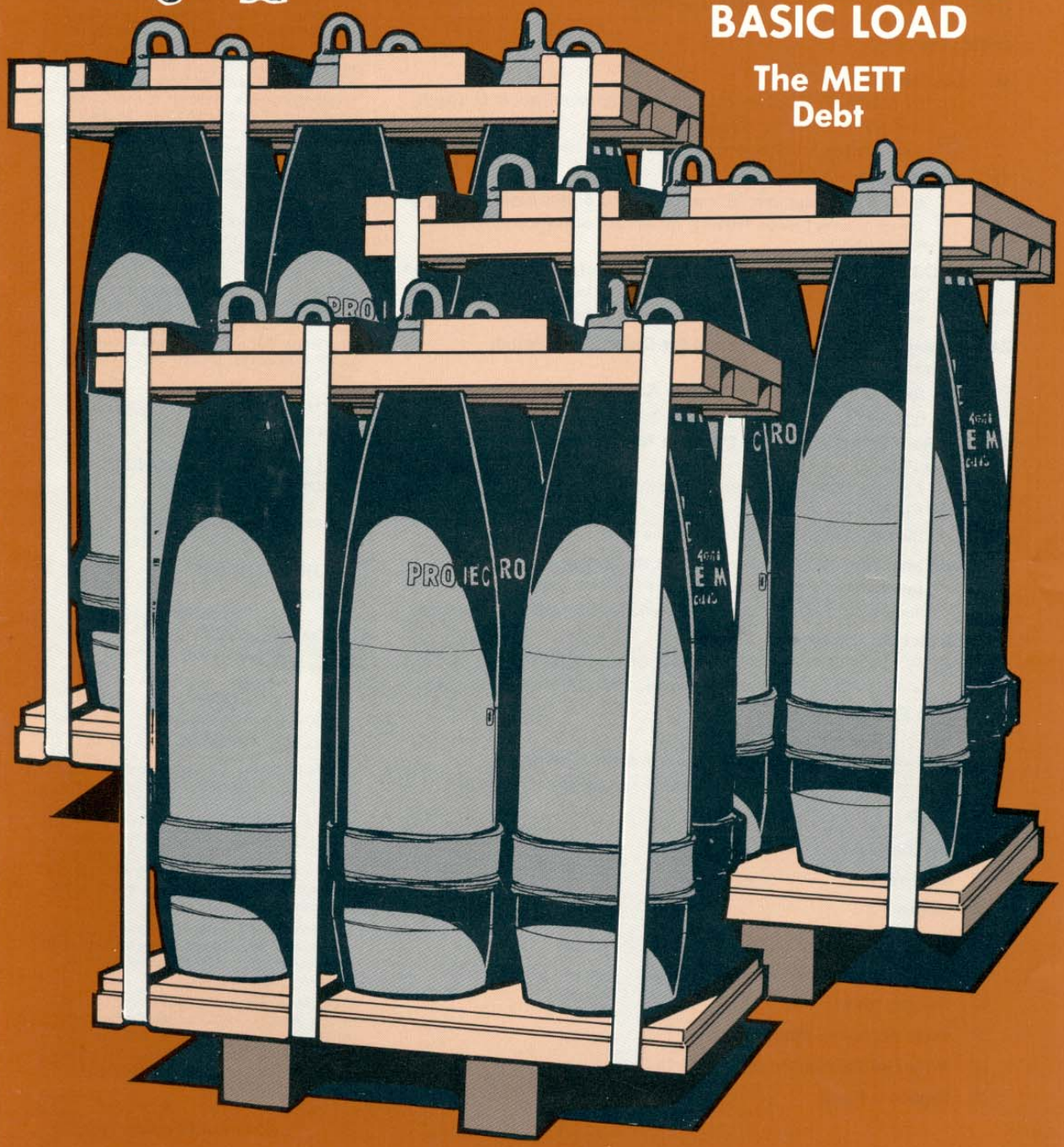
Field Artillery Journal

March-April 1983

AMMUNITION BASIC LOAD

The METT Debt



THE JOURNAL OF FIRE SUPPORT

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

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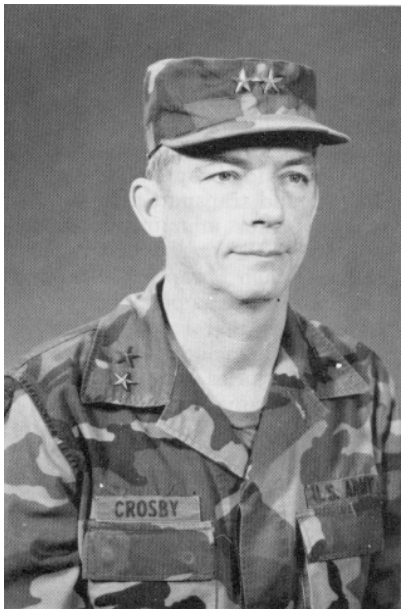
On the Move

MG JOHN S. CROSBY



Upgunning today's Field Artillery to meet the challenge of tomorrow's AirLand Battle involves not only an unprecedented modernization of hardware, but a complete overhaul of personnel requirements as well. Working hand-in-hand with the Army's Deputy Chief of Staff for Personnel (DCSPER), the Field Artillery Community is taking on that complex task in a systematic process known as a Functional Review. Put simply, this Review seeks to match the right number of soldiers — by grade, MOS, and skill level — with the new equipment coming on line. A conference in mid-November provided the DA DCSPER an update on the status of our Review, and I would like to tell you something about what was accomplished.

First of all, the conference proved to be an extremely open, no-holds-barred forum. We were aided with research prepared by MILPERCEN, the Soldier Support Center-National Capitai Region, and the Field Artillery School. In addition to various representatives from the Army staff, virtually every major command was in attendance. The discussions that took place either resulted in on-the-spot decisions or revealed the need for further research and coordination. Here are some of the key topics included in the review:

- The balancing of unit activations (like the Multiple Launch Rocket System — MLRS) with unit deactivations.
- The internal redistribution of Field Artillery soldiers and spaces to meet current and projected manning requirements.
- The serious shortage in our five top noncommissioned officer grades.
- The skill levels 1 and 2 training program for NCOs reclassified into Field Artillery MOSs.
- The professional development of our female officers, who face limited battery-level assignment opportunities.
- The restructuring of career management field 13 to permit the maximum degree of upward career progression.

Inasmuch as so many of our personnel issues seem to revolve around new weapons and equipment, I would like to highlight some of the specific problems we discussed.

MLRS

The Multiple Launch Rocket System is being fielded right now—in fact, the first battery has completed both its training at Fort Sill and its operational testing at White Sands and is now preparing to join the 1st Infantry Division (Mechanized) at Fort Riley. MLRS represents a significant addition to the existing force structure. Each MLRS battery requires six officers, 31 NCOs, and approximately 39 skill level 1 crewmen. The recruitment of the crewmen and the selection and training of the officers have been no problem. Finding the necessary NCOs to be both supervisors and trainers has been another story. In order to field MLRS on schedule, we have had to pull MOS 15D NCOs away from Lance—a choice based on certain similarities in the two systems. We hope to reverse the drain on this MOS through a program that encourages NCOs in overstrength MOSs to reclassify into 15D, receive resident training at Fort Sill, and go on an immediate utilization tour in their new MOS. The DCSPER and MILPERCEN are working closely with us to get this program going.

Pershing II

Based on input from the 56th Field Artillery Brigade, we have submitted to DA a draft table of organization and equipment (TOE) which is in line with DA's space limitations. When this TOE is approved, it will permit the appropriate major commands to develop and submit their modified TOEs. In the meantime, the Field Artillery School is working out the required structure of the Pershing II firing platoon and revalidating the training requirements necessary to support the fielding of this important system.

TACFIRE

The fielding of TACFIRE and the related issue of computer maintenance are under study by the Army staff, TRADOC, various Reserve Component agencies, and the Field Artillery School. The initial procurement of TACFIRE sets does not adequately support the training base and the Active Component. There just are not enough sets to go around, which is one reason why we have no 13C TACFIRE Operations Specialist Basic Noncommissioned Officer Course. So, while DA explores the possibility of an additional TACFIRE purchase, the Field Artillery School is insuring that the 13E cannon fire direction specialists in units receiving TACFIRE are being reclassified as 13Cs.

Next, the Reserve Component roundout battalion for the 24th Infantry Division Artillery will receive TACFIRE and may need to meet the heavy increase in required weekly training by increasing its full-time manning. Additionally, this roundout battalion will need to arrange for TACFIRE repair by the MOS 34Y computer repairman of the Active Component divisional maintenance battalion. We may need to develop a retention package with a very attractive reenlistment bonus in order to provide these chronically understrength 34Ys a greater incentive for remaining in the Army.

RPV

As I mentioned in my last column, the early fielding of our remotely piloted vehicle (RPV), the Aquila, is a must; but to get that RPV platoon into the field by early FY 1984 is going to require some extraordinary personnel management. Our draft plans for doing that are at DA now, awaiting final staffing and approval.

These and the other personnel issues probed by the Field Artillery Functional Review involve all of us in one way or another. The *Field Artillery Journal* will keep you informed of our progress as we hear from the Department of the Army in monthly updates and quarterly in-process reviews. We will also alert you to any new issues which develop as a result of the Functional Review process. Remember that your suggestions to the Field Artillery Proponency Office and your continued support of our entire modernization effort are vital ingredients in its ultimate success. Activities like the Functional Review may provide us game plans for our progress, but it is you in the field who will make it happen.

Incoming

LETTERS TO THE EDITOR

Speak Out
The *Journal* welcomes and encourages letters from our readers. Of particular interest are opinions, ideas, and innovations pertinent to the betterment of the Field Artillery and the total force. Also welcomed are thoughts on how to improve the magazine.—*Ed*.

Casualty care and evacuation

Within a modern battlefield environment, the evacuation of casualties from a direct support battery to the battalion aid station and then to the division clearing station will present the field artillery commanders with some serious support problems—problems which will grow even worse if the enemy engages in NBC warfare.

Investigative research suggests that current evacuation assets are insufficient to handle the projected patient load of 25 percent casualty rate during peak periods. As such, conceptual and minor changes to the table of organization and equipment (TOE) for the field artillery battery must be implemented to increase the overall effectiveness of casualty treatment and evacuation.

Personnel

Currently, there is only one medical aidman (E4, MOS 91B20) attached per battery; and under Division '86 there appears to be little improvement (only two medics for the two 4-gun platoons). Additionally, there is an absence of any realistic evaluation of these vital tasks during Army Training and Evaluation Programs (ARTEPs) and field training exercises (FTXs). After SQT Level 2, there is no requirement for advanced first-aid training. One wonders how one or two medics can care for the large number of injuries expected during peak battle periods.

Vehicles

Aside from the inadequate medical staffing, there are not enough medical evacuation vehicles to handle the expected high casualty load. Both now and in Division '86 there are only two medical ambulances (capable of carrying a total of eight litters) organic to the field artillery battalion. Since no other assets within the battalion are assigned a secondary mission of casualty evacuation, field artillerymen should recognize a real problem here.

The responsibility for evacuation, according to FM 8-35, clearly belongs to the Medical Service Corps (MSC); yet it does not have the assets to handle the anticipated number of casualties. Studies imply that air assets will accomplish 20 percent of all evacuations within the division, but there are only six aeromedical helicopters per division. Thus, these six helicopters would have to evacuate 179 patients within 24 hours to handle 20 percent of the casualties within the division artillery alone; and it is clear that the theory of MSC responsibility cannot work. Ground ambulances at the division clearing station will provide only a minimal amount of support since there are only five to seven 5/4-ton ambulances at each brigade.

There is another problem in the medical aidbag, which is inadequately equipped to permit the care of the multiple fragmentation wounds which enemy counterfire will cause. Individual aid packets can handle only one injury and so are equally unsuitable for the needs of multiple fragmentation wounds.

Recommendations

The problem of insufficient medically trained personnel at battery level could be alleviated by the qualification of at least one noncommissioned officer per section in emergency medical technician (EMT) skills which emphasize triage, emergency first aid, and proper methods of transporting casualties. Assigned an additional skill identifier (ASI), the EMT-qualified NCO would possess the requisite skills to assume the duties of the battery aidman in emergencies and could be evaluated on ARTEPs and FTXs in much the same manner as the NBC teams are evaluated.

The problem of having only two ambulances per battalion could be alleviated by assigning secondary missions to assets organic to the service and firing batteries—for example, to the ammunition platoon/section vehicles. When ammunition is delivered, the empty vehicles could transport casualties to the battalion aid station. For more efficient operations, the battalion aid station should be located within the service battery positions where they would be centralized since the S1 and S4 are personnel-related functions. Additionally, there should be a modification to unit TOEs that authorizes litters for such casualty evacuation. Since weather conditions could ground helicopters for days at a time, ground transportation will be a necessity; thus ammunition vehicles equipped with litters will have to be used in their proposed secondary mission as much as possible.

The individual soldier's first aid packet should include material to treat multiple injuries since the single dressing contained in the individual aid packet will not suffice to treat multiple fragmentation wounds.

Summary

Field artillery commanders must come to grips with the care and evacuation of casualties. Changes must occur if we are to effectively preserve the lives of US Field Artillery fighting men.

Fred Biel,
David Dehnel, and
Kenneth Gerhart,
CPTs, FA
Fort Sill, OK

In response to the observations voiced in your letter, a representative of the Academy of Health Sciences provided the following comments:

- *When the 3x8 concept evolved from the Legal Mix V study, the Academy of Health Sciences made the determination that two battery aidmen should be assigned to each firing battery (one for each of the two firing platoons) based upon a constraint imposed by Headquarters, Department of the Army. The doctrinal concept stresses the utilization of the "buddy aid" system which would allow the battery aidman to care for the more seriously wounded.*
- *The Heavy Division '86 study justified the requirement for two ground ambulances in each self-propelled howitzer battalion, which is an increase from the assignment of one ambulance in current organizations. Empirical data obtained from related studies indicated that additional casualty evacuation capabilities are required, and so there is now a proposed recommendation for*

four ground ambulances at battalion level at Headquarters, Department of the Army. In any event, a commander always has the perogative of diverting any vehicle under his control to a casualty transport role if the situation so warrants.

- *Normally, aeromedical aircraft would not operate forward of the battalion aid station to recover the seriously wounded. Habitually, the battalion aid station will treat casualties who can be returned to duty within 96 hours. More seriously wounded will be evacuated either directly from forward locations by ground transportation or from the battalion aid station by air/ground transportation.*
- *Each battalion-size aid station is authorized a medical equipment set which includes 24 litters as component items, and historical data indicates that this number is sufficient for the treatment of casualties requiring the use of a litter at any one time. In any case, litters are not a TOE item and cannot be added to the equipment section of the TOE; but any unit can add litters to their respective MTOE through appropriate Tables of Distribution and Allowances (TDA) as authorization criteria.*
- *The Academy of Health Sciences has recognized the need to add an emergency medical technician (EMT) NCO in each battlion aid station, and a recommendation to that effect is currently at HQDA for consideration and approval. The training of a firing battery NCO as an additional duty EMT is not under consideration since there are no NCOs at firing battery level who can be utilized in a secondary skill of EMT without jeopardizing the primary mission of the battery to fire the weapon system involved.*
- *Also under consideration is the recommendation to pre-position a case containing 24 field bandages in one vehicle of each howitzer section to augment the individual first aid packet when multiple wounds are encountered. Resupply of these field bandages would be centralized for easy access.*

You can obtain additional information on medical care and evacuation by contacting the Organization Branch of the Academy of Health Sciences, Fort Sam Houston, Texas.—Ed.

TOE changes needed?

I have served 12 years in the Infantry, one year in the Armor, and four years in the Field Artillery; currently, I am the first sergeant of a headquarters and headquarters battery (TOE 6-366H). I would like to recommend changes to the TOE in two major areas — equipment allocations and the general structure of the headquarters and headquarters battery (HHB). (I do not have access to the proposed organization under Division '86 concepts, and I realize that modifications are continuing.)

- *Equipment* (specifically vehicles authorized for the battalion staff)—The battalion commander and S1 are each authorized a vehicle, but no other staff officer has a vehicle (not even the battalion executive officer). It may be sound practice in a combat environment to have the XO, S2, and S3 tied to the battalion command post; but it is totally unworkable in any training environment. So what happens? Vehicles and people are "borrowed" from other sections; then these sections are prevented from getting the proper training.
- *General organization of the headquarters and headquarters battery* (perhaps I should say "disorganization," for the TOE looks like a hodge-podge of small sections each seemingly independent of each other) — I feel that all staff support troops should be in one section, as is the case in Armor and Infantry organizations.

Also, the general layout of the TOE document itself is confusing. The MTOE with which we presently work just lumps people in line items by MOS and rank within a section. While this grouping may present a valid summary of the MOSs/ranks, it is not adequate in helping our people organize their sections. Most junior leaders—officers and NCOs—do not understand these documents; some of the senior leaders do not even understand them.

When I first entered the Army, the best teaching document available was the TOE; for it told me whom and what I should have and how they should be used. The new documents tend to confuse rather than instruct.

Abraham H. Sternberg
1SG, FA
Katy, TX

The force structure personnel in the Directorate of Combat Developments at the Field Artillery School have some answers for you. In 1970, a Wheel Vehicle Study was directed by the Department of the Army; and the participants concluded that there were too many wheeled vehicles in the organizational requirements documents. Therefore, various vehicles were cut from TOE sections, to include all vehicles for executive officers. The Division '86 TOE, however, will reinstate the wheeled vehicles to enhance the mission capabilities of artillery units (not for the purpose of personnel convenience). The TRADOC Supplement to AR 310-31 states that staff officers will be placed in the same paragraph as their equipment and their area of operation. However, the supplement also states that the primary coordinating staff officers (S1, S2, S3, and S4) will be placed in the same paragraph as the commander, and that their equipment will appear in the paragraph which portrays their functional area (i.e., administration center, operations center, etc.). In any event, though the TOE indicates operational requirements, it does not preclude unit commanders from using requirement assets for other than the intended purpose.

Your question on the layout of the TOE requires a preliminary clarification. There is a difference between a table of organization and equipment and a modified table of organization and equipment (MTOE). The TOE is a requirements document written for a type of unit to operate in a worldwide combat environment. For example, there is only one TOE for a divisional 155-mm self-propelled howitzer battalion. However, there are variations of that TOE to accommodate the fire support team (FIST) alignment with the maneuver elements. The MTOE is an authorization document based on the TOE, but the personnel and equipment authorizations are for a specific type unit based on its geographical location, mission, and operational requirements. Two 155-mm self-propelled howitzer battalions in the same division artillery might have different operational requirements which dictate two different MTOEs.

In the proposed Division '86 TOEs, the support personnel are grouped into functional paragraphs along with their equipment. The MTOEs, however, are prepared at the major Army commands under a different set of rules, which may account for the consolidating of personnel into line items. The format of listing personnel numerically by MOS and rank is common to both the TOE and MTOE. Recognizing that an inexperienced leader may have some difficulty in deciding who belongs to whom when he confronts a headquarters support section paragraph which includes mess and supply personnel and a chaplain, the authors of the Division '86 TOEs are writing more clearly to define exactly the number of personnel per section. — Ed.

Managing muzzle velocities

The battery fire direction center (FDC) is one of the busiest places in the field artillery. The FDC is responsible for the rapid computation of firing data to insure accurate fire for effect data on a target, and the management of muzzle velocities is one of the tasks inherent in that mission. With assistance from the Gunnery Department and the Research and Analysis Branch of the Field Artillery School, we have developed a quicker, more efficient way to accomplish that task.

In the past, management of muzzle velocities required a calibration exercise to derive muzzle velocities (for each gun) for each individual charge and lot — a system far too costly in the ammunition and time necessary to obtain subsequent lot muzzle velocities. Our system requires the calibration of each gun for the first lot of powder for all charges within the same propellant group(i.e., green bag or white bag); but only one gun is calibrated for a subsequent lot for all charges within the same propellant group. The subsequent lot muzzle velocities of the remaining guns are determined by adding the muzzle velocity difference — the difference between the selected gun's calibrated first and subsequent lot muzzle velocities—to the calibrated first lot muzzle velocity variations for each gun. The resulting muzzle velocity variations are added to the standard muzzle velocity for the calibrated charge to yield the subsequent lot muzzle velocities for the remaining guns. With this system, minimal amounts of time and ammunition are expended in deriving multi-lot muzzle velocities for different charges.

To further promote this improved system, we developed a model muzzle velocity record which can contain data for two lots of powder for each charge for whichever propellant group is to be calibrated. As an example, we chose white bag powder, model M4A2, and selected the M109A1 weapon system for calibration (figure 1). Column (a) contains the standard muzzle velocities for all the charges within this particular propellant group. The following procedures allow the rapid determination of muzzle velocity variations after first lot calibration:

- Enter the average MV readout for each weapon in column (b).
- Enter the MV correction factor for non-standard conditions in column (c).
- Add columns (b) and (c) together and enter the results — the first lot calibrated MV for each weapon — in column (d).
- Compare the values in column (a) to the values in column (d), and the difference—the first lot MVV for each weapon—is entered in column (e).
- With the M90 chronograph (velocimeter), one gun will calibrate for subsequent lots of powder. Enter the second lot calibrated MV in column (f).

The difference between the value in column (f) and the value in column (d) is the MV difference for each weapon—a constant value. Enter this value in column (g).

- Add the values in column (h) to the values in column (a) to determine the second lot MVs for each weapon. Enter these values in column (i).
- Enter the comparative VEs of each weapon for the first and second lots in columns (j) and (k) respectively.

This model record or form will greatly facilitate the management of muzzle velocities at battery level and the positioning of the guns based on the comparative VEs. It also provides a useful tool for the battery FDC in meeting its responsibility to rapidly determine accurate fire for effect data on targets at all times.

Robert B. Miller and
Randy Nielson
CPTs, FA
Fort Sill, OK

The Gunnery Department reports that the revised FM 6-40, which has a target publication time of 4th quarter, FY83, will contain an even simpler, more cost effective muzzle velocity management scheme which combines your efforts with the work of others on the same subject.—Ed.

WEAPON MODEL _____ **MUZZLE VELOCITY RECORD** LOT 1 _____
POWDER MODEL _____ LOT 2 _____

GUN	CHG	(a) STD MV	(b) AVG MV READOUT	(c) MV CORR FAC	(d) 1ST LOT CAL MV	(e) 1ST LOT MVV	(f) 2d LOT CAL MV	(g) 2d LOT MV DIFF	(h) MVV	(i) 2d LOT MV	(j) 1ST LOT COMP VE	(k) 2d LOT COMP VE
1 TUBE SN	3	292.6										
	4	336.8										
	5	393.2										
	6	475.5										
	7	565.4										
2 TUBE SN	3	292.6										
	4	336.8										
	5	393.2										
	6	475.5										
	7	565.4										
3 TUBE SN	3	292.6										
	4	336.8										
	5	393.2										
	6	475.5										
	7	565.4										
4 TUBE SN	3	292.6										
	4	336.8										
	5	393.2										
	6	475.5										
	7	565.4										
5 TUBE SN	3	292.6										
	4	336.8										
	5	393.2										
	6	475.5										
	7	565.4										
6 TUBE SN	3	292.6										
	4	336.8										
	5	393.2										
	6	475.5										
	7	565.4										

Figure 1. Muzzle velocity record.

Service PLL

The fundamental action in every maintenance cycle is the scheduled service. No amount of daily, weekly, or monthly Preventive Maintenance Checks and Services (PMCS) will make up for an improperly performed service. Every single service, from the initial receipt service until the turn-in of the equipment, must be properly completed, and completed quickly and efficiently. The Army has not done as well as it should in the past with the documentation and organization for servicing vehicles, and each motor pool needs a better system. A Battery, 2-15 Field Artillery has developed a service book for each piece of equipment that meets the need.

The service book for each piece of equipment consists of a three-ring binder, labeled on the outside with the equipment nomenclature. It contains a service PLL listing, a copied extract of the portion of the -20 manual that explains in detail how to proceed through the service, and the appropriate Lubrication Order. These three documents should be consolidated and published by DA as the service book, or as an annex to the -10 manual.

The service PLL listing is simply a list of the replacement parts required for each of the three type services: quarterly, semi-annual, and annual. The service books are kept in the motor

pool shop office and are issued to the section chief early in the service program. The service PLL listing was developed by following the instructions in the -20 and Lubrication Order and looking up the parts in the -20P manual. This consolidated listing is an invaluable aid which saves people involved in the service quite a bit of time.

The conduct of the service begins with the arrival at the motor pool of the vehicle, the chief of section, and the operator. The motor sergeant assigns one or more mechanics to the service and directs that the vehicle get a technical inspection (TI). This TI reveals all operator and organizational level faults on the vehicle. A DA Form 2404 listing the results of the inspection is placed on a clipboard which is kept in the vicinity of the vehicle at all times for use by supervisors who wish to monitor the progress of the work. As deficiencies are repaired by either the mechanic or the operator, the 2404 is annotated to show the correction.

After the initial TI, the motor sergeant and chief of section take the service book to the service PLL storage area. They remove from storage the box containing the replacement parts and check them against the service PLL listing in the service book. Every box also contains a plastic trash bag which is used to keep worn parts as they are removed. If any of the parts are not present, the service is postponed until the part(s) can be procured. A vehicle in service awaiting parts is one of the problems this system alleviates. However, if all parts in the listing are present, the chief will take them to the site of the service.

Now the chief supervises the mechanic and operator as they perform the steps of the service as described in the -20 extract in the service book. They go from step to step, in order, lubing the proper points and replacing parts as required. No worn parts are thrown away during the conduct of the service, but instead are placed in the plastic bag provided. When all these -20 steps are complete, the operator corrects the deficiencies listed on the DA Form 2404. The service is almost complete, but there must be a quality control check by the Battalion Maintenance Technician (BMT), who will look at the vehicle and determine if proper procedures have been followed. He will also inspect the trash bag of used parts, thereby insuring that replacement parts have been installed. His quality control check solves the problem of lazy soldiers who do not replace hard-to-reach parts, and throw the new ones in the dumpster and contend that they installed them. When the BMT is convinced that a proper service has been conducted, he notifies the battery that the vehicle may be officially removed from service. Now the used parts are discarded, and the vehicle is returned to duty. The service book returns to the custody of the motor sergeant.

The only remaining action is the resupply of the service PLL box, which is easily accomplished because the PLL clerk also has a copy of the service PLL listing and initiates the order for the parts required for the next service. The next service will not usually contain the same parts due to the progression from Quarterly to Semi-annual or Annual Services.

The storage of the service PLL in cardboard boxes with a 3 by 5 card stuck on the front speeds the identification and helps parts control. The cards are marked in bold letters with the vehicle bumper number, the type service next due, and the date the service is due. The service PLL is kept separate from the regular PLL. The authorization is for each vehicle to have on hand all the parts required for replacement at the next scheduled service, but stockage for more than one service in the future is not permissable.

These steps are logical and insure total compliance with the technical manuals. The system is simple to understand, easy to use, and not difficult to supervise. A little work at each unit will easily develop service PLL lists which apply to particular situations, produce the service books, and implement the system. I believe the A Battery, 2-15 Field Artillery, solution is applicable throughout the Army.

Timothy J. Heidenreich
CPT, FA
A Battery, 2d Battalion,
5th Field Artillery
APO New York

Order of battle officer

I wish to comment on the November-December 1982 *FA Journal* article "The Order of Battle Officer" by Major Daniel A. Jurchenko and Captain Scott R. Gourley.

I appreciated reading the article and felt empathy with the sentiments expressed. I am a Reserve Components Military Intelligence officer whose first duty assignment was as an order of battle (OB) officer at the separate brigade level. I have since transferred to an 8-inch field artillery battalion where I serve as the battalion S2 and am increasing my knowledge of the field artillery by pursuing the Field Artillery Officers Advanced Course.

The authors hit the idea right on the mark with their comments on the strengths and weaknesses of the OB officer. It was my experience that the OB officer is very much misunderstood or underused in most field artillery units through no fault of the officer or the unit. On the one hand, intelligence is often misunderstood by many officers and NCOs who have vast field artillery experience. On the other hand, the newly assigned Military Intelligence lieutenant has scant knowledge of the field artillery and of what is expected of him within the targeting element. He often has to rely on the intelligence NCO, who is normally a 13 B/E with little formal intelligence training, and on the school trained 96B intelligence analyst, who while superb at intelligence is often at a loss in understanding the field artillery. It all amounts to a difficult situation at best.

The article addresses one point that I feel is crucial—there ought to be a short field artillery orientation course presented at Fort Sill to the newly assigned OB officer (if he is not FA qualified). This course would help a new OB officer sort out much of the initial confusion and relieve the field artillery tactical operations center (TOC) personnel of babysitting him while he learns. The program of instruction would have to lean heavily on the role of the field artillery, fire planning, documentation, and the threat as it applies to the field artillery.

Another important matter is the need to really exercise the OB element during annual training or command post exercises. The interface between the corps All Source Intelligence Center, the division artillery TOC, and the separate brigade TOC is crucial here. No OB officer can accurately inform his commander about enemy intent when his last intelligence summary or other intelligence report is dated three days previous to the beginning of the exercise.

Finally, the OB officer or battalion S2 can take matters into his own hands and develop some kind of mutual assistance program between his field artillery counterparts and the intelligence section, perhaps by starting an intelligence library or by using the RED THRUST OPFOR program.

Thanks for a fine article and also for a magazine that keeps the field well informed.

Richard P. Ugino
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Reunions

189th Field Artillery Regiment (1940-45)—29-30 April in Oklahoma City, Oklahoma. Contact Neal Dodds, 2405 S.E. 5th Street, Edmond, Oklahoma 73034.

538th and 3d Battalions, 28th Field Artillery — 14 August in Colorado Springs, Colorado. Contact Master Sergeant (Ret) Robert G. Davis, 1322 Dublin Blvd, Colorado Springs, Colorado 80907.

Tactical damage assessment

Tactical damage assessment (TDA) is one of the most important expressions in the field artillery vocabulary, but it is also one of the least understood. This term needs to be clarified since lack of knowledge can cause individuals to overlook valuable targeting and order of battle (OB) information. The expression is not included in JCS Pub 1, the Department of Defense *Dictionary of Military and Associated Terms*. Thus, some individuals mistakenly feel that TDA is related to bomb damage assessment (the determination of the effect of all air attacks on targets; e.g., bombs, rockets, or strafe). "Damage assessment" is simply defined as "the determination of the effect of attacks on targets," and reference manuals provide little amplification to that vague definition. The field artillery needs to clarify the what, when, who, and how of damage assessment.

What is TDA?

Tactical damage assessment is listed in the glossary of ARTEP 6-300, *Corps Field Artillery Section, Division Artillery, and Field Artillery Brigade,* but closer examination reveals that mission 3-III-6 (Provide Targeting and Intelligence Information) requires the targeting element within the division artillery tactical operations center (TOC) to request TDA. Three of the four references listed below help clarify the "what" of TDA.

Actually, FM 6-121, *Target Acquisition,* contains the only reference to damage assessment:

Tactical damage assessment allows the targeting element to judge the effectiveness of the fire support system and the accuracy of the target location system. Damage assessment can greatly assist in the purging of data no longer valid from existing maps and files. It can also lead to better methods of target engagement and can provide data that may produce additional targets.

The next two references, FM 6-17C1/2 and FM 6-17C3/4, are Soldier's Manuals which contain the task of "maintaining the target card file" and explain that TDA is:

- Requested by the targeting element.
- Best if it is received from the original source of the target.
- Used to purge target data through the identification of recently engaged targets no longer present.
- Used to gauge target accuracy.

It appears that the Soldier's Manuals are the basis for the training standards in ARTEP 6-300 which require TDA to determine:

- If the target was accurately located.
- If timely and accurate fires were delivered.
- What effects were achieved.
- Revised order of battle data.

Apparently the TDA requirements in both the ARTEP and Soldier's Manuals are based on the single vague paragraph in FM 6-121, where the two key words seem to be "effectiveness" and "accuracy." This lack of a standardized TDA format allows the TOC to tailor each request for information, and this luxury may not be possible or even desirable during a high-intensity combat situation.

When is TDA reported?

The implication of the scanty reference material is that TDA will be requested and received after every mission. Whether or not this is a realistic expectation remains open to debate.

Who requests/reports TDA?

The final reference listed in ARTEP 6-300 is FM 6-20-1, *Field Artillery Cannon Battalion,* which states simply that the target production section and the order of battle section are responsible for requesting TDA within the division artillery TOC. Since both of these sections are within the targeting element, this guidance does not contradict the information found in the Soldier's Manual. The best source for reporting TDA is currently the source that acquired and reported the target.

How is TDA requested?

Tactical damage assessment is currently requested over three radio nets. The target production section requests it over the target acquisition battery (TAB) command/intelligence (C/I) net, and the order of battle section requests it over the division intelligence net, or the division artillery command intelligence net. Here is where one of the glaring shortcomings of the flexible TDA format comes to light; i.e., while the ARTEP evaluates the requested OB data, the target production section might not request the proper information over the TAB C/I net. A standardized, widely disseminated format for OB data would eliminate this problem.

Future developments

With the arrival of the Remotely Piloted Vehicle (RPV) in the near future, it will no longer be true that the best source for TDA will be the source that originally provided the target. While a FIST chief would have little difficulty reporting the effects of observed fire, damage to a target acquired through sound ranging would be much more difficult to assess. While unit SOPs can take care of some of the TDA problems, arrival of the RPV and other equipment such as TACFIRE will require a standardized solution to target damage assessment procedures.

Conclusion

There is a need for discussion within the Field Artillery Community — the combination of comments from the School departments with experiences in the field will expand the information currently available in the reference manuals. Through further definition of tactical damage assessment, the field artillery can facilitate the flow of priceless information within the division artillery TOC.

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Sunnyvale, CA

Correction

The *Journal* staff regrets these errors which appeared in Captain James R. Clark's article entitled "The Targeting Element" (November-December 1982 *FA Journal*): on page 7, "electronic accounting machine" should read "*emergency action message*" and "the TAB commander and S2 devised" should read "*various members of the TAB and the S2 devised*"; on page 9, "requesting TDA equipment" should read "*requesting target damage assessment*"; the date-time groups in figure 6, picture 9, should be *261633Z* for the target indicator and *261730Z* for the target; the author's biography should read "*is attending Airborne School*"; finally, the author notes that the idea of a completely integrated targeting element arose in January 1980 during a 3d Armored Division command post exercise (CPX) and that the targeting element was fielded in September 1981 during the V Corps CPX Certain Encounter.

FIST problems

Finally someone has hit the nail on the head in regard to the major problems concerning the FIST concept. MAJ Karl R. Ingram's letter to the Editor in the September-October 1982 *Field Artillery Journal* addresses this problem admirably.

Stated succinctly, the job of fire support coordination, on both the company and battalion levels, is not taken seriously enough by higher level commanders. In the combined arms system, the job of fire support coordinator is the most valuable and, in many ways, the most important link between the indirect fire system and the maneuver system it supports.

In order for the maneuver commander to get the most effect out of the indirect fire system supporting him, he must have a fire support coordinator (FSCOORD) who is intimately familiar with this system; and this familiarity can only come from experience. A green second lieutenant fresh out of FAOBC is just not experienced enough to provide the advice that the maneuver commander so desperately needs on the battlefield. Higher level commanders need to realize this fact and start making the FIST (and also FSO) jobs priority slots, rather than the "dumping," "holding," or "training" grounds they currently are.

Putting a green lieutenant in a FIST slot is like putting the cart before the horse. He is expected to be knowledgeable in regards to indirect fire, but can only become truly knowledgeable after he has FDO and XO experience. With a proper approach, the FIST system *can* and *will* work.

Ruben B. Ortiz and
Michael A. Casey
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HWB, 1-11th ACR
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Signal fires

Since the beginning of time, wherever there were armies or large bodies of people moving from place to place, there has been a need for day and night signs or signals to guide upon. One of the earliest recorded uses of signals for day and night movement is in the Bible; in the book of Exodus, Moses led the people of Israel out of Egypt following a cloud during the day and a light at night.

Within the army system, there are many munition and pyrotechnic items available which can be used for signaling, ranging from smoke grenades and hand-held flares to artillery munitions. The problem is, however, that these items are not being used or are being used improperly. Each type of munition or pyrotechnic has a specific purpose and, when utilized properly, will provide good results.

A battalion task force in the deliberate attack with three companies abreast offers a prime example of the opportunities which signal fires present. Using artillery support, the task force commander can keep his units oriented on the proper portion of the objective by placing a colored smoke round on each company team objective. This signal would help prevent the intermingling of attacking forces through the teams' orientation on their assigned color smoke—a plus for command and control.

This same procedure would work at night if colored artillery illumination munitions were available. In a supported night attack, once the battalion is at the probable line of deployment, the artillery support would begin; as the task force begins its final assault, properly placed colored illumination would guide the force onto its portion of the objective.

Hand smoke grenades and flares with colored smoke and illumination have been used in scenarios at small unit level, but maneuver commanders have not planned for artillery-delivered signal fires in larger unit operations where hand-delivered items cannot be utilized.

The existing artillery munitions must be used in training, and new colored illumination must be developed. Along with the munitions, standing operating procedures (SOPs) for the use of these items should appear in the training program. The Communication-Electronic Operating Instructions (CEOI) booklet has a helpful section on signals, but each unit must establish its own procedures. As an example, each maneuver unit in a battalion task force could be color-coded; i.e., Company A — red, Company B—green, and Company C—yellow. Then, during the action, the appropriate color of smoke would be used on the objective or as a guide in accordance with the color codes established in the SOP. In a large movement or attack at night those same colors would be used on a filtered flashlight on the rear of each vehicle to keep the unit together, and with the development of colored illumination the unit would have a signal to guide on.

These procedures are simple to use and when used properly can greatly assist the command and control of the unit, especially in an intense electronic warfare environment. Tactical units rely too heavily on electronic measures for command and control. In a mid-intensity battlefield situation the luxury of having a radio available for this use will be limited. Information, messages, and commands will have to be sent by other means. By developing a detailed operations order with explicit coordinating instructions and a detailed signal subparagraph, orders and instructions can be sent by signals during the day or night.

These points may seem to be reverting to the old Army of bugles and flags; but it is a capability that does work, and it should be integrated along with the other more technical means of communications. On the future battlefield we cannot expect to rely on only one means of communication for command and control. Keeping the procedures simple will help reduce the confusion of the battlefield (e.g., noise, action, dust, and smoke) which causes the units to become disoriented and even lost, especially at night.

Presently, there are a large amount of smoke munitions and pyrotechnics in the inventory; but there is a serious shortage of artillery illumination items. There is a need for a similar colored illumination munition for each colored smoke round, mainly for 105-mm and 155-mm artillery. These items would greatly improve the signaling capabilities of the maneuver force. Once the items are on hand, the unit must integrate the munitions into its training program and tactical operations.

The use of signals, both smoke and illumination, is a command and control technique that must not be forgotten or misused; but the unit commander must integrate their use into his SOP so that his commands get to those who will execute them—to win the battle.

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Operations Group NTC
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Your proposal was the signal for a great deal of discussion at the Field Artillery School, but the consensus is that the addition of non-lethal projectiles to the recent proliferation of ammunition components would be neither cost effective nor feasible.

The main mission of the field artillery is to support the maneuver commander with lethal *fire power. The marking of objectives by colored smoke could better be done with smoke flares and, where necessary, with the use of current base-ejection smoke or illumination rounds or the appropriate use of white phosphorus projectiles.*

Another significant restraint on a proliferation of projectiles is the

limited ammunition carrying capacity of current Table of Organization and Equipment (TOE) units to move their basic load. With existing equipment they cannot move their basic load in one movement (especially when limited to the rated capacity of each vehicle and/or trailer).

Futhermore, an artillery unit with the additional mission of providing signal fires would inevitably be more vulnerable to detection and counter-battery fires. Finally, there would need to be a division-wide coordination of signals that would further complicate the CEOI.—Ed.

Soviet markings

I thank Major Troyan for his comments in "More on Soviet markings" in the November-December 1982 *Journal's* "Incoming." Are there other methods to identify Soviet commanders besides antennas and turret markings? If I were a Soviet field commander and already had the turret numbers covered to prevent identification of my sub-unit commanders, I would have dummy antennas that could be attached to the turrets of all my tanks to present a uniform appearance to the enemy. How about the commander's position in a formation? Is the platoon leader always in the middle vehicle when a platoon is on line or the lead vehicle when in column? Is the lead vehicle or the sole vehicle behind a company on line always the commander? Where is he in a column? Though we do not have the sheer number of launchers necessary to attack all vehicles in every formation with precision munitions, we might be able to destroy a commander and slow the momentum of any attack. The bottom line is maximum effective use of limited precision munition assets in support of the ground-gaining arms. If we can select the most valuable targets for priority destruction, we can do the best job for the least cost.

Larry A. Altersitz
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S2, 1-107th FA
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The forward observer's (or gunner's) sighting of antennas to identify Soviet command vehicles would be difficult due to the probability of his vision being obscured by dust and smoke and due to the fact that the platoon leader's tank possesses the same number of antennas as the rest of the platoon. In addition, there is no known open-source information which would indicate the Soviet use of dummy antennas.

A leader's position in a formation may be a means of locating the commander's vehicle at some levels. However, utilizing the platoon leader's vehicle for locating the company commander's vehicle would prove to be a difficult task since (assuming the platoon leader is in the center vehicle of three) an observer would be unable to ascertain where one platoon ends and the next begins. Also, locating the company commander's vehicle behind the line of company vehicles relies on the assumption that there is an identifiable line moving at a relatively uniform rate of march.

The use of precision munitions to eliminate a commander's tank or armored fighting vehicle may not achieve the results you seek since in all probability a platoon would continue toward its initial objective even in the absence of the commander. A more effective alternative might be to use precision munitions to eliminate vehicles which are more difficult to replace, such as the various artillery command and reconnaissance vehicles (ACRVs), tactical air control vehicles, mine clearers, and air defense weapon carriers. In any event, you raise an issue which is worthy of further study.—Ed.

Hotline

QUESTIONS AND ANSWERS

Your "Redleg Hotline" is waiting around the clock to answer your questions or provide advice on problems. Call AUTOVON 639-4020 or commercial (405) 351-4020. Calls will be electronically recorded 24 hours a day and queries referred to the appropriate department for a quick response. Be sure to give name, rank, unit address, and telephone number.

Please do not use this system to order publications. Consult your FA Catalog of Instructional Material for this purpose.

Question: Is there a ballistic scale to go on a modified range deflection protractor for the M110A2 howitzer; if so, what is the procedure for ordering one?

Answer: *The nomenclature to order the ballistic scale to go on a modified range deflection protractor for the M110A2 howitzer is part number 11785265, NSN 1220-01-102-4202. The authority for requisitioning is CTA 50-970.*

Question: Is there a course scheduled to train personnel on the Position and Azimuth Determining System (PADS)?

Answer: *When the PADS is deployed to a unit, a New Equipment Training Team will accompany the equipment and give a 40-hour block of instruction.*

Question: Is there any TRADOC approved plan for setting up a Gama Goat as a battery operations center? Also, is a modification authorized to remote the AN/GRC-47 radio to the operator compartment of the Gama Goat?

Answer: *There is no TRADOC approved plan for a battery operations center; however, the Gunnery Department will propose a standardized fire direction center for the Gama Goat in the coordinating draft of FM 6-40 which was sent to 100 selected battalions or separate batteries in February this year. The AN/GRA-39 can be used to remote the radio to the operator compartment of the Gama Goat.*

Question: Can the CABL (consolidated activities at battalion level) concept be used for a nuclear ARTEP?

Answer: *Current ARTEPs do not specify use of the CABL concept; however, use of this concept or any other operational configuration is not limited by the ARTEP. As ARTEP analysis and review are based on current doctrine, FM 6-20-1 (chapter 5 and appendix I) provides a source of information on consolidated organization (e.g., maintenance, supply, etc.). In addition, chapter 2 of each ARTEP provides guidelines on how to conduct an ARTEP.*

Question: The current job books contain only military occupational specialty (MOS) tasks. Will the new job books contain common tasks as well?

Answer: *The new job books are in production now and will include both MOS and common tasks.*

Question: What is the reference for the dummy projectile, 8-inch, M845?

Answer: *The reference is TB 9-2350-30-4-10.*

Question: Does the Army have practice fuzes for training on vernier and linear fuze settings? If so, how can these fuzes be acquired by a unit in Germany?

Answer: *Training fuzes are available at some US Army training aids service centers (TASCs). If the fuzes are not available at overseas TASCs, units may request them through the US Army Training Support Center, ATTN: ATIC-LO, Fort Eustis, VA 23604, on DA Form 4103 or DD Form 1150. The nomenclature for ordering is listed on pages 7-41 and 7-42 of the Fort Sill Training Aids Service Center catalog as follows:*

Page 7-41:

1. Stock number: TD 6-5-17(a), (b), or (c).
2. Classification: Expendable-returnable.
3. Functional description and utilization: Molded uralite replica of (a) M564, (b) M565, or (c) VT M728. Settable time fuze. Aid facilitates fuze firing training.
4. Physical description: Molded uralite setting fuze.
5. Remarks: Request aid on DA Form 4103 or DD Form 1150.

Page 7-42:

1. Stock number: TD 6-5-18.
2. Classification: Nonexpendable.
3. Functional description and utilization: Aid is a 4' x 6' masonite replica of fuze, time MTSQ M564. Aid is white with fuze in black. Time is changeable by way of a sliding scale. Aid facilitates instruction in fuze components and firing time.
4. Physical description: Aid is 4' x 6' masonite mounted on stand.
5. Remarks: Request aid on DA Form 4103 or DD Form 1150.

Question: Can you clarify the conditions for firing priority targets and final protective fires?

Answer: *The ARTEP standards for execution of priority target tasks and final protective fires are based on fully manned, well-trained crews. If these conditions do not exist within a unit, the commander can modify the standards based upon his estimate of the state of training and the impact of understrength crews. (This provision is outlined in chapter 2 of each ARTEP.)*

Question: How do you determine the correct fuze setting for the M577 fuze?

Answer: *To determine the fuze setting for the M577 MTSQ fuze, use the fuze setting for the M565 fuze as shown in FT 155-AM-1 and correct it as shown in Change 9 to FT 155-AM-1.*

Question: How does one order gunnery high burst mean point of impact (MPI) overlays and also the adapter auxiliary power source for the TI-59 calculator?

Answer: *Keyboard overlays for the TI-59 are issued with each applicable module. If additional overlays are required, they must be fabricated through your local training aids service center.*

Auxiliary power adapters should be requisitioned through normal Army supply channels. Requisitions should be forwarded to: HQ ARRCOM, ATTN: DRSAR-MMH-L, Rock Island, Illinois 61299.

Item name	*NSN*	*COST*
Adapter, Connector	*PN11785357 (part No.)*	*$2.00*
Charger, Adapter, AC	*1220-01-082-1621*	*4.72*
Charger, Adapter, DC	*1220-01-082-1622*	*13.78*
Connector, Plug, Elec	*5935-01-082-1638*	*10.17*
Battery Set, Rechargeable	*1220-01-082-1629*	*9.53*

Question: What is the current cost of the M90 velocimeter chronograph to include the mounting bracket? Does the fielding plan include National Guard and Reserve units?

Answer: *The stock numbers for the M90 chronograph brackets are NSN 1290-01-088-2380 for the M101A1, NSN 1290-01-089-0377 for the M109 series, NSN 1290-01-091-1758 for the M110A2, and NSN 1290-01-091-1918 for the M114 series. The stock number for the M90 chronograph is NSN 1290-01-073-0764. The M90 chronograph costs $11,800.00, and a mounting bracket costs $101.00. Fielding of the M90, underway for approximately two years, now includes both the Active and Reserve Components.*

Question: My question concerns enemy counterbattery fire directed against our artillery. Does the Field Artillery School have a recommended policy on the amounts or duration of incoming fire which should cause a battery to displace automatically?

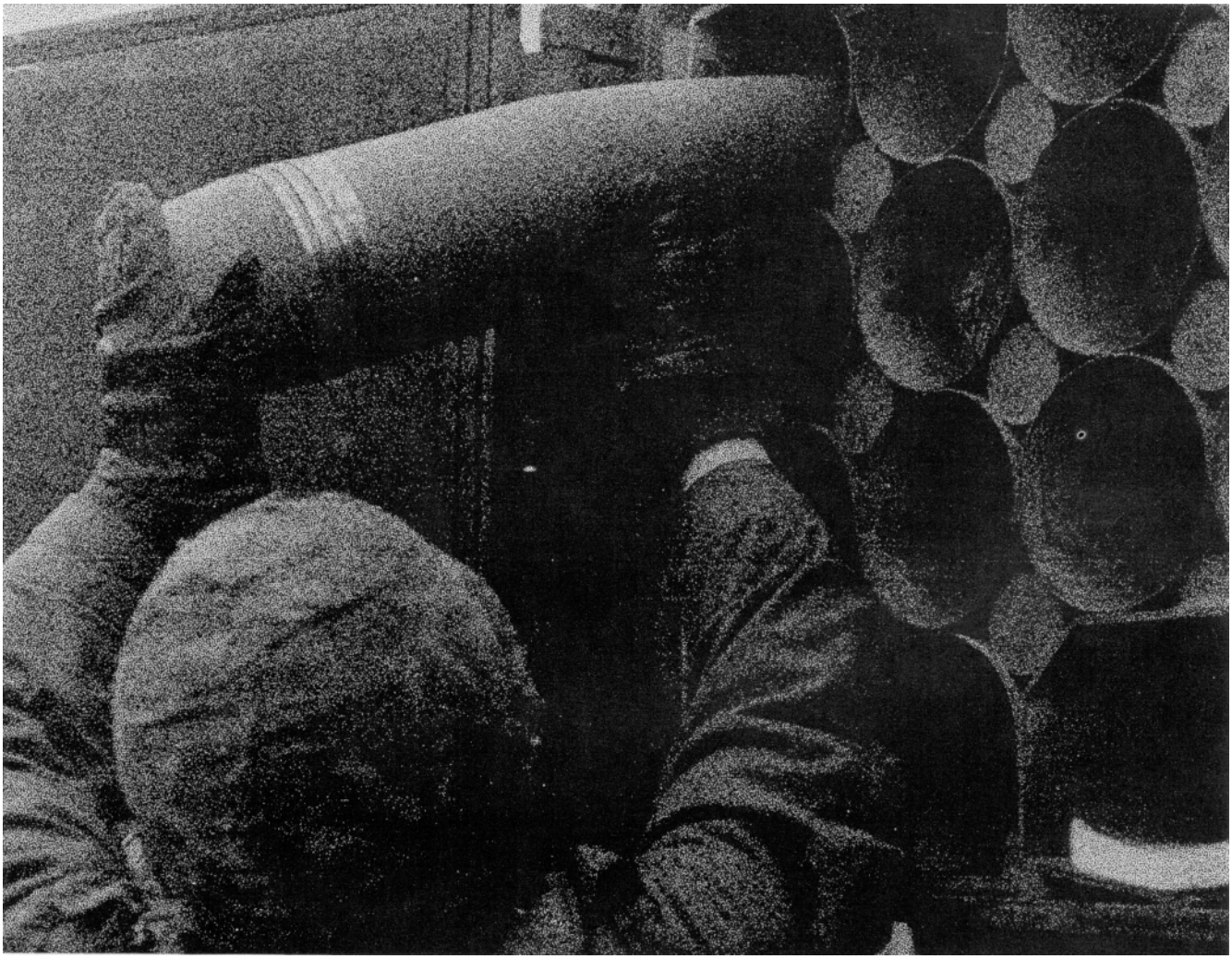
Answer: *There are three considerations: the effectiveness of the enemy counterfire, the mission of the unit receiving the counterfire, and the positioning/movement authority of the unit. When a unit receives counterfire, it should report it immediately to the next higher headquarters. If the counterfire is suppressing a unit but producing no significant casualties or equipment damage, an attempt should be made to ride out the storm. When counterfire becomes effective, steps should be taken to remove non-mission essential personnel from the gun position and/or to occupy covered positions within the battery area. When, in the opinion of the senior man present, the unit cannot afford to sustain any more personnel or equipment losses and an emergency displacement will reduce losses, then an emergency displacement to an alternate position is warranted. The next higher headquarters must receive notification as soon as possible about the effectiveness of the enemy counterfire, including the time the unit is ready to continue its mission and a report on its casualties and equipment losses. In the case of a headquarters element, if an alternate position has not been reconnoitered, an assembly area which is away from the original location can accomplish the same purpose as long as all section chiefs or drivers know where it is. In some cases, like during preparation for a nuclear fire mission, the S3 of the unit may decide to move a battery receiving counter-fire even though the fire is ineffective.*

Question: My question primarily concerns ARTEP 6-445 for a general support (GS) unit, but I believe the same tasks for the two missions which pertain to the battery level firing of an immediate suppression target and firing a priority target are also in the ARTEP for DS units. Both missions require firing improved conventional munitions (ICM). Change 1 to FM 6-40, however, has no discussion on how to compute firing data for ICM—the old M449 or M449E1. My contact at the Gunnery Department indicates that production on the ICM will be limited. Will there be a change to the ARTEP so that we do not fire ICM on these two missions, or are we to continue to train Reserve Components on these two missions using ICM? If so, what is the reference for teaching the computation of firing data for shell ICM?

Answer: *Future ARTEPs will incorporate the proposed high explosive (HE)/time shell/fuze combination for both the immediate suppression and priority target mission. ICM is still a viable munition for target attack; but, because of range safety restrictions, shell HE is more suitable for realistic training. This change, however, does not relieve fire direction centers from maintaining proficiency in computing data for the ICM family of projectiles or the howitzer sections from remaining familiar with ICM fuze settings and handling characteristics. The same procedure for firing transfer data for the family of scatterable mines (FASCAM) is applicable for firing transfer data for the M449, except that the base data is for the HE M107 using either the graphical firing table for that round or the tabular firing table.*

LOADED TO KILL

by Major (P) Bloomer D. Sullivan, Captain Francis D. Quirk, and Mr. Howard H. Rubin



What is in my unit's ammunition basic load? How did it come to be that way? Will it do the job for my supported maneuver unit when we go to combat? What do I need to do to insure its readiness now and in the future?

Though concerned field artillerymen usually ask these important questions about their unit basic loads (UBLs), more often than not their concerns are overcome by the pressures of everyday events — especially since the unit basic loads of ammunition for most units are out of sight and therefore somewhat out of mind. Yet, one can hardly overemphasize the importance of UBL readiness. It is clearly time, therefore, to speak of the issue in specific terms to answer those often voiced questions.

Field artillery commanders and their staffs can profit from recent insights into ammunition expenditures gained from the Fire Support Mission Area Analysis (FSMAA). A comparison of FSMAA results with selected major commands' (MACOMs') authorized basic loads points to some key parameters which field artillery commanders must consider in evaluating correct basic loads, in determining basic load mixtures and density for the Division/Corps 86 force structure, and, finally, in designing steps which will improve UBL readiness now and in the future.

One bit of semantic confusion requires clarification at the onset.

AR 710-2, *Supply Policy Below the Wholesale Level,* dated 1 October 1981 (effective date of 1 January 1982) identifies two types of unit basic loads — basic and operational. Basic loads are quantities of supplies kept by a unit to sustain its operations in combat for a prescribed number of days. Basic loads must be capable of being moved into combat using organic transportation. Operational loads, on the other hand, are quantities of supplies the unit or organization keeps to sustain its peacetime operations for a given time. It is the basic load, not the operational load, which is the concern of the following discussion.

AR 710-2 states that MACOMs will designate the units required to keep basic loads of Classes I, II, III, IV (type classified only), V, and VIII supplies and that the method of establishing the stockage level will also be prescribed. Accordingly, each MACOM has published regulatory guidance on basic loads which supplements AR 710-2 and which, for the most part, is quite specific on stockage objectives for each basic load. For example, USAREUR Regulation 710-65, *Ammunition Basic Load,* dated 12 March 1981, states, ". . . the basic load provides the unit ammunition to sustain itself in combat until the unit is resupplied . . . [it] is managed by the unit and the unit, using unit vehicles, must be capable of moving the basic load quickly in a single lift." Additionally, in recognition of the extremely high rates of fire which may be experienced early in the European battle and of the possibility of constrained transportation assets, the regulation permits European major commanders to request stocking of ammunition above the basic load authorization. Although most MACOM basic load regulations also identify, for each type of weapon system, the authorized quantities of basic load ammunition by Department of Defense Ammunition Code (DODAC) and nomenclature and provide any required explanatory notes, some items, like demolition charges and antipersonnel mines, are less intensely managed; and the regulations delegate the authority to fix the stockage level of these items to designated subordinate major commanders, as is the case in USAREUR.

When a MACOM does set an authorized stockage level, particularly for critical items, the stockage should reflect several variables, including expenditure rates required to fight the initial battle as reflected in various models and commanders' judgments, recognition of the types and qualities of ammunition availability in the theater, and an understanding of the realistic limitations imposed by ammunition handling and transportation capabilities at the unit level. Because, ideally, the unit basic load should sustain the unit until it is resupplied, those responsible for maintaining the basic load must consider factors such as the unit's mission, the availability of ammunition, the unit's lift capability, and the ability of the ammunition resupply system and its organization to manage the timely delivery of the ammunition. In short, since the basic load represents a field artillery commander's sole source of fixed ammunition stocks when his unit enters the battle, commanders must insure, to the greatest extent possible, that the unit basic load is adequate in terms of quantity, munitions mix, deployment readiness, and capability of producing the desired target effects *during the first hours of battle*. After the initial battle is joined, the basic load as a basis for supply ceases to exit; and the unit's required supply rate becomes the statement of requirement, while the announced controlled supply rate becomes the basis of issue.

Munitions mixes

The results of recent computer modeling and analysis conducted at the US Army Field Artillery School as a part of the Fire Support Mission Area Analysis provide field artillery commanders with some significant insights about basic loads. Information on munitions is particularly important to field artillery commanders as the field artillery begins its transition into a Division 86 force structure with increased numbers of weapons systems and the additional ammunition haul capability represented by a heavy expanded mobility tactical truck (HEMTT) vehicle capable of hauling 10 long tons (22,000 pounds) or 11 short tons (22,000 pounds). For example, the USAFAS model derived a percentage distribution for 155-mm and 8-inch rounds that differs significantly from basic load distributions set forth in current MACOM regulations (figure 1).

Ammo type	USAFAS FSMAA MODEL	USAREUR	FORSCOM	WESTCOM
155-mm Improved conventional munitions	61%	6%	—	35%
155-mm High explosive	15%	60%	82%	47%
155-mm Rocket assisted projectile	10%	5%	—	—
155-mm Copperhead	7%	—	—	—
155-mm Field artillery scatterable mine	5%	—	—	—
155-mm Smoke	1%	16%	7%	7%
155-mm Illumination	1%	5%	3%	3%
155-mm White phosphorus		8%	8%	8%
8-inch Improved conventional munitions	68%	18%	40%	40%
8-inch High explosive	20%	82%	60%	60%
8-inch Rocket assisted projectile	12%	—	—	—

Figure 1. Major command munitions distribution.

Rounds expended per weapon per day						
Ammo type	**FM 101-10-1**	**Division 86 planning factors**	**Combat Analysis Agency P86 Study**	**Ammunition Initiative Task Force 77 Study**	**TRADOC schools**	**Combat Service Support Mission Area Analysis**
Tank 105-mm	12-78	20-90	1-4	18-90	10-93	5-93
TOW	4-9	4-12	1	4-14	6-20	2-20
155-mm	71-203	160-520	75-95	310-520	150-550	152-543
8-inch	62-177	115-395	60-75	150-400	100-380	81-366
Hellfire	N/A	3-40	0-3	N/A	16-64	12-64
Mortar 81-mm	22-116	80-350	25-50	N/A	24-420	32-419
MLRS	N/A	30-220	14-120	N/A	50-210	59-191

Figure 2. Ammunition expenditure rates.

Daily expenditure rates

Another important insight involves the required number of rounds expected to be fired on a daily basis—a requirement which obviously impacts on basic load computations and, in all probability, will drive some early decisions by the force commander, in conjunction with his fire support coordinator, as to when and against what targets the basic load will be expended.

One must understand in advance that no clear agreement exists as to what the daily expenditure would be by type weapon. As figure 2 illustrates, various rates appear in approved Army manuals and studies.

The Fire Support Mission Area Analysis, on the other hand, modeled a very intense first battle based on the anticipated 86 threat array and the desired target effects and arrived at the results shown in figure 3.

When one compares these results with the basic load munition densities authorized in current MACOM regulations (figure 4), it becomes clear once again that field artillery commanders need to closely evaluate their UBL readiness.

METT

Given the wide variances in type munition distribution and the numbers of rounds to be fired, what are some considerations and techniques that may enable a commander to determine what his basic load should be and how he can better manage it in peacetime to prepare for those first critical hours of combat? First among the considerations is the old tactical standby of METT — mission, enemy, terrain, and troops.

- The *mission* will necessarily affect the basic load configuration—the force commander's expectations for fire support and target effects will likely be the principal determinant of the ammunition mix. Mission considerations must include a projection of requirements beyond that time when the basic load will be expended; that is, the consideration of mission must include not only the tactical requirement but also the logistical capability to accomplish it.
- The *enemy's* known or expected capabilities, forces, and types of equipment will enter into the decision on what types of ammunition should be included in the unit basic load. The enemy's density and rate of target presentation will surely affect the ammunition expenditure rate. Another consideration is the likelihood that the enemy will attack logistical installations or interrupt the line of communication (LOC) on which ammunition (or any kind of supply for that matter) depends. Is there an alternate to the LOC or another source of supply, and will such enemy actions have an immediate impact on the tactical situation during the first few hours of hostilities?
- The *terrain* in which the field artillery unit will be employed and the terrain on which target effects are to be achieved may determine the type and mixture of projectiles, propelling charges, and fuzes.
- *Troops* suggests the ability of a unit's personnel and equipment to handle, transport, and shoot the basic load. Also to be considered are the capabilities of the supporting ammunition supply point (ASP) or ammunition transfer point (ATP) to both issue the unit basic load and respond to unit needs for resupply during the confusing hours of the first battle.

The field artillery commander must consider all aspects of METT when he reviews his ammunition basic load document since it is he who best understands the implications of the variables on mission accomplishment. It may be, however, that despite the thoroughness of the field artillery commander's analysis and his documentation of the basic load requirements, his access to certain types or quantities of ammunition will be limited or impossible. In this instance, the field artillery commander must consider other alternatives to provide the desired fire support effects for the force commander, including selection of alternate munitions, increases in types of munitions that are available but which have less lethal effects than the preferred munition, greater reliance on munitions which will cause other types of available munitions to be effective, and greater reliance on other fire support means to accomplish the mission.

In evaluating METT, a field artillery commander would benefit

Rounds per tube per day depending on level of combat intensity*			
Ammo type	**Intense****	**Sustaining**	**Light**
155-mm	500	325	200
8-inch	340	220	135

*The figures quoted represent a mid point of firing rates for the particular level of conflict.

**Not all weapons were committed at the intense rate at all times.

Figure 3. FSMAA ammunition expenditure rates.

Ammo type	USAREUR	FORSCOM	WESTCOM
155-mm	215	234	234
8-inch	110	140	140

Figure 4. MACOM ammunition basic load densities.

by asking himself these specific questions:

- What is the anticipated threat? What is the size of the unit, and how is it equipped? Is it attacking or defending? What elements within the threat doctrinal target array are important for achieving threat objectives? What part will the field artillery be expected to play in denying the employment of these elements?
- What are the characteristics of the terrain in the area of operations? Is the ground soft (where high explosive is not very effective) or hard (where high explosive is very effective)? Does the terrain cause targets to group together (Korean valleys) or spread out (Sinai desert)?
- What munitions are available for the UBL and resupply? Are there sufficient theater stocks of these munitions for commitment to the UBL? What munitions are available in sufficient supply for the UBL, but not for resupply (Copperhead could possibly fall into this category)?
- What is the current conventional hauling capacity of the unit? Is there an overload policy? If so, what is it; and what impact does it have on the UBL? What are the number of vehicles, by type, available to haul the UBL? Is the UBL configured by battery, battalion, or by other standards? What effect will carrying the prescribed nuclear load (PNL) and prescribed chemical load (PCL) have on the lift capability of conventional ammunition?
- How long must a unit plan to fight with what it has on hand? When can a unit realistically expect to be resupplied? What will be the munitions mix of the resupply? How do the answers to these questions affect the support a unit can provide the maneuver commander?
- What is the supported unit's mission? Defend or attack? Main or support effort? Are there unique field artillery requirements such as preparations or field artillery delivered barrier minefields in the basic operations plan?
- How is the supported unit equipped? Very light, requiring increased antiarmor support against some threats? Very heavy, requiring less antiarmor support against some threats?

- What are the supported commander's fire support preferences? Does he expect the artillery or mortars to provide the bulk of his illumination and smoke? Does he rely on artillery to disrupt and kill? Does he envision artillery playing a major role in the close support battle, the antiarmor battle, counterfire, or interdiction?
- What will be the force artillery support? Does the force artillery assume responsibility for certain targets or target categories? Are force artillery weapons common or unique: i.e., if UBL computations prove to be wrong, can force artillery help out with its UBL?
- Who has the influence in determining a unit's basic load? Has higher headquarters allowed the field artillery commander to ask questions and adjust his UBL, or must he carry what he is told to carry?

Readiness

Given that he has considered METT, made evaluations and trade-offs as necessary, and arrived at the unit basic load, there are several actions that the prudent field artillery commander should consider to insure that his UBL is ready and available to provide the support required in the first hours of battle. An example of such an action is the ammunition terrain walk which was effectively used in the 8th Infantry Division (Mechanized). Each battery commander took his battalion commander, supported brigade commander, and commanding general to his unit's bunker(s) in the ammunition supply point and briefed them on the unit's basic load, load procedures and times, load plans, transportation flow, etc. Though a time-consuming effort for all concerned, the ammunition terrain walk paid dividends through its involvement of the chain of command in the UBL process; its identification of UBLs by quantity, type, and location; its identification of specific vehicle requirements to move the UBL; its development of vehicle load plans for the UBL; its development of expeditious loading procedures at

the ASP; its development of unit movement plans within the ASP; and its development of plans for the safe movement of ammunition.

In addition, the batteries actually practiced uploading their ammunition in an Emergency Deployment Readiness Exercise environment within designated time frames. Of special interest to the field artillery commanders was the impact on time lines of simultaneous uploading by multiple units in the same ASP. Not satisfied with just handling the UBL, the 8th Infantry Division Support Command, in conjunction with the division artillery and maneuver brigades, developed an ammunition resupply plan which addressed, in detail, the resupply of ammunition once the basic load had been moved forward by the units into their general deployment position locations and the battle had begun.

Though this discussion is necessarily oriented toward those units which have physical access to their UBLs, units whose UBLs are stored in US Army Materiel Development and Readiness Command depots could benefit from similar practices at a reduced frequency and scope. A unit ammunition readiness program of this type may, in some circumstances, reveal the inadequacy of resupply plans, transportation assets, ASP capability, and materiel handling equipment. Not all of these potential shortfalls are under the purview of the field artillery commander, but he should still be the primary "mover and shaker" in correcting them since it is he who must insure availability of the properly configured basic load at the time and place needed to support the force commander.

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MORETRAIN

by Colonel Raymond E. Haddock and Major Keith W. Dayton

The overriding goal of peacetime training is the achievement and sustainment of combat readiness. However, in today's training environment, the attainment of this goal has become increasingly difficult. Limited time, money, experienced teachers/leaders, and real estate create the need for training which is more economical and efficient. Also, increased reliance on specialized battlefield technology has resulted in functional systems with widely varying training requirements that do not lend themselves to routine integrated field training. What is needed is a training system which complements field training and trains units more efficiently and economically while still retaining realism. The MORETRAIN system of the 9th Infantry Division Artillery embodies just such a concept. Although MORETRAIN is specifically oriented toward field artillery units, the concept has application for other type units as well.

MORETRAIN concept

MORETRAIN, a training system characterized by efficient and economical training in realistic conditions, is not intended to replace integrated field training, but rather to complement it by sharpening component skills prior to the field training exercise. MORETRAIN efficiently eliminates the wasted time and money attendant to routine field training by providing an alternative which not only saves resources but also results in qualitatively better training.

Efficient

Efficiency in MORETRAIN results from the decentralization of training into functional/system areas. The 9th Infantry Division Artillery conducts training on radars, forward observation, TACFIRE, manual fire direction center (FDC) procedures, sound-flash, target acquisition, and nuclear operations in separate, specially designed learning facilities. Within these facilities, the appropriate unit leader consolidates and conducts functional system training. Thus, the training in manual fire direction and forward observer procedures occurs at the field artillery battalion level, the sound-flash and Firefinder radar instruction at the target acquisition battery level, and the training in nuclear operations and TACFIRE at the division artillery or battalion level. This decentralized, consolidated training accommodates varying individual or unit learning curves and system-peculiar training requirements and allows each training component to train at its own pace. It also makes the best use of trained leaders and subject matter experts; and, providing profitable training opportunities in garrison, it reduces the demand for already crowded field training areas and the requirements for support troops normally associated with field training. Essentially, MORETRAIN means highly efficient training of various specialized components without some of the inefficiencies associated with field training.

Economical

In addition to providing efficient training, MORETRAIN is highly economical. It reduces the amount of money, time, and equipment required. By making learning facility training productive, units need not go to the field constantly.

Savings in fuel costs alone are significant. When the reduction in Class IX supplies, expendables, ammunition, and repair/replacement of end items is considered, the money saved by MORETRAIN within the division artillery alone runs into hundreds of thousands of dollars annually. MORETRAIN also saves time—in the past, up to 40 percent of a unit's non-field traning time was consumed in moving to the training location, setting up equipment, breaking it down after training, and conducting recovery maintenance. A unit can now use that time for other training. MORETRAIN equipment is routinely located in the training facility, which eliminates or drastically reduces setup and breakdown time and makes possible more training iterations per scheduled training period. Moreover, reduced handling means less equipment breakage and less training time lost due to nonoperational equipment. Additionally, MORETRAIN facilities use commercial power, which is much more economical than the use of tactical generators; thus a unit can save its tactical generators for combat or normal field training and decrease the garrison wear and tear on them. In short, MORETRAIN economizes on equipment, money, and time.

Realistic

Training which is even more realistic than that possible in the field is attainable in MORETRAIN facilities, since they are configured to train units as they would fight and to eliminate restrictions associated with training areas or necessitated by safety. MORETRAIN permits command and control and communications (C^3) operations of an intensity not normally possible in a field training exercise (FTX) environment. Through TACFIRE linkages between training facilities, units can exercise C^3 skills training on all munitions and on the full range of fire planning options, thereby creating a synergistic effect on training. Simply stated, MORETRAIN can actually simulate more realism in training than the field.

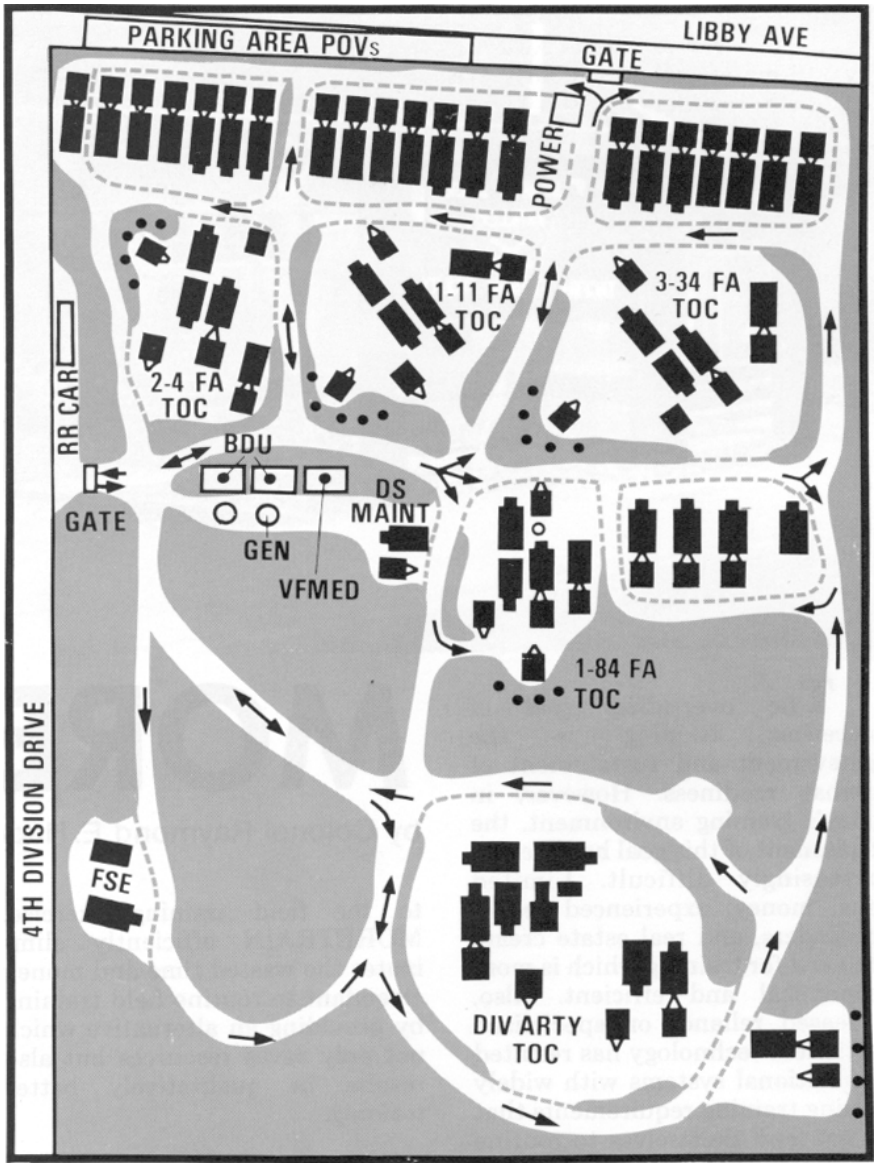


Figure 1. 9th Infantry Division Artillery TACFIRE Training Facility.

Integrated

As an integrated training system, MORETRAIN encompasses the functional areas of command and control and communications, target acquisition, and nuclear proficiency. The primary command and control facilities are the TACFIRE Training Facility (TTF) and the Artillery Battle Drill Centers (ABC). MORETRAIN target acquisition facilities are the Reduced Distance Target Acquisition Battery (RED TAB), the Firefinder Training Facility (FTF), and the Observed Fire Trainer (OFT). Nuclear skills are developed and sharpened in the Technical Training Center (TTC). Several of these training facilities are further integrated with each other through the TACFIRE Training Facility to provide appropriate cross-training among systems. Each training facility embodies the MORETRAIN theme of efficiency and economy in realistic conditions.

TACFIRE Training Facility

The TACFIRE Training Facility (figure 1) is a consolidated, scaled-down field training site in which all 9th Infantry Division Artillery TACFIRE-related command and control elements are continuously located in a Command Post Exercise (CPX)

configuration when not deployed to the field. Located within this 150 - by 210-meter inclosed facility are all field artillery battery fire direction centers (FDCs), battalion tactical operation centers (TOCs), battalion fire support elements (FSEs), the division FSE, the division TOC, and associated vehicles and equipment. This efficient arrangement allows for optimum training, cuts down on movement and setup time and expense, and makes the best use of trained experts. The TACFIRE Training Facility, which is the focal point of MORETRAIN, has a direct communications interface with the RED TAB, FTF, OFT, and Fort Lewis Battle Simulation Center. Consolidation of TACFIRE in the TTF also facilitates necessary TACFIRE sustainment efforts, the use of computer-assisted instruction, and the conduct of team training, CPXs, and FTXs. The fact that elements are linked together in one facility in the CPX configuration also makes fault isolation and leader critique easier at all levels. Most important, however, is the fact that from the TTF, TACFIRE can be trained as an integral system to the entire division artillery at an appropriate speed, free from the setup and breakdown requirements, displacement times, range restrictions, and safety delays which are a part of normal field training exercises. The TTF represents the epitome of efficient training.

The TTF is also highly economical. Construction costs of under $100,000 qualify it as minor construction under the approval authority of the installation commander. Due to the fact that the TTF is supplied with commercial power, cost savings in POL alone more than make up for this cost in less than a year. Based on thirty 16-hour sustainment training weeks and 60 miles per week of vehicular movement to and from the field, POL costs for annual TACFIRE training in an FTX environment could be more than $165,000, whereas similar operations in a TACFIRE Training Facility run on commercial power cost approximately $1,750 per year.

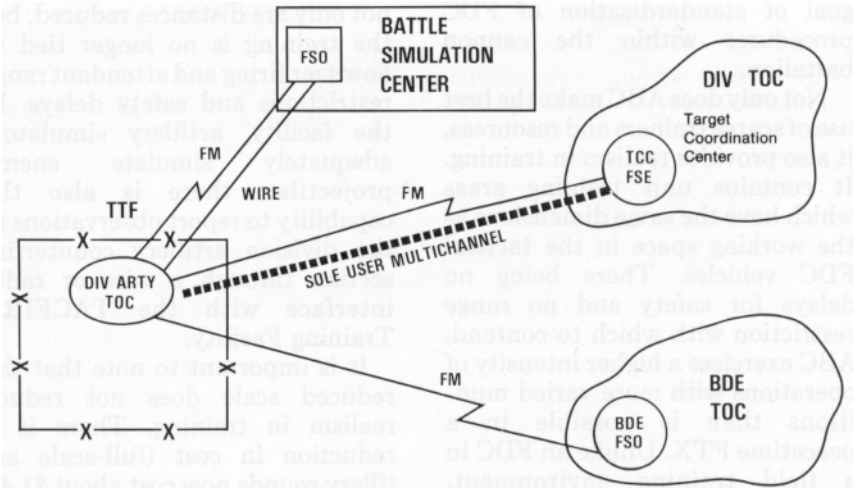


Figure 2. Command post exercise concept.

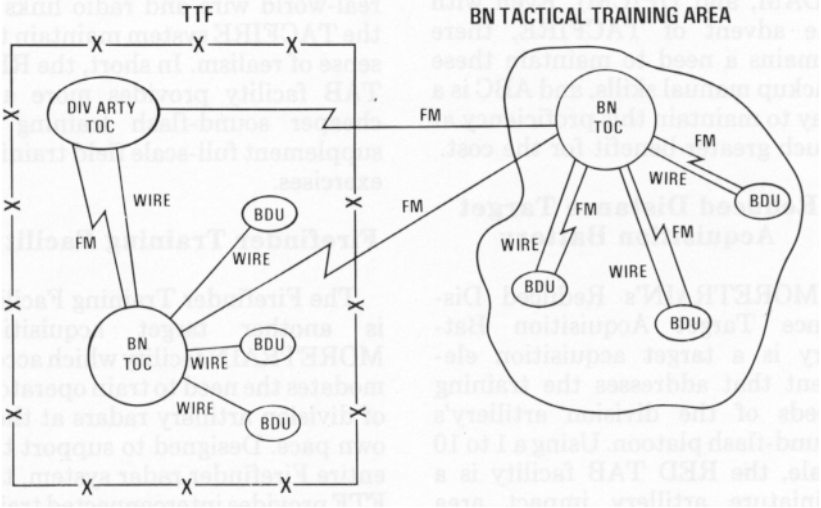


Figure 3. Field training exercise concept.

The TTF also cuts costs in areas such as Class IX supplies, equipment damage due to handling, and wear and tear on communications security material.

In addition to being efficient and economical, the TTF provides genuine realism in training because the facility is a modified field environment. All internal and external communications with other TACFIRE assets are real-world, and these CPX and FTX linkages force units to perform real command and control tasks (figures 2 and 3).

Artillery Battle Drill Center

Another MORETRAIN facility specifically directed toward command and control is the Artillery Battle Drill Center, which consolidates manual FDC training at battalion level under the control of the battalion fire direction officer (FDO) operating in a CPX environment. The entire battalion fire direction structure is located in one large room and has an external interface with both the Observed Fire Trainer and howitzer sections represented by cannon battery base pieces. Thus, this training facility also makes the best use of scarce teachers and leaders and greatly facilitates fault isolation and critique. The CPX configuration also allows the computation of more fire missions per training period than would be possible on a field training exercise, permits the training to advance at a variable pace, and supports the

goal of standardization of FDC procedures within the cannon battalion.

Not only does ABC make the best use of scarce trainers and resources, it also provides realism in training. It contains unit training areas which have the same dimensions as the working space in the tactical FDC vehicles. There being no delays for safety and no range restriction with which to contend, ABC exercises a higher intensity of operations with more varied munitions than is possible in a peacetime FTX. Unlike an FDC in a field training environment, trainers in the ABC can exercise manual FDC skills on *all* munitions (including nuclear, chemical, RAP, ADAM, and DPICM). Even with the advent of TACFIRE, there remains a need to maintain these backup manual skills, and ABC is a way to maintain this proficiency at much greater benefit for the cost.

Reduced Distance Target Acquisition Battery

MORETRAIN's Reduced Distance Target Acquisition Battery is a target acquisition element that addresses the training needs of the division artillery's sound-flash platoon. Using a 1 to 10 scale, the RED TAB facility is a miniature artillery impact area complete with surveyed targets, microphone bases, and flash observation posts. Artillery simulators are used instead of live ammunition to portray hostile artillery rounds.

As with other parts of the MORETRAIN system, greater efficiency in training in the RED TAB facility is achieved through consolidation of training at the functional level. The sound-flash platoon is trained through the full target acquisition, computation, and reporting sequence. In normal field training, sound-flash is dependent on the firing of artillery ammunition with sound and flash bases separated by large distances, but the RED TAB facility's reduced scale permits unit leaders to conduct training on all their assets in one place. The reduced scale also means more training iterations per training period since not only are distances reduced, but the training is no longer tied to howitzer firing and attendant range restrictions and safety delays. In the facility, artillery simulators adequately simulate enemy projectiles; there is also the capability to report observations to the division artillery counterfire section through a wire or radio interface with the TACFIRE Training Facility.

It is important to note that the reduced scale does not reduce realism in training. There is a reduction in cost (full-scale artillery rounds now cost about $1.49 a pound or $100 to $200 each, as compared to the artillery simulator price of less than $10 each), but real-world wire and radio links to the TACFIRE system maintain the sense of realism. In short, the RED TAB facility provides more and cheaper sound-flash training to supplement full-scale field training exercises.

Firefinder Training Facility

The Firefinder Training Facility is another target acquisition MORETRAIN facility which accommodates the need to train operators of division artillery radars at their own pace. Designed to support the entire Firefinder radar system, the FTF provides interconnected training sites for the AN/TPQ-36 and -37 radars in an inclosed field location supplied with commercial power. It also has a communications interface with TACFIRE that is useful for CPXs.

As with other components of MORETRAIN, consolidation of all radar training at the FTF site provides the advantage of easier critique and correction by leaders and thus more efficient training. In normal field operations, the radars are located widely apart; and corrections from trainers are difficult, if not impossible. But, by using the training devices in the FTF to simulate radar tracking of targets, a trainer can supervise and train his whole system at one time, in one place, and at his own pace—not at the pace of howitzer firing. There is no loss of training time due to movement to the field or waiting for the guns to fire. The high cost of radar operations in the field is tied to the fuel consumption of generators; the use of commercial power in the FTF can save as much as $150,000 in fuel costs annually.

Here again, since the FTF is a modified field environment, realism is not sacrificed. The internal and external communications of the facility are the same as they would be in combat; and, in this sense, the unit trains as it would fight. Training devices adequately simulate live rounds for tracking, and the Firefinder/TACFIRE communications interface is real-world.

Technical Training Center

The Technical Training Center is a secure inclosed training site designed to develop and sharpen nuclear skills within the division artillery as a whole. In line with the theme of more and efficient training, the TTC is an improvement on individual battalion nuclear training centers since the consolidation of training at division artillery level makes the best use of truly scarce experts. The TTC provides a secure classroom for all classified training, a secure storage area for tools for each battery, and secure training rooms for each battalion. The TTC also contains a secure load and tiedown training area and vault storage for classified equipment. The collocation of the 9th Division Nuclear Weapons Assistance and Inspection Team office has the additional merit of providing constant on-site expertise for nuclear operations.

Realism in training is maintained in the TTC since all operations are conducted in a secure environment under stringent security measures. Unit training areas within the TTC are similar in size to those anticipated in a field location, and conditions in the load and tiedown area closely parallel field conditions.

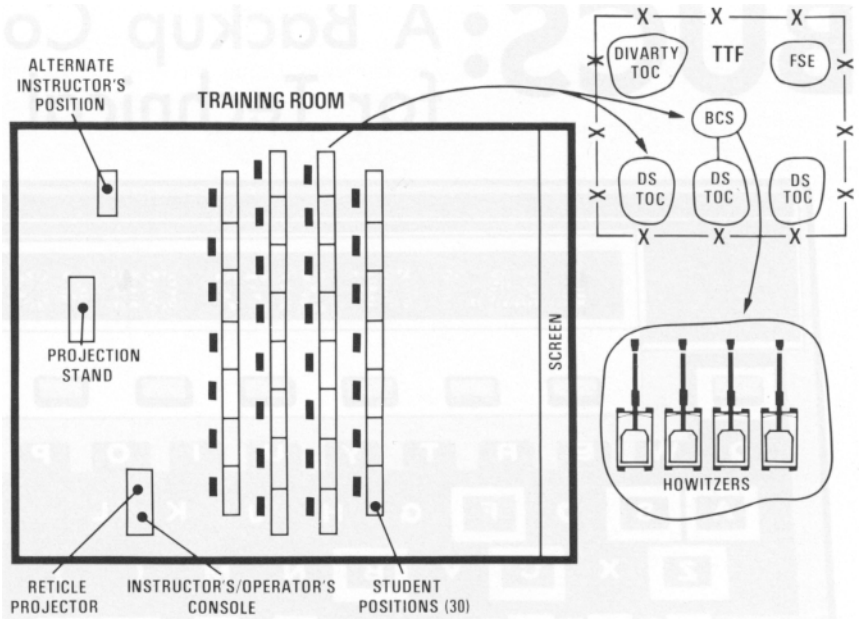
Observed Fire Trainer

The final MORETRAIN target acquisition facility (soon to be constructed) in the 9th Infantry

Division Artillery system is the Observed Fire Trainer (figure 4), which trains the division artillery's forward observers and ground/vehicle laser locator designator (G/VLLD) operators. The facility is a specially constructed classroom area with an interface to the TTF through communications links. Using electronics instead of artillery rounds, the OFT trains observers in the application of the whole range of artillery ammunition.

The Observed Fire Trainer is a large step toward more efficient training since all fire support teams (FISTs) of the cannon battalion can be trained in one place at one time. Far more iterations are possible per training period than through the traditional reliance on observation of live artillery rounds in an impact area. The Observed Fire Trainer means that G/VLLD training for Copperhead employment is also feasible. The communications link with the TACFIRE Training Facility means that an observer can be trained through his entire target acquisition and destruction sequence and exercise the automated reporting system through the digital message device (DMD) to TACFIRE.

When it comes to realism, it could be argued that the OFT makes observer training more realistic than similar training in the field. Not only does it allow for simulation of artillery munitions used in combat but not available for training, but the OFT also provides the realistic flow and volume of combat fire missions unrestrained by range restrictions and safety considerations. The linkage of the OFT and TTF through the use of the DMD allows the observer to train as he would fight and also saves considerable sums in munition costs and other operational costs associated with field training.



- **TRAINS FOs AND LASER DESIGNATOR OPERATORS**
- **INTERFACE WITH TACFIRE**

Figure 4. Observed fire trainer.

Summary

MORETRAIN offers more and better training with available resources. An integrated system of specialized training facilities in which equipment is constantly ready for use, MORETRAIN means a drastic reduction in wasted training time for emplacement and recovery of equipment and a reduction in equipment down time caused by constant movement and handling. It means more training iterations per training period since training starts as soon as the unit arrives at the facility and since each facility trains at its own pace free from other delays or distractions. It means the most efficient use of scarce expert trainers and equally scarce real estate. By eliminating or reducing the need for field training, MORETRAIN saves money. Training is more realistic since components can train on all munitions and at a greater C^3 intensity than ever before possible in routine field operations. MORETRAIN can accommodate the widely different requirements and learning curves of our technology-intensive battlefield systems of command and control and target acquisition. In short, MORETRAIN means an integrated system that can improve combat readiness efficiently, economically, and realistically.

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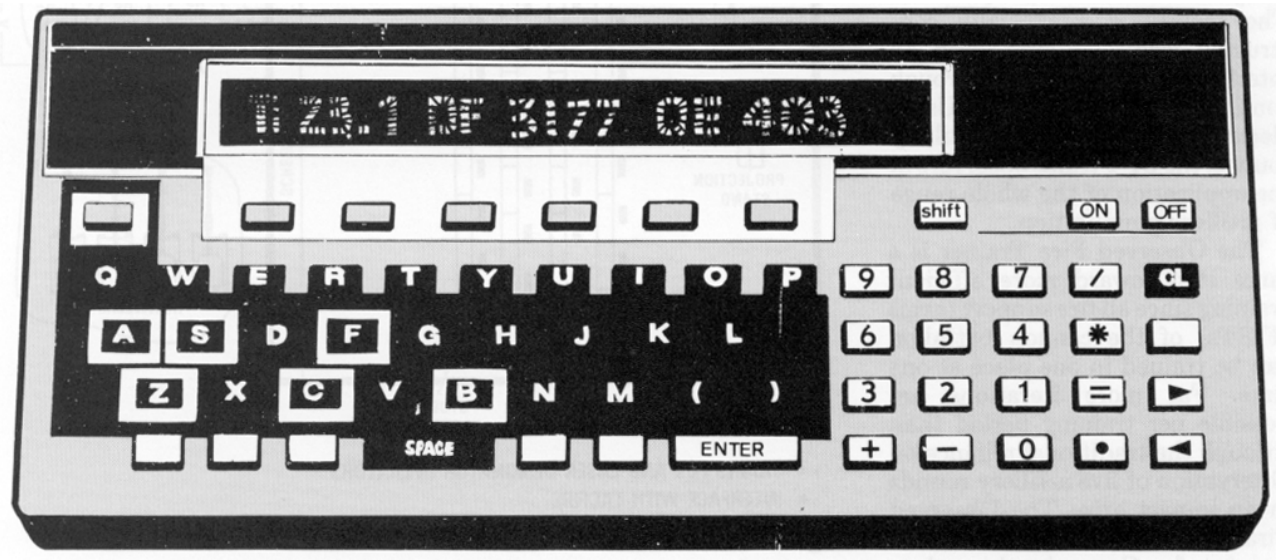
MAJ Keith W. Dayton, FA, received his commission through the ROTC at the College of William and Mary. He received his M.A. in history from Cambridge University in England and is a graduate of the Command and General Staff College and the US Army Russian Institute. He is a former commander of the Headquarters and Headquarters Battery of the 1st Battalion, 84th Field Artillery, and is currently the Assistant S3 of the 9th Infantry Division Artillery.

BUCS: A Backup Computer System for Technical Fire Direction



by Major Michael E. Velten and Mr. Donald J. Giuliano

With the fielding of the Battery Computer System (BCS), field artillery fire direction centers (FDCs) can rapidly compute firing date for individual weapons — a capability which enhances the survivability of field artillery batteries by facilitating optimum use of terrain features during emplacement. But, if the Battery Computer System becomes inoperable, how will the FDC compute firing data? The Gunnery Department of the US Army Field Artillery School is working on a solution to this problem. After investigating several possibilities, the Gunnery Department chose to pursue a new system called BUCS — Backup Computer System.

Alternatives

Other possible alternatives had a variety of problems which weighed heavily against their selection. To understand the concept for BUCS, one ought first to see why these alternatives did not measure up.

● ***Manual system terrain gun position corrections:*** Current gunnery procedures specify that terrain gun position corrections (TGPCs) be computed and carried on the guns to compensate for terrain positioning and muzzle velocity differences among weapons. These corrections are derived at a determined range (center range) and azimuth (center azimuth) and are valid 2,000 meters over and short of the center range and 400 mils right and left of the center azimuth. As fires throughout a TGPC sector are shifted away from the center range and azimuth, factors such as target shape, size, and orientation will cause a degradation in effects on the target. Current procedural specification for TGPCs is that the weapons must be positioned in an imaginary box, no larger than 400 meters wide and 200 meters deep, centered over battery center and oriented perpendicular to the center azimuth of the TGPC sector. Battery positions which exceed these limits will experience increased degradations in target effects. Finally, the manual system of computing TGPCs can become very unmanageable in a combat situation. For example, consider the situation in figure 1 wherein a 155-mm howitzer battery in a direct support role must provide fire support over the division sector. For the battery to adequately cover this area, there should be 12 TGPC sectors per munition family. (The three projectile families which require TGPC computations are high explosive (HE), dual purpose improved conventional munitions (DPICM), and rocket assisted projeciles (RAP)). In other words, 36 sets of TGPC data, based on the projectile fired and the TGPC sector in which the target appears, must be computed, logged, and applied to the guns.

● ***Special corrections:*** Special corrections are individual piece corrections which are computed from individual piece locations and account for the shooting strength of each weapon and the target shape and size. Then these corrections are applied to time, deflection, and quadrant in order to place bursts in a precise location on a target. Because of the time required (5 to 10 minutes) for computation, special corrections are used only in fire-for-effect missions on a mission-to-mission basis. These corrections would not be feasible in an intense battlefield situation where timely fire support is a necessity.

● ***Manual computation of six sets of individual firing data:*** Theoretically, the personnel in a fire direction center, using a firing chart, graphical firing table (GFT), and graphical site table (GST), could compute six individual weapon solutions. In practice, however, more than one firing chart would be required since the close proximity of weapons located on the firing chart causes a cluttering of deflection and azimuth indexes. Also, six sets of graphical firing equipment with individual GFT settings would be necessary to compute unique firing data for each piece. This labor-intensive method would require a significant increase in FDC personnel, computation times would be slow, and accuracy would rapidly decrease.

● ***Battery Computer System (BCS):*** An obvious consideration as a backup for the BCS is another BCS, but operational floats are not available. The BCS of a sister battery could theoretically provide backup technical fire direction; but computation time would be doubled, and response times for both batteries would be increased. Because of the range of the Small Unit Transceiver (SUT), digital transmission of firing data to the Gun Dissplay Unit (GDU) in the battery with the nonoperational BCS is not possible; and fire commands must be by voice from the operational computer, through the other FDC, and on to the howitzers, thereby futher degrading response times for both units. The software for the BCS is designed for single-unit technical fire direction, and this fact causes numerous programming problems and restrictions since both batteries must be laid on the same azimuth of fire, must have the same propellant temperature, and must have compatible ammunition lot designations if a BCS is used as a backup for another BCS. Also, the requirements to maintain current position, ammunition, and muzzle velocity data for accurate computation of firing date by BCS make backup BCS planning and preparation a tedious affair. The significant training problems inherent in BCS/BCS backup technical fire direction and the considerable operational problems and restrictions associated with it make this option difficult at best.

● ***Tactical Fire Direction System (TACFIRE):*** TACFIRE can provide backup technical fire direction for the BCS, but the TACFIRE solution is from battery center to target center and requires refinement with TGPCs. It is possible to program TACFIRE to produce individual piece firing data for a battery; but the reprogramming, operational increase in processing time, increased message and voice traffic, and additional training burden combine to make this option an automatic data processing nightmare.

● ***Field Artillery Digital Automatic Computer (FADAC):*** Since FADAC computes ballistic trajectories, it is another source of accurate firing data; but, like TACFIRE, it computes a battery-center-to-target-center solution and requires TGPCs. Since FADAC has five battery buttons (A through E), one could conceivably enter individual weapon locations as battery locations and then determine individual aimpoints for each weapon and enter them as target locations, one assigned to each weapon. The user could then compute firing data by making five individual computations. Five solutions, however, would not be adequate for 105-mm and 155-mm howitzer batteries which have six weapons. The FADAC method is awkward and results in unacceptably long mission response times.

● ***Hand-held calculator (TI-59):*** The TI-59 solution emulates manual gunnery procedures; but it, too, provides a battery-center-to-target-center solution and requires TGPCs. An operator could use one calculator and compute six solutions, changing weapon and target locations between computations; but this technique would be awkward and would result in unacceptable mission response times. Or, an operator could use six calculators to compute six individual solutions; but there are only two TI-59s in a battery FDC. Putting four more calculators in a battery would require additional personnel in order to provide simultaneous computations; this solution is obviously unacceptable. In addition, the TI-59 is no longer made by Texas Instruments. The US Army Armament Materiel Readiness Command has stockpiled enough calculators and accessory equipment to maintain the system in the field for approximately the next four years, which means that the TI-59 could not serve as a backup over the entire life span of BCS unless a very costly support plan was pursued.

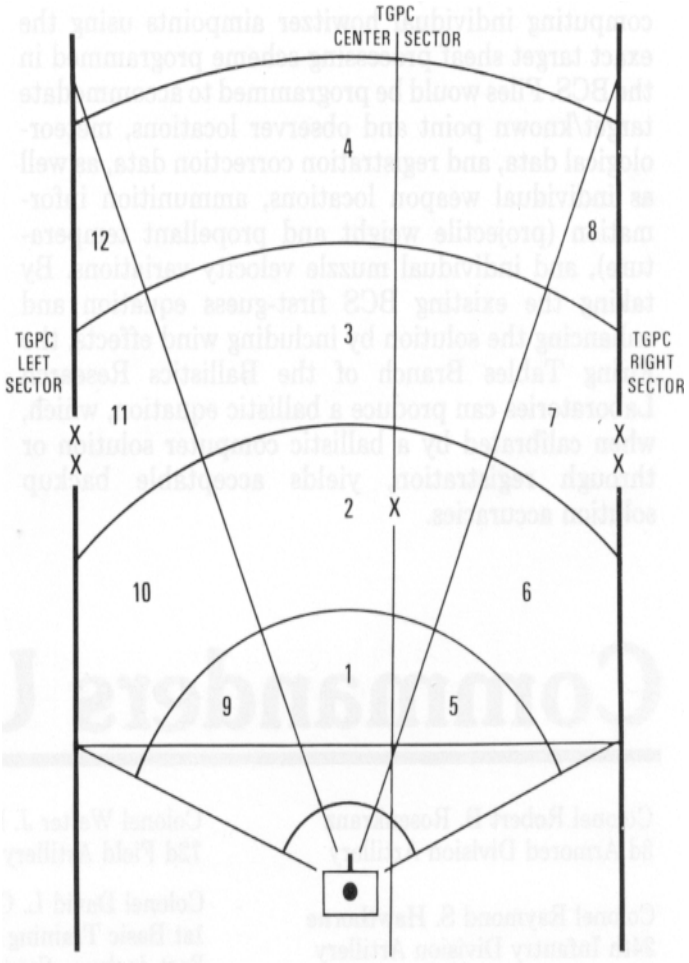


Figure 1. TGPC sectors in a division zone.

BUCS

Since none of the existing equipment was considered adequate as a backup for the Battery Computer System, the Gunnery Department conducted a study and determined that a viable backup should meet the following criteria:

- Compute accurate individual howitzer firing data in a timely manner.
- Correct for all measurable nonstandard conditions automatically.
- Produce solutions across all charges and ranges for all shell/fuze combinations and for all methods of target location.
- Utilize BCS sheaf processing scheme.
- Nonvolatile memory.
- Low cost.
- Lightweight.
- No communications interface.
- Programmed only for technical fire direction.
- Preferably a commercial off-the-shelf item (to eliminate the need to specially design and develop the hardware for the system).
- Easy to operate.

The Gunnery Department then researched available commercial off-the-shelf hand-held computers—these devices proved to be 10 to 30 times faster in computation than the current state-of-the-art hand-held calculators, and the necessary software can be developed. First, there must be a routine developed to compute chart data (range and azimuth) for all methods of target location, to include subsequent adjustments. Next, there must be a routine for computing individual howitzer aimpoints using the exact target sheaf processing scheme programmed in the BCS. Files would be programmed to accommodate target/known point and observer locations, meteorological data, and registration correction data, as well as individual weapon locations, ammunition information (projectile weight and propellant temperature), and individual muzzle velocity variations. By taking the existing BCS first-guess equation and enhancing the solution by including wind effects, the Firing Tables Branch of the Ballistics Research Laboratories can produce a ballistic equation, which, when calibrated by a ballistic computer solution or through registration, yields acceptable backup solution accuracies.

BUCS is workable and responsive and will permit computation of the following:

- Individual aimpoints based on the BCS target sheaf processing scheme.
- Range and azimuth from each weapon to its assigned aimpoint.
- Firing data for each weapon which automatically accounts for nonstandard propellant temperature, projectile weight, muzzle velocity, and meteorological conditions.

The prototype BUCS permits the computation of the solution for six weapons in less than 20 seconds. This capability was demonstrated to the Field Artillery Community at a meeting of the Fort Sill Executive Committee (EXCOM) in August 1982. EXCOM approval was given to the Gunnery Department to pursue the development of a complete software package for all cannon systems.

The BUCS software concept has exciting potential as a backup technical fire direction system for the Battery Computer System — one that fully meets the requirement criteria and one that facilitates operator training.

MAJ Michael E. Velten is Chief of the Research and Analysis Division, Gunnery Department, USAFAS. He received his commission through the ROTC program at the University of Dayton (Ohio). He has a bachelor of science degree in chemical engineering and a masters in chemistry. A graduate of the Field Artillery Advanced Course, he was commander of A Battery, 3d Battalion, 37th Field Artillery, and then commanded Headquarters and Headquarters Battery, 1st Battalion, 15th Field Artillery. Prior to his assignment to the Gunnery Department, he was an instructor in the Department of Chemistry at the United States Military Academy.

Donald J. Giuliano, a Department of the Army civilian, is an Operations Research Systems Analyst in the Research and Analysis Division, Gunnery Department, USAFAS. He received his bachelor of arts degree in mathematics from Northeastern University in Boston, MA, and his masters in mathematics from the University of South Florida. Prior to his assignment at Fort Sill, he worked for the BDM Corporation, McClean, VA, where he conducted test and evaluation studies under contract to the US Air Force, to include a close air support response time study and the A-10 and E-3A follow-on test and evaluation. He has developed all cannon gunnery application software for the TI-59 hand-held calculator and is presently developing the BUCS software.

Commanders Update

Colonel Robert B. Rosenkranz
3d Armored Division Artillery

Colonel Raymond S. Hawthorne
24th Infantry Division Artillery

Colonel Robert B. Adair
17th Field Artillery Brigade

Colonel Walter J. Bryde, Jr.
72d Field Artillery Brigade

Colonel David L. Cole
1st Basic Training Brigade
Fort Jackson, South Carolina

Lieutenant Colonel Robert R. Zoglman
1st Battalion, 3d Field Artillery

Lieutenant Colonel Gerald W. Sharpe
1st Battalion, 38th Field Artillery

Lieutenant Colonel Martin H. Beach
6th Training Battalion
Fort Sill, Oklahoma

FA Test and Development

DESIGN • DEVELOPMENT • TESTING • EVALUATION

M825 screening smoke projectile

The US Army Field Artillery Board conducted Operational Test II for the M825 screening smoke projectile from 6 July to 11 August 1982 in order to resolve performance, logistics support, and employment issues pertaining to the M825.

The M825 is an artillery delivered 155-mm base ejection projectile designed to produce a smoke screen which will cover 125 to 250 meters of ground for a duration of 5 to 10 minutes. The round is ballistically similar to the M483A1 family of projectiles and consists of two major components — the projectile carrier and the payload. The projectile carrier contains a payload consisting of 116 white phosphorous saturated felt wedges which are ejected from the projectile by a predetermined fuze action and fall to the ground in an elliptical pattern. Each wedge becomes a point source for the smoke screen.

Based on the results of Operational Test II and Development Test II, the US Army Materiel Development and Readiness Command proposed aceptance of the M825. It was type classified on 16 December 1982; and first production is to start in July 1984, with fielding of the M825 anticipated for April 1985.

Copperhead scores high in test firing

The initial reliability demonstration of the Copperhead projectile, conducted in early 1982, was cancelled before completion since the round attained a success rate of only 67 percent — well below the specified standard of 80 percent. The demonstration was rescheduled for January 1983, but this test has been ruled unnecessary by the Department of Defense because of the excellent results scored by test rounds in recent months.

In the most recent series, Copperhead scored 12 hits in 13 firings in lot-acceptance tests at White Sands Missile Range. In addition, four more production rounds were fired; and all four hit the target, making a total of 16 direct hits out of 17 rounds fired and a success rate of 94 percent.

Since improved hardware and manufacturing techniques were incorporated in Copperhead production in recent months, the cannon-launched projectile has demonstrated an overall success rate of 87 percent. A total of 82 rounds have been fired since July, of which 65 were lot-acceptance projectiles. Each month, 13 rounds were randomly selected, environmentally conditioned, and fired to assess reliability of that month's production. The other 17 rounds fired during the period supported specific evaluations, such as how well the round performs in obscurants.

The US Army is currently working toward funding authorization to continue the production program and procure the original planned quantity of Copperhead for the inventory. Also, a number of foreign countries have shown interest in this advanced technology round.

Army receives 1000th MLRS Rocket

The United States Army recently received its 1,000th production rocket for the Multiple Launch Rocket System (MLRS) from the Vought Corporation.

The MLRS consists of a highly mobile, tracked launch vehicle and two sealed launch pod containers of six rockets each. The system's sophisticated fire control and onboard position-determining equipment allow its crew of three to fire a single rocket or a ripple of 2 to 12 rockets in less than a minute, at targets ranging to more than 18 miles (30 kilometers).

The MLRS rockets—each 13 feet long, 9 inches in diameter, and weighing more than 650 pounds—are in production at the rate of more than 70 per week. By the time the program reaches its high-rate production phase in the late 1980s, the Vought facility will produce a complete MLRS rocket every three minutes, or a total of approximately 6,000 per month. The plant was designed with a surge production capacity of up to 10,000 rockets per month should a national emergency require such rates.

The Army plans to buy a total of more than 300 MLRS launch vehicles and almost 400,000 rockets as part of the $4 billion program. The first operational unit will take to the field in early 1983.

Air conditioners procured for Pershing II

The US Army Mobility Equipment Research and Development Command (MERADCOM), is currently procuring air conditioners for use with Pershing II ground support equipment.

The air conditioners are the Army Standard 18,000 BTUH, vertical, compact model that has been updated through a product improvement program to reduce noise levels. The first 45 production units have been delivered and are now undergoing tests with the Pershing II system.

Nailing the Board

by Sergeant Major Thomas N. Kuhn

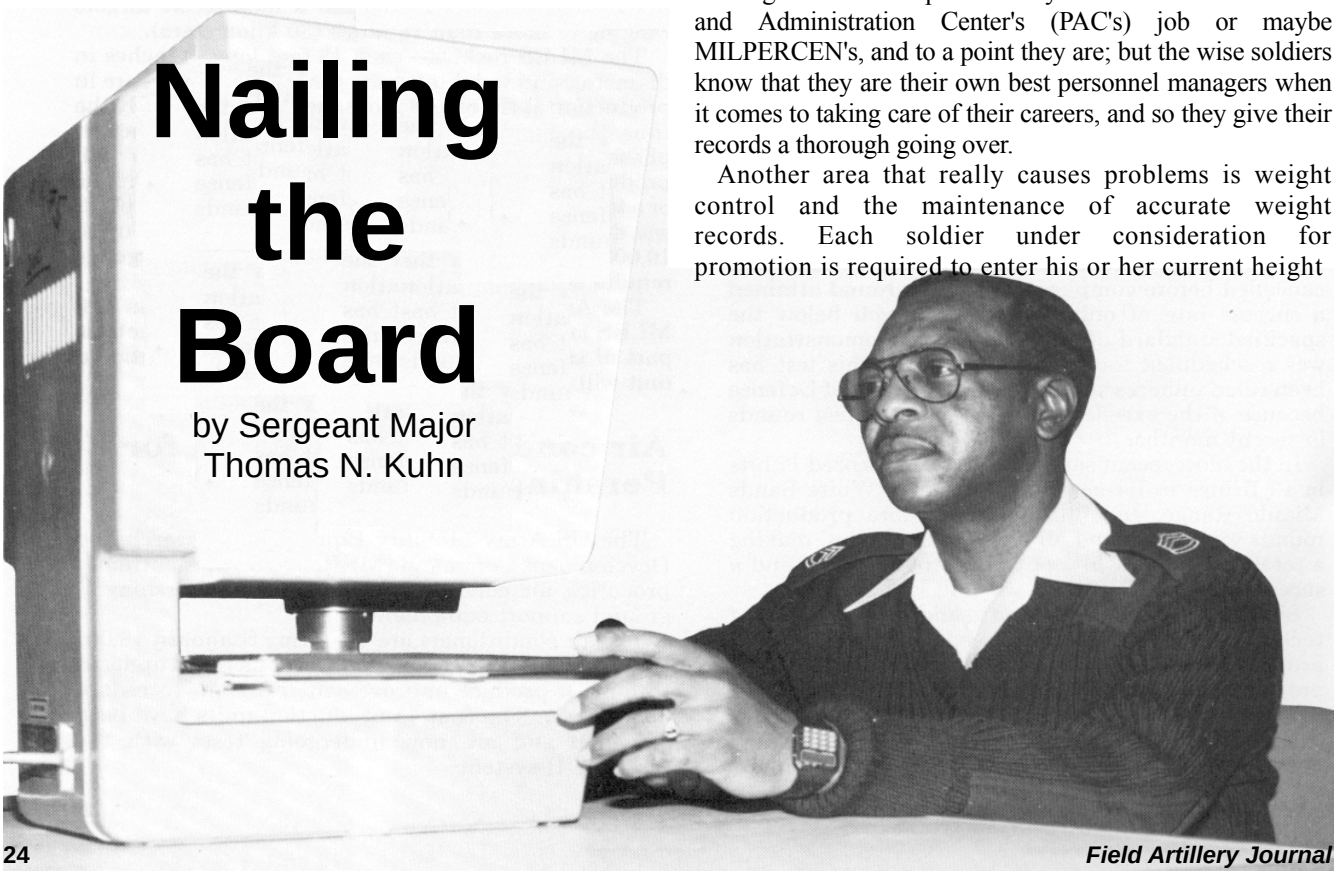
In the aftermath of every senior enlisted promotion selection board, one invariably hears the same question from those field artillerymen not selected: "Why didn't I get promoted?" The Department of the Army Centralized Selection Boards do not keep individual statistics due to the extremely large number of records reviewed, and so it is virtually impossible to answer that question for each individual. Further obscuring the answer are the three successively smaller categories of personnel from which the board makes its choice: eligible, qualified, and best qualified. The eligibles are all personnel who meet the time-in-grade and time-in-service criteria and who do not have administrative disqualifications due to approved retirements, bars to reenlistment, or their age. The qualified are those eligible personnel who have shown the potential for promotion. Since the boards are limited in the number of personnel they may select, they must reduce this group of qualified personnel to the best qualified and then select the quota authorized for promotion from this group. As a result of this process, even some of the best qualified may not be selected due to quotas necessitated by overstrength MOSs. Nevertheless, one can construct a general profile of selectees and nonqualified personnel and from it arrive at some helpful conclusions on how to improve one's chances for promotion under the centralized system.

Field Artillery selectees are consistently high performers who have had a variety of assignments, have served *early* in "tough" assignments, and have been actively involved in the day-to-day leadership and management of their units. Choosing not to sit back and rest on their laurels, they were in the barracks, in the motor pool, or out in the field, always teaching and leading the enlisted soldier and teaching and guiding their junior officers as well. In short, they were solidly involved in "sergeant's business."

On the other hand, the nonqualified personnel did just the opposite. They avoided troop duty, did little teaching or leading, did not become involved in the daily running of their unit, and did not do "sergeant's business." They did not institute an NCO Development Program for their subordinates, did not set or demand high standards of professional performance, and were lacking in their own personal standards and appearance. They declined "tough" jobs such as drill sergeant, instructor, Reserve Component duty, recruiting, and first sergeant.

Having read these profiles, a reader might still say, "I did all these things, but still I wasn't selected. Why?" One reason might be a servicemember's failure to review thoroughly and carefully his or her record. A major problem for the selection board is incomplete records. When a board is announced, the local adjutant general should prepare a packet for all eligible personnel; and each soldier must review this packet and sign it. Even after these packets are submitted, many discrepancies remain in individual records: awards and decorations are missing; efficiency reports are not posted; assignment data is out of date; MOS data is incorrect; educational data is missing or inaccurate; and many other items pertaining to the soldier are incomplete, inaccurate, or missing. These discrepancies may sound like the Personnel and Administration Center's (PAC's) job or maybe MILPERCEN's, and to a point they are; but the wise soldiers know that they are their own best personnel managers when it comes to taking care of their careers, and so they give their records a thorough going over.

Another area that really causes problems is weight control and the maintenance of accurate weight records. Each soldier under consideration for promotion is required to enter his or her current height



(Photo by James E. Williams)

and weight on DA Form 2-1 (Personnel Qualification Record) and sign and date the form. Thus, when a soldier's height and weight differs drastically from that previously recorded on his or her medical records, the disparity is readily apparent; for example, when a soldier's packet shows a growth of three or four inches since the last physical, this immediately causes suspicion of an overweight problem. Such deception shows a lack of integrity, moral courage, and self-discipline and will probably result in an individual's disqualification for promotion. The bottom line here is that AR 600-9 and physical fitness are here to stay, and everyone serious about promotion must be equally serious about weight control and fitness.

Then there is the problem of outdated and poor photographs. Photographs are required every five years, but a four-year-old photograph may not accurately portray the way the soldier looks today. A soldier in the zone for consideration for any of the centralized boards for the first time should get a new photograph made. Preparation for this official photograph is the key to influencing the action — meticulous preparation here is as important as it was for the E5 or E6 promotion board. Personnel sitting on the centralized board are normally senior field grade Field Artillery officers and either a Field Artillery command sergeant major (CSM) or sergeant major (SGM)—the same people who sat on the E5/E6 boards. They are impressed by sergeants who look like sergeants: a regulation haircut; shined brass; properly aligned ribbons and name tag; proper trouser and sleeve lengths; proper patches, chevrons, overseas and service bars; and shined shoes. One ought carefully to review the photograph before submitting it in order to make sure the image presented is the desired one. It might be wise to have the unit command sergeant major look it over as well, because those soldiers who are really concerned plan far enough in advance to get the photograph right.

So much for the problems. What about some other ways by which one can influence the action? A personal letter to the board president is authorized and encouraged. This letter should not attempt to clarify poor ratings on efficiency reports or try to explain personality conflicts; it should, however, bring out those aspects of one's previous and current performance which are not adequately reflected by the existing record. An up-to-date statement on height and weight would be a positive factor. The board will accept no third party letters, including personal commendations or recommendations from current or past superiors. It will accept data that is missing from the Official Military Personnel File (OMPF), providing that this data can be placed in the OMPF under the provisions of AR 640-10. In all cases, the local personnel staff noncommissioned officer or PAC supervisor can advise a soldier on what is allowed to be filed.

Personnel in a promotion zone or about to enter a zone should write for their OMPFs at least six months in advance of a board—requests for an OMPF can be made *only* by each individual and *must* contain name, rank, social security number (SSN), and current complete mailing address. Since these requests for OMPFs are official business, the use of government mail is authorized. Every individual should review his or her OMPF to insure that the data is complete and legible. Additionally, there have been cases when personnel with common names receive an OMPF containing data pertaining to someone else — that is why inclusion of the SSN on the request is so important and why continuous review is a necessity. If a servicemember wants to send documents for inclusion in the OMPF, he or she should insure that it is an authorized inclusion, that it contains the correct name and SSN, and that it is an original document or copy which will reproduce clearly on microfiche. Since these documents will not be returned, the soldier ought to retain a copy until the document has in fact been added to the microfiche file.

The bottom line is that a senior enlisted field artilleryman whose file supports promotion will more than likely be selected for promotion. A file not up-to-date or seriously lacking in pertinent information makes one's chances for selection poor at best. Personnel sitting on the boards do not have a crystal ball and cannot visualize how good or bad a soldier is from a poorly documented file. The OMPF represents an individual's service record, and it is the individual's responsibility to make sure it does the job.

A copy of the performance and service data microfiche is available for review from the Commander, US Army Enlisted Records Center, ATTN: PCRE-RF-I, Fort Benjamin Harrison, Indiana 46249. The wise field artillery senior enlisted personnel will not hesitate, but will write now and insure that their OMPFs are accurate. To use an old phrase, "Be all you can be," not only in person but on paper as well.

Schedule of Enlisted Boards	
Master Sergeant Standby Board	15-16 Feb 83
Sergeant Major's Academy Board	29 Mar-15 Apr 83
CSM/SGM/CSM Retention Board	7-23 Jun 83
Sergeant First Class Standby Board	12-15 Jul 83
Master Sergeant Board	2-26 Aug 83
Sergeant First Class/Advanced Noncommissioned Officer Education System Board	4 Oct - 14 Nov 83
Sergeant Major Standby Board	7-8 Dec 83

Sergeant Major Thomas N. Kuhn is the senior enlisted member of the Field Artillery Proponency Office at Fort Sill, Oklahoma. Sergeant Major Kuhn has held a variety of assignments, including Chief, Field Artillery Branch, Enlisted Personnel Directorate, MILPERCEN, Department of the Army; NCOIC, Enlisted Personnel Management, Adjutant General Division, Fort Sill; NCOIC, Personnel Management Division, 199th Personnel Service Company, Korea; chief instructor of the Personnel Specialist Course and member of the 1st Signal Brigade Personnel Management Assistance Team in Vietnam; and the Consolidated Military Personnel Activities (COMPACT) Sergeant Major, Fort Sill.

Le Roi des Batailles:

THE DECISIVE ROLE OF THE ARTILLERY AT DIEN BIEN PHU

by First Lieutenant John A. Hamilton, Jr., and Mr. Larry M. Kaplan

You must take care to choose an elevated position, in order to fall upon the enemy with greater advantage. But the most important point is not to gather your army on a plain situated at the foot of a mountain which the enemy might be able to occupy unimpeded; for with his artillery he would crush you from the neighboring heights; in vain would you try to prevent his batteries from hitting you ceaselessly and without impediment. Embarrassed by your own troops, you would find it impossible to harm him.

Machiavelli
The Art of War, Book IV

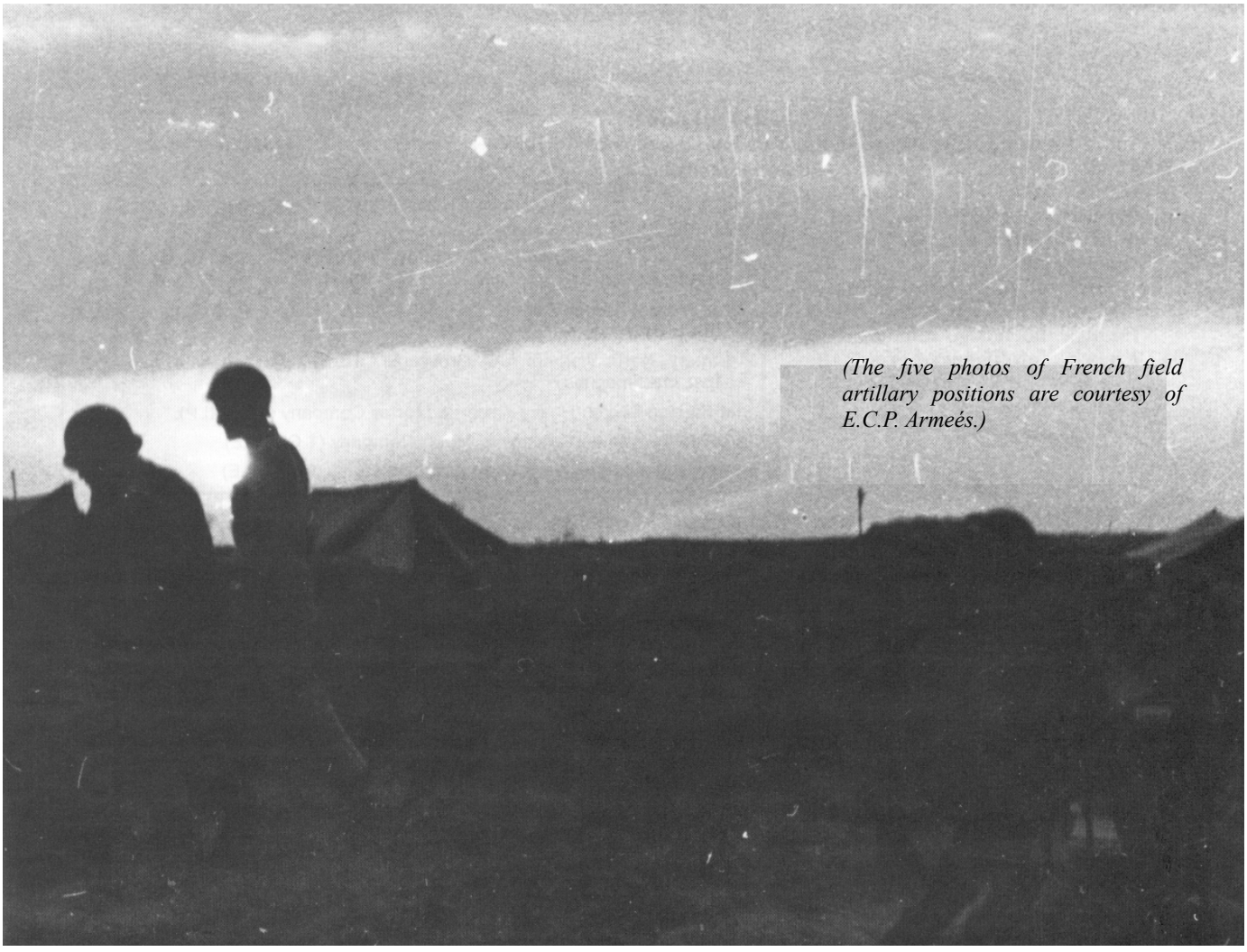
Some historians claim that Dien Bien Phu was the decisive battle of the first Indo-Chinese War (1946-1954) because the Viet Minh defeat of the French just before the 1954 Geneva Peace Talks had wide-ranging military and political effects which have been the subject of more scrutiny than the battle itself. Of the many military lessons, the decisive effect of the Viet Minh's large scale employment of field artillery deserves a closer examination.

When the French returned to regain their former Indo-Chinese possessions at the end of World War II, they became involved in a long, arduous military campaign against Ho Chi Minh's guerrillas. By 1953, Vo Nguyen Giap, history professor turned general, was enjoying considerable success against the French in northern Vietnam. The Viet Minh were growing in strength, forming division-sized units and gaining increasing control of the territory—Giap's purely guerrilla command grew to include six infantry divisions, one heavy division of artillery, and some engineer units.

The Commander in Chief of French Indo-Chinese forces, General Henri-Eugene Navarre, became alarmed when Viet Minh operations threatened existing French outposts in northern Vietnam, many of which could only be supplied by air. As the French situation deteriorated, Navarre believed that the way to salvage French hegemony and stop the spread of Viet Minh activity was to take the offensive against Giap's forces.

Dien Bien Phu, located near the Laotian border approximately 220 miles west by northwest of Hanoi, consists of a broad expanse of flatland ringed by crests five and six miles from the center of the valley. Viet Minh units based at Dien Bien Phu were conducting operations into Laos (a French Union member) and held two of the many pre-World War II French airfields. Navarre's plan was to launch an airborne assault on Dien Bien Phu to reopen the airfields, fortify the valley, and use it both as a base for offensive operations and as a block against further Viet Minh activity into Laos. Unfortunately, Navarre's plan grossly underestimated the artillery capabilities of the Viet Minh and foredoomed the French plan before the first paratrooper hit the ground.

Prior to the battle of Dien Bien Phu, the Viet Minh had sporadically used old Japanese 75-mm and old Chinese 57-mm and 75-mm weapons. But Giap's forces received American 75-mm pack howitzers and American 105-mm howitzers from the Red Chinese, who had captured them during the Chinese Civil War and the Korean War. In addition, the Red Chinese



(The five photos of French field artillary positions are courtesy of E.C.P. Armeés.)

trained numerous Viet Minh units in China and sent advisors and instructors to Giap's army to teach his fledgling artillerymen the basics of fire direction and observed fire techniques.

The Viet Minh's acquisition of modern howitzers and their training did not go unnoticed by French intelligence. Yet, the overwhelming French faith in their abilities, specifically their airpower, led the French to dismiss this threat—a blunder later paid for by the blood of French Union soldiers.

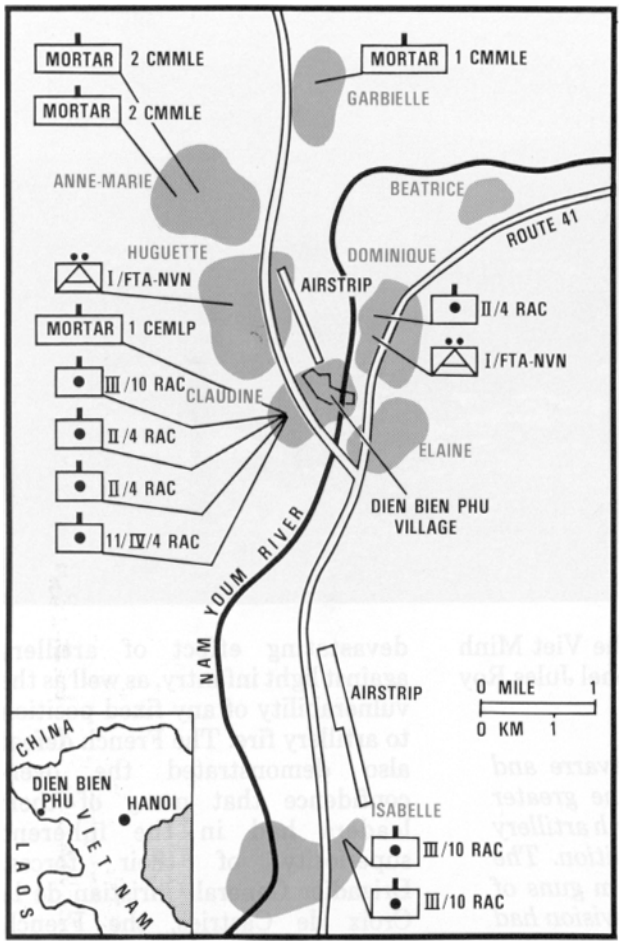
Navarre's attack on Dien Bien Phu began on 20 November 1953, but the bulk of the Viet Minh 312th Division was not present. Unknown to French intelligence, artillery and mortars from the Viet Minh 351st Heavy Division were already in Dien Bien Phu, with more units on the way. Ironically, the Viet Minh considered the valley as an excellent artillery firing range.

The French paratroopers jumped into the Dien Bien Phu valley and were able to consolidate their base. With the first wave jumped two batteries of 75-mm recoilless rifles of the 35th Airborne Light Artillery Regiment (they did not recover their pieces until after the initial fire fights) and the 120-mm mortars of the 1st Foreign Legion Heavy Airborne Mortar Company. Ultimately, French artillery assets would reach a total of four American 155-mm howitzers (towed), 24 American 105-mm howitzers (towed), 32 120-mm heavy mortars, and some 81-mm mortars organic to the various infantry units. (Table 1 shows the order of battle of the French artillery units.)

Table 1. Order of battle of French artillery units posted to Dien Bien Phu (1953-54)

3d Group, 10th Colonial Artillery (III/10 RAC), three batteries of 105-mm howitzers.
2d Group, 4th Colonial Artillery (II/4 RAC), three batteries of 105-mm howitzers.
11th Battery, 4th Group, 4th Colonial Artillery (11/IV/4 RAC), four 155-mm howitzers.
I Battery, North Vietnam AAA Group (FTA-NVN), two sections of quad .50-caliber machineguns.
1st Foreign Legion Heavy Airborne Mortar Company (1 CEMLP).
1st Foreign Legion Composite Motar Company (1 CMMLE).
2d Foreign Legion Composite Mortar Company (2 CMMLE)

Opposing the French artillery were the 154th and 345th Artillery Battalions of the Viet Minh infantry divisions, as well as various other assigned artillery units fielding 75-mm recoilless rifles, 75-mm pack howitzers, and 82-mm and 120-mm mortars. The bulk of the Viet Minh artillery assets were from the 351st Heavy



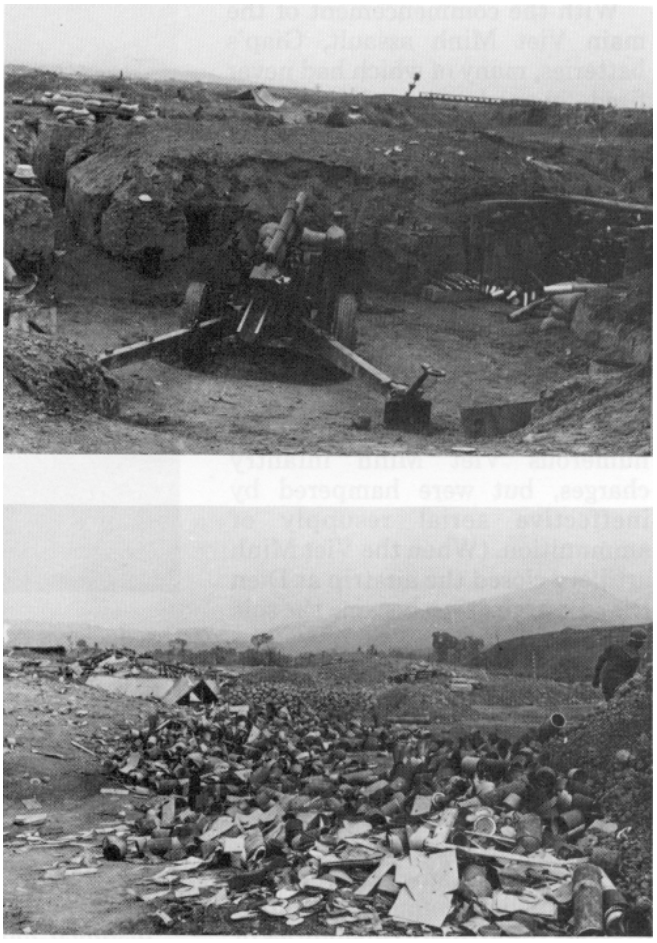


Figure 1. French defense points at Dien Bien Phu (1954).

Division, consisting of the 237th Heavy Weapons Regiment (40 82-mm mortars), the 45th Artillery Regiment (24 105-mm howitzers), the 675th Artillery Regiment (15 75-mm pack howitzers and 20 120-mm mortars), the 367th Antiaircraft Regiment (20 37-mm antiaircraft and 50 .50 - caliber antiaircraft guns), and a rocket unit armed with 16 Katyusha rocket launchers. Indo-China authority Bernard Fall has estimated that the Viet Minh artillery outnumbered the French artillery by four to one.

Giap's regular forces soon moved into the area, surrounding and sealing off the French garrison, leaving it logistically dependent on its overtaxed Air Force. French intelligence reported the movement of large numbers of Viet Minh artillery and again confirmed the existence of American 105-mm howitzers in the Viet Minh inventory. Surprisingly, neither Navarre, who was headquatered in Saigon, nor his northern commander Major General Rene Cogny, who was headquartered in Hanoi, appeared very concerned about these developments. Cogny and Colonel Charles Piroth, the artillery commander and second senior officer at Dien Bien Phu, were both artillerymen; but neither expected any difficulties from the Viet Minh artillery, believing that the Viet Minh could not transport more than 25,000 rounds of ammunition into Dien Bien Phu with the French Air Force interdicting their ammunition trains. In fact, the Viet Minh, through extreme resourcefulness and the back-breaking labor of thousands of coolies, transported howitzers and more than 300,000 rounds of artillery ammunition into the hills surrounding Dien Bien Phu. The success of the incredible Viet Minh supply effort even surprised Giap, whose own logisticians were far from confident they could supply the force that was gathering around the French base *aero-terreste* (air head).

The French gunners, including General Cogny and Colonel Piroth, also did not believe that the Viet Minh artillery could hit their installation in the valley from positions behind the crests of the surrounding mountains. The French assumed that the crests were sufficiently remote from the center of the valley to prevent a trajectory which would successfully target the valley. Piroth believed he could destroy any gun set up on the front of a crest with his 155-mm battery and stated more than once that he could destroy any Viet Minh gun that fired more than three rounds.

In early March 1954, Giap's troops were ready to launch their main assault. After months of preparation the Viet Minh had moved into the area more guns, more supplies, and more ammunition than the French Air Force could fly into the garrison. Even with borrowed US C-119 transport aircraft, the French Air Force experienced increasing difficulty in both supplying the garrison and locating the Viet Minh positions.

With the commencement of the main Viet Minh assault, Giap's batteries, many of which had never fired, opened up on the French position—particularly on their guns and airfield. French observation posts were methodically captured, and Red Chinese antiaircraft guns and crews greatly limited the French use of spotter planes; consequently, Piroth's gunners were unable to acquire and attack many of the Communist gun batteries. They did acquit themselves well in breaking up numerous Viet Minh infantry charges, but were hampered by ineffective aerial resupply of ammunition. (When the Viet Minh artillery closed the airstrip at Dien Bien Phu, airdrops became the sole source of French supply. The French Air Force was unable to airdrop the required tonnages and lost an estimated 20 percent of what it did drop to the Viet Minh.)

The fierce counterbattery duels exacted a heavy toll in French lives and ammunition stocks. Piroth, the French artillery commander, failed to assess the artillery capabilities of the Communists and thus neither dug in his guns nor obtained additional artillery pieces when he had the opportunity. The French gunners took severe casualties early in the battle, and the commander was soon without qualified fire direction center teams and gun crews. Eventually, French artillerymen who were not jump-qualified were forced to parachute into the area. (In light of his own blunders and the devastating cost the French garrison was paying, Colonel Piroth took his own life with a hand grenade during the battle.)

The devastatingly effective Viet Minh artillery destroyed the French strongpoints one by one, until by 7 May all of the French outlying strongpoints (figure 1) had been overrun and a final Viet Minh surge had overwhelmed starving defenders who were down to their last round of ammunition. Seventy-five percent of all French casualties had been inflicted by the Viet Minh batteries which the French artillerymen had been unable to silence. In summing up

the decisive role of the Viet Minh artillery, French Colonel Jules Roy later wrote:

> *Unknown to Navarre and Cogny, by 1954 the greater part of the Viet Minh artillery was already in position. The regiment of 105-mm guns of the 351st Heavy Division had installed most of its 24 guns under yards of rock without being observed.*
>
> *Giap even treated himself to the luxury of establishing dummy emplacements to draw French fire. If Cogny had known this, he would have given orders for the guns of the entrenched camp, which were installed out in the open, to be buried, and Piroth would no longer have said he had too many guns; he would have asked for three times as many.*

The fall of Dien Bien Phu marked the virtual end of French control over Indo-China. The battle reaffirmed the decisive and devastating effect of artillery against light infantry, as well as the vulnerability of any fixed position to artillery fire. The French defeat also demonstrated the over-confidence that many of their leaders had in the inherent superiority of their forces. Brigadier General Christian de la Croix de Castries, the French commander at Dien Bien Phu, later noted, "Our defense had been founded on the fact that planes would be able to detect and destroy the (Viet Minh) guns." The French placed too much faith in their Air Force, which was unable to make up for a deficient artillery capability.

In the final analysis, General Giap understood the importance of artillery and forced his logisticians to move his guns and the vast stores of necessary ammunition through the jungle to the valley of Dien Bien Phu. Had the French made a similar attempt to effectively deploy and employ their artillery assets, the decisive battle of the First Indo-Chinese War might have had a different outcome.

1LT John A. Hamilton, Jr., is the adjutant for the 1st Battalion, 5th Field Artillery, Fort Riley, Kansas. He received his B.A. in journalism from Texas Tech University and an A.A. from New Mexico Military Institute. He has served as a headquarters battery commander, an S4, and a FIST chief.

Mr. Larry M. Kaplan received his B.A. in American history from Ohio Wesleyan University, his M.A. in American military history from Ohio State University, and is currently working toward a Ph.D. in American history from Kansas State University. He is also a broker, dealing with items of military historical interest.

Redleg Newsletter

ITEMS OF GENERAL INTEREST

New DA Pamphlets for officer specialty codes

Published in April 1982, a series of DA Pamphlets — 600-3-11 through 600-3-97 — describe the specialty codes for commissioned officers. There is a pamphlet for 35 of the 36 officer specialty codes, and these pamphlets describe the duties officers perform in each specialty and the types of training offered at service schools.

The pamphlets will aid career managers, trainers, instructors, field commanders, and individual soldiers in their recruiting, professional development, and counseling efforts.

The pamphlets also discuss career progression and list the types of assignments that officers can expect to receive. Each pamphlet is illustrated with color photographs of officers performing typical duties in their specialties.

In May and June 1982, the pamphlets were distributed worldwide to all active Army units, Reserve Components headquarters, the US Military Academy, all ROTC regional headquarters, the Branch Immaterial Officer Candidate Course, and MILPERCEN. Additional copies of the pamphlets can be ordered through local AG publications channels by specialty; e.g., the pamphlet for Infantry, Specialty Code 11, can be ordered as DA PAM 600-3-11.

For more information concerning the pamphlets, contact MILPERCEN, DAPC-OPA-C, AUTOVON 221-0250.

Stabilizing compassionate reassignments

An enlisted soldier may be eligible for compassionate reassignment when illness, death, or extreme and unusual family circumstances make it necessary for the soldier to be with his or her family. A compassionate reassignment is granted when no possibility exists for resolving family difficulties without the soldier's actual presence. MILPERCEN is the final approval authority for such an assignment.

When soldiers are reassigned for compassionate reasons, the assignments will be made to the military installation or facility closest to the place where the soldier's family problem exists. At this point, the soldier is stabilized, or ineligible for reassignment for 12 months unless the situation is resolved sooner. The period of stabilization will not be extended under any circumstances.

An assignment eligibility and availability (AEA) code of "S" is given to soldiers whose assignments are being stabilized. Usually, the period of stabilization dates from the day the Compassionate Review Board approves the soldier's request. The termination date of the "S" AEA code is the date a soldier becomes eligible for reassignment, or the date the stabilization terminates after 12 months.

Military Personnel Officers are responsible for identifying those soldiers whose problems are resolved before the period of stabilization ends and should inform MILPERCEN that these soldiers are available for reassignment. It is important to note, however, that termination of the stabilization period and withdrawal of the "S" AEA code do not necessarily mean that the soldier will be immediately reassigned.

For more information, contact MILPERCEN, DAPC-EPA-C, AUTOVON 221-7730.

New drug penalties

Military legal officials have given commanders more disciplinary authority over drug offenders. Under new rules, certain common drug-related offenses can now result in a dishonorable discharge, reduction to the lowest enlisted grade, loss of pay and allowances, or confinement at hard labor for 15 years. The rules were contained in Executive Order No. 12383, which became effective 1 October 1982.

In addition, confinement and forfeiture can be increased by five years if the military member commits a drug offense at a missile launch facility, aboard a vessel or aircraft, in a hostile-fire pay zone, or in time of war. The penalty also can be increased if the offense was committed while on lookout or guard duty.

The new rules apply to military personnel who wrongfully distribute, possess, use, or manufacture certain types of drugs. These new judicial rules also standardize maximum possible punishments between the services and bring maximum permissible military sentences in line with those authorized by Federal civilian courts.

Misconduct

The criteria for separations for misconduct have been broadened to include minor disciplinary infractions, patterns of misconduct, and serious offenses.

In the past, separation criteria were quite specific in areas such as AWOL, indebtedness, or child abuse; but now commanders have greater latitude in determining whether a soldier's conduct warrants separation action.

A new chapter on defective enlistments has been incorporated for processing erroneous, minority (under age 17), and fraudulent entry separations, as well as separations for breach of enlistment contracts. Previously, fraudulent entry was included under "misconduct" while erroneous enlistments and breach of contract were under "convenience of the government" separations.

Personnel needed for MOSs 13M and 15D

With the advent of the Multiple Launch Rocket System (MLRS), personnel in military occupational specialty (MOS) 15D (Lance crewmember/MLRS sergeant) are required to become proficient in the operation of the MLRS, whose tactics and deployment are similar to the Lance systems.

The MOS for the MLRS is 13M, which progresses through sergeant level and then merges into MOS 15D at staff sergeant level. This merger, based on a logical progression and the tactical similarities of the two systems, helps to alleviate a space imbalanced MOS. The Department of the Army MLRS Personnel Plan calls for volunteer noncommissioned officers (NCOs) to be trained and reclassified into 15D to provide backfill for those 15D NCOs drawn out to fill MLRS positions. Once there has been time to train NCOs in MOS 13M, those positions will be filled by 13M sergeants.

Thus far, sufficient personnel have not volunteered to allow optimum manning of both systems. Through FY84, there is a projected requirement for 217 15D NCOs for the MLRS only; through FY88, there is a requirement for 416 NCOs in support of MLRS only. To assist in the immediate future, there are approximately 93 excess CMF 16 soldiers who will be trained and reclassified into MOS 15D. They will go to Lance units and eventually will be assigned to MLRS units.

The combination of the MLRS and Lance MOSs allows more flexibility in the assignment of personnel. Instead of the Fort Sill-Germany seesaw, NCOs in MOS 15D will be eligible for assignments throughout the United States as well as to overseas locations other than Germany. (SGM Thomas N. Kuhn, Field Artillery Proponency Office)

SMART!

An Army program called SMART (Supply and Maintenance Assessment and Review Team) makes life a little easier for people working in Army supply and maintenance. The goal of the project is to identify and eliminate directives and procedures that create burdens on Army organizations, especially motor pools, maintenance shops, and supply rooms. The team goes to selected Army posts and searches out problem areas; for example, SMART project managers may look at reports filed by a unit motor pool sergeant and ask: Where do these reports go? Who uses this information? Is it duplicated elsewhere? Has the Army created barriers to obtaining necessary parts and supplies; if so, how can these barriers be eliminated?

For suggestions and ideas, SMART depends on people who know where the problems are — motor sergeants, supply clerks, comanders, Department of the Army civilian supply personnel, and US Army service schools. To date, soldiers and civilians have submitted more than 400 suggestions. Experts evaluate the suggestions and test them; and then they are implemented immediately, or sent to the field as a take-it or leave-it suggestion, or rejected. When a suggestion is rejected, a letter of explanation goes to the person who submitted the idea.

The primary test site for SMART suggestions is the 24th Infantry Division, Fort Stewart, Georgia. The division is now testing some 25 initiatives, ranging from simplified maintenance checks to new uses of automatic data processing equipment. For example, one test involves the use of computer processing technology to improve the speed and accuracy of a maintenance shop's bookkeeping functions. In another test, soldiers are setting up a supply warehouse with optical scanners that can read "bar code" information—like the kind used in grocery stores—imprinted on various items.

SMART suggestions should concern Army-wide supply and maintenance procedures—not those with strictly local application. When it is decided that a suggestion has Army-wide application and should be implemented, SMART releases a special message to Army activities around the world.

The Army needs good ideas from soldiers and civilians; no special forms are required, and the suggestion may be handwritten. Send to:

SMART
US Army Logistics Center
ATTN: ATCL-ST
Fort Lee, VA 23801

Overpacking

Soldiers being transferred overseas who plan to catch a military airlift command (MAC) flight are limited on the amount of baggage they can take.

According to the current MAC rules, soldiers are allowed two pieces of check baggage and one carry-on item that must fit under the seat. Each piece, whether checked or carry-on, must weigh no more than 70 pounds and be within certain dimensions. An exception is the duffle bag, which counts as one piece even though it exceeds the 62-inch limit.

MAC officials say that passengers who exceed any of the limits of weight, size, or number will be charged a penalty for the excess. Officials noted, for example, that soldiers traveling to Germany can expect to pay $35 to $40 for each unauthorized piece of luggage.

Claim damage raised on household goods

Soldiers planning to move their belongings to a new duty station should note that the maximum amount that can be paid on claims for loss or damage to household goods has been raised to $25,000.

The increase from $15,000 is the result of an amendment to the Military Personnel and Civilian Employee's Claims Act of 1964. Portions of this act also cover certain other types of property losses related to incidents while in the military. The change in payments for household goods losses applies to loss or damage that occurred on or after 28 July 1982.

If a soldier is planning a move, his or her transportation counselor can best explain all changes in allowable claims.

Changes in drill sergeant assignment procedures

Under new personnel rules, Army noncommissioned officers selected for drill sergeant duty will not be given a permanent assignment until they have successfully completed drill sergeant training. In the past, a soldier picked for drill sergeant duty would receive permanent change-of-station (PCS) orders to either an Army training center or the retraining brigade at Fort Riley, Kansas. The gaining command would send the soldier to drill sergeant school as soon as possible. If the soldier did not pass the training, the command would be faced with keeping an unqualified drill sergeant or paying for a PCS move sooner than normal. The unqualified drill sergeant, if retained, would count against the command's authorized number of drill sergeants.

Now, a selectee for drill sergeant duty will attend the training and return to his or her original assignment. MILPERCEN then will issue instructions for a permanent assignment to insure that Army training sites have only qualified drill sergeants. The change will affect mainly soldiers based in the continental United States. Overseas soldiers picked up for drill sergeant duty will be given PCS orders to a training site, with instructions to attend drill sergeant school en route or upon arrival. The school consists of three weeks of orientation and eight weeks of specialized training.

Flight training

Commissioned officers who wish to enter the field of Army Aviation may do so if they qualify and participate in the Army's flight training program. During the next fiscal year, approximately 80 openings in flight school will be available for officers currently on active duty who have less than 48 months of active Federal commissioned service. They must pass a Class 1A flight physical and score a minimum of 90 on the Flight Aptitude Selection Test.

Applications go to the Aviation Flight Training Selection Board, which will be held on 1 April, 1 July, and 1 November in 1983. Officers interested in applying should read AR 611-110, Selection and Training of Army Aviation Officers, before submitting applications through command channels to:

Commander
US Army Military Personnel Center
ATTN: DAPC-OPE-V (for SC 15 - Aviation)
or
DAPC-OPG-T (for SC 71 - Aviation)
200 Stovall Street
Alexandria, Virginia 22332

Once selected, the officer is sent to Fort Rucker, Alabama, for nine months of flight training. Upon successful completion of flight school, the officer will receive an aviation specialty and will be assigned to an operational flying position.

Interstate bus lines offer discounts

The National Bus Traffic Association has announced a program of discount leave fares for active-duty military personnel and their dependents traveling on leave between states within the forty-eight continental United States.

Sixty-four bus companies will participate in the new discount fare. Leave fare discounts range from 25 to 40 percent as follows:

- Twenty-five percent discount when standard interstate fare is between $40 and $60.
- A flat $45 discount when standard interstate fare is between $60 and $75.
- Forty percent discount when standard interstate fare is over $75. Discount fares will be rounded to the next highest $5.

To receive a discount, all dependents must travel with their active-duty sponsor. Dependents of age 5 and under may travel free. Military do not have to be in uniform to take advantage of leave fare discounts, but members and dependents must show some identification cards.

The military discount applies only for interstate (between states, not within states) travel. Discounts are also available to uniformed US Coast Guard personnel, service academy cadets, and their bonafide dependents.

Increased use of this discount fare adds to the viability of the program. Therefore, the military are encouraged to take advantage of the new low cost fare.

Retirement versus promotion

Some senior field artillery noncommissioned officers who have submitted their applications for voluntary nondisability retirement and have received approval find themselves in a dilemma when the zones of consideration for the next DA Centralized Promotion Selection Board are announced. If they fall in the zone, they feel they should request withdrawal of their retirement so they can compete for promotion. However, even if a retirement is withdrawn, the soldier is not eligible for consideration by the upcoming board and will not gain eligibility until the next board. There are many reasons for this break in eligibility, but the major one is that the soldier has been counted as a loss to the Army in the computation of the numbers of promotions to be made. If senior field artillery noncommissioned officers with approved retirements were allowed to withdraw their retirements prior to an announced board in order to achieve promotion consideration eligibility, it is probable that other deserving soldiers would not get promoted due to a lower percentage of promotions in a given military occupational specialty (MOS). Therefore, senior field artillery noncommissioned officers considering retirement should think hard and long before submitting a retirement application if they suspect they may be coming into or know they are in the zone of consideration for promotion.

You and Your RC:

The Strength of the Reserve

by Major Michael H. Howell and Captain Lee F. Kichen

Exposure in the *Field Artillery Journal* has taught members of the field artillery Active Component (AC) to recognize the needs and achievements of their fellow field artillerymen in the troop program units of the Army National Guard (ARNG) and US Army Reserve (USAR). All the same, too few Active Component field artillerymen understand the total strength of the Reserve Component bench behind the starting line-up. Two significant but frequently overlooked variables of the Total Force equation are the Individual Ready Reserve (IRR) and the Retiree Mobilization Program (RMP), and the following overview of these Reserve Components (RC) non-unit personnel assets will reveal their importance to the Field Artillery Collective Manpower Force.

Individual Ready Reserve

The IRR consists of some 224,000 reservists in one of the following control groups:

- ***Annual Training***—This group includes 55,700 reservists who are serving their initial statutory obligation, normally have less than three years active duty, and are subject to two weeks of annual mandatory training.
- ***Reinforcement***—This is the largest of the three groups with its 160,600 members, and is composed of reservists who have completed three years' active duty and are either completing their six-year statutory obligation or have completed their obligation but have agreed to serve as "citizen-soldiers."
- ***Individual Mobilization Augmentees***—This group includes approximately 7,600 reservists who are preassigned to authorized key positions with Department of Defense and Active Component agencies and units. The bulk of these positions are at the US Army Training and Doctrine Command service schools, US Army Forces Command installations, the Continental United States Armies, US Army Materiel Development and Readiness Command, selected overseas commands, and Headquarters, Department of the Army. There are 40 such positions at the Field Artillery Center. Reservists in this control group serve two weeks annually in their "mobilization for war" positions and will report to their pre-assigned organization and position upon mobilization.

The Field Artillery Collective Manpower Force's post-mobilization requirements for the Individual Ready Reserve are scenario-dependent. Based on full mobilization, IRR personnel will be assigned to forward-deployed units as well as deploying and non-deploying Continental United States units, both Active and Reserve. In many cases, IRR personnel will report to their mobilization stations earlier than many Army National Guard and US Army Reserve troop program units.

Currently, there are approximately 3,200 IRR officers with Field Artillery (13) as their skill specialty identifier and approximately 10,500 enlisted personnel who are managed within the Field Artillery Career Management Field. Personnel management officers and personnel management noncommissioned officers at the Reserve Components Personnel and Administration Center in St. Louis are responsible for the pre-mobilization career management and training placement of field artillerymen in the IRR. They provide timely counseling on career development and training opportunities and monitor the reservist's duty performance to insure that they prepare for mobilization through peacetime training.

The cornerstone of the IRR's highly successful personnel management system is counterpart training, which enhances the reservist's military skills through intensive training with Active Component organizations. For a field artilleryman, counterpart training means a 90 percent chance of attachment to an Active Component field artillery organization to perform specialty skill identifier 13 or career management field 13 functions. These attachments normally last two to four weeks and range from the division artillery or battalion level for field grade officers to crew level for junior enlisted reservists. Training in an Active Component environment provides the reservist with meaningful pre-mobilization training that exposes the reservist to modern field artillery weapons systems and current tactical doctrine and facilitates the post-mobilization transition of a civilian to a full-time soldier. The reservist is usually attached to the Active Component field artillery unit closest to his home, with emphasis on those units that are conducting intensive technical and tactical training or undergoing an Army Training and Evaluation Program, command post exercise, or field training exercise. Formal and informal feedback from the units and the reservists show that, to be most effective, the host Active Component unit commander must provide the reservists with rigorous training in field artillery skills. Upon mobilization, Reserve and Active Component soldiers will be functioning as equals within the total field artillery force; therefore, the AC commander is doing himself and the reservist a disservice if he fails to utilize the reservist in a meaningful position during counterpart training.

(Photo by PV2 Kendal W. Carlson)

Another facet of the IRR professional development is institutional training—the IRR field artilleryman is afforded the same schooling as his active counterpart. The Reserve officer, while on Active or Reserve status, pursues the Field Artillery Officer Basic and Advanced Courses, the Combined Arms Staff Service School, and the Command and General Staff Officer Course. On the other hand, the enlisted field artillery reservist follows an educational track prescribed by the Noncommissioned Officers Education System. (Selected field artillery reserve noncommissioned officers may also attend the Sergeants Major Academy.) As a result of the field artillery reservists' military education, the AC commander is assured of receiving RC personnel with training commensurate with their grade.

Retiree mobilization program

The second element of the Field Artillery Collective Manpower Force is the Retiree Mobilization Program. During full mobilization, the Army would face a personnel shortfall; and retirees, by virtue of their numbers and broad military experience, are key mobilization assets to counter this problem. These retired personnel would serve at Continental United States stations to insure efficient operation of these installations and to release active duty personnel for other assignments. Approximately 1,500 specialty skill identifier 13 positions have been identified for fill by retired field artillery officers. More than 2,000 retired field artillery enlisted personnel have been issued pre-assignment orders to full mobilization duty stations by the Reserve Components Personnel and Administration Center. At this time, only selected Regular Army retirees are being issued pre-assignment orders which are automatically validated upon mobilization. Reserve Component (Army of the United States/United States Army Reserve) and Regular Army retirees who are not selected for mobilization assignments may volunteer during peacetime for any unfilled positions for which they are qualified. Current policy also authorizes installation/activity commanders to recruit volunteers to fill appropriate vacant positions. Selected Reserve Component retirees who are not volunteers will be issued contingent pre-assignment orders prior to mobilization to designate their post-mobilization duty station in the event of national emergency.

Upon Congressional declaration of war or emergency and with the concurrence by the Secretary of Defense and the Secretary of the Army that retired reservists are needed, mobilization orders will be published establishing a reporting date and confirming the location stated in the previously published contingent pre-assignment orders. If proposed legislation becomes law, Army of the United States officer retirees (Reserve officers with 20 or more years of active duty) will also be eligible for pre-assignment orders which become valid upon mobilization. Contingent orders would still be issued to selected United States Army Reserve retirees.

Typical retiree mobilization assignments include TRADOC/FORSCOM installations which will operate under a post-mobilization surge. Other positions are those found on the tables of distribution and allowances (TDAs) at various directorate or special staff levels. Installation commanders may assign retirees to civilian positions for up to 90 days (and beyond 90 days with the approval of Headquarters, Department of the Army). Additionally, the installation/activity commander has the latitude to cross-level assignments as needed.

All Army retirees are classified in three categories, and only Categories I and II have received pre-assignment orders.

- ***Category I***—Those personnel who have been retired less than five years, meet age and grade criteria, and are physically qualified for recall to active duty.
- ***Category II***—Those individuals who have been retired five years or more and who meet age, grade, and physical criteria.
- ***Category III***—Those individuals who do not meet age and grade criteria or those who are physically disqualified for recall to active duty or are exempt by Department of the Army policy.

The age ceiling for grades other than general officers is 62 years old for warrant officers, and 60 years old for all other personnel. General officer assignments, regardless of age, will be determined on a case-by-case basis by the Army Chief of Staff.

The Individual Ready Reservist and the retiree are valuable assets to the Army and its Field Artillery Collective Manpower Force — in the event of mobilization, they will augment the Active Component officers and cannoneers. Through peacetime counterpart training of the IRR and post-mobilization utilization of the retiree, these individuals give the Field Artillery Collective Manpower Force an impressive, strong bench!

MAJ Michael H. Howell, FA, AGR, was commissioned through the ROTC at the University of Oklahoma. He is currently assigned to the Directorate of Training Developments, US Army Field Artillery School, Fort Sill, Oklahoma, as the Review of Education and Training for Officers (RETO) Reserve Component (RC) coordinator. Prior to this assignment, he was a personnel management officer in the Field Artillery Branch at the US Army Reserve Components Personnel and Administration Center. He is a graduate of the Command and General Staff College and has held various command and staff positions with the US Army Reserve.

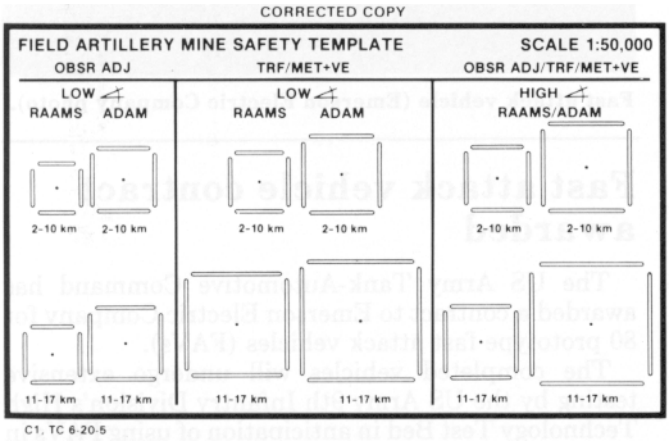
CPT Lee F. Kichen, AR, was commissioned through the ROTC at the University of Massachusetts. He is currently assigned to the 2d Infantry Division, Korea, as the G3 Exercise Officer. Prior to this assignment, he was a personnel management officer in the Armor Branch at the US Army Reserve Components Personnel and Administration Center. He is a graduate of the Command and General Staff College, has masters degrees in Sociology and Corrections and in Criminal Justice, and has served with the 3d Armored Cavalry Regiment. He has held various command and staff positions with the Washington Army National Guard and with the US Army Reserve.

View from the Blockhouse

FROM THE SCHOOL

WARNING!!

TC 6-20-5, *Field Artillery Delivered Scatterable Mines,* was issued with a commercially produced safety template which has been found to contain significant errors—errors which, if one were to follow the instructions as printed, could cause bodily harm to friendly troops. The Field Artillery Mine Safety Template should be removed from the back of the TC and destroyed. Users of TC 6-20-5 can use the tables in appendix D, "Safety Zone Determination," to construct minefield safety zones, pending their receipt of Change 1 to TC 6-20-5 which will include a corrected copy of the template. Users should insure that the new template has the words "CORRECTED COPY" at the top center of the template. Distribution of Change 1 commenced at the end of August 1982 in accordance with DA Form 12-11A, "Requirements for Field Artillery Cannon Battalions and Batteries."



Reduced version of corrected template (not to scale).

Nuclear and chemical training

Reports from the field indicate that there is a shortage of company grade officers with the additional skill identifier (ASI) 5H (nuclear and chemical). The Field Artillery School is working on a plan to alleviate this problem; but, in the meantime, there are three options available to commanders who need trained officers immediately:

- Officers may be sent on temporary duty (TDY) either to Fort Sill or to Oberammergau to attend the resident Nuclear and Chemical Target Analysis Course (NCTAC).
- Officers can complete the nonresident/resident NCTAC through the Army Correspondence Course Program; these officers would then be sent TDY to Fort Sill for the one-week resident portion.
- Officers may complete the nonresident/resident NCTAC through the Army Correspondence Course Program, and then a Mobile Training Team (MTT) could be sent to the unit to conduct the one-week resident portion. Active Army units send requests for the services of the MTTs through their major commands. Reserve unit requests for MTTs are submitted to their US Army Readiness and Mobilization Region; National Guard requests are sent to the State Adjutant General and then to the appropriate Army Readiness and Mobilization Region.

To insure that they receive properly trained officers in the future, commanders should talk to their personnel managers and make sure that their requisitions for these personnel include the nine-character description which indicates ASI-5H qualification. Also, a notation should be made in the remarks column to indicate that the "individual must be ASI-5H qualified."

For further information, call the Tactics, Combined Arms, and Doctrine Department's; Nuclear Weapons Employment Branch at AUTOVON 639-6025 or commercial 1-405-351-6025 or write to:

Commandant
US Army Field Artillery School
ATTN: ATSF -TN
Fort Sill, OK 73503

Rotating bands for 8-inch dummy projectiles M845

The 8-inch dummy projectile M845 is equipped with a replaceable plastic rotating band which is suitable for approximately 100 ramming cycles per side (total 200 ramming cycles per rotating band). After the ramming cycle life has been expended, the rotating band must be replaced in accordance with TB 9-2350-304-10, Operation and Maintenance of Projectile, 8-Inch: Dummy: M845.

Nomenclature for ordering replacement rotating bands is as follows: M845 Replacement Rotating Band Kit, NSN 1320-01-099-8515. The kit consists of two rotating bands, two strap wrenches, and replacement set screws.

Survey Software

The search is on for hand-held computers to replace the TI-59 hand-held calculator for survey computations in the future. Accordingly, the programs now used with the TI-59 are in the process of being reviewed, revised, and rewritten into basic programming language. Suggestions for improvements and corrections to existing TI-59 programs are encouraged and should be submitted as soon as possible to:

Commandant
US Army Field Artillery School
ATTN: ATSF-FS
Fort Sill, OK 73503

With Our Comrades in Arms

NEWS OF OTHER BRANCHES AND SERVICES

Hornets swarm

Marine Fighter/Attack Squadron 314 is transitioning from the McDonnell Douglas F-4 Phantom II to the dual-mission F/A-18 Hornet which will eventually replace all Marine Corps Phantoms. The Hornet has demonstrated a reliability and a maintainability two to three times better than that of the F-4. The Hornet's reliability was measured at nearly three flight hours between failures, compared with less than one flight hour between failures for the F-4. Maintainability has been measured at 25 to 50 percent fewer direct maintenance hours per flight hours compared with the F-4.

The supersonic Hornet has a top speed of 1.8 Mach and can fly at altitudes in excess of 50,000 feet. It can carry two types of air-to-air missiles and up to 17,000 pounds of ordnance; it is outfitted with a 20-mm cannon.

Since the flight of the first Hornet in November 1978, the Hornet fleet has logged over 16,500 flight hours and over 12,000 sorties in test and training flights. Fifty-one of the planned buy of 1,377 F/A-18s for the Navy and Marine Corps have been delivered. In addition, three allied nations plan to acquire 297 Hornets. Canada has ordered 138 and Australia has ordered 75. Spain plans to purchase 84.

Approval for the Hornet fighter version came in June 1981. In 1982, the program moved into full-scale production; and the Defense Department approved production of the attack version of the Hornet in December 1982.

F/A-18 Hornet strike fighters in flight formation. The first Hornets went into operational military service on January 7 this year at the Marine Corps Air Station, El Toro, California. (McDonnell-Douglas Corporation photo)

Fast attack vehicle (Emerson Electric Company photo).

Fast attack vehicle contract awarded

The US Army Tank-Automotive Command has awarded a contract to Emerson Electric Company for 80 prototype fast attack vehicles (FAVs).

The completed vehicles will undergo extensive testing by the US Army 9th Infantry Division's High Technology Test Bed in anticipation of using FAVs in the Rapid Deployment Joint Task Force. The FAV fulfills the High Technology Test Bed requirement for an armed vehicle which can be quickly and easily transported via helicopter or airplane. In recent tests, a prototype vehicle completed a rugged eight-mile course in seven minutes; armored personnel carriers require 35 minutes to run the same course.

The FAVs, which are based on the world class Chenowith off-road racing vehicles, will be equipped with a weapon station, turrets, and fire control systems. Weapon possibilities for the FAV include the TOW antitank missile, 30-mm cannon, .50-caliber machine gun, and MK19 grenade launcher.

Once on-site, the FAV, at speeds of more than 80 miles per hour, will maneuver for surprise attacks and rapid withdrawal. The vehicle's light weight, speed, and firepower make it ideal for the Rapid Deployment Joint Task Force.

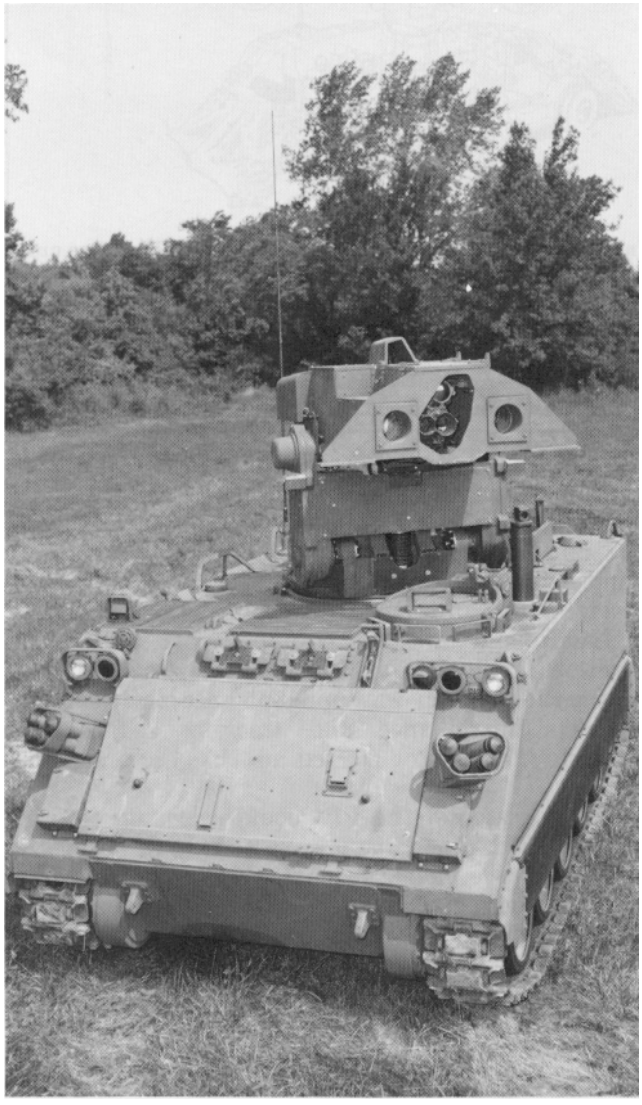
The FAVs will complement the US Army's new high mobility multipurpose wheeled vehicles which are to go into production in 1984. The two vehicles could be deployed anywhere in the world within 24 hours with the necessary mobility and firepower.

Guard unit receives Improved TOW Vehicle

Recently, the 48th Infantry Brigade of the Georgia Army National Guard received 51 Improved TOW Vehicles. In the future, National Guard units will receive new state-of-the-art equipment under the Total Force Policy, and this is one of the first examples of policy implementation. The Army has received more than 2,000 ITVs since production began in 1979.

Based on the M113 armored personnel carrier, the ITV has two launch tubes from which TOW (tube-launched, optically-tracked, wire-guided) missiles are launched. Each ITV carries 12 TOW missiles, which have a range exceeding 3,000 meters and can penetrate and destroy most heavily armored main battle tanks. An improved warhead for the TOW missile is now being produced to counter recent advances in armor protection of Warsaw Pact vehicles and will be incorporated into the ITV.

Improved TOW Vehicle. (Emerson Electric Company photo)



Black Hawks participate in exercise. During the recent REFORGER NATO exercise in Europe, Black Hawk pilots flew 308 sorties and transported 1,216 troops. Black Hawk fleet time is now more than 112,000 hours. (Sikorsky photo)

New M16 rifle

The Army has officially announced that when it buys rifles in the future, it will buy the M16A2, an improved version of the M16A1. The Marine Corps has already purchased the new rifle and reports that it performs better or equal to the M16A1 in all respects. The M16A2 includes the following improvements:

- The barrel has been changed to accept the heavier NATO standard 5.56-mm ammunition, although it will still accept US ammunition without changing the lethal range.
- The handguards, pistol grip, and butt stock are made of a more durable, break-resistant material.
- The handguards are round instead of triangular.
- The slip ring has been redesigned to simplify removing and replacing handguards.
- Full automatic fire has been changed to three-round fire.
- A muzzle compensator, which retards "barrel climb" during the three-round bursts, replaces the flash suppressor.
- The upper receiver has been changed to deflect cartridges away from the face of a left-handed shooter.
- The rear sight has been changed to provide easier range and windage adjustment.
- The front sight is round instead of square.
- The butt stock has been lengthened five-eighths of an inch to improve line of sight.

Because of budget constraints and the number of M16A1s on hand, the Army cannot consider purchasing the new weapon before 1985.

New lights for survivability

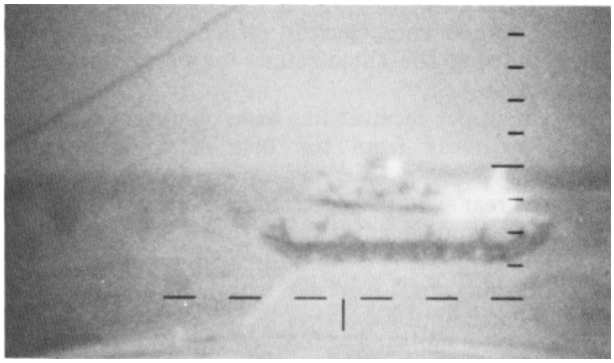
The familiar red color of the interior blackout lamps (dome light) used on all combat vehicles will soon be changed to a blue-green color to make it more difficult for the enemy to see friendly vehicles through his low-light-level imaging devices — infrared (IR) sensors.

The Warsaw Pact nations exploit night vision technology extensively and are known to use active IR sensors and passive image intensifiers (starlight scope technology) for individual weapon sights. They use passive sights for their antitank grenade launchers, antitank guided missile systems, and night observation devices. It is probable that they use an image intensifier on their tank gunner's sight.

Enemy use of these detection devices made a reassessment of US nightlight security systems necessary. Even though present interior blackout light emission from an inclosed combat vehicle cannot be seen at 400 meters by the unaided eye, every viewing port and optical device becomes visible to IR sensors. This vulnerability was demonstrated in a recent test conducted at the US Army Tank-Automotive Command (TACOM) in Warren, Michigan. Two M48 tanks, one with red interior lighting and the other with blue-green, were photographed through a first generation IR sensor from a range of 400 meters. Both vehicles had the same brightness and had the hatches open. The vehicle with the red lights was clearly visible through the intensifier at a range of 1,800 meters, while the vehicle with the blue lights virtually disappeared at 400 meters. Even with the hatches closed, the red lighted vehicle was clearly visible to the intensifier, which detected light emission through vision blocks and optical devices. However, no light emissions were detectable from the blue-green lighted vehicle.

The blue-green lighting also improves personnel visual acuity and makes color coded maps and training manuals easier to read.

All future combat vehicles will come equipped with the new lights, but vehicles already in the field will need the new lighting kits installed by organizational mechanics. The Army has 250 million kits (NSN 6220-01-123-1353) which can be ordered through normal supply channels. The Army Master Data File lists the kit at $7.10. The source of supply is Routing Identifier Code (RIC) AKZ for TACOM. (Christine Richard, TACOM)



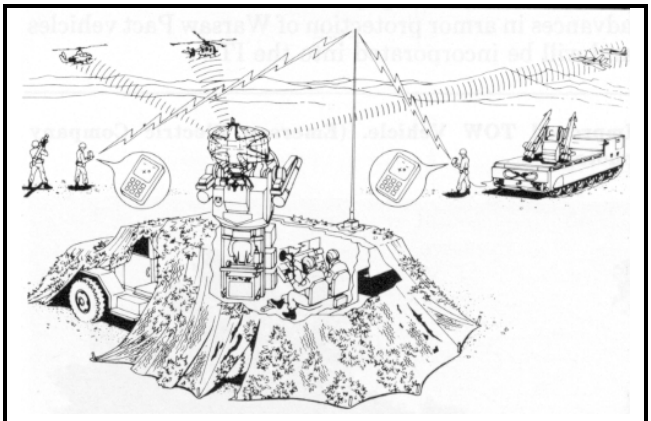
A red-lighted M1 tank, with hatches open, viewed from 200 meters through an infrared sensor.

Roland spots targets

The all-weather US Roland air defense system has shown that it can provide an electronic eye for crews of Army short-range, clear-weather missile systems, enabling them to detect hostile aircraft beyond their visual range.

In a recent week-long test at the Army's Yakima Firing Center, a radar-equipped US Roland fire unit was the key in a demonstration of "cooperative cueing"—a coordinated missile system defense against air attack.

During the test, a radar-equipped Roland fire unit supplied continuous data on target range and direction of approach of attacking aircraft to two "clear weather" Army missile systems not equipped with radar. The data supplied by Roland increased the time available to these missile crews to prepare for and simulate launches against the attacking aircraft.



In the center of the artist's concept of the Roland fire unit, the operator of the Planned Position Indicator (seated to the left of fire unit commander) selected incoming radar-located targets on the display screen. Position information was sent via radio to squad leaders of Redeye (left) and Chaparral (right) who had hand-held units which displayed the location of an incoming target.

The clear-weather missile units, a Chaparral air defense system and a Redeye Manpads (man-portable air defense system), were positioned near the Roland fire unit. Leaders of each companion unit used a hand-held, very high frequency (VHF) receiver to receive cueing information transmitted by Roland.

The Roland unit was equipped with a Planned Position Indicator (PPI) that displayed target information, which was updated once each second. Roland's surveillance and tracking radars and electro-optical sensor located and fixed approaching targets.

The operator of the PPI could select up to four targets from the display screen and, using a touch-sensitive panel, instruct a cueing processor to digest the target information and transmit it in digital form over the VHF communications network.

The cooperative cueing demonstration was part of a larger Army field training exercise at Yakima. More than 60 fixed-wing aircraft and 40 helicopters participated in the exercise, simulating attacks against troop emplacements and armor located elsewhere on

the firing center. Roland's mission was to intercept these attacking aircraft as they flew to their objectives, simulating a battle scenario in which air defenses would protect allied assets.

The Roland's surveillance radar detection range lessens the impact of impaired visibility. Clear-weather missile crews, with this cueing information at hand, can anticipate the approach of a target and be prepared to launch as soon as the aircraft comes into visual contact.

During the test, target cueing continued uninterrupted in the presence of surveillance radar countermeasures.

The Roland fire unit was able to operate in its primary mission as an autonomous air defense weapon while simultaneously providing cueing information to the clear-weather fire units. Thus, Roland, armed with supersonic antiaircraft missiles, could defend itself against attackers using radar-homing weapons.

The Roland fire unit operated for the equivalent of 250 combat days with a high degree of reliability.

Army guard self-propelled howitzers to be upgraded

The Department of the Army and the National Guard Bureau have agreed on a program to upgrade all Army Guard M109A1 self-propelled 155-mm howitzers to M109A3s in the next few months. The Army will issue 33 newer howitzers from the Army maintenance float to various artillery battalions. This "float" is a pool of equipment on hand in the Army inventory but not issued. The units will turn in their A1 models, which will then be sent to depots for upgrading to A3 status. This process will be repeated over and over again until all Army Guard howitzers are upgraded to M109A3 status. *(National Guard, October 1982)*

New combat plane for Air Force

A radically advanced jet combat plane being planned by the Air Force for the next decade will be able to patrol and fight routinely at supersonic speed and operate from runways no more than 1,500 feet long. The plane, now called the Advanced Technology Fighter (ATF), is envisioned for the early 1990s and is to have routine supersonic speed. Today's warplanes have only short bursts of such speed.

Air Force officials expect the useable speeds and operating altitudes to increase dramatically and combine with agility — from greater power, lighter materials, and highly automated controls—to increase the advantage of the warring pilot.

Today's fighters go to supersonic speed to chase or evade an opponent, "kicking in" an afterburner, a long pipe behind the engine where fuel is ignited for extra power. No such "passing gear" will be needed in the ATF, fighter pilots say. The consequently reduced fuel consumption will add to the distance they can fly.

The speed of sound is 660 mph at heights where fighter planes operate. Today's jets can manage speeds of 1,320 to 1,550 mph for short periods.

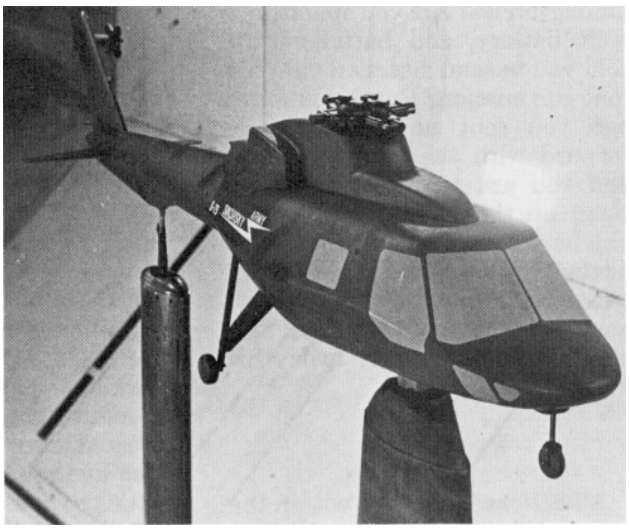
At the same time, the Air Force intends to end its present need for 8,000-foot runways, which are required to launch combat-loaded F-15 and F-16 fighters, and use a range of new technologies to make the ATF work well on 1,500-foot runways. This capability, along with lowered fuel consumption, is intended to greatly increase commanders' options for both geographic deployment and combat use of the fighters. In addition, the ATF will have "stealthy" characteristics, a collection of devices designed to make it hard for a foe to detect the aircraft. *(Current News,* by Charles W. Corddry, *Washington Bureau of the Sun)*

Advanced Composite Airframe Program

Sikorsky Aircraft has won a $17.5 million US Army contract for the fabrication of the advanced composite airframe helicopter. The contract covers the second phase of the Army's Advanced Composite Airframe Program (ACAP) which calls for production assessment and flight testing of a helicopter fuselage made primarily of all composite materials.

The objective of ACAP is to produce and evaluate an airframe that will achieve a 22 percent weight savings and a cost savings of 17 percent over conventional metal airframes, while meeting established military requirements for crashworthiness, ballistics tolerance, reliability, maintainability, and reduced radar signature. ACAP will provide a major portion of the technology base that the Army will apply to its next generation lightweight family of helicopters currently planned for the 1990s and beyond.

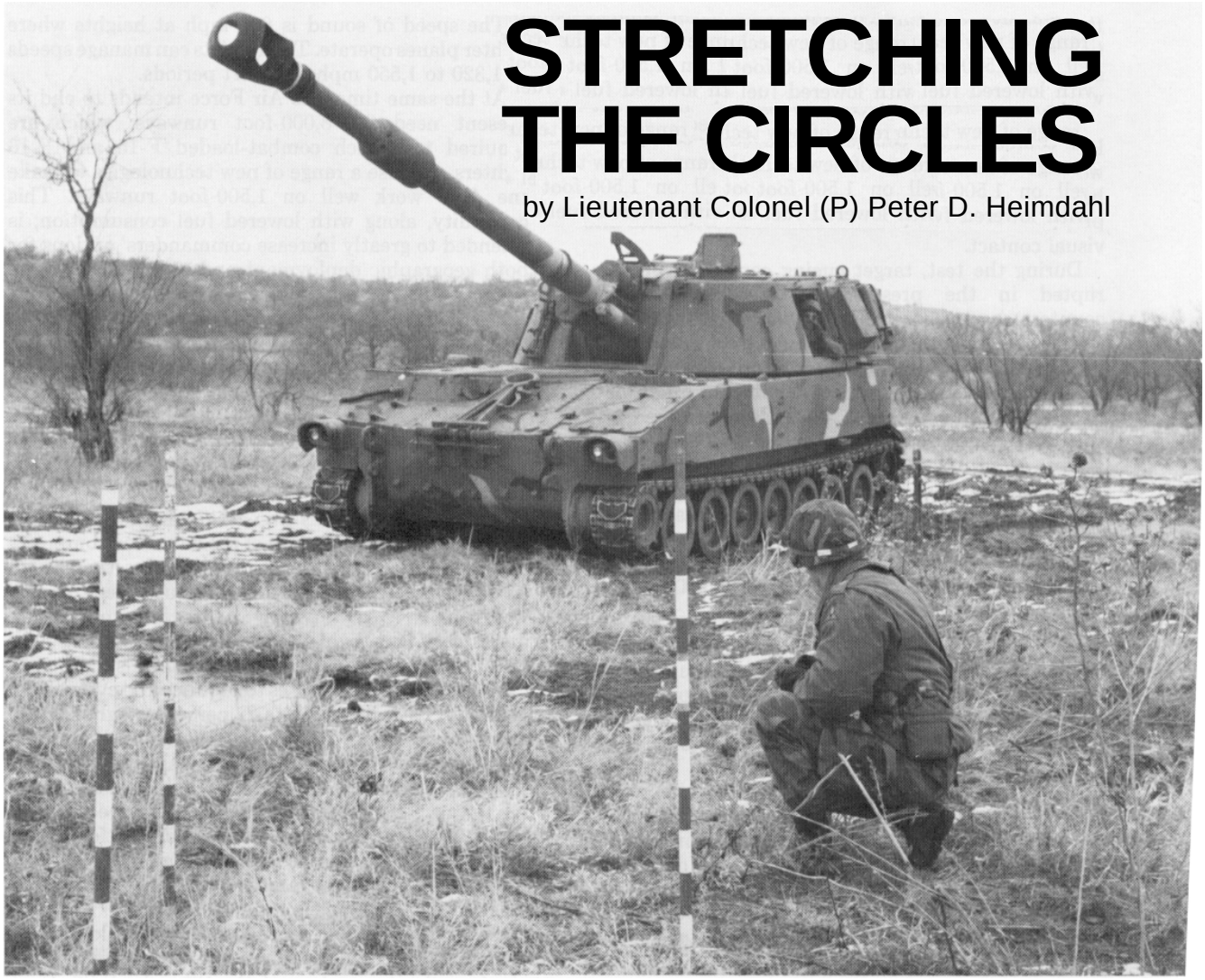
Under the new contract, Sikorsky will build the test vehicle with a composite airframe mated to the power plants and rotor system of the Sikorsky S-76. First flight is scheduled for March 1984, followed by a 50-hour flight test evaluation. Two additional airframes will be produced for laboratory testing.



Model designed for the Army's Advanced Composite Airframe Program (Sikorsky photo).

STRETCHING THE CIRCLES

by Lieutenant Colonel (P) Peter D. Heimdahl



Mr. XO, did you say you're having trouble managing your aiming circles? Are you operating a split battery, and battalion just told you to send a section out on a lone gun mission? But five minutes ago you sent an aiming circle forward with the advance party; and you just told your driver to clean up the extra aiming circle, and he dumped it in an immersion heater? Well, relax. There is a way to stretch the aiming circle assets and keep everyone happy and also allow the section chief to lay his own gun.

Procedure

All actions take place within the gun section, thus eliminating the need for manning the aiming circle and relaying commands. The only requirements are three aiming posts and a programmable hand-held calculator. The aiming posts are emplaced on the corners of a triangle laid out on the ground in the same general location where one would expect to find the aiming circle. One leg of the triangle is aligned with the azimuth of fire. The angle formed by the other two legs points to battery right. The gunner reads the deflections to each aiming post which are then entered into the calculator to provide the lay deflection to one of the aiming posts. The procedure is repeated until the last deflection given by the calculator is the same as the previous one.

Figure 1 shows a bird's-eye view of the firing battery with respect to the aiming post triangle. The triangle legs should be equal in length. While the minimum length is 10 meters, the maximum length is limited only by the terrain and the necessity of being able to see all posts from the guns. The larger the triangle, the more accurate the procedure; but one must keep in mind that the gunner will have to crank his sight through some large angles with a larger triangle. The red-white leg must be lined up accurately along the azimuth of fire. A survey team bringing survey control into the battery can achieve this accuracy and can also measure in the location of the blue post. Lacking survey, one can establish the red-white leg quickly using an aiming circle which can thereafter

be available for other positions. Two pieces of commo wire cut to the length of the red-white leg would allow one to locate the blue post.

During this process, the white post represents the aiming circle; and all lay deflections are read to it. The howitzer may occupy any position within sight of the triangle—left, right, forward, to the rear or even inside the triangle. The gunner reads the deflection to the red, white, and blue posts, *in that order,* even though there may be times when the posts do not appear in red-white-blue order as the sight swings from the left to the right. After the entry of the last deflection and the completion of the program run, the calculator displays a deflection which is the lay deflection to the white post. The gunner sets this deflection on his sight and traverses onto the white post. The sight location will now have moved, changing the previous angle relationships and requiring that the new deflection readings to the posts be entered into the calculator. When the last calculator reading equals the previous reading, the howitzer is laid parallel to the red-white leg.

Mathematical background

The mathematical basis for this method evolves from the diagram shown in figure 2. The key angle in the derivation is θ, which is the angle between the azimuth of fire (red-white leg) and the line of sight from the white post to the gun sight. This angle, after its conversion to deflection and subsequent placement on the sight, ultimately orients the tube on the azimuth of fire. Table 1 shows the mathematical derivation of θ.

The computer program

In order to solve the equation for θ, given the three deflections, it is necessary to use a hand-held calculator with a permanent memory. A program suitable for the TI-58C or TI-59 calculator appears in table 2. Sample deflection readings which test all facets of the program are in table 3.

To run the program for the first time after the calculator has been turned on, one punches RST R/S and then proceeds to enter each deflection in order, each followed by R/S. No numbers should be entered until the display has stopped flashing. After the program has run at least once, it is ready to accept the next round of deflections without the step of punching RST. One needs only to punch in each new deflection in order, each followed by R/S. The program will not work if the first two deflections are the same; but this situation is ideal since it means that the sight is lined up on the red and white posts, and one merely places deflection 3200 on the sight and traverses back onto the white post. In this way, the perfect alignment of the red and white posts is probably lost; and one can now measure three distinctly different deflections.

Applicability of the method

Establishing the triangle can be a matter of routine in every surveyed position. The white post could be the same as the aiming post location, and the survey crew could quickly and easily mark the red and blue post locations with wooden stakes. The battery could initially be laid with an aiming circle in the conventional way; but then the circle could be removed from the position at any time, and internal control would still exist in the battery area.

The triangle is useful in establishing directional control in any number of advance positions without tying up aiming circles. Alternate or lone gun positions could be fully developed, and the advance party could set up a number of forward positions. A battery could be completely dispersed, and each gun would have its own directional control.

The method has considerable potential for streamlining the lay in a night occupation. Visibility problems normally restrict the laying process to one gun at a time. As a result, the rest of the battery waits

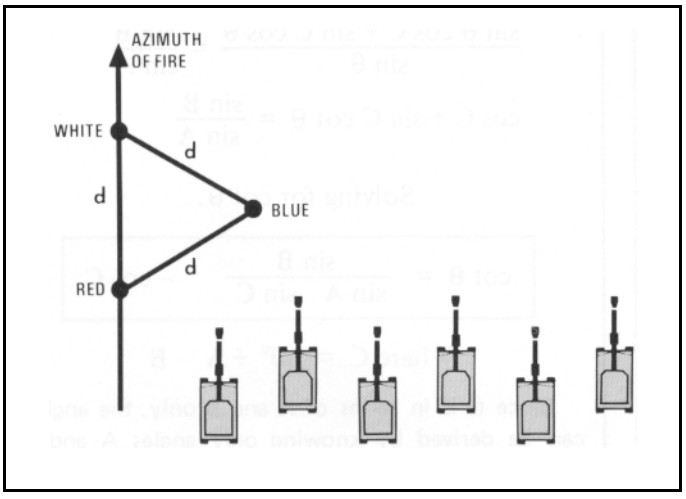


Figure 1. Position layout.

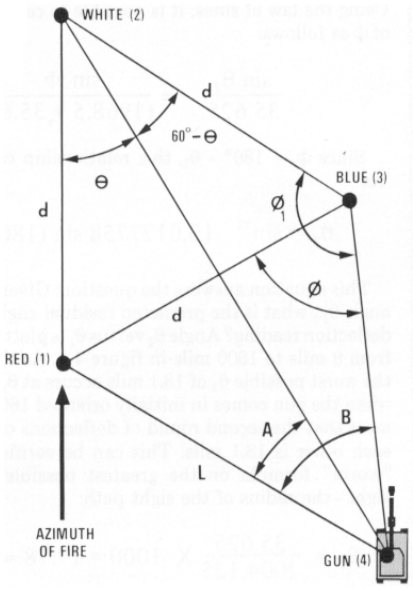
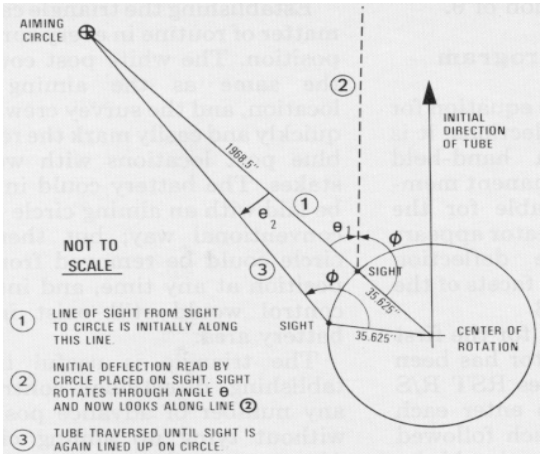


Figure 2. Angular relationships.

Correction

The *Journal* staff regrets errors in editing which created some confusion in the transmission of Lieutenant Colonel Peter D. Heimdahl's ideas in his article entitled "The Magic Formula" (January-February 1983 *FA Journal*). The correct labeling of various lines in figure 3, page 31, appears below.



On page 32 column 1, lines 31-33, one should read *"and θ_2, as derived in table 1, has a maximum value of 18.1 mils corresponding to a worst case of being initially oriented 1600 mils out."* Table 1 is depicted below as well. The first word in line 12, column 2, page 33, should be *"deflection."* Finally, on page 33, column 1, line 2 and line 9, to say here and in other places in the article that the chief of section sees a value of θ_2 erroneously implies that the chief of section must have and make reference to figure 4-2 in the article this implication is, of course, not correct; for the chief of section or XO would know in advance that a residual angle of 28 mils or less would preclude the necessity of another reading.

Table 1. Calculation of angle θ_2.

Using the law of sines, it is possible to calculate θ_2 in terms of Φ as follows:

$$\frac{\sin \theta_2}{35.625} = \frac{\sin \Phi}{(1968.5 + 35.625)}$$

Since $\Phi = 180° - \theta_1$, this relationship can be simplified to:

$$\theta_2 = \sin^{-1} \quad [0.0177758 \sin (180° - \theta_1)]$$

This equation answers the question: Given initial residual angle θ_1, what is the predicted residual angle θ_2 on the next deflection reading? Angle θ_2 versus θ_1 is plotted for θ_1 varying from θ mils to 1600 mils in figure 4-1. As the figure shows, the worst possible θ_2 of 18.1 mils occurs at θ_1 = 1600 mils or when the gun comes in initially oriented 1600 mils out! The most that the second round of deflections can deviate from each other is 18.1 mils. This can be verified by using the "worm" formula on the greatest possible motion of the sight—the radius of the sight path:

$$\theta_2 = \frac{35.625}{2004.125} \text{ X } 1000 = 17.78 \approx 18.1 \text{ mils}$$

Table 1. Mathematical derivation of θ.

The objective is to develop an equation for θ in terms of angles A and B, which are the angles from the red post to the white and blue posts, respectively, as seen from the gun. Since each angle in the equilateral triangle 123 is 60°, angle ϕ_1 can be found from triangle 234 to be:

$$\phi_1 = 180° - (60° - \theta) - (B - A)$$
$$= 120° + \theta + A - B$$

It follows that:

$$\phi - \phi_1 - 60° = 60° + \theta + A - B$$

From triangle 124 the law of sines gives:

$$\frac{\sin \theta}{L} = \frac{\sin A}{d}$$

$$\text{or} \frac{d}{L} = \frac{\sin A}{\sin \theta} \quad \text{(Equation 1)}$$

From triangle 134 the law of sines gives:

$$\frac{\sin \phi}{L} = \frac{\sin B}{d}$$

$$\text{or } \frac{d}{L} = \frac{\sin B}{\sin \phi} \quad \text{(Equation 2)}$$

Substituting equation 2 into equation 1:

$$\frac{\sin B}{\sin \phi} = \frac{\sin A}{\sin \theta}$$

Note that the distances L and d are no longer involved in the derivation.

Rearranging and substituting for ϕ:

$$\frac{\sin B}{\sin A} = \frac{\sin (\theta + C)}{\sin \theta}$$

Where C = 60º + A – B

Using the trig identity:

$$\sin (\theta + C) = \sin \theta \cos C + \sin C \cos \theta:$$

$$\frac{\sin \theta \cos C + \sin C \cos \theta}{\sin \theta} = \frac{\sin B}{\sin A}$$

$$\cos C + \sin C \cot \theta = \frac{\sin B}{\sin A}$$

Solving for cot θ:

$$\boxed{\cot \theta = \frac{\sin B}{\sin A \quad \sin C} - \cot C}$$

Where C = 60º + A – B

Since C is in terms of A and B only, the angle 0 can be derived by knowing only angles A and B, which result from the measured deflections to the three aiming posts.

Table 2. TI-59 (58C) program.

STEP	CODE	KEY	STEP	CODE	KEY	STEP	CODE	KEY
000	76	LBL	051	85	+	102	12	B
001	11	A	052	06	6	103	76	2d Lbl
002	58	FIX	053	00	0	104	16	A'
003	01	01	054	75	-	105	43	RCL
004	93	.	055	43	RCL	106	09	09
005	00	0	056	04	04	107	77	2d × ≥t
006	05	5	057	95	=	108	14	D
007	06	6	058	42	STO	109	85	+
008	02	2	059	07	07	110	03	3
009	05	5	060	38	SIN	111	02	2
010	42	STO	061	42	STO	112	00	0
011	08	08	062	06	06	113	00	0
012	43	RCL	063	43	RCL	114	95	=
013	09	09	064	05	05	115	14	D
014	91	R/S	065	55	÷	116	76	2d Lbl
015	42	STO	066	53	(	117	12	B
016	01	01	067	43	RCL	118	43	RCL
017	91	R/S	068	06	06	119	09	09
018	42	STO	069	65	×	120	77	2d × ≥t
019	09	09	070	43	RCL	121	13	C
020	75	-	071	03	03	122	85	+
021	43	RCL	072	54	)	123	06	6
022	01	01	073	95	=	124	04	4
023	95	=	074	75	-	125	00	0
024	65	×	075	43	RCL	126	00	0
025	43	RCL	076	07	07	127	95	=
026	08	08	077	30	TAN	128	14	D
027	95	=	078	35	1/X	129	76	2d Lbl
028	42	STO	079	95	=	130	13	C
029	02	02	080	35	1/X	131	85	+
030	38	SIN	081	22	INV	132	03	3
031	42	STO	082	30	TAN	133	02	2
032	03	03	083	55	÷	134	00	0
033	43	RCL	084	43	RCL	135	00	0
034	09	09	085	08	08	136	95	=
035	91	R/S	086	95	=	137	76	2d Lbl
036	75	-	087	94	+/-	138	14	D
037	43	RCL	088	42	STO	139	42	STO
038	01	01	089	09	09	140	09	09
039	95	=	090	29	2d CP	141	11	A
040	65	X	091	43	RCL	142	76	2d Lbl
041	43	RCL	092	02	02	143	15	E
042	08	08	093	22	INV	144	85	+
043	95	=	094	77	2d × ≥t	145	01	1
044	42	STO	095	15	E	146	08	8
045	04	04	096	75	-	147	00	0
046	38	SIN	097	01	1	148	95	=
047	42	STO	098	08	8	149	77	2d × ≥t
048	05	05	099	00	0	150	12	B
049	43	RCL	100	95	=	151	16	A'
050	02	02	101	77	2d × ≥t			

Table 3. Sample Calculations.

DEFL TO	Δ TO LEFT FRONT		Δ TO LEFT REAR		Δ TO RIGHT FRONT		Δ TO RIGHT REAR		GUN INSIDE Δ
Red Post	2167	6200	0567	6200	4233	6200	5933	6200	0467
White Post	2700	0333	1100	0333	3700	5667	5400	5667	2600
Blue Post	3233	0867	0034	5667	4233	6200	5400	5667	4734
Lay Defl	2668	2668	1066	1066	3734	3734	5333	5333	2666

while the aiming circle is dedicated to that one gun. Through use of the aiming post triangle, the lay could proceed much more efficiently since all guns could be laid simultaneously. The aiming circle, marked by a visible light, could be the white post; and aiming post lights could be attached to the red and blue posts to make them visible. While the aiming circle is being used to lay the first gun, the other guns could be brought to zero mils with respect to the aiming post triangle. Then the aiming circle would be required merely to verify or make small adjustments to the lay of the rest of the battery.

Conclusion

The Weapons Department of the US Army Field Artillery School has tested and verified the procedure and the calculator program. Accuracy came to within one mil of the aiming circle method. The major problem appeared to be the reliability of the calculator in holding a charge in the field. Also, there is a limited quantity of hand-held calculators available in the firing battery area in the first place.

The Field Artillery has led the way in applying the calculator to field use, particularly in survey and fire direction operations. Now there is an opportunity to extend its usefulness to gun section level. The TI-58C, which is available off-the-shelf at modest cost, would be more than adequate for the gun section chief's purposes. The investment will pay dividends to a firing battery which can make better use of its aiming circles and enhance its flexibility.

LTC (P) Peter D. Heimdahl, FA, is a Permanent Associate Professor in the Department of Mechanics at the United States Military Academy. He graduated from the Academy in 1961 and received his PhD in mechanics from the University of Illinois in 1969. He served tours in Vietnam, Germany, and Korea and, among his other assignments, was a battery commander; commander of the 2d Battalion, 34th Field Artillery; and S3 of the 72d FA Group.

Right by Piece

NOTES FROM UNITS

Pegasus simulation in "Killer Eagle"

FORT CAMBELL, KY—A "trend-setting" command post exercise of the 1st Battalion, 321st Field Artillery, 101st Airborne Division (Air Assault) Artillery, was held in October last year.

The CPX was witnessed by officials from the Combined Arms Battle Simulations Directorate at Fort Leavenworth, KS, who have since taken the idea back to be used in an Army-wide CPX, according to battalion representatives.

Entitled "Killer Eagle," the exercise featured the Pegasus battle simulation game, which was used by battalion fire support teams, fire support elements, and fire direction centers.

The scenario followed a light infantry versus armored unit battle where the 2d Brigade opposed a mock Soviet regiment.

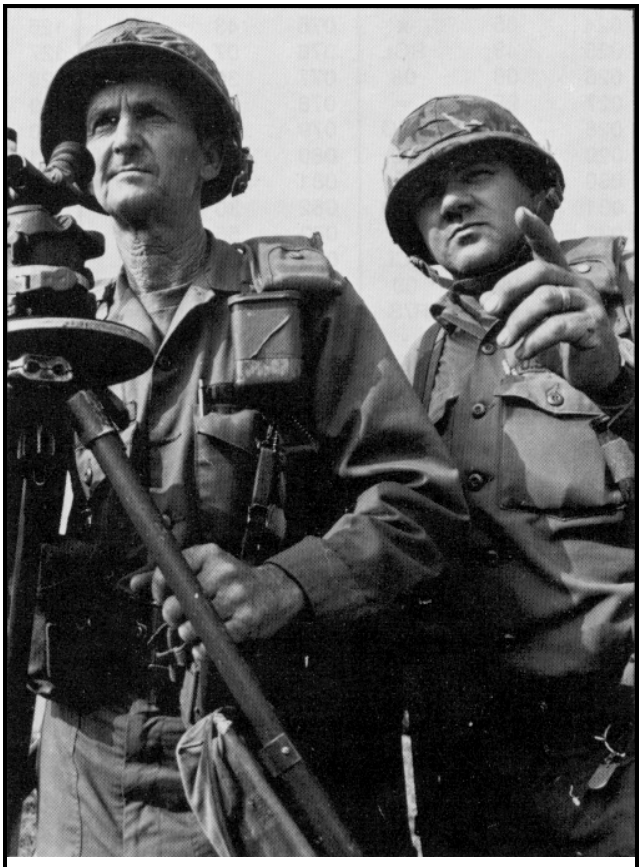
The fire support team and fire support element received exposure to infantry tactics, since they also acted as maneuver commanders and were able to graphically see their fire support planning go from lowest to highest levels. Also, the fire direction center was able to process many fire missions under different conditions. (1LT Jerry Sullivan, *Fort Campbell Courier)*

Cold Steel I

FORT ORD, CA—Facing a formidable opposing force (OPFOR), elements of the 1st Brigade, 7th Infantry Division, awaited the inevitable dawn attack. The soldiers were confident that they would repel the enemy because of their thorough combined arms team planning effort. But it would be the execution of fire support planning and coordination that would ultimately crush the enemy's desire to continue the offense. Forward observer teams developed target list data; and the fire support team (FIST) chiefs provided vital fire support information to the battalion fire support officer (FSO) who reviewed the integration of all available fire support. Their efforts broke the back of the enemy attack and set up the 1st Brigade counterattack and the ultimate defeat of the OPFOR.

Such was the scenario during Cold Steel I, a combined arms live fire exercise (CALFEX) conducted at Camp Roberts, California, during September 1982. Cold Steel I featured the coordinated efforts of field artillery, infantry, armor, air defense artillery, engineer, military police, aviation, and psychological operations units. Close air support was also available.

Field artillerymen of the 2-8th FA agreed that Cold Steel I was a tremendous success. "Of particular note was the thoroughness of the pre- and post-exercise command and staff coordinations. This exercise produced a first class training experience for our soldiers," reflected Lieutenant Colonel John C. Truesdell, the commander of the 2-8th FA; "One of the major results of such CALFEX activity is an understanding by the maneuver arms that field artillerymen require pure artillery training time to hone fire support coordination skills before collective involvement with infantry." First Lieutenant Russell Wentworth, a battalion FSO, agreed: "The CALFEX provided realistic training which allowed the FIST chiefs to exercise their collective tasks with the infantry companies." The brigade fire support NCO, Sergeant First Class Alvarado, added that Cold Steel I gave FISTs "a great overview of what it will take to achieve mission accomplishment." (Captain Dick Grabowski)



Sergeant Wells Combs (left) and Staff Sergeant Ercil McNett, members of Battery A, 2d Battalion, 130th Field Artillery of the Kansas Army National Guard, use an aiming circle while participating in REFORGER 82 Exercise Carbine Fortress. National Guardsmen from Kansas and Wisconsin on duty with the 3d Battalion, 6th Field Artillery, 1st Infantry Division (Mech), went to Germany for the exercise. (Photo by PV2 Kendal W. Carlson, Kansas Army National Guard)

Howitzer crewmen of A Battery, 1-84th FA, 9th Infantry Division Artillery, prepare for the direct fire portion of a section chief's evaluation during a 17-day FTX last September. The battalion's M114A1 155-mm howitzers were retired in January 1983.

Competitive training

LOS ANGELES, CA—Competitive training—the key ingredient to increasing combat readiness—builds proficiency and competence and keeps the soldiers interested. This was the experience of the 40th Infantry Division (Mech) Artillery of the California Army National Guard during Annual Training 1982.

As early as December 1981, Colonel Melvin G. Gordon, commander of the 40th Infantry Division (Mech) Artillery, directed his S3 to develop a competitive training program for the command to test individual and collective training skills at battery and battalion levels. Lieutenant Colonel Paul E. Myron managed the project and was instrumental in developing Project Active—Artillery Competitive Training Including Verifiable Evaluation. Colonel Myron's team used existing training documents (i.e., ARTEPs and Soldiers' Manuals) and developed a three-phase scenario that actually evaluated battalion, battery (HHB, service, and firing), and howitzer sections.

- Phase I consisted of a 30-kilometer motor march simulating deployment of an artillery battalion from the main battle area (MBA) to the covering force area (CFA). During the move, the battalion was evaluated on its ability to react to such things as air/ground attacks, NBC situations, and employing proper motor march techniques.
- Phase II consisted of a battery ARTEP for one firing battery and the HHB/service battery of each battalion.
- Phase III consisted of a howitzer section evaluation to determine the best howitzer section in each battalion. A modified format paralleling the section evaluation in FM 6-50 was used.

Scoring in the evaluation process was cumulative and weighted by phase. The best battalion was the unit with the highest total points for phases I, II, and III. Although individual recognition was given to numerous sections (i.e., mess, howitzer, ammunition, etc.), the emphasis was on battery and battalion level competition.

The schedule for evaluation was restricted to a three-day period and was therefore very strenuous. During a typical day, one battalion would be taking a battery ARTEP and best howitzer evaluation while another battalion would be displacing to the CFA as part of phase I. Project Active taught the command many lessons, including these:

- Participating units must be given as much advance notice as possible of testing dates and tasks to be evaluated so that the annual training program can be developed to culminate with the evaluation phase.
- Although some battalion/battery commanders initially appeared skeptical of the training benefits of such a program, the results achieved supported continuance of competitive training at battery and section levels.
- Extra effort is required when Reserve Components must use outside personnel as evaluators. Although continued external support is certainly necessary for a division artillery level competitive training program, partnership or affiliated units in this role may be more appropriate because of their availability and their ability to bring their own support equipment. (Major William F. Wentz)

During Annual Training at Fort Drum, NY, members of the 4th Battalion, 92d Field Artillery, prepare an 8-inch round for loading. The 4-92d FA has batteries in Meadville and New Castle, PA, and is part of the 479th Field Artillery Brigade. The other battalion in the 479th Field Artillery Brigade is the 4th Battalion, 8th Field Artillery, a 155-mm self-propelled battalion, with batteries in St. Mary's, Dubois, and Punxatawny, PA. (Photo by MAJ Dick Crossland)

528th United States Army Artillery Group

CAKMAKLI, TURKEY—One of the Army's "best kept secrets" is the 528th United States Army Artillery Group (USAAG). With a distinguished combat record dating back to its original constitution at Camp Hood, Texas, on 4 January 1944, the 528th USAAG has the mission of administering a US Army special ammunition support program and of providing selected Turkish units with assistance in security, training, logistics, administration, and operational requirements. In this endeavor the 528th relies on the following headquarters for support: Southern European Task Force (SETAF), Vicenza, Italy, for operational and administrative support; 8th Support Group, Livorno, Italy, for logistics support; and Landsoutheast (LES), Izmir, Turkey, for aviation support.

A full colonel commands the 528th USAAG, whose subordinate units span the width of Turkey. The Headquarters and Headquarters Detachment (HHD) of the 528th and the 70th Ordnance Company are both located at Cakmakli; but the remaining detachments are spread over 1,200 miles (from west to east: 10th United States Army Field Artillery Detachment (USAFAD), Ortakoy; 21st USAFAD, Corlu; 14th USAFAD, Izmit; and the 27th USAFAD, Erzurum). With the exception of the HHD, field artillery majors command all detachments.

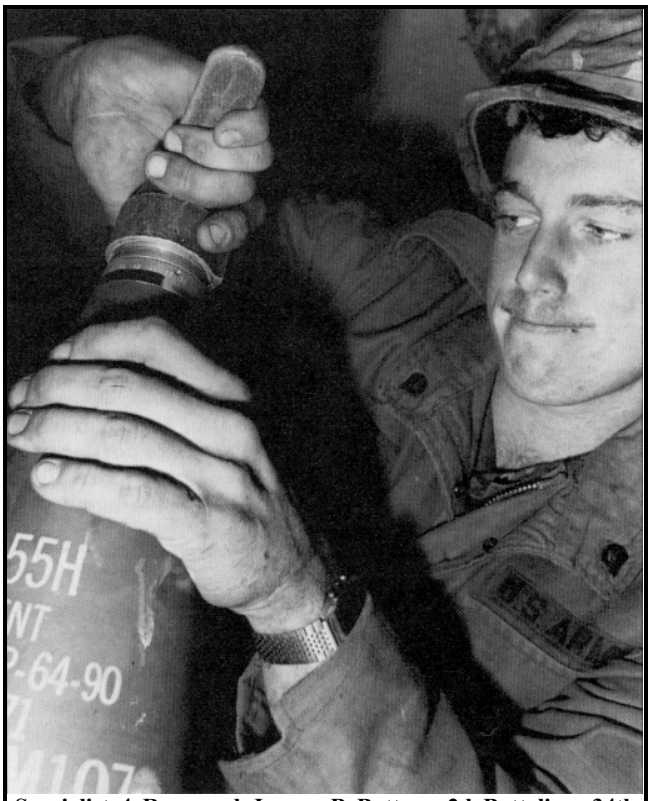
The detachments are the backbone of the 528th Group. Each consists of 35 to 60 personnel who handle the mission requirements. All detachments have lieutenants who are qualified in the language of the host nation. The training of Turkish units has increased and is conducted weekly between maintenance and assembly teams and their Turkish counterparts. The detachments hold evacuation exercises quarterly and participate in NATO exercises which feature command and control exercises and liaison with Landsoutheast and the Turkish First and Third Armies.

As an integral part of the defense of NATO's southern flank, the 528th USAAG plays a vital role. Through its continually improving combat readiness as a member of SETAF, it lives up to its motto of "POINTING THE WAY." (Captain Blaise X. Schmidt)

Field artillery at the Armor Center

FORT KNOX, KENTUCKY—There is a field artillery battalion at the Armor Center at Fort Knox—the 3d Battalion, 3d Field Artillery, the organic direct support field artillery battalion of the 194th Armored Brigade (SEP).

Tracing its lineage to Battery F, 5th Regiment of Artillery (constituted 18 June 1861 and organized on 10 August 1861 at Fort Creble, Pennsylvania), the 3-3d FA participated in the Civil War, World War I, and World War II. Deactivated three times since 1946, 3-3d



Specialist 4 Raymond James, B Battery, 2d Battalion, 34th Field Artillery, sets the fuze on a 155-mm howitzer projectile during a recent Army Training and Evaluation Program (ARTEP) on Fort Sill's east range. During the 36-hour ARTEP, the battalion moved four times—twice at night. The 75th Field Artillery Brigade and III Corps Artillery Nuclear Surety Branch evaluated personnel of the 2-34th FA on their basic military and field artillery knowledge and on their NBC, maintenance, mess, supply, and personnel operations. (Photo by SP5 Mike Howard)

FA was reactivated on 21 December 1975 at Fort Knox, Kentucky, as an organic battalion of the 194th Armored Brigade (SEP) and has since that date performed its threefold mission of providing direct support artillery fires, Armor Center and School support, and Reserve Components support.

Equipped with M109A3 155-mm self-propelled howitzers, the battalion also has an organic meteorological section, two organic radar sections (AN/MPQ-4 and AN/TPS-25), and several other additional authorizations which allow the unit to accomplish its direct support mission of the 194th Armored Brigade (SEP), the largest separate brigade in the current force structure of the US Army. In its role as a school support battalion, the unit conducts the self-propelled field artillery portion of West Point cadets' Third Class Armor Training, conducted annually at Fort Knox to familiarize future lieutenants of all branches with the capabilities of the field artillery. The battalion is also responsible for the Leadership Reaction Course, a requirement for every ROTC cadet assigned to basic summer camp at Fort Knox. As each ROTC cycle graduates, one of the battalion's firing batteries fires a salute with the six 75-mm pack howitzers assigned to the battalion; and

selected ROTC cadets participate in the actual control and firing of the salute. The battalion also fires salutes for visiting dignitaries and on such special occasions as Memorial Day and Independence Day. The battalion also provides personnel and equipment support to the Armor Engineer Board located at Fort Knox.

The 3-3d FA provides Reserve Components support to its affiliated 155-mm self-propelled artillery battalion, the 1st Battalion, 201st Field Artillery, West Virginia Army National Guard, as well as to two other partnership units, the 3d Battalion, 115th Field Artillery, Tennessee National Guard, and the organic howitzer batteries of the National Guard's 107th Armored Cavalry Regiment. Mobile Training Teams visit these units throughout the year, but the major support occurs during joint annual training during the summer. The 3-3d FA expects to conduct Army Training and Evaluation Programs (ARTEPs) for these units on a regularly scheduled basis in the near future.

Whenever possible, the battalion conducts combined arms training with the organic maneuver battalions of the 194th Armored Brigade (SEP). To enhance and improve fire support coordination, only seasoned and experienced lieutenants are assigned as fire support team (FIST) chiefs, while newly arrived Field Artillery Officer Basic Course graduates are assigned to firing batteries as soon as possible. All fire support officers (FSOs) are experienced Advanced Course graduates who can sell fire support to the maneuver battalion commanders. All FISTs and FSOs are included in the operational planning of the maneuver units, and the overall result of this intensive management has been significantly more effective fire support coordination.

Despite the numerous missions assigned to the battalion, the unit has, since August 1982, successfully completed an Annual General Inspection, an ARTEP, and a Department of the Army Technical Validation Inspection. So Redlegs assigned to the 3d Battalion, 3d Field Artillery, continue to handle tough and challenging missions with "Speed and Accuracy." (Lieutenant Colonel Juergen Nolte, Battalion Commander)

Action at Fort Hood

FORT HOOD, TX—The hills of Fort Hood echoed with the sound of cannons and the whirr of helicopters recently as the 1st Battalion, 92d Field Artillery, and Battery A, 1st Battalion, 3d Field Artillery (both of the 2d Armored Division) spent several days training in the field.

The soldiers of the 1st Battalion, 92d Field Artillery, were practicing for the annual Army Training and Evaluation Program (ARTEP). They fired their 8-inch howitzers, which were nestled in woodlines for cover and concealment.

Soldiers of Battery A, 1st Battalion, 3d Field Artillery, were in the field for a two-day aerial training exercise. While these Redlegs supported various missions on the ground with their 155-mm self-propelled howitzers, their forward obeservers (FOs) practiced aerial observation from an OH-58 helicopter supplied by Company D, 502d Combat Aviation Battalion. Flying "nap of the earth" or navigating close to the ground, the forward observers learned that it was important for them to know how to read a map. The helicopter moved so fast that the observer had to stay two grid squares ahead or get lost; if the observer got lost, the helicopter pilot would have to fly around until the observer found a familiar mark to get oriented on.

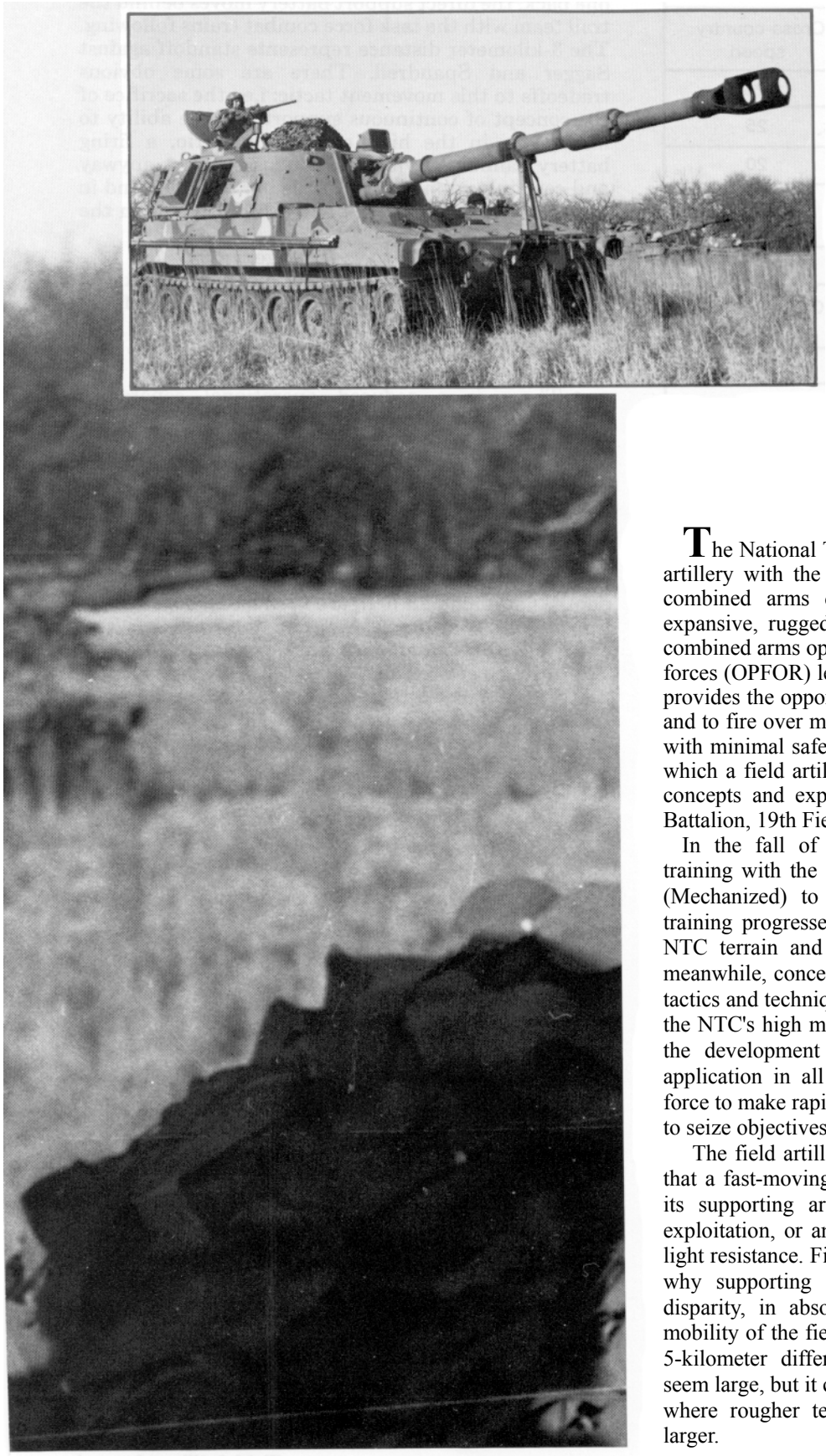
As a highly visible target, it is never wise for a helicopter to fly in one spot for very long; thus, the pilot played a game of aerial "hide and seek," in which he would hover behind a hill or treeline and rise only long enough for the FO to observe round impact and determine what corrections would have to be made. The helicopter would then settle behind a hill, and the FO would radio corrections to the battery and wait for the message that the next round was about to reach the target. The FO had only 12 seconds to view the target area per round. The forward observers agreed that more aerial practice is necessary, because observing would be even more difficult over unfamiliar terrain.

Forward observers from A Battery, 1-3d FA, take off from a firing battery position on their way to aerial observation training.

South Dakota's 147th again wins "most ready" award

SOUTH DAKOTA—For the second year in a row, the General Walter T. Kerwin Award for the most ready Army National Guard battalion-sized unit was presented to the 2d Battalion, 147th Field Artillery of South Dakota. The competition included six other battalions.

The awards ceremony took place in October during AUSA's annual meeting in Washington, D.C. Army Chief of Staff General Edward C. Meyer made the presentation.



MOVE FAST AND DEEP

by Major Randy L. Wilkes

The National Training Center (NTC) provides the field artillery with the best laboratory in existence for testing combined arms doctrine, tactics, and techniques. The expansive, rugged, desert terrain demands high mobility combined arms operations; and the highly mobile opposing forces (OPFOR) lend realism to the training. In addition, it provides the opportunity for the field artillery to maneuver and to fire over mechanized infantry and armor formations with minimal safety restrictions. The NTC is a crucible in which a field artillery unit ought to be validating existing concepts and experimenting with new ones; and the 3d Battalion, 19th Field Artillery, did just that.

In the fall of 1981, the 3-19th FA began intensive training with the 2d Brigade of the 5th Infantry Division (Mechanized) to prepare for the NTC experience. As training progressed, the brigade tailored its tactics to the NTC terrain and OPFOR. Within the division artillery, meanwhile, concern arose over the adequacy of traditional tactics and techniques in providing adequate fire support in the NTC's high mobility environment. That concern led to the development of tactics and techniques which had application in all scenarios requiring the maneuver task force to make rapid movements over relatively open terrain to seize objectives as deep as 30 kilometers or more.

The field artillery's mobility problem, simply stated, is that a fast-moving battalion task force could often outrun its supporting artillery in a movement to contact, an exploitation, or an attack to seize deep objectives against light resistance. Figure 1 shows that one of the key reasons why supporting artillery can be outrun is simply the disparity, in absolute terms, between the cross-country mobility of the field artillery and the units it supports. The 5-kilometer difference in cross-country speed may not seem large, but it certainly can be significant on the ground where rougher terrain makes the difference loom even larger.

Kilometers per hour		
	Maximum speed	Cross-country speed
M60	50	25
M113	67	25
M109	58	20

Figure 1. Current mobility capabilities.

Kilometers per hour		
	Maximum speed	Cross-country speed
M1 (Abrams)	75	50
M2 (Bradley)	75	50
M109	58	20

Figure 2. Near future mobility capabilities.

The problem in the immediate future will be even more dramatic (figure 2). The M109 battalion trying to keep up with a pure Abrams/Bradley brigade could really be left in the dust. In a situation where the battalion task force bypasses enemy resistance in an irregular manner and the battery commander must follow a task force cross-country to provide them adequate fire support, conventional doctrine dictates that he move by echelon in the absence of reinforcing artillery. But his inadequate cross-country mobility quickly makes it difficult for him to range the supported task force, and the doctrinal tactics he is employing extend his command and control and test his limited communications capabilities. The deeper and more fluid the battle, the more difficult it is to provide continuous fire support.

The new tactics to overcome these problems include dedicating one battery to support a mechanized infantry/armor task force. Since moving fast and deep results in a greater risk to open flanks, the battery moves as an element of the task force and is thus able both to have a degree of security and be in range when it counts. The philosophy is that the battery is either moving or shooting, but never waiting (figure 3).

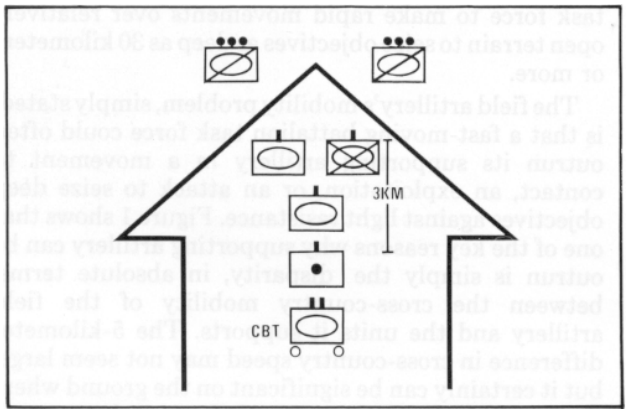


Figure 3. Battery movement with the task force.

In the armor-heavy task force with two teams up and one back, the direct support battery moves behind the trail team with the task force combat trains following. The 3-kilometer distance represents standoff against Sagger and Spandrell. There are some obvious tradeoffs to this movement tactic: i.e., the sacrifice of the concept of continuous support and the ability to mass. Yet, in the high mobility scenario, a firing battery cannot provide continuous support anyway and certainly cannot mass if it is out of range; and in return for these sacrifices, one achieves gains in the following areas:

- The battery is always in range.
- The battery is secure in spite of open flanks.
- The battery is inside the task force air defense artillery envelope.
- The battery has increased flexibility to use innovative formations.
- There is a reduced operational separation between the supported maneuver units and the supporting field artillery since the artillery commander can see the battle as the maneuver commander sees it.

Experiences at the NTC have also led to some new techniques. Although field artillery units usually move in a column, the wedge may be a preferred formation (figure 4). The guns are 100 meters apart in width and depth. The diamonds in figure 4 reflect M548s with the fire direction center M577 in the middle. The executive officer commands and controls from the lead gun. Advantages to the wedge are:

- There is security against attacking aircraft because the battery is no longer a linear target.
- Enemy counterbattery is largely negated because the battery is moving when it is not shooting.
- Time required to pass through encountered enemy artillery is reduced by 50 percent due to shorter battery length.

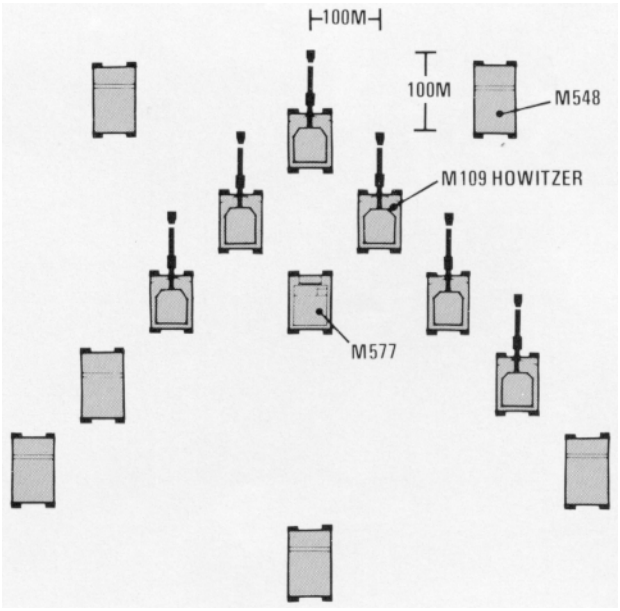


Figure 4. Battery wedge (not to scale).

- There is security against bypassed direct fire weapons because the battery gains protection of tanks which are immediately available to respond.
- The hipshoot is facilitated because the battery can simply pull straight into position and shoot. An AN/PRC-77 radio set strapped under the .50-caliber on each howitzer and remoted through the junction box to the section chief is a quick fix communication link which permits control of this formation and also allows faster laying of the battery. The cost is 18 AN/PRC-77 radios which must be relocated from survey and fire support sections.

Other techniques which help reduce the effects of inadequate mobility include moving in a column to achieve the speed necessary to catch the task force after the shooting is over, and taking selected forward observers from the mechanized infantry platoons and putting them out with the scouts. All of these modifications in tactics and techniques make use of existing equipment, but the ultimate equipment answer appears simple — the direct support artillery needs a high speed chassis and short-range tactical radios for the guns. These materiel fixes are critical if fire support for the mechanized infantry/armor formations is ever to realize its potential.

Given the mobility problem and some answers to it, one needs to consider the training for the new tactics and techniques. The actual training at the NTC was not difficult, but the planning was challenging. Preparatory training was critical to enable the 3-19th FA to make the best use of the execution stage when it arrived in California. Using only hand and arm signals and flags in the beginning, the battalion's firing batteries learned how to move in a wedge on an abandoned airfield. Later, they progressed to the use of radios to overcome the problems created by smoke, dust, and darkness. The battalion already had planned a combined arms live fire exercise (CALFEX) featuring a maneuver company/team assaulting an objective with the support of live artillery fire. This CALFEX was an opportunity to test the new tactics and techniques prior to arrival at the NTC. The scenario was modified to permit live firing to within 800 meters of each company/team from one task force as it assaulted the final objectives, while the remainder of the brigade conducted a force-on-force FTX using MILES equipment.

The first step in the conduct of the exercise was for the task force commander to develop the scheme of maneuver. Fire support team (FIST) chiefs and battalion fire support officers (FSOs) developed quick fire plans to support it, and the targets they developed were actually inside the maneuver area. Since shooting into the maneuver area was prohibited, it was necessary to transpose target grids from the maneuver area to the impact area by assigning new grids to the targets. As shown in figure 5, target 015 in the maneuver area had a similar location in the impact area. Radar flashed the rounds for accuracy, thus permitting the evaluation of the accuracy and the effectiveness of the gunnery team. Additionally, by having radar immediately report "did hit" data, firing

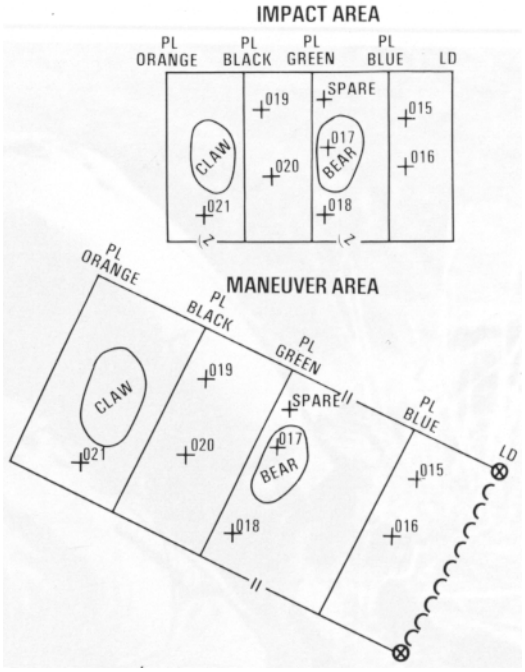


Figure 5. Impact and maneuver areas.

units were able to achieve a real sense of where the rounds were impacting in relation to where the task force elements were maneuvering, thereby allowing the confirmation of the system of command, control, and communications and the rapid modification of fire support coordination measures. During this modified CALFEX, the technique of moving from a wedge formation to a hipshoot using the intrabattery communications link proved very effective. This exercise was the crawling and walking stage which enabled the battalion to hit the ground running at the NTC.

Having witnessed the training and execution of these new tactics and techniques, field artillerymen in the 5th Infantry Division (Mech) Artillery believe strongly that they have a definite place in doctrine. As the 2d Battalion, 21st Field Artillery, began its preparation for its February 1983 deployment to the NTC in support of the 5th Mech's 1st Brigade, there was ongoing refinement of how to execute these principles. Success in the demanding training environment encountered at NTC is a prelude to equal success in combat, but the mobility problem requires a solution first. These tactics and techniques will serve to keep the supporting artillery in range of its fast and deep moving supported maneuver units.

MAJ Randy L. Wilkes entered the Army in 1969 and received his advanced individual training as an 11B. He graduated from the Officer Candidate School and the Field Artillery Officers Advanced Course. He has served with Sergeant and Pershing units; he was the S3 of the 3d Battalion, 21st Field Artillery and the brigade fire support officer of the 2d Battalion, 21st Field Artillery. He is currently the executive officer of the 2d Battalion, 21st Field Artillery, at Fort Polk, Louisiana.

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