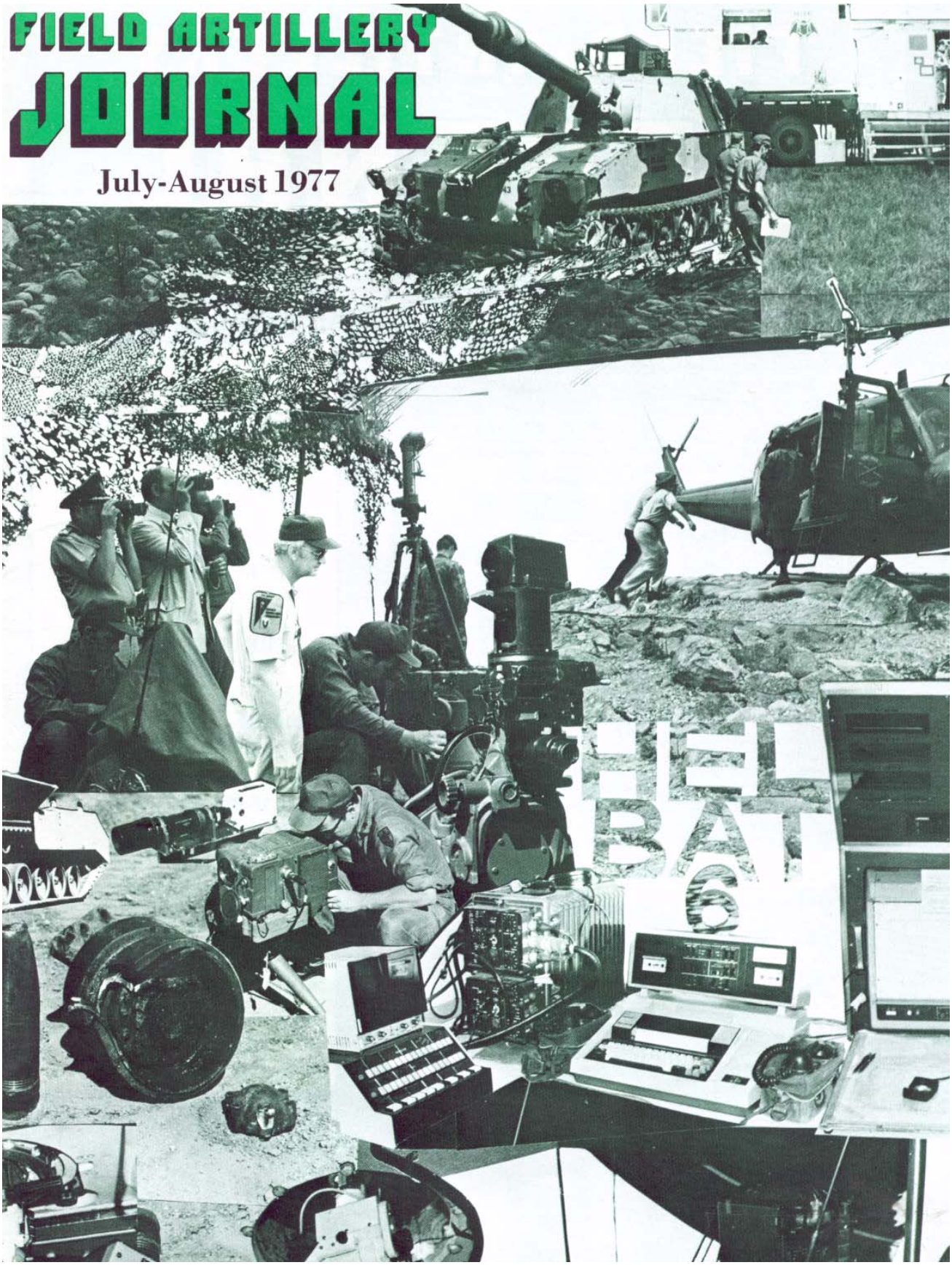
FIELD ARTILLERY JOURNAL

July-August 1977



FIELD ARTILLERY JOURNAL

Volume 45 **July-August 1977** **Number 4**

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

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

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

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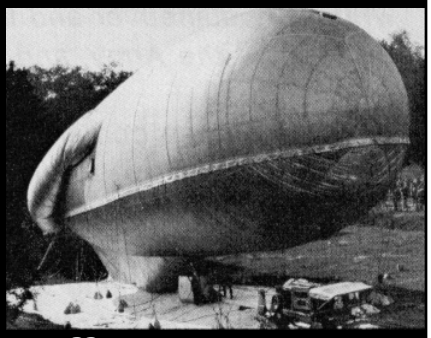

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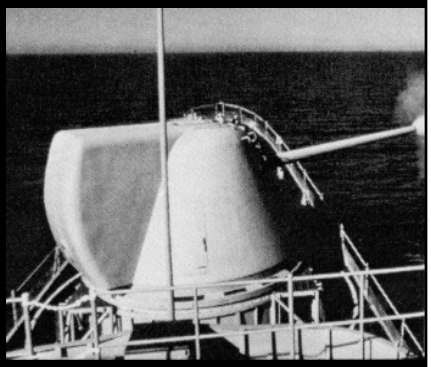

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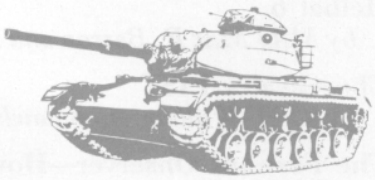


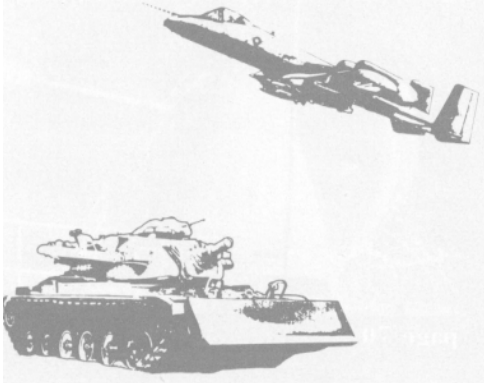
FM 6-20 IS COMING!

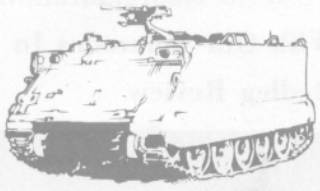
The final approved draft of FM 6-20, "Fire Support in Combined Arms Operations," the Army's capstone "How to Fight" manual for fire support, is now being distributed to Active Army maneuver and fire support units. This manual provides the first comprehensive treatment of the maneuver commander-fire support coordinator (FSCOORD) relationship and illustrates how to integrate all fire support into combined arms operations. It was written by maneuver and fire support personnel, with input from elements throughout the Army, and is designed for all members of the combined arms team.

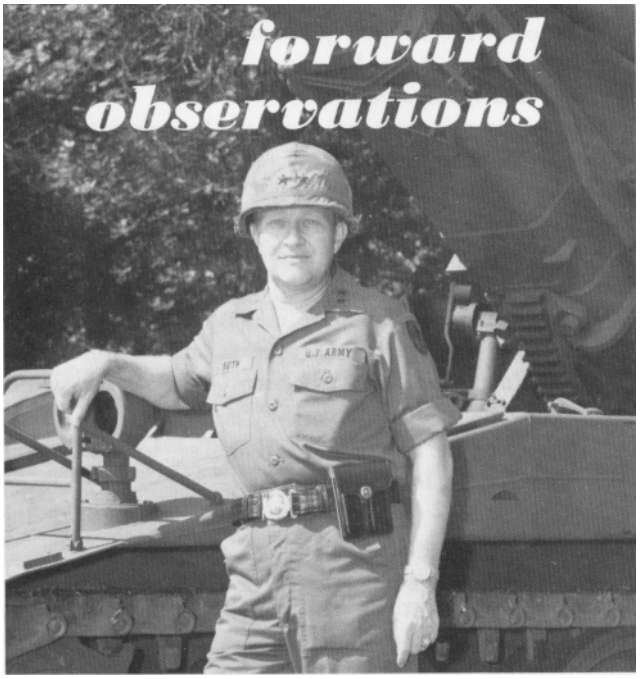
The doctrine contained in the final draft of the FM is approved by Headquarters, TRADOC, for instruction at TRADOC installations and for training in the MACOMs. The final approved draft will remain current until superseded by the official Department of the Army printing of the manual in late summer 1977. The DA printing will be announced by TRADOC message and will be sent to units, both Active and Reserve, through pinpoint distribution. If units do not receive the manual within 30 to 60 days from the date of the message, it may be ordered via DA Form 17, addressed through publications channels to: USA AG Publications Center, 2800 Eastern Boulevard, Baltimore, MD 21220.

FM 6-20 is not an FA tactics manual. Rather, it is the maneuver com mander's and FSCOORD's total fire support manual. FM 6-20 will be followed by FM 6-21, "FA Cannon Battalion," and FM 6-22, "Division Artillery, FA Brigade, and FA assigned to the Corps," which discuss tactics and operations for internal FA organizational use. Each manual will be "product improved" as the need arises.

Donald R. Keith
MG, USA
Commandant







by MG Donald R. Keith

The corps artillery, so familiar in past wars, has been phased out and replaced with a new structure, with new concepts for the employment of field artillery at this echelon. The new title for this level of field artillery organization is "the field artillery assigned to corps."

I want to discuss this change and its operational concepts, why it was necessary, and what the replacement structure looks like and can do.

Corps Artillery

The old corps artillery was not a fixed organization. It was flexibly tailored to meet the field artillery support needs of a US Army corps in combat. The number and types of FA battalions, control headquarters, and other elements varied from corps to corps and from day to day dependent on the mission assigned to a corps. This echelon of the field artillery was used by the corps commander to influence the combat actions anywhere within his zone of action by augmenting the fires of committed divisions while normally retaining some artillery in general support of the corps. A typical corps artillery is shown in figure 1.

The headquarters and headquarters battery (HHB) of corps artillery served as the control headquarters for this pool of field artillery resources. The HHB contained the assets needed to command, control, and coordinate corps artillery operations and to provide the assets needed to coordinate all corps fire support used against surface targets. A primary function of the corps artillery operations/intelligence section was to direct the corps counterbattery effort.

The field artillery target acquisition battalion (FATAB) assigned to corps artillery provided the needed target acquisition means, survey, and meteorological support for the corps artillery.

Headquarters and headquarters batteries for FA groups were used to assist in the control of corps firing elements. FA Groups were tailored by caliber and number of battalions for each situation.

Firing elements of the corps artillery were a mixture of cannon and missile battalions. These battalions were either attached to a group's HHB for control or operated under the direct control of the corps artillery headquarters. When directed by the mission of the corps, a searchlight battery was assigned for support. This organization provided a flexible system which worked.

This corps artillery, which reached its zenith of effectiveness in Europe during WWII, is being replaced with a new structure.

Why The Change?

The tempo of modern combat, as clearly seen on mideast battlefields during the 1973 war, has been dramatically quickened. As a result, the ability of a corps commander to directly influence the outcome of battle by responsive application of conventional fire support has been considerably lessened. Battles will be won or lost, quickly and decisively, at the division and lower levels before corps artillery, as currently structured, can responsively answer the demands for fire support. Since the corps artillery headquarters is too far removed from the battle to effectively control fire support, the division artillery must assume some of the tasks previously centralized at corps. One such important task is the counterfire effort.

The counterfire effort, both countermortar and counterbattery operations, is obviously most effective when centrally directed. Since the battle will be fought at the division level, then it is div arty which must have the counterfire responsibility in order to quickly and effectively react against hostile fires. Supported maneuver arms will also require a considerable increase in FA fires in close support

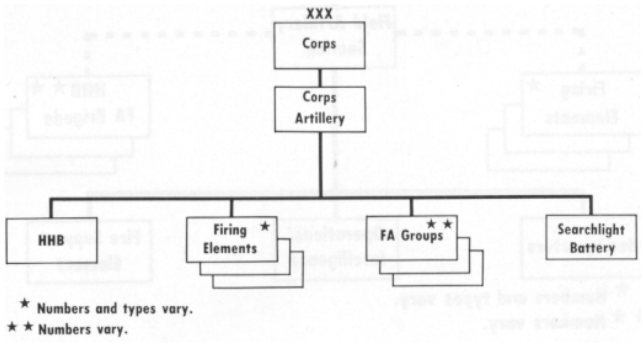


Figure 1. A typical corps artillery.

of maneuver in the face of hostile gunners and observers. To meet these responsibilities, the div arty must be given the necessary control means and target acquisition resources to react responsively and effectively. To provide the additional field artillery firepower for the division, field artillery assigned to the corps will be habitually assigned missions in support of divisions.

Where We Are Going

The following changes in corps artillery are to be effected:

• The echelon of the field artillery above division is redesignated as "the field artillery assigned to the corps."

• Headquarters and headquarters battery (HHB), corps artillery is being disestablished and replaced by the corps field artillery section (FAS).

• The FATAB has been eliminated.

The new structure for the field artillery assigned to the corps is shown in figure 2.

Besides the obvious differences in organization, the brigade HHB will be structured to allow it to control firing elements more effectively and to serve as a field artillery control headquarters under the missions assigned it by the division or corps. The resources from the FATAB were used to provide an organic target acquisition battery (TAB) within each div arty, and the corps FAS is being made organic to the headquarters and headquarters company, corps (TOE 52-2H).

One of the most significant changes is centered on the functions and organization of the new corps FAS. The corps FAS performs the following missions for the corps:

• Controls (for the corps commander) FA elements retained under corps.

• Supervises corps planning for the use of special ammunition (nuclear and toxic chemical).

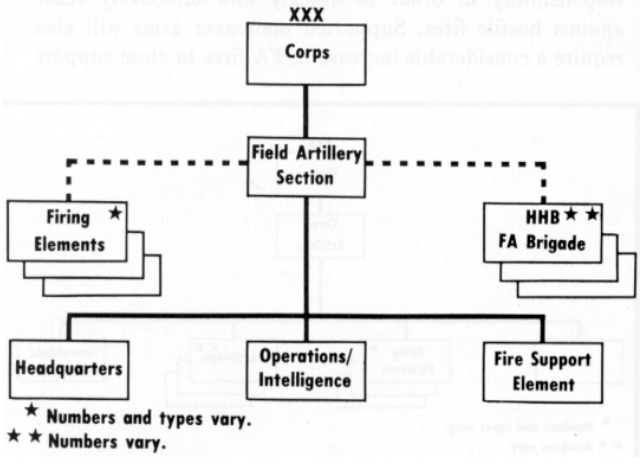


Figure 2. New structure for the field artillery assigned to corps.

• Performs fire support planning and coordination for the corps and executes FA fires using the field artillery retained under corps control.

• Develops and acquires targets through intelligence channels for corps fire support means.

• Recommends the organization and allocation of fire support assets.

• Advises the corps commander and staff on fire support matters.

• Coordinates with airspace managers.

• Prepares fire support documents and records.

• Coordinates the Army's portion of the suppression of enemy air defense for the corps.

To perform these functions, personnel are provided in the FAS organization for the following:

Headquarters — Serves as the office of record for the FAS.

Operations/Intelligence — Serves in lieu of a field artillery tactical operations center (TOC) or fire direction center. The operations intelligence section directs the support effort of those artillery elements retained under corps control. It uses the HHBs of FA brigades to assist in controlling firing elements, working closely with the corps fire support element (FSE).

FSE — Operates within the corps TOC and is concerned with planning, coordinating, and executing all fire support expended on surface targets. It collocates all representatives immediately concerned with fire support operations of the corps, thus enhancing responsiveness, the exchange of information, and unity of effort.

In certain combat situations, the corps commander will elect to retain *some* of his assigned field artillery immediately responsive to his needs. The FAS will control these assets. This "hip-pocket" field artillery may be brigades, battalion groups, or separate firing battalions. Brigades retained in general support of the corps assist the FAS in controlling its firing elements.

Targeting data are obtained by placing personnel in the corps "all-source" intelligence facility and by predicting target locations. Intelligence representatives from the FAS in the all-source facility feed target data to both the FSE and the operations/intelligence element.

The new "FA assigned to corps" with its FAS, brigades, and firing elements is more in keeping with today's combat needs. This echelon of the field artillery can better augment division artilleries while still meeting the fire support requirements of the corps commander. It places FA resources where they can do the most good and provides the div arty with the augmentation to meet its expanded role. Finally, it affords the flexibility to alter brigade organizations to meet changing combat situations.

Department of the Army has approved all elements of this reorganization except the details of the proposed brigade TOE. We expect that approval soon.

INCOMING

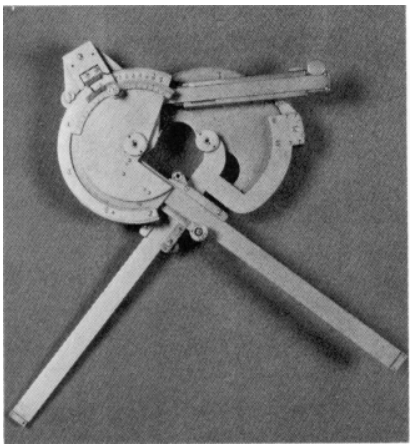
letters to the editor

"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

Was Ist?

Perhaps you or your readers could help me in identifying the device in the enclosed photographs. The device was used during WWII in a German unit, believed to be some type of an 88 unit. It is made of stainless steel. The circular scales are graduated in mils. There are slipping scales on the obverse of each circular scale as well as movable indexes. In addition, the bottom circular scale has a sliding scale and a movable index on its reverse. The arms are graduated in meters at a scale of 1:25,000. The whole device is 14" long. The circular scales are 5" in diameter. My guess is that it is either a device used in the determination of firing data for anti-aircraft pieces, or a direct fire device used in an anti-tank unit.

Charles E. Gettig, Jr.
MAJ, FA
US Army Readiness Group
Fort Douglas, UT



Should any of our readers recognize or know about the above device, the ***Journal*** *would appreciate hearing from them. —Ed.*

White Bag GFT Setting

As we all know, interpolation is very time consuming and if we have to interpolate, valuable time is lost.

One example of required interpolation is when firing white bag (WB) powder under charge 6. This is very time consuming considering the suppressive fire responsibility of field artillery.

In a classroom environment, if charge 4 or 5 is fired, green bag (GB) firing data is just naturally used. But in an actual situation, even live fire training situations, it is not uncommon to fire charge 4 and 5 WB powder.

Last year, while computing safety data for some firing points, (both WB and GB data), the time consuming interpolation became very apparent. Due to necessity, you might say, I discovered a very easy solution to the problem. It is what I call a "white bag GFT setting on a green bag GFT." You simply put the manufacturer's hairline on a medium range for charge 4 or 5 on the GFT (e.g., range 4000 for charge 4). Then enter the TFT, charge 4 WB and extract the elevation (206) to the nearest mil and the time (13.2). Use this elevation and time just as an adjusted elevation and time for a registration and apply them as a GFT setting. Now, for almost any range, you can read WB data off the GB stick within an accuracy of 1 mil and a time to 0.1 second.

For complete accuracy, a two-plot GFT setting can be applied, for example, use ranges of 3000 and 6000 for charge 4. Go to the WB tables at these ranges and extract elevation and time and apply a two-plot using the procedure listed above. This simple procedure only takes 1 to 2 minutes to perform and eliminates the requirement to interpolate. WB data can be fired off the GFT for charge 4 and 5 just as fast and just as accurate as GB. You can register using this "TFT" GFT setting and obtain a registration GFT setting, which then can be applied to the GFT in lieu of the WB TFT GFT setting.

We have been using this procedure in our battalion for more than a year and it works perfectly. I may not be the only one who has thought of or used this procedure, but I have talked to several Active Army and NG Battalions and none of them have ever used it.

Roger L. Shields
CPT, FA
MS ARNG

The Gunnery Department found your idea of sufficient interest to conduct both analytical and live fire evaluations. While not embracing the idea as doctrine, there is no reason not to use the procedure. Tests here at Sill with both the one plot and two plot methods yielded accuracies to 1 mil. Thank you for the input. —Ed.

ARTEP Feedback

Your editorial on ARTEP (March-April 1977) was very thought-provoking. You have outlined the two schools of thought concerning ARTEP very well.

In my opinion one of the best things about ARTEP is that it is flexible enough to encompass both viewpoints. It is a diagnostic tool that the commander uses to determine strengths and weaknesses. It is also a formal evaluation that the unit receives on a regular basis. This formal evaluation is important because it is one of the few times that the commander has the

opportunity to operate with his unit as a unit. In that regard the formal evaluation also serves as a diagnostic tool in evaluating how well the entire unit adjusts to the uncertainties of combat.

The "gut" issue is what is done with the results of the formal evaluation. If we demand perfection and then evaluate the commander on how well he meets that goal, then we have lost the real value of "the most valuable and most realistic training tool to come down the road in decades."

Your editorial has served to point out this pitfall and, hopefully, will help us avoid this trap.

In closing, all members of my battalion look forward to receiving the *Journal*. I may be slightly parochial, but I consider the *Journal* the best in its field. Keep up the good work.

Dennis J. Reimer
LTC, FA
Commander, 1-27th FA

As a junior officer, it was with pleasure and some amazement that I read your editorial in the March-April issue concerning the ARTEP and training. My experience leads me to believe that you will receive a very vocal response to the effect that no problem exists and that all units are using the ARTEP as it was intended. I would be willing to bet that the response is primarily from senior officers.

The last great bastion of the "we need to test our units" is alive and well in the ranks of the middle managers. These are the guys who were brought up on the old annual ATT and haven't yet realized that there is a better way. Unfortunately, this "it was good then — it's better now" philosophy is present in too many of our senior commanders. They associate test with training to the extent that the word "train" appears only infrequently in their conversation or correspondence.

One sometimes wonders if they genuinely believe that their efforts really contribute to training or if they just want a tool with which to rate their subordinates.

The dangers inherent in a periodic, cyclic test (peaking, training to pass the test, not perform the unit mission, etc.) have been documented and published. The resources that are wasted on a full-scale battalion test that could have been spent training are close to criminal. The results of the test (combat ready) are generally translated into a readiness status and reported to the world. It is not surprising that a War College study found that the readiness report was generally a sacrifice of the commander's integrity, took undue advantage of loopholes in the regulation, and were generally not indicative of the unit's actual status.

Hopefully, as the education of these officers continues, training will receive a higher priority. Perhaps, then, the chain of command will be able to express some interest in training the year round, and not just for the annual orgy of evaluation.

Jonathan M. Osborn
CPT, FA
Fort Sill, OK

Congratulations on your "Editors Notes" article on the ARTEP in the March-April issue. After watching the ARTEP develop, and knowing the basic underlying philosophy, your article hits the heart of our training problem.

The misuse of the ARTEP is very discouraging.

Training time in a battalion is a precious commodity. The ARTEP was designed to make maximum use of that precious commodity. Unfortunately, many commands have used the ARTEP as an excuse to conduct yet another exercise (demonstration/show) called "evaluation" that uses a vast amount of expensive ammunition, training time, training areas, and maintenance support, while providing a minimum of training.

Many units are actually requesting more ammunition, "because we have to do a battalion evaluation before we take the group evaluation, which is conducted just prior to the corps artillery "evaluation."

The underlying problem is that most commanders are afraid to allow their subordinates the flexibility of performing "on their own". The ARTEP and Soldier's Manuals stress getting the section chief back into the training business. He is the one who knows what he needs to train, to accomplish. You cannot expect the section chief to make decisions and function effectively, if you stifle his initiative and direct his every move.

We need to publicize the fact that proper use of the ARTEP will make a better trained unit and develop the leadership ability of the battery level commissioned and noncommissioned officers.

Philip W. Holden
CPT, FA
Fort Sill, OK

Your candid remarks in the "Editor's Notes" of the March-April 1977 issue are to be applauded. I refer, of course, to your views on the ARTEP.

You are right — absolutely right! Unfortunately, the "don't rock the boat" coalition is probably banging down the door to your office at this very moment. But so be it.

We try very hard around here to get the old "pass or fail" syndrome out of the minds of the commanders. Articles, such as yours, help tremendously.

James C. Ewald
LTC, IN
Wisconsin National Guard

The preceding comments are appreciated. The comments in the "Editor's Notes" of the May-June issue still pertain, as does the editorial response to the Guffey and Neal letters in "Incoming" of that issue.

The Annual FORSCOM/TRADOC Conference was held at Fort Sill 24 and 25 May. The commanders of FORSCOM and TRADOC as well as most division commanders were among the 100 General Officers in attendance. The subject of the Conference was training, and the ARTEP came up numerous times. On every occasion, the participants who spoke including General Kroesen voiced their firm position that the ARTEP is a valuable diagnostic tool and an indispensible component of their overall training programs. —Ed.

105 Booster

Bigger is better. This seems to be the thinking today. In the January-February *Journal* we read "I see no role for the 105-mm on the future battlefield," a comment from a retired senior commander. In the March-April *Journal* we

read "Most NATO forces in Northwest Europe, Canada's included, equip their artillery with the M109 155-mm self-propelled howitzer . . . . I have even heard infantrymen express the opinion that the gunners aren't providing the best support available when all we can deliver are 155-mm weapons." — quotes from the excellent article "Which Weapon" by MAJ G. J. Oehring, FA — Canada.

The quotes alone concern the discussion taking place as to the optimum caliber for divisional artillery to accomplish its primary mission — the close support of infantry. The most important type of fire by far for this mission is *neutralization* as opposed to *destruction*.

Neutralization fire requires first a high rate of fire to produce a lethal blanket of fragments over the target area, and, secondly, a small enough radius of splinter coverage plus small probable errors to permit the troops to "close" when fire is lifted before the enemy can react. The 105-mm can fire three rounds per gun per minute as opposed to the one round per gun per minute for the 155-mm. Troops can advance to 250 yeards of 105-mm fire as opposed to 500 yards for 155-mm fire. Obviously only the 105 is suitable as the primary caliber for infantry support.

This will apply wherever infantry units are employed.

Hence our present decision to equip the div arty of armored divisions with 155s only is *unsound*.

The "bigger is better" crowd have only to study history — the history of decisive artillery support in some of the bitter battles in WWI and WWII, to realize the effectiveness of the smaller caliber support.

I can only ascribe the present illogical thinking to a lack of combat experience against a first class enemy by those concerned.

Let's hope that those charged with the restructuring of our divisions do not think "bigger is better."

R. P. Shugg
Brigadier General
USA (Ret)
San Francisco, CA

Your points are well taken in the never ending dialogue over the "most effective caliber." However, the much greater frontages and the anticipated threat composition of a modern war demand the range and munitions available only with the 155. You can be assured that the Field Artillerymen watching the division restructure tests are not prejudiced in favor of "bigger is better." —Ed.

Nuclear Training

Major O'Donnell's letter on Nuclear Training (*FA Journal*, March-April 1977) was right on target. The changes that he advocates in clarifying regulations and requirements to permit realistic mission accomplishment, reorienting evaluation (read NSI) emphasis to test peacetime mission performance and wartime mission readiness independently, and providing realistic doctrine on how nuclear operations will be conducted (FM 100-50) have been needed for years. Thankfully these changes *are* coming. For too many years, units were able to pass a TPI and an ATT that were conducted as entirely separate and isolated entities. In reality, many of these units could not have performed their nuclear tactical mission if they had been required to do so. For too many years, commanders have had to live in fear of failing an NSI and risking relief because of an insignificant deficiency that would have to be tolerated in a combat situation.

The draft of FM 100-50 goes a long way toward meeting the needs of the nuclear unit in the field. Such statements as "Units must train as they fight" are scattered throughout and set the general tone of the manual. There are still vestiges of the old TPI criteria, though. It is implied that units must maintain a nuclear duty position roster in combat, even though an earlier paragraph admits that the strict administrative requirements for the selection and retention of soldiers in nuclear duty positions may not be possible. Field storage location (FSL) guards are required to have a formal entry control roster, except in an emergency. But a basic premise stated early in the FM is that when a unit has deployed to an FSL, it is assumed to be in a tactical wartime readiness posture. What then is an emergency? A final example of wording that needs refinement deals with movement of nuclear weapons in a tactical situation. The statement that "Weapons convoy vehicles will be inspected to insure that, as a minimum the vehicle is free of electrical or mechanical defects which would prevent safe arrival" is so cleverly worded that an inspector or evaluator can interpret it any way he wants to, while the unfortunate courier officer who must decide whether or not to accept the vehicle is left to his own best guess. A familiar situation? If you have been a courier officer on an NSI, it is. Since the guidance in the first FM 100-50 will be with us for a long time, it is imperative to make sure the wording gives the tactical commander the latitude he needs while establishing realistic controls and custodial standards.

Hopefully, a new dawn is rising.

Thomas B. Sharratt
MAJ, FA
570th Arty Gp
APO New York

Where Are "C" and M/m?

I recently looked at FT 105-H-7, a new firing table for the 105-mm howitzers. There is a problem in that I cannot find two old friends in Table F — the "C" factor and M/m which used to be in columns 3 and 5.

"C" is handy if you do not have a GFT or FDC and are adjusting by plotting board. Personally, I would rather have a GFT *and* a plotting board if there is no FDC. The "C" factor was an important part of the "Liaison Method of Conducting Fire" prior to Pearl Harbor.

M/m is useful in obtaining position corrections for opening or closing sheafs.

Why not leave some things alone. I will never get used to "shot" versus "on the way."

How about some articles on the liaison method of conducting fire; pack, horse, and horse-drawn artillery; and the *Grand Puissance Filloux* (155-mm gun, M1918 GPF) while some wonderful guys are still around?

George A. Rentschler
MAJ, USAR
Philadelphia, PA

Your old friends are still there — one has a new name and another you have to work for. Meters/mil is in column 5 which is now called "dr per 1 mil d elev" or change in range per one mil change in

elevation. To get the "C" factor, find the reciprocal of the number in column 5, or take the difference in elevations 100 meters short or 100 meters over your entry range.

On your comment regarding "shot," there are several older Redlegs who agree, but this was done to shorten radio transmissions and standardize fire terminology among several of our allies.

Regarding your last item on writing about our proud history, the ***Journal*** *considers articles on our heritage to be a very important, even essential, part of every issue. The invitation is always open. —Ed.*

FA Brigade Insight

Colonel Coleman's article, Field Artillery Brigade (May-June issue), was thought-provoking and illuminated the changing needs for field artillery support on the modern battlefield. It points out how this new FA organization can reinforce a division artillery, serve as a force FA headquarters, or provide direct and general support fires.

The Brigade is of particular interest to the Tactics/Combined Arms Department as we are currently developing FM 6-22, "Division Artillery, FA Brigade, and FA Assigned to Corp." Concept papers on the FA Brigade, as well as the Corps FA Section, are being completed and should be in the field shortly.

There are several areas in Colonel Coleman's article which I feel require additional discussion:

The FA Brigade has not been approved by Department of the Army yet. This approval is anticipated during September 1977.

The FA Brigade may be assigned a direct support (DS) mission by a division to which it is attached. However, to meet all the responsibilities inherent in this mission, the firing battalions of the Brigade require certain non-organic assets such as fire support teams (FISTs), fire support officers (FSOs), and fire support element (FSE) resources — communications and others. The division assigning the DS mission must make the needed arrangements for these. One way to do so is to attach the normal DS field artillery battalion to the brigade. This keeps the FISTs and FSOs in place and maintains established fire support relationships. It keeps the same field artillery liaison intact.

The missions of the Brigade in support of offensive and defensive combat actions reflect the degree of field artillery control desired by the parent force (corps or division) headquarters. A force commander is usually more prone to relax control of his field artillery during offensive operations. Using tactical missions of general support and general support reinforcing, he retains a greater degree of responsiveness from his field artillery during the defense.

The headquarters and headquarters battery (HHB) FA Brigade, can serve as an alternate HHB for short periods. While the Brigade does not possess the same resources as a div arty, it can use expedient means to serve in this role. The FA Brigade does not have the organic target acquisition battery found in a div arty, but does have air observers. Additionally, the Brigade has its own tactical operations center and can form an FSE using its liaison section of two liaison teams.

We are in agreement with Colonel Coleman that the new FA Brigade, when approved, will be a welcome addition to the field artillery arm. It will afford additional flexibility and command and control in meeting the challenges for field artillery support for modern combat forces.
Giac P. Modica

COL, FA
Director, T/CAD
Fort Sill

Chatham Artillery

The article by MG (Ret) George Ruhlen entitled "Firepower and Punch" (March-April 77) gave the recipes for several varieties of artillery punch, one of which was our Chatham Artillery Punch.

We of the Chatham Artillery take great pride in the fact that we have delivered artillery firepower for over 190 years, and we're also tremendously proud of the potency of our punch for almost as many years.

The anniversary of the Chatham Artillery is celebrated on the first Saturday of May each year at a formal military ball with some 500 members and guests attending. A considerable quantity of our version of artillery punch is enjoyed at this and other similar social events.

I very much enjoyed General Ruhlen's article and appreciate the mention of our unit and the printing of our recipe. Hopefully, others will try our version of artillery punch and will be just as pleased with its smooth, yet exciting flavor. May I respectfully also point out that in 1968, due to reorganization of the Georgia National Guard, the active units of the Chatham's became HQ and HQ Btry, 118th FA Gp, Georgia Army National Guard, Savannah.

Dempsey Q. Logue
CSM
118th FA Gp
President, Chatham Artillery

Wrong Wrench?

When I received the March-April *Journal*, I came across the article on the new XM36 electronic fuze setter, and was very impressed. I turned to one of my co-instructors and said, "Wouldn't you know the Army has everything — we're still using the mechanical fuzes and the mechanical fuze setter."

Then, I came across the item on the 24th Infantry Division Artillery Retraining Academy on page 16. In the caption, the instructor is supervising a student on setting a time fuze. It looks like they are using an M16 fuze wrench. The Marines may not have electronic fuzes and fuze setters, but we do have the XM34 and M63, which are the correct fuze setters for time fuzes. If I am wrong about the instructor using an M16 fuze wrench, which is for a concrete piercing fuze *only*, please let me know what new fuze wrench they are using.

W. B. Hagenswold
CPL, USMC
Artillery Instructor
Camp Pendleton, CA

The instructor pictured on page 16 of the March-April issue has been reassigned to Europe, so we cannot determine what was taking place. An expert on fuzes examined the photo closely and is of the opinion that the instructor may well have been using the M16 wrench as a fuze setter. This practice is incorrect. Only authorized fuze setters should be used for setting fuzes.

With eyes as sharp as yours, it is understandable why the Marines only need "a few good men." —Ed.

HELBAT 6

by MAJ Max R. Barron and Mr. Gary L. Horley

Where do errors exist in the field artillery system, and how do we eliminate them? How can the system become more responsive and accurate? What new doctrinal or materiel concepts will allow the system to become even more effective on the battlefield of the future? Human Engineering Laboratory Battalion Artillery Tests (HELBAT) are designed to answer these questions. As reported in previous editions of the *Field Artillery Journal* ("HELBAT Connects," May-June 1974, and "HELBAT 5," November-December 1975), HELBAT is a continuing program of field artillery studies and field experiments involving elements of both TRADOC and DARCOM — the primary agency within TRADOC being the Field Artillery School (USAFAS), and the primary agency within DARCOM being Human Engineering Laboratory (HEL). The joint nature of the HELBAT program allows the combat developer and the materiel developer the opportunity to examine new materiel and doctrinal concepts early in the development cycle to gain a better understanding of how to increase the effectiveness of the field artillery system as it exists and as it may be in the future. As a basic research and exploratory development program, it is not tied directly to any particular materiel development program. USAFAS views HELBAT as a test bed for the evaluation of conceptual operational doctrine, procedures, and materiel.

Since HELBAT's inception in 1969 as a study by HEL to measure the frequency, source, and magnitude of human error in the field artillery system, the field experiments have evolved into an examination of the automated battlefield of the future where target acquisition means, fire control centers, and firing elements are fully integrated by virtue of automatic data processing and digital data communications. HELBAT 5, conducted in May-June 1975, demonstrated the feasibility of a closed loop fire control system in which real-time continuous feedback on round and target locations was provided to the system. HELBAT 5 data-linked a forward observer's laser rangefinder to an

automated battery-level fire direction computer. As one of its key features, the computer contained a moving target prediction capability that enabled it to predict intercept points of moving targets based on target lasings, and then rapidly generate firing data and transmit it to howitzer sections where it was visually displayed at the weapon. The entire process used digital data communications rather than voice communications. The system demonstrated capabilities, particularly in accuracy and responsiveness, that have previously not existed in the field artillery system.

Admittedly, the system used in HELBAT 5 was optimized and was one in which some aspects of battlefield realism were lacking. For example, the forward observer (FO) had no means of informing the battery-level computer as to the nature of the target. Further, the system relied almost totally on wire communications (not tactical radio communications) from the FO to the battery-level computer. The concept of closed loop fire control had been tested successfully in HELBAT 5; yet more realism was required to give credibility to the concept and answer important questions being asked by the combat and materiel developers.

In July 1975, USAFAS formulated a list of priorities for doctrinal and materiel concepts for examination in HELBAT 6 field experiments and presented the list to HEL. These priorities were:

- TACFIRE/automated battery-level computer interoperability.
- Firing data displays/intrabattery communication.
- Further investigation into closed loop fire control to include target acquisition devices, a digital message device (DMD) the tactical fire direction system (TACFIRE) an automated battery-level computer, and firing data displays.
- Cannon launched guided projectile (CLGP) doctrine.
- Firing battery laying system.
- Forward observer vehicle (FOV).
- Fire direction center vehicle.
- Automated howitzer test bed.

Based on the list of USAFAS priorities, two broad objectives for HELBAT 6 were established:

- Continued investigation into closed loop fire control, incorporating TACFIRE and developmental target acquisition devices into the system.
- Investigation of firing battery operations, focusing on rapid battery laying.

Detailed planning for the experiment began shortly thereafter, and a tentative time period of fall 1976 was selected for the test. HEL would be responsible for overall test integration, while USAFAS would make arrangements for troop support and a test site. Two items of equipment on the USAFAS priority were not available for examination; these were a conceptual fire direction center vehicle and the automated howitzer test bed (a test bed being fabricated for Armament Research and Development Command that will allow examination of several levels of howitzer automation, now scheduled for evaluation by the Field Artillery Board beginning July 1977).

FO lases target using ground/vehicular laser locator designator. Camera mounted on G/VLLD nightsight records data for simulated cannon-launched guided projectile.

TACFIRE

TACFIRE is the field artillery's new automated command and control system — an integrated system of computers, input/output devices, digital data storage and retrieval units, graphical displays, control consoles, and other equipment. TACFIRE is designed to perform automatic data processing associated with a number of field artillery functions, those of primary importance to the HELBAT 6 test being technical and tactical fire control. Arrangements were made with the TACFIRE Team, Directorate of Combat Development, USAFAS, for the use of one battalion TACFIRE set during a two week-period of the test. Because of heavy TACFIRE training commitments, the battalion set had to remain at its training site in Knox Hall, Fort Sill, thereby requiring that a radio relay be established to communicate from the testsite to the TACFIRE set — a distance of approximately 22 kilometers.

Battery-Level Computer

Frankford Arsenal's automated computer was used in HELBATs 4 and 5 and has a portion of the capabilities of the battery computer system (BCS) now under development which will extend automatic data processing to the battery level. Software and hardware modifications were made for

HELBAT 6 to allow the computer to interface with TACFIRE. Also, new firing data displays were fabricated. In addition to the chief of section's display (which showed piece to follow, charge, fuze setting, deflection, and quadrant), two new displays were introduced. The gunner's display showed only deflection, while the assistant gunner's display showed only quadrant.

Data Automation Device

The DMD is a small, lightweight, data automation device that allows transmission and receipt of digital messages over both tactical radio and wire communications. The DMD will be employed in TACFIRE as the FO's input/output device and features automatic prompting of the operator for message composition. Two models, straight off the production line, were made available for the test by Army Tactical Data Systems.

Ground/Vehicular Laser Locator Designator (G/VLLD)

Two engineering development models of the G/VLLD were made available by Missile Research and Development Command. The G/VLLD is a ground and vehicular mounted laser designator to be used for marking hard point moving or stationary targets with a laser signature. It is designed to be used with laser terminal homing weapons, to include the CLGP. The G/VLLD provides accurate range to a target and measures both horizontal and vertical angles to a target. Direction to a target is attained upon referencing the G/VLLD to a known direction. It has the capability of tracking moving targets and automatically providing target data to a DMD. The G/VLLD has operating modes for both ranging and designating. In HELBAT 6, the ranging mode alone was used.

Conceptual FOV. One member of FO team lases target with laser rangefinder on HEL's precision target locator while another operates digital message device.

AN/GVS-5 Laser Rangefinder

An AN/GVS-5 laser rangefinder was made available by Electronics Command. The AN/GVS-5 laser rangefinder would be mounted on a precision target locator (PTL) provided by HEL. The PTL is a viscous-damped tripod, with shaft encoders for azimuth and elevation, and has tracking capabilities similar to the G/VLLD.

AN/TPQ-36 Mortar Locating Radar

The AN/TPQ-36 radar can automatically detect and track hostile projectiles to determine their point of origin. It can locate hostile mortars, other high-angle fire weapons, and short-range rockets. The radar interfaces with TACFIRE, and can register and adjust friendly indirect fire. Because of a heavy developmental testing schedule, only one radar was available during the test.

The key phrase for the HELBAT 6 test was "first time integration." The lash-up between TACFIRE and the AN/TPQ-36 radar which had never been examined in a field environment, now had the linking of the laser, DMD, TACFIRE, and automated computer. Views from the Field Artillery community indicated that the integration of these systems worked fine *on paper*, but how well would they operate in a field environment? What shortcomings would be uncovered? What new operational procedures would be needed to fully exploit the new technology incorporated in the systems for successful use on the battlefield of the future?

The Test

On the morning of 29 August 1976, approximately 50 soldiers convoyed from Fort Sill to Quanah Range to begin a three-week training period in standard forward observer, fire direction, and firing battery operations. Efforts had been made during test planning to keep test support requirements to a minimum while still insuring that the test mission was accomplished. To that end, weapons to be used during HELBAT 6 initially consisted of only two howitzers — one 105-mm M102 and one 155-mm M109A1. Later, two mortars and a 105-mm M101A1 howitzer were acquired to be used as the "hostile" weapons for detection by the AN/TPQ-36 radar, and another M102 and M109A1 were acquired to be used in an examination of a system which features rapid lay of a battery.

Personnel and equipment from HEL and Frankford Arsenal began arriving during the week of 13 September. In addition to establishing the test control and communications center, HEL provided training to the FO parties on some of the new equipment that was to be used during the test, to include the AN/GVS-5 laser rangefinder and the G/VLLD. HEL also provided training to crews on how to operate three modified M103 tanks, to be used as target vehicles. The two-week period from 13-26 September was one of intensive preparation. An extensive data collection program was put into effect. Flash teams were positioned around the range area to observe and record all rounds fired during the test. An AN/TPS-58 moving target locating radar was positioned to record the path of the manned target vehicles as they moved through the impact area. Advanced development models of the G/VLLD were located at several vantage points to serve as an independent means of determining the locations of targets and bursting rounds. Velocimeters were mounted on the two howitzers so that accurate muzzle velocity data could be collected throughout the test.

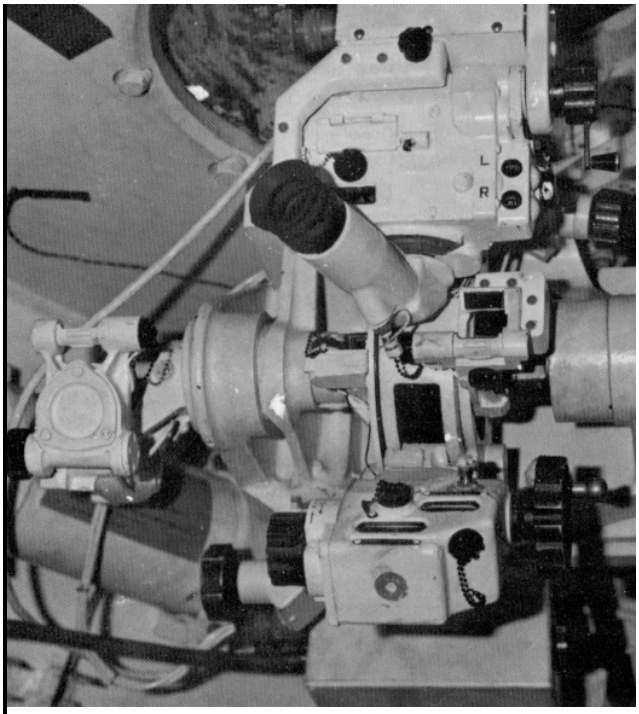
HELBAT 6 missions began on 26 September. Before the final day of testing on 13 October, data were collected on 200 missions of 17 different types. Four basic types of observed fire missions were conducted.

• During one type mission, conventionally equipped FO teams located stationary targets and adjusted fire on them, with a FADAC FDC computing firing data.

• A second type mission involved an FO team, equipped with a G/VLLD or an AN/GVS-5 laser rangefinder mounted on the precision target locator. A stationary target was lased, and the target information (range, azimuth, and vertical angle) was input automatically to a DMD by the G/VLLD or AN/GVS-5. The DMD was connected by cable to a tactical radio. A request for fire was then transmitted by radio to the HELBAT computer using digital data communications. The HELBAT computer generated fire commands and transmitted them over wire to firing data displays located at each weapon.

• A third type of mission was conducted in much the same way as the second type, except that the request for fire was addressed to TACFIRE. TACFIRE then generated fire commands and transmitted them to the weapons through the HELBAT computer. Fire commands for subsequent rounds were generated in one of two ways: TACFIRE could continue to provide the technical fire control or "pass off" the remaining technical fire control to the HELBAT computer.

• The last type of observed fire mission involved attack of a moving target. The process was similar to that described in mission type two, except that the HELBAT computer predicted future target positions based on past target locations and took into account gun crew reaction time and time of flight. It then generated fire commands and transmitted them to firing data displays. The sequence of lasings in the last three missions involved several on the target itself, then alternately on the target and bursting round until fire-for-effect was achieved, and then finally on the target alone in the fire-for-effect phase. For the moving target missions, special 105-mm inert projectiles with spotting charges were fired at the modified M103 target vehicles. The turret and main gun had been removed from the vehicles, and armor plating, sufficient to provide safety for the two-man crew, had been installed.



Instrumented M109A1 panoramic telescope, part of weapon error measurement system. Four pairs of indicator signals provide feedback to gunner on errors in deflection setting, sight picture, and level and cross-level of panoramic telescope mount.

Four basic types of missions were conducted using the AN/TPQ-36 mortar locating radar. The AN/TPQ-36 radar acquired an artillery or mortar target firing and digital information was then sent from the radar by tactical radio to TACFIRE or the HELBAT computer. Fire commands were generated and sent to firing data displays on the howitzers, and rounds were adjusted by the radar onto a preselected "enemy" position into the impact area.

• In one type of mission, the radar located hostile rounds and sent intelligence reports to TACFIRE.

• In a second type of mission, the radar located hostile rounds and adjusted friendly fire onto a target, using fire commands generated by the HELBAT computer.

• In a third type of mission, the radar located hostile rounds and adjusted friendly fire onto a target using fire commands generated by TACFIRE.

• In the fourth type of mission, the radar located hostile rounds, sent a request for fire to TACFIRE for an initial adjustment round, and then completed adjustment using fire commands generated by the HELBAT computer.

During the last two days of the test, 20 simulated CLGP missions were conducted. No actual CLGP rounds were fired, but data were collected showing typical response times that could be expected during CLGP missions. Additionally, a tracking camera, mounted on the nightsight bracket of the G/VLLD, was turned on at the command of "designate" by the HELBAT computer. A film record was thus made of what the FO actually saw during the conduct of the CLGP mission.

Several other systems or devices were examined as part of HELBAT:

• Two types of conceptual FOVs were examined. Both used M113 armored personnel carriers and featured laser rangefinders and automated input to a DMD. One system mounted a laser rangefinder on top of the vehicle, while another featured a laser rangefinder/periscope arrangement. The conceptual vehicles had no land navigation systems, thus requiring them to be positioned over surveyed points. Their laser rangefinders were then used to range on stationary and moving targets. What was investigated here was the capability of an FO team to acquire and attack targets using a mobile, "on-the-deck" system, rather than acquiring and attacking targets from a fixed observation post.

• The Canadian Gun Alignment and Control System was examined. The system is divided into three interdependent functioning groups of equipment and consists of an alignment group, featuring a reference unit with a rotating laser beam, a fire orders data system group, and a command and control link. The system orients weapons quickly and provides a digital display of bearing, fuze setting, and elevation at a gun unit located at each howitzer.

• Two weapon error measurement systems provided by HEL were used in the test. Both were designed to measure seven common errors that could be made by the gunner and assistant gunner, such as incorrect settings on the panoramic telescope, quadrant, or levels, in real time, without interfering with the howitzer section's performance. The newer of the two systems, mounted on an M109A1 howitzer, provided a digital display as well as a printout of the errors, while the older system was mounted on an M102 howitzer. A feature of the newer system that seemed to be particularly attractive was that of feedback to the gunner and assistant gunner. If a particular sight function was set outside a preset tolerance limit (usually one mil), error indicator signals on the instrumented panoramic telescope and instrumented quadrant warned the gunner and assistant gunner that an error had been made and indicated the direction in which the error was made. (Two similar systems will be evaluated as a howitzer crew training device this summer.)

• An experimental electronic time fuze setter (XM36E1) provided by Harry Diamond Laboratories was interfaced with the HELBAT computer, thus enabling experimental electronic time fuzes (XM587E2) to be set by the computer.

• An azimuth gyroscope provided by HEL was mounted on both the G/VLLD and PTL, giving both devices onboard directional capabilities. Upon completion of the test, HEL began the arduous task of data reduction and analysis. Thousands of pieces of data collected during the test had to be correlated and analyzed. HEL's efforts thus far have yielded an interim report (HEL Technical Note 1-77) that gives a "quick look" at accuracies and response times achieved by the various systems in HELBAT 6.

What have we as field artillerymen gained from the test? We have examined several major items of materiel that will be coming into our inventory, as well as examined operational concepts involved in integrating the materiel into a smoothly functioning system. We have observed the operations of several items of conceptual hardware which may lead to materiel developments. We now have accuracy and response time data that will greatly assist in making logical decisions concerning future field artillery developments.

More than 500 visitors traveled to Quanah Range to observe the HELBAT 6 test. What they saw was an automated battlefield of the future — one in which communications were conducted by digital rather than voice means; responsiveness was measured in seconds, not minutes; and accuracy was measured in meters, not tens of meters.

USAFAS is in the process of establishing priorities for materiel and doctrinal concepts to be examined in the next of the test series, HELBAT 7. The HELBAT program will continue to provide a means for gaining insight into how to improve the field artillery system, a major contributor in the combat power equation of the combined arms team.

MAJ Max R. Barron, USAFAS HELBAT Project Officer, is assigned to Directorate of Combat Developments, USAFAS. Mr. Gary L. Horley is Chief of the Artillery Team at the Human Engineering Laboratory.

RIGHT BY PIECE

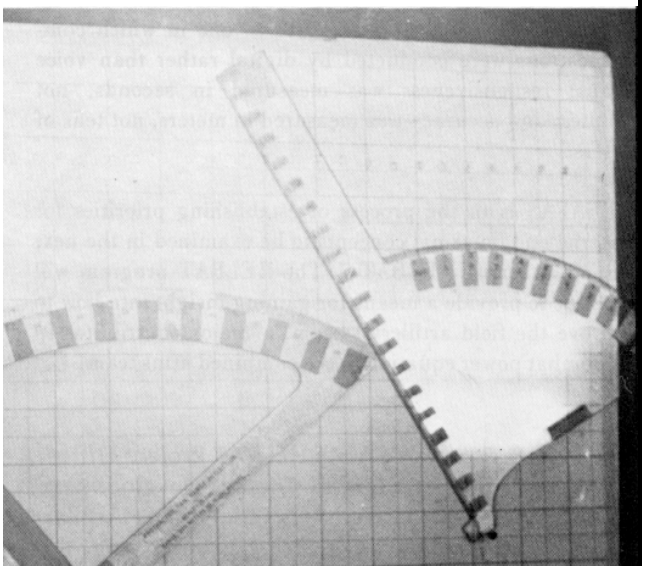
RDP and Chart Home Made

FORT STEWART, GA—Whenever Bravo Battery, 1st Battalion, 35th Field Artillery (105-mm, towed) conducts an airmobile operation, the battery fire direction center has an immediate firing chart capability. Using a locally fabricated 1:50,000 plexiglass range-deflection protractor (RDP) and firing chart, one man can carry, set up, and operate a reduced scale firing chart.

The RDP is constructed by scaling down a conventional RDP and accurately inscribing the range and deflection scales. The chart is a normal 1:25,000 firing chart, reduced to 1:50,000 by quartering the grids. The reduced scale RDP/chart currently in use by the battery has an accuracy of 10 meters and one mil.

The light weight and compactness of the reduced scale RDP/firing chart is critically important during airmobile operations when weight and bulk directly affect the set up time of the battery FDC.

A conventional RDP and the reduced scale RDP which was developed by SGT Paul W. Cook of B Btry, 1-35th FA.



B Battery, 1st Bn, 35th FA, has conducted numerous airmobile live fire operations (including ABCA registrations) using the reduced scale RDP/firing chart and found it to be an important asset during these missions.

FIST Packs Combined Punch

FORT CARSON, CO—If the US should go to war today, it is faced with a major threat on the battlefield — not enough artillery.

The Army has responded with a method to make the most effective use of all indirect fire support available, including naval gunfire and Air Force fighters and bombers.

To accomplish this, the Army is setting up the fire support team (FIST). Its job will be to know what type of fire support is available and its capability, how to analyze a combat situation, and how to use this knowledge effectively.

Members of the first division fire support teams will be taken from observer duty positions in MOSs 11C and 13E. These men will be selected from the 40th Armor and 10th and 12th Infantries. According to LTC Michael Proctor, Headquarters, Div Arty, these men will go through 60 hours of instruction on subcaliber and live-fire training.

The team will receive 10 days of training in initiating a correct call-for-fire, using correct adjustment-of-fire procedures, reporting surveillance, and terminating a fire mission. The teams will also learn proper coordination when support from another service is required.

Later, the teams hope to receive additional training at Fort Sill. "This will probably be the first time a whole team will go to a school and work as a team," Proctor stated. "These men will have a big responsibility after they have completed their training."

13E Named Best In Eighth Army

MUNSAN-NI, KOREA—Eighth Army Soldier of the Quarter is SP4 Norman Ellis of B Battery, 1st Battalion, 15th Field Artillery, who works as the chief computer in the battery's FDC.

Ellis was chosen from a group of 14 finalists for the award. Before joining the Army Ellis spent four years in the Air Force as an air cargo specialist. In Korea, he learned to read the language and taught English Bible study classes to Korean students. He hopes to earn a commission and complete a career in the Army.

FIX Includes Reserves

FORT CAMPBELL, KY—A live-fire training exercise called STARFIRE 77 held recently here was the first to involve Reserve Component field artillery units and all battalions of the 101st Airborne Division Artillery (Air Assault).

Objectives of the exercise were to improve coordination and field artillery techniques between active and reserve organizations and improve the overall readiness of participating units.

Included in the exercise was a battery ARTEP, an air assault artillery raid, and a presentation of the XM204 howitzer which is being field-tested here. The exercises, presentations, and briefings of STARFIRE 77 were a valuable experience according to observers and participants. Army National Guard and Army Reserve units from Indiana, Kentucky, Tennessee, and Michigan took part in the exercise.

STARFIRE 77 offered Reserve Component artillerymen a chance to observe the XM204 and compare its performance with the M102.

FORT SILL, OK—Charging to another firing position, an M109 self-propelled howitzer races the clock during a recent competitive shoot-off to determine the best gun section in the 2d Battalion, 36th Field Artillery. The winning section established a Post record by emplacing its howitzer, engaging, and destroying a target in three minutes, 50 seconds. The competition is held regularly among III Corps Artillery units to keep them at a peak of training. (Photo by SP5 Dave Knapp)

It's Becoming A Habit

FORT HOOD, TX—The 2d Battalion, 19th Field Artillery, 1st Cavalry Division, has successfully completed its fourth consecutive annual Nuclear Surety Inspection (NSI).

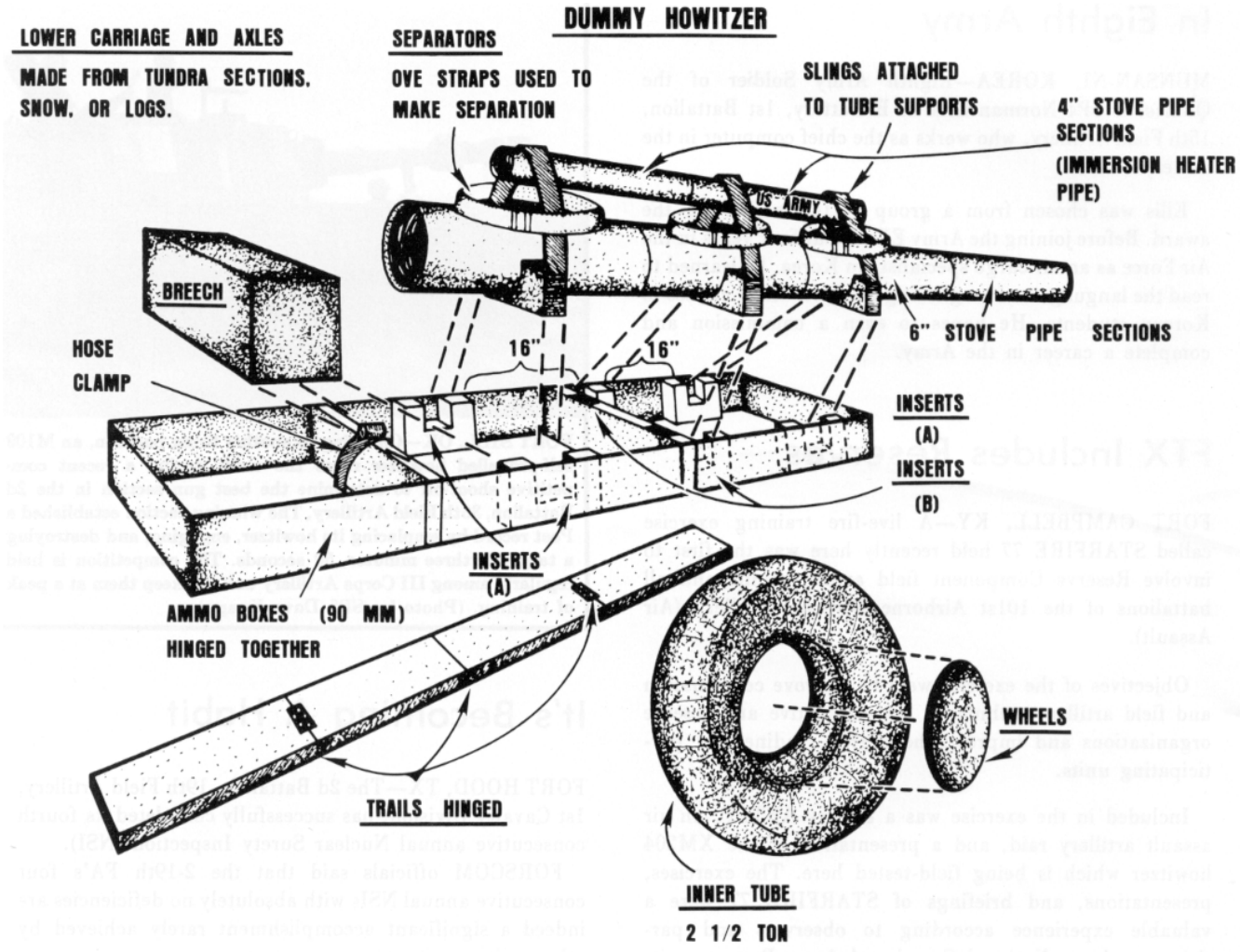
FORSCOM officials said that the 2-19th FA's four consecutive annual NSIs with absolutely no deficiencies are indeed a significant accomplishment rarely achieved by other units.

A four-man team of inspectors from FORSCOM spent two days evaluating every facet of the unit's nuclear readiness program.

The artillerymen of the 2-19th FA received no deficiencies, shortcomings, or unfavorable comments. In fact, they were commended in several areas of the NSI, including administrative procedures and the esprit of their security force.

The NSI covered tactical areas, such as transportation of a simulated nuclear round and its assembly and preparation for a fire mission, to administrative procedures, such as screening personnel who would come into contact with the nuclear round and upkeep of the mountains of rules and regulations pertaining to nuclear surety.

The 2-19th FA troopers were also required to demonstrate their proficiency in transporting the simulated nuclear round by air, using three UH-1H helicopters.



Bogus Batteries Befuddle Air Observers

FORT RICHARDSON, AK—Dummy 105-mm howitzers designed by SSG Malcom L. Wiggins of B Battery, 1st Battalion, 37th Field Artillery, stole the show during a recent combined arms live fire exercise here.

The bogus batteries were positioned about two kilometers from actual howitzer positions and within traverse limits of the firing batteries' primary direction of fire. The dummy positions were used as offset positions for registration and "roving gun" missions, as well as a landing zone for resupply. Rations and POL were then transported to the actual battery position.

When a counterattack plan was coordinated with the supported infantry units, about 10 personnel remained in the dummy positions to call in artillery and mortar fire in support of the counterattack plan.

Aircraft repeatedly reported the dummy positions as battery locations while failing to locate the camouflaged firing batteries.

When the collapsible dummy howitzer is broken down for march order it is carried by one soldier and is approximately the size of a standard suitcase. The accompanying schematic illustrates the general structure of the dummy howitzer. All materials are available on most posts. For detailed information on construction of the gun, interested persons may write SSG Wiggins' unit, 1st Bn, 37th FA, APO Seattle 98749.

Realistic Gas Training

WILDFLECKEN—Gun crews of the 2d Battalion, 41st Field Artillery in Germany recently conducted exercises requiring them to conduct dry fire missions inside a large, gas-filled chamber. The crews were the first known US artillery units to take advantage of the gas training facility provided by the German 355th Panzer Artillery.

During the exercise, the 2-41st crews took turns lining up their M109 self-propelled howitzers in a large shed used as a gas chamber. They wore protective masks and otherwise operated as usual. Radio communication provided coordinates of the enemy and the fire direction personnel worked with pencils, charts, firing tables, and the FADAC. They were scored for speed in plotting targets, obtaining firing data, and the accuracy of information obtained.

Upon completion of a fire mission under gas, the chamber doors opened to admit another howitzer and crew. The exercise, which has long been part of the German training program, provides confidence in the gas protective equipment carried by the US crews.

Artillery Works With Airborne Eyes

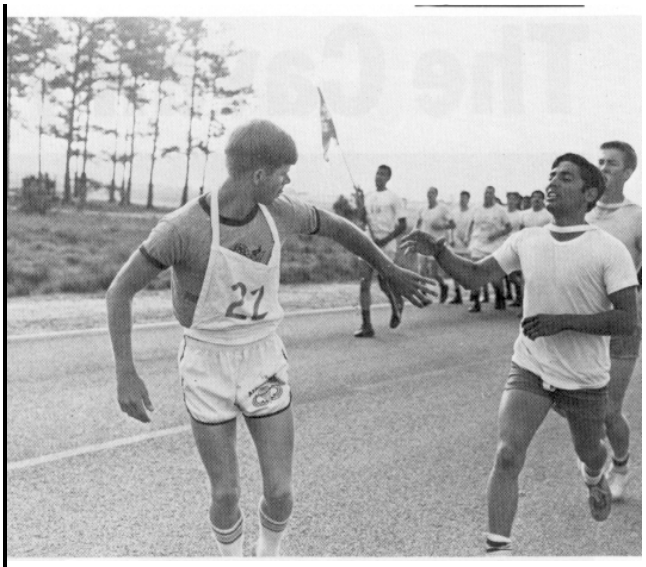
FORT HOOD, TX—Combined arms teamwork for "maximized training" took place here recently when units of the 92d Field Artillery (2d Armored Division) and the 6th Cavalry Brigade joined in live fire artillery exercises.

During the exercises, the 1st Battalion, 92d FA, which as a general support battalion, is not authorized any forward observers (FO), called upon the aerial observers in the 4th Squadron, 9th Cavalry, 6th Cavalry Brigade, to call for and adjust artillery fire on suspected and observed enemy targets.

While each of the aerial observers had been through classes in "call for and adjustment of fire," the combined exercise provided their first live firing experience with a field artillery unit.

Artillery instructors, cannon crewmen, and the aerial observers all profited from the combined training exercise according to the artillery training and fire support officers involved.

Although it has no organic field artillery support the brigade has developed a course in fire support and is aiming toward having every aerial and ground scout and every pilot attend. Some of the scouts had the opportunity to fire the howitzers during the exercise and learned what the artillery can do.



FORT BRAGG, NC—Intrabattalion competition in the form of a 52-mile relay run recently sparked physical conditioning efforts among units of the 82d Airborne Division's 2d Battalion, 321st Field Artillery, which fielded five eight-man teams for the race. Each runner, like these shown tagging up, ran three two-mile legs and two men from each team ran an extra two miles. A gap of 45 minutes, 30 seconds was recorded between first place Battery B with 5:11:48 and the last place Battalion Staff with 5:57:18, second place Battery C posted 5:29:29, followed by Battery A with 5:34:02 and Headquarters Battery 5:44:32.

(Photo by PVT James W. Mitchell.)

3d Armored Implements Counterfire

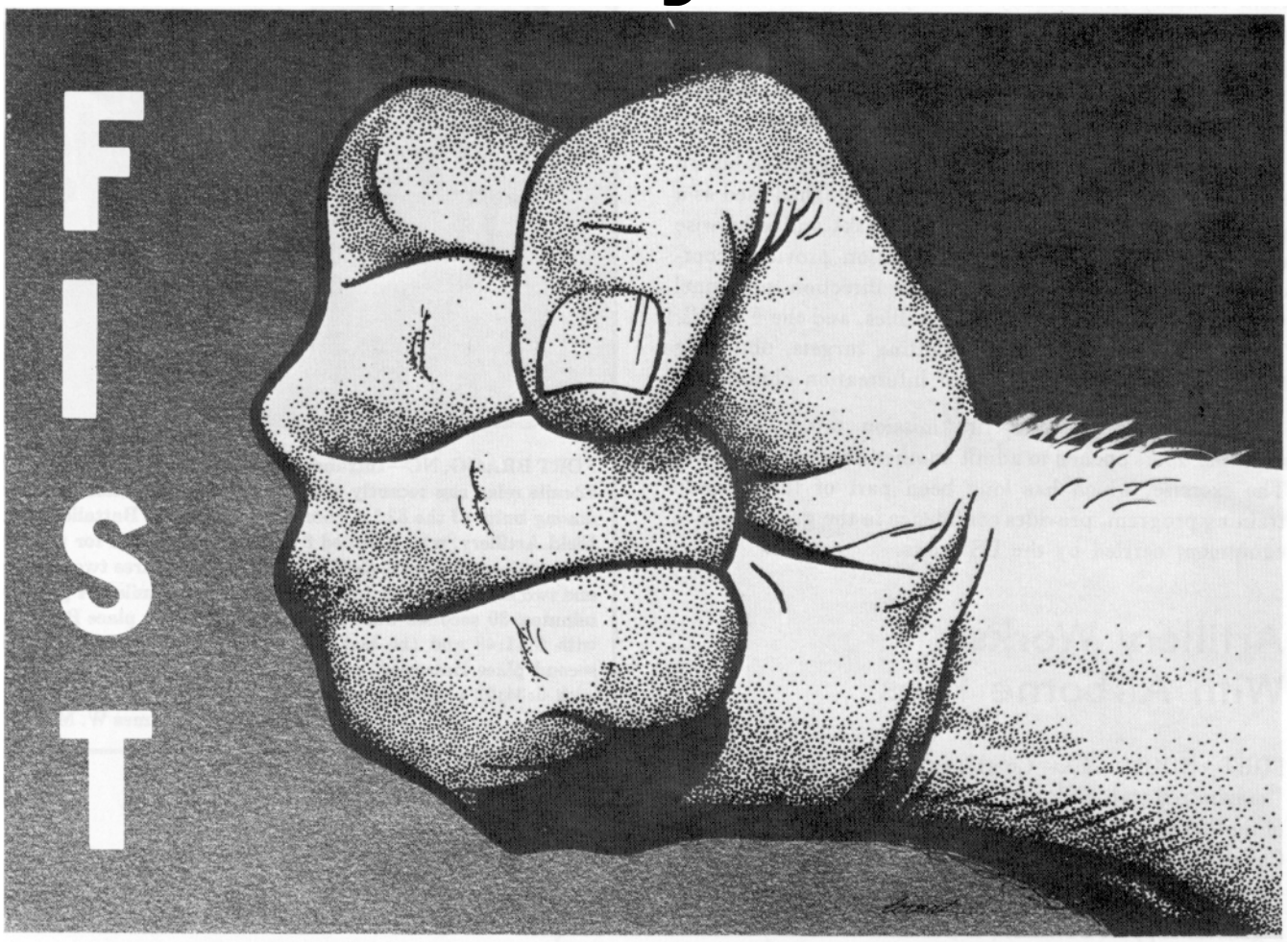
HANAU, WEST GERMANY—The 3d Armored Division Artillery is aggressively implementing the organizational aspects required to support the Army's counterfire doctrine.

The "Spearhead" Div Arty is not scheduled to activate its target acquisition battery (F Battery, 333d FA) for some time, but, in a move to set the stage, Div Arty relocated A Battery, 1st Battalion, 26th Field Artillery, from Giessen to Hanau and tasked the unit to begin performing as many of the counterfire missions and functions as possible. The battery has assumed responsibility for training and managing all field artillery radars in the division.

Claiming the title of "first counterfire battery in US Army Europe," A Battery will speed up familiarity with the counterfire concept, as well as ease the transition for F Battery, 333d FA.

by CPT William A. Knowlton, Jr.

The Cavalry



Fire Support For The Armored Cavalry Troop

Within the past two years, a dynamic new concept for fire support for the maneuver arms has been introduced by the field artillery — the company fire support team, or FIST. At TRADOC direction, the Close Support Study Group (CSSG) was formed in July 1975 at Fort Sill to study the problem of optimizing observed fire support for the maneuver arms on the modern battlefield. The FIST was a result of that study.

The major emphasis of the CSSG study was on the development of FIST organizations to support the mechanized (mech) infantry company and the tank company. These two FIST organizations were used as the basis for FISTs for other types of maneuver units, including the armored cavalry troop. This article will reevaluate the application of the FIST to the armored or mech infantry division's armored cavalry troops and suggest a method by which a troop commander could effectively employ his FIST.

The CSSG recommended forming two basic FISTs — the mech infantry company FIST and the tank company FIST. Two organizations for each were developed — a quick-fix solution using current TOEs and available resources, and a long-range solution, projecting TOE changes and requirements for new equipment under development.

Mech Infantry FIST

The mech infantry FIST (quick-fix) developed by the CSSG is shown in figure 1. The four-man FIST headquarters has 24-hour operational capability and is

Personnel	*Equipment*
FIST HQ	
LT—FIST Chief	**M113A1**
SSG—Sr FS SGT	**AN/VRC-47**
SGT—Asst FS SGT	**AN/GRC-160 (2 ea)**
SP4—Dvr/RTO	**AN/GRA-39**
	KY-38
Platoon FO Party (3)	
SGT—FO	**AN/PRC-77**
PFC—Asst FO/RTO	

Figure 1. Mechanized infantry company FIST (quick-fix).

mounted in an M113A1 armored personnel carrier (APC) identical to those in the supported company. Each platoon forward observer (FO) party would ride in the infantry platoon leader's APC and communicate independently of the platoon leader on an AN/PRC-77.

Tank Company FIST

Figure 2 shows the CSSG-developed tank company FIST (quick-fix). The FIST headquarters has basically the same

Personnel	*Equipment*
LT—FIST Chief	**M113A1**
SSG—Sr FS SGT	**AN/VRC-46**
SGT—Asst FS SGT	**AN/GRC-160 (2 ea)**
SP4—Dvr	**AN/GRA-39**
PFC—RTO	**KY-38**

Figure 2. Tank company FIST (quick-fix).

organization and equipment as the mech infantry company FIST. However, the three platoon FO parties are not included in the tank company FIST. There were four primary reasons for not having FO parties:

(1) Tank platoons have an immediate direct fire capability out to 2,000 to 3,000 meters. This capability can be used to suppress until indirect fire can be brought to bear on most targets.

(2) There is no place in a tank platoon for the FO to ride — making him the vehicle commander of a tank would negate his effectiveness as an FO.

(3) Tank platoons will normally be cross-attached with mech infantry platoons which will have platoon FOs.

(4) Tank platoon leaders and platoon sergeants have a communication capability which provides easy access to fire support nets, and they will be trained to request and adjust indirect fire.

Before discussing the proposed cavalry FIST organization, it will be helpful to outline briefly the organization of the divisional armored cavalry troop as organized under TOE 17-107H and some of the assets available in that troop.

As shown in figure 3, there are three command and control elements within the headquarters section of the troop. The troop commander is mounted in an APC with two additional crew members. He communicates by means of an AN/VRC-12 radio (one transmitter/receiver and one auxiliary receiver) and has a KY-38 for secure operation and an AN/GRA-39 for remote capability. The troop executive officer (XO) controls the troop operations center from an M577 command post vehicle, with the three-man communications section and the driver. Communications is provided by an AN/VRC-47 radio (one transmitter/receiver and one auxiliary receiver) also with a KY-38 and an AN/GRC-106, the troop's only AM radio. The troop first sergeant coordinates logistical and maintenance support for the troop from a ¼-ton jeep, also with an AN/VRC-47 with secure capability.

The headquarters platoon also includes a supply vehicle and a maintenance section. The ground surveillance section has been deleted from the troop on the most current TOE with the consolidation of all divisional ground surveillance radars (GSR); however, the most current MTOE available (to be implemented in June 77) still includes the authorization for the GSR section in the troop and perhaps the personnel and equipment.

Each of the three line platoons consists of 10 vehicles organized into a platoon headquarters and four sections: a scout section, a light armor section, a rifle squad, and a mortar squad. The platoon leader controls the platoon from an APC by means of an AN/VRC-12. The platoon sergeant, who also has a two-net capability with an AN/VRC-12, controls the light armor section from one of its M551 Sheridans. The three mortar squads, although part of the platoon organizations, usually will be consolidated as a section at troop level under the control of the troop XO.

Quick-Fix FIST

The problem in designing a quick-fix solution is obtaining the personnel and equipment assets with which to form a FIST. The personnel and equipment for the long-range FIST organizations can be added to current TOE authorizations, but the quick-fix FIST must come from immediately available assets. With TOEs usually notably lacking in any but absolutely essential personnel and equipment authorizations, a quick-fix FIST can only be created at the expense of the full operational capability of some other section. The situation is worse in the armored cavalry squadron than in mech infantry or tank battalions,

Troop Headquarters

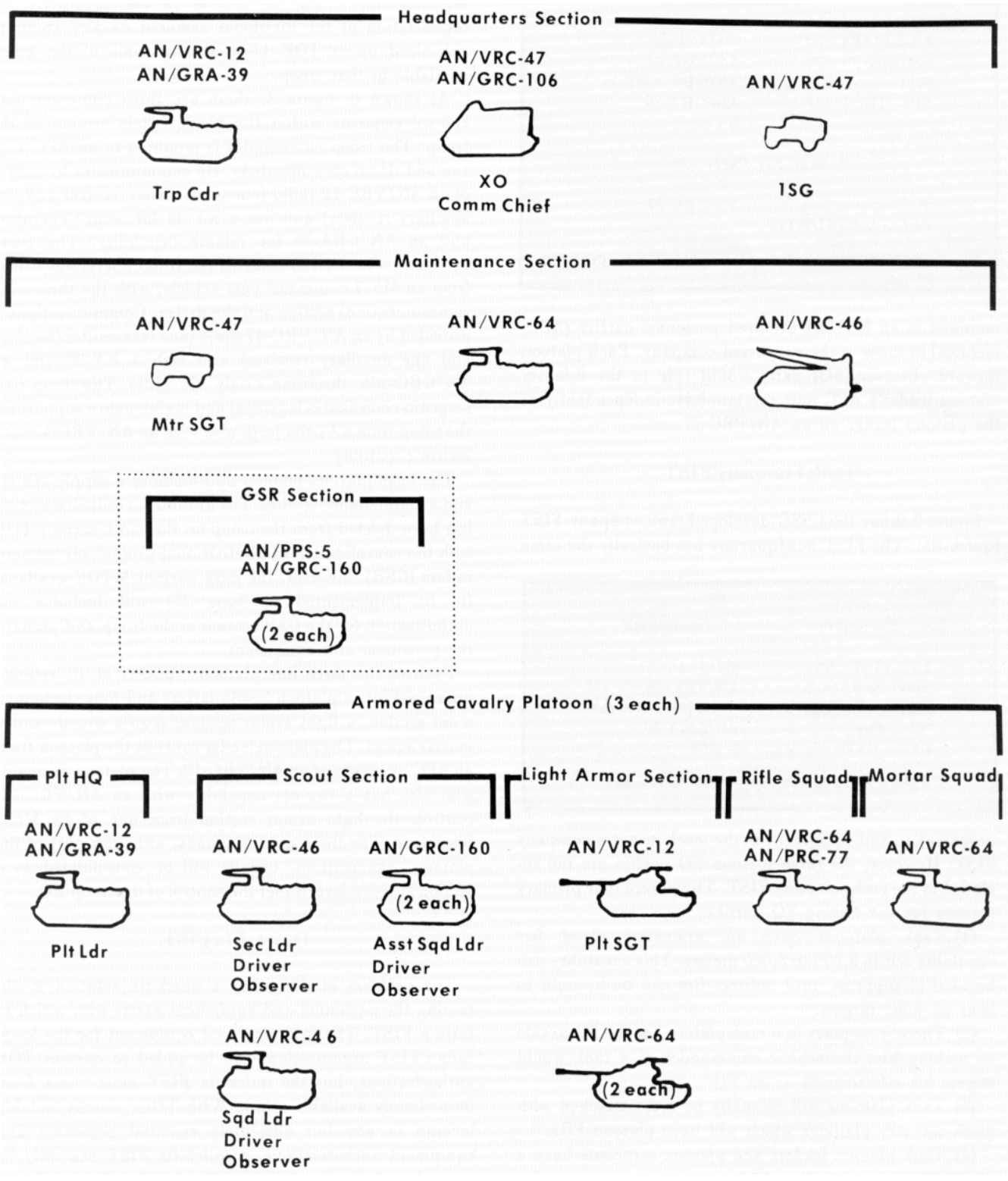


Figure 3. Armored cavalry troop organization (only affected elements are shown).

as the squadron has no organic mortar FO parties, no mortar FDC personnel, and no direct support (DS) artillery battalion to provide artillery FO parties. Aware of this lack of available assets, the CSSG determined that a quick-fix FIST for the divisional armored cavalry squadron was not feasible and recommended only a long-range FIST organization.

Based on current troop TOEs, a possible quick-fix troop FIST organization is shown in figure 4. This organization is the bare minimum necessary for operation. It cannot be overemphasized that this is only one possible solution and that for each piece of equipment or soldier used in the FIST, a tradeoff has been made with a reduced operational capability elsewhere.

Personnel	*Equipment*
FIST HQ	
LT—FIST Chief	**M113A1**
SGT—FS SGT	**AN/VRC-47**
PFC—Dvr/RTO	**AN/GRC-160**
	AN/GRA-39
	KY-38
Platoon FO Party (3)	
SGT—FO	**AN/PRC-77**
PFC—Asst FO/RTO	

Figure 4. Proposed armored cavalry troop FIST (quick-fix).

Equipment And Personnel For The FIST

An APC and the AN/GRC-160 would be taken from the Troop GSR section. It is anticipated that by the time the GSR section is actually removed from the troop, the equipment will have been added to TOE authorizations. Both troop radars would have to be emplaced by one APC, and one would have to be employed dismounted; however, this is an acceptable tradeoff. The AN/VRC-47 would be taken from the motor sergeant. This will necessitate a redistribution of the two remaining radios in the maintenance section; however, the section still can communicate. The KY-38 for the FIST can be obtained from the first sergeant, and the AN/GRA-39 from the troop commander without significantly affecting troop operation. The AN/PRC-77 for each platoon FO party can be obtained from the rifle squad in that platoon. This reduces the squad's dismounted communication capability and their ability to simultaneously man two observation posts; however, this also is an acceptable tradeoff.

The personnel to man the FIST are not as easy to find. The NCOs and the FIST chief must be obtained from sources outside the troop. The CSSG identified the three-man FO sections in the headquarters batteries of the three DS battalions in a division as being a possible quick-fix expedient source of personnel for the 10th maneuver battalion in a division. I propose using these FO sections for the FIST headquarters of the three armored cavalry troops. It is more important for the divisional armored cavalry squadron to have a FIST than for that 10th maneuver battalion to have one (for those divisions that have 10 active maneuver battalions). The armored cavalry squadron will almost always be committed with a tactical mission that requires fire support. Three maneuver battalions will habitually be associated with each DS artillery battalion and have FISTs and FSEs provided by that artillery battalion. Some thought should be given to task organizing so that the 10th maneuver battalion is habitually initially part of the reserve, to minimize the impact of their lack of fire support personnel. The assistant FO in each platoon FO party could be the ammo bearer from the platoon mortar squad. As an 11C (MOS), he should be trained in FO procedures to a minimum level at least. That leaves only the platoon FO to find. Nine of these NCOs are needed to support all three troops. I propose that in nine of the division's mech infantry companies, the assistant fire support sergeant be stripped from the FIST headquarters to provide the cavalry squadron with platoon FOs. This change leaves those affected mech infantry companies with three two-man platoon FO parties and a three-man FIST headquarters each, exactly what has now been created for the cavalry troop.

The difficulty with which some of the equipment and particularly personnel for the cavalry FIST were obtained obligates justification of the cavalry FIST organization proposed, particularly because, in their proposed long-range cavalry FIST organization, the CSSG did not include platoon FO parties, citing the same reasons for their omission as for the tank company FIST.

In the armored cavalry, the smallest maneuver unit is the platoon—not the company, as is usually the case in tank and mech infantry units. Armored cavalry missions are extremely diverse, and, in both reconnaissance and security operations or in an economy-of-force role, armored cavalry units are expected to operate independently and on extremely wide frontages. All three platoons in an armored cavalry troop are habitually employed independently of each other and in separate sectors. It is not unusual for a troop to operate on a 10-kilometer front, covering an entire brigade sector during a guard or covering force mission. Under these circumstances, even from the most commanding terrain in the troop's sector, it would be impossible for the FIST chief alone to observe and adjust all indirect fire. Platoon FO parties are required to get accurate and effective indirect fire support.

Furthermore, the reasons stated by the CSSG for not having FO parties in a tank company are not valid for an

armored cavalry troop. Armored cavalry platoons have generally the same direct fire capability as do tank platoons; however, there are many situations where it will not be desirable to use direct fire to suppress enemy targets that could be more effectively engaged first with indirect fire. Armored cavalry units usually fight outnumbered, especially in delay actions common to covering force missions or employment in an economy-of-force situation. To be effective, the platoon leader will have to engage identified targets immediately with both direct and indirect fire to effect maximum destruction of the enemy force at maximum range.

Moving to the second argument, the platoon FO party in the armored cavalry platoon does have a place in the platoon leader's APC but would probably be a welcome addition to the crew. Armored cavalry platoons also will very rarely be cross-attached with other platoons having FOs, and, even if trained to do so, the platoon leader or platoon sergeant would not be able to effectively adjust indirect fire. The platoon leader's primary job is the control and employment of his platoon. With 10 vehicles in the platoon (double that in the tank or mech infantry platoon) and an independent sector and mission, control for the platoon leader and platoon sergeant is a full-time job. With only one radio, the platoon leader could monitor only two nets, causing him to leave his platoon net to adjust fire on a fire direction net. Lengthy periods of time off the platoon net reduce the platoon leader's control of the platoon to an unacceptable level.

Long-Range Troop FIST

The proposed long-range troop FIST is shown in figure 5. The personnel and equipment have been increased over the quick-fix FIST to what is necessary for an effective long-range solution, although developmental equipment is not included. The primary change in personnel is the increase of the size of the FIST headquarters to one officer and four men. All radios are upgraded to highpower sets, which are absolutely essential because of the increased ranges

Personnel	***Equipment***
FIST HQ	
LT—FIST Chief	**M113A1**
SSG—Sr FS Sgt	**AN/VRC-12**
SGT—Asst FS SGT	**AN/VRC-46**
SP4—Dvr	**AN/GRA-39**
PFC—RTO	**KY-38**
***Platoon FO Party* (*3*)**	
SGT—FO	**VRC-46**
SP4—Asst FO/RTO	

Figure 5. Proposed armored cavalry troop FIST (long-range).

required in a troop's area of operations. Also changed is the FIST chief's primary radio, an AN/VRC-12, to give him the same rapid frequency change capability that the platoon leaders and troop commander have, which will increase his responsiveness. This responsiveness is especially important if the troop uses a troop fire net.

Troop Fire Net

The addition of a separate troop fire net is a prerequisite for effective use of a FIST in an armored cavalry troop. A troop does not have an administrative/logistics net; so, not only does the troop commander have to exercise command and control on the troop command net, but also the first sergeant and maintenance sergeant have to coordinate mess, maintenance, and logistics support on this net. Adding control of indirect fire support (including mortars) and adjustment of fires to this already overcrowded net would not provide responsive fire support and would interfere with troop command and control. For the same reason, operating on an individual platoon net would not allow the platoon leader to effectively control his platoon (there are already nine or 10 stations on each platoon net). Operation by the FIST chief on individual platoon nets would also not be conducive to a coordinated troop fire support effort. Each platoon FO party can easily be kept abreast of the platoon's tactical situation through face-to-face communications with the platoon leader and can also monitor both platoon and troop nets from the speakers on the platoon leader's radio.

In the proposed quick-fix cavalry FIST (figure 4), the FIST chief would operate as the net control station (NCS) of the troop fire net on his AN/GRC-160, operate on the appropriate battery or battalion fire or command fire net on his AN/VRC-47, and monitor the troop command net on the auxiliary receiver of the AN/VRC-47. When called on the troop command net, the FIST chief could switch the AN/VRC-47 to that frequency in the same manner that the platoon leader does when called on the troop command net. The addition of the AN/VRC-12 to the FIST would, of course, appreciably shorten response time. Neither the troop commander nor troop XO currently has the capability to monitor or transmit on the troop fire net; however, consideration should be given to adding a receiver/transmitter or receiver to either vehicle to give this capability. The primary net for communication between the troop commander and FIST chief would still be the troop command net; however, the troop commander or troop XO should be aware of what indirect fires are being called for on the troop fire direction net.

The operation of the troop fire net is the key to responsive fire support at troop level. The net could be organized as shown in figure 6. There are a number of options available to the FIST chief for the control of fire missions. A request for fire from a platoon FO could be denied by the FIST chief, assigned to the troop mortars, or relayed to the supporting artillery battery over the battery fire net. If the

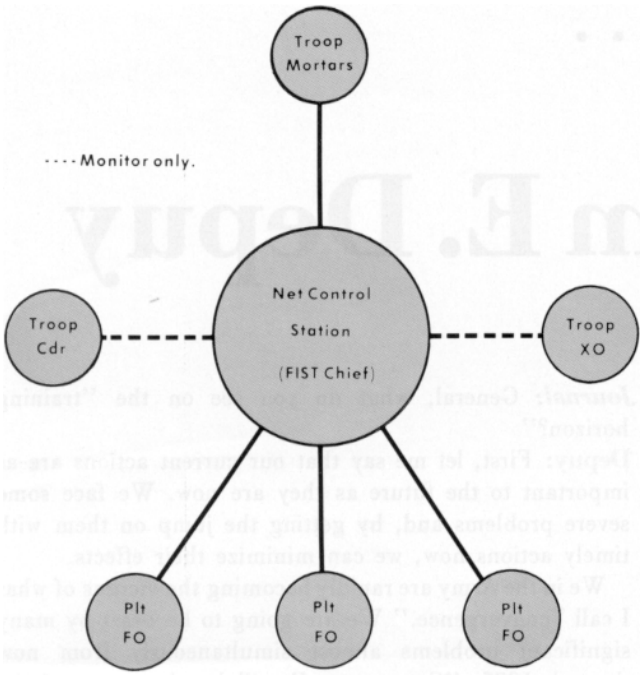


Figure 6. Troop fire net.

mission were given to the troop mortars, adjustment of fire would be made by the FO on the troop fire net. If the mission were given to supporting artillery, the call for fire and conduct of the mission would be relayed by the FIST headquarters to the FDC.

In the same manner the FIST chief also can initiate fire missions for either the troop mortars or the supporting battery. Missions for the mortars would be handled on the troop fire net and those for the battery on the battery fire direction net. There is currently no fire direction or fire control net in existence for troop mortars; when consolidated at troop level, they are forced to operate on the troop command net. If the troop commander and FIST chief elect to attach one or more of the troop mortars to their respective platoons, that mortar squad would revert to platoon control and operate on the platoon net with fires adjusted by the platoon FO or platoon leader. When returning to troop control, the mortar squad would reenter the troop fire net. Control and positioning of the troop mortars when under troop control would be the responsibility of the FIST chief rather than the troop XO.

Should the platoon FO not be in a position to observe a particular mission and adjust fire, the platoon's scouts do have that capability. However, observer skills are not basic to the 11D MOS and are not related to the scout's primary mission of gathering information. The capability of scouts to call for and adjust indirect fire should be used only to augment that of the platoon FO.

I have attempted in this article to build on the work of the CSSG and suggest an organization for the cavalry FIST and a method for its employment. As mentioned earlier, this is not the only solution. Probably many different organizations and methods of employment would also be effective. Situational factors, such as the different organizations of US Army Europe and regimental armored cavalry troops, must be considered before applying this FIST organization to all cavalry units. I hope, however, I have stimulated some thought about the peculiar fire support requirements of an armored cavalry troop and have submitted a proposed FIST organization which meets those requirements.

CPT William A. Knowlton Jr., AR, is attending the Field Artillery Officers Advanced Course 1-77 at Fort Sill.

Commanders Update

COL Jere L. Hickman
XVIII Airborne Corps Artillery

COL James E. Drummond
2d Infantry Division Artillery

COL Amil J. Eckhart
4th Infantry Division Artillery

COL Orren R. Whiddon
5th Infantry Division Artillery

COL Llyle J. Barker
210th Field Artillery Group

COL Michael Rhode, Jr.
4th Missile Command

LTC Marvin L. Covault
1st Battalion, 10th Field Artillery

LTC Patrick J. Kirwin
3d Battalion, 13th Field Artillery

LTC Mark A. Monroe
2d Battalion, 17th Field Artillery

LTC Henry M. Hagwood Jr.
1st Battalion, 20th Field Artillery

LTC Johnnie P. Byrd
2d Battalion, 20th Field Artillery

LTC Robert H. Cole
2d Battalion, 36th Field Artillery

LTC James R. Foreman
1st Battalion, 42d Field Artillery

LTC Valmore J. Girard
1st Training Battalion
Fort Sill

COL Emory W. Bush
12th Aviation Group
Fort Bragg

COL Robert A. Mountel
7th Special Forces Group
Fort Bragg

COL Joseph Ganahl
Yongsan Garrison
Korea

LTC Lanny K. Walker
7th Battalion, 3d Training Brigade
Fort Dix

LTC Phil K. Bomersheim
2d Battalion, 3d Training Brigade
Fort Dix

LTC William A. Luther Jr.
Support Battalion, 193d Brigade
Fort Amador, CZ

The *Journal* Interviews . . .

GEN William E. Depuy

GEN William E. Depuy, the Commander of Training and Doctrine Command, was recently interviewed by the *Journal* at Fort Sill where he co-hosted and gave the opening address to the fourth Annual Forces Command/Training and Doctrine Command Conference. General Depuy is the man charged with training the total Army, Active and Reserve, and formulating its doctrine.

Journal: General, what do you see on the "training horizon?"

Depuy: First, let me say that our current actions are as important to the future as they are now. We face some severe problems and, by getting the jump on them with timely actions now, we can minimize their effects.

We in the Army are rapidly becoming the victims of what I call "convergence." We are going to be beset by many significant problems almost simultaneously from now through 1985. "Convergence" will be the name of the game and you will be inundated with problems. The first of these converging factors is new equipment, and we have to digest it all — new tanks, MICVs, TACFIRE, battery computers, Rolands, Patriots, and on and on and on. This procurement will increase exponentially as will all the other factors I'll mention.

Costs. At Langley Field near my headquarters, are parked 72 F-15s at $18 million a copy. That sum of money equals nearly 1,300 XM-1 tanks or 80 percent of all the tanks we have in Europe. The new MICVs each cost eight times as much as an M113. These costs put us in the position of having the finished product *available* but I'm convinced we won't be given the funds to modernize the entire Army. So you will be faced with how much of each you will buy and where you will put each so you will be ready to fight the next war. Costs impact on training too — how do you train a TOW crew? You can't give them 10 rounds and say "Go qualify" and, if they fail, give them 10 more rounds.

Complexity. All our new systems are more complex than the systems they replace. Not only are the systems more complex to train on and to maintain, but, if you look at the combat troops in a division, there is one major piece of equipment (truck, tank, radio, generator, howitzer, TOW, etc.) for every soldier. And remember, *all* these factors are converging exponentially on commanders at all levels.

Effectiveness is the next factor. I'm told that the XM-1 tank is more effective when moving and firing at a moving target than previous tanks have been when stationary and shooting at stationary targets. That's kind of startling! One soldier in the turret of a MICV with a "bushmaster" has more combat power than an entire squad. You artillerymen

have CLGP, FASCAM, and other highly effective munitions hooked through the BCS and TACFIRE to the MPQ-36 and -37 radars and to observers with digital message devices and laser rangefinders and laser target designators. Our night vision devices are now capable of detecting targets *beyond* the range of our weapons! Deciding how to maximize the effectiveness of all this is a real challenge to someone in the division.

Another factor is *maintenance.* A lot of the new effectiveness is due to levels of engineering sophistication whose maintenance problems cannot be accurately predicted. And finally, how about *personnel* — selecting them, training them, and marrying them up with the correct system?

Journal: Are there solutions to these problems?

Depuy: There are almost always solutions to problems we face in the military, but it is in the solving of these problems that we have to very carefully look out for hurting the "spirit" of our soldiers. Getting wrapped up in the mechanics of the new materiel and getting deeply involved with the training tools (SQTs, Soldiers Manuals, ARTEPs), we can choke out the spirit which is always an essential ingredient of successful combat. But spirit alone won't do it. Somehow we must keep the spirit in our Army as it becomes ever more complex and materiel-intensive.

To answer the question, we *can* solve the problems with effective logistics subsystems, personnel subsystems, and training subsystems — all coordinated, integrated, and managed. In studying the possible solutions to these problems, we have become acutely aware of the spread between the *potential* we've bought, and the *capability* we achieve. Take a large system such as TACFIRE which by itself has, say, 100 percent potential. Link it with its subsystems such as BCS, the DMD, associated data links etc., and add in the personnel, training, and maintenance problems, each operating at, for example, 90 percent effectiveness. Multiply all the various subsystem efficiencies of this interdependent system and you end up with 50 or 60 percent capability overall.

To counter the problems, I see two approaches we need to use — decentralization of complexity and individualization of training. I'll explain.

Decentralization of complexity means increasing the quality of leadership down to the level where the complexity exists. The higher the command level, the less time and attention can be given to problems. We are looking at this idea in the Division Restructure Study. Too many combat systems terminate at the division level — intelligence, personnel, electronic warfare, maintenance, etc. More of these systems have to function as the artillery's "closed loop" functions — without the division commander becoming involved. You people acquire your targets, you move where and when necessary, process your own firing data, shoot and make a surveillance — all by artillerymen without a word from the division commander.

Training must be individualized to single soldiers and small units. This is the purpose of SQTs, Soldiers Manuals, and ARTEPs. Because of the density of equipment mentioned earlier, we can no longer train on a "gross" basis. We don't have the time to train everyone to do everything. The SQT/ARTEP system with TEC and correspondence courses put more training responsibility on the person, or section to be trained. We have to limit ourselves to train the soldier or unit on what is specifically needed — not what's nice to have or something that is considered universal within a branch.

Journal: The current training system of ARTEPs, Soldiers Manuals, and SQTs is something of a revolution in technique when compared with the preceding 10 to 30 years. Where and why did it originate?

Depuy: I think it was in 1971 that General Westmoreland created the Board for Dynamic Training which was a part of VOLAR. That Board, headed by my chief trainer, MG Paul Gorman, devised a system called "criterion referenced instruction" from which evolved the ARTEPs and SQTs. General Gorman went on to be the first president of a new organization, the Combat Arms Training Board. When I took over at TRADOC, I got General Gorman to come to work for me and with some support and resources from TRADOC, he has polished his original idea into the current system.

Journal: During the conference, the subject of an "SQT system" for officers came up. Do you think something like that is needed to keep battery level and field grade officers current during alternate specialty tours?

Depuy: I'm not sure. Officers are fairly well tested in basic and advanced courses and again at Leavenworth. One possibility might be to require all officers to take the Leavenworth correspondence course or establish some sort of periodic open-book branch review.

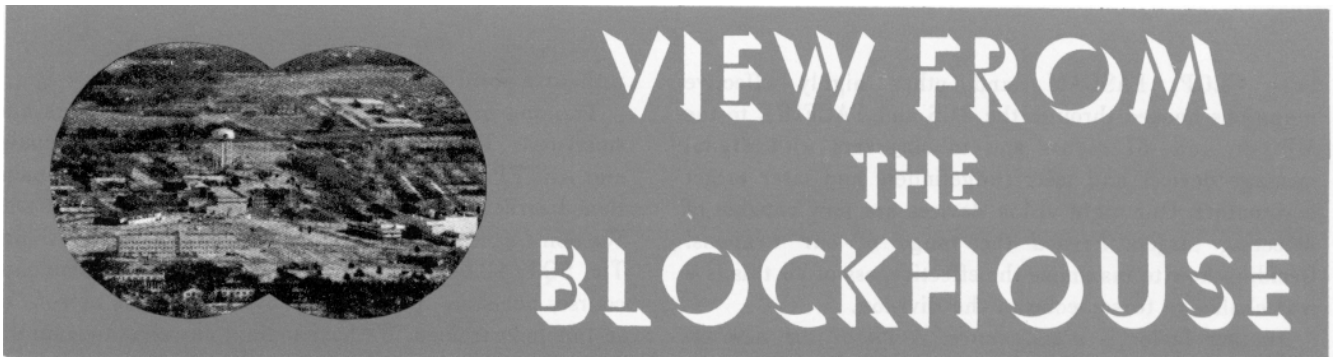
Journal: Is there a solution to the training problems of the Reserve Components?

Depuy: The SQT and ARTEP are training aids, or maybe training *assists,* and can assist Reserve training as well as Active unit training. The Reserves are very active users of our materials. The Battalion ARTEP may be a problem for them, but the subelements or section level aspects of the ARTEP are perfect tools for the Reserves.

Journal: Sir, a parochial question — Why was Sill selected for AFTCON IV?

Depuy: Sill is a very attractive post. You have a microcosm of the Army here — one station unit training, a training center, officer and NCO resident training, troop units, combat and training doctrine developers, and post management. Another factor, no one is ahead of Sill in meeting the TRADOC goals.

Journal: Thank you.



M119 Prop Charges Fixed For M109A1s

There have been recent misunderstandings concerning the status of the M119 propelling charge for the 155-mm M109A1 howitzer. The questionable status centered around the issue "Is the M119 charge released for routine service firings, or is it restricted to emergency combat use only?"

Early lots of the M119 charge were suspended from routine use due to problems in the manufacturing process. Those problems caused erratic performance by the charge and, in some cases, created hazardous firing conditions. The suspended lots, listed in TB 9-1300-385-2, were suspended until an appropriate fix could be made. The fix consisted of adding a sheet of lead foil and a laced jacket to each charge.

Headquarters, Army Armament Readiness Command (ARRCOM), has confirmed that the fix to the M119 charge has been completed worldwide. The fixed charges are identified by the suffix "A" or "B" added to the *old* lot numbers. Any M119 charge with the suffix "A" or "B" following the lot number is authorized for routine firing with the M109A1 howitzer EXCEPT WITH THE M549 PROJECTILE. The restrictions against the M549 will continue until that shell-propellant combination is corrected by ARRCOM.

New Change For FM 6-40-5

FM 6-40-5, "Modern Battlefield Cannon Gunnery," has been revised to keep pace with ongoing artillery hardware and doctrine changes. Change 1 to FM 6-40-5, which is expected to be published in December 1977, is presently being staffed for School and field comments and incorporates the following major changes:

1) Observed Fire—New instructions for obtaining gridded template coding tables for divisional CEOIs and substitution of the term "smoke" for "HC" in calls for fire, fire orders, and fire commands.

2) Fire Direction—Substitution of the "most practical charge" for "highest charge" concept as the basis for charge selection; revised alternate loading procedures for firing pieces; new fire order and method of completing the record of fire for ICM missions; new computational procedures for immediate and quick smoke missions; introduction of a muzzle velocity correction for erosion into the 155-mm nuclear "meteorological correction" technique.

Fire Direction Film Available

One of the many doctrinal changes that has been developed at the Field Artillery School is the new relationship that exists between the battalion FDC and the battery FDCs. The essence of this new relationship is that the battalion FDC is responsible for tactical fire direction and the battery FDCs are responsible for technical fire direction. This entire concept has been incorporated in a document written by the Gunnery Department called "The Guide for Fire Direction Operations" which fully explains the relationship between the battalion FDC and the battery FDCs.

To facilitate gunnery instruction, the Guide is issued to each Officers Advanced Course student and is used throughout the course. To reinforce this document and to provide each student with the "big picture" in the beginning of the gunnery portion, a TV film has been made, based on the Guide.

This film is also valuable to field units which must execute this FDC relationship. The film itself lasts 32 minutes and fully depicts the new doctrine. Units in CONUS can request the film "Guide for Fire Direction Operations" by sending 32 minutes of blank cassette tape (1/2 or 3/4 inch) and TRADOC Form 517-R, to Training and Audiovisual Support Center, ATTN: ATZR-F-ETV, Fort Sill, Oklahoma 73503. Forces overseas should submit their requests to Training Support Center, Fort Eustis, VA 23604.

New FADAC Tapes For Lance

The Lance Branch, Weapons Department, USAFAS, has recently completed verification of two new program tapes for use with FADAC. These tapes have been redesigned to provide two additional functions as well as an increased storage capability.

One of the new functions enables FADAC to transform UTM coordinates to geographic coordinates. The second function solves the "Azimuth by Altitude" survey problem using either UTM or geographic coordinates. The new tapes will be able to store 64 targets and 48 firing points. The procedures for these new functions are in the FADAC User's Manual fielded in June 1977.

The initial issue of tapes and matrix panels will be distributed by Redstone Arsenal and will be available to the field in July or August 1977.

Replacement requests should be forwarded to:

Material Management Director
DRSAR—MMH—AA (ATTN: Mr. Weinberg)
ARRCOM
Rock Island Arsenal, IL 61201

All requests should include part number P/N 8213315-99M for tactical tapes.

FADAC Job Aid Prepared

A FADAC job aid has been developed by the Gunnery Department, USAFAS, to be used in resident FADAC instruction and unit training. The job aid gives step-by-step instructions, a flow diagram, and a background narrative for each task an operator performs with FADAC. Related tasks are organized into sections which are tabbed for easy reference. The document is printed on heavy card stock for durability and punched for a three-hole loose-leaf binder. This format is convenient for initial learning in an academic environment, as well as for quick reference in a field situation. The FADAC job aid is the forerunner of the FADAC User's Manual which is currently under review and expected to be fielded in the first quarter, FY 78. Units desiring the job aid should contact the Directorate of Course Development and Training, Field Support Division, Fort Sill, OK 73503.

M31 Training Tape Available

TV tape 6-1, "M31 Training," is currently available from Training and Audiovisual Support Centers (TASC) in CONUS, Europe, and Korea. In CONUS, this tape may be requisitioned from the local TASC on DA Form 4124. In Europe and Korea, the tape is obtained through normal requisitioning procedures.

This tape will assist in the development of an M31 training program to supplement live fire and ARTEPs. It covers the composition of a battalion kit, FDC operations, set up of tripod mounts, boresighting, ammunition, and mounting of the adapters in the M102, M107, M109, and M110.

Local training aids offices are authorized to reproduce these tapes. (MAJ Ed Smith, AUTOVON 639-1481/3461.)

COUNTERFIRE SYSTEMS REVIEW

Training Device Designed For Radar Crewmen

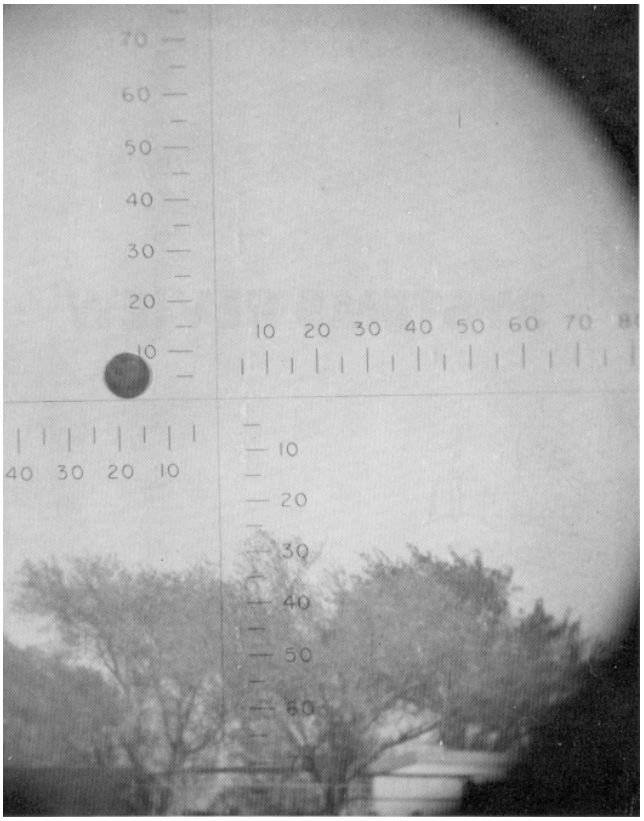
The problem of scheduling sufficient realistic training to keep the individual soldier MOS-proficient has always plagued the commander. The FA Radar Crewman's (MOS 17B) skill is particularly difficult to maintain, since he obtains most of his operational training in a live-fire environment. This posed a problem in the self-pace training for 17Bs at USAFAS in that artillery support must be scheduled 30 days in advance. Since self-pacing does not provide more than a 7- to 8-day predictability of the student's progress, an alternative to field firing had to be developed.

The logical solution was to develop a field exercise

simulation module that students could use at any point in their instruction. The radar target simulator AN/TPA-7 was available in sufficient quantity and could be used to duplicate all actual target echo conditions except one on the B-scope of radar set AN/MPQ-4A. The exception was the high-burst registration, which requires a simultaneous sighting of a projectile burst in the elbow telescope and a B-scope presentation of the burst.

Mr. Woodley O. Truitt Jr., a training specialist assigned to the Radar Branch of the Counterfire Department, solved this problem by designing and producing a simple, but effective, device that closely duplicated the actual conditions experienced by the telescope observer and control unit operator during a radar-observed high-burst registration. Using salvage materials and components purchased at local electronic supply outlets, he developed simulators that could be easily attached to, and operated with, the AN/MPQ-4A. Simulators are interconnected by a control box that causes a burst of light to appear simultaneously in the aperture of the telescope and on the face of the B-scope. The instructor can select up to six registration rounds, including a "bad" and a "O-O" round. The number of combinations available to the instructor is unlimited.

The B-scope device incorporates miniaturized lamps, stagger-mounted into the edge of multilayer plexiglass that has been scribed at various points. They appear as illuminated bursts on the face of the B-scope. The telescope device uses a mirror-diffracted light source that appears as an illuminated burst above the actual horizon seen by the observer in his telescope. Both light sources are synchronized and calibrated to the same range and azimuth positions relative to the initial pointing data and are activated by a power source from the control device of the simulator.



Simulated High-Burst (observed through telescope)

The device was designed to train resident 17B students in the procedures outlined in FM 6-161 (paragraphs 5-3 to 5-5). Since live artillery support is not required, the student can be given any number of repetitions necessary to develop Skill Level 1 proficiency in high-burst registration techniques. During the relatively short period of time that the simulator has been used for resident training, saving in programmed ammunition alone is $30,000 with an additional $49,000 projected for the remainder of FY 77.

The reliability of the device has been highly satisfactory. In more than a year of use, no component failures have occurred, and its original battery power source is still in use.

In light of the demand for maintaining field artillery radar crewman proficiency to meet the continuing skill qualification test standards, the radar-observed high-burst registration simulator is under evaluation by USAFAS for possible field application. Inquiries concerning the device are welcomed by the Director, Counterfire Department, USAFAS, Fort Sill, OK 73503.

Better Gear For TABs

New equipment for target acquisition batteries (TAB) is being issued and other items are being tested, some of which may require changes in TAB operations.

Sound ranging sets, AN/TNS-10, were sent to the field in June with only two sets per TAB issued initially. Methods of sound base employment should not be changed because of this, and two sound bases (one for each sound-flash platoon) should still be established, as well as alternate bases. A contract for the remaining AN/TNS-10s will be awarded in early FY 78. The radio data link (GRA-114) has had some developmental difficulties but it appears the initial operational capability date will be FY 80.

Army Armament Command is currently refurbishing 321 battery commander scopes, M-65, of which most will be completed by September. TABs should get early consideration for these scopes.

The fifth order survey set, authorized for the sound-flash platoons, contains two SR-56 hand-held calculators. USAFAS is now writing SR-56 programs for processing data from the flash ranging deliberate and hasty base and

for converting polar to rectangular coordinates for use with the laser rangefinder when it becomes available. Also being prepared is an SR-56 program for applying sound ranging corrections and converting time intervals to their four-second equivalents. When complete, these programs will be sent to the TABs.

SR-56 Power Problem

The short life span of batteries for the SR-56 (hand-held calculator for surveyors) is a major problem currently under study by the School. The nickel-cadmium batteries now in use will keep the calculator going for only 2½ hours, and the calculator requires reprogramming each time the batteries must be recharged or replaced. As a result, valuable time may be lost during the survey operation.

One solution being tested by the School calls for use of the night-lighting power supply for the survey instrument (T2 or T16). This power supply uses BA-30 batteries which can operate the SR-56 for more than 36 hours. In addition, the School is trying to obtain a connecting cable that plugs into the instrument power supply and the recharging receptacle on the calculator. USERS ARE CAUTIONED AGAINST FABRICATING THEIR OWN CABLE SINCE UNAUTHORIZED USE OR MODIFICATION MAY VOID THE WARRANTY AND POSSIBLY DAMAGE THE CALCULATOR.

Sound Ranging Makes Comeback

A study and field exercise were recently conducted at Fort Sill to test the viability of sound ranging on today's battlefield. The study centered on a European battlefield and used an approved scenario to test movement requirements and determine sound saturation points.

Results of the study indicated that sound ranging could keep pace with the battle and that saturation of sound recorders occurred in only a small percentage of situations. The notion that sound base installation required eight to ten hours was dispelled when it was found that sound ranging can begin 30 to 90 minutes after arrival in an area of operations.

The field demonstration was conducted using the new sound ranging recorder AN/TNS-10 and a developmental radio data link, the AN/GRA-114. A sound-on-sound adjustment was fired with a miss distance of 40 meters. Targets at a range of eight kilometers were located with 70 and 110 meters radial error. Both the sound-on-sound adjustment and target locations were made with winds of 30 and 35 miles per hour.

Based on the study and demonstration a message in support of sound ranging was sent to the field by the Commandant, MG Donald R. Keith. A 25-minute TV tape has been produced also which covers the history, capabilities, limitations, and employment techniques of sound ranging. The tape was distributed in June.

Doctrinal guidance for sound ranging and other target acquisition systems will be contained in FM 6-121, scheduled for publication in December.

Evaluating the ARTEP

The Directorate of Evaluation is conducting a three-phase evaluation of the Field Artillery ARTEPs. This evaluation began in January 1977 and is scheduled to terminate in December 1977.

The first phase, which is currently underway, involves determining how Active Army units are using the ARTEP as a management/diagnostic tool and what changes, if any, are needed to make the ARTEP document a better tool for field artillerymen. There are three separate questionnaires: one each for section chiefs, battery level trainers, and battalion level trainers. The data collected will be analyzed and recommendations will be passed on to the Directorate of Training Developments — the ARTEP writers — for their use during the second generation of ARTEPs. Sixty-one battalions have received questionnaires. In general terms, the field is extremely complimentary regarding the ARTEPs. Preliminary data seem to indicate the following concerns:

- A majority of the respondents, particularly NCOs, view the ARTEP as nothing more than a replacement for ATTs/ORTTs.
- A large percentage of the section chiefs have no knowledge of, or access to, the ARTEPs.

In keeping with the philosophy that NCOs are responsible for integrating individual and collective (ARTEP) training, the above shortcomings appear to indicate that we have not achieved our goals regarding training. Whether these are ARTEP shortcomings, training management shortcomings, or a combination of both is yet to be determined.

Phase II consists of collecting and analyzing the same type data from Reserve Components.

During Phase III, selected tasks, conditions, and standards of the ARTEPs will be analyzed to determine whether they are valid. Active Army and Reserve Components will be asked specific questions on selected tasks from the ARTEP.

The results of the evaluation depend on the feedback from the field and, to date, the responses have been gratifying. With continuing ideas and recommendations from the field, the next generation of ARTEPs will be better tools for section and unit trainers.

The Directorate of Evaluation again thanks all commanders for helping the Field Artillery School make the ARTEP a better training document for all artillerymen.

Art by Donna Covert

THE FORWARD OBSERVER
HOW EFFECTIVE IS HE?

by LTC Allison H. Patrick

One day, during the War Between the States, a frustrated Federalist Redleg climbed a tree to better observe where his battery's cannon shot was falling. This unnamed artilleryman was the first forward observer (FO). We do not know what procedures he used or whether he was a good "shooter." We do know that in 1917 CPT William J. Snow was charged with establishing, within the School of Fire, a Department of Firing with the responsibility for teaching "firing instruction . . . observation of fire and service practice." Since that time, one of the primary objectives of the Field Artillery Officer's Basic Course (FAOBC) has been the production of highly qualified forward observers. Obviously, the term "highly qualified" is open to a great deal of interpretation, but the FO, to be qualified at all, should be able to meet the requirements specified in the various ARTEPs. Table 1 outlines these standards.

Table 1. ARTEP standards.

Event	Accuracy	Time (seconds)
Observation post location (map spot)	150 meters	30
Target location (map spot)	250 meters	60
Subsequent corrections		15
Number volleys for adjustment fire-for-effect	3 rounds within 50 meters	

The first documented indication that FO performance was not adequate surfaced in two field experiments conducted in the early 1970s. These experiments were the first of the Human Engineering Laboratories' Battalion Artillery Tests (HELBAT) series. The findings included evidence that well-trained, experienced FOs were unable to locate targets with sufficient accuracy for first-round fire-for-effect.

—30—

In fact, the target location errors (TLE) made by the observers were from 500 to 700 meters away from the target. The meaning of this is clear to any experienced artilleryman — the farther from the target the first rounds are, the more time and ammunition are wasted to move the rounds to the target; *and*, the target, once warned, assumes a much harder posture and is much more difficult to destroy. The results of the HELBAT series were further confirmed by both the Gunnery Department and the Counterfire Department when they determined that only 37 percent of the graduating students could locate targets to an accuracy of 200 meters or less. As a result, changes were made to FAOBC in FY 76 which resulted in improved target locating ability to the point that 50.5 percent of the officer students were able to achieve an accuracy of 200 meters or less on their last shoot. But, even on their last shoot, 27 percent of the students still were unable to locate targets to within 400 meters. Clearly, something was still amiss.

To get a better insight into this problem at the institutional level, all the FAOBC students' shoot (service practice) records from all the shoots conducted for classes 1 through 7, FY 76, were analyzed in detail (Table 2).

Table 2. Target location error.*

Shoot Number	Mean TLE (meters)	Number of Students
1	382	483
2	394	469
3	360	519
4	370	519
5	344	438
6	337	236

** These data are based on targets located by grid coordinates only.*

These results caused concern at the Field Artillery School because a very small increase in accuracy was realized as the student progressed through FAOBC. This concern led to a detailed analysis of instruction and an increased emphasis on teaching FO trainees better methods of *accurately* locating targets.

Although the analysis conducted within the School was revealing and resulted in a great deal of innovative and creative thinking, it did nothing to indicate the status of training of field artillery FOs assigned to cannon units. This information was mandatory if the Artillery School was to prepare a complete training program for FOs. To gether data, the Directorate of Evaluation, in conjunction with the Directorate of Training Development and with invaluable support from the Field Artillery Board and III Corps Artillery units, planned and conducted a field evaluation at Fort Sill to examine precisely the training status of graduates from FY 76 FOABC classes. Forty-five graduates were selected at random from five division artilleries and three field artillery groups and brought to Fort Sill for a closely controlled and monitored field evaluation. The exercise generally simulated a combat situation by placing the graduate in the role of an FO for a direct support battalion. This consisted of rapidly moving the FO through a series of five OPs and locating targets from each OP. Evaluation results are in table 3.

Table 3. Field evaluation results.

Event	Mean Miss Distance	Time (seconds)
Observation post location	213 meters	53
Target location	674 meters	75
Subsequent corrections		13
Number volleys for adjustment	4.7	
Fire-for-effect	90% within 50 meters	

Several points can be made concerning these results. First of all, the FO currently in the field, when faced with unfamiliar terrain, cannot locate himself or the target within the time and accuracy requirements of the ARTEP (table 1), nor can he adjust fire onto the target in the required number of rounds. This leads to the conclusion that the FO cannot *read* a map, but, when he sees a round impact, he can adjust that round onto the target.

The School is devoting a great deal of effort to correct this situation, but a little reflection on unit training methods is also required. The participants in the field evaluation indicated that we short-change training for our observers when we allow them to "memorize" impact areas for the sake of an ARTEP evaluation. When FOs are required to shoot into an unfamiliar area, it is difficult for them to locate themselves and their targets. This seems to indicate a lack of adequate map-reading training. The School has prepared and dispatched a training package for use within garrison and local training areas. This package will assist in organizing a comprehensive training program for officer and enlisted observers. The School will reexamine the status of training of observers again this summer using a similar field exercise to determine whether our training upgrade program is working and what additional training is needed to improve the performance of the FO. If this training upgrade program is successful, it will be made available to all FA units. In the interim, all unit commanders should be aware of the FO shortcomings and pursue independent improvements. Suggestions will be most welcome to USAFAS-DOE, Fort Sill, OK 73503.

LTC Allison H. Patrick is Chief of the Analysis Division, Directorate of Evaluation, USAFAS.

A battery of 75-mm pack howitzers at Quantico, VA, April 1935.

China, Vera Cruz, Haiti, France — exotic names, new challenges, an evolving doctrine. In the August 1915 issue of the *Recruiter's Bulletin*, CPT Robert O. Underwood, USMC, stated:

> Artillery in the Marine Corps has certainly demonstrated its worth in recent operations on shore, with both the Army and Navy. Past experience should clearly point out that it will be an indispensable adjunct in the future, in the conduct of advance base operations and expeditionary work, both of which operations will doubtless be conducted on a much larger scale than ever before in the history of our country.

In that prophetic article, Captain Underwood, an artilleryman of note during his time, stated accurately what was to take place during the next three decades.

Although artillery had been a part of the Marine Corps since its early years, it was during the first few years of the new century that organization and specialization as we know it today was developed.

The photographs on these pages depict a segment of Marine Corps artillery history from 1900 to 1941. They reflect and parallel the growth of the Marine Corps during a brief, but colorful and turbulent period of its 201-year history.

The number and variety of guns in the Corps multiplied as the Corps grew and expanded to meet the needs of the Nation. The men who commanded those guns in the early 1900s — Fuller, Dunlap, Underwood — began to leave their mark as Marines and artillerymen.

In China during July 1900, 3-inch naval field guns and Colt automatic guns accompanied the Marines under the command of CPT Ben Fuller (later to be the 15th Commandant of the Marine Corps) in the action against the Boxers. According to official dispatches, artillery was "well-handled and their fire effective" although it was known that the artillerymen were plagued by bad ammunition. Several models of the 3-inch guns were used by Marines early after the turn of the century. The guns fired a maximum range of 8,500 yards using a 15-pound projectile and could easily be manhandled by the small crew.

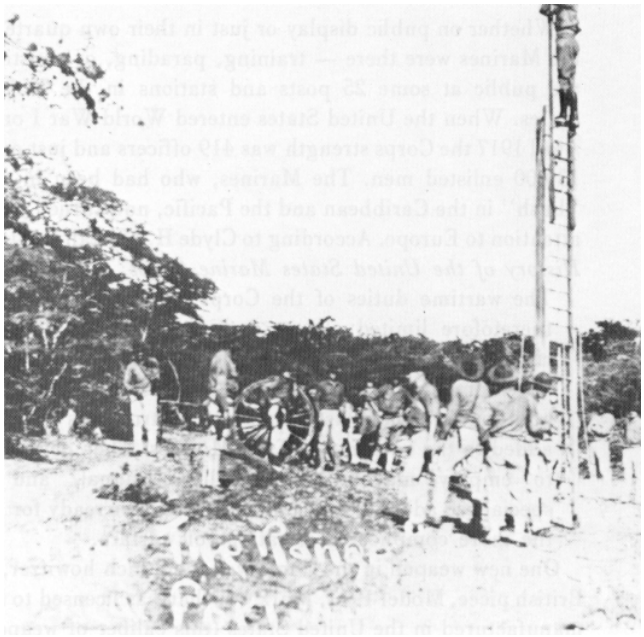
The Advance Base Force — the emerging new role for Marines — set the machinery in motion for the birth of the "force in readiness" of the future. Fixed defense regiments and mobile defense regiments were the organizations established for the newly defined mission. The following excerpt from LTC Kenneth J. Clifford's *Progress and Purpose: A Developmental History of the United States Marine Corps,* describes some of the equipment used in the new units.

> . . . The Regiment consisted of one battery of 5-inch rapid-fire, .40 caliber; one battery of 3-inch landing guns; two US Army experimental 4.7-inch heavy field guns; one mine battery with 60 mines; one signal company; one engineer company with necessary equipment, together with eight automatic rifles and four 1-pounders.

The Atlantic became the test bed for amphibious operations during those years, and it was during the Atlantic fleet exercises that amphibious operations techniques were developed that proved their worth in the years to come.

In 1911, an artillery unit (Company C of the Advance Base Battalion) was formed and became the forerunner of the present 10th Marine Regiment, which activated in 1914 and remains active today. The units, artillery and others, trained in the United States, the Canal Zone, and Puerto Rico, preparing to meet contingencies that would involve the United States before, during, and after World War I.

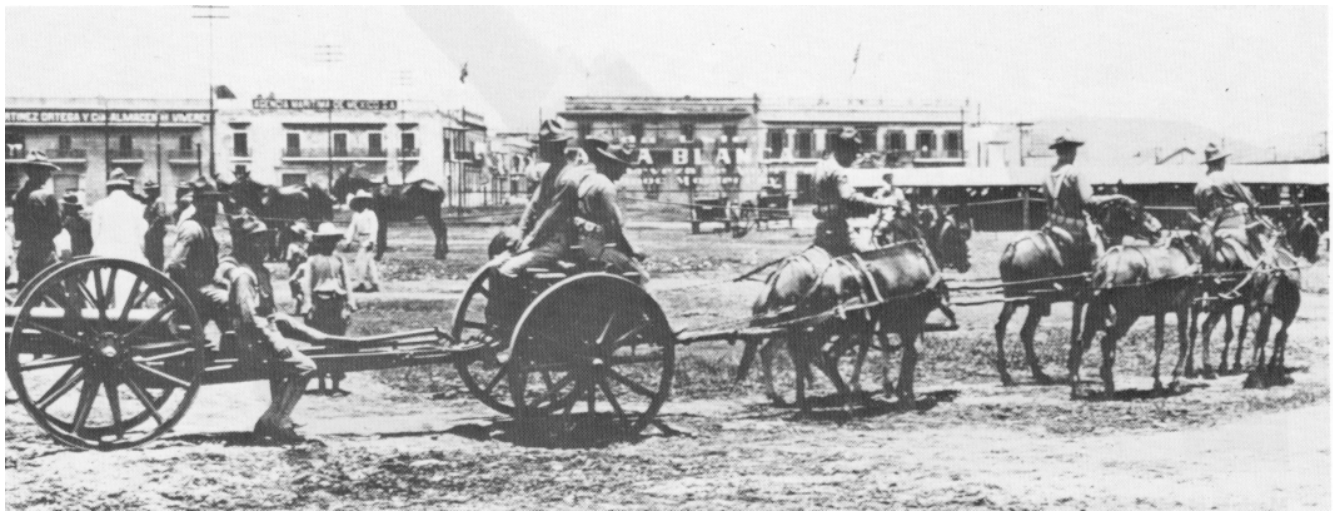
In April 1914, Marines went ashore at Vera Cruz, Mexico. Among the Marine units that made the landing was the artillery battalion under the command of MAJ Robert H. Dunlap. The battalion consisted of 10 officers and 375 enlisted men and was equipped with 3-inch field guns. Horses and mules were procured locally and trained to haul the guns and caissons. As during most of the early days of Marine artillery history, the men performed more tasks as infantrymen than as artillerymen.



Finding the range. Three-inch guns were in Haiti for the action in 1915, along with the "instant OP." Records do not indicate whether the FO received any hazardous duty pay for climbing that ladder.

In the Dominican Republic in 1916, artillery successfully supported the advance of infantrymen along with machineguns in the battle of Las Trencheras. This was reputed to be the "first experience of Marines advancing with the support of modern artillery and machineguns." The following is an excerpt from a commendation of CPT Chandler Campbell, 13th Company, Artillery, for his part in the engagement at Las Trencheras on 27 June 1916.

> The skill and good judgement displayed by you in handling the fire of the artillery, on the occasion in question, meets with hearty commendation of the Major General Commandant.



Marine artillery in Vera Cruz, Mexico, 1914.

Whether on public display or just in their own quarters, the Marines were there — training, parading, or assisting the public at some 25 posts and stations in the United States. When the United States entered World War I on 6 April 1917 the Corps strength was 419 officers and just over 13,000 enlisted men. The Marines, who had been in the "bush" in the Caribbean and the Pacific, now turned their attention to Europe. According to Clyde H. Metcalf in his *A History of the United States Marine Corps:*

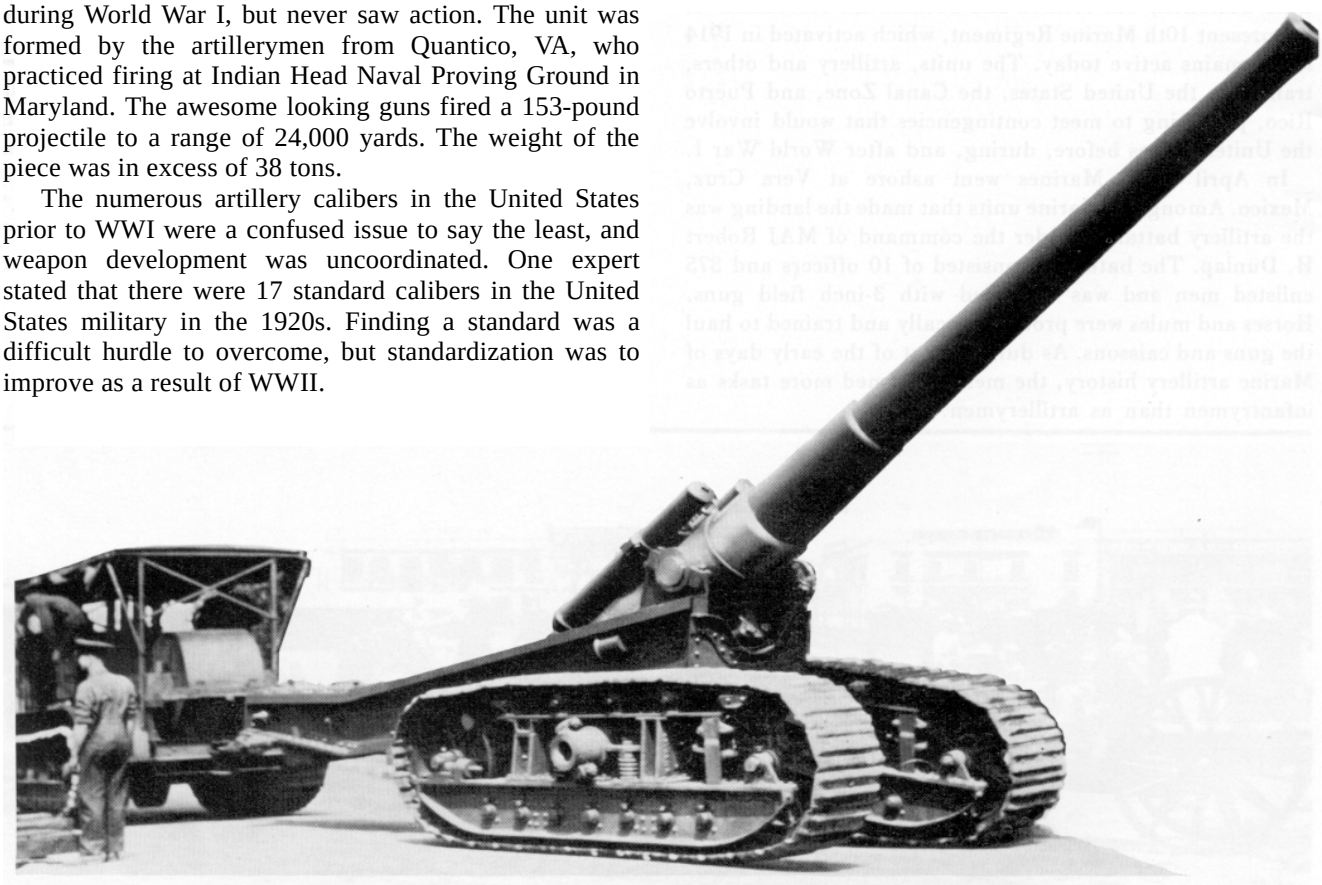
> The wartime duties of the Corps, which had been theretofore limited almost exclusively to duties as riflemen, became somewhat more complex with the development of new weapons of warfare. Several additional weapons as well as new instruments were added to the equipment of the Marines. They began to employ machineguns, artillery, signal, and specialized advance base units in order to be ready for the more complicated situations of warfare.

One new weapon in the Corps was the 8-inch howitzer, a British piece, Model 1917, Mark VI, that was licensed to be manufactured in the United States (this caliber of weapon has remained a part of Marine artillery). The big cannon was towed by a 10-ton Holt tractor and fired a 200-pound projectile some 11,000 yards. And the guns got larger — a regiment of 7-inch naval guns on caterpillar mounts was readied for service in France during World War I, but never saw action. The unit was formed by the artillerymen from Quantico, VA, who practiced firing at Indian Head Naval Proving Ground in Maryland. The awesome looking guns fired a 153-pound projectile to a range of 24,000 yards. The weight of the piece was in excess of 38 tons.

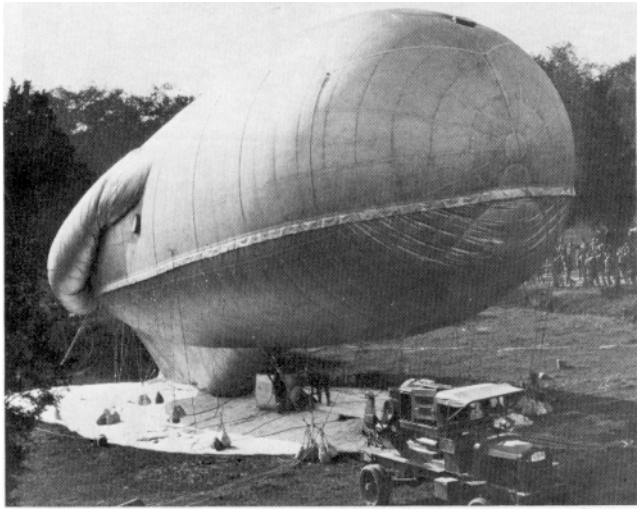
The numerous artillery calibers in the United States prior to WWI were a confused issue to say the least, and weapon development was uncoordinated. One expert stated that there were 17 standard calibers in the United States military in the 1920s. Finding a standard was a difficult hurdle to overcome, but standardization was to improve as a result of WWII.

In June of 1918, a balloon company was formed at Quantico, VA, and attached to the artillery force that had been stationed there. The balloons were ground-controlled by winch, could be raised to a maximum height of 5,000 feet, and were used for artillery observation, photography, and other associated tasks. Balloon units were to become part of the Corps and, like the 7-inch guns and the rest of Marine artillery, would not get their chance to see combat like their infantry counterparts. Although no actual Marine Corps artillery units participated in WWI action in France, numbers of artillerymen did serve. In fact, COL Robert H. Dunlap, USMC, commanded the 17th Field Artillery Regiment of the 2d Division, US Army.

Later, in the 1920s, artilleryman Dunlap was one of a group of Marine officers with prophetic vision who sought to ready the Corps for the grand test that was to come in the 1940s in the Pacific. W. H. Russell in his article, "Genesis of FMF Doctrine" in the November 1955 issue of the *Marine Corps Gazette*, discussed a thesis written by Dunlap.



Marines moving gun mounted on tractor for sesquicentennial exhibit.



Observation balloons could be winched up to 5,000 feet.

In 1921, COL Robert H. Dunlap, USMC, closely associated with Ellis during the Advance Base period, published an important analysis of the Dardanelles-Gallipoli campaign which laid down fundamental requirements for the infantry component of an amphibious fleet. Perhaps the most significant element of Dunlap's thesis lay in his insistence that fleet infantry comprise a balanced force of all arms, carefully trained in advance for the advance mission and supported by painstaking staff planning. Like Ellis, Dunlap insisted that this force must be prepared in all respects for daylight landing under fire. And though few of the Dunlap concepts were new, his paper drew significance from its stress upon the fact that US forces might soon face conditions similar to those that had defeated the British at Dardanelles-Gallipoli.

The concept of the doctrine they strove hard to develop was forged in ancient times but was taken to new heights by modern technology of the 1940s.

"Les bons soixante-quinze", (the efficient 75), held by some Frenchmen to be the winner of World War I, was, in one form or another, a regular part of the Marine Corps from the end of WWI to the beginning of WWII. Developed by the French and modified by the Americans, this rapid-firing, accurate weapon soon became the mainstay of Marine artillery. It was joined later by another French stalwart, the 155-mm. The "French 75" had a range of 12,000 yards using a 15-pound projectile. Model 1897 was followed by a US made, split-trailed version.

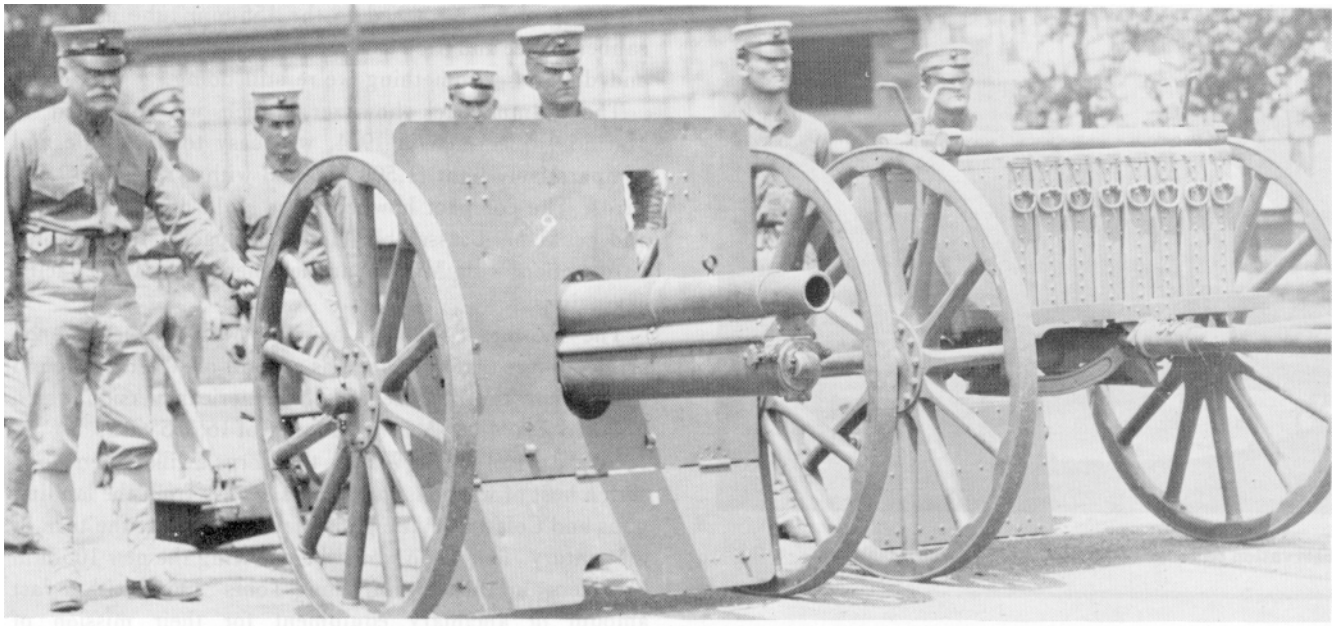
"Grand Puissant Filloux," the French 155-mm gun, GPF, pulled by the Holt 10-ton tractor was added to the inventory in November 1919. The long tube had a range of 18,000 yards and fired a 95-pound projectile. In training, a 37-mm gun was attached to the 155-mm tube as a subcaliber device and fired as a means to conserve ammunition and dollars — something we're still doing.

The 75-mm pack howitzer, which was provided to Marine artillerymen in 1934, was easy to dismantle and comparatively light (1,500 pounds) with a range of 9,500 yards. The compact howitzer used a 15-pound projectile and could be disassembled into man-packs. It saw some hard action with Marine artillerymen in WWII Pacific campaigns.

The 155-mm Schneider howitzer was another French artillery piece that developed as a result of WWI and found its way into the US arsenal. The American version which followed was Model M1 with a range of 16,355 yards.

On the eve of World War II, the Corps artillerymen stood with a host of weapons that were a far cry from the landing guns and Colt automatic guns they had used at the turn of the century. They soon would be receiving the new 105-mm howitzers and the 155-mm "long-Toms" along with a vast amount of ancilliary equipment for their mission of supporting the Marine carrying the rifle. The "cannon-cockers" of the era learned their basic skills and went on to develop a skilled profession within the Marine Corps. The 155-mm guns gave the artillerymen the capability to add depth to the battlefield as never before and the flexibility to support the development of new tactics. Like the airplane, the artillery weapons added greater dimension to the battlefield.

Marines of the Advance Base Brigade at Marine barracks, Philadelphia, PA, training in pedal-mounted guns, prior to World War I.



Marines on duty at the Marine barracks, Navy yard, New York, NY. The equipment is the 3-inch field gun and caisson, prior to World War I.

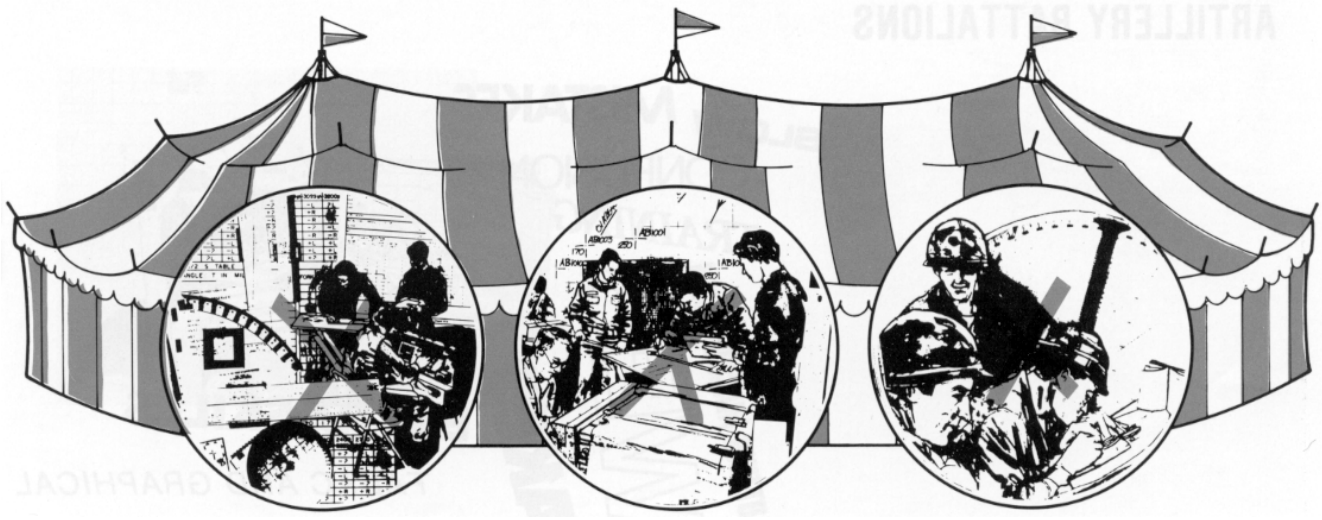
These few photographs can only give a fleeting glimpse of the artilleryman's tools during the first 40 or so years of the new century. Pictures alone cannot grasp the true history of the "lanyard-yankers" and their contributions to the Marine Corps. Just as with all Marines involved in a large list of specialties, they have contributed in their own way to the first 201 years of the Marine Corps.

The photographs contained in this article were extracted from the official Marine Corps files and are part of a larger collection of more than 200 photos depicting the history of USMC artillery from 1900 to 1941. They reflect one of America's most turbulent eras — these pictures are America, the people and places that have made us what we are today.

MAJ A. D. Nastri, USMC, is Fire Support Coordinator for the 17th Marine Amphibious Unit, Camp Pendleton, CA.

"A few good men" comprising a gun crew, Company C (3-inch naval landing guns), Marine Barracks, Panama Canal Zone, 1913.

Let's take the three-ring circus out of all fire direction centers with a—



Fire Control Calculator

by LTC Thomas J. Moore

At div arty and battalion levels, TACFIRE handles all the complexities of tactical fire direction, as well as the more stable requirements of technical fire direction. At battery level, the battery computer system (BCS) solves all the requirements for technical fire direction. Both of these systems are long overdue answers to the artilleryman's dream. Their entry into the inventory will give the artillery both the capability and the flexibility to successfully fight in any kind of war.

TACFIRE And BCS Lacking?

Fantastic as they are, TACFIRE and BCS do not cover all needs! Within the overall fire direction/fire support structure, there are still critical and significant requirements for:

- BCS back-up.
- Interim assistance for National Guard, Reserve, and other artillery units scheduled to use FADAC with manual back-up.
- Improved mortar fire direction equipment.
- Improvements in fire direction capabilities of a great number of our allies and other friendly nations who do not have the sophistication, the financial means, the organization and number of units, or the compatibility of doctrine to warrant either TACFIRE or BCS.
- Some kind of automated means for computing firing data for the rarely used, but massive, indirect fire capabilities of armor.

Fortunately, the world is experiencing a major revolution in micro-miniaturization of the computer, and the exploitation of this phenomenon is producing calculators that are finding their way into every field of activity. Therefore, there is no need for the artillery, armor, and mortar fire direction centers to hesitate in taking advantage of this extraordinary opportunity to materially improve their capabilities.

Calculators For Fire Control

There is some development of fire control calculators already under way. An exciting lightweight version for mortars has been used for dry and live firing demonstrations all over the world. The reception, by infantrymen and artillerymen who have observed the demonstrations, was of overwhelming enthusiasm.

Even more exciting than the 18-pound feasibility model is another model which will weigh less than 10 pounds and measures only one tenth of a cubic foot. Powered from an internal or external source, the calculator includes all the capabilities one would realistically want at the mortar battery, company, or platoon level. These include:

ARTILLERY BATTALIONS

ARTILLERY BATTERIES

MORTAR PLATOONS AND ARTILLERY BATTERIES

M16 PLOTTING BOARD AND FIRING TABLES

NTICIPATED AND POTENTIAL USERS ⟷ FUTURE FIRE DIRECTION CENTERS

U.S. ACTIVE ARMY AND MARINE ARTY

SOME FREE WORLD ARTY BNS

MINIMUM EFFORT

EFFICIENCY

TACFIRE (FIRE DIRECTION ELEM ONLY)

U.S. ACTIVE ARMY AND MARINE ARTY

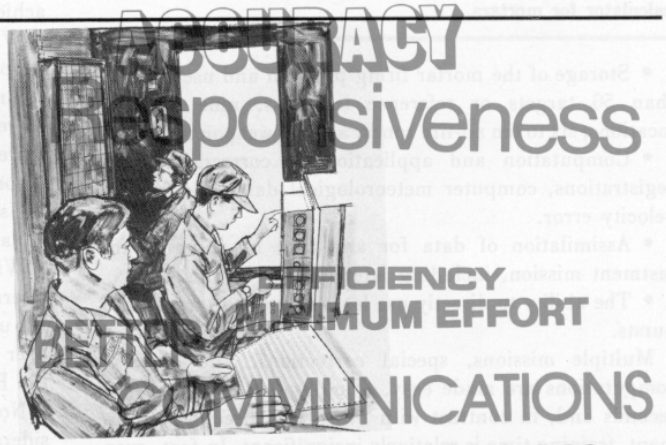
SOME FREE WORLD ARTY BNS

BCS BACKUP

MOST OF FREE WORLD ARTY

NATIONAL GUARD AND RESERVE U.S. ARTY

TANK GUNS IN AN INDIRECT ROLE



BATTERY COMPUTER SYSTEM (BCS)

ALL U.S. ARMY AND MARINE MORTAR UNITS

ALL FREE WORLD MORTAR UNITS

BETTER COMMUNICATIONS

MINIMUM EFFORT

Efficiency

RESPONSIVENESS

ACCURACY

FIRE CONTROL CALCULATOR (FCC)

Figure 1. Control panel of development model fire control calculator for mortars.

• Storage of the mortar firing problem and use of more than 50 targets or reference locations, nine observer locations, six to ten no-fire zones, and six weapon locations.

• Computation and application of corrections from registrations, computer meteorological data, and muzzle velocity error.

• Assimilation of data for any type of observer adjustment mission, including lateral shifts in mils.

• The ability to directly use laser ranges to targets and bursts.

Multiple missions, special corrections, and traverse computations are made easy. Computation time is a few seconds and, in contrast with other fire direction equipment, training time is relatively insignificant. In fact, even the most skeptical must admit that the calculator meets all essential technical fire direction requirements, and, in quantity production, the cost is only about $2000!

Figure 1 shows the control panel of a development model, which contains fire control data for 60-mm, 81-mm, and 4.2-inch mortars. The panel for an artillery or armored version would be basically similar.

Other Advantages

Here are some of the reasons why the US should have such a calculator in its inventory:

1) It is simple and extremely reliable.

2) An operator with fire direction background can be trained in minutes — the complete novice artilleryman, in about two hours.

3) Such calculators are inexpensive. The cost ($2000 each or $2500 with a connector for wire or radio communications) is compensated by:

- Savings in ammunition due to its accuracy.
- Simplified training requirements.
- Decreased time to get the first round on target.

4) With two or three calculators in each unit, the need for graphical plotting and other time-consuming manual methods are completely eliminated; thus, the operational efforts in fire direction operations are drastically reduced. This will permit 24-hour operation with existing manpower.

5) It provides improved flexibility of operations.

6) It is accurate.

7) As weather and terrain conditions deteriorate, the existing advantages of the calculator accelerate sharply.

8) It is more responsive than present equipment. This is especially significant since responsiveness can be equated to lives.

9) The calculator's capabilities and its simplicity and inexpensiveness should result in adoption by all allies, thereby achieving a long sought degree of fire direction standardization that has heretofore been difficult to achieve.

Within the battery/platoon technical fire direction/fire support parameters, the calculator has reached a technological plateau far beyond that of other elements and there is currently little room for improvement. Therefore, there is no long development cycle before production can be accomplished.

Using existing hardware and building-block techniques, it has production and modification flexibility.

With the addition of an inexpensive connection and an interactive display terminal or a digital message device, the fire unit can add a quick digital communications capability over standard wire lines or radio/voice channels between the FO and FDC.

Normally, there are very important and difficult considerations in any developmental effort such as maintenance, reliability, training, enemy countermeasures, systems interface, technical risks, etc., but these are minimized within this development.

The results of one small calculator may not appear impressive, but the cumulative results of tens of thousands may well exceed the contributions of the more impressive weapons. If we assume that the threat is real, then this cumulative effect must be given an appropriate priority.

The calculator on which this article is based is one developed for mortars. Artillery programs, with their more complex ballistics and longer ranges, have not been tested or presented to FA developers.—Ed.

LTC Thomas J. Moore is Commander of the 3d Battalion (155-mm, SP), 144th Field Artillery, California Army National Guard.

Project Manager Designees

Department of the Army has announced the names of officers selected by the DA Project Manager Selection Board to fill PM vacancies programmed during FY 77.

Field Artillery colonels selected are:

August M. Cianciolo — Standoff Target Acquisition System.

Edward A. Kelley — TACFIRE.

Joseph H. Leszczynski — Training Devices.

Barrie P. Masters — General Support Rocket System.

Robert P. St. Louis — AH-1 "Cobra."

John J. Top — Special Electronic Mission Aircraft.

John F. Zugschwert — Aircraft Survivability Equipment Program.

Stabilization

If you are in a command or an aide-de-camp position, be sure to notify branch. An entry will be made in your file to insure your stabilization in the job. Often an officer is considered for reassignment not knowing he is in a stabilized position. Call or write Field Artillery Branch and let us know that you are scheduled for or already in a command or an aide-de-camp job.

Redleg MOS Retraining Reduced

No additional soldiers will be selected for retraining in 13E (cannon fire direction/fire support specialist) and 82C (field artillery surveyor), according to a recent MILPERCEN announcement regarding a cutback in the 1977 combat arms NCO retraining program. The same announcement says there will be an increase in retraining for MOS 17C (field artillery target acquisition specialist) because of target acquisition battery activations.

Overall, the 1977 retraining and reclassification program will be pared by about 200 from the original 1,400 goal. Although the cutback is not large, MILPERCEN officials say, it does signal the end of the program. Volunteers, however, are still being accepted for the remaining MOSs which have high promotion potential.

DA officials have expressed concern that many commissioned officers in year group (YG) 1970 have not told MILPERCEN their preference for an OPMS alternate specialty.

Only about 25 percent of the 4,200 commissioned officers involved have returned the specialty preference statements sent out last year. MILPERCEN needs statements from those who came on active duty between 1 July 1969 and 30 September 1970.

Officers in this year group who have not filled out a preference form should contact their local MILPO or MILPERCEN. AUTOVON number for company grade combat arms career division at MILPERCEN is 221-7820. Officers also may write Commander, MILPERCEN, DAPC-OPP-S (YG 70), 200 Stovall Street, Alexandria, VA 22332.

Officer Records Answering Service Available

Active duty officers who have questions about their official records at MILPERCEN's Personnel Records Division now may call a central telephone exchange to obtain prompt responses to their questions. Types of questions anticipated are those relating to OERs, status of appeals, official photographs, awards, and other documents which are placed in officers' Official Military Personnel Files.

The system consists of recording equipment capable of receiving queries 24 hours a day — seven days a week.

Officers may call AUTOVON 221-8792 or commercial (area code 202) 325-8792 to record their questions. To assist MILPERCEN in processing calls, officers are asked to call *only* this number with records-related questions. On a daily basis, calls are transferred to worksheets and distributed to appropriate action officers.

When a call is placed, a brief recorded statement announces that the officer personnel records telephone inquiry and answering service has been reached. The caller then is asked to state his full name, rank, social security number, military address, and AUTOVON telephone number. The

caller's question then should be asked. Questions should be clearly stated and kept as brief as possible. Queries requesting only a return call will not be answered.

Exceptionally long or technically complex questions should be directed in writing to MILPERCEN. Correspondence should be addressed to Commander; USA MILPERCEN; ATTN: DAPC-PSR-R; 200 Stovall Street; Alexandria, VA 22332.

Additionally, requests for documents or microfiche files should not be made telephonically. These requests must be in writing and a small reproduction fee will be charged.

Hold On WO ASIs and SQIs

The authority of field commanders and service school commandants to award additional skill identifiers (ASI) and skill qualification identifiers (SQI) to warrant officers has been terminated pending implementation of a revised AR 611-112 on 1 April 1978.

This action is necessary to permit Headquarters, DA, to purge all records of invalid and erroneously awarded ASIs and SQIs in preparation for the reclassification actions to be directed by the revised AR.

Service school commandants will continue to forward to DA, rosters of warrant officers who complete courses which result in qualification for a current ASI or SQI. Individual requests or commanders recommendations for award of ASIs or SQIs will be documented and forwarded to Commander, MILPERCEN, ATTN: DAPC-OPW-P, 200 Stovall Street, Alexandria, VA 22332 for action.

Fort Benning Schedules OCS Courses

Four officer candidate courses are being offered at Fort Benning, GA to individuals on permanent duty station assignments who meet the minimum basic requirements.

To attend the 14-week course, an individual must be between 19 1/2 and 29 years of age. Male applicants must have a GT score of 110, an OCT score of 115, and a minimum composite of 200 on OCT and OQI scores. Females need a GT score of 115. Both must have physical profile scores of 222221 and have completed advanced individual training. All applicants must have two or more years of college.

Applications must reach Headquarters, MILPERCEN by the following dates: Class 1-78, 29 July 1977; Class 2-78, 14 October 1977; Class 3-78, 30 January 1978; and Class 4-78, 26 May 1978.

If an applicant is rejected, he may reapply six months after the date of rejection.

E5/E6 DOR Change

DA has changed the way it computes dates of rank for soldiers who are promoted to E5 or E6. The change will affect primary and secondary zone hikes for these individuals.

DA officials say that dates of rank are now based on the score that soldiers make on the 1,000-point promotion worksheet kept at the unit. Soldiers with the highest worksheet scores will get the earliest monthly dates of rank.

Soldiers earn worksheet points for military and civilian schooling, EERs, MOS test scores, decorations, time in grade, and time in service. Previously only one score per MOS was listed for hikes to E5/E6. However, since April 1, E6 secondary zone scores have been listed.

DA officials say that the DOR change should more evenly spread out monthly promotion lists.

Assignment Following The Advance Course

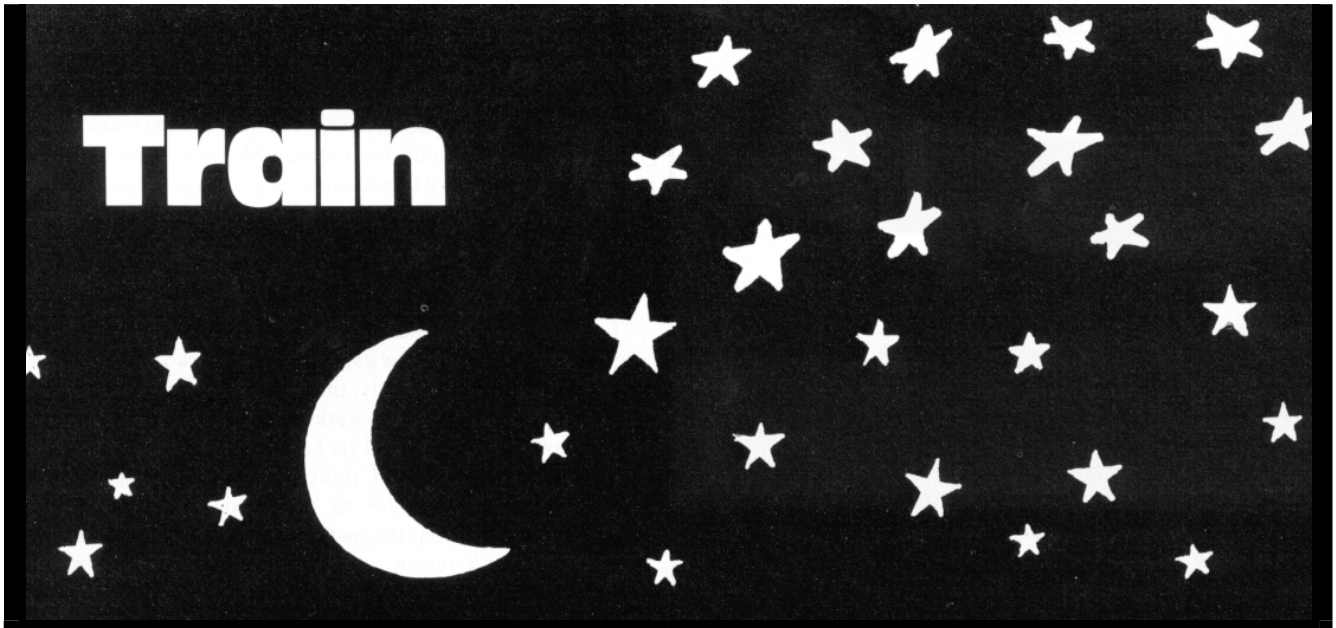
A frequently asked question by officers with orders for the Advance Course is, "What is my assignment following the Advance Course?" It is rare that this question can be answered prior to arrival at Fort Sill. This is because we do not have the requirements for the time frame in which you will be available for assignment following the course. As part of your inbriefing at Fort Sill, you will be asked to fill out a new preference statement. When both the preference statements and requirements are received, we immediately begin working on your assignment. Our goal is to finalize these assignments in the second or third month of the course.

FA Commanders Selected

The names of 68 Redlegs selected for Field Artillery troop commands were released by DA message in April 1977. Approximately 700 officers competed for these positions resulting in a 9.7 percent selection rate. All of the selectees were graduates of CGSC level schooling and 69 percent had advanced degrees. Average age of the selectees was 38.4 years. Two of the selectees were reserve officers. The Field Artillery selectees by year group are:

59	60	61	62	63	64
3	10	20	10	20	5

In addition to the 68 officers selected for FA troop command, five Redlegs were selected for non-artillery troop command.



as you will fight- At Night

The phone call announcing our annual battalion training evaluation was brief and to the point. "You have a little less than two months to prepare and, by the way, plan to do it *all* at night." That challenge — to prepare the 1st Battalion, 321st Field Artillery, 101st Airborne Division (Air Assault), to do everything at night and make it seem routine — set into motion a unique reverse cycle training program designed to achieve Army Training and Evaluation Program (ARTEP) standards under total blackout conditions.

Preparation

The men in the battalion were primarily oriented, as are most Army troops, to daytime operations. Night training was simply regarded as an extension of daytime activities. Our training was designed to reverse their physiological clocks gradually and, through practice, condition them to do *everything* at night within the strictest standards of light and noise discipline. We set three broad objectives. The first objective was to sharpen technical proficiency to ARTEP standards. Next, we sought to perform at that level routinely at night. The third objective was to overtrain and overtask ourselves deliberately so the actual evaluation would appear easy in comparison.

Fortunately, our training was oriented toward the evaluation long before we knew it would be conducted at night. We started with individual and section training based on the individual tasks, conditions, and standards specified in the ARTEP. Building on this, effective use was made of the improved 14.5-mm artillery trainer before sending each battery to the field on a three-day, live-fire field training exercise (FTX). Thus, our first objective — to sharpen technical proficiency — was already within reach by the time the night requirement was announced.

Subsequently, the entire battalion participated in an 11-day brigade FTX, White Eagle 1, supporting infantry battalions undergoing their own rigid training evaluations. Our fire support sections received their evaluations at this time also. As a step toward our second objective — to perform well at night — the battalion made only night moves during the FTX. This helped us get a better perspective for what lay ahead.

Following White Eagle 1, members of the battalion's fire support sections formed the nucleus of a team which administered ARTEP evaluations to the headquarters and service battery and all three firing batteries. This enabled us to identify precisely the battalion's strengths and weaknesses. Subsequent training was tailored accordingly. These ARTEP evaluations became the baseline from which the last phase of our training began.

The final preparation consisted of several battery and battalion FTX's alternately emphasizing tactics and gunnery with total concentration on night operations. During the battery exercises, all ARTEP missions were fired at night except the dissipating target and hasty smoke.

by MAJs James R. Martin and Dale W. Schofield

CH-47 delivers base piece to offset registration position (Photo by J. W. Burkey.)

These were fired at daybreak. It was virtually impossible to judge their effects in the dark. Battalion-level preparation began with a two-night exercise in which no displacements were made. Primary emphasis was placed on gunnery. All battery and battalion ARTEP missions were dry fired until procedures were correct and then live fired. Forward observers used artillery illumination and the Night Vision Sight (NVS), AN/TVS-4, to adjust fire. This device, organic to the battalion survey section, is good for ranges out to approximately 3,000 meters. After each exercise, leaders met to review progress toward ARTEP goals and to share ideas for coping with the darkness.

During these initial exercises everyone became very tired as the nights wore on and were totally exhausted well before daylight. Although no one was required to report for work until 1300 hours on the day of an FTX, most of the battalion personnel took advantage of their "morning off" to run errands. It took several exhausting nights for everyone to realize we were really serious — that night training meant working from dusk until after dawn.

While the majority of this field training was conducted at night, a complete reverse cycle schedule was not in effect. This had been purposely delayed to preserve, as lont as possible, the "newness" of total night operations.

Two weeks before the scheduled evaluation the entire battalion began reverse cycle in earnest, including garrison operations. It started with a night occupation which kicked-off a three-day FTX. The exercise included night moves and air assault raids by each firing battery (see "The Artillery Raid, Air Assault Style," *FA Journal*, May-June 1976). All battery and battalion ARTEP missions were fired. By the third night it was apparent that night operations were indeed becoming routine. Sections were operating more smoothly, mission times were improved, and air assault raids were more rapid.

The following Monday evening the battalion moved to the field for the final preparatory effort. As before, the emphasis was placed on gunnery. In contrast to the first battalion exercise, howitzer crews and FDC personnel now continued throughout the nights with no apparent loss of snap or precision. All sections were able to achieve ARTEP standards with minimum difficulty. This training ended early Wednesday morning.

With five days remaining before the deadline, it became apparent that our last major task was to protect our troops from garrison requirements so they would not lose their psychological edge. Our garrison schedule ran from 1800 to 0500 hours. Unfortunately, the rest of the division persisted in maintaining a daytime work schedule. Although division artillery headquarters did its best to assist, there were still important meetings and things for us to accomplish at unreasonable hours such as 1000 and 1400! Even more severe was the requirement for the entire battalion to participate in a review at 0830 hours on Friday morning. We managed to salvage our reverse cycle orientation by having the troops report to work at 2400 hours on Thursday and remain on duty until completion of the review. Returning to work at 1800 hours Friday, we had our final briefings and released the battalion for the weekend. We were ready.

Evaluation

Overall, the battalion was evaluated in 14 general areas. All ratings were satisfactory. We had achieved our third and final objective. The most significant result of our night training, however, was not the completion of a successful training evaluation but rather the lessons learned, the confidence gained, and the techniques developed.

At the outset the decision had been made not to lower any performance standards nor restrict our operations to compensate for the handicap imposed at sunset. We soon realized there was no shortcut to the physiological and psychological adjustment required for efficient night operations. Practice is the key.

Putting It In Reverse

The first two nights of reverse cycle training are critical. The training must be demanding throughout the night with no allowances made for getting tired. We learned that the troops' psychological orientation was more important than physiological adjustment ane we had to push them very hard to make them believe we were really serious. Once that hurdle was crossed, the physiological adjustment was only a matter of time. It took about two weeks before everyone could perform routinely all night without becoming excessively tired.

Although the best way to accomplish reverse cycle training is to go to the field for the entire period, we could

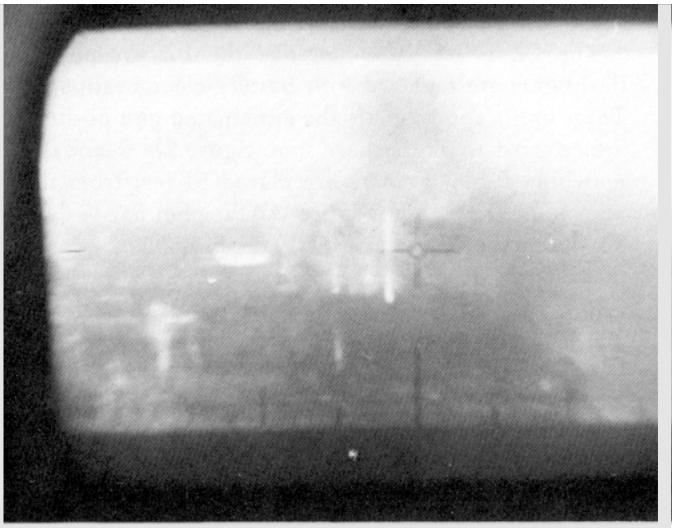
not do so. Nevertheless, we did maintain a reverse cycle orientation even though some key personnel were working 18 to 22 hours each day — at night during training and all day with external agencies and higher headquarters. We were successful, however, in preserving the reverse cycle orientation for most of the men. Our schedule included breakfast at 1800, lunch at 2400, and supper at 0500 hours. The dining facility schedule is very important because it shows the troops that everyone in the unit is involved.

Planning

Stay away from classroom training. Make the training as interesting and challenging as possible but, whatever you do, make it active. It is absolutely essential that the non-SOP aspects, particularly the control, evaluation, and safety structure supporting the training, be planned in meticulous detail and completely coordinated before the training begins. In the darkness everything takes at least twice as much time. A poorly prepared safety officer can ruin a full night of training. Delays are devastating to troop morale. We used a written schedule of events ofr each night of training. It was provided to key staff officers and support personnel but not to the batteries. This schedule allowed staff members to anticipate support requirements, phase safety officers into the exercise, and keep the commander informed so he could be present to observe critical phases of the training.

Command and Control

Command and control was the most significant problem of night training but also provided the greatest opportunity. The battalion and battery commanders learned early that their control was usually limited to the narrow beam of a red-filtered flashlight! Key leaders simply could not see to make on-the-spot corrections. They had to rely heavily on junior leaders and individuals to perform properly, exercise initiative, and report accurately and quickly. We were successful in our night program because of the extensive preparatory individual, section, and battery training conducted in the daytime. Our officers and NCOs, particularly those who previously tried to do everything themselves, spent some uncomfortable hours but learned valuable lessons about the capabilities of their subordinates and the superiority of teamwork over individual performance. Junior NCOs and section chiefs grew in proficiency and confidence to meet the challenge thrust upon them by darkness. It is impossible for a handful of key individuals to carry a unit through training of this type. The sooner this lesson is learned, the sooner the unit will benefit.



Artillery adjustment as photographed through the lens of a night vision device. (Photo by Michael Lada.)

Pickup And Landing Zone Operations

Perhaps the most significant innovation to come out of our night training was the development of a new and simple pickup zone/landing zone (PZ/LZ) lighting system. Designed by CPT John Teague, B Battery commander, this "silent light" system eliminates the standard lighted "T" in both the PZ and the LZ. A color code system is used which enables a pilot to pick up his load and deliver it to the LZ with pinpoint precision. Guns are off-loaded in position and pointed in the primary direction of fire. Lateral maneuvering of the helicopter in the new position is virtually eliminated. The major advantages of this silent light system are speed of occupation and the radio silence under which LZ operations can be carried out. Color codes used in the PZ correspond to those used in the LZ to insure emplacement of each gun section in the proper order.

The PZ is set up with different colored beanbag lights positioned approximately 54 feet in front of the guns (figure 1). These lights represent specific loads. (Pilots report that blue beanbag lights are difficult to see and should not be used.) Flashlights with like-color filters are affixed to each howitzer tube. The flashlight color represents a specific battery. Inbound to the PZ, pilots are given an approach heading and a load color. They are asked to land on their load color so the beanbag light is directly between their feet. By aligning the aircraft with the light on the end of the tube, the helicopter lands in a postiion ready for loading. Howitzers are winched or pushed on, and the crew loads the aircraft through the right door. As the section chief boards, he hands the pilot a note which confirms the location of the LZ, the LZ radio frequency and call sign, the load color he is carrying and the battery color. All that remains is to fly to the LZ.

The LZ is set up much like the PZ except that the flashlights are replaced with battery-color beanbag lights. These lights approximate the anticipated gun positions and are referred to as the base line (figure 2). Beanbag lights matching PZ load colors are placed 54 feet from the base line, along the azimuth of fire. All the pilot has to do is land on his load color — beanbag between his feet — and align the tail of the aircraft with the base-line light associated with his load. As the howitzer rolls out of the helicopter, it will be pointed in the primary direction of fire. No radio transmissions are necessary. (LZ controllers should, however, warn pilots of any obstacles which may endanger their approach.) If the gun positions are along a treeline, the pilot simply makes his approach to the base light, executes a 180-degree hovering turn and lands on the color light representing his load. Making the base-line lights a different color for each battery eliminates the possibility of a pilot identifying the wrong LZ. If confusion exists, battery commanders can mark the LZ with a strobe light.

The silent light system significantly improved our night operations and was particularly adaptable to the night raid. We also found that a pre-mission briefing for the air crews, while highly desirable, was not necessary when they learned how the system worked. Since standardized loads were used, only locations, PZ times, frequencies and call signs had to be coordinated to move the entire battalion on short notice. When the TOC or other headquarters elements were moved by air, the standard lighted "T" or inverted "Y" was employed in both the PZ and the LZ.

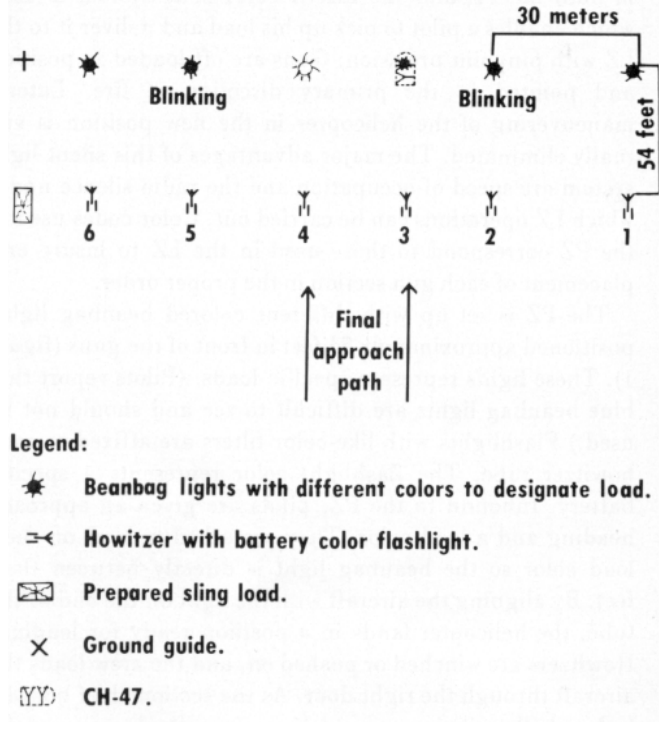


Figure 1. Different colored lights positioned in the pickup zone, approximately 54 feet in front of the guns, represent specific loads.

Camouflage

It is possible to camouflage well at night. However, with darkness for concealment, there is a strong tendency to disregard camouflage discipline. If left until daylight, personnel fatigue will work against camouflage receiving the attention it requires.

Maintenance

Maintenance was the only major area which could not be performed well at night. Many routine tasks became major obstacles without adequate lighting. The simple task of reading an oil level proved almost impossible with a red-filtered flashlight. Cosmetic damage to vehicles increased sharply at night. Even with ground guides and slow speeds, narrow trails and trees combined to crumple fenders and remove a few side mirrors. Lacking sufficient blackout shelters, the best solution seems to be supervised maintenance at dusk and dawn.

Firing Battery

Several of the techniques used in the firing batteries are SOP in many units. Those recounted here may not be new and innovative but they worked. After each occupation every individual must be briefed on the layout of the position. Key leaders must know the location of a central meeting place so conferences can be assembled quickly without personnel getting lost. This point should always be manned and can also serve as an internal message coordination center. Do not use the FDC for this purpose!

Night laying was improved by using wire communications and color-coded flashlights. Where possible, wire was installed by the advance party. During laying, gunners used green flashlight filters which allowed other members of the battery to continue working with red. The aiming circle was unmistakably marked with a flashlight wand suspended beneath. Gunners were cautioned not to use the wand as an aiming point.

The standardized layout of section equipment proved invaluable. Items returned to their proper places were easily located when needed again. This simple technique virtually eliminated equipment losses.

Additionally, different colored lights were used on the near and far aiming posts, collimators were sandbagged and surrounded with ammo boxes to prevent accidental

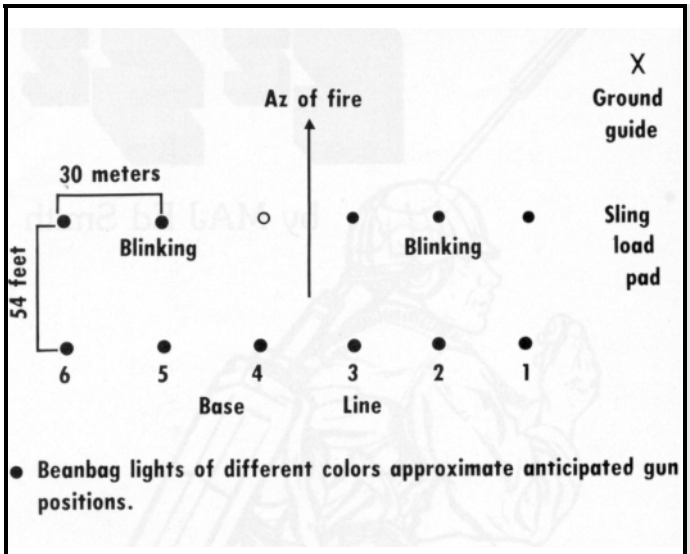


Figure 2. Battery-color beanbag lights in the landing zone approximate the anticipated gun positions and are referred to as the base line.

bumping, and standard angle checks were used to verify boresight after moves. Boresighting at night with a test target is painfully time-consuming.

Forward Observers

To simplify the identification of targets to the observers, FO parties were allowed to occupy their positions one hour prior to darkness. This time was used by the observers to make terrain sketches which, after dark, became primary reference sources, often replacing the observer's map. The most useful piece of equipment on the hill was, of course, the NVS. After a little practice, observers preferred the NVS to adjusting under illumination. It worked best when there was some available light such as moonlight. On extremely dark nights clarity was severely reduced — a drawback easily overcome by firing a single illumination round in the general vicinity of the target. This round rarely had to be adjusted and the light it provided improved the range of observation, clarity of the target, and the depth of field seen through the scope. However, viewing such a light source directly through the NVS quickly destroyed the observer's night vision. To prevent this, illumination burnout was computed at a point above the NVS field of vision. A well-placed illumination round improved the capabilities of the NVS so dramatically that it could be used to advantage even on bright moonlit nights. Observers using this device should avoid viewing any direct light source including the moon and navigation lights on passing aircraft.

Survey

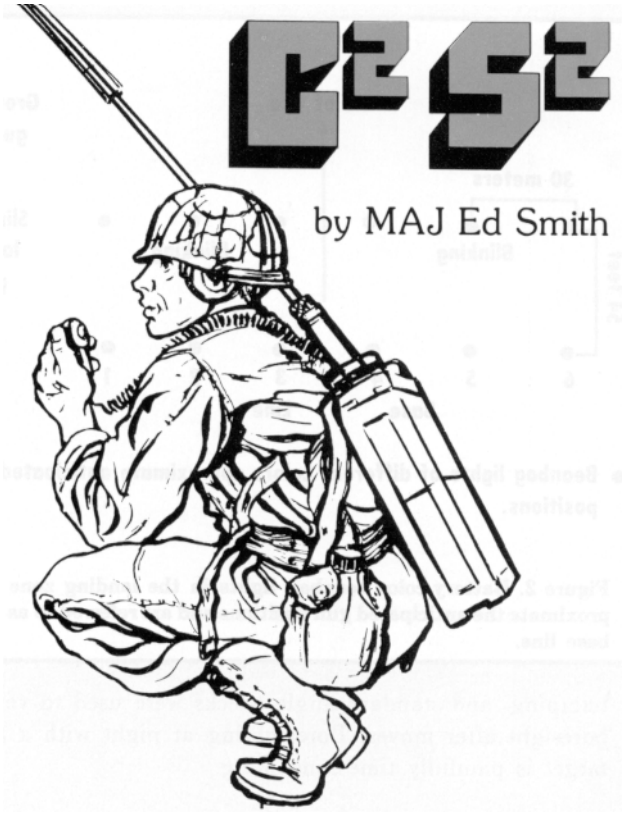
Our survey team did very well at night, achieving a speed of 600 meters per hour. The team used two lights on the forward range pole to facilitiate vertical alignment. The rodman turned the forward pole until the instrument operator could identify it in his instrument and then went on to the next station. This kept the rodman two stations ahead of the instrument operator. Meanwhile, the chief of party was one or two stations ahead of the rodman emplacing range poles and marking them with a red-filtered flashlight to orient the rodman and tapemen. As he emplaced each range pole, the chief of party signalled to the rodman by flashing his light and waiting for acknowledgement that the rodman could see the light on the pole before he moved to the next station. The instrument operator realigned the lights on the near station pole toward his next station before he moved forward. This enabled him to easily identify the rear station once he had moved. It also eliminated the requirement for a rear rodman who was then free to assist the tapemen. The tape party consisted of five men, two holding the tape, two assisting with red-filtered flashlights, and one keeping the tape clear. All commands were signalled by flashlight. Surprisingly, very little practice was required to make this procedure work smoothly.

Perspectives and Conclusion

Many of the ideas, techniques, and procedures mentioned served to make our night operations more efficient. The ARTEP provided us with a way to set specific goals and measure progress which, in turn, allowed us to make the most efficient use of our limited training time and resources. As a result, the battalion improved rapidly in spite of the darkness. Self-imposed mental barriers gradually fell away as men, almost unconsciously, adapted to the new environment. From an initial attitude bordering on despair, everyone came to realize not only that it could be done, but it could be done well!

During the night training, MAJ James R. Martin was the executive officer and MAJ Dale W. Schofield was the S3 of 1st Battalion, 321st Field Artillery. Major Martin is presently at the Defense Language Institute, Monterey, CA, and Major Schofield assumed the duties of executive officer of the 1st Battalion, 321st Field Artillery.

Solving the battle captain's command and control dilemma . . .



The battle captain on the modern battlefield does not have an adequate command and control system with which to effectively control the various combat resources at his disposal. We have provided him with sophisticated, highly mobile forces and have given him specific tactical guidance on how to fight. In effect, we have given him a multimillion dollar fighting organization with a two-dollar command and control system. Relatively little has been spent on his personal command and control tools, other than expensive radio gear. This is similar to a brain surgeon performing surgery with a P38. Visits and interviews with field commanders in CONUS and in USAREUR have reinforced this conclusion. The Combat Communications Systems Study Group (C^2S^2) was formed by the Commanding General, TRADOC, to find solutions to this dilemma.

Mission

The mission assigned the C^2S^2 Group was to simplify and speed battlefield command and control procedures primarily at brigade level and below while maintaining an acceptable degree of security. Institutionally, the battle captain has been taught to rely entirely on FM radio communications. Yet, such a high degree of security is required in his transmissions that he cannot use his radio effectively in the heat of battle. Our mission was to correct this imbalance.

Organization

The C^2S^2 Group was organized into six "cells":

- Threat/security (ASA).
- Systems integration.
- Communications-Electronics Operating Instructions (CEOI)/Communications-Electronic Standing Instructions (CESI)(NSA).
- Artillery and indirect fires.
- Maneuver arms.
- Air defense and air.

Each cell's members fully represented their school or organization throughout the study and provided functional area expertise to the other group members.

Study Methodology

Field-experienced combat arms officers with troop command experience were selected for the group. The technical service officers were selected based on their experience in supporting combat units.

A thorough literature and hard data search was conducted. Many problems uncovered and their likely solutions were intuitively obvious. Searching for hard data could have turned this study into a lifetime project. The decision was made to not get bogged down with numbers and laundry lists of alternative solutions, when obvious solutions were apparent.

A thorough knowledge of the signal intelligence/electronic warfare (SIGINT/EW) threat by group members was essential, so a significant amount of time was devoted to this analysis. We consulted NSA, ASA, the Chief of Telecommunications and Command and Control, the Commandant of US Army Signal School (USASIGS), and a number of field commanders. All group members rapidly became aware of, and gained an appreciation for, the enemy's SIGINT/EW capabilities.

The Problem

The enemy is capable of effectively monitoring and locating a combat brigade's radio nets. His objective is to destroy by fire, or neutralize by jamming, at least 50 percent of our key command and control and weapons systems emitters during the first minutes of the offensive. This finding was tempered with the understanding that it was only a *capability.* However, this subject needs wider dissemination and higher priority in training than it is currently receiving.

The next step was to determine why command and control is a problem at the fighter level.

The US Army is the most secure of any Western army. In

fact, it is so secure that operational effectiveness is hindered. The battle captain has been burdened with a complex, awkward set of communications electronics operating instructions (CEOI) and, in general, has not been taught alternate means to FM radio. The fighter is forced to cope with changing call signs, radio frequencies, suffixes, operations codes, ciphers, authentication systems, and operations overlays, plus perform all the troop leading functions necessary to command his unit.

This problem is aggravated at every level, all in the name of security. What degree of security is really required at the fighter level? The degree of security required depends on the tactical situation, the level of command, and the perishability of the information being passed. The intelligence community has given us great security in our lower level systems and, unintentionally, has made the command and control system, which should be an asset, a burden to the fighter. Because it is a burden, the battle captain will not use it in the heat of battle.

Figure 1 subjectively depicts the effectiveness of security in radio transmissions using 24 hours as the change period for call signs, radio frequencies, and suffixes.

The devised communication security (COMSEC) curve shows how quickly our security decreases during the 24-hour time period. The black dotted line shows what would happen if we did not change our data at 24 hours. Currently, most units change at midnight. There are about six hours of limited radio use just after the change. This adds to the system's security, but does nothing for operations.

Operational alacrity is just as important. (See colored portion in figure 1.) An "alacrity curve" shows an inverse relationship to the COMSEC curve. This operational alacrity curve is also based on expert opinion as there is no data to show just how much changing the suffixes, frequencies, and call signs affects operations. Based on group experience, the field survey, and personal interviews, operational effectiveness at the beginning of the change period is fairly low. Effectiveness increases as the users become accustomed to the new data. Everybody operates increasingly more effectively until the change time (24 hours) is again reached. The curve then drops back to its original level, but it would continue to climb if the data were not changed.

Considering the two curves, it is recommended that a variable change policy be used on a trial basis. The length of this change period would be left up to either the division or corps commander and would be at any time between 18 and 36 hours, depending on the tactical requirements. The commander should know that he runs the risk of being less secure but, conversely, more operationally effective if he exceeds certain points in time. He would also have the option of shortening the change period if he desires added security.

Field Survey Results

The C^2S^2 Group felt that operational effectiveness had not been fully considered in the policy of changing data every 24 hours. Security is certainly there, but the question of how effectively the battle leader can operate with data changing every 24 hours had not been adequately addressed. For this reason, an extensive tour of the combat units in both CONUS and USAREUR was conducted. Interviews were held with battle leaders to determine *their* problems with the system and what was needed to overcome these problems. Units visited were maneuver arms, fire support, armored cavalry, and air cavalry to include 10 divisions, all three armored cavalry regiments, and the 6th Air Cavalry Brigade. The III, V, and VII Corps commanders were also interviewed, as well as many of the division commanders. The 6th Air Cav Bde was particularly helpful as they are true believers in EW. They had just completed the Red Flag EW exercise and have had extensive training in countering EW measures.

Based on the survey and personal interviews, the following conclusions were reached:

- Nearly half have trouble using the current CEOIs.
- Enemy EW capability is not widely known and quite often not appreciated, especially at lower levels of command.
- Over one-third of personnel surveyed have trouble with changing call signs and suffixes.
- Brevity lists and operations codes are seldom used in tactical operations.
- Alternate means of communications are not emphasized in many units.

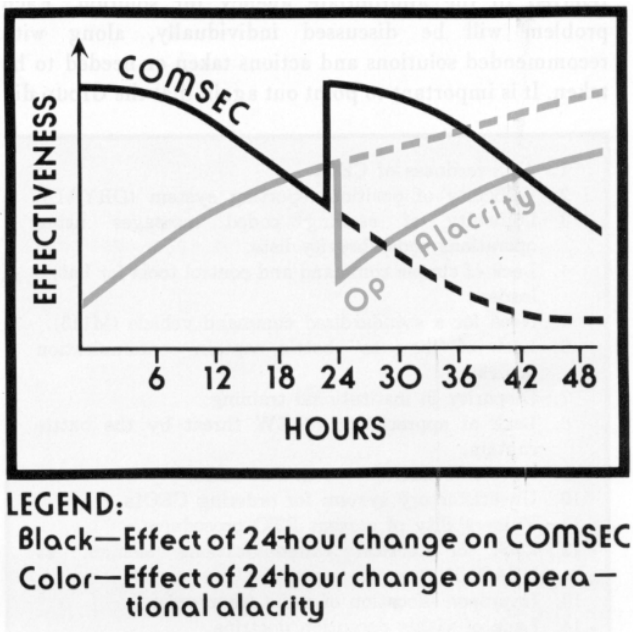


Figure 1. Effect of the 24-hour change period on COMSEC and on operational alacrity.

• Communications training is not emphasized in most units. Many are unaware of or do not use TEC lessons.

• Over half feel they need more communications training before combat.

• COMSEC is not emphasized in many units.

• Secure radio voice equipment is not considered reliable.

Needs Of the Battle Captain

The next step was to determine just what items the battle captain needs to conduct and fight the battle. Again, these needs were based on the survey results and the collective experience of group members. The needs were placed in two categories:

• *Immediate*—call signs, radio frequencies, suffixes, combat scene-of-action frequencies, the sign/countersign, a position reporting system, a coded message system, an authentication system, and finally, a map with map case.

• *Within reach*—tools of the trade, such as binoculars, penlights, mechanical grease pencils, etc.

The battle captain also needs CEOI backup information and alternate communications information, such as hand-and-arm signals, panel markings, light signals, and pyrotechnic signals in a convenient package.

Individual Problem Discussion

Based on the conclusions from the survey and the needs of the battle captain, the problems listed in figure 2 were identified.

The C^2S^2 Group identified 14 separate problems which they felt could be solved. Problems beyond their scope were referred to the appropriate agency for solution. Each problem will be discussed individually, along with recommended solutions and actions taken or needed to be taken. It is important to point out again that the Group did not dwell on alternatives when the correct solution was obvious, but concentrated on what the field needs *now.*

1. Awkwardness of CEOI.
2. Difficulty of position reporting system (DRYAD).
3. Difficulty of sending coded messages using operations codes/brevity lists.
4. Lack of simple command and control tools for battle leader.
5. Need for a standardized command vehicle (M113).
6. Lack of "how to" battle captain communication doctrine.
7. Disparity in institutional training.
8. Lack of appreciation of EW threat by the battle captain.
9. No viable alternatives to FM radio.
10. Unsatisfactory system for ordering CEOIs.
11. Vulnerability of current RTO procedures.
12. Lack of tactical communications element at USASIGS.
13. Improper allocation of radio frequencies.
14. Lack of viable deception doctrine.

Figure 2. Problems identified.

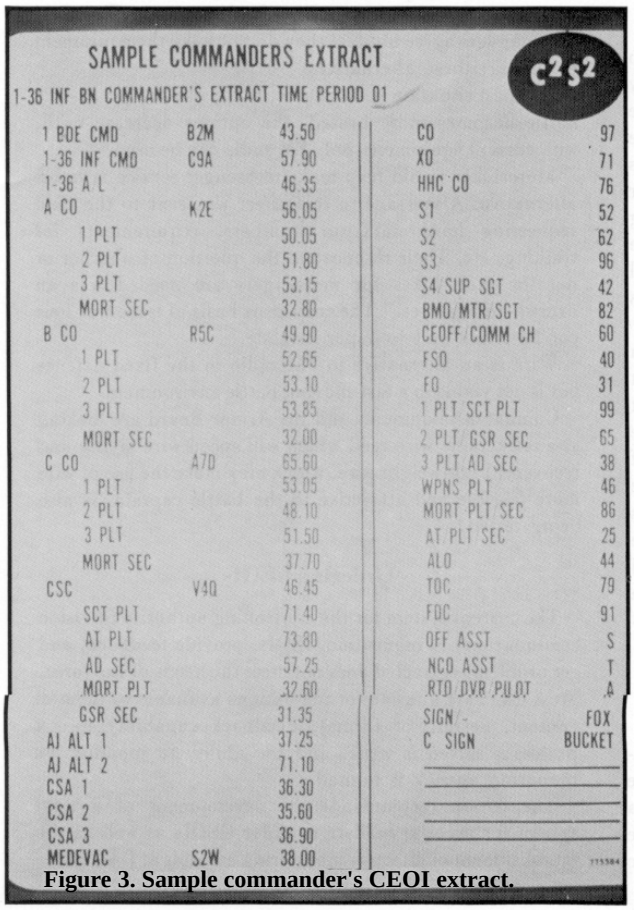
Awkwardness of CEOI

The first problem heard repeatedly from the field was the awkwardness and difficulty of use of the CEOI in its current format. The junior leader can be seen wearing the entire document around his neck. Almost without exception, the senior leader has an extract made. Any user is required to go to three different locations to find his call sign, radio frequency, and suffix. He is faced with locating his suffix from among 99 *plus* 20 expanders listed in most CEOIs, making it an extremely difficult document to use in the heat of battle. It must be put in a format that is easy for the user. This has been coordinated with NSA and they are moving to get it done.

The Group examined the degree of security gained by changing each separate piece of information. Call signs, which identify the unit, should be changed frequently, *provided their assignment is limited to company level and above.* Currently, they are assigned to platoons and sections are given their own internal net which is totally unnecessary. So many call signs serve as distractions to the battle leader. These sections and platoons can easily use the call sign of their parent organization, and thus reduce the total number significantly. Several suffix alternatives were examined, considering both operational ease and security requirements. Suffixes should be assigned only to the "fighters" and those essential to the conduct of the battle. Ideally, they should be fixed for memorization purposes.

Limiting call signs to company level and above and limiting suffixes to 25 or less are essential to this system. Simply stated, those people essential to the conduct of the battle should be the only ones on the radio. Finally, that information necessary *to fight* would be placed on a one-page extract for the battle commander. This one-page extract, on a pad for 30 time periods, would be the first element of the reformatted CEOI. This page would be similar to figure 3. It has superior and subordinate unit call signs and radio frequencies, as well as combat scene-of-action frequencies, sign/countersign, and a space for attached unit data. Call sign assignment is limited to company level and above, and the suffix listing is limited to those essential to the battle. This single page can be inserted into an armband. The Training Support Center has been asked to develop, produce, and field these armbands. The basis of issue would be roughly 1,200 per infantry division, 1,600 per armored and mechanized division, and similar ratios for other units.

The remainder of the reformatted CEOI would be backup information and would be placed into the commander's packet for each level of command. The packets for the division, brigade, and battalion would be broken down by NSA prior to shipment and received by the account holder ready to use. These "fixes" may take a while to incorporate — probably about 1 year to 18 months.



SAMPLE COMMANDERS EXTRACT

C²S²

1-36 INF BN COMMANDER'S EXTRACT TIME PERIOD 01

1 BDE CMD	B2M	43.50	CO	97
1-36 INF CMD	C9A	57.90	XO	71
1-36 A L		46.35	HHC CO	76
A CO	K2E	56.05	S1	52
1 PLT		50.05	S2	62
2 PLT		51.80	S3	96
3 PLT		53.15	S4 SUP SGT	42
MORT SEC		32.80	BMO/MTR/SGT	82
B CO	R5C	49.90	CEOFF/COMM CH	60
1 PLT		52.65	FSO	40
2 PLT		53.10	FO	31
3 PLT		53.85	1 PLT SCT PLT	99
MORT SEC		32.00	2 PLT GSR SEC	65
C CO	A7D	65.60	3 PLT AD SEC	38
1 PLT		53.05	WPNS PLT	46
2 PLT		48.10	MORT PLT SEC	86
3 PLT		51.50	AT PLT SEC	25
MORT SEC		37.70	ALO	44
CSC	V4Q	46.45	TOC	79
SCT PLT		71.40	FDC	91
AT PLT		73.80	OFF ASST	S
AD SEC		57.25	NCO ASST	T
MORT PLT		32.60	RTO DVR PU OT	A
GSR SEC		31.35	SIGN -	FOX
AJ ALT 1		37.25	C SIGN	BUCKET
AJ ALT 2		71.10		
CSA 1		36.30		
CSA 2		35.60		
CSA 3		36.90		
MEDEVAC	S2W	38.00		

Figure 3. Sample commander's CEOI extract.

Difficulty of Position Reporting System

The next problem is the difficulty and slowness of our current approved method of position reporting. Encoding, sending, and decoding one grid with this system takes about 8 to 14 minutes, depending on the user's proficiency. This is just too long for the battle captain's needs.

Another system, called the KVC 2001, is recommended for fielding expeditiously. This system is a direct readout of encoded map coordinates. The first part of the system is a 26- by 26-kilometer square from the map area of operations coded with two randomly selected alphabets. The second part of the system is a coded template, approximately 8 by 12 inches in size.

Both the template and the random alphabet change on a 7- to 10-day schedule. Initial tests of this system confirm that it is easier and faster than the DRYAD and is a workable concept. It received enthusiastic attention from almost every commander visited in the field. The C^2S^2 Group examined many alternatives to this system, most of which were simple point of origin codes that the security community has convinced us are fairly easy to break. Reporting of friendly locations at all levels requires a great amount of security, and the KVC 2001 provides this security. We have asked for expeditious fielding of the system.

The battle captain has difficulty sending coded messages using current approved operations codes and brevity lists, because it is so confusing and slow to use these items. The operations codes have too many items listed and the brevity list is anything but brief. For example, the operations code normally has about 1,500 three-letter groups which correspond to 1,500 terms of all sorts. It is unusable when speed is necessary. One division's brevity list consists of 24 pages with over 900 terms, not even in alphabetical order.

The idea of a brevity list is good, but it must be short and usable. About 25 action verbs or statements should accommodate any maneuver unit. These 25 words could be placed either on the front or back of the DRYAD. The user can send this message with 25 security variables, simply and quickly. We do not know if the security community is going to bless this simple method, as they have presented some alternatives which are more complicated.

Simple Command and Control Tools

The lack of simple command control tools was repeated often by those battle leaders we interviewed. The US Army has always concentrated on giving the battle leader more firepower and leaving it up to the individual to devise ways to effectively command and control these assets.

One idea is to procure map cases of different types for different jobs which will accommodate the KVC 2001. Another is lightweight binoculars to replace the current issue, which are entirely too bulky and heavy.

The recommended basis of issue for map cases and binoculars is similar to that recommended for the CEOI armband.

Penlights and other items, such as mechanical grease pencils, to make the battle leader's job easier should be procured as a matter of course. These items could be purchased for every battle leader for about the price of two XM-1 tanks.

The Group is still investigating potential sources of funds for some items and has recommended the establishment of a one-man office in combat developments to keep procurement of such items going in a timely manner.

Command and Control Vehicle

The battle leader needs a practical combat command vehicle with some good operating tools at his disposal. The current M113 and M151, the mechanized infantry alternatives, are not properly equipped for command and control. The Israeli modified M113 appears to be what we need. We should fund new production line vehicles and/or fund modification kits to be sent to the field without a long procurement action.

Communications Doctrine

During the search for literature and data, the Group found no printed communications documents specifically written for the battle captain. The battle captain must be told how to command and control his resources. There are numerous technical documents available and FM 24-1 is full of information, but none are oriented on how the fighter can organize his resources. A training circular (TC) is being developed, based on lessons learned, telling the battle captain how to organize battlefield command and control and what he needs to know for combat communications with the intention of developing doctrine.

The TC will not be oriented toward future solutions such as secure radio. It has been pointed out on occasion that secure radio is the solution to all our problems. However, it should be remembered that the secure radio puts out the same emission signature and breeds in the user the belief that, since he is secure, he can talk as long as he wants. The secure radio presents a different set of training problems from those discussed so far and the thrust of the TC will be to use the FM radio only as a last resort. Alternate means of communications, such as messengers, wire, etc., will be emphasized as the fighter's primary means of communications when not in contact.

Disparity In Institutional Training

One early examination in the study was into the institutional base of instruction for combat leaders. In the area of CEOI and related communications instruction, a wide disparity was found. For example, the amount of pure CEOI instruction varies from 0 to 4.2 hours for officer basic and advance courses at the various branch schools.

The Group recommends that a critical task analysis be conducted by each school, with the Signal School as coordinator on required instruction, and that the instruction be redesigned and reoriented on "how to" command and control using communications assets.

EW Threat Not Appreciated

In the field, there was a lack of appreciation of the SIGINT/EW threat by battle leaders. The Group first concluded that the fighters were not aware of the threat, but we found that many *know*, but are just not *impressed* by the information they have been given. A good Army-wide "threat" training program must be developed with some of the pertinent information (now classified) made available to the guys who need it. We need to get on with this program and get it out to the field.

No Viable Alternatives to FM Radio

During field visits, the Group stressed the need to use alternate means, such as wire and messengers, as primary means of communications and maintain and enforce radio silence when not in contact with the enemy. The field commanders agree but feel they do not have the equipment to support these alternatives.

The best situation is, of course, radio silence. But, as the battle becomes more heated, the options decrease until, with current equipment, only FM radio can be used.

Motorbikes would help make messenger service a viable alternative. A message to this effect was sent to the field requesting hard data on numbers, requirements for training, etc. Their response to the question of whether or not the motorbikes for messengers are needed was an overwhelming "yes." The consensus basis of issue was four per battalion and four per brigade.

Wire is an alternative to FM radio in the fixed defense but is not viable in a fast-moving battle environment.

Combat developments and the Armor Board are looking at a retractable wire reel, which will speed wire laying and recovery. Lightweight wire, which may make the use of wire more feasible and attractive to the battle captain, is also being tested.

Ordering CEOIs

The current system for the controlling authority (division headquarters) to requisition CEOIs, provide feedback, and get problems corrected does not meet the needs of the force. Most users are unaware of the options available to them in content, design, or format. Feedback capability to get problems solved is weak, and the ability to monitor the preparing agency is limited.

The Group recommends the development of a total system for account holders to order CEOIs as well as the establishment of effective monitoring controls at DA level to get user problems solved.

Vulnerability of Current RTO Procedure

The current radiotelephone operator (RTO) procedure is slow and ponderous as it increases transmission time and thereby contributes to electronic vulnerability. The use of call signs for each transmission and use of prowords such as "I say again," increase transmission time.

Prowords that increase transmission time and words that reveal senior/subordinate relationships, such as *execute*, *move to*, etc., should be eliminated. Call signs should be dropped completely after initial contact. Below platoon level, elements should not have call signs or suffixes; the initials of the leader could be used.

Tactical Communications

There is a significant gap between current tactical battlefield communications needs and the programs of the Signal School. This is not to imply that the Signal School is not interested in the needs of the field, but there is no single element to provide interface between signalmen and the fighters for doctrine and communications equipment in use today. The Group recommends the establishment of a four-

to five-man group at the Signal School to provide this interface, oriented on "how to" problem solutions for the battle captain.

Radio Frequencies

The current allocation of available radio frequencies presents a significant problem in tactical operations. The study revealed an overuse of discreet frequencies at the higher levels of command, where alternatives to FM radio exist. The lower levels, where most of the cross-attachment will occur, have fewer alternatives to FM radio and also have the fewest discreet frequencies, causing a significant amount of interference in a fast-moving battlefield situation. These lower levels are where the clear FM nets are essential.

The Group recommends that all units at various command levels prepare their lists of essential nets based on the corps commander's battle plan. The corps then makes up the net priority list and allocates discreet frequencies based on this priority listing. If this were accomplished, the radio frequencies available could support our modern battle tactics.

Specific guidance needs to be passed out to the field on how frequency allocation can be accomplished to support the corps battle.

The Group recommends that this method of frequency allocation be tested during REFORGER 77. Such a test could help to convince corps commanders that it is the best approach to frequency allocation.

As a further step, some nets could be completely deleted to reduce the management problem. For example, senior armor officers interviewed on the necessity of tank platoon nets agreed that these nets could be deleted. The assignment of a tank company command net and an alternate net would suffice. The single company net could control the tanks and would breed net discipline much as the football huddle does. This same approach could be taken across the board by everyone to determine just what nets are really needed.

Cover and Deception

The Group found that there is a total lack of a *viable* US Army cover and deception doctrine. We just do not have anything that is workable. Current policy calls for the tactical commander to divert combat assets to conduct a deception mission; something none of them are willing to do. Draft FM 90-2 on this subject is being prepared and publication of this document must be expedited.

Other Problems

Three other problems which the Group feels are significant but are beyond their scope to correct are:

• First, the Air Force close air support (CAS) element attached to US Army tactical units compromises our security. The CAS element radio has a unique signature on the battlefield, and this makes the enemy's job of tracking our units and CP locations that much easier. We have established coordination to try to get this problem worked out.

• Second, our NATO allies' COMSEC is very poor by NSA standards. This problem has been referred to appropriate authorities for action.

• Third, during the field visits and interviews with commanders, the Group found a wide range of problem areas not associated with this study.

Most commanders expressed dissatisfaction with their communications posture. Their problems include lack of trained personnel (MOSs 31B and 31G) to maintain equipment, poor equipment durability and maintainability, equipment or repair parts shortages, and the lack of tactical orientation and experience of signal officers through the rank of major. This has been referred to the Signal School Commandant for action. The establishment of the tactical communications group at Fort Gordon will provide field commanders with a sounding board to assist in getting problems solved.

Summary Of Actions Required

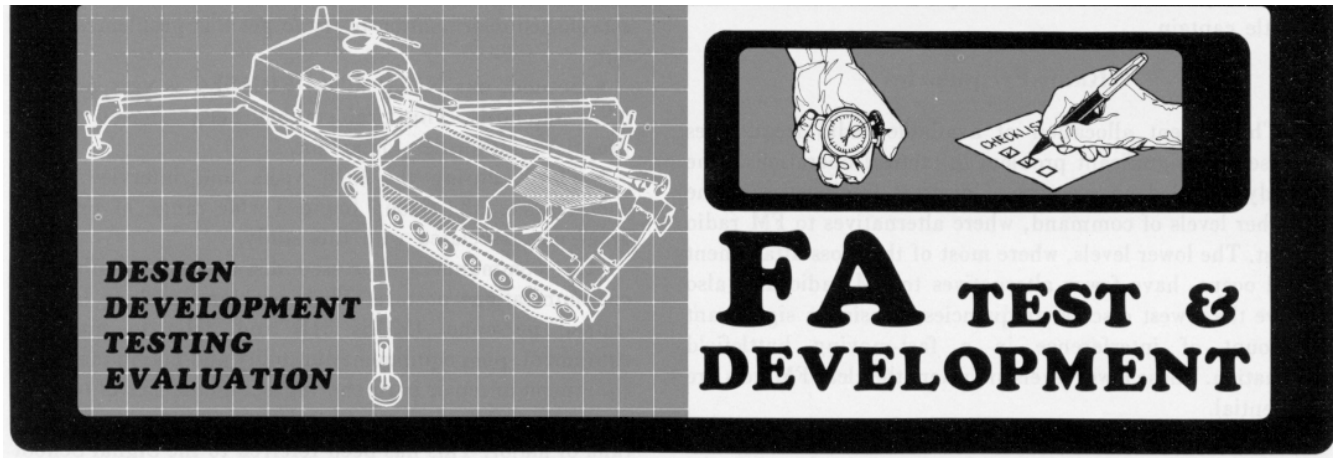
Figure 4 summarizes the actions required of various agencies to resolve problems surfaced by C^2S^2. The Field Artillery School has designated specific action offices to monitor each of these actions.

1. Battle captain's CEOI extract, simplified code, and position reporting system must be fielded.
2. Armband for extract must be fielded.
3. Total system of CEOI acquisition must be developed (to include feedback).
4. Battle captain's TC must be fielded.
5. EW threat training must be developed and implemented.
6. Institutional training base for leaders must be improved.
7. Tactical communications element must be established at USASIGS.
8. Frequency management study is required.
9. US Army cover and deception doctrine must be developed and fielded.
10. Procurement action for motor bikes must be initiated.
11. One-man office to manage command and control tools for battle leaders is needed.

Figure 4. Summary of actions required.

C^2S^2 was a much needed look at realistic battlefield communications. The completion of the actions proposed will enable the battle captain to spend his efforts on defeating the enemy instead of wrestling with a cumbersome communications system.

MAJ Ed Smith is assigned to the Training Simulators Team, Directorate of Training Developments, USAFAS.



Ideas Wanted

When the term "combat developments" is heard, the thought which comes to mind is of new pieces of combat equipment. However, combat developments also entails, and in fact evolves from, doctrinal developments. The following items will address some of the major activities of the Doctrine Team, Directorate of Combat Developments.

The success of recent changes in field artillery doctrine is due to a function of a development process that involves every department within the School and, in some cases, every artillery unit and organization in the Army. These changes are based firmly on current maneuver doctrine. The Doctrine Team is responsible for overall management of doctrine development. We solicit your ideas on the following issues.

Senior Artillery Headquarters

A number of doctrinal changes aimed at making FA support more responsive for close support and counterfire have caused wholesale examination of FA organizations from battery to corps artillery level. Organizational changes which are under study or are being implemented are:

The Corps Field Artillery Section (FAS)

The corps artillery HHB is being disestablished and will be replaced by a field artillery section (FAS) organic to the corps HHB. TOE changes to accomplish this action were published by TRADOC on 1 March 1977. Formal disestablishment of the three active corps HHBs is expected in late 1977. The corps FAS will be the corps fire support and coordination agency. It will coordinate the employment of fire support within the corps, perform nuclear fire planning, exercise control over field artillery retained under corps control, and be the Army interface with the USAF for joint suppression of enemy air defense. See the Commandant's column (page 3) for a detailed discussion.

The FA Brigade

The results of exercises conducted by III Corps on REFORGER indicated that an FA group headquarters does not possess sufficient personnel or communications equipment to perform adequately as a force artillery headquarters for a covering force operating under emerging doctrine. The counterfire doctrine, approved by DA in April 1976, stated that FA groups will be habitually associated with divisions to provide div arty with additional resources to fulfill the competing requirements of close support and counterfire. Further, the group headquarters must be prepared to assume the responsibilities of a div arty (alternate CP) to provide FA support and fire support coordination to a designated force (force arty headquarters), or to assume responsibility for a portion of the division FA battle due to extended frontages or an intense battle in a portion of the division zone. A proposed organization, the FA Brigade, was sent to the field for comment and was briefed and discussed at the FA Commanders' Conference in October 1976. Comments from the field have been incorporated into a final FA Community position on the mission, functions, and organization of the FA Brigade. The formal FA Brigade draft TOE for TRADOC approval is currently being staffed.

Division Artillery

In June 1976, CG, TRADOC, directed the development of a restructured heavy division that provided a "clear alternative" that integrates and optimizes new weapons systems within modern warfare concepts. USAFAS was

tasked to develop organization, tactics, and techniques to support the restructured heavy division. USAFAS has prepared, and submitted to TRADOC for approval, the following documents:

• TOEs for the 8-inch battalion, TAB, 155-mm DS battalion, and HHB div arty.

• Restructured Division Operations Manuals (RDOMs), for FIST, counterfire, gunnery, battery operations, and fire support planning and coordination.

Developing a "clear alternative" required extensive, internal changes to artillery organizations. The major changes include adding one firing battery to the DS battalions with two additional tubes in each battery (32 cannons total), and the addition of one firing battery to the GS battalion (16 cannons total). The DS battery will be employed in two four-gun firing elements separated by 400 to 1,600 meters for increased survivability. The clear alternative organization will be field-tested through June 1979.

FA Board Tests

The Board is always involved in several projects at any one time. The time required for the individual evaluations depends on various factors, such as the complexity of the system, stage of development, degree of Field Artillery interest in the end item or system, etc. Board tests recently completed, in process, or on the drawing board are listed below:

- Modified crater analysis techniques.
- M109A1 howitzer camouflage.
- Cartridge, 105-mm, HEAT, XM622E2.
- Time fuzes, XM587/724.
- Projectile, 8-inch, RAP, XM650.
- Hand-held calculator, FDC.
- Lightweight field wire.
- Gama goat communications.
- M110A1 crew shield.
- Projectile, 155-mm, screening smoke, XM761.
- Improved M548 cargo carrier.

Board Offers Help With Suggestions

An office to assist in the Concept Evaluation Program (CEP) has been organized by the Field Artillery Board at Fort Sill. The CEP is a TRADOC program that allows conduct of testing on new or modified concepts involving doctrine, tactics, training, and hardware. Suggestions for CEP testing may be made by anyone within TRADOC (TRADOC Reg 71-9).

Personnel in the CEP office help develop concepts and plan, conduct, and report on necessary testing. They will also assist originators of a concept to submit suggestions through the Incentive Awards Committee. Originators receive full credit and monetary reward, if any, for suggestions.

Additional information may be obtained by calling AUTOVON 639-3086/5106 or write: President, US Army Field Artillery Board, ATTN: ATZR-BDCE, Fort Sill, OK 73503.

Project Seeker

Field testing of a remotely piloted vehicle (RPV) is being conducted by the Board as part of a TRADOC effort to develop the RPV for target acquisition, range finding and target designation. Called Project Seeker, the development tests are centered on the RPV's capability to acquire tactical targets and engage them with artillery fire.

The RPV being tested is a propellor-driven, unmanned aircraft carrying several sensor packages which include a stabilized TV camera and a stabilized TV camera with laser range-finder and designator for real time target acquisition and engagement.

Observed Fire Trainer Evaluated

Operational tests of a prototype observed fire trainer (OFT) are being conducted by the Board to assess the effectiveness of the OFT as a supplement to, or replacement for, conventional training of forward observers.

The prototype OFT was developed under a contract calling for a portable device which could be set up within 30 minutes in a standard military classroom. It displays a full color terrain scene similar to what an observer would see from a real point of observation. Realistic targets such as tanks, artillery weapons, dismounted soldiers, trucks, and reconnaissance vehicles are included in the scene.

A shell burst presentation system is designed to simulate the appearance of air, air with ground effect, and graze bursts with associated sound effects matching the student observer's call for fire and location, weapon type, number of rounds, fuze type, and terrain features. A smoke screen visualization is built in, including effects caused by wind conditions. The student's fire mission is tape recorded to aid in a critique.

If successful, the OFT will help defray the growing costs of conventional live-fire exercises and provide training for many units, primarily Reserve Components, which do not have easy access to a suitable artillery range.

An Enemy Within

Cringing at the noise and concussion of a 155-mm howitzer, a 4th Division soldier covers his ears with his hands for added protection against the more than 150 decibels of sound produced by the artillery piece. (Photo by SP4 Ron Cosens.)

Opinions expressed in this contribution reflect those of the authors and do not reflect DA policies.

The importance of preventing hearing loss among Army personnel is normally emphasized in terms of dollar outlay for compensation claims filed by those leaving the military. The Veteran's Administration estimates payments of $72 million during 1976 for claims in which hearing loss is the major disability. This dollar cost is distant to the artillery commander and has no effect on his day-to-day operations. A more effective way to emphasize the problems of noise-induced hearing loss and its effects on the artillery unit may be in terms of training and combat effectiveness.

The effectiveness of an artillery unit depends on an interwoven, complex communications network. Verbal communication links form an intricate, complicated system from the forward observer to the fire direction center to the guns. One military author described as many as 26 separate communication links in a counterfire operation. Hearing acuity by human communicators in these systems is of vital importance in mission accomplishment.

With the development of computerized fire control systems, the importance of human communicators in fire operations may decrease in the future. However, it is not likely that the emphasis being placed on training readiness will decrease. The distribution of Training Extension Courses to field units suggests that new and innovative training methods will be used. Communication must take place for training to be effective.

Hearing loss may well be the reason why information presented in group training sessions is not effectively transmitted to the students. When the hearing loss is severe enough to impair communication, then one of two reactions is generally observed:

- The student loses interest and his attention wavers.
- The student gives his full attention to the speaker with his eyes riveted on the speaker's face — attempting speech reading!

An informal check of these phenomena can be gained by observing the behavior of students — where they sit and how they attend. Next time a group training session is scheduled, check hor many long-time FA personnel are lip reading.

It is hard to believe that a commander would purposely decrease his unit's communicative effectiveness by 10 to 20 percent, but, without an ongoing and effective hearing conservation program, the commander is actually contributing to ineffectiveness in combat and training. Assigning personnel with hearing loss to key positions during firing operations and not requiring good hearing protection practices during firing and in all mechanized combat vehicles may very well result in decreased operational effectiveness.

by COL Richard L. Butler, CPT Homer Emery, and CPT Henry King

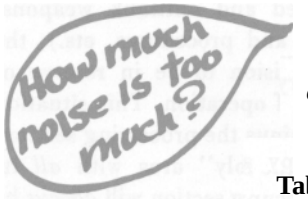
In 1971, a survey of hearing loss in the Army showed that 43.8 percent of career artillery personnel had a hearing loss requiring an H-2 or greater profile (profiles for hearing loss are expressed as H-1, no loss; H-2, mild to moderate loss; H-3, moderate to severe loss; and H-4, severe loss to deaf). In many cases, hearing loss was severe enough to require MOS reclassification and, in extreme cases, barment from reenlistment. During a recent sampling of an artillery battalion-sized unit of 490 personnel, 24 percent showed a hearing loss.

The prevention of hearing loss is simple — use hearing protection when exposed to hazardous noise. For a continuing source of noise, such as a generator or a tactical vehicle, the noise level considered hazardous is 85 decibels (dB) on the A scale (the scale which indicates actual perceived noise as heard by the human ear). Combat vehicle noises normally range from 90 to 123 dB(A); therefore, except for smaller trucks and jeeps, practically all tactical vehicles are noise hazardous (see table 1). A decal (NSN 9905-00-198-2728) to remind drivers and occupants of this hazard should be attached to the vehicle.

The type of noise associated with the firing of weapons is impulse noise. Impulse noise is considered a hazard at 140 dB(A). An M16 rifle has a peak impulse noise level of 154 dB while a 155-mm howitzer has a peak impulse noise as high as 192 dB. All weapons in the Army arsenal are noise hazardous at least to the firer and nearby observer. Again, the only way to prevent hearing loss by gun crews is for them to use proper hearing protection when firing.

Like any other military problem faced by the unit commander, hearing conservation and prevention of hearing loss must be approached systematically. Elements that are recommended for managing a hearing conservation program are shown in figure 1.

What may work in one unit may not be suitable for another. For example, the battalion safety officer may be best suited as the program manager in one unit, whereas the S1 may be the best suited in another. At the battery level, a resource often overlooked is the field sanitation team which could be responsible for monitoring the use of hearing protection, scheduling hearing tests, and acquiring and distributing ear protectors. Whatever approach is used, the goal is the same — the prevention of hearing loss.

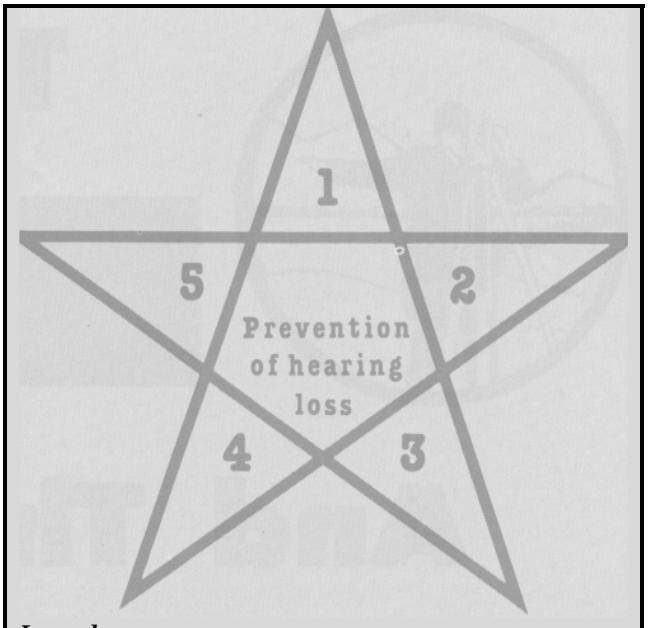


Anytime you have to shout to be heard, your ears are taking a beating!

Table 1.

Noise source	Decibels(A)
152-mm tank gun	191 (peak)
M16 rifle	156 (peak)
155-mm howitzer	155
M548 cargo carrier	114
Chinook helicopter	110
Radial saw	108
Caterpillar grader	107
Subway	100
2-1/2-ton truck	94
Multilith offset press	85*
Conversation	60
Whisper	34
Rustling leaves	20

*** Hearing loss begins above 85 dB(A).**



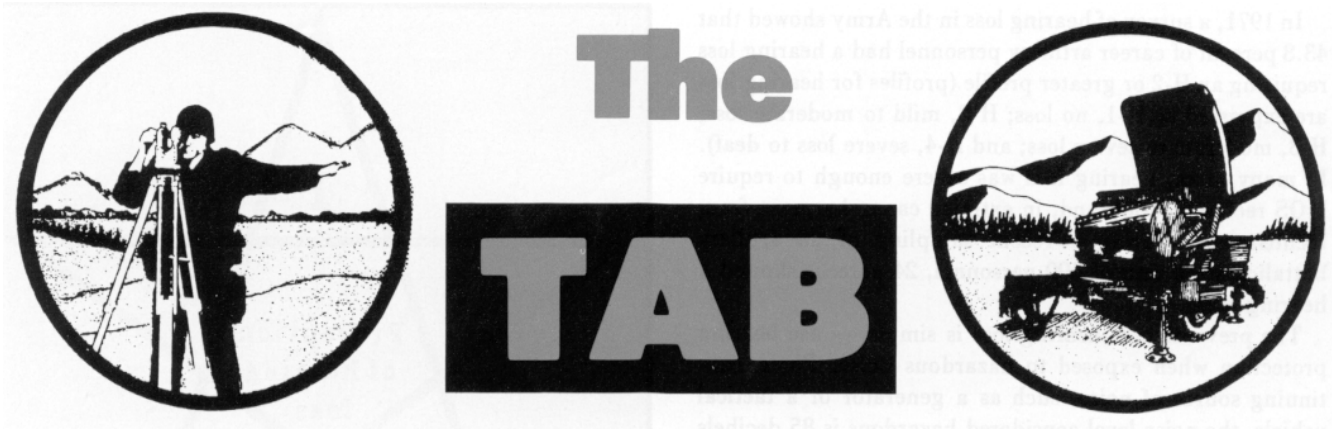
Legend:

1—Establish commander's policy and develop unit SOP.
2—Identify personnel exposed to hazardous noise — in some cases the entire unit may be considered potentially exposed.
3—Conduct hearing tests for new personnel to establish baseline hearing levels, and conduct annual hearing tests to determine if hearing loss has developed.
4—Demand wear of hearing protection by individuals exposed to hazardous noise.
5—Educate and enforce policies through command emphasis and example.

Figure 1. Hearing conservation program.

The Journal staff offers its condolence to the family of COL Richard L. Butler who died suddenly 27 May 1977 of an apparent heart attack. —Ed.

The late COL Richard L. Butler, MC, was Chief of the Health and Environment Activity; CPT Homer Emery, MSC, is an environmental science officer; and CPT Henry King, MSC, is an audiologist at Fort Sill.



And The ARTEP

by COL James P. Holley

During the past year, the formation or reorganization of new target acquisition batteries (TAB) has been taking place in division artilleries throughout the force structure. To date these units have been concerned primarily with individual training and procurement of personnel and equipment, but, in the near future, each of these batteries will begin using the ARTEP.

Some TAB batteries have used the ARTEP, and common difficulties or problems have appeared. The purpose of this article is to share with all division artilleries the lessons learned and provide recommendations for more productive use of the TAB ARTEP (6-307).

A comprehensive evaluation of TAB training progress using ARTEP standards is difficult. Unlike cannon or missile units, the TAB will probably never be employed as an autonomous unit. Of necessity, its assets must be tactically deployed throughout the division zone of operations and integrated with various other artillery units. This concept of employment must be fully understood before a good ARTEP plan can be developed.

Additionally, almost every unit in the division artillery should be represented if the TAB is to be evaluated properly.

First of all, space is one of the major considerations in planning the evaluation. As a minimum, an area 10 kilometers wide by 8 kilometers deep is required. The ideal setting, however, would encompass an area that could accommodate a division employed on an extended frontage of 40 to 60 kilometers.

Look now at each part of the battery and some suggested DOs and DON'Ts in the evaluation process.

Battery Headquarters

When the TAB is employed, the battery headquarters is collocated with the div arty command post element. The battery commander also performs as a special staff officer advising the div arty commander and S3 on the employment of his battery.

To evaluate those tasks common to all sections (such as the employment of crew-served and antitank weapons, camouflage, NBC equipment, and procedures, ets.), the scenario could call for the division to be in reserve or preparing to move to the area of operation. This situation would then allow the battery (minus the processing section) to realistically occupy an "assembly" area with *all* its platoons and sections. The processing section will *always* be with the div arty tactical operations center (TOC) forming part of the target production element. It's difficult to envision other situations where the battery would or could be consolidated to facilitate the evaluation.

The one document which determines the overall target acquisition program for the division is the Target Acquisition Annex to the Field Artillery Support Plan. This annex could be prepared prior to the exercise. A copy should be provided the battery commander, each platoon, and the processing section.

Processing Section

As previously stated, this section is *always* with the div arty TOC. For evaluation, the fire control element and the plans and operations element of the TOC must be fielded in

order to exercise the processing section. This section serves as the focal point for *all* target information coming to the div arty TOC from *all* echelons — not just from the sound and flash and radar platoons of the TAB. The scenario should include considerable message play from intelligence and other sources which causes the processing section to react. The other part of the targeting element, the order of battle section, should also participate if the targeting element is to function properly. Actions of the processing section should result in requests through the fire support element to the appropriate agency for additional information or actions. This is in addition to the orientation cuing of the div arty target acquisition systems.

Radar Platoon

This platoon of five AN/MPQ-4A radars and one AN/TPS-25A radar will be scattered from one division flank to the other. One of the major problems encountered by this platoon is communication. The radars normally will not be deployed by themselves or communicate directly with the div arty TOC; therefore, command, control, and communications should normally be exercised through subordinate artillery units, represented by reduced battalion FDCs or individual controllers for each radar. These battalion FDCs (controllers) should be positioned on the "battlefield" as they would in a real situation subject to administrative restrictions. There may be times, however, distances permitting, that the TOC may need to control one or more radars. A typical deployment might consist of one radar attached to each direct support (DS) battalion, one to the general support (GS) battalion, and the fifth radar to one of the nondivisional battalions of corps or placed under the operational control of one of the sound-flash platoons.

There are numerous deployment variations depending on the enemy situation and the mission of the division. The AN/TPS-25A might be attached to a DS, GS, or nondivisional battalion. Regardless of the control arrangement, the div arty TOC will specify the area to be covered by the radars. The battalions or element to which the radars are attached will respond to the targets located by the radars either by firing on the target and informing the TOC or by passing the target to the TOC. Also, the battalion to which the radars are attached normally will provide survey control, security, mess, and limited maintenance support (through control/administrative procedures if player unit/support elements are not available).

To facilitate the evaluation process, one gun or mortar could be used to check the locating ability and accuracy of all five radars simultaneously. Controllers (the battalion FDCs) would direct the radars (simulating cuing) to orient on an area where the "enemy" gun is suspected.

With the proper coordination, radar registrations could be conducted in a similar manner. Radar-adjust missions would require a tube(s) for each of the radars, or missions could be conducted one at a time. A point to remember is that each radar needs a unit (controller) to respond to its locations, to task it, to cue it only when needed, and to feed it information. Distances will usually prohibit the processing section or any other part of the TOC from communicating directly with the deployed radars.

Sound-Flash Platoons

This 35-man, combination sound and flash ranging platoon offers a tremendous challenge to the lieutenant platoon leader. It is the least understood platoon of the battery. The key to the success of this platoon is the employment technique. The evaluators and the control central for the ARTEP must understand the capabilities, limitations, and support requirements of the sound-flash platoon. A typical scenario for employment of the platoon would go as follows:

While in the assembly area, the sound-flash platoon leader would get an order from his battery commander or the processing section of the TOC to move to an area and establish a sound and flash base to provide coverage of a particular area forward of the FEBA (forward edge of the battle area). The platoon leader and his platoon sergeant would perform a map reconnaissance and select potential locations for a command post (sound-flash central), a sound base, and a flash base. Three parties would then be formed:

The platoon leader would form the sound base party consisting of himself, a four-man wire team composed of CP personnel, and a survey party. The platoon sergeant would form the flash base party consisting of himself and the personnel and equipment of the four observation posts (flash OPs). The survey platoon leader or sergeant will accompany either or both of the sound and flash parties, depending on the survey priority established by the TOC or the battery commander.

The third party is led by one of the section chiefs of the sound-flash central. He will lead all remaining personnel and equipment to the place designated by the platoon leader and establish the command post.

The sound base party will initially establish four microphones, map-spot the coordinates, connect the microphones to the recorder in the sound-flash central, and start survey. Four microphones should be installed and sound ranging begun within 30 to 90 minutes of arrival in the area.

What must be understood by the TOC and controllers is that only very general target locations can be provided by sound ranging; however, sound-on-sound adjustments can be conducted very rapidly and accurately. Second round fire-for-effect with miss distances of less than 30 meters is the rule, not the exception.

Until the survey party finishes its job on the base, a quick-fire unit (normally a GS or nondivisional unit) must

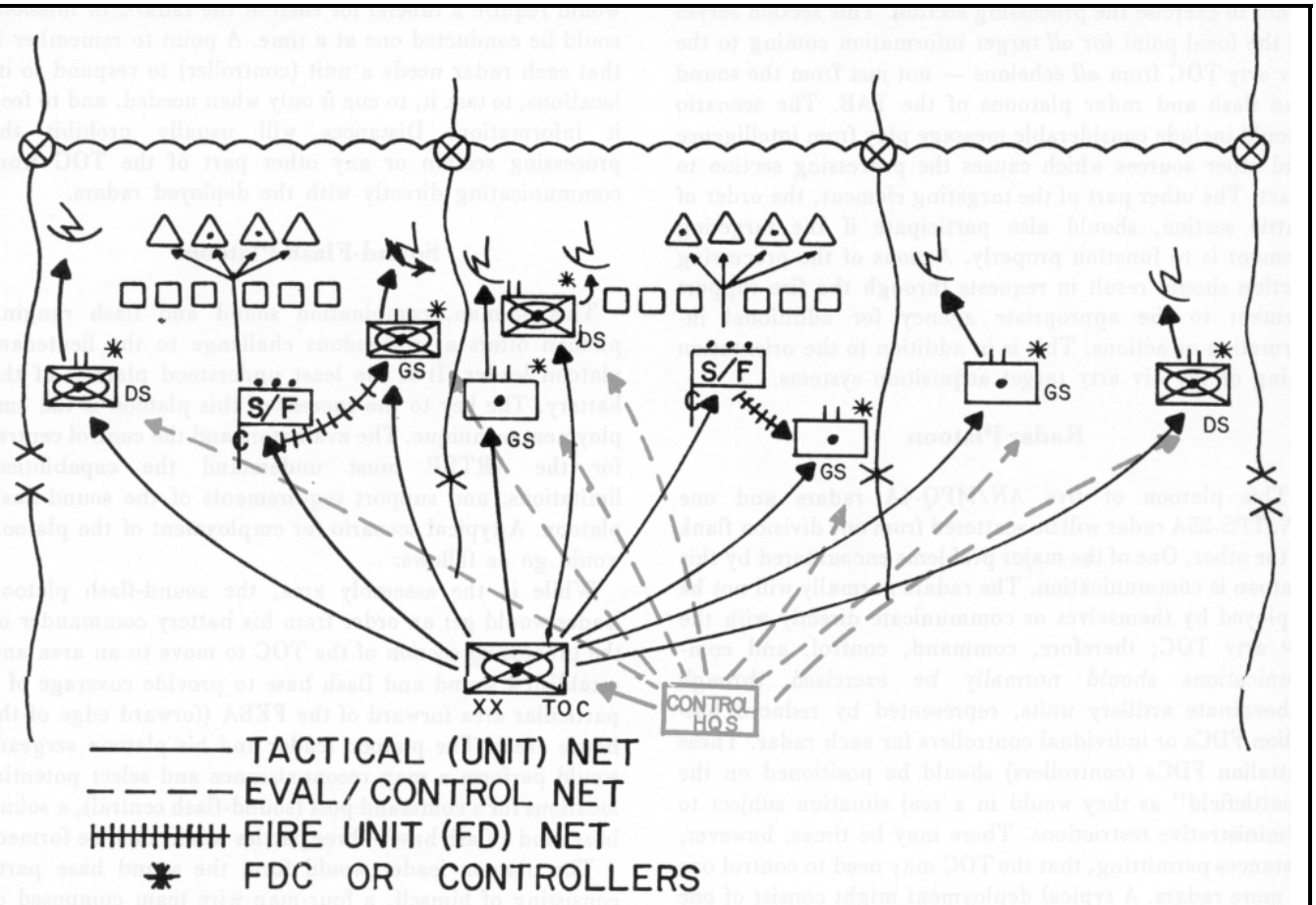


Figure 1. Wire and radio communications of the controlling elements.

be provided to the sound-flash platoon. When at least four microphones are surveyed, the TOC must be informed so they can consider having the platoon send all its targets to the TOC rather than to the fire unit previously designated. Two additional microphones are added to the base to form the standard six-microphone base.

Another point to remember is that for sound ranging to be evaluated, the sound wave from the source (gun) to be located must reach the microphones. A 105-mm howitzer, firing charge 3 at a distance of six kilometers from the microphones, will not produce a sound wave of sufficient intensity to register on the recorder.

In positioning guns to act as targets for sound ranging, insure that the propellant charge used is large enough to cause the projectile to land on or slightly beyond the sound base. Even then, wind factors may require a higher charge or larger caliber weapon to be fired or an administrative change in sound ranging direction. The same principle applies for sound-on-sound adjustments. In most cases, a 155-mm projectile will produce a sound wave of sufficient intensity to conduct adjustments out to ranges of 8 to 10 kilometers.

One of the better (and cheaper) methods of evaluating sound locations is with the use of TNT. Ten pounds of TNT is equivalent to a 130-mm howitzer firing at mid-range. By pre-surveying 15 to 20 widely spread demolition pits for the TNT charges, an accurate and easily controllable method of target location can be conducted. The demolition of TNT involves few of the safety and administrative requirements associated with a howitzer. Frequently the design of an impact area and disposition of firing points will not permit the realistic evaluation of sound ranging. The use of TNT can get around those restrictions and add realism to the problem. The Counterfire Department of the School has suggested schematics for such a plan.

The installation, command and control, and evaluation of the flash element require many of the same considerations as those for sound ranging. Under the general supervision of the platoon sergeant, each OP chief occupies his OP and begins the establishment of a short base. The use of hasty survey techniques outlined in TC 6-2-1 can be used to locate and orient each OP. Evaluators and controllers should remember that each OP should be prepared

to conduct adjust-fire missions immediately upon occupation of the OP. For that reason a quick-fire unit should be provided the platoon.

Depending on the priority, survey may or may not bring survey control to the flash base. In most cases, hasty survey techniques and simultaneous observation for direction will suffice.

In the evaluation process, the smoke-puff generator used on pre-surveyed points is the best method of determining location accuracy of the flash base. At night, 105-mm or 155-mm howitzers firing from a slight defilade will produce the necessary flash for target location.

Although specific personnel have been identified for specific functions, the availability and capability of these individuals may cause a completely different method of employing the platoon. The organization and method described is one way, not the only way.

Survey Platoon

Most of the efforts of the survey platoon with its two parties will be on the sound bases and then on the flash bases and radars.

Once the primary sound and flash bases are established, secondary or alternate bases should be surveyed. The div arty TOC should have caused the sound-flash platoon leader to reconnoiter and select alternate bases in anticipation of the developing tactical situation.

When the two parties finish surveying the alternate bases, they should be required to provide control to radars or to gun battalions of the div arty. Using survey personnel as observers is not recommended; they have too much to do.

Evaluation/Control

Where does the div arty S3 obtain the necessary technically qualified evaluator personnel? The TAB is the only unit in div arty with radar warrant officers, sound-flash rangers, and radar operators. However, the tasks, conditions, and standards outlined in the ARTEP are descriptive enough for most officers and senior NCOs to follow and make an evaluation.

In those areas with more than one TAB (Germany; Fort Hood), expertise can be borrowed on a mutual exchange basis. Units within reasonable distances of each other (Ord and Lewis; Riley and Carson; Polk and Hood; Bragg, Campbell, and Stewart) may also consider an exchange of evaluators. The National Guard should also be contacted and participate. By the end of FY 78, the Guard's eight divisions will also have TABs. For other areas within CONUS, the Counterfire Department of USAFAS is prepared to provide some assistance.

The administration of an ARTEP for a target acquisition battery is expensive, particularly in terms of manpower. In addition to the div arty TOC, a separate control facility to act as overall coordinator should be established. A reduced battalion FDC or controllers should be provided for each radar and the two sound-flash platoons. Evaluators for each radar, the processing section, the different elements of the sound-flash platoon, and the survey platoon are also required. Figure 1 is a tactical and administrative diagram of the battery elements and the controlling elements.

Since the TAB is dependent on the div arty headquarters battery (HHB) for maintenance and mess, the HHB should participate in the evaluation process by responding to the needs of the TAB. Consideration might be given to administering an ARTEP to the HHB at the same time.

Your views on this subject and experiences with the TAB ARTEP with suggestions for improvement are solicited. Please send your comments to the Commandant, US Army Field Artillery School, ATTN: ATSF-CF.—Ed.

COL James P. Holley is Director of the Counterfire Department, USAFAS.

I'd rather do it myself!

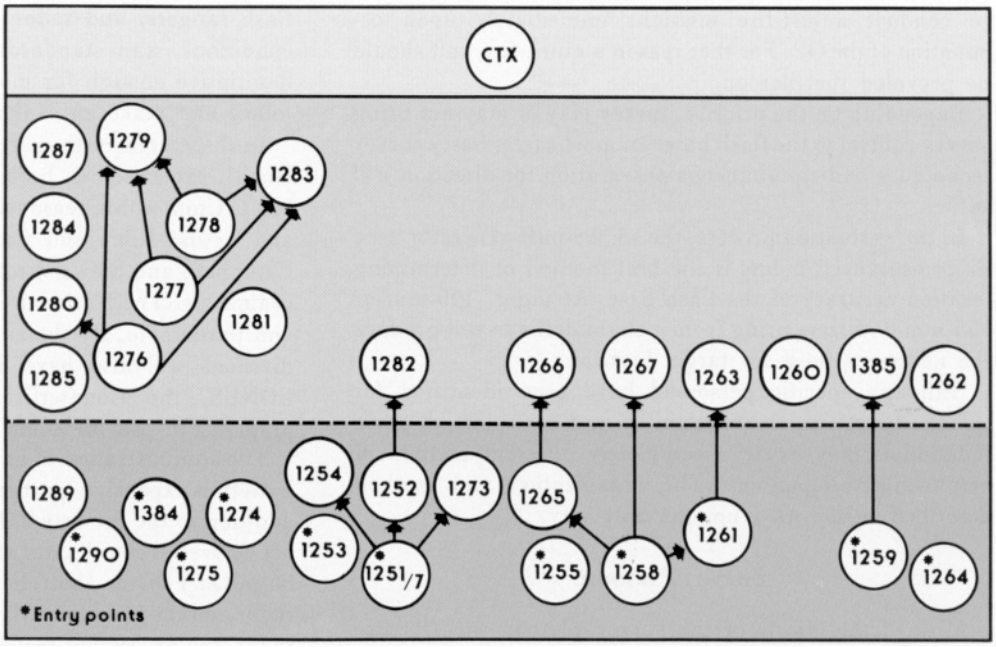


Figure 1. Course map.

"Please sergeant, I'd rather do it myself" is the cry that will soon be heard from 13E soldiers taking advanced individual training (AIT) at Fort Sill. On 24 June 1977, with class 36-77, the traditional platform gunnery instruction presented by the Field Artillery School was replaced by an instructional systems development program called Self-Pace.

"You mean that you are going to let a private fresh out of basic combat training teach himself fire direction procedures? You're outta your mind!" Now, wait. The answer to that is an *emphatic* "yes," "no," and "maybe."

The self-pace theory is not new. Civilian educators and industry have been using it successfully for a long time. It's just taken a while for it to break through the "You can't learn it unless *I* stand up and teach it to you" philosophy. Self-pace is the commonsense approach to instruction. Here's how it works:

We observe a competent performer on-the-job to see what he does and what skills it takes and then decide how best to teach a rookie to do the job. The self-pace program was tried out first on part of a 13E class and then on a full AIT class (18-77) with excellent results. From these trials, it appears the majority of students will finish the course in 4 to 5 weeks, saving overall, an average of one training week. The present "lock-step" course is seven weeks. We have received favorable feedback about the course. For example, "I felt more motivated in this type of instruction." "This course taught me what self-discipline is all about." These comments tell us that the course is doing some good toward developing good soldiers, as well as efficient FDC personnel.

The School believes that the quality of the self-pace 13E graduate is better than, or at least equal to, that of the traditional lock-step product. The last step in developing a self-pace course is to "monitor and revise." Revising is no problem; monitoring, on the other hand, is a problem. We can monitor the course as it progresses and catch the administrative problems, but until these 13Es get to units, we can't really tell what they will do in a real FDC environment. The only people that can help us in this area are artillerymen in the field. By receiving your feedback in specific technical areas we can tell what our product can or cannot do, and redesign the program to add, eliminate, or otherwise modify the instruction. This is an on-going process that never ends and depends on the response from the field.

What happens to the individual 13E10 trainee as he progresses through the program? His first three days in the school are taken up with administrative details and 12 periods of communication instruction. When he arrives at the Gunnery Department he is assigned to a section of about 25 students. Each section is assigned two instructors instead of the usual one. The student has the same instructor from start to finish. The student is then given a brief overview of the course and a guidance package that includes a course map (figure 1) with specific information on how he can move through the course.

by MAJ Alfred M. Evans

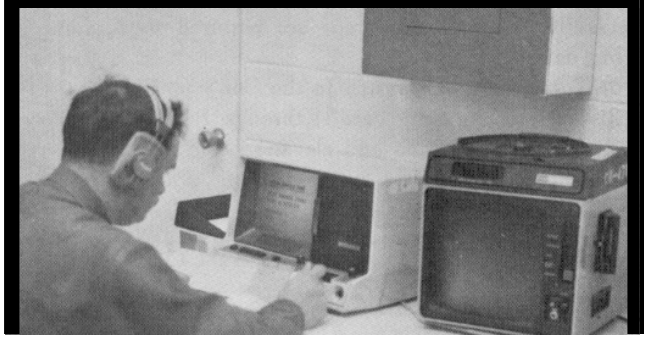
Circles

The circled numbers represent tasks taken from the Soldier's Manual. The grouping of the circles indicate tasks that are related. The vertical lines indicate the preferred sequence for progressing through a particular "track" and the horizontal lines are control lines. You cannot move above the horizontal line unless you have successfully accomplished all the tasks in that track.

Once the students are briefed, they all begin a self-pace map-reading course using several programed texts and study guides. The student may then begin the course by selecting any one of the tasks on the bottom of the chart. Multiple-entry points allow the student to make his own decision on what to do first. Whatever task he chooses, he has several options as to the medium he will learn from; e.g., TV tapes, slide/audio programs, TEC lessons, or written material. In each task there are student and peer sign-off points. These are control measures that give the student responsibility for controlling his pace and encourage peer assistance by forcing the student to accept the responsibility of checking the work of fellow students. Throughout the learning process, the student is encouraged to seek answers to his questions in reference materials, from his peers, and last of all from his instructor. As the student completes each task (except for 1289 and 1290 FADAC generator tasks) he is required to take a performance-related examination. This is a closed-book examination except for graphical firing table, tabular firing tables etc., and he must make 100 percent to pass. If he does not meet this standard, he is "looped back" to correct weak areas. He gets three attempts at each exam before a decision is made about his future status. Once the student has completed all exams, he has completed the course.

As you have no doubt noted, I have carefully avoided discussion of the CTX (Collective Training Exercise) circle at the top of the course map. This represents a final Go/No-go test in which the student demonstrates his ability to perform the job he was trained for. To do this so that it is fair to the student we must control a multitude of variables, allowing the individual student to demonstrate his abilities without being hindered by wrong data from another student or feeling threatened by working with three or four gunnery instructors. We are working on several TV tapes that will cause the student to interact with the personnel in the film as if he were a member of the FDC. The student will then have to satisfactorily perform in each of these positions before he can be declared proficient. Until the tapes are ready, we introduce the student to the CTX by having him read a script of what is said in an FDC during a fire mission, and he progresses until he is finally doing the job of-particular position. Each student must rotate through each FDC 13E position before he leaves the course. The instructor makes a subjective evaluation of each student in the CTX and makes a final recommendation as to his proficiency. Admittedly, this is not the best method of testing, but we believe that it is better than a norm-referenced composite exam.

Students may select from a variety of instructional media to facilitate their personal learning process.



That's a brief look at the 13E Self-Pace course. Now let me address some of the comments that the skeptics are bound to have.

"Everyone gets an A." That's true, self-pace is designed for success. There's no reason for a qualified student to fail. Even if it takes longer for the slower student to complete the course, it doesn't mean that he is a failure or is incompetent. In many cases, quite the reverse is true.

"Standards have degraded to nothing but a 'Mickey Mouse' course." This is just not true. Standards have increased, not decreased. Did you have to make a perfect score on your MET exam?

"You tell the student what he is going to learn." Of course we do. Why keep it a secret? However, we don't tell him *how* he is going to learn — that's his decision.

"You are teaching the test." Right again! If we want someone to determine range and deflection, we tell him that. Then we have him show us whether he can do it. What we don't do is hold extra instruction periods to "format familiarize" the student with the exam.

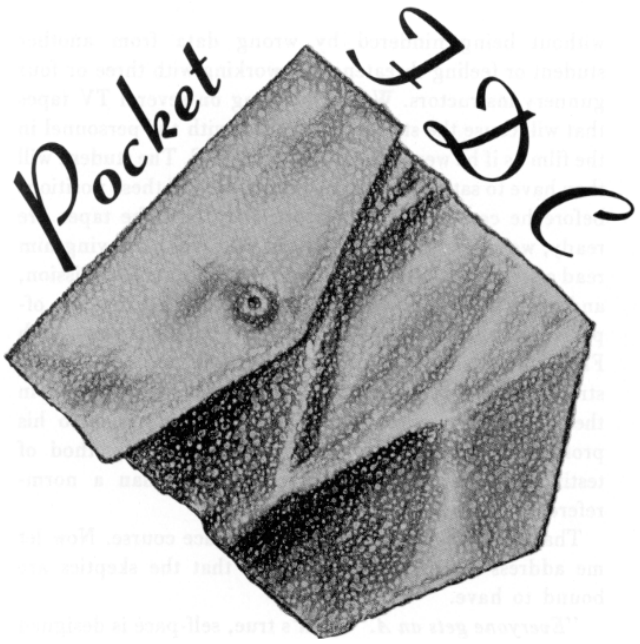
"Self-pace calls for more instructors." Not necessarily. The instructor's job has changed. How many instructors are needed depends on how many other types of information sources the student can rely on. Teaching isn't necessarily confined to the instructor. Each student is a potential assistant instructor. If he has acquired a knowledge that his friend needs, he can get valuable reinforcement and confidence by serving in this capacity.

These are just some of the skeptical comments. There will be more and some of them will be valid. We are keeping open minds and are willing to alter the course as necessary.

What we are trying to do is to cut down on educational expenses and give the field a better trained 13E for a longer time. Can we do it? We think so, but your help is essential.

MAJ Alfred M. Evans is Chief of the Enlisted Branch, Gunnery Department, USAFAS.

Pocket FDC



Bravo Battery was moving to its new location. Their convoy was straight — air guards posted, flawless vehicular intervals maintained, and vehicles in perfect SOP sequence. The executive officer was proud of his unit and totally confident that the battery would conduct a quick, orderly occupation into their next planned position area. Training had paid off.

Suddenly, the radio crackled with a call for fire; the battery must "hip-shoot." The firing battery had also trained on *these* procedures.

The XO quickly selected a position for the battery to occupy. With the aid of the chief of firing battery, the lieutenant laid the battery, then turned his aiming circle on two prominent terrain features, and determined the direction to them. Racing back to his vehicle, the tireless artilleryman opened the ammo can that went everywhere with him. From the ammo can, he selected a program card, fed it into his pocket calculator, keyed in the terrain feature locations and directions to them, and there, displayed on the panel of the calculator, was his location, accurate within 100 meters — and in only 30 seconds. Next, he "read in" two cards and keyed in the target location; within one minute, he had accurate firing data. There was no need to approximate his location or to use any make-shift firing data apparatus. This was all done well within normal hip-shoot times.

Capabilities

Although programable calculators have an unlimited variety of applications, ranging from celestial navigation to statistics, they can be specifically programed to perform basic gunnery computations. A general-purpose calculator can be used to compute basic fire direction center (FDC) output such as range, deflection, charge, and elevation. These devices are relatively cheap (ranging in cost from $200 to $450) compared to the more sophisticated special-purpose computers such as field artillery digital automatic computer (FADAC), battery computer system (BCS), and tactical fire direction system (TACFIRE). However, the FDC calculators provide a high degree of convenience and accuracy over a standard firing chart and are easier to transport and faster to set up.

The programable calculator can be a supplement to existing equipment until BCS is available and then used as a suitable backup for BCS (particularly for Active Army light divisions and National Guard and Reserve units who do not have FADAC). In addition, pocket calculators can be used to produce accurate data in such situations as hip-shoots, roving gun missions, and offset registrations, as well as ordinary arithmetic calculations for metereological (met) computations. In garrison, the calculators could even be used to compute the battalion PT average or to balance unit fund checkbooks.

As an example, the current firing data program for one type of calculator provides the following capabilities:

1) Grid, shift, and polar plot target location. The calculator functions as an electronic chart to compute initial and subsequent data more accurately than a chart since it uses analytic geometry rather than graphical analog.

2) Application of registration corrections, expressed as a constant range K and a specified deflection correction.

3) Charge selection, using corrected range.

4) Elevation corresponding to corrected range for any of five pre-selected charges. Each program contains elevation data for only one type of shell.

5) Altitude correction expressed in mils. The program will not compute site, but will apply a specified correction to elevation before display.

6) The current "pin location" is stored during a mission and may be recalled to provide recorded targets or used for replot procedures.

Computing Firing Data

Specific calculator operating procedures vary slightly, depending on the brand, but all are relatively simple. Generally, the following steps are required to compute firing data.

1) Turn the off/on switch to the "on" position.

2) Feed the magnetic card(s) through the reader. This loads both the program and elevation constants.

3) Key in the battery easting, northing, and azimuth of lay.

by CPT Joseph C. Antoniotti, CPT Allan M. Resnick, and 1LT Charles M. Bosley

4) Key in range K and deflection correction, if desired. These are automatically zero initially.

5) Enter target location, expressed as a grid, a shift, or a polar plot.

6) Depress a key to compute range and deflection.

7) Depress another key to compute charge (which may be overriden).

8) Finally, depress a key to compute elevation (or quadrant, if site is available).

9) Key in observer-target direction if not previously entered, and apply observer's correction.

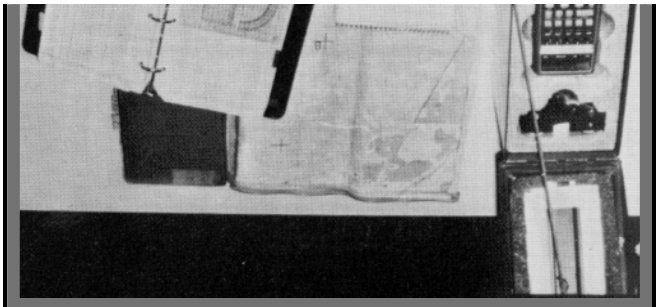
10) Depress a key to compute subsequent deflection and quadrant. Initial firing data can be calculated within one minute after the calculator is switched on, whereas chart setup alone requires five minutes. To key in a target takes 10 to 15 seconds, and to obtain initial data takes 11 to 13 seconds. Subsequent data require 15 to 20 seconds, including the time to key in the observer's correction.

Programs

Programs have also been developed for high-burst registration, two-point resection, and hasty traverse. Commercial programs are available which compute azimuth of the sun, azimuth of Polaris, and other standard survey applications.

The FDC calculators weigh only a few ounces and are identical in size and appearance to other calculators on the civilian market. There are several power sources available, including internal nickel-cadmium batteries, external BA-30 batteries, and converters for AC line or 12-volt DC operation. Card-programable calculators use a magnetic recording head with a tape drive motor to load a prerecorded program into machine memory. Once the program is loaded, data entry and program execution are controlled from the keyboard. The "tapes" are 1/2-inch by 3-inch magnetic cards which can contain either program instructions or data for register memory. Although the calculators do not conform to military specifications for durability, they are relatively rugged. They use an integrated circuit microprocessor similar to those used in the cannon-launched guided projectile and BCS. The calculators have proved to be dependable in the hands of civilian surveyors and Apollo astronauts.

Programs can come from any of three sources. First, pre-corded cards can be used, in which case all that is necessary is to feed the card into the calculator. Second, the calculator can be "taught" a set of instructions that are composed by the user by keying these into the calculator; then these instructions can be recorded on a card by the calculator and used at a later time by merely feeding in this recorded card. Finally, the user can be furnished with a set of instructions, and the same procedure as previously stated can be used.



Everything needed to solve the gunnery problem — map, plastic protractor and range-measuring instrument, notebook, and hand-held calculator which, with all its program cards and accessories, fits neatly in an ammo box with homemade Styrofoam packing.

Under one proposed employment concept, the FDC computer uses a calculator to run his own chart. This reduces the requirement for a horizontal control operator and reduces the quantity of verbal data passed in the FDC. The resulting decrease in confusion could make a difference in efficiency, particularly in high stress situations.

Limitations

The program and register memory is volatile and is erased when the calculator is switched off. The card reader is sensitive to low temperatures, which makes it necessary to carry the calculator inside a shirt pocket during cold weather. Current models permit storage of only one target and one battery, which requires the operator to maintain a target list and there is therefore a stronger requirement to maintain a current situation map. As with FADAC, the computations are susceptible to keyboard errors. One solution would be to use two independent computers as a check. Existing programs do not compute fuze settings or data. The simplified equations used to compute elevations may deviate as much as plus or minus three mils from the tabular firing table values.

Infantry units at Fort Ord and Fort Sill are making local purchases of these calculators for use in their mortar FDCs. It is believed that the increased accuracy and speed of computation will improve the response of the mortars to their supported elements.

The Gunnery Department of USAFAS, in conjunction with the Directorate of Combat Developments, has initiated a Concept Evaluation Program of these calculators to collect data for accuracy evaluation and to demonstrate the operational potential of these calculators when used by fire direction personnel.

The artillery community may finally be able to bid farewell to the firing chart.

CPTs Joseph C. Antoniotti and Allan M. Resnick are assigned to the Directorate of Combat Developments, USAFAS, Fort Sill, and 1LT Charles M. Bosley is assigned to Headquarters Battery, 2d Battalion, 8th Field Artillery, Fort Ord, CA.

Interoperability —

by LTC William B. Howerton and MAJ Phillip W. Childress

Key To Success In Allied Operations

MISSION: Reinforcing the Panzer Field Artillery Battalion 295.

The American field artilleryman prides himself on flexibility. Reallocate the forward observers (FO), shift a liaison team, or realign communications, and the field artilleryman assumes a new mission without breaking stride. The inherent responsibilities of the four standard field artillery missions tell him what to do. He has practiced the procedure many times. It works. It is smooth, efficient, and simple — as long as the mission is an all-American show.

So what's the difference if we are given a mission to support a German Army (Bundeswehr) unit? We are all artillerymen and function basically the same — right? The Bundeswehr is very accommodating and always seems to be able to communicate in English — right? We should be able to provide support by relying solely upon the procedures of our tried and true doctrine — right? Wrong!

The differences are there — not only in language, but also in doctrine and capability. The differences, whether subtle or glaring, have a profound effect upon the fighting capability of a multinational force. The need to overcome the differences has been recognized by the allied forces in Europe. The resulting program has been labeled "interoperability."

"Interoperability" is not a buzz word. It is a necessity. The field artilleryman who does not get on board will not be able to do his job correctly or effectively. In this article, experiences of American units operating with Bundeswehr forces will be drawn upon to provide guidelines for future operations.

Differences

German artillery is by organization decentralized. The American artilleryman is accustomed to the centralized structure of the division artillery, with corps artillery available to be employed according to the need for greater firepower. Decentralization is accomplished through the assignment of standard artillery missions. The American artilleryman pales at the suggestion of an "operational control" or "attached" status for his units, and such artillery employment is accepted only in exceptional cases such as the armored cavalry regiment.

The German artilleryman, however, "violates" this rule by the way his division is organized. Not only are the direct support (DS) battalions (155-mm) organic to the supported maneuver brigades, but most of the corps artillery is assigned to division artillery (artillery regiment, by German terminology). The regimental artillery is organized with a target acquisition battery, a composite 175-mm/8-inch battalion, and a rocket battalion equipped with Honest John rockets and multiple rocket launchers (see organization chart). If a corps artillery exists, it consists of no more than two or three battalions.

German artillery has two types of reinforcing missions. Although Bundeswehr artillery missions of DS and general support (GS) are similar in concept to the US missions, the mission of reinforcing has a different connotation. The German reinforcement may be one of two types. The first is analogous to the US concept of "priority of fires." The second entails attachment of one or more batteries to the reinforced unit for an extended period of time.

The Bundeswehr DS battalion commander is the FSO. With the Bundeswehr DS battalion organic to the maneuver brigade, the bond between the maneuver force and supporting artillery commanders is much stronger than in the US structure. In fact, the DS artillery battalion and battery commanders are located at the supported maneuver

force command post and personally coordinate fire support activities. The routine operations of the battalion and firing batteries are handled by the executive officers, who as a result assume a more decisive role than their American counterparts. The US and German systems for planning and executing fire support activities are basically the same. Both call for coordination of required fire support at the lowest level feasible. In both systems, the capability of integrating artillery, air support, and mortars into the force commander's fire support plan exists at all levels down to battalion.

Communication is the major stumbling block. The communications challenge falls into three general categories: language, equipment, and terminology. The language difference surprisingly has the least impact of the three areas, but not because of any special efforts by Americans. Experience has shown that many more German soldiers speak English than American soldiers speak German. Consequently, virtually all communications, verbal or otherwise, passing between German and American forces are in English.

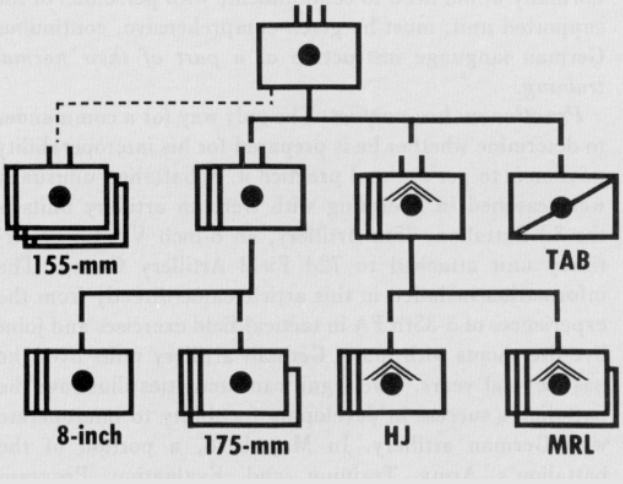
The most significant problems are caused by incompatibility of German and American equipment. German radioteletype equipment is FM and American equipment is AM. Although FM voice radios do net, the associated secure equipment is imcompatible, as are US and German multichannel systems. Finally, although it may be possible to translate messages sent by some means of communication, danger still lies in differences in terminology and unfamiliarity of technical terms. Standard military terminology notwithstanding, there still exist nuances in the interpretation of communications.

Getting Together

It is obvious from the relatively stiffly structured Bundeswehr artillery organization that it is more likely that a US unit will be placed in a role supporting a German unit than vice versa. Furthermore, it is an implied requirement that the supporting unit makes the adjustments necessary to provide the best possible fire support.

So — we have just been given a mission to reinforce a German artillery battalion. We know what the problems are. Now, what do we do about them?

Exchange of bilingual liaison teams. The best bridge for closing the multinational gap is the bilingual liaison team. Experience has shown that liaison should not be a unilateral effort, but that teams should be exchanged. Continuous face-to-face communication with a representative of the other nation's force is important whether one is the supported or supporting headquarters. In actual practice, US units reinforcing German artillery units found it essential to adopt the German units' liaison system through frequent coordination of the US battalion commander with the maneuver brigade CP. Since the US



Bundeswehr Artillery Regiment Organization

battalion commander is expected to function differently from the German commander and cannot provide continuous personal liaison, it is recommended that a second liaison team be established for this purpose.

Liaison teams should be equipped with secure communications equipment to include radioteletype. Through this means, the incompatibility of German/US equipment is circumvented, and a variety of channels are provided to pass fire support information in a secure mode in the native tongue of sender and receiver. For units with known wartime or contingency missions in support of Bundeswehr artillery, the additional liaison and communications personnel and equipment should be authorized. Such units should be earmarked for assignment of personnel with demonstrated German language ability.

Plan and test the FO call-for-fire system. The US unit must develop a capability to answer calls for fire from German FOs. Although the call for fire can be filtered through liaison channels, expedience demands direct contact with the FO. As a bare minimum, FOs and fire direction centers (FDCs) must be provided with common "key word lists" of technical artillery and military terms. The lists should include phonetic spellings of the foreign terms in both languages and explanations of terminology where necessary. Also, the key word lists are insufficient because of the obvious necessity for coordination and conversation outside of the limited terms on the list. Dependence on the Bundeswehr FOs ability to speak English is not practical. Americans are not known for their ability to speak foreign languages. The mandatory language programs for junior officers, NCOs, and enlisted men assigned to USAREUR units prepare a man for ordering in a gasthaus (restaurant) or asking for directions to the bahnhof (railroad station), at best. Therefore FDC, operations and liaison personnel, plus any others that

normally would need to communicate with personnel of the supported unit, must be given comprehensive, continuous German language instruction *as a part of their normal training.*

Practice makes perfect. The only way for a commander to determine whether he is prepared for his interoperability mission is to get out and practice it. A battalion unusually well-seasoned in operating with German artillery units is the 3d Battalion, 35th Artillery, an 8-inch VII Corps Artillery unit attached to 72d Field Artillery Group. The information included in this article came directly from the experiences of 3-35th FA in tactical field exercises and joint live-fire shoots with many German artillery units over the past several years. Two significant activities illustrate the battalion's success in developing its ability to interoperate with German artillery. In May 1976, a portion of the battalion's Army Training and Evaluation Program (ARTEP) was conducted with a mission of reinforcing the fires of the 12th Bundeswehr Artillery Regiment. As part of the ARTEP scenario, live-fire missions, to include preparations and battalion and battery time-on-target missions, were passed to the battalion from the regiment. In exercise LARES TEAM (REFORGER 76) the battalion reinforced the Panzer Artillery Battalion 295, a Bundeswehr DS unit. Using the concepts described in this article, the battalion provided excellent reinforcement to the German battalion and sharpened its own skills in doing so. Even so, one mishap was a good example of the pitfalls facing even the most experienced unit in the interoperability situation. On one occasion, the German commander ordered the battalion to reconnoiter new positions. The battalion and battery commanders immediately went forward to look over possible locations and develop plans for occupations. Less than 30 minutes later, the battalion was directed to move to the new positions. Belatedly, it was discovered that the intent of the initial order was to send advance parties, prepare positions, and await the movement order for the main bodies. The lesson learned was that mutual agreement on common terms of reference should be established prior to commencement of combined operations. The best way to smoke out these misunderstandings is through joint training.

Last Word On Interoperability

Think about interoperability, plan for it, and train for it! The success of NATO forces in the next war depends on how well we work together. For 3-35th FA and all other American and German artillery units in the USAREUR area, interoperability is more than just a word. It is a necessary way of life and well could be the concept required for survival on the next battlefield. As Field Artillerymen we can't sit around wargaming the situation should the balloon go up. The time to prepare is now! In Europe we are practicing what is being preached in this article. We'll be ready — THEY SHALL NOT PASS!

The Bundeswehr is developing secure FM equipment which will be compatible with US equipment, and communication can take place using a common NATO code or key list. Communication via RTT is possible by inserting OPM Gear 404 (NSN 5815-00-407-6161 and 5815-00-407-6162) as described in TM 11-5815-238-35, in the US rig. This conversion kit is available through normal supply channels and will make the "words per minute" of the two systems agree.

Some help in arriving at common terminology may be obtained by using the "NATO Glossary" (APP-6 (L)) from the Military Agency for Standardization, NATO, B1110, Brussels, Belgium. The document can be locally reproduced, so ordering one copy should be adequate. Also STANAGS 2867 on radiotelephone procedure and 2101 on liaison should be helpful. —Ed.

LTC William B. Howerton was Commander of the 3d Battalion, 35th Field Artillery, until January 1977, and MAJ Phillip W. Childress is the S3 of the 3-35th FA.

58th Armored FA Bn Reunion

The 32d annual reunion of the 58th Armored Field Artillery Battalion will be held at the Colonial Court Motel, Greenville, SC, 13 and 14 August 1977. All former members and their families and friends are anxiously awaited for this event.

For information, contact H. M. Ballington, 2016 Holland Street, West Columbia, SC 29169.

4th FA Reunion

The 4th Field Artillery (Mule Pack) will meet 10 September 1977 at Fayetteville, NC. For details, contact W. L. Crawford, 416 Wayberry Dr., Fayetteville, NC 28303.

USAFAS Reorganization

The latest revision of the USAFAS internal structure resulted in a merger of the Directorate of Course Development and the Directorate of Training into the Directorate of Course Development and Training. This reorganization better defines roles and missions and will result in more efficient operation.

Here is a recap of the current USAFAS organization:

Office	*Symbol*	*Extension*
Commandant	**(ATZR-CG)**	**3006**
Assistant Commandant	**(ATZR-AC)**	**6604**
Deputy Assistant Commandant	**(ATZR-DAC)**	**2301**
Secretary	**(ATZR-SE)**	**6702**
Academic Records		6214
USAF Representative		2300
USMC Representative		2307
Modern Battlefield Techniques Committee	**(ATSF-MBT)**	**5103**
Communications/Electronics Department	**(ATSF-CE)**	**2501**
Communications Division		3419
Electronics Division		2425
Review and Analysis Division		5107
Weapons Department	**(ATSF-WD)**	**2400**
Cannon Division		6716
Guided Missile Division		5906
Pershing Branch		4920
Lance Branch		5424
Review and Analysis Division		6590
Directorate of Combat Developments	**(ATSF-CD)**	**6980**
Doctrine Team		4491
Project Seeker		3161
TACFIRE		6089
Weapons Team		5879
Systems Team		3669
Directorate of Training Developments	**(ATSF-TD)**	**6403**
Individual Training Team		3092
Training Simulators Team		3300
Collective Training Team		5004
Training Media Team		4902
Training Effectiveness Analysis Team		3092

Office	*Symbol*	*Extension*
Counterfire Department	**(ATSF-CF)**	**6207**
Meteorology Division		2406
Targeting Division		6486
Radar Division		4982
Survey Division		6616
Review and Analysis Division		5979
Gunnery Department	**(ATSF-G)**	**2014**
Fire Direction Division		2802
Analysis Branch		3901
Tactics and Combined Arms Department	**(ATSF-CA)**	**4704**
Review and Analysis Section		5609
Combined Arms Division		3000
Artillery Tactics Division		5801
Nuclear Weapons Employment Division		6209
Directorate of Evaluation	**(ATSF-AE)**	**4190**
Collection Division		1423
Analysis Division		2364
Directorate of Course Development and Training	**(ATSF-CT)**	**5771**
Training Management Division		4393
Training Support Division		3611
Design Division		5077
Reserve Component Division		2520
Library (Morris Swett)		4525
FA School Brigade	**(ATSF-TP)**	**5265**
Staff and Faculty Battalion		2009
Officer Student Battalion		6194

AUTOVON prefix for Fort Sill extensions is 639. Commercial calls should be made to 405-351 plus above extensions.

New Navy Gun Funds Restored

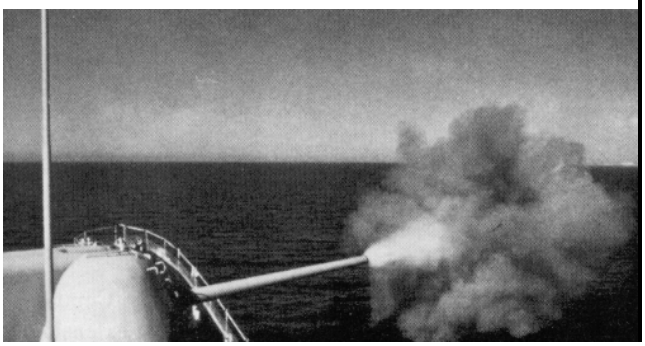
Naval gunfire support for Army and Marine troops ashore has a brighter future since the recent restoration of funds by Congress for the Navy's new 8-inch major caliber lightweight gun (Mark 71). The gun is the first new design by the Navy in 25 years and, according to proponents, will upgrade the offensive striking power of the US surface Navy.

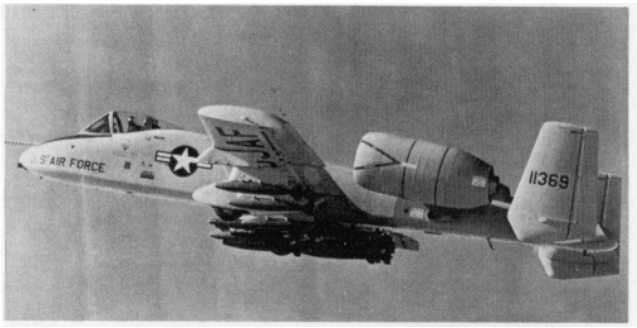
Built for a one-man crew, the new gun fires more rounds per minute than a standard 8-inch three-gun turret with 44 crewmen. It fires a 260-pound projectile over 15 miles every 5 seconds. Its range is 25 percent greater than existing 8-inch guns, and it is the first weapon of this size and power which can be mounted on a destroyer.

In comparison with 8-inch guns used in WWII, the new gun yields 4 times as much penetration, 6 times as much blast and fragmentation, and 3 times as much destructive and neutralization capability. The Mark 71 accommodates a guided projectile that is now in development. In tests, the guided projectile had 8 direct hits in 10 shots.

If the gun is approved for service, 40 units will be procured for 30 Spruance class destroyers, 8 strike cruisers, and 2 training sites. The first production gun would be installed in a DD-963 class destroyer and be operational by 1982.

Navy's 8-inch major caliber lightweight gun (Mark 71)





A-10 close air support aircraft (USAF Photo)

More Punch Per Buck With 30-mm Uranium Round

Exceptional close air support to the soldier in combat, as well as an aircraft with the necessary punch to destroy tanks and other heavily armored vehicles, will be provided by the Air Force Tactical Air Command's A-10 with its 30-mm GAU-8 gun system, according to the command's publication *TAC Attack.*

Basic to the effectiveness of the aircraft's gun system is the 30-mm armor piercing incendiary (API) round, which uses depleted uranium (DU) for its punch. Depleted uranium is one of the few materials that can be used in the construction of an armor-piercing projectile and is effective because of its high density. Another such material, tungsten, is less effective and costs from $12 to $16 per pound as opposed to $1.50 per pound for DU.

The DU round's density enhances penetration and spalling because a significent amount of weight impacts a small target area. The DU munition will also burn through self-ignition on impact which can cause secondary damage in fuel tanks or ammunition bays. Additionally, DU penetrators offer distinct ballistic advantages in their ability to penetrate a target at greater ranges than other ammunition.

Tests have shown depleted uranium ammunition to be safe to manufacture, load, and fire and to pose no radiation hazard.

Lasers Work

Army and Air Force laser equipment is compatible and performed remarkably well in close air support tests recently concluded at Gila Bend, AZ.

The Army's laser target designator (LTD) was used to designate targets for the Air Force's A-10 close support fighter.

The A-10 is equipped with a laser seeker which enables the pilot to detect, identify, and engage targets illuminated by laser energy.

During two weeks of tests in the Arizona desert, Army and Air Force personnel designated parked aircraft, trucks, antiaircraft guns, and tanks on a simulated airfield. The A-10s, flying at altitudes from 50 to 5,000 feet, made a variety of strafing runs using the aircraft's 30-mm cannon and dropping 500-pound laser guided bombs.

Several night missions were conducted during which the planes engaged targets invisible to the pilots. Since the LTD did not have a night sight, the A-10s dropped flares, enabling observers to see and designate targets.

"Night missions were just about as successful as day," said MAJ Ray Benson, R&D coordinator for precision laser designators. "Results were excellent. There was little or no reduction in night accuracy."

On several runs, two designators were used to mark different targets for individual fighters. The equipment, operating on different codes, permitted each aircraft to engage a specific target with maximum effectiveness.

New Smoke Round On The Way

A program to develop an improved 155-mm screening smoke projectile has been approved by the Army Materiel Development and Readiness Command. The projectile is designed to be a member of the M483A1 ballistic family of ammunition and to be compatible with all existing and developmental 155-mm howitzers.

The new smoke round is envisioned to use a fill of multiple phosphorus subunits to provide a screening smoke over a 125- by 250-meter area within 45 seconds of detonation with a duration in excess of 5 minutes.

Use of smoke on the battlefield has been emphasized since the 1973 Mid-East war. Efforts to update the employment tactics of artillery smoke are documented in TC 6-20-5, "Field Artillery Smoke."

Semaphore Back In Action

Combat communications are returning to the old style of more than 50 years ago in the 82d Airborne Division with the use of semaphore flags to relay messages in situations where radio and land line phones cannot be used. Division communicators however have added a new concept to the old semaphore code to meet the faster time requirements of the modern battlefield.

A number code in which three numbers represent a specific phrase or sentence has been devised for the flags. For example, the numbers one, two, and three could tell the receiver that "an airborne assault is due at 1600 hours."

Extensive tests of the new semaphore system showed that an average of 33 seconds was required to send a three-number group message. LTG Henry Emerson, XVIII Airborne Corps Commander, has ordered 396 sets of flags for distribution among the artillery, infantry, and other battalions of the Corps.

Contract Let For Squad Automatic Weapon

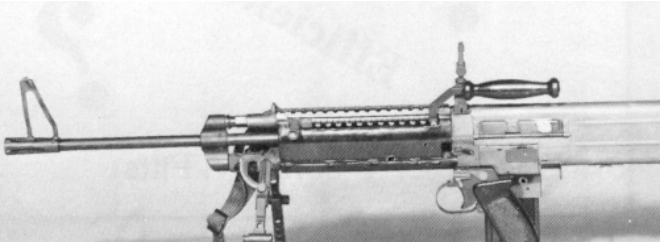
A new weapon for infantrymen is one step closer. The Army Armament Material Readiness Command has contracted for development of an infantry squad automatic weapon (SAW). The contract calls for production of a prototype called the XM235 SAW, designed with metric measurements.

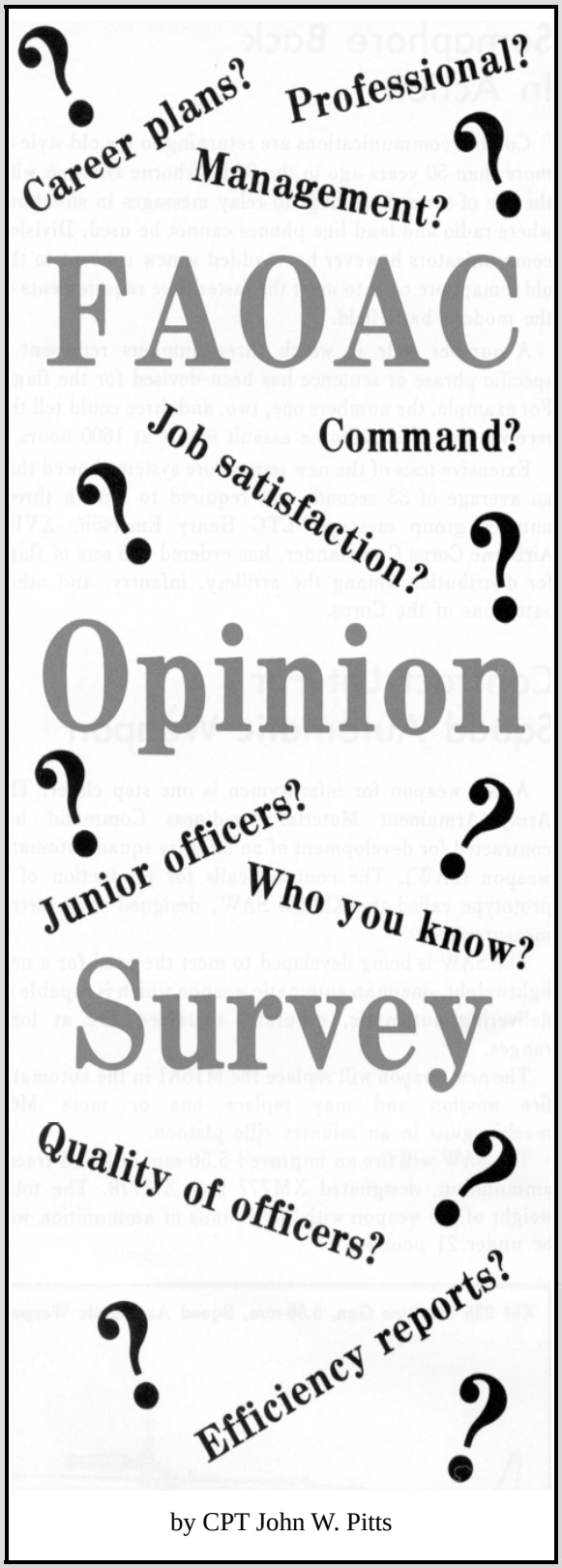
The SAW is being developed to meet the need for a new lightweight, one-man automatic weapon which is capable of delivering automatic, accurate, sustained fire at long ranges.

The new weapon will replace the M16A1 in the automatic fire mission and may replace one or more M60 machineguns in an infantry rifle platoon.

The SAW will fire an improved 5.56-mm ball and tracer ammunition, designated XM777 and XM778. The total weight of the weapon with 200 rounds of ammunition will be under 21 pounds.

XM 235 Machine Gun, 5.56-mm, Squad Automatic Weapon





by CPT John W. Pitts

In late November 1976, a questionnaire was distributed to officers of Field Artillery Officers Advanced Course 2-76. The questionnaire dealt with junior officers' career plans and attitudes toward professionalism. The survey showed a commitment to an Army career, but there are indications of discontent because of the individual's inability to control his future.

The Questionnaire Format

The survey instrument contained 22 questions. The general data were developed through the first eight of those questions. Additionally, respondents were asked to state whether they intended to remain in the Army as career officers, and two open-ended questions solicited their views on junior officers' careers and on needed improvements in the management of their careers. The remainder of the questions required respondents to quantify (on a scale of one to five) the importance of various considerations in their decision-making processes and to express agreement or disagreement with a number of statements.

Demographics

The questionnaire was distributed to 203 officers with Regular Army (RA) or Reserve (USAR) commissions; 120 responded. The group responding was comprised of relatively junior captains: 108 were members of year groups 1970, 1971, or 1972; only 12 had dates of rank prior to 30 September 1973. Sixty-eight percent of the respondents had RA commissions and 32 percent were USAR officers.

Of those surveyed, 47 percent were commissioned through ROTC programs, 21 percent through OCS, 31 percent graduated from West Point, and two officers had received direct commissions. Eight percent had college degrees, 10 percent had master's degrees, and the remainder had some college but no degrees. Seventy-five percent were married; 21 percent were single; and 4 percent were separated or divorced or were widowers.

The majority of the officers surveyed had limited command experience. Fifty-nine percent had held battery/company level commands for less than six months. Battery level command experience is summarized in table 1.

Table 1. Command experience.

Command time	No.	Percent
None	62	52
1-12 months	23	19
13-24 months	29	24
25-36 months	6	5

Table 2. Career plans — percentage by source of commission.

Source of commission	Plan to remain	Plan to resign	Undecided
USMA	51	16	33
ROTC	58	1	41
OCS & Direct	85	0	15
Class total	62	6	32

The Findings

Of the 120 respondents, 62 percent plan to remain in the Army as career officers. Thirty-two percent were undecided, and only seven officers planned to leave the Army. All seven leaving the Army had RA commissions. OCS graduates and officers with direct commissions demonstrated the most consistent commitment to remain in the Army. West Pointers comprised the highest percentage of officers planning to resign, while ROTC graduates comprised the greatest percentage of "undecideds" (table 2).

Those planning to remain beyond any legal obligation and those who were undecided were asked to evaluate the importance of a number of considerations in their decision-making processes. The mean (average) responses are summarized in table 3. The most important single consideration in keeping junior officers in the service appears to be the variety of interesting assignments available. On the other hand, respondents either disagreed with, or considered unimportant, the argument that they had few alternatives for civilian careers.

Those who had decided to leave the Army upon completion of their service obligation and those who were undecided were asked to evaluate the importance of a similar number of considerations. The most important concern to these officers was their lack of control over their own fates (table 4). They tended not to be discouraged with the Army's value systems nor were they impressed with the chance to earn more money as civilians.

Table 3. Importance of certain factors for those remaining in Army and those undecided.

(The question was: "If you have decided to remain in the Army beyond your legal obligation, how important were the following considerations in your decision? Or, if undecided, how important are these considerations in your decision-making?" Respondents' choices were: 1—very important; 2—important; 3—neither important nor unimportant; 4—unimportant or 5—very unimportant. Number reported indicates the average response.)

Note: The scale is continuous. For example, an average of 1.5 implies a rating between important and very important.

a.	Varied and interesting assignments	1.63
b.	The challenges of the job	1.77
c.	Salary and benefits	2.05
d.	Belief in Army's ideals and traditions	2.35
e.	Job security	2.40
f.	Personal skills and abilities well-suited to military	2.58
g.	Opportunity for continued education (e.g., graduate school)	2.59
h.	Fellowship with other officers	2.67
i.	Family's satisfaction with Army life	2.71
j.	Few alternatives as a civilian	3.80

Table 4. Importance of certain factors for those planning to leave the Army and those undecided.

(The question was: "If you have decided not to remain in the Army beyond your legal obligation, how important have the following considerations been in your decision? Or, if undecided, how important are the following considerations in your decision-making?" Respondents' choices were the same as for Table 3.)

a.	No control over own fate	2.26
b.	Lack of trust in Army system	2.38
c.	Uncertainty about promotion	2.42
d.	Not satisfied with the types of jobs available	2.48
e.	No long-term job security	2.53
f.	Family's dissatisfaction with Army life	3.26
g.	Lack of dedication to Army's values	3.60
h.	Can earn more as a civilian	3.66

Job Satisfaction

The level of satisfaction experienced by the respondents with respect to certain aspects of their jobs are given in table 5. The variety of jobs available to junior officers and

Table 5. Job satisfaction.

(The requirement was: "Please rate the level of satisfaction you have had as a junior officer with respect to the following aspects of your jobs." Respondents' choices were: 1—very satisfied; 2—satisfied; 3—neither satisfied nor dissatisfied; 4—dissatisfied; or 5—very dissatisfied. Number reported indicates the average response.)

a.	Variety of jobs	1.85
b.	Challenge of the work	1.90
c.	Content of the work	2.15
d.	Degree of autonomy granted by superiors	2.35
e.	Recognition received for good work	2.76
f.	Interest shown by senior officers	2.88
g.	Control over work and assignments	3.25

the content and challenge of Army work appear to contribute to a general satisfaction with jobs. No single response was indicative of serious dissatisfaction, though lack of control over work and assignments concerned a number of officers.

Professionalism and Career Success

The officers surveyed considered themselves to be professionally competent. In fact, they rated their own professional competence significantly higher than that of other Army captains, field grade officers for whom they had worked, and junior officers who had worked for them (table 6).

Table 6. Professional competence.

(Possible responses to the following questions were: 1—very much so; 2—for the most part; 3—marginally; or 4—not at all. Number reported indicates the average response.)

a.	Do you consider yourself to be professionally competent?	1.47
b.	Do you consider most other Army captains to be professionally competent?	1.98
c.	Do you consider most field grade Army officers for whom you have worked to be professionally competent?	2.08
d.	Do you consider most officers who have worked for you to be professionally competent?	1.95

Respondents felt that a person who is a good supervisor and is technically competent would be the most likely to advance to the highest ranks of the Army. They viewed supervisory competence to be more important, however. Of those surveyed, 6.5 percent felt that neither supervisory nor technical competence is important to advance to the top. Demonstrated performance, command time, willingness to command, effort expended, and luck were all rated as important for a successful Army career.

When asked to rank certain activities according to their importance to the officer, the following priorities were indicated (the lowest number represents the highest priority):

1.62—Individual's job or profession.

1.64—Individual's own family activities.

3.00—Individual's own creative or recreational activities.

3.67—Participation in community functions (including political and religious activities).

General Views

The questionnaire included a number of statements on which the officers were asked to comment. Responses were limited to: 1—strongly agree; 2—agree; 3—no opinion; 4—disagree; or 5—strongly disagree. Following are those statements and the average responses.

a. There are many outstanding junior officers leaving the Army.	1.71
b. The junior officer is often forced to place expedience above principle.	1.76
c. Personal appearance is an important component of military professionalism.	1.98
d. Officers have an obligation to actively participate in post or unit social activities.	2.62
e. The greatest threat to an officer's career is that the personnel system is a "who-you-know" system.	2.76
f. If I establish a good reputation on one post, that reputation will follow me to my next assignment.	3.42
g. DA personnel managers are very concerned with individuals' personal long-term goals	3.50
h. There are very few top quality officers entering the Army.	3.77

Thus, there is significant agreement that many outstanding junior officers are leaving the Army, as well as concern that junior officers are often forced to compromise themselves on issues of principle. Respondents disagreed with the contention that there are few good officers now entering the Army and were somewhat dubious of the assertion that DA personnel managers are sincerely concerned with individuals' long-term goals.

Respondents' Comments

The questionnaire concluded with two open-ended questions, aimed at getting suggestions for improving the management of junior officers' careers and at further developing issues relating to their careers.

Among the issues of greatest concern was the concept of Primary Specialty Qualification. While many expressed support for the concept (as well as the entire OPMS), some officers were concerned that too much emphasis has been placed on command. They argued that some officers who have little aptitude for command might make valuable contributions to the Army in other fields. Yet without successful command experience, they feel there is little hope for advancement. Similarly, there was concern that both branch-related and other skills (especially the aviation qualification) have not been used because of assignment practices.

There was criticism of the Officer Efficiency Report (OER) and the fact that mistakes made very early in one's career could become handicaps as one approached promotion to major. Several officers argued that the junior officer should be allowed to make some mistakes without the fear of severe penalty. Finally, many respondents complained that they had never been counseled by senior officers with regard to their job performance or career plans. Many regretted that their battalion commanders had not taken more active roles in providing them with career guidance.

The officers surveyed were not without suggestions for correcting these and other problems. Because of the widespread perception that individual career goals are often at odds with the needs of the Army, several respondents suggested the need for explicit goal setting. One suggestion was that branch maintain a record of an individual's stated career goals. Such a record would be part of the officer's file and should be updated regularly. Concurrently, officer personnel managers at MILPERCEN would be required to match these individual goals with a similarly explicit statement of Army officer personnel needs and to advise each officer whether or not his goals were in consonance with the Army's needs. Also, a number of corollary suggestions were made. It was argued that the three-year rotation system should be ended and that officers should be reassigned to specific jobs when positions they desire, or need, become available. Several respondents saw little benefit in reassigning an officer to a post where he would "stand in line" for a needed job. Additionally, it was suggested that there should be more branch transfers approved and that year-group order-of-merit lists should be published regularly. In short, these respondents desired more openness in the career management process and the flexibility to meet their individual goals in another branch if necessary.

It was also recommended that only recent OERs (the past five or six, for example) be maintained in one's official file, thus reducing the impact of early mistakes. One officer contended that the subjectivity of the efficiency reporting system could be reduced, by adopting an objective measure (comparable to a Skill Qualification Test) to accompany each OER.

Finally, a number of aviators felt that their skills and career needs were not being well managed under the current system and therefore suggested that a separate aviation branch be established. Similarly, several USAR officers felt that they were discriminated against and recommended that the separate Regular Army and USAR designations for active duty officers be dropped.

Conclusion

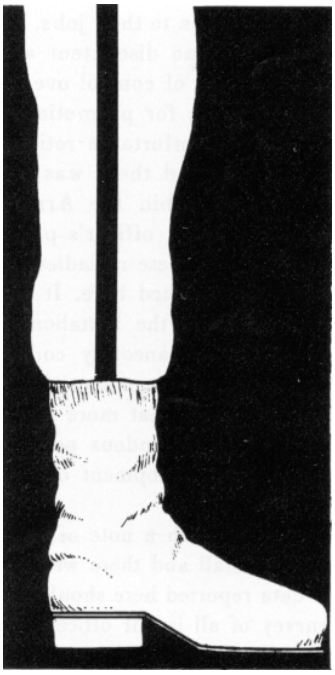
The 120 captains who responded to this questionnaire have, as a group, asserted a commitment to remain in the Army and indicated a dedication to their jobs. There was evidence, however, of a vague discontent among them. There was a sense of a lack of control over their careers, worry about opportunities for promotion, and concern that the promise of a comfortable retirement might not be a sound promise. And there was a perception that very few persons within the Army are genuinely concerned with the junior officer's plight.

There are ways, however, to treat these maladies. Some of these treatments have been suggested here. It is also important to emphasize the role of the battalion commander — the man who can simultaneously command respect and provide some guidance — as a potential mentor for young officers. It must be hoped that more battalion commanders will recognize their tremendous power *and* responsibility for influencing the development of battery officers.

This report must be concluded with a note of caution. The survey's sample size was small and there were many non-responses. Thus, the data reported here should not be readily generalized. A survey of all junior officers in the Army or in the field artillery might yield different results. In-depth analysis has deliberately been avoided here since any projection of these data to a larger population must await a more rigorous analysis of these and additional data.

CPT John W. Pitts, who was a member of FAOAC 2-76, is assigned to 1st Battalion (Airborne), 320th Field Artillery, Fort Bragg, NC.

Redleg Review



MISSILES OF THE WORLD, by M. J. H. Taylor and J. W. R. Taylor, Charles Scribner's Sons, New York, 1977, 159 pages, $7.95.

Since its first publication in 1972, the book. *Missiles of the World*, has become an established reference on missiles. It contains definitive details and photographs of all guided missiles known to be in use or under development throughout the world.

All data on the various missiles appear to be up-to-date and accurate. The majority of the weapons described are accompanied by photographs. Each section contains full technical data, to include missile dimensions, characteristics, and capabilities.

Included are surface-to-surface, surface-to-air. air-to-air, and air-to-surface missiles which range in size from those fired by an individual soldier to massive intercontinental ballistic missiles. Systems are listed in pure alphabetical order either by nickname (Pershing) or alpha-numeric designation (RB04). A listing either by similar systems or by the nation owning the system would seem to have been more useful. Part of this dilemma is overcome by an index, but this still requires the reader/researcher to know more about the system being sought than simply that the system is a "surface-to-air weapon designed by the French." —Ed.

ARTILLERY OF THE WORLD, by Christopher F. Foss, Charles Scribner's Sons, New York, 1976, 202 pages, $7.95.

This is a revision of the 1974 edition by the military materiel expert, Christopher Foss. The artillery arena is changing so significantly and rapidly that such revisions are essential.

The title is something of a misnomer from the parochial view of field artillerymen, in that the book includes data on air defense artillery and direct fire weapons such as recoilless rifles. To round out the picture, mortars, radars, and fire control systems are also described.

This is a fairly technical work describing the systems of nations from Argentina to Yugoslavia. The East and West armies are studied, showing the clear dominance of the United States in the weapons development field.

The material is as up-to-date as any non-periodical can be, with data on the latest radars (such as the Q-37), fire control devices (such as TACFIRE with its digital entry devices), and laser designators.

The numerous photographs are of good quality, and those pictures of communist weapons are some of the very best available. Foss has included a thorough index, essential to such a reference work.

This book is highly recommended to all artillerymen, field or otherwise. —Ed.

THE COURT-MARTIAL OF GEORGE ARMSTRONG CUSTER, by Douglas C. Jones, Charles Scribner's Sons, New York. 1976, 291 pages, $8.95.

Although pure conjecture, the tale is so intriguing and interesting that no professional soldier or student of the military will be able to lay the book down once it has been started.

The characters are portrayed in an excellent manner, and the narrative could hardly be better. One gets a complete picture of the events surrounding the action at Little Bighorn.

Each character draws his own conclusions, and so must the reader, despite the verdict being reached by the court. Whatever one concludes about Colonel Custer. there will be at least a little compassion felt for him.

A military reader should find no fault with descriptions of army life, army men, and the court-martial. An excellent, intelligently written book.

LT (*Ret*) *Ralph R. Balestrieri served with the 58th Armored Field Artillery Battalion during WWII.*

PATTON: A STUDY IN COMMAND, by H. Essame, Charles Scribner's Sons, New York, 1974, 280 pages, $8.95 (paperback, $3.95).

MG (Ret) H. Essame, a prolific British author and broadcaster, has provided a unique and perceptive analysis of GEN George Patton's performance as a commander from his early cavalry days under Pershing up to his tragic death in Germany at the end of World War II. The unique contribution of this work is the author's British perspective and his evaluation of Patton in contrast to his colleagues, American and allied.

This work is neither a thorough biography of Patton nor a definitive work of military history. Instead, the author paints a broad-brush portrait of Patton's career, stopping along the way at critical points to describe him as a man, an actor, a decision-maker, and a leader. What comes through is a picture of a general who had a full grasp of the human element in war. General Essame describes the man behind the flamboyant facade. He shares Patton's belief that armies are useless without discipline and faith in leaders.

The chapters in the book are arranged according to the major campaigns and battles of Patton's career. Essame gives a concise but detailed description of the planning background of each battle, showing Patton's interaction with key figures and an analysis of his role. The actual battles are described only briefly except for examples of Patton's personal intervention. Essame obviously is an admirer of Patton's "touch of magic". To get at the key lessons, the reader has to plow through a tremendous number of names of personalities and places. Essame assumes that the reader has an encyclopedic knowledge of all French, British, and American brigade, regiment, division, and corps commanders and staff officers. Maps are essential to follow the discussion, but only a few sketchy maps are provided and they do not show many of the towns, villages, etc. mentioned in the text.

In spite of the effort it takes to get at the author's message, the reader is rewarded with an excellent overall view of Patton that perhaps could not have been provided by an American writer. This work provides little new for the dedicated Patton buff, and the average reader looking for an easy-to-read popular biography may become discouraged. It is recommended the book be read along with works such as Farago's *Patton, Ordeal and Triumph* and the *Patton Papers* or as a comparison with memoirs by Bradley and Eisenhower.

Major Carl C. Nelson, FA, is currently assigned to Readiness Group Stewart, Readiness Region I, Newburgh, NY.

ON WATCH: A MEMOIR, by Admiral Elmo R. Zumwalt Jr. (USN Ret). Quadrangle/The New York Times Book Co., New York, 1976, 568 pages, $12.50.

This is a book which should have a major impact on foreign policy issues of today! Every day we read of the dangers of detenté, the growing Soviet military threat, and of Henry Kissinger's belief that the US has passed the high point in its history like many other civilizations. Much of the controversy surrounding these facts has been raised by the book *On Watch: A Memoir,* by retired Admiral Zumwalt. As the author explains in the preface, he has departed from the reticence concerning his duties as Chief of Naval Operations (CNO) in writing this book. He has done this because he felt it was his duty to speak out against the policies of the Nixon administration and specifically those of Henry Kissinger as they affected the nation's decision makers.

The book is divided into four sections, the first of which serves as an introduction to the author. The second section is a discussion of the author's naval procurement programs and his problems in dealing with Admiral Rickover and Congress in attempting to implement these programs. Part three turns to the second half of the military equation and discusses Admiral Zumwalt's efforts to improve conditions for navy personnel and to implement the volunteer force concept. The concluding section is devoted to his duties and responsibilities as a member of the Joint Chiefs of Staff.

Section one begins with a touching and amusing war story from 1945 shortly after the Japanese surrender. Then Lieutenant Zumwalt was assigned as commander of a prize ship in the western Pacific and was directed to proceed up the Yangtze and Hwang Pu Rivers to Shanghai where he was to contact a small group of Americans. It was on this adventure that he met and married his wife. This section continues with a review of the highlights of his naval career and concludes with a detailed closeup of his "summons" to become CNO.

The second section of the book begins with a detailed comparison of the accelerating obsolescence of the US Navy, and the impressive growth and modernization of the Soviet Navy since World War II. Admiral Zumwalt recognizes the differing maritime roles of the two navies. He explains the nature of the conflict with the Rickover faction pertaining to the desirability of an all-nuclear navy versus his theory of balanced naval forces. He points out the critical decisions that must be made if we are to keep pace with the Soviets, describes his plan to accomplish this and concludes with a summary of how his program fared in the executive and legislative branches of government.

From the battles of naval materiel and its procurement, the author turns to a discussion of the manpower to operate that materiel. He provides excellent justification of his views on improving life for Navy personnel, as well as his concepts to improve recruiting and retention in the Navy in preparation for the volunteer force. It is in this section that the author provides he reasons behind his famous "Z-grams." Skeptical when I first heard about them, I must admit that the author makes an excellent case for their use. In the final section of the book, Zumwalt discusses his membership in the Joint Chiefs of Staff. Pointing out his initial respect and support of the Nixon administration, the author develops step-by-step his disenchantment with the administration. He explains the reasons for his disenchantment were Kissinger's fatalistic attitude toward Soviet power, Watergate and the administration's efforts to circumvent the democratic process.

Whether one agrees with the author or not, all must agree that this book involves major issues of national policy as well as significant questions of the constitutionality of the actions taken by the administration. Admiral Zumwalt points out numerous instances where Henry Kissinger either mislead or concealed from his elected colleagues facts they should have known. The author traces this type of action by Dr. Kissinger through the Vietnam peace negotiations, the 1973 Middle East War, the India-Pakistan War and the Strategic Arms Limitation Talks.

As a professional soldier reading this book, I was torn between the concepts of duty, honor and country versus the recognition that what happened to the Nixon administration was unprecedented in this country's history. Because of the uniqueness of this situation, the time may be right for a military man to speak out concerning the long-term impact these events had on the strength of this nation. If that is true, then Admiral Zumwalt chose the only way to do this and should be commended.

This book is a *must* for professional military personnel and should be highly recommended to all members of the public service and the nation at large. The judgment of the correctness of the author's actions in writing the book and his views expressed therein must remain with the reader and time.

MAJ(P) Peter T. Zielenski, FA, is serving in Headquarters, US Army Readiness Region V. Fort Sheridan, IL.

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