTC John J. Madigan
1st Battalion, 320th Field Artillery

LTC Albert E. Wolfgang
2d Battalion, 320th Field Artillery

LTC Hugh Socks
1st Battalion, 321st Field Artillery

LTC R. Gingras
2d Battalion, 321st Field Artillery

LTC Cassius Mullen
1st Battalion, 333d Field Artillery

LTC Thomas Wing
2d Battalion, 377th Field Artillery

LTC Leon Cloud
512th Group

LTC John Farley
557th Group

LTC Jose A. Riovo
1st Training Battalion
Fort Sill

LTC Roland Holmstrom
2d Training Battalion
Fort Sill

LTC Frederic Stubbs
3d Training Battalion
Fort Sill

LTC James Bolin
4th Training Battalion
Fort Sill

LTC Richard Skowronek
5th Training Battalion
Fort Sill

LTC Ronald Baldwin
Training Command
Fort Sill

LTC Frank J. Klein Jr.
Specialist Training Battalion
Fort Sill

LTC Lyman A. Lackey Jr.
Staff and Faculty Battalion
Fort Sill

LTC Gerald D. Gross
Officer Student Battalion
Fort Sill

LTC Eugene Lynch
4th Battalion, 1st Training Brigade
Fort Dix

LTC William Fraase
3d Battalion, 2d Training Brigade
Fort Leonard Wood

LTC Ollie Langford
6th Battalion, 2d Training Brigade
Fort Dix

LTC Richard K. Pfabe
4th Battalion, 2d Training Brigade
Fort Leonard Wood

LTC Dudley L. Tademy
2d Battalion, 3d Training Brigade
Fort Dix

LTC Milton Newberry
2d Battalion, 3d Training Brigade
Fort Leonard Wood

LTC Frederick B. White
4th Battalion, 3d Training Brigade
Fort Leonard Wood

LTC William E. Trent
2d Battalion, 4th Training Brigade
Ford Ord

LTC Raymond Cole
5th Battalion, 4th Training Brigade
Fort Leonard Wood

LTC Ted Gray
11th Aviation Battalion

LTC Billy W. Fugitt
14th Aviation Battalion

LTC Jerry W. Childers
25th Aviation Battalion

LTC Ellis D. Parker
82d Aviation Battalion

LTC William L. Longarzo
223d Aviation Battalion