Field Artillery Journal

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Field Artillery Journal

the journal of fire support

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> "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 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."

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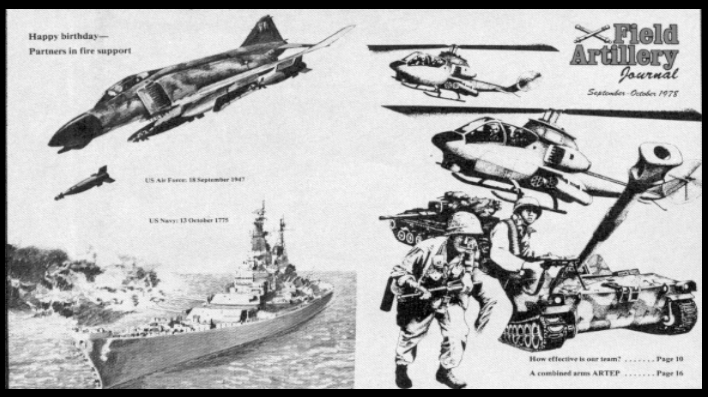

The front cover depicts the combined arms team. The back cover salutes the US Air Force and the US Navy on their birthdays. (Artwork by Lee Gibson)

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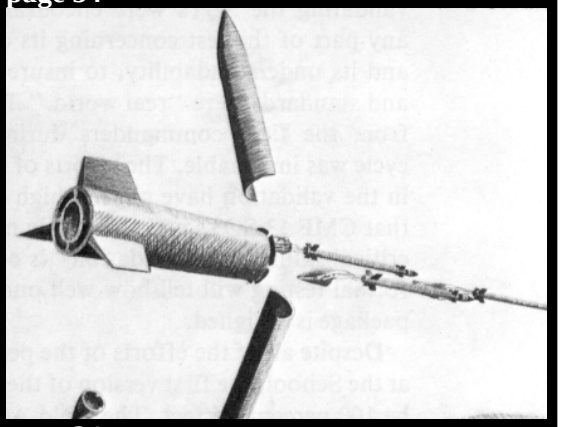

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On The Move. . .

by MG Jack N. Merritt

Starting almost immediately — during the period October 1978 to March 1979 — all Field Artillery soldiers in Career Management Field (CMF) 13 are going to be taking their first Skill Qualification Test. This is a *critical* period for the entire Field Artillery Community. The SQT is the culmination of the development of an innovative and important individual training system. The individual training process contributes significantly to both the combat readiness of the Army and to the careers of our individual soldiers. That being said, I know that each of you recognize your responsibilities within the individual training process and will fulfill your obligation to the Army and our soldiers.

In early 1975, the Skill Qualification Test concept was initiated. Initial guidance provided to the SQT developers was very general. As guidance and direction became more precise, many changes were necessary. The individual training process began with job and task analyses. Next, Soldier's Manuals, Job Books, and Commander's Manuals were developed. Following this, the Skill Qualification Tests were created, validated, and finalized. All SQT components were extensively field-validated to insure that each scorable unit measured each task in the intended manner. Soldiers validating the SQTs were encouraged to comment on any part of the test concerning its criticality to the job and its understandability, to insure that the conditions and standards were "real world." The support received from the field commanders during the development cycle was invaluable. The efforts of all who participated in the validation have given a high degree of assurance that CMF 13 SQTs will accurately measure the combat-critical skills. The "validation" is over — the results of formal testing will tell how well our individual training package is designed.

Despite all of the efforts of the people in the field and at the School, the first version of the SQT is not going to be 100 percent perfect. The Field Artillery is a dynamic and complex organization. Although soldiers are grouped by MOS, there are many jobs within each MOS. The variety of variables, such as the caliber of weapon, equipment availability, special skill identifiers, and other considerations, would necessitate the production of thousands of SQTs were we to design an SQT for each individual soldier. To overcome this problem, we have tracked our SQTs and, for the most part, they will meet the needs of our soldiers.

Full recognition that the SQT system is not perfect is the reason I emphasize the need for the assistance of all commanders and key people in the administration of SQTs.

Command emphasis is the major ingredient that will make this complex SQT system work.

These coming tests *must* be administered in a fair and proper manner. I certainly do not want the SQT system to be violated or skewed by oversupervision. To administer the SQTs in the proper manner will require an understanding of the SQT system, skillful preparation, and a high degree of professional concern on the part of all involved.

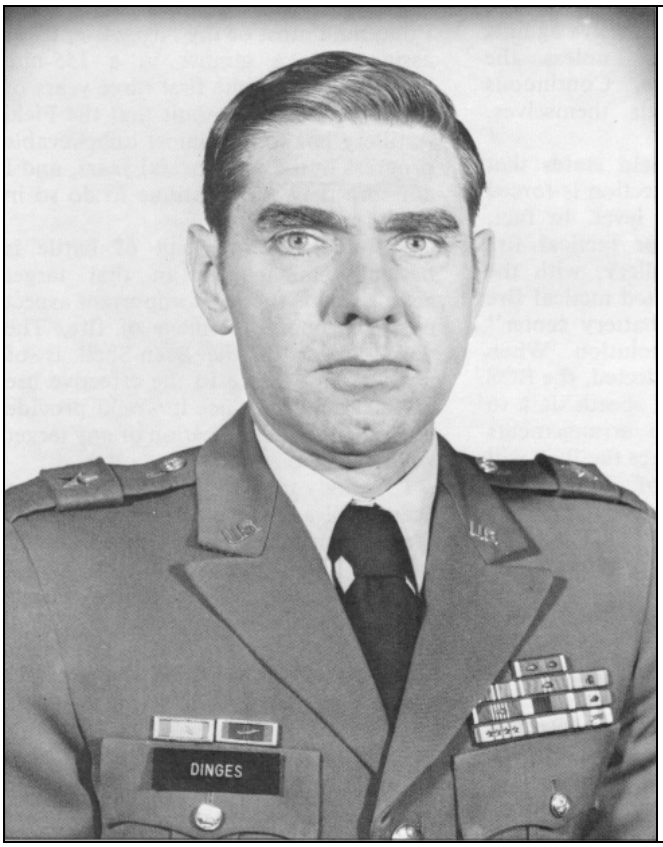
The TRADOC staff has recently completed an evaluation of USAFAS procedures for developing and validating training products. The results were highly commendable, but the *real* evaluation of our efforts will be most evident when the initial SQTs are administered and our Field Artillerymen are able to demonstrate that they have the required knowledge and job proficiency.

Even though the SQT program revolves around individual soldier proficiency, commanders and NCOs must be totally involved. They must create a training environment that is conducive to learning and achieving mastery of individual tasks. The individual soldier is still responsible for maintaining proficiency in Soldier's Manual tasks by making effective use of training materials provided. ULTIMATELY, THE EFFECTIVENESS OF OUR INDIVIDUAL TRAINING IS A JOINT RESPONSIBILITY OF JUNIOR LEADERS AND INDIVIDUAL SOLDIERS.

The SQT is the cornerstone of Army training which ultimately leads to successful execution of the unit ARTEP. This test at the lowest level offers a focus for training and serves as a benchmark to measure the effectiveness of the entire training process. Additionally, the SQT system is the perfect framework to exercise the leadership of our junior leaders.

As CMF 13 enters the SQT cycle, it is essential that the Field Artillery Community recognize the importance of the SQT. The concerted effort of each of us is required to enhance the combat readiness of our units and to increase the proficiency and professionalism of our individual soldiers.

Brigadier General Ed Dinges has been here about three weeks and has taken full control of the Assistant Commandant's duties. General Dinges is an outstanding Artilleryman with all the credentials necessary to help me direct all the exciting changes underway in the Field Artillery. We are happy to have him here.



New AC

BG Edward A. Dinges is the School's new Assistant Commandant. Before coming to Fort Sill, General Dinges was the assistant division commander of the 3d Armored Division in Europe.

General Dinges commanded the 8th Battalion, 6th Field Artillery, in Vietnam and was 3d Armored Division Artillery commander prior to becoming 3d Armored Division assistant division commander.

He is a 1953 graduate of the US Military Academy and earned his masters degree in international studies from American University, Washington, DC.

He attended the Field Artillery Officer Basic and Advanced Courses, the Command and General Staff College, and the Army War College.

BG Robert W. Sennewald, previously reported as assuming AC duties, was selected for promotion to MG and assigned to command the US Army Training Center at Fort Dix, NJ.

"There are improvements to be made in nearly everything we do, if we will but exploit all the resources available to us, including soliciting the ideas of all soldiers, from private to senior general." –GEN Bernard W. Rogers, 17 Aug 76

Field Artillery family

To those who have served or are serving in a Field Artillery missile assignment, Mr. Field Artillery's remarks (On The Move . . .) in the May-June 1978 issue of the *FA Journal* were a breath of fresh air. Although we have never considered ourselves anything but professional Field Artillerymen, temporarily privileged to serve in the most challenging of all field artillery assignments, too often we have felt that there was very little concern for, or awareness of (among the Redleg family, often emanating from the USAFAS hierarchy), the role we play and our need for support.

Certainly, the Commandant's philosophy makes very clear the importance of the Army's most devastating and sophisticated weapons systems, Pershing and Lance, to the overall picture of firepower on the modern battlefield. Thank you, General Merritt, for placing things in their proper perspective.

Robert J. Baker
MAJ, FA
USA Readiness Region VI
Indianapolis, IN

TACFIRE criticism unwarranted

In reference to CPT Thomas H. Barfield's article on hand-held calculators (March-April 1978 *Journal*), I wish to express the following observations about TACFIRE and BCS.

First, TACFIRE is *not* a single computer, but is a network of computer systems providing mutual support throughout the artillery. The BCS is a remote TACFIRE device which optimizes munitions effects by providing terrain gun position corrections for the TACFIRE solution. Although BCS will have the capability to operate using intrabattery radio, it currently communicates with the cannon sections over WD-1 field wire. BCS can also be an independent gun direction computer.

Secondly, TACFIRE operates over existing field artillery communications nets. Nothing new has been added; the same number of RT-524s are still there. Captain Barfield is correct in stating that the FDC can be targeted easily since it has such a peculiar electronic signature, but through the use of digital communications, much more information can be transmitted in the same period of time. The radio nets are theoretically less active with digital traffic than with voice traffic, thereby making them more difficult to locate. Enemy jamming is less effective against digital communications, unless the jamming is continuous. Continuous jammers become targets themselves, very quickly.

Third, Captain Barfield states that centralization of fire direction is forced to battery or battalion level. In fact, centralization occurs for tactical fire control at division artillery, with the battalion providing limited tactical fire control and doing a "battery center" technical fire control solution. When the fire unit(s) is (are) selected, the BCS refines the ballistics and speeds data to the guns. Split platoon arrangements should be uncommon since the BCS will allow battery fronts of up to two kilometers, being limited by the wire line impedance.

Finally, Captain Barfield refers to the fluid environment with long communications distances. It seems to me that in such an environment the observers are forced to use high power radio communications. By decentralizing to platoon level, we lose the capability to mass and become saturated with targets, particularly with current European scenarios. Centralization of control through automatic data processing and high speed digital communications is essential.

My final observation is that I am not trying to detract from the hand-held calculator; I firmly believe that it has a place in today's FDC. My intent is only to dispel the myth and misinformation about TACFIRE and BCS.

Richard F. Brown
DAC
Fort Sill, OK

Favors Scan-Shell

I was very impressed by "The Baron Rides Again" in the March-April 1978 issue.

Though I have been a Military Policeman most of my Army life, I was assigned as a gunner in a 155-mm howitzer battery the first three years of my career. I must admit that the Field Artillery has made almost unbelievable progress in the past several years, and I am sure they will continue to do so in the future.

However, the concept of battle is basically unchanged, in that target acquisition is the most important aspect of the proper placement of fire. The development of the Scan-Shell is of utmost importance to the effective use of field artillery since it would provide precise and timely location of any target within range.

I strongly urge the development of a Scan-Shell as well as the adaptation of the scanner in a missile, as suggested by LTC William H. Rees in the July-August 1978 issue of the *Journal*, except I would suggest a longer range missile than the Navy's 5-inch Zuni. The Scan-Shell would probably be the greatest advance in Field Artillery since I left it in 1960.

Jerry L. Jeffries
SFC
Fort McClellan, AL

Mobility for the XO

My 155-mm towed unit is supposed to be 100 percent mobile; however, there is no provision for a radio and vehicle for the executive officer (XO). The "plan" is for the firing battery headquarters to ride with the fire direction center (FDC). Fourteen people and 1,200 pounds of equipment in the back of a gama goat — no thanks!

How is the XO to be responsive if he can't communicate or at least listen to a radio? With all his additional duties, such as CBR officer, the XO must have a vehicle.

I spent six years in the mechanized infantry and during an annual training test our major "gig" was that my platoon sergeant rode in the track with me — cross loading and separation of leaders. In the artillery, apparently no one worries whether the FDC personnel and XO are killed. We can't operate effectively if the XO has to "hitch a ride" from position to position.

Let's get with it. We XOs need a vehicle with a radio. A gama goat would be nice, but a ¼-ton truck with trailer would do. Let's all get together and solve this problem.

Kevin J. Coughlin
1LT, INF
6th Battalion, 830th FA (USAR)
Ogden, UT

Help is on the way. Apparently your unit has not received Consolidated Change Table 300-64 dated 20 April 1978 which authorized one additional vehicle per firing battery headquarters (for your unit, TOE 6-427H, an M561 with radio set AN/VRC-47). This vehicle and radio should provide you the flexibility you require. This organizational change has been made in line with new doctrine contained in FM 6-50. — Ed.

Ammo tactics — II?

The following is a copy of a letter to LTC William W. Breen, author of "Ammunition Tactics-I," which LTC R.C.H. Schmidt agreed to share with-Journal readers. — Ed.

Dear Colonel Breen,

I've read with interest your article, "Ammunition Tactics-I," in the July-August 1978 *Field Artillery Journal.-Per* our conversation [Schmidt-Breen telecon] the following is a description of my travails in Vietnam. The situation I found in my battalion was this:

• We had three 8-inch/175-mm batteries, with tubes of each caliber in each battery. The batteries were collocated with airstrips and Vietnamese ranger battalions. Surface supply routes were insecure; all ammunition resupply was accomplished by USAF Caribou, C-130, or — on rare occasions — Army Chinooks.

• I found a tremendous number of ammunition lots at each battery. One battery had 17 lots of 175-mm white bag propellant, including two or three lots no larger than a pallet load. I was appalled, particularly because the vast majority of our fires (about 95 percent) were unobserved, and we had no means by which to register the weapons other than by firing toward the coast (*away*-from the majority of potential target locations) or by committing my sole helicopter to observe registrations on unsurveyed stream junctions.

For the remainder of my tour, I fought a battle to establish order in our ammunition posture.

I started by directing the S3 to get the mess straightened out by requiring weekly ammo inventories by lot and by including the lot to be fired in all fire orders so that the larger lots could be reserved for targets with solid grid locations.

After a couple of weeks, the inventory charts showed no improvement whatsoever although we fired up to 100 rounds per day per caliber per battery. The small lots still cluttered the charts and the large lots had shrunk. I found part of the reason when I questioned the FDO on duty. The boys had developed the practice of designating the largest projo/prop charge lots as "XY," on a day-to-day basis, and had faithfully specified "lot XY" in every fire order — just like the example in FM 6-40.

With things getting worse instead of better, I wrote a directive that spelled out, in detail, how we were going to control lots. I hand carried it to each battery commander and gave him specific instructions to dig the small lots out of his ammo dumps for ready use.

We finally got *some* results. The small lots diminished, but so did the large lots. Now we had several medium sized lots and a few *new* small ones. I also found that several of the lots were present in all three batteries, although the separation between batteries (28 to 35 kilometers) made it virtually impossible to mass fires. That led me to the decision to probe my ammo section's procedures in requesting and staging ammo for airlift to the batteries.

What I found was dismal. My S4 was requisitioning ammo — by lot number — from the ASP daily. The ASP was issuing *other* lot numbers. Furthermore, in the staging area at the airbase, I found that pallets tagged for A Battery were being sent to B or C Battery because an Air Force forklift operator persistently ignored the tag addresses. After some jawboning with AF operations, we got cooperation.

By now a couple of months had passed without real improvement, so I made an appointment with the division ammunition officer for a tour of the ASP. Our suspicions were confirmed when we found that the ASP inventory records were totally unreliable. Locations and amounts on hand did not agree with their records. As a consequence, when our requisitions were filled, they were filled with whatever lot the forklift operator could find.

We had a long hard talk with the ASP commander. We finally reached an agreement which allowed my S4 a degree of control over the ammunition in the ASP. This was reasonable because the ASP supported no other 175-mm units and only one other 8-inch battery.

The agreement was that two large lots (500 or more rounds) in the ASP would be designated for exclusive issue to each of my batteries, on request by my S4, but limited to no more than 60 percent of the day's request for that item. The reason for the limitation was that the ASP had dozens of lots — many of them small by their reckoning (100 or so) — and they wanted to ease their inventory control problems, as did I.

During this meeting, the ASP commander alleged that a major part of the problem originated at the port, where ammunition off-loaded from ships was not segregated or forwarded by lot. As a consequence, the small lots in the ASP could become large lots whenever a convoy arrived from the port.

I'd like to say there's a happy ending to this mess, but I can't. We succeeded in controlling what we had, but we never eliminated the problem of the single pallet lot.

Incoming

I left with the feeling that no one was really capable of managing the mess because their performance was graded by their superiors on different criteria. To provide the clearest example of this phenomenon, I'll describe a problem with USAF: Their support was graded on the basis of pounds of cargo moved per day. Consequently, aircraft pilots attempted to carry the max load on every sortie. To accomplish this, the loadmaster would select pallet combinations that would bring the gross aircraft weight closest to the maximum, fuel included. In the morning — with a full tank of gas — they could carry two or three lighter pallets of 8-inch prop charges or 175-mm projos, but only one pallet of 175-mm prop charges. So they would "defer" the heavier pallets for later sorties when some of the fuel had burned off. Unfortunately, those heavy pallets were frequently left on the ground at the end of the day because of diversions, delays for midday maintenance checks, or — damn it all — because they refueled during lunch. The net result was that I was up to my ears in 175-mm projos and 8-inch green bag and starved for 175-mm prop charges and 8-inch projos.

I anticipate your next installment will cry for improvement in tactical ammunition management. I'm with you all the way and hope our visionaries will take advantage of the capabilities available in TACFIRE, the Battery Computer System, and the XM90 Radar Chronograph to organize the laborious and mundane task of keeping track of our proliferation. To do otherwise would, I fear, change victory into certain defeat — amid a heap of mismatched ammunition components.

R.C.H. Schmidt
LTC, FA
Chief, Artillery/Ship Gun
Munitions Div
Rock Island, IL

LTC William W. Breen's use of the Number "I" in his article's title did not imply that he planned to write a sequel, but rather as a challenge to others to share their ideas. Thank you Colonel Schmidt for writing "Ammo Tactics-II." Anyone for "AT-III"?—Ed.

Correction

A substantial error was made in the printed version of LTC William W. Breen's article, "Ammunition Tactics-I," in the July-August 1978 *FA Journal*.

On page 47, right-hand column, 10th line, the word "not" was inadvertently left out. The sentence should have read:

"Specialization of functions and tailored ammunition packaging are not elements of current doctrine."

HHC report from "down under"

The Australian Army is introducing the Hewlett-Packard 25C hand-held calculator into the Royal Australian Artillery (RAA), as a backup to our FADAC equivalent. So, it was with more than passing interest that our Artillery School staff studied Captain Barfield's article, "Calculators and the Field Artillery Mission," in the March-April 1978 issue of the *Journal*.

The RAA system is called FABS (Field Artillery Backup System) and will replace most of the graphical fire control instruments currently used as a manual backup. The FABS program is similar to that illustrated by Captain Barfield, but with the following advantages:

- It is simpler to operate because the R/S button needs to be pressed only once versus four times in Captain Barfield's program.
- With FABS, unless direction is stored, there is less chance of stored data being corrupted by operator mistake. With Captain Barfield's program, an extra press of the R/S button will necessitate a return to "step one" to rectify the error.
- All types of missions can be computed.
- The "test data" mode of FABS is quicker to process than the preoperation check described in Captain Barfield's article.

In summary, if Captain Barfield's program were reorganized to follow the FABS logic, there would be sufficient steps remaining in the HP25C to include processes for corrections.

I appreciate that the US Army Field Artillery School has progressed beyond the HP25C generation calculator to backup/complement FADAC. However, if any unit or individual would like further information on FABS, including the HP25C program, write or call me.

R.N. Wickenden
MAJ, RAA
Australian Exchange Instructor
Counterfire Department,
USAFAS
Fort Sill, OK 73503
AUTOVON: 639-3312/6179

FIST begins in Hawaii

The inclosed report documents the 25th Division's progress in implementing the fire support team (FIST) concept. Since much of the Fort Sill literature does not apply to a light infantry division, the initial phases of our program were even more experimental in nature than those conducted in the mechanized and armored divisions.

The expected reluctance to change aside, we became more and more convinced that FIST was not only viable, but indeed a significant improvement over the traditional system.

The wrap-up of the FIST trial period came with the 3-13th Field Artillery's ARTEP this past March. The FIST team members simply did a superb job. For the first time there was proof that the 13F NCO was undeniably capable of calling for and adjusting artillery and mortar fires.

The underlying significance is the continuity that will exist in the observer positions as a personnel base of 13Fs is formed. Concurrently, the amount of time the lieutenants can now devote to fire support doctrine will round out the team concept of FIST. Overall, we are very pleased with the FIST concept and the success we have experienced to date.

James F. McCarthy Sr
COL, FA
25th Infantry Division Artillery
Schofield Barracks, HI

By the end of September, all CONUS Active Army divisions will have implemented FIST. European divisions have delayed full implementation pending personnel fill. Part of Colonel McCarthy's report concerned a handbook for FIST members, details of which we hope to share with Journal readers in a future issue. — Ed.

Communications for the TAB

To implement counterfire doctrine and to focus the information that the elements of the divisional target acquisition battery (TAB) can provide, it is imperative that the countermortar radars and the sound/flash platoons be able to communicate reliably with the div arty TOC, usually over long distances.

The current concept of employment of the radars and sound/flash platoons is to attach some of these elements to the cannon battalions or group headquarters, especially those whose area of coverage is on the flanks of the division. This hampers the target production effort and, in effect, puts blinders on the division's artillery.

A strong argument to attach TAB assets to cannon battalions is that, because of the expected extended frontages, these battalions will be the only firing elements that can react to the TAB assets. With the advent of longer range tube artillery, non-nuclear Lance, and the GSRS, this argument loses validity.

What happens when TACFIRE is deployed? How is the new generation of radars going to pass information to the div arty TACFIRE? Passing this targeting information to a battalion TACFIRE will flood its storage ability. Even if the battalion TACFIRE can store all these targets, will the close support battalion have the assets to engage them?

What the TAB needs is a secure radio that can range to the div arty TOC and is directional in nature at the countermortar radars and sound/flash platoons. The radio at the processing section must be omnidirectional in order to communicate with all elements.

This one piece of equipment will permit the unit to be used more efficiently and, more importantly, will enable the counterfire duty officer to see the entire counterfire picture in the division's zone.

Daniel A. Jurchenko
CPT, FA
Battery G (TA), 333d FA
Fort Stewart, GA

The School's Counterfire Department agrees with your concerns that countermortar radars and sound/flash platoons should be able to communicate reliably over long distances with the div arty TOC.

In principle, your concept of directional antennas and long range, secure radios for the radars and platoons is sound and would increase our reliability and survivability. Such a capability is being studied and several candidate systems have been identified for development. They are a long way down the road, however. In the interim, we have to operate within current capabilities.

The concept of employment of countermortar radars with cannon battalions, field artillery brigades, sound/flash platoons, or reporting directly to the div arty TOC is driven not only by realities of command, control, and communications, but also in the interest of facilitating fire support coordination and the target acquisition needs of supporting field artillery units.

To attach a countermortar radar to a DS battalion not only provides the radar section a communications link, but also provides for its security, mess, and limited maintenance support. Further, it provides a responsive target acquisition asset to the DS battalion to locate mortars which will be of interest and concern to the supported brigade commander. Countermortar targets can be fired by the DS battalion or, if available, its reinforcing battalion and subsequently reported to div arty, or the target can be passed to div arty.

Similar arrangements can be made with other cannon battalions or FA brigades. If a radar is attached to a sound/flash platoon, targets can be passed through the platoon to the controlling field artillery unit. Communications links might include FM, wire, or VHF links through a nearby signal center/terminal.

When TACFIRE is fielded, radars will have devices which will allow direct input to the appropriate TACFIRE computer — either a battalion set or a div arty set. A single countermortar radar will not "flood" a battalion computer any more than five radars, two sound/flash platoons, and several peripheral devices would "flood" a div arty computer — and that won't happen.

The following ongoing developments apply to the issues you raised:

• A test of the AN/PRC-74B SSB AM radio was conducted in late 1976 at Fort Sill. The test was designed to determine whether this radio would provide more reliable communications between the div arty TOC and the sound/flash CPs than the presently authorized FM radios. Different types of antennas were used in the test, and the PRC-74B proved to be superior to the FM sets under those test conditions. As a result, a favorable recommendation that this AM radio be added to the TOEs of the HHB, div arty, and the TAB was forwarded to DA last year.

• A new FM radio, the AN/GRA-114, was tested at Fort Sill as the data link between microphones and the sound/flash control center and found to be very effective. A procurement contract will be let in November 1978 with expected fielding in fiscal year 1981. The addition of the GRA-114 to units will eliminate the requirement for installing long wire lines to the sound base. — Ed.

Bar-David interview

In your May-June 1978 issue interview with BG A. Bar-David of Israel, he mentioned some modifications that were made to the M109A1; for example, performing direct fire with one man.

Are those modifications available for use by the US Army or would it be possible to at least have those modifications elaborated on in future articles?

Virgil R. Gleason
1LT, FA
Fort Bliss, TX

To answer your questions directly: No, the School has not done anything in particular in direct response to the visit by BG A. Bar-David; we are, and have been, working on several related issues which take into account the vast differences in the types of war the two nations expect to fight. For example, an extensive study has been underway for months to determine the optimum howitzer crew size. Also, while a very high rate of fire can be sustained in a six-day or two-week war, these rates could not be maintained in a longer war.

No follow-up articles are planned on the issues raised by General Bar-David in his interview. By the way, that interview has created more reader interest than any other article published under my editorship. Glad we were able to bring you his views based on modern battlefield experience. — Ed.

Incoming

More programs for the hand-held calculator

I have designed two programs for use with the SR-56 which others may be interested in. The first is for use as a firing chart simulator during "hip shoots," and the other is for computing terrain gun position corrections.

The firing chart simulator program only holds data on one battery, but there are two registers available to store other locations. In our TGPC computations, we sometimes use the howitzer itself in subtense computations. We either point the M109A1 tube at the aiming circle and measure the width of the turret or, for guns at greater distances, turn the turret 1,600 mils from the aiming circle and measure from the tip of the tube to the back of the turret, giving us greater accuracy at greater distances.

The program displays displacements for the center, left, and right sectors of fire. Values for other sectors can be obtained by swapping values and signs.

SGT Fred Stephens
HHB, 3d Bn, 34th FA
Fort Lewis, WA

Thank you for the programs — they have been forwarded to Gunnery and the Combat Developments Directorate for possible inclusion in the set of programs being compiled for branch-wide use. — Ed.

Journal index available

An "Index to the *Field Artillery Journal,"* January 1940 to December 1976, Volumes 30-44, is now available from the National Technical Information Service, 5285 Port Royal Rd., Springfield, VA 22161.

The Index is available in both paperback ($8.00) and microfiche ($3.00). Listings are made by both subject and author.

Les Miller
Morris Swett Library
Fort Sill, OK

For those who buy the Index, an ongoing annual update (by title only) can be found in each November-December Journal. Les Miller, with the help of the Morris Swett staff, did the painstaking compilation of this valuable reference. — Ed.

Reunion

The 108th Field Artillery World War I Veterans Association will meet October 14 at McCallister's, 1811-17 Spring Garden St., Philadelphia, PA. Contact Herbert J. Kitchenman, 400 Pennbrook Ave., Lansdale, PA.

Shedding light on the searchlight story

On behalf of our unit, Battery D (searchlight), 140th Field Artillery, Utah Army National Guard, Logan, UT, we would like to comment on the article in the *Journal*, May-June 1978, on page 27, about the searchlight unit in Las Vegas, NV. It said that the unit was the only one of its kind in the western US. This statement hit my unit a little low, since we have been operating as a searchlight unit for the past 10 years. Two years ago on two separate weekend drills, four of our personnel were requested by the Las Vegas unit to help in their training.

Also, only four men are required to operate a searchlight instead of the six men mentioned in the article, and crews do not wear asbestos gloves and face masks to operate the searchlight as was indicated, only to change the globe, which is seldom.

SSG Michael D. Weese
and 11 members of
Battery D (slt)
140th FA, UT ARNG
Logan, UT

Sorry we excluded you from the category of searchlight units in the Western US.

While four men can operate a searchlight, we are told that six men make a more efficient crew for continuous operation and in combat. You are also correct about the gloves and face masks. Thank you for your letter. — Ed.

Was Molly Pitcher a task analyst?

I really enjoyed MAJ Ron West's article on TEC in the May-June 1978 *Journal* and wanted to share some memories of my work on TEC at Fort Sill.

A lot of us feel a special fondness for Molly Pitcher. A few outstanding women, usually wives of artillerymen, have the coveted Molly Pitcher award for meritorious service to the Field Artillery Community hanging on their walls. Saint Barbara also strikes a feminine note in relation to the Field Artillery. As I press out the scarlet ribbon on my husband's Saint Barbara's medallion, I look back over my 2½ years of specializing in Field Artillery training and know that was the award I coveted!

But I digress.

How was Molly Pitcher able to pick up that rammer staff and use it correctly without prior training? My guess is that she was an early day "task analyst." That is, while bringing water to the crew, she observed over and over the exact details and exact order of the tasks involved in using a rammer staff. Then, rather than use that task analysis to write or devise training for someone else, Ms. Pitcher put her analysis directly into action.

In the TEC office at Fort Sill, we made every effort to follow Ms. Pitcher's example. We observed over and over (studied and read as well) and then made sure we could do a task correctly. Then we went to the next step; we devised and tested training for artillery soldiers. We worked with many outstanding officers who were dedicated to the proposition that all soldiers deserve the very best training.

My co-worker and our chief local artist (both women) and I had many interesting experiences in the halls of Artillery academia and "in the field" (otherwise known as "hot and windy" or "cold and windy").

Our first lessons were fire direction, the turf of the 13 Echo. We were fascinated by fans, sticks, charts, and forms and by how small math errors can cause big problems.

My saddest FDC moment came when I was told about "ABCA registrations" and realized that I had spent a year learning all that "over and short" stuff for naught. I was privileged, however, to write the TEC lessons on the new precision registration system, so I recouped my losses.

Then we began work on some common subject area lessons. The whole area of communications proved fascinating. I managed to get into all kinds of hot water by pointing out that "tree" and "fife" were how you really

were supposed to say three and five over the radio.

One of our final adventures was Field Artillery survey. I had always wondered just what a logarithm was and I found out. My assistant was a math major and thought it was easy, but I really had a time. I did better with "stick" and "stuck"!

At last, after more than a year we were ready to become *real* Molly Pitchers — 13 Bravos. We started on the M109A1 and were surprised to find that the inside of the howitzer was white! We also discovered how cold we could get inside a howitzer.

Before going further we had to conquer the 100 series pantel and the gunner's quadrant. My co-worker is probably the only artillery wife who has lived for a week with both of these little gems in her home. She mastered every sub-task of the "end-for-end test" and may still rank as the person who knows the most about every inch and every function of the gunner's quadrant.

Just when we thought we could manage the cold and SPs, along came the burning sun and the subject of ammunition. We traveled to the field to check out the 8-inch loading and misfire procedures. After a harrowing jeep ride, we arrived during a lull in firing. One section chief, a young man impressed by my attractive assistant, volunteered to explain misfire procedures to her. Much to her embarrassment and his chagrin, he waxed a bit too enthusiastically and mashed his thumb in the breech.

I had been told that "you ain't heard nothin' yet," until you had experienced the shock of standing near an 8-inch as it fired. They were right. As it happened I had my back turned to the guns and was discussing the "jump" FDC concept with someone when the first round was fired. It would not be an exaggeration to say I "jumped a foot." From then on, I *never* turned my back on the guns!

The whole afternoon, now a fondly cherished memory, was a delight and remains the summation of my happy experience as a Field Artillery woman. If there are finer soldiers in the world than those in a good Field Artillery unit, I don't want to hear about them.

I believe that women can make a great contribution to the Field Artillery, following the precedent set by Molly Pitcher. My experience indicates that women would be particularly valuable as 13 Echos or 82 Charlies. However, I myself still would like to stand near the gun and holler "fire" or pull that lanyard and fell the spirit of Molly standing by whispering, "Well done!"

Lucy-Lee S. Reed
Fort Bragg, NC

From August 1973 to May 1976, Ms. Reed was the on-site representative for American Analysis Corporation, the Field Artillery School's TEC contractor at that time. She worked with more than 150 TEC lessons in one phase or another and tested and interviewed more than 1,000 soldiers, mostly 13E, 13B, and 82C. Her husband now commands an FA battalion at Fort Bragg. — Ed.

Our error

I wish to correct a statement which appeared on page 17 of the July-August 1978 edition of the *Field Artillery Journal*. The column dealing with the STARFIRE 78 exercise stated, "One 155-mm howitzer battalion flew in from Fort Bragg, NC . . . ." This statement is incorrect. Only one battery was flown in from Fort Bragg. That was C Battery, 1st Bn (155-mm towed), 39th FA.

I might add that C Battery fired over 480 rounds in support of STARFIRE 78, and then road marched over 650 miles back to Fort Bragg without losing a single vehicle to mechanical problems. Battery C, 1st Bn, 39th FA, arrived on a Friday at Fort Bragg, pulled maintenance on Monday, and was in action on Tuesday in support of a battalion FTX.

Stephen R. Tatham
CPT, FA
C Btry, 1st Bn, 39th FA

The Artful-Dodging Artilleryman

As the story comes to us, modernization of the British Army included viewing time-and-motion films of a Royal Artillery crew drill which turned up a lingering mystery. In serving the piece on the armored gun carriage, analysts were stumped by the actions of one man who would leap from the carriage just before the command "Fire!"

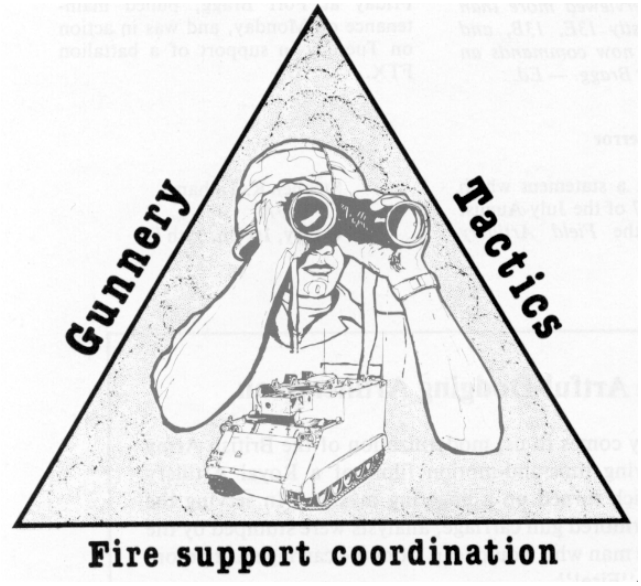
On the ground, he would charge off about 40 meters and artfully freeze into a position with his arms out horizontally.

Hundreds of viewings gave no hint of the reason for this action. Weeks of probing and questioning followed during film showings throughout the Army, but no one could explain the man's sudden action except that "it has always been done."

One day the desperate researchers were showing the film to a retired Brigadier's club. As soon as the film showed the man hurtling off the vehicle and dashing off, an ancient "gunner" popped up and barked, "I know what 'e's doing — that chap is the bloody 'orse-'older!"

Bill Herman
DAC (Ret.)
San Francisco, CA

How effective



is our "team?"

by COL Henry R. O'Neil

This article probably would not have been written had it not been for the timely receipt of the May-June 1978 issue of the *Field Artillery Journal*. It arrived in early June while the author and the 1st Armored Division were at the Hohenfels major training area in Germany participating in an opposing forces combined arms ARTEP. LTC Carl S. Taylor's outstanding article on "Effective Fire Support" in that issue provided the framework for continuing the dialogue on this critical element of the Artillery triad — gunnery, tactics and *fire support coordination*.

Much has been written on the doctrinal aspects of the triad, and we as managers of firepower on the battlefield lead the way in demonstrating and measuring our effectiveness in delivering accurate and timely fire support. We shoot, move, and communicate better than any force in the world and possess the tools to measure our weaknesses and train up to our rigid standards. Look at any Level 1 ARTEP conducted at a major training area and you'll see professional artillerymen administering, participating in, and evaluating the innumerable tasks of gunnery, tactics and techniques, communications, NBC, and other key tasks of our ARTEP. But, during these intensive training periods, usually one significant and critical task is not fully exercised or evaluated — *fire support coordination*. Our FISTs and FSOs operate under unrealistic scenarios since maneuver task forces are off doing tank gunnery or infantry training. Thus, our ARTEPs often are conducted without the full combined arms team which makes the effectiveness of our fire support coordination difficult to measure. Lieutenant Colonel Taylor articulated well all the key points FIST and FSO personnel are required to implement. The seminar he described in his article should be institutionalized by the Field Artillery School and exported to the field with supporting visual aid material. We must continue to "doctrinalize" doctrine and "push" fire support, but we must also evaluate the effectiveness of our training and the utilization of our fire support resources as part of the combined arms team under realistic, mission-oriented ARTEPs or exercises. It was this task that the 1st Armored Division Artillery set out to tackle during 1978. How effective are our FO and FSO teams and where must we devote our remedial training?

Background

During January-February 1978 the 1st Armored Division Artillery conducted external Level 1 evaluations of the direct support artillery battalions at the Grafenwoehr major training area (MTA). While scenarios paralleled wartime missions and FOs demonstrated their capabilities to "adjust fire," little

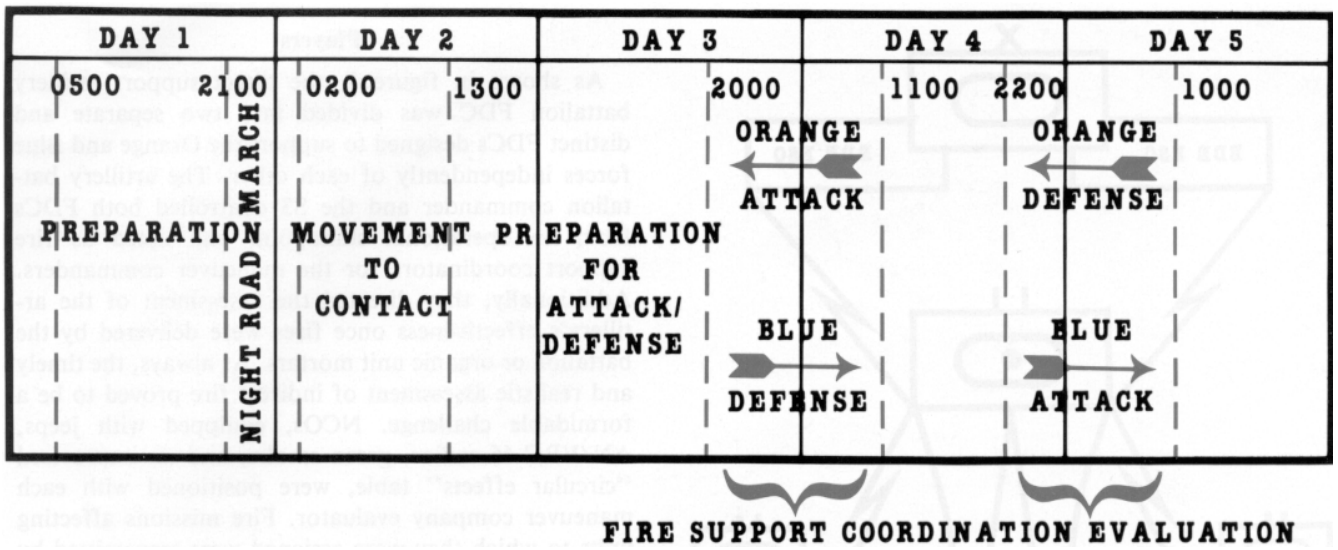


Figure 1. Maneuver ARTEP sequence of events.

realistic fire support coordination was effected since maneuver forces were not available. Recognizing this as "real world" in US Army Europe with current MTA constraints, the plan was to support fully the maneuver ARTEPs at Hohenfels in May-June 1978 and formally evaluate direct support battalions as they supported maneuver task forces involved in an opposing forces ARTEP. Two task forces, each controlled and evaluated by its parent brigade, squared off against one another in a grueling five-day, semi-free-play Level 1 combined arms ARTEP.

Figure 1 outlines the sequence of the opposing forces combined arms battalion ARTEP. Each ARTEP lasted five days. To evaluate the 12 maneuver task forces (to include the division cavalry squadron), six ARTEPs were scheduled back-to-back for a total of 37 days at the Hohenfels major training area. Ideally, it would have been advantageous to have each direct support artillery battalion support the maneuver task force with which it is habitually associated. However, to do so would have required that the three DS artillery units be in the field for the entire ARTEP period.

After reviewing our schedule of other major activities such as AGIs, NSIs, etc., we concluded it would be infeasible to tie up all three battalions simultaneously. Additionally, since no live fire could be delivered at Hohenfels concurrent with the ARTEPs, it was impractical to include firing batteries except for their full complement of FOs. Thus, each DS battalion FDC/TOC was scheduled for a two-week period to provide an FDC and control to both Orange and Blue artillery, while FOs and FSOs linked up with the units they habitually would support. The 1st Armored Division Artillery would provide all evaluators and measure the effectiveness of all fire support. ARTEPs were to start on 12 May 1978.

Objectives

The 1st Armored Division Artillery's objectives for the support of the maneuver ARTEPs were clear and selectively limited (figure 2). Basically, these objectives point to the same goal outlined in Lieutenant Colonel Taylor's article; i.e., to produce a more combat-ready organization through training of fire support personnel. The maneuver ARTEPs permitted the artillery the opportunity to train in a realistic combined arms atmosphere. This "hands-on" training proved to be invaluable.

1. Exercise the fire support coordination system and develop closer commander-FSO relationships at company, battalion, and brigade levels.

(a) Instill in maneuver battalion commanders and FSOs a greater understanding of their combined arms relationship, as well as an appreciation for all the fire support means available to them.

(b) Emphasize maximum integration of fire support planning with scheme of maneuver/defensive planning.

2. Evaluate the effectiveness of FSOs and FOs in fire support techniques, use of available assets, and working relationships with maneuver commanders.

Figure 2. Objectives.

Preparation at home station

Two months before the maneuver ARTEPs, the DS battalions initiated intensive training for FSOs and FOs to insure that they were well versed in fire support

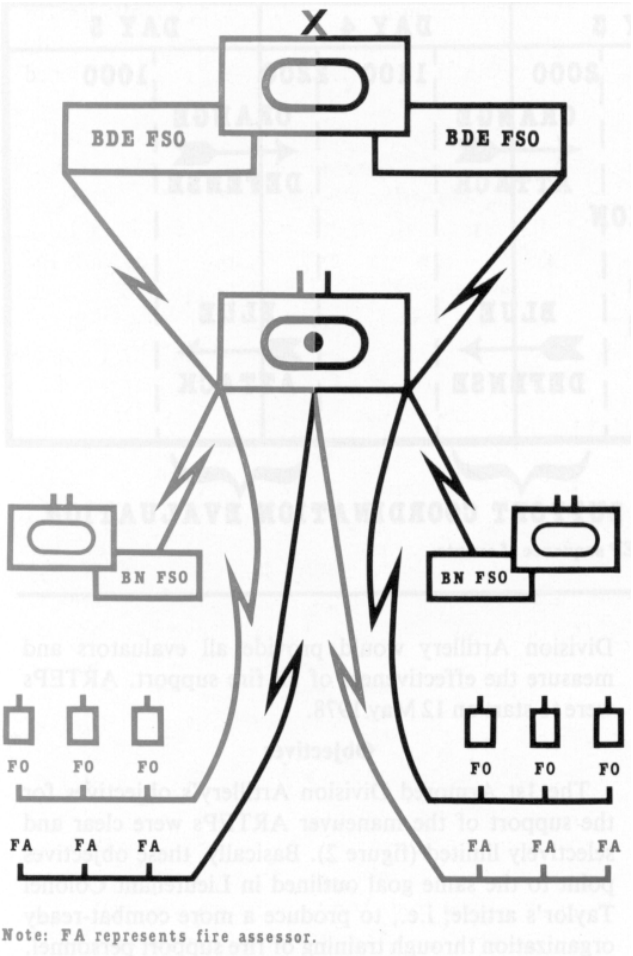


Figure 3. Player organization.

planning and coordination as outlined in FM 6-20. Additionally, battalion FSO and FO teams participated in 24 pre-ARTEP FTXs conducted by the maneuver battalions. These FTXs provided the framework for a close working relationship and rapport between maneuver and artillery that proved to be extremely beneficial in the later ARTEPs. Division Artillery then administered a hands-on and a written examination to FSOs and FOs to identify areas in which personnel needed more training. As expected, the examination validated the need for an officer to attend the Field Artillery Advanced Course before assuming duties as an FSO. Other training was provided to the artillery fire assessors collocated with each maneuver company to insure that the end result of the artillery play was properly integrated into damage assessment. To conclude preparatory training, an evaluators' seminar was conducted for division artillery personnel who would be evaluating the FSOs and FOs against artillery ARTEP tasks and standards.

Players

As shown in figure 3, the direct support artillery battalion FDC was divided into two separate and distinct FDCs designed to support the Orange and Blue forces independently of each other. The artillery battalion commander and the S3 controlled both FDCs from an operational standpoint and acted as fire support coordinators for the maneuver commanders. Additionally, they directed the assessment of the artillery's effectiveness once fires were delivered by the battalion or organic unit mortars. As always, the timely and realistic assessment of indirect fire proved to be a formidable challenge. NCOs, equipped with jeeps, AN/VRC-46 radios, green smoke, and an improvised "circular effects" table, were positioned with each maneuver company evaluator. Fire missions affecting units to which they were assigned were transmitted by either the Blue or Orange FDC, as appropriate (figure 3). Assessors popped green smoke and passed casualty assessment data to the maneuver company evaluator who in turn assessed the damage. Additionally, affected units were required to "button up" whenever green smoke was thrown which realistically emphasized the effects of suppressive indirect fire. The entire FDC and control system provided an unique opportunity to train FDC personnel concurrently on gunnery, radiotelephone procedures, and sustained TOC operations.

Evaluators

Throughout the five-day ARTEPs, division artillery evaluators (figure 4) were observing and informally evaluating the functioning and performance of FOs and FSOs. Formal evaluations were made during the 12-hour defense and attack portions of the ARTEP. These active periods provided numerous opportunities to observe fire support coordination in action. Evaluators not only evaluated FSOs and FOs, but observed the cementing of working relationships between field artillery personnel and supported maneuver units.

Lessons learned

Figure 5 outlines issues that needed additional emphasis. Most are not new; they have been observed for years. But only in the confusion of battle does it become distinctly clear how easy it is to violate doctrine, if doctrine has not been imbedded through rigid training and supervision. The FSO must supervise and direct the efforts of FOs/FISTs continuously. In essence, he commands the teams he overwatches. In view of this fact, he should be responsible for their peacetime training. Thus, we should move quickly to consolidate the FOs/FISTs under the FSO chain of command in the headquarters and headquarters battery of our battalions.

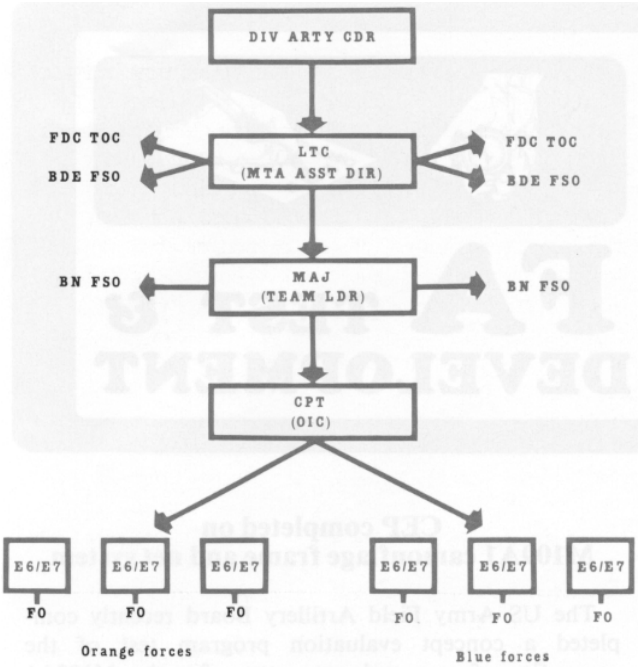


Figure 4. Fire support evaluators (inside rectangles).

1. Too many targets selected by FOs.
2. FOs improperly positioned (could not observe battle area).
3. FSO and FO not coordinating all indirect fire assets.
4. FOs not being managed by battalion FSOs.
5. FOs in M151 vehicles cannot maintain mobility with maneuver units.
6. Battalion FSO unable to coordinate support when forward in a tank.
7. Reorganize FO/FIST under the FSO chain of command in the headquarters and headquarters battery *now*.

Figure 5. Lessons learned.

The Division Restructure Study provides for this organizational streamlining; however, we should modify existing MTOEs now to effect this much needed change.

Current Department of the Army TOEs authorize FISTs in the headquarters and headquarters batteries of appropriate field artillery battalions — Ed.

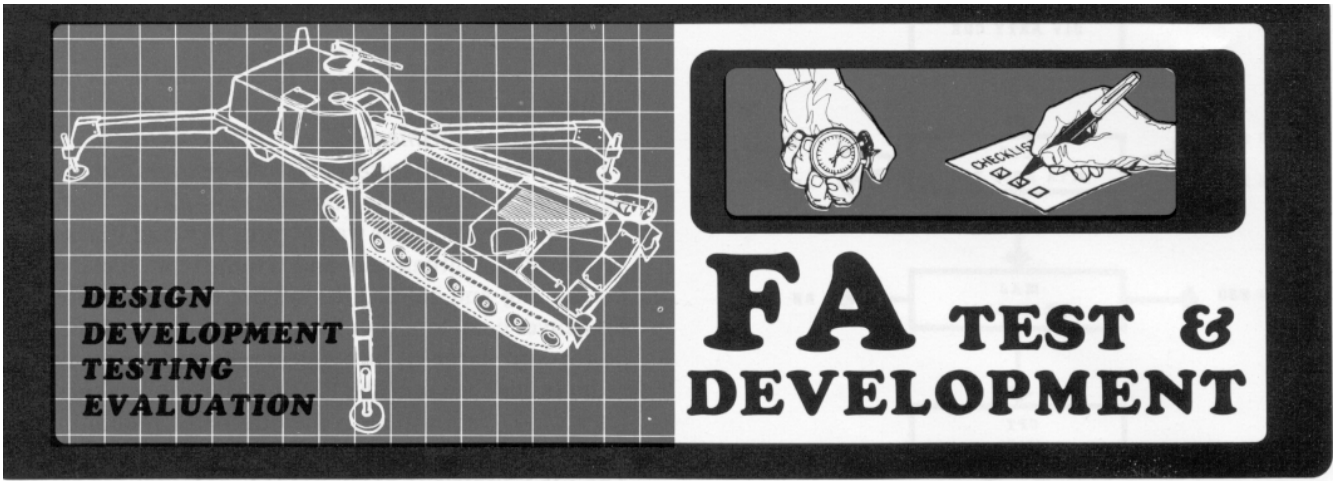
Flexibility is a major watchword. FOs and FSOs must be flexible. Situations and equipment dictate the positioning and capabilities of fire support personnel. Maneuver commanders often would require the FSO to be forward in tanks, but, unless provided with a secure radio inside the tank, the FSO became inoperable when his PRC-77 radio (tied to the outside of the tank) was unavailable when the tank was forced to "button up." The FIST vehicle is badly needed, not only for FISTs, but also for the battalion FSO. Although operating from a tank puts the FSO in the commander's hip pocket, the FSO's decreased capabilities forces the maneuver commander to make some hard decisions as to where he wants him. A tank, especially when the XM1 is fielded, is an extremely expensive vehicle to be used as an FSO carrier. Needless to say, many times the FSO will be loading the tank's main gun instead of attending to his responsibilities of fire support.

The ARTEPs provided an outstanding opportunity for the combined arms team to operate together, learn about each other's needs, and train as they will fight. The results of the ARTEP fire support evaluation provided a good basis for remedial training and some enduring experiences for FOs and FSOs. Finally, full integration of all elements of the combat arms into a combined arms ARTEP enhances "effective fire support" through a hands-on training vehicle.

We must train as we may have to fight!

COL Henry R. O'Neil is Commander of the 1st Armored Division Artillery.

Don't Forget!!
Senior FA Commanders' Conference
14-16 November 1978 at Fort Sill



PADS test being evaluated

The US Army Field Artillery Board has completed operational test IIA of the position azimuth determining system (PADS). PADS is a field artillery inertial surveying device for use in 4th and 5th order survey. Design criteria specify a horizontal accuracy of 20 meters circular error probable, a vertical accuracy of 10 meters probable error, and an azimuth accuracy of 1 mil, root mean square error.

Operated by only two men, the PADS is designed to be mounted in either a jeep or an OH-58A helicopter. While operating in a jeep, it may be driven onto a CH-47 helicopter, flown across an obstacle, off-loaded and then continue on its mission. PADS will give the commander coordinates, elevation, and azimuth control almost instantaneously.

The results of the test are currently being evaluated by the Field Artillery School and the Engineer School. If adopted as standard US Army equipment, one conventional survey party in each field artillery battalion will be converted to a PADS survey party. In addition, the division artillery survey section will have two PADS survey parties and the target acquisition battery will have one.

PADS survey team with TOE equipment. (Photo by Al Kennedy)

CEP completed on M109A1 camouflage frame and net system

The US Army Field Artillery Board recently completed a concept evaluation program test of the camouflage frame and net system for the M109A1 howitzer. (See page 58, January-February 1978 *FA Journal*.) Results indicated that the concept of using a semi-permanently mounted, rapidly deployable camouflage system for the M109A1 howitzer was feasible; however, the two hardware designs tested had several significant limitations which have been redesigned. The Field Artillery School is currently conducting an independent evaluation of these latest test results.

Artillery-deliverable jammer being developed

An expendable, artillery-deliverable communications jammer is being developed for the Army by the Harry Diamond Laboratories. Each low-cost jammer will be operated automatically and spent after a single use. It will be packaged in an M483 155-mm canister round.

When dispersed well behind the forward edge of the battle area in the vicinity of enemy troops, the jammers will disrupt and confuse enemy tactical communications without affecting friendly forces' communications.

The new multi-year, $3.5 million jammer program will involve advanced technology in the areas of electronics, antennas, power supplies, and aerodynamic dispersion techniques. It is the first major electronic warfare task to be assigned to Harry Diamond Laboratories in direct support of the Army's intelligence surveillance and target acquisition mission.

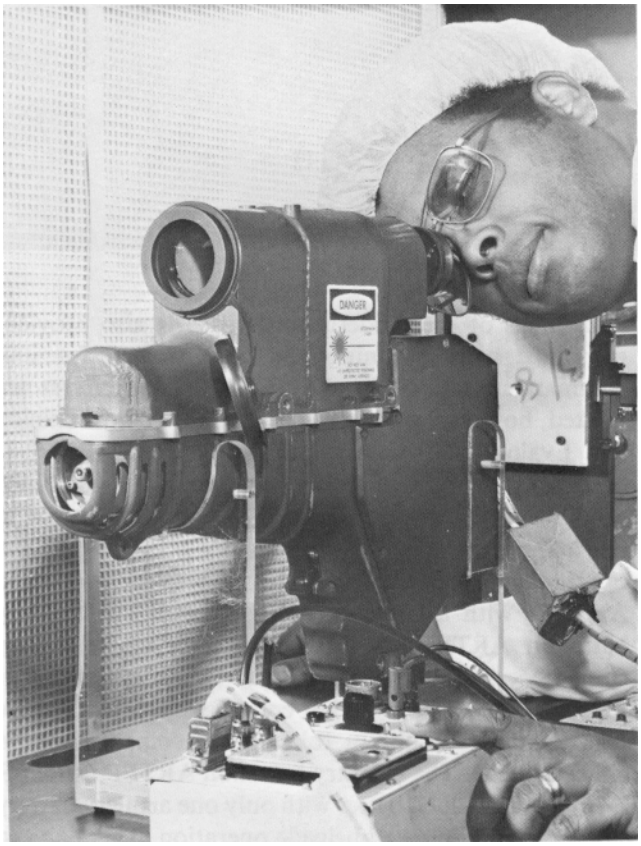
Laser target designator enters production

The Army's new laser target designator (LTD) has entered production at Hughes Aircraft Company's facility at Culver City, CA. The hand-held device can designate targets for any of the US Armed Forces laser homing weapons, mark the position of troops, or designate sites for aerial supply drops.

The LTD consists of three easily-replaceable modules designed to withstand field handling. The battery pack makes up the stock of the rifle. It contains 22 battery cells resembling common flashlight batteries and can be replaced in seconds. The second component, the power supply, transforms the battery current into energy usable by the laser transmitter, the third component.

More than 90 percent of the LTD's active electronics are mounted in the power supply on a 4- by 5-inch circuit card which contains the equivalent of 10,000 transistors etched into the microcircuitry.

Under an Army Missile Research and Development Command contract in excess of $15 million, Hughes will manufacture 152 systems for the Army and 25 additional systems for the Air Force.



Hughes Aircraft Company engineer Douglas Chism tests the new laser target designator now being produced by the company.

COL R. E. Philipp, Project Manager of Cannon Artillery Weapons Systems, accepts delivery of the first two production models of the M198 towed howitzer for the Army.

M198 production rolling

The first two production M198 towed howitzers were turned over to the Army in ceremonies at Rock Island Arsenal, IL, July 6, two weeks ahead of schedule. The first two howitzers were sent to Aberdeen Proving Grounds, MD, for production verification testing.

Operational testing of the M198 will be conducted at Fort Bragg, NC, by the 1st Battalion, 73d Field Artillery, which will receive 18 of the weapons from Rock Island Arsenal with fire control and basic issue items. The Arsenal is scheduled to assemble 654 howitzers by 1984. Watervliet Arsenal will build the cannon assemblies. The cannon was designed and developed by Benet Weapons Laboratories at Watervliet.

Fire control equipment for the M198 will be produced by NUMAX Electronics, Inc., and Consolidated Diesel Electrics Co. will produce the gun carriages.

The M198 is the first new weapon built under the new NATO standardization agreements. It fires all current and developmental ammunition and doubles the range of the M114 it replaces.

In spite of its improved capabilities, the M198 weighs only about 2,000 pounds more than the M114 due to the extensive use of aluminum and high-strength steel throughout the weapon. The M198 will provide general support artillery fire and direct support for the light divisions of the post-1979 period and may replace the 105-mm howitzers in those units.

A Combined Arms ARTEP —

In his interview (March-April 1978* Journal*) MG Albert B. Akers strongly emphasized the need for a combined arms ARTEP. This article describes one way to achieve this goal.

All the great trainers of today emphasize that we must train as we are going to fight. This task is much easier said than done. Executing realistic and effective combined arms training in today's Army is difficult. Often the lack of training funds, safety constraints, and negative attitudes are problems too great to overcome. Consequently, artillery battery and battalion training is conducted in a vacuum devoid of the infantry or armor. In the 82d Airborne Division Artillery, this problem is attacked vigorously with the annual conduct of platoon and battalion combined arms live fire training exercises (CALFEX). The CALFEX provides the 82d Airborne Division trooper the experience of the sights, sounds, and smells of the modern battlefield. It also provides combined arms planning and coordination for unit commanders and staffs. The CALFEX objectives are limited, however, when compared to the Army Training and Evaluation Program (ARTEP). Each ARTEP is designed to be run within the framework of a combined arms scenario; however, few, if any, are conducted in this manner.

Prior to 1976, the 82d Div Arty had conducted ARTEPs with a combined arms flavor. The artillery battalion ARTEP (ARTEP 6-105) used an infantry company on the ground and simulated the remainder of a maneuver brigade. The company provided some realism, but was only a token force compared to an entire brigade. The infantry battalion ARTEP (ARTEP 7-15) was not much better with only one artillery battery supporting a simulated brigade operation. There *had* to be a more realistic way to run an ARTEP. The ideal situation for conducting an artillery battalion ARTEP

would be in conjunction with a manever brigade ARTEP with division and div arty as controlling headquarters. The exercise should be held in a training area that would allow complete freedom of maneuver and live fire support.

We decided to "do it right"

In the summer of 1976, planning began on just such an exercise. Initial planning was nothing more than brainstorming sessions between field artillery and maneuver ARTEP project officers who shared a sincere desire to improve training realism in their units. The ultimate goal was a combined infantry/artillery ARTEP. The 1st Brigade, 82d Airborne Division, and its direct support artillery battalion, the 2d Battalion, 321st Field Artillery, had developed an excellent training relationship. Many successful combined arms operations and live fire exercises had been conducted. In each of these exercises valuable experience was gained; however, training realism had suffered. The safety restrictions of the live fire support would often limit maneuver or vice versa. How could training be evaluated in a more realistic situation? The combined ARTEP was the answer! The "ideal combined ARTEP" proved too ambitious; so an exercise featuring one infantry battalion task force and one artillery battalion was the consolation. The 2d Battalion, 504th Infantry, and the 2d Battalion, 321st Field Artillery, were selected for the exercise. The remaining forces of the 1st Brigade would be simulated and the exercise controlled jointly by 1st Brigade and div arty headquarters. Some dreaded simulations existed, but the exercise had the potential to far surpass any previous ARTEP.

In September, the 269th Aviation Battalion joined the exercise to make a three-battalion combined ARTEP. The aviation battalion would be controlled by its parent unit, the 12th Aviation Group. Each control headquarters appointed an ARTEP project officer whose primary function was to work on the exercise. Joint planning sessions were conducted each week to develop the combined ARTEP scheduled for the first week in November.

Joint scenario

The need for a joint scenario based on supporting the infantry scheme of maneuver was readily apparent if the goal of training evaluation within a totally integrated combined arms exercise was to be reached. This joint scenario containing every event would be used by all controllers. A large flow chart was used initially to develop the joint scenario. The chart was arranged with time phasing, i.e., D-1, D-Day, D + 1, on the top and all participating units in the left margin. These units included the US Air Force, "Cobra" gunships, aggressor forces, etc. Then came the tedious task of inserting every event that would take place, by time and unit.

The infantry had first crack at the flow chart. The level 1 tasks and objectives from the infantry battalion ARTEP were listed. These tasks and objectives represented to the aviation and artillery the scheme of maneuver that had to be supported. Artillery and aviation ARTEP tasks were developed to fully support the infantry plan. After the primary mission of supporting maneuver was accomplished, the remaining ARTEP required tasks that could not reasonably be evaluated within the main scheme were added. With the aid of the flow chart, the final scenario was easily written. Each event was extracted from the chart and organized in sequence. The time-phased flow chart proved to be an excellent briefing tool. It depicted every mission to be fired, every objective to be taken, and every airmobile operation to be flown. The joint scenario prevented the common pitfall of many so-called combined arms exercises where controllers allow units to isolate themselves from the combined arms team.

Control

To fully support the infantry scheme of maneuver and properly evaluate level 1 tasks in ARTEP 6-105, the following concepts were adopted for control:

- At least one artillery battery would provide the infantry battalion with live fire when possible and dry fire when required by safety restrictions.
- The remainder of the artillery battalion would provide live fire support to the two simulated battalions of the brigade.
- The infantry mortars would be fully integrated into the live fire scenario. Each platoon would receive an ARTEP.
- The live fire support of Air Force, US Marine tac air, and Army attack helicopters would be fully integrated into the live fire scenario.

Control of a three-battalion combined arms ARTEP is a task of great magnitude. To simplify this task, the control spectrum was split three ways. Brigade would control the infantry scheme of maneuver that triggered all major events. Div arty would control all live fire activities to include artillery, mortars, tac air, and gunships. The aviation group would handle all aviation activities to include airspace control in and out of the operations area. The three control headquarters were

located so as to enhance coordination in the field. Controllers/evaluators were thoroughly briefed and followed the joint scenario religiously.

Conduct of the combined ARTEP

Devil Strike IV was conducted during the period 1-6 November 1976 at Fort Bragg. The exercise began with an alert at 0800 hours on 1 November (D-1). At 1000 hours, a briefing was given by the 1st Brigade, the operations order (OPORD) was issued, and the operation was underway. Having an infantryman write and present the OPORD provided a more realistic situation than previous ARTEPs where artillery controllers, acting as the maneuver brigade staff, presented a hastily prepared, often inaccurate, OPORD.

The 2-321st FA went to work immediately rigging guns and prime movers for heavy drop. The Redlegs rigged a total of 40 heavy drop loads (18 howitzers, 20 "Gama Goats," and two trailers) in less than eight hours. Bravo Battery and the 2-504th Inf comprised the Division Ready Force One which conducted the main assault on DZ Devil and DZ Strike simultaneously. This airborne operation was a night jump conducted at 0300 hours on 2 November. The 2-504th Inf assembled quickly and moved out to secure the initial assault objectives. Bravo Battery provided live fire support from its drop zone (DZ) position. After the assault objectives were taken, the battery conducted a night split battery move from the DZ. The split move allowed continuous fire support as Bravo Battery was the only artillery in the airhead.

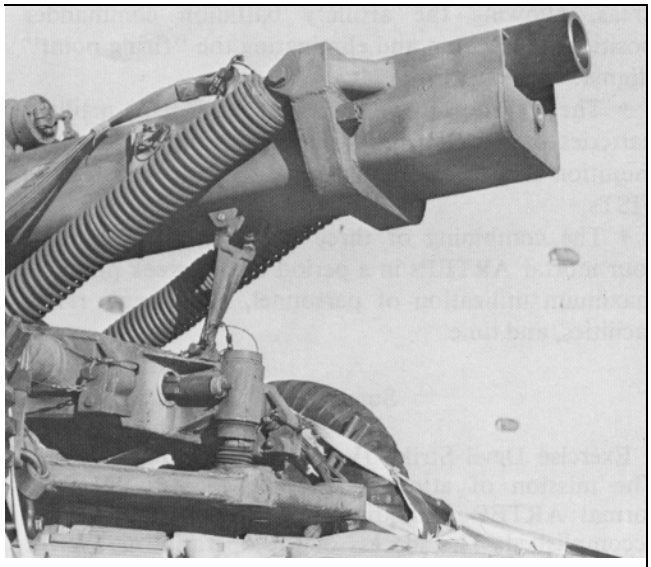
The 269th Aviation provided invaluable support in airlifting firing batteries and resupplying food and ammunition.

The remainder of the force was introduced into the problem approximately six hours after the main assault. Alpha and Charlie Batteries (each supporting a simulated battalion task force (TF) jumped in.

Subsequent operations for TF 2-504 were evacuation of endangered US nationals from the US Embassy in the mythical country of Uzbek. The civilians were successfully evacuated by the 269th Aviation Battalion. After completion of this ARTEP task, TF 2-504 conducted a two-company "movement to contact" as directed in the OPORD. The third company was extracted from the problem for sub-unit evaluation. During company sub-unit evaluations, the 81-mm mortars and the fire support teams (FISTs) were placed under artillery control for live fire evaluation. Each day a different mortar section was evaluated using mortar ARTEP standards. On the fourth day of the exercise, the 4.2-inch mortar platoon was evaluated. Each mission fired by the mortars was included in the joint scenario. With the addition of mortar fires, sufficient ammunition was generated to evaluate all FISTs on at least one live fire mission.

Since TF 2-504's movement to contact was outside the impact area, Bravo Battery was required to use dry fire procedures. In the dry fire mode, certain safety precautions were taken. These were clearly defined by controllers to the firing battery. First, a separate radio net was provided for the conduct of dry fire missions to prevent the mixing with live fire missions. Second, the call for fire on a dry mission was amended. The words "dry fire" were inserted in the warning order; e.g., "M24, this is F49, adjust dry fire. . . ." Third, all personnel in the firing battery were carefully briefed by controllers when a change was to occur in the firing procedure.

The movement to contact was completed at 1200 hours on D-Day. "Frag Order 1" was then issued to TF 2-504. This order required a live fire airmobile assault to seize and secure an objective vital to future operations. The air mission commander's briefing was held at the infantry battalion tactical operations center (TOC). Attending the briefing were the infantry battalion commander and his S3, the fire support officer (FSO), the Bravo Battery commander, the 269th Aviation Battalion air mission commander, the USAF liaison officer, and the naval gunfire liaison officer. The airmobile assault was to be preceded by a preparation fired by Marine and Air Force tac air, artillery, and



Alpha and Charlie Batteries jump in.

gunships. The "prep" was to be controlled by the FSO based on the guidance from the infantry battalion commander. Overall safety control for the operation was the responsibility of the div arty S3 from a helicopter.

After TF 2-504 seized the objective, the 2-321st FA was required to airlift one battery to support future operations. The habitual association of a particular artillery battery with an infantry battalion is vital for success during an airborne assault and initial operations in an objective area; however, for subsequent operations, it may be necessary to cross-attach infantry companies as well as artillery batteries within a brigade task force in much the same way as was done in Vietnam. With this in mind, plus the desire to balance the live fire tasks with the dry fire tasks, Alpha Battery (rather than Charlie Battery) was airlifted by CH-47 helicopter to support TF 2-504's night area defense.

The next morning (D + 1), "Frag Order 2" was issued requiring an antiarmor defense. Alpha Battery suffered numerous casualties during the night and was replaced by Charlie Battery. An airmobile move provided the speed necessary to rescue the battered Alpha Battery troopers. Supporting the antiarmor defense was a very challenging mission for Charlie Battery. Aggressor tanks severely tested the ability of TF 2-504 to execute the division's antiarmor doctrine. By late afternoon of D + 2, each battery in the 2-321st FA had received a taste of the action with TF 2-504. Fire support planning and realistic movement in support of an infantry battalion task force had been thoroughly evaluated.

During the first phase of the ARTEP, batteries operated independent of battalion control. During this extremely fast-moving phase of the exercise, the 269th Aviation Battalion provided invaluable support in airlifting firing batteries and resupplying food and ammunition. None of the airmobile operations were prearranged. The requirements for aviation support were generated by the tactical situation, providing an excellent evaluation of the aviation battalion.

After completion of the antiarmor defense mission, the artillery battalion finally gained complete tactical and technical control of its batteries for its direct support mission. The 2-321st FA was required to conduct a battalion-size airmobile displacement at night to better support the brigade. On D + 2, the TF was required to conduct a live fire airmobile assault on two objectives in the impact area simultaneously. This complicated operation required extensive planning and preparation by all participants. The live fire preparation, controlled by the FSO, called for simultaneous attack of the two objectives by tac air, artillery, and gunships. At 0900 hours on D + 3, the assault began with Marine air attacking one objective with napalm and 20-mm cannon while the Air Force attacked the other objective some 1,500 meters away. The artillery preparation immediately followed the tac air. Seconds later, Cobra gunships rolled in with 2.75-inch rockets, leading the way for the lift ships transporting the infantry. The operation was executed flawlessly — a real tribute to what the combined arms team can do!

Conclusions

The ARTEP terminated on D + 4. When the smoke and dust finally cleared, three level 1 battalion ARTEPs had been administered within the framework of a realistic and challenging combined arms scenario. Three 81-mm mortar sections and one 4.2-inch mortar platoon had been evaluated. All FISTs had been evaluated, each firing at least one live artillery or mortar mission. Sixty-six artillery missions were fired, including all the standard ARTEP missions as well as missions using the roving gun concept, the night observation device, and coordinated artillery high explosive under mortar illumination. The mortars were evaluated on 70 missions. More than 3,000 troops participated in the exercise including players, controllers, and support troops. More than 100 CH-47, 200 UH-1H, and 48 C130 sorties were flown. Two large-scale live fire airmobile assaults using tac air, artillery, and gunships were conducted. Of even greater importance were the lessons learned by players and controllers on how to exercise and evaluate the combined arms team in a realistic training environment.

Devil Strike IV is one example of how to conduct a combined ARTEP. In the process of planning and executing this exercise, the following lessons were learned:

• The overall concept of the operation must be firmly established early in the development phase. Detailed planning must begin at least three months prior to the exercise. A dedicated project officer from each controlling headquarters must be appointed and made responsible for his portion of the ARTEP.

• The joint exercise scenario is a must!

• The exercise must be conducted at an installation with a very liberal range control.

• The artillery control headquarters should control *all* live fire by establishing a field range control. The aviation control headquarters should control all aviation activities to include VIP visits, airmobile operations, etc. The infantry control headquarters should control the maneuver plan.

• Ammunition forecasts and requests should be submitted well in advance. All ammunition to include 2.75-inch rockets should be drawn early by the support units and prepositioned in a field ammunition supply point (ASP). The field ASP provides easy access to ammunition, enhances scenario flexibility, and provides an excellent means for evaluation of ammunition sections.

• At least one battalion is required to support a like battalion undergoing an ARTEP.

• Close, early coordination must be made with range control. For an exercise as large as a combined ARTEP, complete maneuver areas should be reserved exclusively for the exercise. Range clearance should be obtained to fire artillery from almost anywhere within the assigned areas, allowing the artillery battalion commander positioning freedom and eliminating the "firing point" stigma.

• The inclusion of mortars and reinforcing artillery batteries or battalions is desired to provide more ammunition and therefore more live fire missions for the FISTs.

• The combining of three battalion ARTEPs and four mortar ARTEPs in a period of one week provides maximum utilization of personnel, equipment, range facilities, and time.

Summary

Exercise Devil Strike IV was a resounding success. The mission of attaining training realism during a formal ARTEP evaluation for three battalions was accomplished. The success of the operation is a vivid example of the "can do" attitude of the 82d Airborne Division.

The author's interchangeable use of the terms "CALFEX" and "ARTEP" does not take into account the fixed scenario nature of the CALFEX and the more flexible nature of the ARTEP which allows the commander to pause in the ARTEP to conduct remedial training and repeat certain events. Despite this, the coordination techniques for combined arms training under CALFEX appear transferrable to ARTEP requirements.—Ed.

MAJ William E. Tyson is assigned to the Headquarters and Headquarters Company, 1st US Army Intelligence and Security Command, Fort George Meade, MD.

Commanders Update

COL Thomas P. McHugh
2d Infantry Division Artillery

COL Ronald S. Savard
7th Infantry Division Artillery

COL William E. Sweet
8th Infantry Division Artillery

COL Harry E. Soyster
24th Infantry Division Artillery

COL Thomas G. Lightner
25th Infantry Division Artillery

COL Donald L. Burton
17th Field Artillery Group
(formerly 46th Field Artillery Brigade)

LTC Fred L. Hill
1st Battalion, 3d Field Artillery

LTC Robert G. Sausser
1st Battalion, 8th Field Artillery

LTC Richard Manupella
2d Battalion, 8th Field Artillery

LTC Richard E. Helmuth
2d Battalion, 10th Field Artillery

LTC James L. Green
2d Battalion, 17th Field Artillery

LTC Richard W. Linde
1st Battalion, 31st Field Artillery

LTC Ronald A. Coleman
2d Battalion, 35th Field Artillery

LTC Reinhold J. Kraft
1st Battalion, 77th Field Artillery

LTC David L. Pearce
4th Training Battalion
Fort Sill

LTC Charles W. Hendrickson
Officer Student Battalion
Fort Sill

LTC Edward H. Robertson
Specialist Training Battalion
Fort Sill

LTC Emile A. Robert
Training Command
Fort Sill

LTC Robert C. Johnson
5th Battalion, 1st Training Brigade
Fort Jackson

1978 Readership Survey Results

Most of the responses to our latest Readership Survey are in and have been consolidated, studied, and, in most cases, acted upon. The interest you showed in completing the survey forms is appreciated. There were no radical changes from the 1977 survey in either who our readers are or their basic opinions, but the specific comments were different.

To put the results in context, our survey shows that 55 percent of our readers are Active Army, 21 percent are Army National Guard, 8 percent are Reserves, 6 percent are US Marine Corps, and 5 percent are retired. Officers make up 73 percent of the readers; NCOs, 15 percent; and lower enlisted grades, 4 percent. Almost half the respondents are in cannon units, and only 4 percent are in missile units. Nearly 70 percent have at least a college degree, and 31 percent have graduate degrees. Only 3 percent have less than a high school diploma.

The survey showed that 80 percent of our readers read more than half of each issue and 35 percent read the-*Journal* from cover to cover. The *Journal* content is rated "highly useful" by 60 percent of the respondents and "moderately useful" by another 37 percent, giving us a positive response of 97 percent. The *Journal* was rated as "better than most" compared with similar military publications by two-thirds of the respondents and "about the same" by 31 percent. Similar percentages gave us good and fair marks for reading ease, layout, and illustrations. It was the opinion of 97 percent of our readers that the *Journal* is fulfilling its aim as an open forum for all readers.

Popularity of features was similar to the 1977 survey with the most popular being a tie between "FA Test & Development" and "Right By Piece" followed by "View From The Blockhouse," "Incoming," "Redleg Newsletter," and "Commanders Update."

The specific articles mentioned as having the greatest reader interest were "DRS" by LTC Homer J. Gibbs, the interview with BG A. Bar-David (Chief of the Israeli Artillery), and the two-part series on North Korean Artillery by CPT J. D. Schnabel. Incidently, the Bar-David interview resulted in more correspondence than any other article published in the last two years.

Readers indicate they would like heavier emphasis devoted to the following subjects: FA tactics, techniques, and organization; weapons and equipment; foreign armies; career information and guidance; strategy; and future concepts.

We had 208 offers to write for the *Journal*, and each of those volunteers who included his address should have received a letter and our "Writer's Guide" by now.

The most valuable section of the survey was the space for your general comments. Here are some of those most often mentioned and some that we plan to react to:

Make monthly — Costs and staff size preclude more frequent publication.

More on Reserves (and National Guard) — Not to "cop out," but we can only print what we receive. The-*Journal* recognizes the importance of the Reserve Components and is anxious to print good RC material if we can get it.

Not written for enlisted men — Unfortunately the interests of officers and junior enlisted men vary too greatly for one publication to span. We try to orient primarily on the career professional — the senior NCO through field grade officer, but everyone is encouraged to send us his ideas.

Put in a 24-hour-a-day phone for calls from overseas- — An excellent suggestion that is being implemented. The *Journal* will publicize the number when it is in operation.

Reduce the price — The subscription service is part of membership in the FA Association, a private nonprofit organization. The dues are comparable to other branch associations.

Create a special section on _____ — The blank represents dozens of special interest areas from "how to organize an FDC" to "a centerfold on the howitzer of the month." We believe a general approach to the entire system, changing emphasis as appropriate, is a better way to use our limited resources. Again, anyone can send us anything.

Send more copies — Each battalion, Active and Reserve, receives 30 copies which are intended for dayrooms and unit reference files. One problem is that too many people, who should *subscribe* to get a personal copy, take a unit copy home instead. This is a problem area for each battalion S1 or CSM to look into.

Your collective comments were most useful and we appreciate every one of them. We will use them to continue to improve your professional journal. We thank you for your continuing support.

The *Journal* staff

Apply now for OCS

Applications are being accepted from active duty enlisted personnel and warrant officers for Officer Candidate School (OCS) at Fort Benning, GA. OCS is a 14-week course designed to produce professional commissioned officers for various Army branches. Basic eligibility requirements are:

• No more than 10 years active service at date of OCS completion.

• Two or more years college (minimum of 60 semester hours).

• At least 19½ and not more than 29 years of age on enrollment.

• Test scores of 110 GT, 115 OCT, and composite OCT/OQI of 200 for male and 115 GT for female personnel.

Other eligibility requirements are physical and leadership abilities, an outstanding military attitude, and high motivation to become an officer. Weight standards listed in AR 600-9 are a requirement for all applicants. If the applicant is overseas, 24 months of the tour must be completed (waiverable).

Class dates are:

Class number	Reporting date	Application deadline to HQ FORSCOM
2-79	7 Jan 79	22 Sep 78
3-79	22 Apr 79	8 Jan 79
4-79	3 Jun 79	16 Feb 79
5-79	23 Sep 79	8 Jun 79

Turkey bound troops *must* carry required gear

Soldiers on orders to Turkey must have all required clothing and equipment with them upon arrival there, according to the Department of the Army. While soldiers are required by regulation to carry these items between all PCS stations, Turkey presents a special problem.

Restrictions on stocking certain items locally and time-consuming inventory replacement procedures require up to six months to obtain many items. Women's clothing items are currently not available for issue in Turkey.

Commands have been directed to increase efforts to insure that all soldiers who PCS to Turkey are carrying the required clothing and equipment.

Enlisted Branch notes

The Field Artillery Enlisted Branch at MILPERCEN recently reported that:

• LTC Marvin A. Bihn assumed duties as Chief, Field Artillery/Air Defense Artillery Branch, Enlisted Personnel.

• MOS 13F (Fire Support Specialist) is critically short at grades E6 and E7. Qualified volunteers are being accepted.

• Promotion criteria for specific grades are contained in letters of instruction to the last promotion board. You may request to see a copy of this letter when visiting your MILPO.

• Enlisted Preference Statements (DA Form 2635) should be kept current since this form is the most important management tool used by Branch to consider your requests.

Personnel files available to Reserves

Army Reservists may now review their military personnel files at MILPERCEN. Minimum information required to obtain records includes full name, rank, and Social Security number. Callers should request a date for the review and provide a phone number where they can be reached during working hours.

To request record review call MILPERCEN Reserve Affairs advisor at: AUTOVON 221-8835 or commercial (202) 325-8835, or write HQ MILPERCEN, ATTN: DAPC-MS-RA, 200 Stovall Street, Alexandria, VA 22332.

To review records at Reserve Components Personnel and Administration Center (RCPAC) in St. Louis, MO, call AUTOVON 698-7733 or commercial (314) 268-7733.

Requests should be made not less than four working days before the desired date of review.

Height and weight standards applied to Guard

Effective 1 July Army National Guard members applying for service schools must meet active duty height and weight standards as prescribed in AR 600-9. This rule became effective last January, but waivers were allowed for Guard members making progress in weight reduction programs. Waivers are no longer being considered.

MOS 13F to SRB list

To attract more volunteers for the new Fire Support Specialist MOS (13F), the Army has added it to the selective reenlistment bonus rolls at the Zone 1A level. Zone A payments are made to reenlisting soldiers who have less than six years service.

The Army is having serious trouble finding enough soldiers, particularly at grades E5, 6, and 7, to fill the 4,216 positions in MOS 13F, according to MILPERCEN. An attempt is being made to have soldiers in related MOSs voluntarily reclassify or reenlist in the skill.

Combat arms not popular with "Class of 78"

This is the first year that West Point cadets were allowed to select other than combat arms branches for their initial Active Army duty and many took full advantage of the opportunity to join the support branches.

The three combat arms of Field Artillery, Infantry, and Armor were selected by less than the minimum number of cadets required by the Department of the Army. The 1978 graduating class produced 117 Armor officers, 150 "Redlegs," and 245 Infantrymen. To meet the combat arms minimums, 41 cadets were ranked into Infantry.

Some branches, which received few West Point graduates in the past, received the maximum number of cadets allowed by DA. The Adjutant General branch "maxed out" with 36 West Pointers, the Chemical Corps got nine, Finance 12, Military Intelligence 55, and Quartermaster had its maximum of 32. Transportation got one less than its maximum authorization of 57. A total of 327 Military Academy cadets (33 percent of the class) selected other than combat arms.

FA enlistment bonuses cut

MOS 17C (Field Artillery Target Acquisition Specialist), was dropped from the enlistment bonus program 3 July 1978. In addition, bonus payments were dropped from $2,500 to $1,500 for people enlisting in MOS 13E (Cannon Fire Direction Specialist).

Enlistment rules for enlistment bonuses are more stringent than for other enlistment programs. Applicants must be high school diploma graduates, have a Category I-III mental aptitude score and enlist for at least four years. Prior service personnel are ineligible for an enlistment bonus.

Communications MOS structure changed

A new MOS, 31V (Tactical Communications Systems Operator/Mechanic), has been added to the Army's list. Established to support the Enlisted Personnel Management System (EPMS), the new MOS will affect approximately 5,600 soldiers.

MOS 31V was developed to absorb the duties and responsibilities of personnel and positions from the following MOSs and grades:

- 31B — grades E1-E5.
- 31G — grades E6-E8.
- 05B — grades E6-E7.
- 36K — grade E6.

Those 31V positions that call for a background in Morse code will be identified by a new additional skill identifier (ASI), "A4." Another ASI, "F7" (Field Artillery Digital Automatic Computer Mechanic), will be awarded to those who formerly held MOS 31B30.

A nine-week 31V course has been developed to prepare those soldiers who are unfamiliar with tactical communications to perform the duties of company, battalion, or brigade communications chief. The course will train E6s and above and those E5s who are on the standing promotion list. The training will be conducted at the Field Artillery School at Fort Sill and will be open to those E6s who already hold MOS 31V.

The ultimate long-range goal is to train all E6s who held 36K, 05B, and 31G.

Approximately 150 individuals were reclassified between December 1977 and February 1978 into 31V because of a critical shortage in grade E6, and there may be additional reclassifications.

Caution issued on officer separations

Officers and local military personnel offices have been cautioned by MILPERCEN that the final decision on exactly when an officer's service obligation ends can be made only by his career management division.

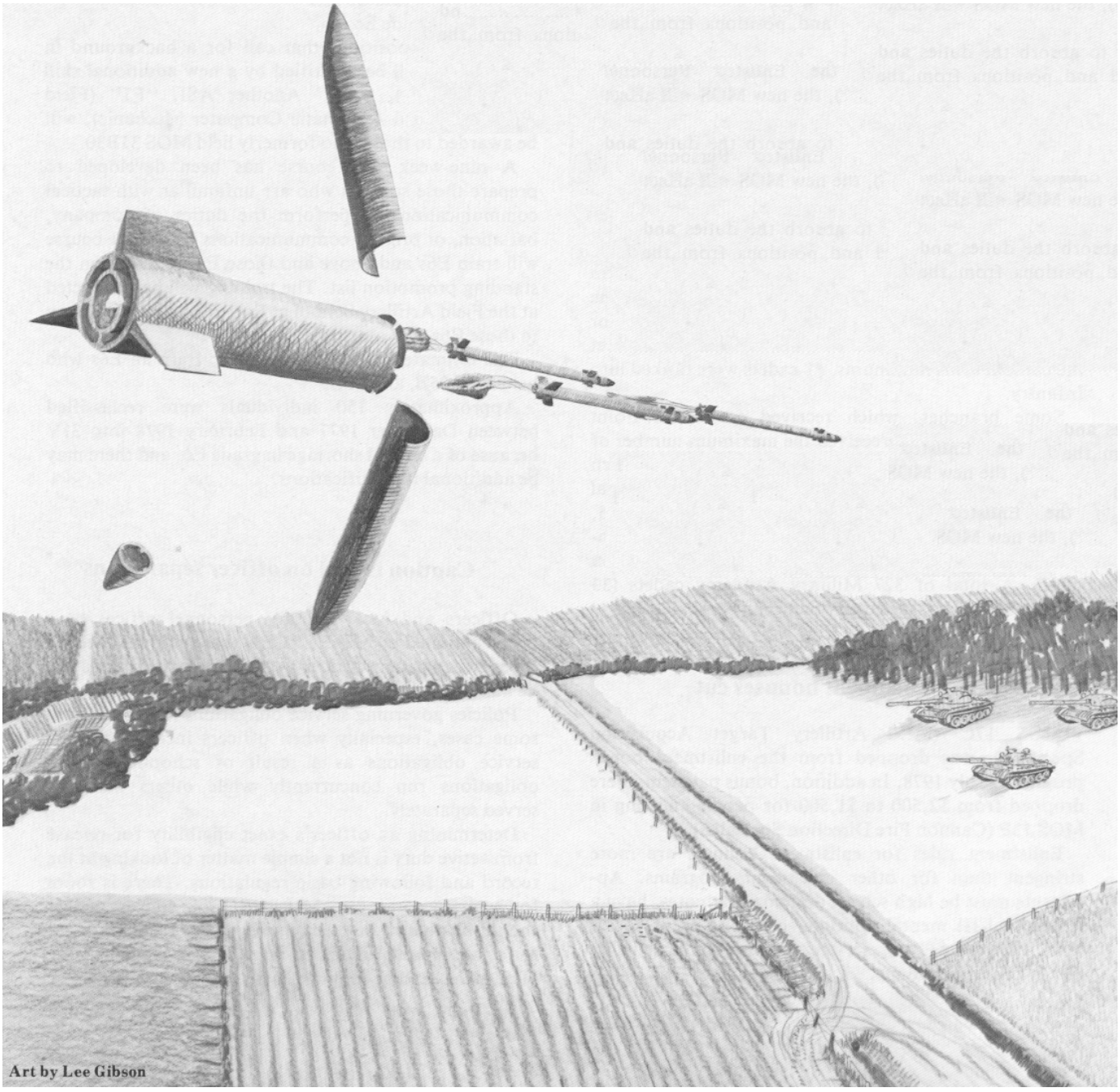
Policies governing service obligations are complex in some cases, especially when officers incur additional service obligations as a result of schooling. Some obligations run concurrently while others must be served separately.

Determining an officer's exact eligibility for release from active duty is not a simple matter of looking at the record and following basic regulations. There is room for error, according to MILPERCEN, and an officer should be able to buy a house or make a commitment for a job without having to change those plans because of an error in what he thinks is his release date.

Development of Precision Guided Munitions

A Field Artillery point of view

by CPT Joseph C. Antoniotti and Mr. William J. Krondak



Art by Lee Gibson

munition (DP-ICM) projectile (M483) has brought us a long way in this direction. DP-ICM is about twice as effective as HE against some materiel targets and up to nine times more effective against personnel. However, the number of bomblets which a projectile can carry sets an upper limit on the maximum effectiveness of this type of projectile.

Another way to increase effectiveness is to increase accuracy and precision; i.e., enable the conventional rounds to detonate within a few meters of the actual target location. To accomplish this, target location error and system delivery error must be reduced to near zero. This cannot be done with the field artillery systems we have today. Current target location errors (100 to 300 meters), precision errors, and cumulative system inaccuracies limit the accuracy with which we can deliver purely ballistic munitions.

The next logical step in the use of technology is the development of guided artillery projectiles — "smart rounds." The concept of smart rounds actually began during WWII, when the first proximity, or variable time (VT), fuzes were introduced. A simple radio device enabled the fuze to sense when it was within a certain distance of the ground and, from this information, control its own detonation. The VT fuze, however, cannot *steer* the projectile to the target. For the round to "fly to the target," it must have a fully maneuverable airframe. The XM712, Copperhead, is the first artillery-delivered munition which possesses this fly-to-the-target capability — the ability to defeat moving, hard point targets with a high degree of reliability and economy. As a result, Copperhead will allow the engagement of more targets because the amount of ammunition required to be fired against each target is reduced. To defeat an APC using DP-ICM projectiles, given accurate target location and no excessive delivery error, would cost approximately $45,000. Copperhead could do the job for approximately $10,000.

The Copperhead munition, while providing an order of magnitude improvement in the overall FA system, has certain shortcomings. The system is dependent on target designation by a pulse-coded laser source, such as the vehicular/ground laser locator designator (V/GLLD). Hence, the designator's range and the operator's ability to maintain line-of-sight become significant factors. The designator is also susceptible to degradation by adverse weather conditions and smoke screening. Despite this, Copperhead provides the first step in the development of a revolutionary type of artillery projectile. The use of the Copperhead airframe and various seekers (perhaps interchangeable seeker/fuzes) for attack of specific types of hard targets will give the Field Artillery a flexibility and impact heretofore unknown. Candidates for these alternative seekers are:

- Other wavelength lasers.
- Radio frequency (RF) (antiradiation).
- Infrared (IR).
- Millimeter wave radar (MMW).
- Holographic imagery (HI).
- Combinations of the above technologies.

Semiactive laser Copperhead

Although it requires the smooth functioning of the entire artillery system to be effective, in its simplest form, the standard semiactive laser (SAL) Copperhead system is made up of two essential elements:

- Designator (a remotely piloted vehicle equipped with a laser device, an airborne designator, or a V/GLLD operated by the forward observer) — The designator is used to place a pulse-encoded laser spot on a target to be engaged with Copperhead.
- Copperhead round — The round uses the energy reflected from the target and received by the munition's sensor to guide the round to the point illuminated by the designator.

Antiradiation projectile

The antiradiation projectile (ARP) is a round with a seeker containing radio frequency reception antennas. Its primary purpose will be the destruction of enemy radars and other electromagnetic emitters. Based on cues from direction finders or electronic intelligence, the round may be fired against known or suspected enemy radars to suppress enemy air defense and allow friendly aircraft to attack deep targets. Other possible targets are countermortar and counterbattery radars and command posts. The round uses the energy from the targeted emitters as an aimpoint in the same manner that the Copperhead uses the reflected laser energy. ARP requires an active emitter to home on. If the radar is turned off to avoid engagement by ARP, the round has still performed its mission in that the radar is eliminated for a time from the threat acquisition system. Netting of fire control radar systems where any one radar can control a number of firing systems may reduce the effectiveness of the ARP.

Infrared

An infrared (IR) seeker may be placed on the Copperhead airframe or used on a terminally guided submunition in any of the payload-carrying projectiles available. The IR seeker senses radiant heat emitted by internal combustion engines or other heat-creating devices and guides the projectile to the source of that heat. The IR sensor recognizes the emitted radiation as elements of two specific wavelength bands. One band is

Copperhead, the "one round, one tank" precision guided munition, is in the developmental testing stage. (Photo by Warren Weaver)

used as a false target discriminator, and the second is used to detect and engage the actual targets. The atmospheric conditions which degrade the SAL also reduce IR sensor effectiveness. In addition, IR requires an accurate initial target location.

Millimeter wave radar

The millimeter wave (MMW) radar sensor system can be divided into three distinct sensor type devices: passive radiometry, semiactive, and active transmitter-receiver. Unlike the preceding technologies which are usable now, the MMW is a system which is likely to mature in the late 1980s. It has a distinct advantage because it is a radar. That is, its guidance energy can penetrate most adverse weather conditions and visual countermeasures. However, the system is vulnerable to chaff and radar jamming. A home-on-jam capability could reduce this vulnerability.

The passive MMW system uses energy of the appropriate wavelength, which is always present in the atmosphere, to detect targets. This energy is reflected from the earth with different degrees of efficiency by different objects. The sensor device detects cold spots (non-reflective areas) which are characteristic of man-made metallic objects.

The semiactive MMW sensor system requires two separate and distinct elements. One is an aerial platform, such as a helicopter, equipped with an MMW transmitter-illuminator which covers a large target area with radiation of appropriate wavelength. The other is an MMW receiver on the round itself. Once the target has been "painted" by the illuminator, the round receives the reflected radiation and guides to the target.

The active MMW system is entirely self-contained within the guided projectile. The round contains a transmitter of the MMW energy as well as a sensor receiver for guidance. The system provides its own target illumination and is independent of other systems for effective target engagements.

Dual-mode sensor

An alternate laser wavelength system operates in generally the same manner as the SAL system. It has the advantage of greater penetration of smoke and is less affected by adverse weather conditions. Its major advantage is that its wavelength lies in the band of radiation which is sensed by those rounds employing the passive IR technology. Therefore, a dual-mode sensor device could be made available using this system. A designator can be used to select and illuminate the target for engagement. The round will home on the pulse-encoded laser energy reflected from the target until the natural IR energy emitted by the target (and received by the sensor) reaches a preset level. The round will then home on the IR signature of the target itself.

Holographic imagery

The holographic imagery (HI) technology is the least mature and the highest risk of the seeker systems discussed. This system uses a sensor, such as a TV camera, and a preprogramed optical negative which contains a holographic image of the target to be engaged. The image received by the sensor is optically

matched to the hologram. When a match is obtained, the round is guided toward the sensed matching target. The HI system is a true "fire-and-forget" technology and can be used for attack of specific target types. It is susceptible to countermeasures or conditions which degrade the sensor's capability.

Airframe considerations

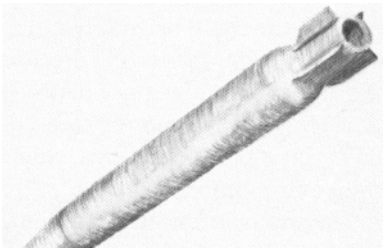
Development of these candidate seekers must be managed so that the least risk, highest payoff technology will have priority for development, testing, and deployment to the field. It is the user's responsibility to define the systems which will provide the greatest incremental increase in field artillery effectiveness.

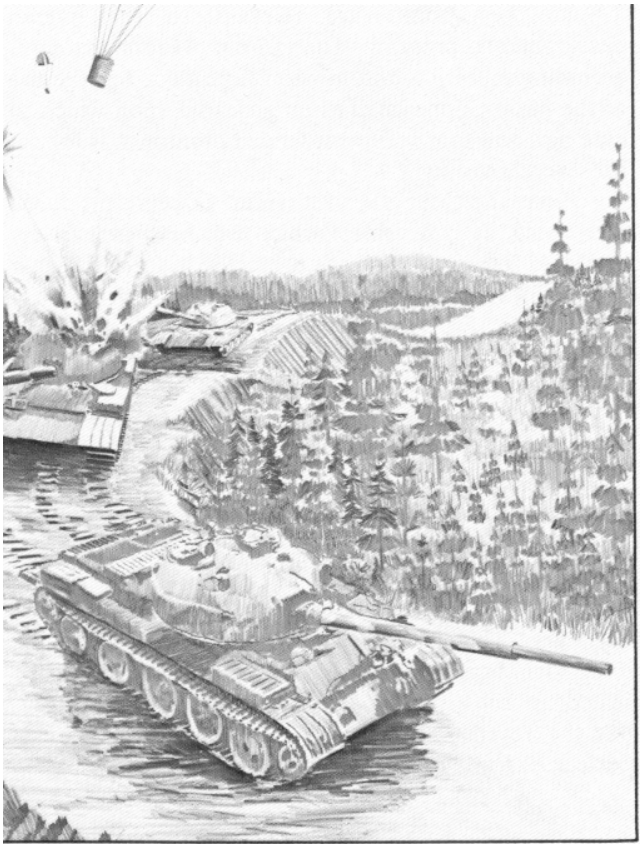
Based on technological assessment of advanced seekers for Copperhead, the RF device is clearly the primary choice for the first of a family of PGMs based on Copperhead technology. This RF device will be based on technology in use by US Air Force missile systems. It may make use of the current Copperhead airframe. This antiradiation projectile will be the only precision munition system other than SAL Copperhead which could be available in the early 1980s.

The remaining PGM systems are not in the state of technological development necessary to make firm decisions on airframe characteristics. It is in these developmental items that the specific requirements of future field artillery doctrine and concepts must drive the research and development community to specific weapons system applications early in the development cycle. The funds available for base technology programs must be used with a specific weapon assignment in mind, and yet be distributed in such a manner as to allow the research to be applied across a spectrum of candidate weapon and seeker systems.

Some key points are relevant to the overall developmental program. The 155-mm weapon system is becoming munition and mission saturated, but the use of the basic Copperhead as an airframe upon which to base new and more efficient guided munitions is logical for several reasons:

- First, the Copperhead airframe is being produced and tested. It is a vehicle which can be inexpensively modified for use as the base projectile in further seeker development.
- Second, the 155-mm weapon system is the most common cannon in the inventory of the NATO countries. The introduction of PGMs in this caliber would insure the largest number of launch systems for precision munitions. With the use of sabot techniques, it is also possible to fire the 155-mm projectile from 175-mm and 8-inch tubes, thus providing a further increase in the number of launchers (and greater range capability).
- Third, a technology for both seeker and guidance packages, which can be adapted for use within the dimensional constraints of a 155-mm projectile can be scaled up and used on any larger diameter projectile, but the reverse is not true. After the technology is perfected, it may be found that the 155-mm is not the





most cost effective or operationally effective projectile and the sensor could be adapted to a larger munition.

• Finally, the use of precision munitions will ultimately decrease requirements for general purpose HE or DP-ICM munitions and their associated components, on a per target basis, thus effectively reducing fire unit ammunition handling.

The logistical implications throughout the system are significant. The only drawback in using the Copperhead airframe is that the seeker must be designed to withstand launch accelerations of at least 7,000 times the force of gravity (g).

The rocket alternative

The use of a rocket system with a much lower "g" launch load for use as a general seeker airframe would provide a significantly lower technological risk. This situation, however, provides its own unique problems.

• First of all, no acceptable rocket airframe currently exists which could be modified to allow the addition of a guidance package within a short time.

• Secondly, the cost of a maneuverable rocket (missile) developed specifically for the guided munitions program may be so expensive as to be economically infeasible.

• Finally, projectile designers who believe that a low "g" rocket launch is all that is required may not devote enough attention to hardening a general system design to enable it to be modified to withstand the "g" load required for launch from a cannon. This may result in a requirement to design two separate and unique seekers; one for rocket application, and one for cannon application, both based on detection of the same target signature.

An alternative to development of a maneuverable rocket is the use of a basic nonmaneuverable rocket airframe with the employment of one or more maneuverable submissiles as the rocket's payload. This would enable the same rocket to be used for delivery of both submunitions and guided submissiles. This solution, called terminally guided submunitions (TGSM), is being pursued in general support rocket system (GSRS) application. To avoid duplication of effort and unnecessary expenditure of scarce research and development funds, designs for all PGMs must be accomplished with one all-important fact in mind: GENERAL DESIGN PARAMETERS MUST INSURE THE THOROUGH INVESTIGATION OF SEEKER COMPONENT COMMONALITY BETWEEN HIGH AND LOW "g" LAUNCHED SYSTEMS. This does not necessarily mean that the identical seeker will be used for both cannon and missile applications, but, whenever possible, components will be interchangeable between similar seeker systems. The candidate launch systems for PGMs are the 155-mm and 8-inch cannon systems, the Lance system, and the developmental GSRS. The efficient application of PGM technology to these systems is the ultimate goal of the Field Artillery.

Development considerations

In what priority is this technology to be applied to available systems? From an effectiveness analysis point of view, certain facts must be established to facilitate the decision-making process.

• Targets, for analysis purposes, will be of a vulnerability equal to that of the hardest target type the munition is designed to attack.

• Systems with probability of kill of less than certain preselected values (given accurate launch) will not be considered for further development.

• If the design of the munition is in the submunition/submissile category, it must be sized to allow its use in all currently existing and developmental submunition carrier rounds unless precluded by physical size requirements necessary to fulfill the kill probability requirement. Tying development of candidate systems to specific weapons must be prioritized to achieve the earliest feasible fielding for the new munitions. For this reason, only currently fielded systems, or accelerated developmental programs such as GSRS, should be considered as candidates.

• Cannon-launched projectiles should have an unassisted range at least equal to that of the ballistic baseline projectile for the system without modification to the cannon carriage, tube, or recoil system. This characteristic is also desirable for rocket systems.

• The use of rocket-assisted or improved ballistic efficiency projectiles, to extend the system range, should be fully investigated. Extended range is particularly significant with passive PGMs.

• Target acquisition systems, which are sufficiently accurate to make use of the munitions, must exist in the time frame when the munitions will be available.

With the advent of the first two precision munitions — the SAL Copperhead and the RF projectile — we can efficiently attack any target which can be designated or which radiates electromagnetic energy in certain frequency bands. What is lacking from overall target engagement is the capability to attack the spectrum of materiel targets with a "fire-and-forget" munition. This capability will be available with the IR, MMW, and HI technologies. They enable the fire-and-forget engagement of targets at great distances from the forward edge of the battle area. Each of these technologies can effectively free the artillery from the requirements of optical line-of-sight to the target and still provide a high probability of single shot kill. Fire-and-forget munitions are the ultimate in first round fire for effect.

The development of a round using one of these technologies would have a further system benefit. It would reduce the accuracy requirement for target location (and meteorological) data before engagement. The current Copperhead can "fly" approximately one kilometer in deflection and two kilometers in range from its ballistic aimpoint to engage a sensed target. Even though these maneuver capabilities may be reduced in different types of guided munitions, it is apparent that any in-flight maneuvering capability would reduce dependence on target location accuracies. This impact point correction capability can also enable the artillery to engage ill-defined targets based only on the general target information provided by terrain and intelligence analysis or targets derived from electronic intelligence sources.

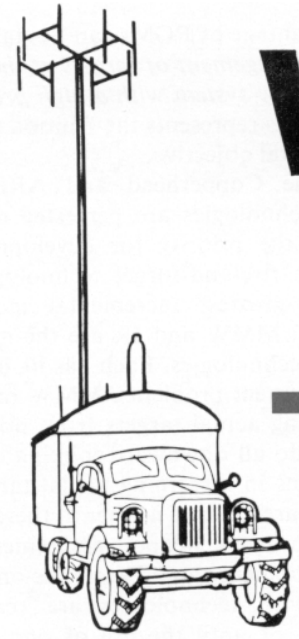
Having a high probability kill munition for materiel targets would have a further beneficial effect. A guided munition, with the kill capabilities stated earlier, would enable the artillery to engage more targets than previously possible. Reduction in the expenditure of the total amount of ammunition fired on hard, deep targets and the resulting increase in the availability of fire units to engage targets previously not engaged will have a dramatic effect on the overall situation in the main battle area.

The advantage of PGMs can be stated simply — *they allow the engagement of targets at the maximum range of the delivery system with a high probability of single shot kill*. This represents the fruition of a long standing developmental objective.

After the Copperhead and ARP-improved Copperhead technologies are perfected and fielded, what should be the priority for development of the next PGM? The fire-and-forget technologies offer the artillery the greatest incremental increase in overall capabilities. MMW and IR are the most useful of the candidate technologies. Each has its particular research and development problems. MMW has some difficulty distinguishing actual targets from normal background clutter, as do all downward looking radar systems; IR has problems in discerning actual targets from decoys (fires and flares). Since neither of these seeker systems is ready for primary weapon assignment at the present time, development should continue on both MMW and IR until both technologies are ready for weapon assignment, or until the use of one system is proved infeasible. Assuming that at least one system does advance into engineering development, the optimum case would be to produce a submunition device which could be delivered by a cannon or rocket carrier. This would allow the PGM to be fired by the maximum number of delivery systems. If the technology of the seeker does not lend itself to a vertical descent submunition, the use of the Copperhead airframe (low angle of descent) equipped with interchangeable seekers would be the best solution to the delivery problem. Designing totally new rounds to deliver these devices would be practicable only if a highly reliable and effective seeker/munition required special delivery techniques.

The battlefield potential of PGM technology is clear. The concept of achieving superior combat power through qualitative superiority takes on real meaning when such revolutionary technology is introduced. It now behooves the Field Artillery and the development community to assure the most expeditious realization of the capability with deliberate development programs that exploit the new technology.

Joseph C. Antoniotti and William J. Krondak are both former Active duty captains assigned to the Doctrine Team, Directorate of Combat Developments, USAFAS. Mr. Krondak is now a civilian employed by the Doctrine Team as an Operations Research Analyst. Captain Antoniotti, who retained his rank in the Reserves, is working for a firm in Florida. The authors have co-authored other Journal articles.



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Communicate longer than 30 sec

Electronic counter-countermeasures a

AN/VRC-12

Situation	Transmit power	Frequency (MHz)	Approximate antenna height	Antenna polarity	Probability of intercept	DF CEP (meters)
Base situation	High power 35 watts	47	3 meter AT 912 or AS 1729	Vertical omnidirectional	99%	750
1	35 watts	47	10 meter RC 292	Vertical omnidirectional	99%	500-750
2	Low power 8 watts	47	3 meter AT 912 or AS 1729	Vertical omnidirectional	83%	750
3	Low or high power	47	3 meters AT 984/A/G long wire	Horizontal directional	15%	DF system cannot locate this signal 85% of time

Notes:

1. **All radios assumed 10 km from enemy DF site, European terrain, antenna gain of 2 dB.**
2. **Enemy DF site is ideal, DF system operating to within 1° accuracy using an average of 10 readings.**

* **Special adaptation--no low power switch on AN/PRC-77.**

To improve your survivability, use low power, try to use dire

BE B

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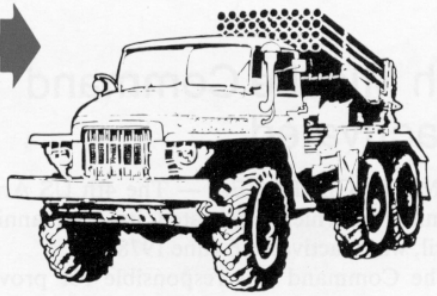
onds in combat, and you'll get one!



ffecting the current family of FM radios

AN/PRC-77

Situation	Transmit power	Frequency (MHz)	Approximate antenna height	Antenna polarity	Probability of intercept	DF CEP (km)
Base situation	High power 2 watts	47	1 meter AT 892	Vertical omnidirectional	61%	1.3
1	2 watts	47	3 meter AT 271A	Vertical omnidirectional	61%	1.3
2	2 watts	47	10 meter RC 292	Vertical omnidirectional	73%	0.9
3	2 watts	47	3 meters AT 984/A/G long wire	Horizontal directional	8%	DF cannot take bearing on this signal
4	Low power 1 watt *	47	1 meter AT 892	Vertical omnidirectional	19%	5.6
5	2 watts	31	1 meter AT 892	Vertical omnidirectional	71%	1
6	2 watts	72	1 meter AT 892	Vertical omnidirectional	51%	1.9

ctional antennas, select higher frequencies when available, and

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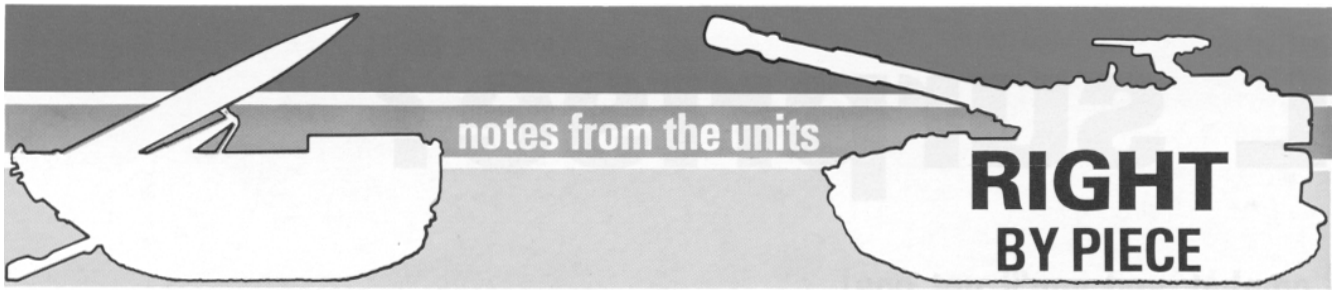


4th Missile Command inactivated

CAMP PAGE, KOREA — The 4th US Army Missile Command, which celebrated its 20th anniversary in April, was inactivated 6 June 1978.

The Command was responsible for providing long range and special weapons support for the Eighth US Army and the Republic of Korea Army. Recent modernizations eliminated the Sergeant and Honest John missiles with which the Command was equipped.

FORT HOOD, TX – A 155-mm SP howitzer crew of the 1st Battalion, 16th Field Artillery, 2d Armored Division Artillery, stands ready for review by President Jimmy Carter during his recent visit. SSG James L. Wallace (forward of crew) briefed the President on the weapon's capabilities and mission. A tactical exercise and weapons effects demonstration for the President were supported by elements of the 1st Battalion, 78th Field Artillery (155-mm) and the 1st Ballation, 92d Field Artillery (8-inch). Mr. Carter was the first president to review the 2d Armored Division since 1945 when it was selected as the honor guard for President Truman during the Potsdam conference. (Photo by Jorge Ramirez)

In Memoriam

Seven soldiers of the 8th Infantry Division Artillery died in the line of duty last June 27 when the helicopter they were riding on a routine training flight crashed near Wurzburg, Germany.

The fatalites included Division Artillery Commander COL Robert T. Basha, LTC Edward F. Kelly, CPT David T. Johnson, CPT Harvey R. Jokinen, CSM James W. Cook, SGM John W. Knighton, and SP4 Terry W. Clark.

Two battalions get M110A1

FORT HOOD, TX — The 8-inch cannon battalions of the 2d Armored and 1st Cavalry Divisions have completed conversion to the M110A1 howitzer. Test firing of the modified howitzers has been successfully completed by the units.

Changes to the M110 8-inch howitzer, making it the M110A1, increase the range of the weapon from 16.8 to 20.6 kilometers and improve its accuracy.

The barrel of the M110A1 is 33 feet, 11 inches long compared to 24 feet, 6 inches on the M110. Weight of the converted weapon is 61,100 pounds, 2,600 pounds heavier than the M110.

FA reorganization

AUGSBURG, GERMANY — The 17th Field Artillery Group was activated here on 22 August 1978. Subordinate units of this headquarters will be the —

- 1st Battalion, 18th Field Artillery (155-mm SP).
- 1st Battalion, 30th Field Artillery (8-inch SP).
- 1st Battalion, 36th Field Artillery (8-inch SP).
- 2d Battalion, 42d Field Artillery (Lance).

Commanding the reorganized unit (formerly the 46th Artillery Brigade) is COL Donald L. Burton.

C/1-73d — best in the Corps

FORT BRAGG, NC — Winner of the XVIII Airborne Corps Artillery's most recent Honor Battery award is C Battery, 1st Battalion, 73d Field Artillery. Competition for the award is designed to increase unit readiness and is based on a 1,000-point system from inspections in 28 unit activities, including all types of maintenance, weapons training, and other readiness areas.

C Battery scored 878 points for which they won a four-day pass and an honor battery guidon streamer.

"The honor battery competition is not a new idea," said COL Jere Hickman, Corps Artillery Commander, "We've just expanded it to look at a lot more areas. Evaluations are unannounced and thorough. For example, the physical training inspector might show up at a unit on any day and go through PT with them, including the run. He doesn't count the distance as much as the spirit with which they run."

"The good part about it [design of the competition] is you can shift the emphasis to make a point," said Colonel Hickman. "For example, I think the Army is weak in nuclear, biological, chemical (NBC) training so I raised the number of points for this category from 30 to 100."

A week to 10 days after the inspections, Corps Artillery holds a formation at 0645 hours and announces the honor battery and runners-up. After the ceremony the entire Corps Artillery runs morning PT with the honor battery leading the way.

"The honor battery competition is a super program," Colonel Hickman concluded. "It has considerably reduced the amount of 'crash' before an IG inspection, plus it increases combat readiness and espirit."

The honor battery competition was created in 1976 by COL Nolan Sigler, a former Corps Artillery commander.

9th Infantry Div Arty first

FORT LEWIS, WA — Another first occurred recently when the 3d Battalion, 34th Field Artillery, won the 9th Infantry Division Commanding General's Quarterly Maintenance Award. This is the first time an FA unit has won the award which was initiated in 1976.

The battalion's C Battery underwent the inspection that won the award. BG Jack Walker presented the award to LTC Alanson D. Bartholomew, 3d Battalion Commander.

FORT SILL, OK — The instant between pulling the lanyard and firing the round is caught as soldiers of the 2d Battalion, 12th Field Artillery, fire the first test rounds through the recently modified M110 8-inch howitzer, now the M110A1. The battalion is the first TOE unit at Fort Sill to receive the improved howitzer. Modifications are explained on page 43 of the May-June 1978 Journal. (Photo by SSG Ron Hatcher)

Partnership award for US-German FA units

FRANKFURT, GERMANY — Recent winners in the 3d Armored Division's 10-year participation Project Partnership program with the German Army were the 2d Battalion, 3d Field Artillery and their partner unit, Panzerartilleriebataillon 135. The US and German artillery units won in the "outstanding battalion" category of the program.

The 2-3d FA Battalion Commander, LTC Marshall R. McRee, received a silver trophy from LTG Horst Hildebrandt, the German Army Chief of Staff while GEN George S. Blanchard, USAREUR Commander-in-Chief, presented awards to the Germans.

Artillery ready at Four-Papa-One-North

DMZ, KOREA — It is the last active fire base in the US Army.

Fire base "Four-Papa-One-North" is located north of the Imjin river, less than three miles south of the

demilitarized zone. In rotating shifts of two weeks each, batteries of the 1st Battalion, 15th Field Artillery move into the base and emplace their howitzers. For the next 14 days they live in almost total isolation from the outside world.

"We have to be able to muster our crews and be ready to offer indirect fire support to the battalion pulling the DMZ mission, and support the troops at the joint security area (Panmunjom)," explained CPT Mike Murry, commander of B Battery, 1-15th FA. "To do that, only two or three men can leave the fire base at any one time while we're here."

Shopping runs are made to the PX at Camp Greaves to the south and a PX truck comes by several times daily with soft drinks, snacks and sundries.

Since the Korean conflict ended, the fire base has been operated by both US and Republic of Korea units at various times. Conditions at the fire base have been improved in the last few months with paved roads being added and barracks being constructed for the men.

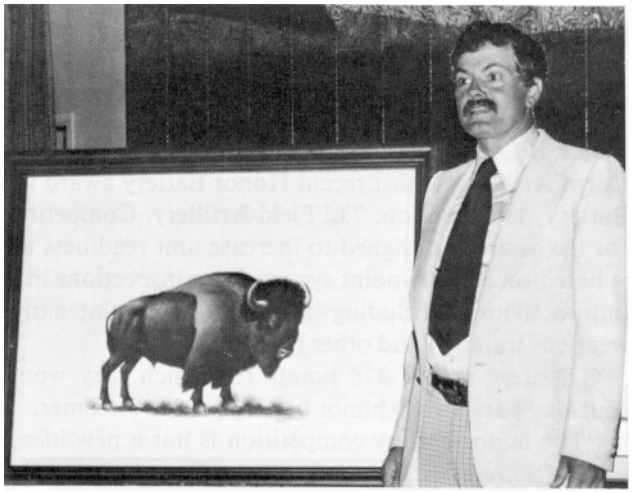
Every three days one howitzer is turned toward the south and registers on a target area near the Imjin river. "If shooting ever starts" said Murry, "we are not going to have time to monkey around. We have to be able to shoot — and be on target."

From forward observers at guard posts inside the DMZ, information is fed into the fire direction center on a 24-hour basis. "Our target areas are already plotted, so we can swing into action and start shooting back almost as soon as any attack starts," explained Murry.

When the battalion on the fence has an alert, the fire base also goes on the alert. "We never know," Murry says, "if it is the real thing or not. We get a fire mission from the FO at one of the guard posts, blow the whistles, and the men scramble. It is not until they are on their guns that they know whether it is a drill or not," Murry said.

To avoid accidentally sending a round across the DMZ, the section chief keeps the firing pin clipped to his uniform and waits for the order to insert it.

The long two weeks at the last active fire base is broken up by cards, softball games and alerts. While the tours at Four-Papa-One-North get tedious, the men are proud of their duty. Said SGT Raymond Kelly, "We're the only artillerymen in the Army who have a mission for their howitzers that is not training — here is the real thing. What we trained for, and what we're paid for." (Galen Geer)



Wildlife artist Ray Harm and "Monarch of the Plains."

Buffalo print sale successful

FORT SILL — Saturday, 3 June 1978, was designated "Ray Harm Day" at Fort Sill. The Field Artillery Association held an open house and reception for its First Day of Issue of the exclusive limited edition collector print, "Monarch of the Plains," by Harm.

More than 1,000 collectors and supporters of the Association's fund-raising project for the US Army Field Artillery and Fort Sill Museum attended the open house at the Officers' Club, keeping the distinguished artist busy personalizing prints.

The festivities actually began the afternoon before with the arrival of Mr. Harm and his wife by private plane from their ranch near Tucson, AZ. Fort Sill commander MG Jack N. Merritt held a special retreat ceremony in honor of Harm and several colonels departing Fort Sill. A reception hosted by General and Mrs. Merritt followed, and the evening concluded with a "buffalo burger" cookout at the home of Colonel James W. Wurman, Field Artillery Association President.

The First Day of Issue began with the introduction of the artist by COL Wurman and the presentation of the first framed print by the Noncommissioned Officers Wives Club to the Merritts for permanent display in Sherman House, the Post commander's quarters.

Fifty wildlife prints by Ray Harm, loaned by local collectors, were on display.

Museum Director Gillett Griswold termed the First Day of Issue an outstanding success, and the sale of the prints a matter of great importance to the future development of the Museum. Museum Seal prints of "Monarch of the Plains" continue to be available at $75 each, which includes the cost of postage. While they last, the prints may be ordered from the Field Artillery Association, FA Museum, Fort Sill, OK 73503.

STANAGs

It has been estimated that standardization within NATO could save billions of dollars annually in operating expenses. STANAGs are an important part of standardization.

by LTC (Ret) Charles W. Montgomery

As an enemy force in Europe assembled for a night attack against the NATO defense, a field artillery time-on-target, consisting of fires from three US battalions, two battalions from the Federal Republic of Germany, and one British battalion, came crashing in on this force. These surprise fires were achieved in a smooth, responsive manner using standardized NATO field artillery procedures.

The goal of NATO military standardization is to allow the armed forces of member nations to operate as a team and to insure that the best uses of combined research, development, testing, logistics, and production resources are made. Toward this goal, standardization agreements (STANAGs) are developed.

Standardization agreements are made among several or all NATO nations to adopt like or similar military equipment, ammunition, supplies, stores, and procedures. Nations accepting and agreeing to abide by these STANAGs implement them in their training and literature. Army Regulation 34-1 sets forth these agreements in detail.

Military operations STANAGs involve Belgium, Canada, Denmark, France, Germany, Greece, Italy, Luxembourg, The Netherlands, Norway, Portugal, Turkey, United Kingdom, and the United States.

The United States Army Field Artillery School is involved in the development of STANAGs through representation at meetings conducted by the NATO Military Agency for Standardization (MAS) Army Board.

Military Agency for Standardization

The Artillery Procedures Working Party (APWP), working under a "Terms of Reference" document established by the Army Board, meets annually at NATO Headquarters in Brussels for the purpose of developing field artillery procedures to meet the needs of as many member nations as practical. The Field Artillery School provides the US delegation to such meetings. STANAGs are drafted initially by the APWP and are then taken back to home nations for consideration, modification, and hopefully ratification.

Because the field artillery of the quadripartite military communities of America, Britain, Canada, and Australia (ABCA) can usually arrive at a standard agreement on FA procedures early, a quadripartite standardization agreement (QSTAG) usually precedes a STANAG. The APWP uses these QSTAGs as points of departure for developing STANAGs in the same areas of concern, if practical. Though ABCA is not a NATO organization, three of the QSTAG nations are NATO members—only Australia is not.

Occasionally, there are areas of concern wherein NATO nations cannot reach standard agreements. If this occurs, it may be beneficial to produce an "Informative STANAG." This document sets forth the national preferences of all concerned to keep others informed, should they be called on to work together in combat. Just such a STANAG is currently under development in the area of *command, control, and tactical missions*.

Because of differences in organizational structures, it was found impractical to standardize tactical missions throughout NATO. The informative STANAG will allow battalions of several nations to work together in harmony while retaining their national preferences for FA responsibilities.

To date there have been seven meetings of the APWP and numerous STANAGs have been developed that are in use throughout NATO. Others are under development. Together these agreements allow the NATO field artillery to be more effectively employed in a common effort.

Training in the use of today's STANAGs make TOTs such as that described at the outset a reality.

LTC (Ret) Charles W. Montgomery is a research analyst in the Research and Analysis Section of the Tactics/Combined Arms Department, USAFAS.

Attacking The *Irregular* Shaped Target

by MAJ Thomas L. Hennigh and 1LT Ronnie E. Reid

Current battlefield doctrine incorporates all the fundamentals of accuracy, responsiveness, and survivability, with maximum effectiveness on a variety of target categories. Most fire direction techniques and the ammunition, currently in the inventory or in some stage of development, enhance today's philosophy of how to fight. However, current procedures for attack of linear or irregular shaped targets have required the use of time-consuming special fire direction techniques to acquire satisfactory effects. Current procedures, both manual and FADAC, require separate and individually determined gun data to compensate for *all* effects of nonstandard conditions. There is no question that these procedures, when properly applied, will achieve the desired degree of accuracy, because firing data computed for each gun corrects for all position, weapon, and weather errors. The standard for total mission time for the battalion has been increased from

10 to 12 minutes in the new ARTEP 6-105, and the resulting degradation of responsiveness is not acceptable to many artillerymen.

In an effort to gain greater responsiveness without sacrificing accuracy, the 2d Battalion, 2d Field Artillery, developed a simple method of computing data for irregular shaped targets which provides reduced computational effort and time, is compatible with the FADAC and manual systems, meets the accuracy standard (100-meter allowable radial error for each aimpoint), and enhances the fire direction officer's capability to maintain tactical and technical control of fires.

This new approach requires some detailed preparations, which are easily accomplished during garrison training or during firing lulls while the unit is in the field. Among these are the construction of one "grid square" (scale 1:2,500) and "interval tables" for the number of battalion and/or battery firing elements.

Constructing the grid square

The necessary grid, 1,000 meters square with a scale of 1:2,500, is constructed by taping together cut-out portions of either target grids (DA Form 4176) or gridded templates (DA Form 4506). The grid square is then covered with a regular 1:25,000 transparent grid sheet that has at least 10 grid squares on each side. The completed grid square is then mounted on poster board or heavy cardboard for backing material. Each large square equals 100 meters; each small square equals 10 meters. Because of its size (10 times that of a firing chart), the grid square produces a high degree of accuracy. The 100-meter grid lines are left unnumbered until the target location is received.

With some additional training, the vertical control operator (VCO) is able to plot any linear or irregular shaped target while determining the value to assign to the lower left-hand corner of the grid sheet. After constructing the target plot, the VCO determines the difference in easting (dE) and the difference in northing (dN) from endpoint to endpoint of each leg of the target. These values are used as the entry arguments for the interval tables (figure 1), which provide the VCO with distance data between aimpoints.

The interval table

The horizontal and vertical margins of the table list dE and dN for every 100 meters. The values in the body of the table represent the distances, or intervals, between each aimpoint. The data in figure 1 are based on nine firing platoons for nine aimpoints, as prescribed by ARTEP 6-105 for a battalion target of irregular shape. Interval values were solved using the Pythagorean theorem to determine the length of the leg and then dividing by the number of firing elements minus one. Stated as an equation:

$$I = \frac{\sqrt{(dE)^2 + (dN)^2}}{8}$$

To develop an interval table for engagement by one six-gun battery, use "5" as the denominator. This will provide table data when one battery and six aimpoints are used.

Tabulation of these data to the nearest 1 meter eliminates measurement of total target length and subsequent division by the number of firing elements minus one, for each mission. This is particularly advantageous if the target is L-shaped or V-shaped. Furthermore, the tables are adaptable to the number and size of firing elements specified in the fire order, whether it is a battery of six howitzers or a battalion of 18 howitzers.

dE and dN (100 meters)	0	1	2	3	4	5	6	7
0	0	12	25	38	50	62	75	88
1	12	18	28	40	52	64	76	88
2	25	28	35	45	56	67	79	91
3	38	40	45	53	62	73	84	X
4	50	52	56	62	71	80	90	X
5	62	64	67	73	80	88	X	X
6	75	76	79	84	90	X	X	X
7	88	88	91	X	X	X	X	X

Data is based on nine firing elements.
Maximum target length is 730 meters.
Maximum interval is 91 meters.
X indicates that the length of one leg is greater than 730 meters.

Figure 1. Interval table.

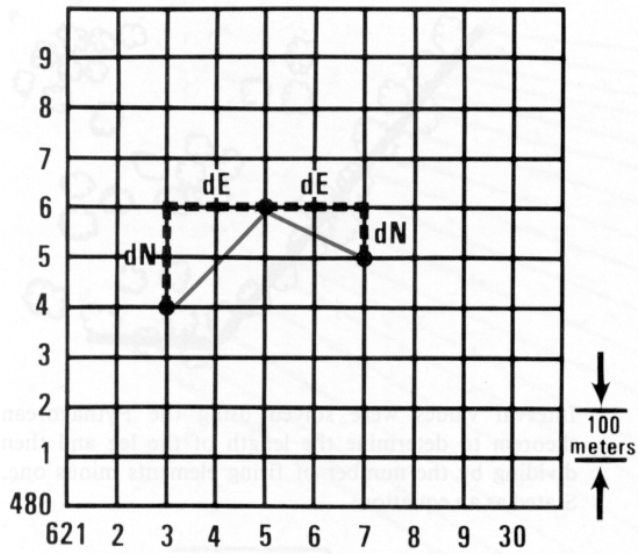


Figure 2. Sample problem.

By using the grid square and the interval tables, all aimpoints can be plotted to the nearest 1 meter and marked successively from endpoint to endpoint. With a little practice, the VCO can easily determine the correct interval 5 to 10 seconds after plotting the target as described in the call for fire. As an additional assistance to the fire direction officer (FDO), the interval table may contain information concerning the maximum size target his unit can effectively cover. Even though the commander's guidance on type and volume of ammunition expenditure governs this decision, a guide for training can be based on one effective burst width for the high explosive shell, multiplied by the number of howitzers in the firing element. For example, the maximum target length for an M102 battalion would be 540 meters (30-meter effective burst times 18 howitzers).

Sample problem

Figure 2 shows a sample of one target plotted on the grid square. First, the VCO determines dE and dN from endpoint to endpoint for each leg. Then, using dE and dN, he extracts *separate* intervals for *each* leg of the target from the interval table (figure 1). To obtain the interval between aimpoints, the VCO simply adds the extracted *separate* intervals. The sum is the interval used to plot all aimpoints. In the example provided, dE and dN between grids 623484 and 625486 are 200 each and yield an interval of 35 meters. Subsequently, dE and dN between grids 625486 and 627485 yield an interval of 28 meters. Adding the two extracted values (35 + 28), an interval of 63 meters would be used to construct all aimpoints.

Battalion fire order

Concurrently with plotting the irregular target, the battalion FDO can determine the method of engagement and formulate his fire order. Though practice it was found that using a two-part fire order improved the orderly processing of firing data. In the first segment, the battalion FDO announces the method of fire, volume, ammunition information, method of control, and the number of aimpoints. For example "Battalion, two rounds, at my command, nine aimpoints" tells each battery FDO to engage three aimpoints. To identify his particular aimpoints, the battery FDO need only know which portion of the target he will attack.

Refer to the linear target in figure 3. As soon as the endpoints are plotted by the VCO, the battalion FDO makes his decision and announces the second segment of the fire order: "Alpha Battery, grid 572397; Charlie Battery, grid 576403." With our SOP, this sufficiently describes each battery's area of responsibility, even though Bravo Battery is not mentioned in the supplemental fire order. As a result of the above order, Alpha Battery attacks aimpoints 1, 2, and 3; Bravo battery attacks aimpoints 4, 5, and 6; and Charlie Battery attacks aimpoints 7, 8, and 9.

Now refer to the V-shaped target in figure 3. The supplemental fire order is: "Alpha Battery, grid 577397; Bravo Battery, grid 578401." As a result of that order, Alpha Battery attacks aimpoints 1, 2, and 3; Bravo

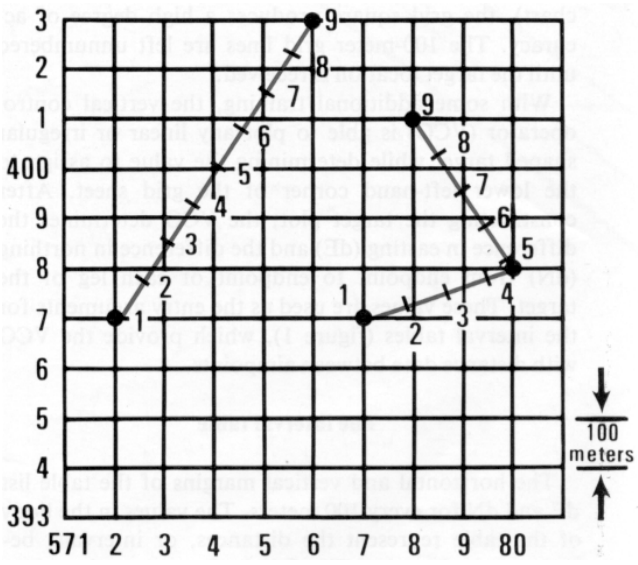


Figure 3. Linear and irregular shaped targets plotted on the grid square.

Battery attacks aimpoints 7, 8, and 9; and Charlie Battery attacks aimpoints 4, 5, and 6. By judicious use of the fire order, the FDO is afforded a clear and concise method for disseminating needed information to the batteries. Of course, if all batteries do not monitor the call for fire, a more definitive supplemental fire order will be required, especially for a V-shaped target. This technique proved very successful in live firing exercises.

Data computation

In approximately one minute, all information pertinent to the engagement of the target is known by all fire direction centers. From this point, all that remains is final gun data computation, announcement of fire commands, and control of opening fires.

The FDO indicates to the FADAC operator and the VCO which aimpoint to use as a starting point. While manual processing of backup data occurs, the FADAC operator determines initial firing data for the initial aimpoint and firing element. Subsequent FADAC firing data is based on lateral and vertical "corrections" provided by the VCO.

The VCO, using grid north for directional reference, determines and announces lateral shifts to each succeeding aimpoint. The FADAC operator inputs an observer-target direction of 6,400 mils along with the announced corrections and depresses the "TRIG" button to derive data. This process is repeated, with any necessary change in altitude included for each aimpoint. Application of altitude changes are based on the actual vertical differences in altitude between the target endpoints. The FDO must use discretion, insisting on

Time	FDO	VCO	HCO/FADAC operator	Computers	Chief computer
Receipt of call for fire	Inspects target plot and announces initial fire order.	Plots grid on "grid square."	Inputs initial grid from call for fire; awaits supplemental fire order.	Relay initial fire order to all batteries.	Monitors call for fire and fire order transmissions. Plots target and aimpoints on backup firing chart.
+ 1 minute	Announces "supplemental" fire order based on plot and orientation of all aimpoints.	Determines and announces aimpoint interval to chief computer, using "interval table," and plots all aimpoints designated in initial fire order. Measures altitude of each endpoint and tells FDO.	Computes initial firing data for appropriate firing element as designated by FDO's supplemental fire order.	Relay supplemental fire order to all batteries.	
5 to 5½ minutes	(Issues all additional instructions to insure battalion FDO's fire order is carried out.)	Announces lateral and altitude corrections to each aimpoint to FADAC operators. (Provides interval data for battery aimpoints to HCO and determines site.)	Uses corrections from VCO and appropriate mass fire procedures to determine initial firing data to remaining aimpoints. Data displayed is announced to each computer. (Plots aimpoints and announces chart data.)	Determine refinement corrections for gun displacement, apply corrections to FADAC data, and announce fire commands. (Determines manual firing data to include displacement corrections. Announces fire commands to guns.)	Measures and announces chart data to each computer. Supervises FADAC operator.

Events apply at battalion and battery levels. Notes in parentheses are battery level tasks annotated for clarity. Computational checks are made at both levels. Assignment of duties depends on individual state of training.

Figure 4. Sequence of actions and duties for 105-mm battalion personnel with FADAC at the battalion FDC.

essential use of altitude corrections without unnecessarily encumbering the computational process. Additionally, the FADAC operator is closely supervised to insure that he depresses the appropriate fire unit button and uses proper mass fire procedures when transferring target location from one firing element to another.

Since the FADAC has only five fire unit buttons, separate gun data or platoon firing data requires input of additional weapon location data, which results in further loss of time. To improve responsiveness, initial FADAC and manual firing data are based on battery center-to-aimpoint range and deflection. Refinement data for platoon/weapon displacement are determined and applied by each computer using 100/R and elevation change per 100 meters change in range (table F of the TFT). Once this step is completed, each computer announces the remaining fire commands. No deviation from the fire commands specified in FM 6-50 is necessary.

All computations include corrections for nonstandard conditions, less calibration range corrections for battery comparative velocity error (VE) or muzzle velocity variation (MVV). Only when battery comparative VEs or MVVs are greater than plus or minus 1.5 meters per second will calibration range and fuze corrections become necessary for individual weapons. If a battery has occupied by terrain and uses terrain gun position corrections, the computer, when determining final firing data, will include calibration corrections for the appropriate weapons as well as weapon displacement corrections for all weapons. On the other hand, if the battery width is equal to the width of an open sheaf, predetermined calibration corrections are provided to the appropriate howitzer chiefs of section in the form of "section chief's data cards." Corrections from the data card are applied by the howitzer crew to the final quadrant and fuze setting announced by the computer. Figure 4 is a recapitulation of duties with a sequence of actions for a typical 105-mm battalion with FADAC at the battalion fire direction center.

Experience with this technique has demonstrated increased responsiveness with no degradation in accuracy. On the average, data computation for all batteries is completed in 5 to 5½ minutes. This is a considerable time saving compared to the current standard of 10 minutes (ARTEP 6-105) and particularly enhances engagement of those targets which may be stationary for only brief periods of time.

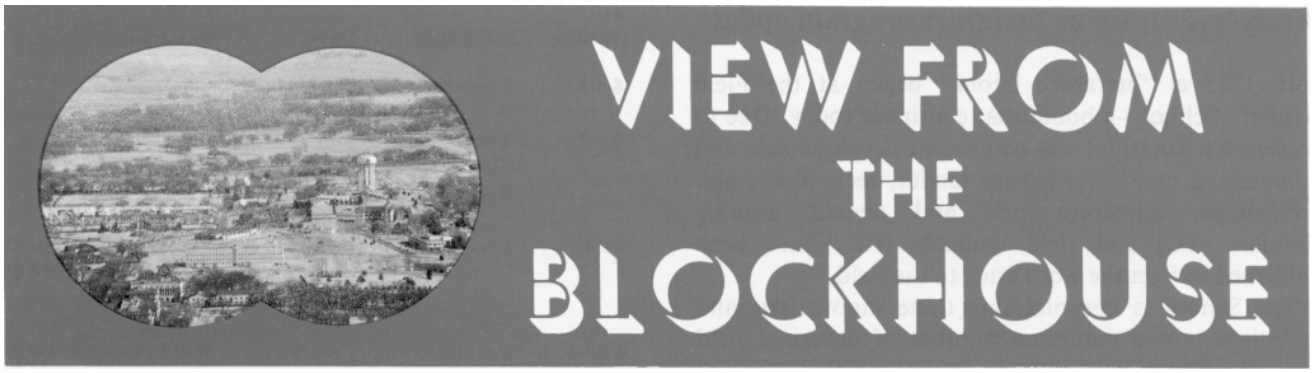
MAJ Thomas L. Hennigh, former FDO of 2d Infantry Division Artillery, is now S3, 2d Battalion, 2d Field Artillery. 1LT Ronnie E. Reid, former battalion FDO, 2-2d FA, is now attending FAOAC 1-78.

"Stonk"

What is a "stonk"?

The question came to the attention of the Gunnery Department in a letter from COL (Ret) Wilbur E. Davis. He encountered the word while working a crossword puzzle. The clue was "five letter word for heavy artillery." Not being familiar with the term, Colonel Davis, a field artilleryman, sought the knowledge of the School to answer the question.

The dictionary defines a stonk only as heavy artillery, possibly of Australian origin. We contacted our Australian exchange officer who described a stonk as a heavy concentration of artillery fire, possibly compared to a preparation. The School's Morris Swett Library finally provided a complete, official definition. Stonk has a British origin and means "a standard linear concentration of gunfire used chiefly in the desert."



ARTEP changes

In the July-August 1978 *Journal*, General Merritt discussed the new DA policy for training, evaluation, and certification of noncustodial nuclear-capable units. The changes to ARTEP 6-165 and ARTEP 6-365 that are necessary to implement the new policy were completed in mid-July. Distribution of Change 1 for both ARTEPs to Active and Reserve Component units has been accomplished. Incorporated with these changes are nuclear training objectives for the section, battery, and battalion. The training objectives encompass the operational aspects of the following nuclear mission responsibilities:

- Technical operations.
- Transportation (tactical air and ground movement).
- Maintenance of personnel reliability program.
- Security.
- Action in response to an accident/incident.
- Accountability/custody.
- Emergency destruction.
- Authentication of nuclear control orders.
- Firing a nuclear weapon.

In essence, the new policy allows the chain of command to assess the ability of a unit to perform its nuclear, as well as its conventional, mission. The Inspector General will conduct a Technical Validation Inspection (TVI) for the first 18 months of the new policy to insure the quality and standardization of the technical operations as well as administrative procedures. The primary basis for determining the unit's proficiency at performing its nuclear mission, however, will be an evaluation based on the training objectives contained in Change 1 to the applicable ARTEP.

Target numbering system changed

The target numbering system now shown in FM 6-20 is being replaced by a six-place system of two letters followed by four numbers. The change is being made to insure interoperability with NATO systems.

The new system closely parallels the one defined in the 1973 version of FM 6-20. It will be described in Change 1 to FM 6-20, due for publication during fiscal year 1979.

Use of illumination in supporting TOW/Dragon

The Infantry School has brought to our attention some problems that exist when field artillery is firing the illumination shell in support of TOW or Dragon night firing.

When the target is located between the flare and the antitank gunner, the silhouette of the target is black or very dark under night conditions and the sight cross hairs are also black, so there is little or no contrast for the gunner.

Another problem occurs when the flare burns out at a low height and enters the gunner's field of view, creating a total "whiteout" in the gunner's sight.

The Field Artillery must employ its fires in the most effective manner and coordinate these fires with the supported elements. When artillery is firing illumination for TOW or Dragon gunners, the flare should be placed so that it is between the gunner and his target or behind the gunner. Also, firing data should insure that the flare will burn out before it enters the field of sight of the antitank gunner.

The solution to this problem is not an alteration of FDC procedures, but rather an education process as to what effect our firing has on the battlefield and how best to serve our maneuver counterparts.

Army-wide training literature program update

In 1975 a "literature boom" began at the Field Artillery School—a boom that continues today. Due to accelerated doctrinal and equipment developments and innovations in Field Artillery tactics, techniques, and procedures, numerous new and revised training circulars (TC) and field manuals (FM) have been published to "get the word out" to the field.

The School is consolidating these innovations and initiatives into a minimum number of doctrinal field manuals. The following is an update on the status of Field Artillery publications:

TCs rescinded or never published by DA

TC number	Short title	Date	Remarks
6-20-1	Suppression	12 May 75	Rescinded. Incorporated into FMs 6-50 and 6-20.
6-20-2	Dedicated Battery	12 Apr 75	Rescinded. Incorporated into FMs 6-50 and 6-20.
6-20-5	FA Smoke	Aug 75	Published in USAFAS draft edition only. Incorporated into FM 6-40-5.
6-20-6	Fire Support Planning and Coordination	Sep 75	Published in USAFAS draft edition only. Incorporated into FM 6-20.
6-40-1	Modern Battlefield Gunnery Techniques	30 Jun 75	Rescinded. Incorporated into FM 6-40-5.
6-50-1	Firing Battery Operations	30 Jun 75	Rescinded. Incorporated into FM 6-50.
6-100	Combined Arms Team Effectiveness	Feb 76	Rescinded.

Field Artillery TCs and FMs currently available through DA pinpoint distribution

TC number	Short title	Date	Remarks
6-1	TACFIRE	Jul 77	
6-2-1	Survey	Dec 76	Will be rescinded with fielding of FM 6-2 early in FY 79.
6-4-1	Threat	Oct 76	
6-4-2	Threat (Organizations)	May 77	
6-10-1	FA Commo	May 77	Will be rescinded with the fielding of FM 6-10 early in FY 80.
6-20-4	Counterfire	Feb 76	Will be rescinded with the fielding of FM 6-22 early in FY 80.
6-20-9	FA Battery Defense	Apr 78	
6-20-10	FIST	Dec 77	
6-40-3	M31 Trainer	Nov 75	
6-40-4	Fire for Effect	Feb 78	
6-40-6	FA Aerial Observer Team Operations	Oct 76	
6-121-2	FA/ASA: A Targeting Team	Mar 76	
(S) 6-121-2	FA/ASA: A Targeting Team (U)	Mar 76	

FM number	Short title	Date	Remarks
6-20	Fire Support in Combined Arms Operations	30 Sep 77	Capstone field artillery/fire support how-to-fight manual.
6-40	Cannon Gunnery	20 Jun 74	With C1. Will be superseded by revised FM 6-40 in mid-FY 79.
6-40-3	Cannon FADAC	26 Aug 70	With C2.
6-40-5	Modern Battlefield Cannon Gunnery	1 Jul 76	Will be rescinded with fielding of revised FM 6-40 in mid-FY 79.
6-50	Cannon Battery	1 Jul 76	Will be superseded with fielding of revised FM 6-50 in late FY 78.

FM number	Short title	Date	Remarks
6-141-1	Target..... Analysis: Nonnuclear	15 Feb 78.....	
(C)6-141-2.	Target..... Analysis: Nonnuclear (U)	15 Feb 78.....	

New or revised TCs and FMs expected in the field through the first half of FY 79

FM number	Short title	Date	Remarks
6-2	FA Survey	Early FY 79.	
6-15	FA ..... Meteorology	Early FY 79.	
6-30	FA Forward ..... Observer	Late FY 78.	
6-40	Cannon..... Gunnery (Revision)	Mid-FY 79.	Will supersede FM 6-40 (Jun 74) and rescind FM 6-40-5.
6-42	Lance..... Battalion	Early FY 79.	
(C)6-42-1	Lance..... Battalion (U)	Early FY 79.	
6-50	Cannon Battery ... (Revision)	Late FY 78.	Will supersede FM 6-50 (Jul 76).
6-121	Target ..... Acquisition	Late FY 78.	
6-161	FA Radar..... Systems	Early FY 79.	

Two other key how-to-fight field manuals are being written as companion publications to the capstone FM 6-20. They are FM 6-21, Field Artillery Cannon Battalion; and FM 6-22, Division Artillery, Field Artillery Brigade, and Field Artillery Section (Corps). Fielding of these FMs is expected in late FY 79 and early FY 80, respectively.

Users of these TCs and FMs are encouraged to make periodic audits of their pinpoint accounts for currency and accuracy. If problems exist, write Commander, US Army AG Publications Center, 2800 Eastern Boulevard, Baltimore, MD 21220, or call AUTOVON 584-2562.

Night compass available

Unit commanders may requisition the lensatic compass for their fire support teams (FIST). The lensatic compass has a luminous dial to aid the FIST member in determining direction at night. The M2 compass dial is not visible at night without an external light source which may reveal the FIST location and impair the user's night vision. The lensatic compass is listed in the common table of allowances (CTA).

Scoring the SQT

Contacts with the field indicate continued questions concerning Skill Qualification Test scoring. The following explanation should answer those questions.

The test for each skill level within each MOS is divided into three major parts: The written component (WC), the hands-on component (HOC), and the performance certification component (PCC). Each major part is made up of a number of individual scorable units.

The written component has between 30 and 50 scorable units. Each scorable unit may include up to 10 questions, some of which have multiple correct answers. The respondent must select all correct answers in order to receive a passing score on any given question and must answer a required number of questions correctly to receive a "go" for that scorable unit. The soldier is awarded a score of "one" for each scorable unit on which he receives an overall "go."

The hands-on component may include up to 16 scorable units. Each unit is double weighted. The soldier must demonstrate his mastery of each task in accordance with the standards listed in the individual soldier's manual. The soldier is notified in his SQT Notice which tasks he will be required to perform.

The performance certification component may include up to 10 tasks which are either too complex to test or require excessive time to score. The soldier's commander is responsible for awarding "go" or "no-go" for each of these tasks based on the commander's verification.

The final score is determined by computing a percentage from the number of tasks taken. One of three determinations will be given the soldier. If the soldier receives a "go" in 80 percent or more of the scorable units, the soldier has qualified in his MOS. If his score is between 60 and 79 percent on all scorable units, the soldier has verified his MOS. A score of less than 60 percent results in a failure to verify the MOS.

EXAMPLE: Four soldiers received their SQT notice 90 days ago. They have reported to the SQT testing site

with all required equipment. SP4 Jones, SP4 Williams, and SGT Smith (recently assigned) will take the SQT for the M102 howitzer. SGT Baker has been assigned to a detachment in Europe for the last two years, and the test control officer has decided that he will be required to take only the written component of the SQT. The SQT has 40 scorable units in the written component, 10 scorable units in the hands-on component and one scorable unit in the performance certification component. Remember, the hands-on component is double weighted. The results follow (total possible points = 61):

	SP4 Jones	SGT Smith	SP4 Williams	SGT Baker
WC	28	28	17	40
HOC (5×2) = 10		(10×2) = 20	(5×2) = 10	not observed
PCC	1	1	0	1
	39	49	27	41
	64%	80%	44%	100%
	Verify	Qualify	Fail	Qualify

Training ammo survey

The Army is implementing a new Training Ammunition Management System which will replace the Common Table of Allowances (CTA) effective 1 October 1978. The system is designed to provide the Army an efficient means of managing training ammunition and providing commanders a means of reviewing and evaluating ammunition expenditures. The system will provide each major commander a bulk training ammunition authorization consistent with his mission and will allow subauthorization within his command as local training requirements dictate.

USAFAS, in conjunction with TRADOC, is developing training ammunition management guidelines which will identify complementary training programs to meet the commanders' needs in attaining and maintaining proficiency. A worldwide survey of Active Army Field Artillery units is presently being conducted by the Field Artillery School as the basis for these guidelines.

Selected unit officers and NCOs at all levels will be asked to respond to the survey in order to provide the best data on which to formulate the Field Artillery position on ammunition use. We are asking for responses from enlisted personnel as well as from senior officers. We want the views of the Redlegs in the field — the users — the people who have to be able to move, shoot, and communicate.

Maximum response to the questionnaire is encouraged due to the Army-wide impact that these guidelines will have on the availability of training ammunition.

SQT schedule

The Field Artillery (CMF 13) Skill Qualification Tests (SQT), originally scheduled for administration 1 July through 31 December 1978, have been postponed due to delays in publication of materials. The new test period is 1 October 1978 through 31 March 1979. All test notices have been distributed to the field and are valid for the revised SQT test dates.

Comments sought for change to FM 6-20

Change 1 to FM 6-20, Fire Support in Combined Arms Operations (Dec 1977), is scheduled for completion in Fiscal Year 1979. Your comments for improving this field manual are solicited. Send comments to:

Director
Tactics/Combined Arms Department
ATTN: ATSF-CA-RA
Fort Sill, OK 73503

Please indicate the page, paragraph, and lines of concern, together with the reason your change (improvement) is needed.

COUNTERFIRE SYSTEMS REVIEW

First Firefinder soldiers graduated

Fourteen soldiers were recently graduated from the first Firefinder (mortar locating radar) courses. They will be the only soldiers trained in the system until mass classes open in late 1979. Four of the group are graduates of the 5-month Firefinder maintenance course and ten of the 5-week Firefinder operators course.

The graduates are being assigned to units in Europe which will receive two of the radars for field testing.

Met support increased

US Army Europe has taken the lead in making meteorology support more responsive to the needs of the Field Artillery. Both V and VII Corps have initiated actions to add a met warrant officer (201A0) to the Field Artillery Section (FAS). This officer will provide the met expertise required to make efficient use of met assets within the corps.

The V Corps target acquisition officer is in the process of centralizing control of met section training and plans for a comprehensive program to upgrade met data production capabilities. V Corps FAS is also helping to coordinate met supply and equipment maintenance, two chronic problem areas discussed in a recent artillery met warrant conference.

The School recognizes the need for coordination and control of our limited met assets and is presently staffing a proposal to add a met warrant to the Field Artillery Section TOE.

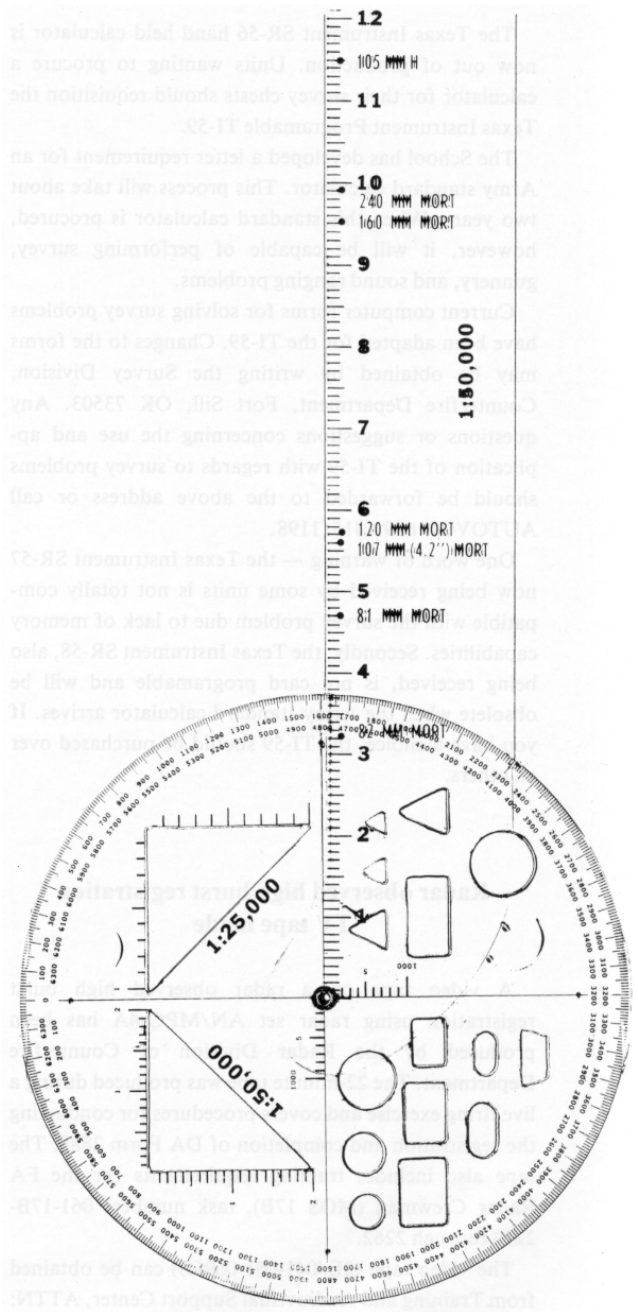
Multipurpose protractor designed

A multipurpose protractor, developed by the Counterfire Department, will be available during the first quarter of fiscal year 1979. The protractor was developed by MAJ Richard Wickenden, exchange instructor from the Royal Australian Artillery, in cooperation with the Fort Sill Training and Audiovisual Support Center.

Development of the protractor meets a need for better instruments to east plotting, analysis, and purging of graphical data, especially in the manual methods, before fielding of TACFIRE.

The protractor is divided into mils (black), with a back-azimuth scale (red), around its circumference allowing rapid, accurate plotting of directional information. Die-cut into the protractor are a variety of standard military symbols and a coordinate scale for 1:25,000 and 1:50,000 maps. The radial arm is printed with ranges indicated for standard US and Warsaw Pact indirect fire weapons.

Following extensive coordination with other TRADOC schools, Training Support Command has recommended that the multipurpose protractor be a standard issue item. The basis for issue will be to FISTs, FSEs, and FDCs (all levels), and to div arty and FA brigade TOCs.



Multipurpose protractor (the radial arm reads to 30 kilometers).

Hand held calculator change made

The Texas Instrument SR-56 hand held calculator is now out of production. Units wanting to procure a calculator for their survey chests should requisition the Texas Instrument Programable TI-59.

The School has developed a letter requirement for an Army standard calculator. This process will take about two years. When this standard calculator is procured, however, it will be capable of performing survey, gunnery, and sound ranging problems.

Current computer forms for solving survey problems have been adapted for the TI-59. Changes to the forms may be obtained by writing the Survey Division, Counterfire Department, Fort Sill, OK 73503. Any questions or suggestions concerning the use and application of the TI-59 with regards to survey problems should be forwarded to the above address or call AUTOVON 639-1415/1198.

One word of warning — the Texas Instrument SR-57 now being received by some units is not totally compatible with the survey problem due to lack of memory capabilities. Secondly, the Texas Instrument SR-58, also being received, is not card programable and will be obsolete when the Army standard calculator arrives. If you have a choice, the TI-59 should be purchased over all others.

Radar observed high burst registration TV tape made

A video tape on a radar observed high burst registration using radar set AN/MPQ-4A has been produced by the Radar Division of Counterfire Department. The 22-minute tape was produced during a live firing exercise and covers procedures for conducting the registration and completion of DA Form 2888. The tape also includes training requirements for the FA Radar Crewman (MOS 17B), task numbers 061-17B-2259 through 2262.

The video tape (2E/041-061-0696B) can be obtained from Training and Audiovisual Support Center, ATTN: ATZR-F-ETV, Fort Sill, OK 73503. A blank 3/4-inch TV cassette must accompany the request.

Revised radar maintenance course graduates first class

The first students of the newly revised FA Radar Maintenance Course graduated in July 1978. The course was revised during late 1977 and early 1978 as a result of disestablishment of common basic electronics training at Fort Jackson, SC and realignment of CMF 29.

The course prepares the soldier to perform the tasks of the Weapon Support Radar Repairer, MOS 26B10. Formerly taught in two separate courses to prepare soldiers for MOSs 26B20 and 26B30, the new course includes all the tasks requiring resident instruction as listed in FM 6-26B-CM (Commanders Manual).

The FA Radar Maintenance Course (nominally 23 weeks), is self-paced with basic electronics training integrated throughout the course and tailored to the requirements of the MOS.

New tables to be printed

FM 6-16, Tables for Field Artillery Meteorology, is being revised as a series of separate tables and is scheduled for printing during the third quarter of fiscal year 1979. The proposed FM 6-16 series will separate the tables required to compute electronic, visual, and sound ranging met messages.

The concept is basically as follows:

- FM 6-16 will contain only the tables used by the electronic met section to produce electronic computer and/or ballistic type 3 messages.
- FM 6-16-1(*) will contain only the tables used by the visual met section to produce visual computer and/or ballistic type 3 met messages. It will be lettered (A, B, C, etc.) indicating updated regional supplements to FM 6-16-1(*) from the Atmospheric Sciences Laboratory, US Army Electronics Command. Each lettered supplement will pertain to a particular region of the world and will be divided by altitudes and seasons.
- FM 6-16-2 will contain only those tables required by the sound ranging platoons to produce sound ranging met data (electronic met sections must use these same tables for developing sound ranging winds data).
- FM 6-16-3 will contain the tables required to produce electronic or visual type 2 met messages for air defense artillery (gun) weapon systems.

The *Journal* interviews . . .

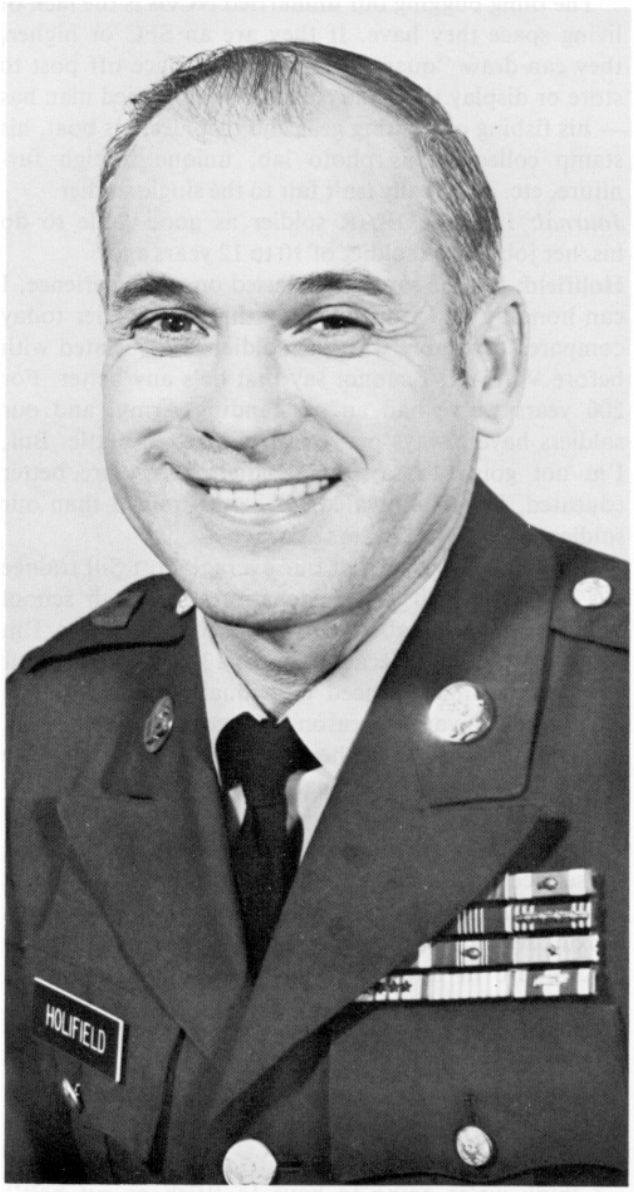
CSM Melvin J. Holifield

Journal: Sergeant Major, you spend a lot of time talking to Field Artillery troops of all ranks and all MOSs both here at Sill and on other posts. What really "bugs" them?

Holifield: Well, I don't think our soldiers here at Fort Sill are much different from those all over the Army. Our soldiers are concerned about the erosion of benefits, promotions, pay, and overseas turnaround time. But, actually what "bugs" our soldiers more than anything else is not enough time to train. They hate "details" that they have to perform which are not related to their MOS. They can't understand this and it really bothers them. Another thing that "bugs" a particular group of our artillerymen more than anything else is the turnaround time for our 15Ds and 15Es, our Lance and Pershing people. The current turnaround time is 12 months for the 15E and 14 to 16 months for the 15D. The only place where we have the authorization for the Lance and Pershing battalions is in Germany and Fort Sill. These guys can't look forward to tours at Carson, Lewis, Hawaii, or anywhere other than Fort Sill and Germany. Not only are they restricted to these geographical locations, but the turnaround time involves so much family instability. What we've tried to do in the past was to take some of the other career management field (CMF) 13 series MOSs and give them a secondary MOS of 15D or 15E, but this really hasn't helped too much. We have a very small sustaining base in CONUS. The Field Artillery School, Department of the Army, and many other concerned people are trying to solve this problem but we really don't have a "quick fix" to this and it is one of the things that really bothers our soldiers.

Journal: What are the real "gut issues" bothering senior NCOs — our staff sergeants and above?

Holifield: There are several things — the erosion of benefits, the Qualitative Management Program ("up or out") is a big concern, lack of understanding of the promotion system — I could go on and on, but the single biggest complaint our senior NCOs have is the change of station business — moving. There are times when family considerations affect the NCOs' career decisions. At the senior NCO level, men often have children in the last years of high school or ready to go to college, and a PCS disrupts the lives of their children. An unaccompanied tour or a tour to an accompanied area where schools or family situations are not very pleasant can cause a man with 20 years to call it quits.



CSM Melvin J. Holifield is the Command Sergeant Major of the United States Army Field Artillery Center. He is a native of Pensacola, FL, and has more than 30 years of service. He served with the 1st Cavalry Division Artillery during the Korean conflict and with the 3d Battalion, 82d Field Artillery, in Vietnam.

The Army's "home base" policy is a great help, but it doesn't solve all the problems. By necessity, many of our soldiers have to "moonlight" and their wives have to work. When PCS orders arrive, the soldier must decide to either have his wife quit the job or leave her and separate the family.

The thing bugging our unmarried NCOs is the lack of living space they have. If they are an SFC or higher, they can draw "quarters" and rent a place off post to store or display the same collections a married man has — his fishing or hunting gear and trophies, his boat, his stamp collection, his photo lab, unique foreign furniture, etc. This really isn't fair to the single soldier.

Journal: Is the VOLAR soldier as good (able to do his/her job) as the soldier of 10 to 12 years ago?

Holifield: Let me say this — based on my experience, I can honestly and truthfully say that our soldier today compares favorably with the soldiers I associated with before VOLAR. I cannot say that he's any better. For 200 years we've had an outstanding Army, and our soldiers have always proved themselves in battle. But, I'm not going to say that soldiers today are better educated, better motivated, or better trained than our soldiers were 10 to 12 years ago.

Our statistics show that our average Fort Sill trainee has a 9th or 10th grade education. Our high school graduates make up about 61 percent of the trainees. I'm somewhat alarmed because almost 13 percent drop out before finishing advanced individual training. This is attributable to various reasons — medical problems that existed prior to entering the Army, the trainee discharge program when the individual cannot adjust to military service, etc.

Additionally, 10 percent of the soldiers coming into the service today are married. About 64 percent are ages 17 through 19, 25 percent are 20 to 22, and approximately 12 percent are 23 and older. Almost 15 percent are in intelligence category 4, which is our lowest category.

I don't have the statistics to compare these soldiers with those of some years back. I think that soldiers today are certainly good soldiers and they will respond to leadership. And I think that our soldiers today will prove themselves in combat.

I think we're going to have to "fish or cut bait" pretty soon as far as the draft is concerned. I'm not saying the draft is going to be "the" solution to our problems, but up until the last couple of years, we had no problem meeting the requirement to fill the ranks. We're not getting a cross section of our society that we need so desperately in the Army. With new hardware coming into being, we need soldiers with a good math background.

It's not only the Active Army that we have to be concerned about — what's really hurting now is our Reserve forces. Under the draft, when soldiers came into the Army, they incurred a longer obligation with part of that time to be spent in the Reserves. We don't have the sustaining base that our Army Reserve forces have always given us. We're going to have to do one of two things: either go back to the draft or come up with more money in the defense budget to make service more attractive to young people. I think the quality and quantity of people that we get into the service under VOLAR is going to be directly related to the state of our economy and the feelings of the public toward the Army.

Journal: What is your opinion of the female soldiers' ability to operate in CMF 13 MOSs?

Holifield: Let me start by saying that the female soldier has just done an outstanding job for the Army — just tremendous. As a matter of fact here at Fort Sill, they compete very well with our male soldiers in the Soldier of the Month competition. In 1977, almost half of our Soldiers of the Month were female. They try harder. Of course females entering the Army must have a high school education. That is not required of the male enlistee. So to begin with, the female is more educated than her male counterpart. They have done well in combat support units and in some combat units, and it is interesting to see that they have been assigned to the 82d Airborne Division. To say the female soldier can go out and drive a 5-ton truck is without question, but to see her wrestling with that tire and trying to repair it is something else again. But, to answer your question, I frankly hope that we never see females in the 13F, 13B, and 13E MOSs. The reason why I say that is, I don't think it's a matter of *can* they perform in a combat MOS such as 13F or 13B, but rather *should* they? I just don't believe that our society is ready to see our female soldiers in the infantry or in an MOS such as 13F or 13B. We can find enough jobs for our female soldiers in other MOSs, and I hope we will resolve to do this.

The Army's goal is to have something like 100,000 females in our Army by 1982. This is some 10 to 12 percent of our total Army force. They can certainly be useful in groups and higher headquarters. We have women in 13Z and 13W. However the 13B cannoneer, 13E computer specialist, or 13F is just too far forward in the combat area.

Journal: You sound like this is more from a desire to protect the women than it is from any feeling that they either couldn't move ammo or would create some sort of morale problem for the unit commander. Is that why you don't want women in those MOSs?

Holifield: The answer to part of your question is part yes and part no. Yes, I have no doubt that some of them can lift those projectiles. Yes, it is more or less a protection for them and they may resent that. But, as for the morale problem, I will have to honestly say that I

believe it will be a problem in the units. The male will tend to protect them; and again, this is going to be misunderstood by a few.

Journal: What do enlisted soldiers and NCOs think of the Soldier's Manual/SQT concept?

Holifield: Well, like any other new program, it takes some adjusting and we haven't got all the bugs ironed out. Our 13 series MOSs are not scheduled for testing until August — perhaps even November — of this year. It is the general feeling of people here at Fort Sill that the SQT is a tremendous improvement over the MOS test.

In the grades of E6 and in some MOSs, there are no "hands-on" components in their SQTs, so it will be more or less like the MOS test for them. For E7s, we don't have a test completed and don't know when it is going to be ready to be administered to the field.

There are some problems however, with our SQT and with our Soldier's Manuals. Soldiers feel that they can study their Soldier's Manual and verify their MOSs but not qualify for promotion. A soldier has to score *80 percent* or higher to qualify for promotion. As you know, 75 percent of each Skill Qualification Test comes from the man's present skill level Soldier's Manual and the remaining 25 percent comes from the Soldier's Manual of the skill level he is aspiring to. So there's a 75/25 split. But, the biggest concern is that the Soldier's Manual may have been written a little bit too hurriedly; not enough time was allowed to insure that all the information gathered was correct. One might refer to the Soldier's Manual and get one method of doing something, and then go to a TM or an FM and perhaps find something different. So it's misleading to some extent. I'm sure that, given sufficient time, this will be corrected.

Another problem with the SQT is that it has to be cranked into the training schedule and a typical battalion training schedule is designed 18 months in advance. As a result, we haven't allowed sufficient time in our training schedule for the SQT. A final problem is that some of our people are not working in the MOS they will be tested on; for example, the sergeants first class who are performing duties of first sergeants. This is good experience for them, but it takes them away from daily contact with the material their SQT will cover. This sort of thing concerns some of our NCOs. "Special duty" assignments also take NCOs away from their MOSs.

But, in summary, the SQT is a definite improvement over the MOS test. Though the schedule for testing is off track a little, our soldiers like the program.

Journal: How about the massive reclassification of NCOs we had a couple of years ago [September-October 1976 *Journal*]? Have we gotten that smoothed out yet?

Holifield: I can honestly say that reclassification was our [Field Artillery] salvation. We have gotten some truly outstanding people transferred into CMF 13. As a matter of fact, many of them have gone on to be battery first sergeants. I would say to the Department of the Army, "Send us some more!" We had some that didn't work out, but most of them are now glad they came to us, and we're glad to have them. We are now facing reclassification into MOS 13F. Hopefully we can get enough from voluntary reclassification from within CMF 13, but if we have to involuntarily reclassify, I hope it goes as well as the 1976 action.

Journal: Are we forcing some NCOs with more than 15 years' service into the drill sergeant program?

Holifield: I would not use the term "forcing." There is a DA selection board that reviews qualified NCOs' records and nominates them for the drill sergeant program based on their outstanding records. I think that any NCO selected that does not want to be a drill sergeant can get out of it by letting his desires be known. We have a backlog of people *wanting* to go the the drill sergeant school here at Sill, so we are not seeing any "forced" accessions.

Journal: I've heard it said that junior NCOs are "under trained and over supervised." What is your feeling about this statement?

Holifield: I have to agree with that. We have got to give these young men the jobs and, by golly, step aside and let them make their mistakes! The sergeants are not given the responsibility that the job and rank calls for. Given the opportunity, they will perform. They will never learn if we don't give them the chance.

Journal: How can we get a bigger role for the NCO in the ARTEP — both in the conduct of it and in the remedial training that follows?

Holifield: That is a tough one. The commander is responsible for the activities associated with the ARTEP and his NCOs should help him with that task, as with any other. The NCO is fully responsible for his section in an ARTEP, a TPI, an AGI, or whatever. The officers should command their units and let the noncoms run the units.

Journal: The perennial problem of having 200 subjects that are "priority 1" with the priority changing every day is a source of bewilderment for NCOs who really want to do well that which the Army wants done. Is there any way to beat this problem?

Holifield: We have had that problem as long as we've had an Army. I see no way it will ever change. I think we have some pretty smart NCOs that have been around long enough to "prioritize within priorities." It is a source of frustration, but the only way to get around it is to be flexible and to react professionally.

Journal: Thank you.

French Field Artillery: An Update

by LTC Pierre Saint-Arroman

The new Field Artillery System at battalion level

Detailed reports on French Field Artillery organization and the GCT 155-mm howitzer were printed in the July 1973 and November-December 1974 issues of the ***Field Artillery Journal.*** *This report summarizes major materiel developments in the French Field Artillery. — Ed.*

In the early 1980s, French FA battalions assigned to corps and armored divisions will undergo an entire change of equipment. Considered separately, each new piece of equipment is more or less comparable to other military hardware currently under development elsewhere in the industrial world. However, as a whole, the different components are worth a short review for the following reasons:

- It is a true *system*; that is, every functional area of field artillery operation is considered — target acquisition, weapons and ammunition, gunnery, and command and control.
- Each component of the system was devised to meet the same operational requirements, at the same time, and by the same group of people. As a result, compatability is the main feature of the whole system.

Goals

The first goal we sought was to obtain *first round fire-for-effect*, even on moving targets. This choice was made because of the predominance of fleeting targets on the modern battlefield and the necessity to make the best use of available ammunition.

To achieve this goal, it was necessary to considerably reduce the value of any possible error which was likely to introduce a difference of more than 100 meters between the center of the target and the average round. Usually, such errors and inaccuracies are possible in the following fields:

- Target acquisition and position area survey data.
- Meteorological and muzzle velocity data.
- Weapon dispersion.
- Computation errors.

The second goal was maximum *firepower;* i.e., the capability to deliver the greatest quantity of ammunition, in the minimum period of time, against any target within the zone of operation, without changing the launchers' positions. Indeed, fleeting and protected targets, wide battle area frontages and depths, and surprise attacks, in a very mobile and changing battle, require increased firepower.

To increase the firepower of a field artillery unit without increasing the number of costly launchers or introducing more mobility and logistics problems related to larger calibers, the following solutions are available:

- Improve rates of fire.
- Increase ranges.
- Improve ammunition efficiency and availability.
- Ease and expedite command and control decisions.

The third goal was *survivability*. On the modern battlefield, field artillerymen will be subjected to many dangers likely to prevent them from carrying out their mission. To cite only a few well-known hazards, field artillerymen will endure airstrikes, counterfire, CBR attacks, and last, but not least, physical exhaustion from lack of sleep. Therefore, they must be protected and given vehicles which are sufficiently comfortable to allow crewmen to sleep, at least in shifts.

Target acquisition

The French forward observer will have a specially designed vehicle mounted on a chassis similar to any French armored personnel carriers — the AMX 10 — to avoid recognition by enemy observers. Along with a self-defense weapon and a night vision device, this vehicle will contain the following equipment:

- A laser rangefinder with an azimuth and elevation measuring system. Out to 20 kilometers, its accuracy is five meters in range, two mils in azimuth, and 0.5 mil in elevation. This system can be used dismounted.
- A land navigation system coupled with a north-finding device and azimuth-determining capability. The

accuracy of this system is one mil in direction and 20 meters in coordinates.

• A message entry device coupled with communication equipment which allows direct digital access to the field artillery battalion automatic data processing system (ADPS) — the "Atila," which will be discussed later.

Mounted on the same type vehicle and using similar equipment, the moving target acquisition and fire control radar "RATAC" is designed to operate under poor visibility conditions, locating armored vehicles out to a distance of 20 kilometers and helicopters to 15 kilometers. Each French FA battalion is currently equipped with six RATACs.

Weapons and ammunition

The new 155-mm self-propelled gun "GCT" was presented in the November-December 1974 issue of the-*Field Artillery Journal*. Therefore, a brief review of its main features is sufficient.

The automatic loading system, which is the most original aspect of this weapon, enables each gun to fire six rounds in 45 seconds. Forty-two complete rounds are immediately available inside the turret. A specially designed laying system, coupled with gun-mounted individual display of firing data, considerably reduces the risk of errors and increases the speed of laying operations.

The maximum range of the gun is about 24 kilometers with the new hollow-base shell and 28 kilometers with the prototype rocket-assisted projectile (RAP). The gun itself complies with NATO standards. Its accuracy at long ranges is remarkable.

As the weapon is mounted on the same chassis as the French main battle tank, the GCT possesses a real cross-country capability which is often rewarding in terms of survival.

Last, but not least, only a crew of four is required, which not only saves personnel but also saves lives. Four men can remain inside the turret where they have sufficient room, heating, sleeping equipment, and protection from small arms fires, shell fragments, and CBR hazards — thanks to an air-filtered, pressurized system.

The French ammunition system is characterized by-*simplicity* in order to cope with expected resupply difficulties on the modern battlefield. Until the introduction of some kind of terminally-guided projectile, the French inventory will retain the following features:

• Complete compliance with NATO standards.

The French forward observer vehicle with prototype turret (see inset) contains a laser rangefinder, land navigation system, and digital message device.

• Two types of shells — hollow-base and RAP.

• Two types of propellant — combustible cartridge for the GCT and conventional charges for other types of weapons.

• Only one type fuze which is multipurpose (impact and proximity).

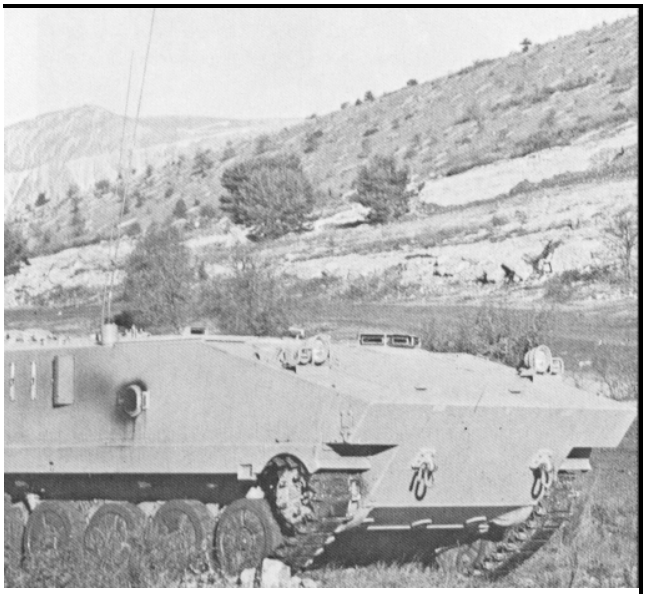
Gunnery

Improvements are needed in survey for firing battery positions, meteorology, muzzle velocity measurement, and firing data computation.

To ease and expedite survey operations in emergency situations, particularly when immediate firing is requested from a battery on the move, each battery will have a land navigator coupled with azimuth referencing identical to the one of the forward observer vehicle.

In the field of meteorology, the "Sirocco" station is a fully automated radar system which can send digital results directly into the field artillery battalion ADPS Atila. Accuracy is to within one knot for horizontal wind components, 0.25 percent for air temperature, and 0.50 percent for air density.

The Sirocco station can compute and send met messages every two hours. Each field artillery battalion will have its own Sirocco station. Those capabilities are based on experience with the weather conditions in western Europe; indeed, weather can change in two hours, and the validity of met data does not exceed a surface of about 40 square miles, which is closer to the zone of a battalion than to the zone of higher level field artillery organizations.



"Atila" is the name given this very low profile vehicle used for fire direction centers and command post operations.

*Grande Cadence de Tir***, which translates to "great rate of fire," is an appropriate name for the self-propelled 155-mm howitzer with an automatic loading system.**

In the past, French field artillery battalions had a velocimeter mounted on a small trailer. This device had sufficient accuracy, but was heavy and fragile and needed specialized personnel to operate it. Also, there was only one velocimeter per battalion, which was insufficient considering that each battery of a battalion could have different lots of propellant.

The new velocimeter, "Miradop," is sturdy and lightweight; each of its two components weighs only 22 pounds. The active device, a small Doppler radar with protective radome, can be mounted on any gun in two minutes, thanks to a coupling shoe. The display device gives the non-specialized operator immediate direct reading of the gun muzzle velocity, either for one round or an average for up to nine rounds.

Every firing battery will have its own Miradop; thus, variations in muzzle velocity for any new lot of propelling charges will be checked immediately and the results introduced into the battalion ADPS for real-time corrections.

Command and control

Target locations, survey, meteorology, and muzzle velocity data, provided with great accuracy and in real time by the different subsystems should not be wasted by careless or lengthy processing. The new field artillery battalion ADPS Atila is intended to perform this processing, in real time and without any loss in accuracy. Indeed, Atila is less sophisticated than its US Army Field Artillery counterpart, TACFIRE. Atila is designed to fit the exact needs of the French field artillery battalion equipped with GCT guns. It is capable of commanding a temporary group with an additional field artillery battalion equipped with another type of 155-mm gun.

Understanding the capabilities of Atila must begin with a clear statement about the functions performed by TACFIRE which are *not* performed by Atila. These functions are:

- Target analysis for delivery systems other than field artillery; i.e., tactical aircraft, rocket/missile, and naval guns.
- Vulnerability studies, target analysis, fire planning, and fallout prediction for nuclear and chemical weapons.
- Simultaneous handling of a great number of fire missions.
- Target combination and automatic buildup notification.
- Automatic encryption of communications.

Conversely, some functions performed by Atila are not performed by the current TACFIRE without its expected battery computer system extension. Among these functions are:

- Individual display of firing data in each gun turret.
- Automatic communication rerouting in case of communication interruptions.

There is a broad overlap regarding functions between the two systems, and the complete list of common functions would be too long.

Finally, there is an important point to mention about command and control with Atila. This system will include specially designed vehicles from the new basic French AMX 10. Every command post in the field artillery battalion will be tracked and protected. Atila vehicles, with new integrated communication equipment and a mobility comparable to any other vehicle in the battalion inventory, will certainly introduce a new style of command and control; old routine methods will not be allowed to survive in such a different environment. Simpler and better procedures are likely to deeply transform field artillery command and control staffs and policies.

Calibration and measurement of muzzle velocity is accomplished with the "Miradop," shown here mounted on an obsolete weapon.

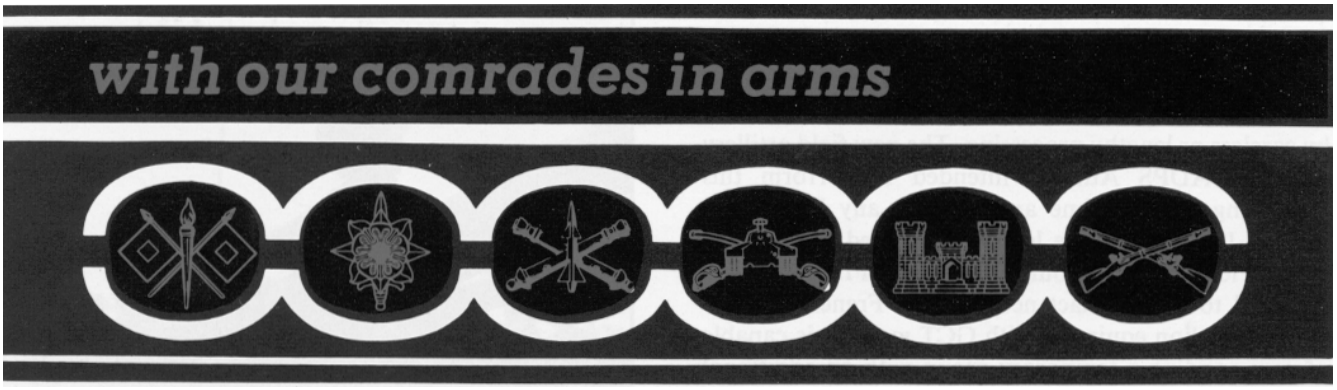
The new French Field Artillery System at battalion level greatly increases the capabilities of related organizations. It gives the field artillery battalions assigned to corps and armored divisions a real autonomy, except for counterfire target acquisition assets. It also allows immediate centralization of command at corps level, thanks to the interface between Atila and the new area communications system.

LTC Pierre Saint-Arroman is the French Liaison Officer at the US Army Field Artillery School. Before coming to Fort Sill, he was S3 of the 73d Regiment, a 155-mm self-propelled unit stationed in Germany.

Buy a Fort Sill?

The oil rich Arab nations are beefing up their defense forces at a rapid rate, buying all types of the latest sophisticated military goods. There are daily reports of Arab purchases of this plane and that tank, but a recent issue of the *International Defense Review* reported, without comment, a Saudi Arabian contract with the US Government for one each "Field Artillery Centre and School" at a cost of $496,000,000.

Rest easy, Redlegs — Fort Sill is not for sale.



Modified CABL to continue

Since the consolidation of administration at battalion level (CABL) was established as an Army precept in August 1976, a comprehensive review of its effectiveness to reduce company/battery level administration has been completed and the following conclusions reached:

• The personnel administration center (PAC) has completed consolidation of personnel administration at battalion level, and TOEs to support it have been published. Refinements of personnel, equipment, and transportation requirements are being made.

• The consolidation of logistics functions cannot be uniformly applied to all battalions and, in many cases, have resulted in peacetime organization and training that would have no application in wartime.

• Training management was never intended to be performed at battery level. Batteries lack authorized personnel, so it is appropriate to perform the training management functions at battalion in accordance with TC 21-5-7.

• Consolidation of garrison dining facilities was implemented to achieve peacetime economies before starting dining facilities administration center evaluations. Therefore, garrison dining consolidation should continue, based on facilities available and local requirements.

Based on this review of CABL, the following actions are directed:

• PAC implementation and operations will continue, as will the refinement efforts.

• Consolidation of supply and maintenance under the CABL concept will not be pursued further. Units provisionally organized under these concepts will revert to TOE configuration as soon as practicable.

• Training management and administration will be performed at battalion level in accordance with TC 21-5-7.

TRADOC will use the Division Restructure Study (DRS) testing and other analyses to evaluate wartime efficiencies to be achieved by consolidating maintenance, supply, and feeding functions. Any future changes to these operations will be based on test results and keyed to wartime requirements.

According to TRADOC, these actions are intended to reduce the administrative burden at battery level. The thrust is to permit units to organize and train in peacetime the way they will perform in wartime and to insure that battlefield doctrine for these functions is in accordance with FM 100-5.

Recommended reading

In the June 1978 edition of *Military Review*, LTC Clayton A. Pratt provides a scenario of a Warsaw pact invasion through "The Benelux and Northern German Plains Avenue of Approach." According to the author, today's vehicles with true cross-country capability, improved tactical bridging, helicopter assault forces, and a good hard-surface road network, make the Northern Plains an even more inviting path into the economic heartland of Western Europe.

The same edition of *Military Review* contains a comprehensive article on the history and progress of "Soviet Self-Propelled Cannon Artillery" since World War II.

The July 1978 issue of *Military Review* has an article on the great interest being shown in precision-guided munitions, such as the Field Artillery's Copperhead. The author looks at the training, organizational and doctrinal impact of this evolving weaponry.

The July 1978 issue of the *Marine Corps Gazette* features a 42-page report on the "Northern European Command Exercises" held by NATO in the fall of 1976. LTC E. J. Dyer, USMC, writing the "Combat Support: Artillery," segment of the report, describes the

sometimes unusual tactics and techniques employed by USMC and British artillery during exercises in Norway. Of one lesson learned he says, "for operations with armor, and in mountainous terrain, artillery must press forward continually or risk being outrun or masked."

Army aviation has come a long way in a short time, from the first helicopters designed for observation/liaison, to troop transport, to a leading member of the heavy firepower element of the combined arms team. The May 1978 issue of *Aviation Digest* contains two articles on the latest in Army aviation firepower: HELLFIRE, the "fire and forget" antitank missile; a report on the latest developments in the old standby, the 2.75-inch rocket (summarized in the following item). All fire support officers should get a copy of this magazine and read this information.

2.75-inch aircraft rocket system update

Aircraft system improvements to the 2.75-inch rocket are explained by the system project manager in the May 1978 issue of *Aviation Digest*. Briefly summarized, these improvements include:

• Fire control — Incorporating the laser rangefinder, will correct the massive problem of a 25 percent range estimation error in the manual system and reduce it to 1 percent. Fire control in AH-1 Cobras is expected by late 1979.

• "Stores" management and fuze setting — Pilots will be able to use a cockpit panel to choose the type of warhead they want, apply the fuze setting, select the quantity to be fired, and set the rate of fire. These improvements should appear on AH-1 Cobras late this year.

• Lethal warhead improvements — The remotely set multioption fuze is being added to the existing 17-pound warhead and the 10-pound high explosive warhead. With this fuze, the pilot can select a super quick mode or two variations in delay. This new warhead is scheduled to be fielded during 1980.

Another addition to the remotely set family is the M439 fuze which can be set in terms of range and either manually dialed from the cockpit or automatically set from the rangefinder to the rocket warhead. With this fuze the aircraft can engage several different targets at various ranges with different warheads, all without moving the aircraft.

• Multipurpose submunition warhead (MPSM) — Using the M439 fuze, the MPSM expels its submunitions at selected points along its trajectory. Each submunition is multipurpose — effective against personnel, materiel, and armor. Each warhead has five times more lethal area than the standard 10-pound warhead. Advanced development of the MPSM is complete and progress depends on funding.

• Supporting warheads — The screening smoke warhead contains 10 "wicks" filled with fiberglass in a canister filled with white phosphorus. When the warhead functions, the canister bursts, creating a cloud of white phosphorus with the wicks falling individually, providing a continuing source of smoke. Procurement is planned for fiscal year 1979.

• Illumination warhead — This warhead will use the variable range fuze to illuminate targets which will be engaged by either ground antitank weapons or from the aircraft firing TOW or HELLFIRE. Programing is planned for fiscal year 1980.

• Mark 66 higher velocity rocket motor — The Mark 66 is planned for interoperability with NATO launchers because of its higher velocity which gives a direct fire capability to 6,000 meters. The program will address the compatibility problem and fin and nozzle design for firing from a hovering helicopter.

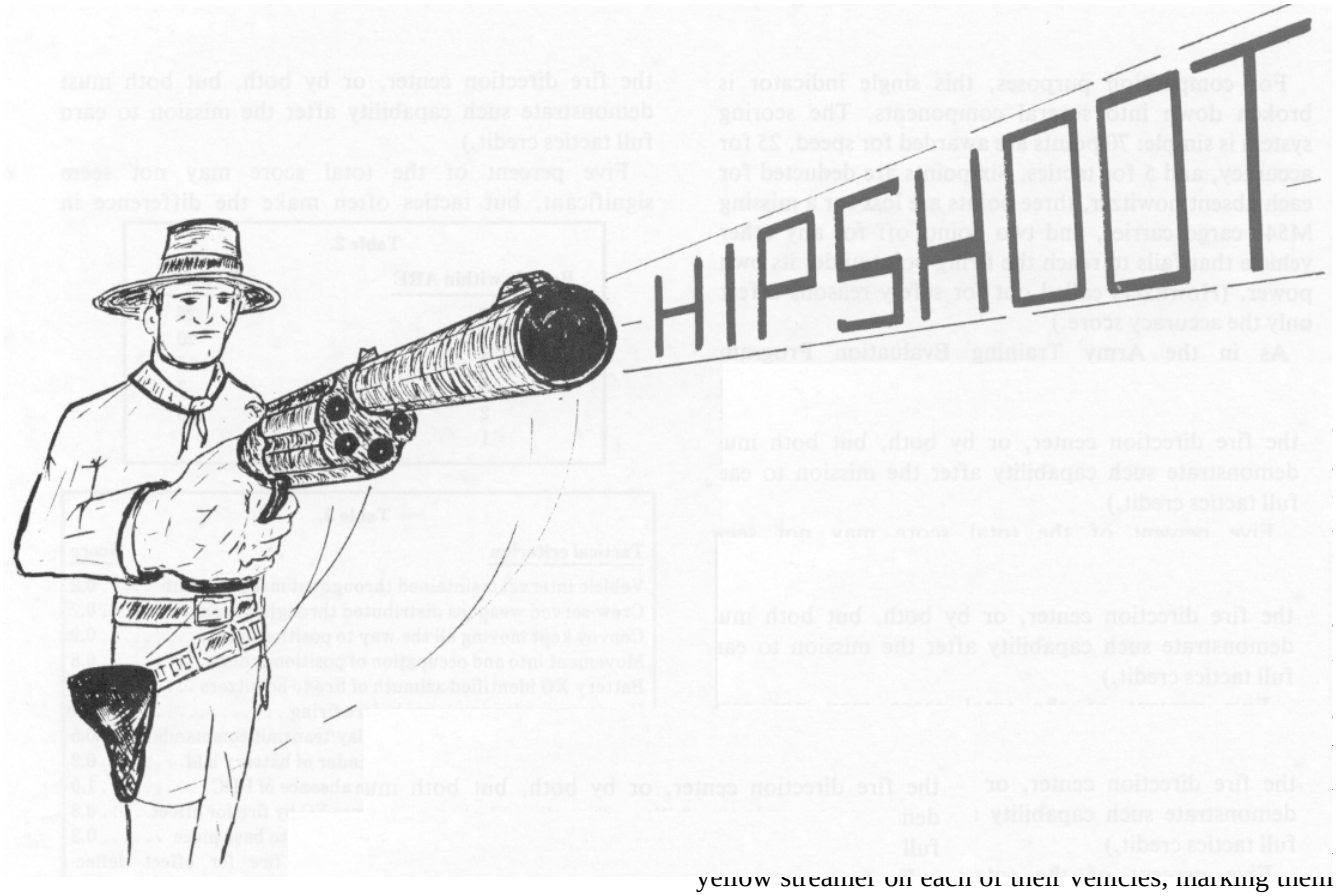
Marines demonstrate a new laser device that will enable forward observers to spot targets accurately for conventional artillery, and direct sophisticated laser-guided weapons with precision. The Modular Universal Laser Equipment (MULE), has entered full scale engineering development at Hughes Aircraft Company. The man-portable, tripod-mounted MULE is compatible with all laser-guided weapons now operational or under development. The engineering development contract for the MULE is being managed for the Marine Corps by the Army Missile Research and Development Command.

Materiel costs forecast

Weapons, ammunition, and systems of major interest to the Field Artillery don't come cheap. The accompanying table lists some major materiel costs projected for the next five fiscal years. Figures are in millions of dollars. To put the figures in perspective, the XM1 tank is included.

The three items of ammunition (Copperhead, 155-mm and 8-inch ICM), will cost nearly $1 billion by 1983. That is two-thirds of the present Army budget for ammunition.

	FY 79	FY 80	FY 81	FY 82	FY 83	5-year total
Remotely Piloted Vehicles						
RDT&E	**22.0**	**32.5**	**13.0**	**11.8**	**9.2**	**88.5**
Procurement	**–**	**–**	**17.1**	**17.8**	**25.0**	**59.9**
General Support Rocket System						
RDT&E	**62.8**	**61.3**	**37.6**	**22.0**	–	**183.7**
Procurement	**–**	**47.1**	**42.8**	**162.5**	**198.5**	**450.9**
Pershing II						
RDT&E	---------- Classified ----------					
Procurement	**–**	**–**	**–**	**128.9**	**121.0**	**249.9**
Forward Observer Vehicle						
RDT&E	**3.7**	**.3**	**–**	–	–	**4.0**
Procurement	**–**	**–**	**–**	**–**	**–**	**–**
Ground Laser Designator						
RDT&E	**8.7**	**.8**	**–**	**–**	**–**	**9.5**
Procurement	**26.5**	**16.8**	**20.8**	**21.9**	**24.0**	**110.0**
REMBASS						
RDT&E	**8.7**	**11.1**	**13.3**	**12.3**	**12.9**	**58.3**
Procurement	**–**	**–**	**–**	**52.4**	**19.2**	**71.6**
Counterbattery Radar						
RDT&E	**6.8**	**2.5**	**–**	**–**	**–**	**9.3**
Procurement	**40.2**	**63.0**	**72.1**	**–**	**–**	**175.3**
Countermortar Radar						
RDT&E	**4.4**	**2.1**	**1.1**	**–**	**–**	**7.6**
Procurement	**49.9**	**74.5**	**–**	**–**	**–**	**124.4**
Copperhead						
RDT&E	**13.0**	**5.2**	**–**	**–**	**–**	**18.2**
Procurement	**55.8**	**275.1**	**81.3**	**236.5**	**220.4**	**869.1**
155-mm HE ICM Projectile						
RDT&E	**–**	**–**	**–**	**–**	**–**	**–**
Procurement	**144.4**	**222.1**	**334.2**	**241.4**	**402.1**	**1,344.2**
8-inch HE ICM Projectile						
RDT&E	**.5**	**.6**	**.9**	**–**	**–**	**2.0**
Procurement	**115.7**	**239.2**	**319.4**	**312.9**	**324.1**	**1,311.3**
155-mm M-198 Howitzer						
RDT&E	**2.0**	**2.0**	**–**	**–**	**–**	**4.0**
Procurement	**32.1**	**60.0**	**–**	**–**	**–**	**92.1**
XM-1 tank						
RDT&E	**78.4**	**31.6**	**2.5**	**–**	**–**	**112.5**
Procurement	**403.1**	**767.8**	**846.6**	**818.9**	**830.4**	**3,666.8**



The crowd tenses in anticipation, awaiting the third quarter of Super Bowl II. The defending champions are poised to begin an offensive that they hope will bring them a second title. All eyes are on the field ahead. The public address system crackles: "Mike five-niner, this is mike six-niner, adjust fire, over."

The champions hurry into formation and trust the competition will unfold exactly as did their practice drills.

No, it isn't the Green Bay Packers in 1966 at Miami — it's C Battery, 1st Battalion, 16th Field Artillery, in April at Fort Hood, TX, in the second semiannual 2d Armored Division Artillery "Hipshoot Super Bowl."

Having received a call for fire on a surveyed target from his forward observer while moving in convoy, the battery executive officer (XO) leads his march column into a nearby firing position, selects a range and azimuth from his map, and lays the base piece with a compass. A safety officer verifies the lay with his own compass. Meanwhile, the chief of firing battery sets up his aiming circle and begins to lay the rest of the battery. The XO announces a charge and quadrant to the base piece and the first round is fired. Using a bold correction, the fire support team chief makes his adjustment and requests fire for effect. Deflection and quadrant are recalculated. All six guns ram and fire a high explosive projectile. Rounds complete. End of mission.

yellow streamer on each of their vehicles, marking them as hipshoot champions. Div Arty Commander COL Gary L. Turner presented guidon streamers to each of the participating batteries, which were selected by competition within their own battalions. Battery C, 1st Battalion, 14th Field Artillery, finished third; and B Battery, 1st Battalion, 92d Field Artillery, represented the Division's 8-inch unit for demonstration purposes only.

The Hipshoot Super Bowl idea was conceived last year after Colonel Turner asked his S3, LTC Fred F. Marty, to develop a tool for improving Div Arty hipshoot performances. As S3, Lieutenant Colonel Marty was responsible for the competition's scenario and scoring, and, as current commander of the 1-16th, he can evaluate what hipshooting can do for a battalion:

> "I think this Div Arty is definitely better at hipshoots than it was 10 months ago. Right now I'd stack my Charlie Battery up against any unit in the army. A hipshoot allows a battery to get teamwork down and requires them to be proficient in technical skills. For an armored division artillery unit, that's the way the war's going to go. It's just teamwork, polish, and proficiency. The hipshoot is the best single indicator of a highly trained artillery unit."

For competition purposes, this single indicator is broken down into several components. The scoring system is simple: 70 points are awarded for speed, 25 for accuracy, and 5 for tactics. Six points are deducted for each absent howitzer, three points are lost for a missing M548 cargo carrier, and two points off for any other vehicle that fails to reach the firing point under its own power. (Howitzers called out for safety reasons affect only the accuracy score.)

As in the Army Training Evaluation Program (ARTEP), speed is determined by the amount of time required between the start of the observer's call for fire and the impact of the last round of fire for effect. One minute of safety time is built in to the scoring table (table 1).

Table 1.

Time	Score
6:00 or less	70 points
each 10 additional seconds	1 point deducted
11:00	40 points
each 6 additional seconds	1 point deducted
16:00	0

After the mission, the battery fires right by piece, and the impact for each round is determined. Accuracy is measured by the Allowable Radial Error (ARE) specified in the ARTEP. A battery placing all six of its rounds within ARE is given the full 25 points for accuracy; less accurate units are scored as shown in table 2.

The five points for tactics are distributed by Div Arty evaluators as listed in table 3. Each task must be accomplished for a unit to receive credit; partial scores are not given. (Firing data may be computed by the XO, by the fire direction center, or by both, but both must demonstrate such capability after the mission to earn full tactics credit.)

Five percent of the total score may not seem significant, but tactics often make the difference in

Table 2.

Rounds within ARE	Score
6	25
5	20
4	15
3	7
2	3
1	1

Table 3.

Tactical criterion	Score
Vehicle interval maintained throughout march column	0.2
Crew-served weapons distributed throughout convoy	0.2
Convoy kept moving all the way to position area	0.2
Movement into and occupation of position orderly	0.8
Battery XO identified azimuth of fire to howitzers	0.4
Howitzer spades emplaced before firing	0.1
Means other than voice used to lay/transmit commands	0.5
Base piece adjusted while remainder of battery laid	0.2
XO could compute corrections in absence of FDC	1.0
FDC ready to assume mission from FO by fire for effect	0.3
Remaining sections followed commands to base piece	0.2
All guns laid when XO announced fire for effect deflection/quadrant	0.3
Maintenance performed during lulls in firing	0.2
Remaining personnel/vehicles used for local security and hasty position perimeter defense	0.3
Position area improvement begun upon conclusion of mission, pending orders to move	0.1
TOTAL	5.0

"Hell's fire" belches from the base piece of C Battery, 1-16th FA, the winning battery in the 2d Armored Division ("Hell on Wheels") Artillery's second hipshoot Super Bowl. (Photo by LT Sandy Goss)

Speed counts, but so does accuracy and proper use of tactical considerations in scoring to determine the best hipshooting battery in the 2d Armored Division Artillery. (Photo by Jorge Ramirez)

Super Bowl competition; in fact, the 16th's 0.4-point winning margin resulted from tactics. "Over time," Lieutenant Colonel Marty says, "the guy that practices the best tactics will do the best in and out of all kinds of firing positions. Our guys followed good, sound tactical procedures all the way through. Tactics will be the determinant between two units that fire well; it won't make a mediocre unit a winner."

How does a battery train for the Super Bowl? 1LT David White, executive officer and coach of the winning team in both competitions, claims there's nothing magical involved:

> "We went out six times, concentrated on fundamentals — nothing fancy — and on section chiefs doing their thing. Everything we did was standard; we preorganized so that, no matter which direction we were coming from, everything was standardized. It was just preorganized execution, and after that everything was basic field artillery. Each time we'd go out, we'd set goals for speed and accuracy, and we wouldn't come in until we met them. We emphasized maxing the time, but not overmaxing it (going too far below six minutes). There were no shortcuts — just everybody performing their duties the way they should."

Only in fire direction does C Battery use an unusual technique. The battery is plotted at any grid intersection on blank chart paper; then the target is plotted along any grid line at the range determined by the XO. A target grid is set up over the target with the azimuth of fire set off on the gun-target line; the north-seeking arrow on the grid is now pointing north, no matter where it may point on the chart. If a pin is placed at north on the grid, the observer-target direction can then be set off and corrections plotted.

Other than that, there are no tricks in C Battery's method. "The big things are consistency and planning," Lieutenant White says. "The consistent battery will win."

Lieutenant Colonel Marty agrees. "The reason they're consistent is they know where they have to go, they go there, and they do it. I think the gun section chiefs in Charlie Battery know their jobs as well as any I've seen. They have an experienced XO and chief of firing battery, and their FO has good initial data. They've got their act together better than any battery I've seen, collectively as a team."

The major benefits of hipshoot competition, then, are improved technical proficiency, increased teamwork, and higher morale.

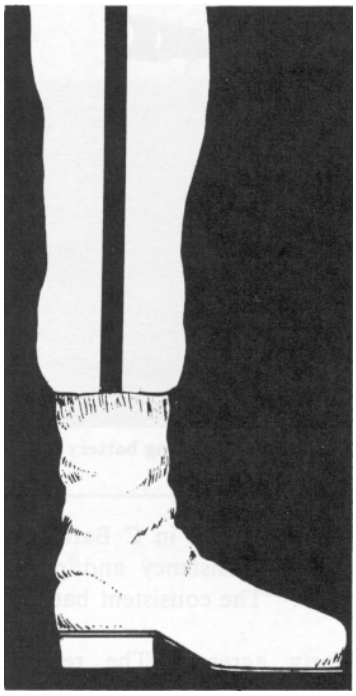
"The people really enjoy it," Lieutenant White says. "There's competition between the sections, and it gives the chief of section latitude to use his imagination."

"At the battery level," Lieutenant Colonel Marty adds, "this is something every soldier can identify with — the individual soldiers and section chiefs get more keyed up about this than about the ARTEP. This is a battery task, and they identify with the battery. The competitive aspect has really paid a dividend. Our guys consistently whip the ARTEP standards by three or four minutes."

With results like that, it is small wonder that Div Arty plans to continue hipshoot competition and perhaps challenge other units such as the 1st Cavalry Division Artillery. One thing is certain, however — like the Packers, the 1-16th will *not* win the first three Super Bowls. Not only will the competition continue to improve, but the 1-16th will be in Germany as a part of Brigade '75 when the next Div Arty hipshoot takes place.

1LT David Vogels is the fire direction officer in Battery B, 1st Battalion, 16th Field Artillery.

Redleg Review



SOLDIERS OF DESTRUCTION: The SS Death's Head Division, 1933-1945, by Charles W. Syndor Jr., Princeton University Press, Princeton, NJ, 1977, 387 pages, $22.50.

This case study of the birth, life, and death of one of Germany's most aggressive, powerful, and destructive Army elements deserves a place among the many unit histories, both domestic and foreign. The Shutzstaffel Totenkopf (SSTK) Division had its beginnings with the birth of the Third Reich. The division was an outgrowth of the concentration camp guard units, and many of the cruel and inhuman characteristics of these soldiers carried over into the SSTK.

One of the founders of the SS concentration camp guards and one of the first commanders of the infamous camp at Dachau, Theodor Eicke, organized the division just after the outbreak of hostilities in 1939. Eicke, for whom this book could well serve as a biography, showed a flair for innovation and a mastery of administration. A psychopathic, power-mad, cold-blooded devotee of National Socialism, he organized, trained, and produced a fighting machine that commanded the respect of his superiors in the SS as well as the Fuhrer himself.

Eicke demanded and got strict discipline. He drove the troops hard in training and would accept nothing less than perfection of execution. Initially estranged by the Army (Wehrmacht) for the conduct of the SS regiments during the campaign in Poland in 1939, the SSTK faced formidable obstacles in obtaining supplies and equipment during their early organizing days. To alleviate this problem, Eicke scrounged, begged, borrowed, and actually stole much of what he considered necessary to his training mission.

The author does a masterful job in documenting the growing pains of the SSTK and its baptism of fire in France and the low countries in the spring of 1940. During this campaign there occurred the first recorded combat atrocity committed by the Waffen SS. At Le Paradis, France, on 27 May 1940, an SS company massacred 100 British POWs who had surrendered when their ammunition ran out. The pattern was to be repeated again and again at places such as Tulle and Malmedy and in the reprisal killings on the Arno. Despite a thorough investigation, little, if any, consequence resulted for the perpetrators.

When Hitler decided to invade Russia, the SS played an important, if notorious, part in the initial successes. Despite its penchant for cruelty and atrocity, the SS fought gallantly and well. In the final stages of the Russian debacle, when the Germans suffered so many devastating defeats, the efforts of the SS in fighting rear-guard actions prevented these defeats from becoming humiliating routs.

On 9 May 1945, SS Brigadefuhrer Hellmuth Becker, the Division Commander (Eicke was killed in Russia on 26 February 1943), surrendered to the Third US Army. The Americans then turned the entire Division over to the Russians. Little is known of the fate of the officers and men after they were removed to detention camps inside Russia.

Professor Syndor does not accept the apologist's view that the Waffen SS functioned separately from the SS organization and was just another part of the Wehrmacht. He documents many incidents which clearly prove the connection in almost a direct line from the SS Reichsfuhrer Heinrich Himmler to the armed elements of the SS. The combat atrocities, the extermination of the Jews and other "enemies" of the state, and the brutality directed toward the Russian civilians cannot be but outgrowths of the SS system.

This book is copiously footnoted, perhaps even to excess. This reviewer finds the lengthy footnotes, some of which take up two-thirds of the page, somewhat distracting. The great amount of effort to compile this complete chronicle of a fighting element of the German Army is obvious. The author's style, in spite of the footnotes, makes reading this fine history most enjoyable. By presenting the facts without passing judgment, he allows the reader to make his own assessment and form his own conclusions.

The book is recommended for anyone studying German history and is a welcome addition to the many histories written about World War II.

COL (Ret) Howard F. Brown resides in East Greenwich, RI.

THE ENCYCLOPEDIA OF LAND WARFARE, edited by Ray Bonds, Salamander Books, London, 1977, 245 pages, £4.95.

This is another handsome military volume by the respected Salamander Books group. *Land Warfare* is a history of weaponry and military transport from the beginning of the 20th Century to the present and includes the latest mideast war, African unrest, and the street fighting in Ireland.

The board of editors, working with Ray Bonds, describe the major battles of the century and the strategic planning that preceded them. The readable text is enhanced by the generous use of color in the nearly 300 photographs, maps, and line drawings. — Ed.

THE RAND MCNALLY ENCYCLOPEDIA OF WORLD WAR II, edited by John Keegan, Rand McNally & Co., Chicago, 1977, 256 pages, $19.95.

A beautiful book compiled by a team of renowned military editors. The events, people, and major items of equipment are portrayed in encyclopedic format with alphabetized, concise summaries giving the impact each particular subject had on the war. For example, the first five listings under the letter W:

Waffen SS

Wainwright, Major General Jonathan H.

Walcheren, Assault on

Wallace, Vice-President Henry

Wallbuster shell

More than 300 quality photographs, drawings, and maps help make this a comprehensive one-volume reference of World War II. As with any encyclopedic work, this book provides the facts, uncluttered by an author's attempt to weave worldwide events into a cohesive narrative.—Ed.

THE TRAIL OF THE FOX, by David Irving, E. P. Dutton, New York, 1977, 495 pages, $15.00.

In this latest biography of Irwin Rommel, the celebrated Desert Fox, David Irving claims to have new information upon which he bases some new and startling conclusions about Rommel.

Irving points out that Rommel was stubborn and tended to see only one view of a battle, which nearly drove his staff to distraction. Irving also discusses Rommel's loss of control of his command during his frequent trips to the front where he often lost touch with his headquarters.

There is nothing new or startling in these revelations or those of Rommel's lack of appreciation of logistics, or his big mistake in not capturing Malta before pursuing the British into Egypt. Rommel convinced the high command that he could take Egypt without having to wait for the capture of Malta. With Malta interdicting his supply lines from Europe, his troops were strangled by a lack of reinforcements and supplies. All of these points have been brought out by Rommel's other biographers.

The new conclusion about Rommel is that even though he was not a loyal Nazi, he was still Hitler's "man" (he was the headquarters commandant of the Fuhrer's personal headquarters during the Polish campaign, and he owed all his promotions above colonel to Hitler).

Irving says Rommel was not a part of the anti-Hitler plot but misunderstood the approaches he received from anti-Hitler civilian and military leaders. Irving concludes, unconvincingly, that Rommel perceived the plot as a plan to remove Hitler from power and then negotiate a separate peace with the western allies.

Despite his shortcomings, Rommel was not stupid. It is inconceivable that he did not know what those trying to recruit him to the plot were talking about.

The book is well written and enjoyable — not the best biography of Rommel, nor the worst.

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Note: Both of the following reviews are by COL Warren E. Norman.

BRIDGE ACROSS THE SKY, by Richard Collier, McGraw-Hill Book Company, New York, 1978, 239 pages, $12.95.

By 1948, the gulf between Western and Soviet ideologies had widened to an abyss. The "liberated" countries of Eastern Europe had become nothing more than Soviet vassal states, while in Western Europe the Marshall Plan was defeating the abject poverty on which Communism thrives.

The Soviets made a deliberate attempt to bankrupt the German nation by grossly overprinting occupation currency and thereby spawning inflation. When the West countered by issuing a new, stable currency, the Soviets retaliated by closing all land routes to Berlin.

An airlift was conceived as a stop-gap measure. Few realized that the airlift could or would have to last for more than two weeks. However, the Russians were determined to make Berlin their city, and they knew that winter would be on their side. It became apparent to the Allies that the airlift would either succeed or the politically strategic city would be lost and its hapless citizens handed over to the Communism.

Bridge Across the Sky is the story of the Berlin blockade and airlift. The book is the product of careful research and superb writing. It is one of the most interesting histories that I have read. The author carefully reconstructs the events leading to the blockade and lets the reader live through the airlift as it happens. His factual account is a fitting tribute to the people who made the airlift a reality. This book should be a welcome addition to any library.

F4U CORSAIR AT WAR, by Richard Abrams, Charles Scribner's Sons, New York, 160 pages, 1977, $12.50.

The Vought F4U with its distinctive inverted gull wings was one of the finest propeller-driven fighters in history. Designed in 1938 and built around the world's most powerful radial engine, it first flew in 1940 and became the first US fighter to exceed 400 miles per hour in level flight. The Corsair was not without fault, however, for it stalled with little warning and had a tendency to bounce on landing. These difficulties, later corrected, were sufficient grounds for the Navy to deem the aircraft unsuitable for carrier service, and it went to war as a land-based aircraft flown by Marines. Conversely, the Corsair's merit as a fighter was never in doubt. Its pilots quickly gained air superiority in the South Pacific and achieved an 11.3 to 1 kill ratio over the Japanese, who regarded it as the best US fighter in the Pacific. Over 11,000 Corsairs were built during WW II, and it was one of the few aircraft to be produced in quantity after the Japanese surrender. The F4U was used extensively in the Korean conflict and then was assigned to reserve units until 1957, when it was retired after 16 years of service.

The history of the Corsair is traced accurately in the book, complemented with first-person accounts by the pilots who flew it. Included is a chapter by "Pappy" Boyington of Black Sheep fame, who scored 22 of his 28 kills in the aircraft. The book is interesting to an airplane buff and contains many facts, but one is left with the feeling that the style could have been more concise. There are 230 photographs which are individually excellent, but tend to become repetitious and in cases detract from the book's continuity. Apparently, the author completed 160 pages to conform to the format of other books in this series, but did not present sufficient material to do it comfortably.

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