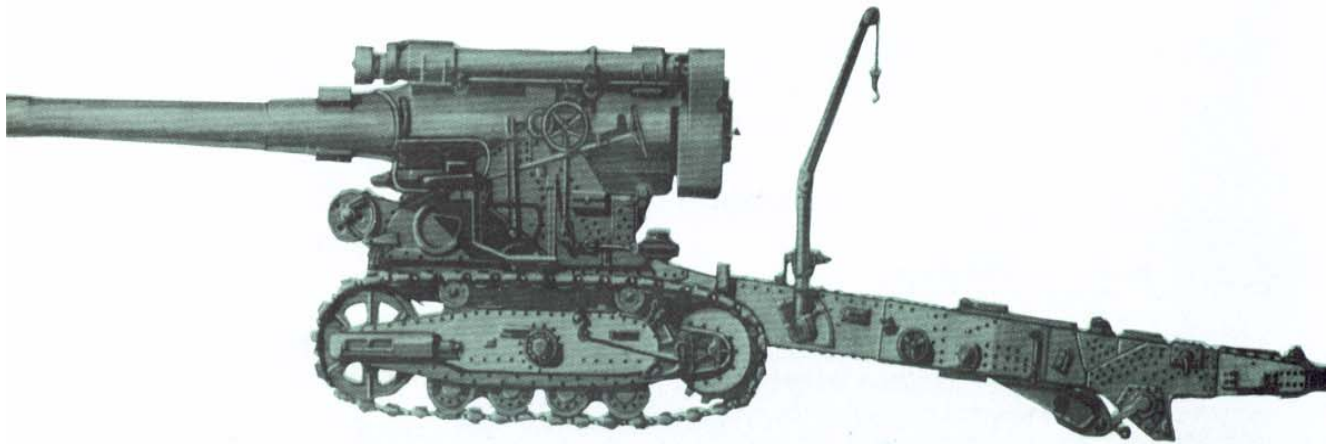


FIELD ARTILLERY JOURNAL

March-April 1978



Soviet 152-mm howitzer JSU 152

Evolution Of Soviet Artillery



Soviet 203-mm howitzer M1931

FIELD ARTILLERY JOURNAL

Volume 46

March-April 1978

Number 2

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"To publish a Journal for disseminating professional knowledge and furnishing information as to the field artillery's progress, development, and best use in campaign; to cultivate, with the other arms, a common understanding of the powers and limitations 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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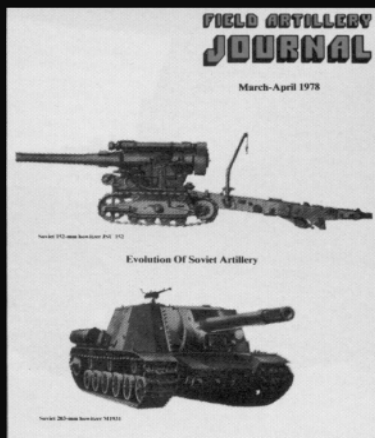
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Bottom photo from book, *Artillery*, by John Batchelor and Ian Hogg.

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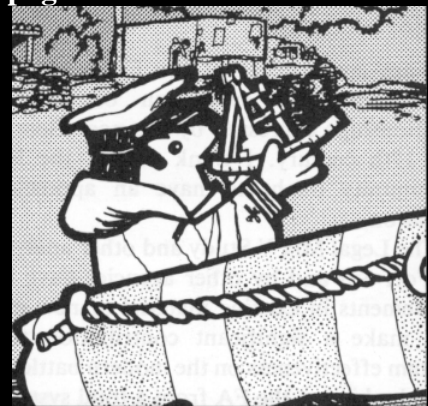
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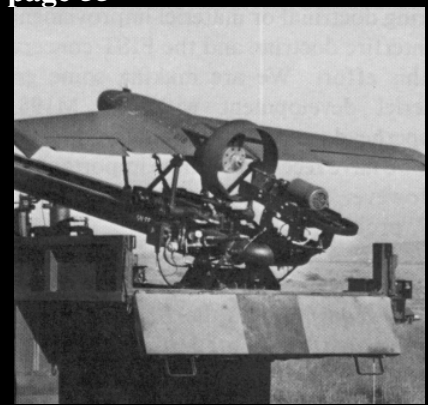
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On The Move . . .

by MG Jack N. Merritt

*For want of a nail, a shoe was lost;
for want of a shoe, a horse was lost;
for want of a horse, a king was lost;
for want of a king, a battle was lost.*

I am concerned that the Field Artillery System is faced with this succession of cause and effect relationships expressed by the poet George Herbert in the 17th century. I think you in the Field Artillery community ought to have an appreciation of this situation.

The Legal Mix V Study and other analyses conducted at Fort Sill and by other agencies have identified improvements in existing materiel or new materiel which can make a significant contribution to overall FA System effectiveness on the modern battlefield. We have been looking at the FA from a total systems standpoint in order to identify where we can improve our system by making doctrinal or materiel improvements. Changes in counterfire doctrine and the FIST concept are products of this effort. We are making some great strides in materiel development with the M198, TACFIRE, Copperhead, and the like and we are grateful for the help we have received in these important areas.

However, it appears to me that we have a "horseshoe nail" problem.

We have a number of low visibility and relatively low cost items which we have problems in getting over the budget/acquisition hurdle. Specific items which are key to modern fire support but are difficult to bring into being are:

- **Field Artillery Meteorological Acquisition System (FAMAS).** Our current meteorological system is the Rawinsonde System, AN/GMD-1. This system was classified Standard A in 1949 and has been in continuous use since that time. The GMD-1 uses World War II electromechanical technology, is cumbersome, requires manual data reduction, lacks mobility, and does not interface with TACFIRE. Over the years, the equipment has become increasingly more expensive to maintain because of its age and relative low density within the Army. In many cases, depots must fabricate replacement parts. The GMD-1's lack of required capabilities and its low reliability render it inadequate for employment on the modern battlefield. However, as



is traditional with field artillery meteorological equipment, the FAMAS is experiencing severe funding problems. Its predecessor developmental system, the Meteorological Data Sounding System, AN/UMQ-7, suffered the same type of funding problems and, after 14 years of development, was finally cancelled. FAMAS is headed down the same road. Current funding limitations might delay FAMAS fielding until at least 1985. By the time all units receive FAMAS, the GMD-1 will be more than 40 years old. Meteorology is the only part of the FA System that has not been upgraded during the past 30 years, even though meteorological effects are the greatest contributor to the overall FA System error. Delaying development of FAMAS will preclude us from maximizing the capabilities of other elements of the FA System; e.g., longer range weapons, improved ammunition, and our modern automated TACFIRE/BCS system. Most serious of all will be the delay in achieving the Field Artillery's ultimate goal of first round fire for effect.

- **Field Artillery Acoustic Locating System (FAALS).** Sound ranging is the only passive target acquisition system currently in the Army inventory. The technique

of sound ranging in our Army has remained virtually unchanged since it was first employed in World War I. Nevertheless, sound ranging is a viable target acquisition technique as evidenced by the fact that every major army in the world employs it. However, to remain an effective target acquisition system, sound ranging must be automated and then its concept of employment changed to keep it from being saturated by battlefield noise. It would provide us with a passive, extremely rapid and accurate means of locating enemy cannon artillery. FAALS will be employed as a complementary system to our FIREFINDER radars, acting as a cuing system that will cut the emitting time of the radars, thereby increasing the radar's survivability. To counter the massive artillery employment of the threat forces, rapid and accurate location of their artillery is critical. Survivability in the electronic warfare environment is also critical. In spite of these critical needs, development and fielding of the FAALS has been cancelled.

- **Field Artillery Radar Chronograph (XM90).** The current radar chronograph (M36) is used to determine the muzzle velocity variations of cannons. It is bulky, heavy, difficult to maintain and operate, and requires a dedicated vehicle, generator, and crew. To assist in achieving good first round accuracy without registration or adjustment, a better system is needed. Commercial items have been undergoing testing and evaluation since 1971. In 1973 USAFAS submitted a requirement for a lightweight doppler radar system that could be attached to a howitzer. Such a system would be operated by the howitzer crew and not require additional people, vehicles, or equipment. Three competitive models were submitted for testing and evaluation in 1976-77. None of the models met all the desired performance characteristics; however, one model was considered acceptable without additional testing. We are hopeful that procurement actions now under way will move this project along and we can get our hands on this sorely needed item soonest.

- **Intrabattery Radio Communications System.** In the past, field artillery moves were mostly deliberate, well-planned, and infrequent. However, our studies indicate that, in the battlefield of the 1980s and beyond, an artillery battery may move 10 to 12 times per day — with the majority of the moves being hasty. Consequently, an intrabattery system providing instantaneous communications to supplement our current wire system is essential. The Small Unit Transceiver (SUT), AN/PRC-68, is therefore being developed. The SUT is a short-range FM radio to be issued one per howitzer, one per battery FDC, and one per battery operation center.

- **Protection from enemy artillery.** Materials are now available which, properly applied, offer the potential

of enhancing the survivability of the softest element in our gun positions, the cannoneer. The exposed posture of the M110 howitzer crew and the M548 ammunition vehicle which serves both the M110 and the M109 must be corrected. Legal Mix V analysis shows beyond doubt that protection of the people in these two vehicles results in significantly fewer personnel casualties and therefore increased operational availability of cannons. In addition to the ballistic protection for the M548, improved materiel handling equipment is needed for better handling of packaged ammunition in the firing position to improve response time and perhaps identify personnel savings.

The above items may appear insignificant to many since they don't have the visibility of a Pershing missile, a tank, or an aircraft, but these are the weak links — the "horseshoe nails" in the Field Artillery System. Moreover, these are not gold plated frills — to the contrary; the potential savings in ammunition alone by providing a better meteorological system to improve the accuracy of our system offers enormous reduction in the logistics burden from factory to gun tube.

The Field Artillery "horse" and "rider" are in good shape and deserve your full confidence, but I am concerned about some of the "nails." I will devote my best efforts to filling out the system and I solicit the support of Redlegs everywhere in this important work.

Salute to MG Akers

This issue of the *Journal* includes an interview with a fine Artilleryman — MG A1 Akers who spent a crucial 40 months at the School before leaving to become the Director of Materiel Plans and Programs, Office of the Deputy Chief of Staff for Research, Development, and Acquisition at DA. Colonel Akers came to Sill from Fort Hood in August 1974. He became the Director of Instruction and was involved in the formulation of many of the innovations being developed in the newly formed TRADOC.

On 1 August 1975 he was promoted to Brigadier General and became the Assistant Commandant and undertook the task of directing the reorganization of the School. Many of the training and management concepts found throughout TRADOC are the result of things A1 Akers started here at Sill. And, he was responsible for developing an effective team to bring about the many changes in the Field Artillery.

On behalf of Redlegs everywhere, I want to express our deep appreciation to A1 Akers for his great contribution.



letters to the editor

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

Pershing is FA

I, along with other Pershing missilemen throughout the world, am offended by the term "Artillery related MOS" in reference to 15E (Pershing missile crewman) SRBs in the Redleg Newsletter (FA Journal, Nov.-Dec. 77).

I was of the opinion that we in Pershing were full-fledged Field Artillerymen and not just some second cousin to the tube types.

Pershing is the Army's longest range and most powerful weapon system and the only Field Artillery system with a full time Quick Reaction Alert role.

Let's remember that those of us who serve in missiles are not, and will never be, second class artillerymen.

Douglas J. Middleton
MAJ, FA
Fort Sill, OK

There was certainly no slight intended. The term you objected to arose through the editorial process of taking a DA release on Army-wide MOS changes and extracting only those MOSs that are of interest to commanders of artillery units. For example, the item listed 31D which is a Signal Corps MOS, but a Pershing unit would certainly be interested in the availability of TRC-80 operators.

*Despite the fact that Pershing battalions make up less than four percent of the Active Field Artillery, that is the only caliber to which an issue of the **Journal** has been devoted (May-June 1977). To help allay any concern that the **Journal** is strictly "cannon" oriented, we have changed our "Right by Piece" logo to include a missile.*

It is time to put to rest the feeling that there are two US Field Artilleries — tube and missile. There is only one, with different calibers, and it is the best artillery in the world! — Ed.

Individual training — at the crossroads?

Most of us have been part of a four-year evolution led by General DePuy. TRADOC, under DePuy's leadership, led the Army to some fundamental changes in thought and force structure. The motive force for the changes was basic: Prepare for the war we are likely to fight rather than devote too much study to reruns of the last war — a syndrome which has historically given rise to faulty preparations. The new TRADOC focus provided two positive results. First, it fostered an environment alive with the excitement of study and debate of the tactics necessary to win the central battle of the next war. Second, it precipitated a new drive toward training soldiers and units how to fight and win.

A third effect is not quite so positive. An environment for change exists which may see us overextend the successes of the last four years. We must resist the temptation to build more complex tactical and training systems simply because the model from which to do so exists.

Individual training in the Army is coming perilously close to being an aberration of anything that could have been remotely intended by General DePuy. We are turning out voluminous Soldier's Manuals and are developing the Skill Qualification Test (SQT) as a measure of the soldier's job proficiency and suitability for promotion. Most of this was done thoughtfully. The skill concept appears sound, but there are recognized pitfalls in testing.

- How much should we test hands-on versus written?
- What happens to the administrative overhead in the field as the percentage of performance sampling goes up?
- Can we afford such luxury? (If not, are we compelled to reduce the proposed role of SQTs in personnel management decisions?)

To pursue our concerns a bit further, let's look at the officer training proposals. The Lieutenant's Manual is a reality. Currently, it does not have the same impact as the Soldier's Manual. However, in its fledgling form, the Lieutenant's Manual represents a first step toward a move to officer's qualification tests. Yet the manual now is little more than a laundry list of disjointed tasks, most of which have little to do with "how to fight." As such, the manual serves very little use as a working document for training officers. This flows from a fundamental problem which has been recognized for more than a decade by leaders in education and military training research. *Subjective* skill identification and follow-on performance-oriented instruction is difficult, if not impossible, to develop. On the other hand, the *objective* skills required in our enlisted career management fields have proved generally easier to identify and place into well defined tasks, conditions, and standards. Thus, it is not accidental that the officer courses in our service schools are still wrestling with something called "criterion referenced instruction" more than a decade after researchers introduced the schools to the concept of training keyed to tasks, conditions, and standards. Our error is one of commission, in that, in our zeal to coordinate individual training programs for officers, we force the issue of an officer's manual akin to the Soldier's Manual without giving careful consideration to the very real differences between the basic nature of the skills of the officer and enlisted soldier.

There are some who have heard the DePuy "best soldier" theory which, put simply, says that the unit leader must be the best of each type soldier in the unit — the field artillery battery executive officer should be the best cannoner in the battery. Should the officer leader be

the most skillful member of the unit in Soldier's Manual tests, or are we off the mark by establishing such requirements? There is no evidence to support other than the latter. The officer leader must not get embroiled in detailed task performance of those career fields under his supervision. He must, however, know weapons systems capabilities and how to employ them. He must know the enemy in detail and must supervise the individual training of subordinates, promoting their welfare and inspiring them to win in the face of sometimes overwhelming odds. This is "officer business" and must be the focus of our officer training — lieutenant to general officer.

The first four years of TRADOC have been good years. We however stand at a crossroad. We must consolidate the positive gains in training the individual and move continually, but thoughtfully, forward in order to extend our system of individual training, especially as it applies to officers.

David S. Jackson
LTC, FA
Fort Ord, CA

The USAFAS department responsible for the Lieutenant's Manual says that the manual is not intended to be a vehicle for officer's qualification tests. While the tasks listed may seem like a laundry list, the purpose was to provide a comprehensive starting point for subsequent refinement into a valid task list. The rationale for the task list and plans for its future use are explained in detail in this issue's "View From The Blockhouse." — Ed.

FATC corrections

One point needs clarification in the article I wrote which appeared in the January-February 1978 *Journal*. The Field Artillery Training Center (FATC) does not teach all skill level 1 tasks. We teach only the skill level 1 tasks identified in the 13B Commander's Manual which have been designated to be taught in the institutional setting. This is, in fact, less than half of all skill level 1 tasks. The remainder must be taught at the unit of assignment. To help clarify exactly where each individual stands in individual training, the soldier reporting to his first unit from the FATC brings along in his 201 file an individual training record (TRADOC Form 578-R). The receiving commander or section



Super shot

I thought you might be interested in this picture because of its rarity. Many "old timers" tell me this is the first time they've seen such a picture.

I took the picture at Grafenwoehr during our unit's ARTEP. The 175-mm round "caught" is traveling at approximately 3,000 feet per second.

A Minolta SRT 201 with a 50-mm f/1.7 lens was used with the following setting: shutter speed 1/1000 seconds at f/1.7.

Phillip D. Parks
Specialist 4
6th Bn, 9th FA
APO New York

Thanks a million. We welcome good FA action shots. Any other good photographers out there? — Ed.

chief can refer to this form to find out what the soldier has been taught and how well he performed in training.

Paul Green
CPT, FA
FA Training Center
Fort Sill, OK

As long as we are correcting the record, there are two typographical errors in the red charts on page 20 of that issue. Line 1 of block 1 should read "Apply first-aid procedures" and title of block 3 should read "(individual and crew served weapons)." — Ed

Resident training schedules

It is almost impossible to keep up with what resident courses are available for Reserve Component Artillerymen. Why don't you publish course titles and starting dates in the *Journal*?

A Guardsman

The data you are talking about is so voluminous it would take about half the pages of each issue. The information you want should be available in every FA unit orderly room in at least one of the following formats:

- USAFAS Circular 135-1, published annually, mailed to every Reserve battalion and separate battery listing staff refresher courses.

- The USAFAS "Schedule of Classes" (the "Red Book"), published annually and mailed to every state Adjutant General and Readiness Region, lists the start dates of every session of every resident course. Distribution is being expanded to include every battalion and separate battery.

- DA Pam 351-4, available to all units, lists the courses but not the start date of each class. This data, or any USAFAS training data, can be obtained from the School's Directorate of Course Development and Training. — Ed.

Incoming

SSB solves NG training problem

Now that recognition of the "hostile training environment" exists at all levels of command, it is time to act to counter this common enemy. It is surprisingly easy for commanders and operations personnel to blame their lack of training on this environment; unfortunately, it is much harder to come face-to-face with the problems and use resourcefulness to overcome them. Perhaps a good look should be taken at what National Guard units are doing to overcome their training problems. Not only are these units operating under extremely limited budgets, but they are forced to train units based on two days training a month plus a two-week annual training session. In spite of this, many units have become very efficient in the training field. Obvious techniques, such as using the M31 trainer and wheel vehicles to simulate tracks, are routine. Real training accomplishments are gauged by innovations going beyond these simple training techniques. My battalion went much farther and overcame overwhelming obstacles in order to provide battalion level control to its field operations on a routine basis.

The 1st Battalion, 157th Field Artillery, Colorado Army National Guard, has a TOE similar to the active component nondivisional, 8-inch general support battalion. There the similarity ends. My battalion has its headquarters in Longmont, CO, its service battery in Boulder, and its firing batteries spread throughout the state in Golden, Grand Junction, and Montrose. In the best weather (summer), it is a six-hour drive from the eastern Rocky Mountains slope to the two units on the west side of the mountains. In the winter, travel through the Rockies is difficult at best. While active component units find integration of battery and battalion operations difficult, this battalion faced the ultimate challenge. The goal was to provide for battalion controlled operations on a weekend drill period — a necessity to meet the operational readiness goals outlined in ARTEP 6-165.

We devised Operation Longshot, aimed at integrating the battalion's control of both operations and fire direction.

The obvious initial problem was communications. FM communication was definitely out because of the 14,000-foot peaks and distances in excess of 250 miles. Single sideband (SSB) communications

appeared to be the best solution as each unit maintains an SSB receiver/transmitter for state emergencies.

Finding a location to fire is a constant problem for units remote from military installations. After some research, we requested and received permission to fire live ammunition on Bureau of Land Management land near a small town named Delta, about halfway between Montrose and Grand Junction in western Colorado. It was then planned for A and C Batteries to fire live at Delta while B Battery would participate in a dry exercise at a training area on the outskirts of Denver.

Ammunition was brought from Fort Carson, howitzers were transported by lowboy, and all other logistical aspects were resolved. Reservations about the exercise from State officials and Regular Army advisors were assuaged, and the operational planning emerged as an operations order.

Finally on 21 May 1977, two firing batteries rolled onto parched earth near Delta, established communications with a battalion FDC 250 miles away, and commenced shooting.

While Operation Longshot was not an end in itself, it was certainly a beginning. Enormous obstacles were overcome and a dispersed battalion was able to function as a single entity. The operation was viewed as a success by even the most skeptical, and it exhibited what can be accomplished with a combination of initiative and aggressiveness. This exercise far exceeded my expectations. For the first time, the unit was able to mass fires and compute missions from a common focal point on a weekend drill using distance to our advantage.

On 1 October, the whine of diesel engines and the echoes of exploding rounds were again heard by the inhabitants of western Colorado. It is extremely impressive to note that a battalion, not having fired in five months, was able to put rounds out within two hours of arrival in the simulated combat arena. This time included both reconnaissance of position and operator's pre-operation checks.

Even though SSB radio cannot solve every unit's training problems, this example of aggressively meeting and overcoming training obstacles can have impact on all training situations. It is without question, a remarkable example of

winning our most crucial peacetime battle — that against the "hostile training environment."

Richard E. Bond
LTC, COARNG
Longmont, CO

Countermortar training

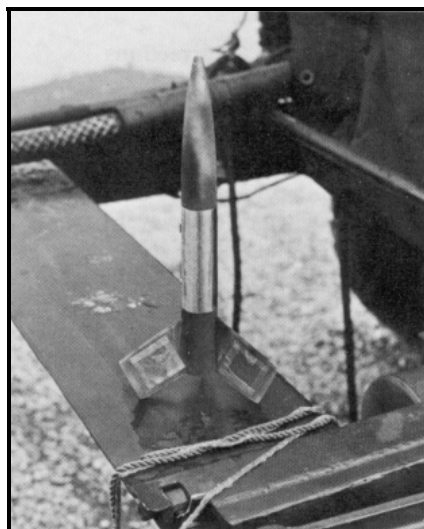
My unit has devised what we believe is an excellent aid to training countermortar radar crews. We use an inexpensive commercial model rocket, with aluminum foil attached for reflectivity (see photo), to simulate hostile weapons. The rockets available range in size from one to three feet and can achieve heights of a few hundred to more than 1,000 feet.

Each rocket costs about \$4 and each engine (propellant charge) costs about 80 cents. A built-in recovery parachute enables multiple launchings, so we get "lots of bangs for a few bucks."

We devised some conversion formulas and firing tables to account for difference in scale. We have found this system works, it saves money over using service ammunition, and it adds some fun to training. Anyone desiring details may write to me.

Douglas M. Hurst
LT, USMC
HQ Btry, 12th Marines
FPO San Francisco, 96602

Thank you for sharing your ideas with us. Always good to hear from our Marine Redlegs. — Ed.



Modified hostile weapons simulator with aluminum foil attached to body and fins.

Mil versus meter shift?

Before I comment on the School's note at the end of my article "Improving the Adjustment of Fire" in the January-February 1978 *Journal*, I should like to commend the *Journal* for their outstanding accomplishments in keeping field artillerymen informed on what is going on in their branch. I am biased perhaps, but to me the *Field Artillery Journal* is the most interesting of the service publications, and I read most of them. The articles in the *Journal* are very closely tied to the intellectual and pragmatic needs of all field artillerymen, and the variety of articles and the way they are presented are exceptional. In the last issue, there were two unusually outstanding contributions — the one from the Commandant, Major General Merritt, and the one from Doctor Bloustein.

Now to the main objective of my letter — my rebuttals to the Editor's note:

- First, let me say that the implication that I was recommending a *replacement* for the meter shift (mil relation) procedure is not valid. I never mentioned exclusivity; and by telecon I emphasized several times that my article was not meant to restrict the observer to any one type of procedure and that an optional "either/or" capability (mil shift, if the observer is roughly located; meter shift, if he is not) was what I meant.

- Secondly, I agree that there are situations when the observer may not be able to locate himself, even roughly. In this case, we have no alternative except to fire the meter shift. Thus, the "either/or" option harms nothing; it is simply available to provide flexibility and greater accuracy and responsiveness when feasible.

- Third, to prove that my idea is not as wild as some may think, I should like to add that the Swiss have a super-outstanding artillery force (500 batteries), and they have incorporated the dual capability in their new battery computer systems. In fact, in the only instances where we [Litton] made this suggestion to other countries (Norway, Sweden, and Germany), all have not only expressed their desire to add this capability to their calculators, but have been extremely enthusiastic about it. With this start, I am sure that the fire direction computer of the future will have this dual capability.

- Fourth, in contrast to the chart syndrome, mil shifting is an extremely simple problem for a computer or a calculator because the subroutines are already there and the capability to store almost any number of FO locations (our 3.5-pound calculator stores 9) adds practically nothing to the cost.

From another viewpoint, doesn't it seem incongruous that in our observer polar plotting procedure we plot initially with an azimuth (mils) and distance and then revert to the inaccurate (mil relation) meters for subsequent shifts? Is this going backwards?

I do not agree with the statement that the observer has the full burden of locating himself. It can be done by PADS, PLARS, laser, etc.; by having the FDC compute his location from azimuth and distance from a known point; or by measuring and reporting angles between known points, simultaneous bursts, or successive bursts. There are many more existing techniques, and new technology will keep adding to this. If we fight in Europe, we will have the best maps in the world, so the observer should have no difficulty, even under the most mobile conditions, in locating himself to near-survey accuracy.

The Editor's comment about the number of artillery observers under FIST is correct, but this is because the infantry mortar platoons have lost their observers to the artillery. Actually, before FIST, we had a greater combined number of infantry and artillery observers.

In conclusion, my question as stated in the article still stands. "Is there now any basis left for keeping the observer *tied* to the meter shift?"

Hopefully, my article, as well as these comments, will be read and the matter explored further to stimulate comments and suggestions from the field.

S. Rizza
COL (Ret), FA
Van Nuys, CA

Reunion

The Washington Artillery Veterans Association will meet May 5-7 in Lawton, OK. Contact Eddie P. Benezech, 1200 Friscoville Ave., Arabi, LA 70032.

FA Commemorative print

A major project is underway by the Field Artillery Association in cooperation with one of the most famous wildlife artists in America to help preserve our branch heritage.

The artist, Ray Harm, is widely acclaimed for his West Point eagle painting and other works. A limited edition color print of the American Bison or buffalo will be made from an original painting by Harm.

The buffalo is both a national symbol and a symbol of the West. In the 19th century, buffalo were more numerous than any other large game animal on earth. Countless thousands of these great beasts roamed the Fort Sill area in Indian Territory days. They served as the Plains Indians commissary and as a welcome staple in the diet of early-day troopers.

Few who have visited the Field Artillery Museum will forget the old sign at the entrance to the Geronimo Guardhouse, "The shooting of buffalo from barracks windows is prohibited." Ancient buffalo wallows can still be seen on the firing ranges, and the nearby Wichita Mountains Wildlife Refuge is home to one of the nation's largest buffalo herds.

The buffalo print will be approximately 24 by 30 inches. Four hundred prints will be released on the first day of issue at Fort Sill in June of this year. These prints will be signed by the artist and bear a "First Day of Issue" seal and a special FA Museum seal. An additional 800 signed prints will be available later with the Museum seal and inscription.

Members of the Field Artillery Association will be given first priority in ordering these prints. Inquiries should be addressed to the FA Association, c/o the FA Museum, Fort Sill, OK 73503.

Funds derived from the project will be used to obtain vitally needed environmental control equipment for the Museum's Conservation Laboratory and its collection of perishable, irreplaceable artifacts.

James W. Wurman
COL, FA
President, FA Association

Evolution of Soviet Self-propelled Artillery

by Mr. Andrew W. Hull

Despite the Soviet military's interest in self-propelled (SP) artillery stretching back to the 1930s, developmental objectives and operational requirements for these weapons have varied greatly from one decade to the next. This changing emphasis is of particular note since it is in marked contrast to the developmental pattern of other Soviet ground forces weapons, such as tanks or towed artillery, which have had fairly consistent design objectives and operational roles over the last 30 to 40 years.

Prewar systems (1930-1941)

Soviet developmental efforts through the mid-1930s concentrated on creating SP artillery configurations suitable for supporting infantry and tank operations. In fact, of the 12 systems known to have been designed between 1932 and 1936, only one — a coastal defense weapon — had a role other than infantry or armor support (table 1). Such design and development emphasis was predictable since the 1931-1932 Armor Program called for SP artillery configurations capable of direct support for armor, cavalry, and infantry offensive operations.¹ Although the Soviets devoted considerable resources to creating these early SP guns, most of the systems never got beyond the prototype or limited production stage. Nevertheless, these experiences provided the groundwork for later Soviet designs.

After this lengthy period of experimentation, Soviet

design bureaus began to develop systems which merited more extensive production and introduction into Soviet military units. And, as with earlier experimental models, these systems emphasized supporting infantry and armor operations. Several of these guns, particularly the SU45 and the SU57, were of such quality that they saw extensive action in the fighting with Finland and in the early phases of the German invasion.

Wartime tank destroyers (1942-1945)

Originally during 1941 and early 1942, members of the Artillery Committee² planned for the "fastest development of SAU (self-propelled artillery) designed to accompany infantry" — concepts in keeping with prewar designs.³ These plans conceived of many new systems (table 2), including a self-propelled pillbox destroyer outfitted with a 152-mm gun-howitzer.⁴ Although the State Committee for Defense had approved these plans, it changed its decision in October 1942 and ordered concentrated development and production of antitank SP artillery systems.

This change of plans was virtually complete; that is, only one system was fielded throughout the rest of the war which aimed at infantry support — the SU76. And even this system was originally intended as an antitank weapon, but the thinness of its armor made it too vulnerable to German tank guns and consequently it was relegated to infantry support duties. Soviet disregard for the value of a specialized infantry support SP gun is well illustrated by the fate of the SU122 which began production in January 1943 but was withdrawn in autumn of that same year. The SU122, according to an article in the September 1976 edition of *Soviet Military Review*, was "an effective antipersonnel weapon; however, owing to the low initial velocity, its armour-piercing characteristics were inadequate." This same Soviet article reported that, because of its poor performance as a tank killer, the SU122 was soon replaced by the SU85 which was later praised as "an excellent tank buster and tank support gun."

Despite Soviet disinterest in specialized infantry support SP artillery, existing tank destroyers sometimes did provide such service. This is suggested by the fact that the tank destroyers carried high explosive shells in addition to armor-piercing rounds; however, regardless of this capability, accounts of World War II actions make it clear that this was a limited secondary function.

¹ John Milsom, *Russian Tanks 1900-1970* (Galahad Books, New York, 1970), p. 36.

² The Artillery Committee was apparently subordinate to a main administration charged with production of self-propelled artillery.

³ "Heavy Self-Propelled Artillery," *Technology and Armament*, No. 2, February, 1973, p. 162.

⁴ *Ibid.*, p. 162.

Table 1. Prewar SP artillery (1930-1941)				
Experimental and limited production models				
Designation	First year identified	Chassis	Caliber/type	Purpose
M1932	1932	T28 medium tank	152-mm gun/howitzer	Direct support of armor units
M1933	1933	Modified T28 medium tank	152-mm	Coastal defense
SU7	1933	Unknown	203-mm gun/howitzer or interchangeable 305-mm howitzer	Infantry support
AT1	1933	Reinforced & modified T26 light tank	76-mm tank gun	Tank support
SU5-1	1934	T26 light tank	76-mm divisional gun	Tank and cavalry support
SU5-2	1934	T26 light tank	122-mm divisional gun/howitzer	Tank and cavalry support
SU5-3	1934	T26 light tank	152-mm divisional gun/howitzer	Tank and cavalry support
SU6	1935	T28 medium tank	152-mm gun/howitzer	Probably infantry support
SU8	1935	T28 medium tank	76-mm	Tank support
M1935	1935	T26 light tank	76-mm	Tank support
SU14	1935	T28 and T35 medium tank chassis components	203-mm	Probably infantry support
SU14-1	1936	T28 and T35 medium tank chassis components	152-mm naval gun	Probably infantry support
Series production models				
Designation	First year identified	Chassis	Caliber/type	Purpose
SU14-Br.2	1939	Unknown	152-mm gun/howitzer	Destruction of bunkers & strong fortifications
SU100Y	1939	T199/SMK heavy tank	130-mm	Infantry support
SU45	1940-1941	Komsomolets tractor	45-mm	Armor support
SU57	1940-1941	Komsomolets tractor	57-mm	Armor support

Analysis of Soviet articles dealing with World War II weapons design and production suggests several major reasons why they concentrated on SP artillery as antitank weapons. For one thing, the large tank battles with the Germans from 1942-1944 caused an extensive requirement for more tank killers. Manufacture of SP artillery provided an attractive alternative to increased tank production since these weapons could be produced more quickly than tanks, as SP guns required no turret assemblies. In addition, SP artillery mounts could be equipped with larger caliber guns than could be fitted on a tank with an equivalent chassis. For example, the T34 tank carried a 76-mm gun, but the SU85, using the same chassis, was fitted with an 85-mm gun.

Developments from 1957 through 1962

The first signs of postwar Soviet SP artillery design did not emerge until 1957 when four new systems (table 3) were unveiled: the ASU57, the M1957 310-mm gun, the M1957 400/420-mm mortar, and the M1957 122-mm gun. Significantly, three of these four systems were special-purpose weapons. The ASU57, for instance, came in two models (one with steel armor and the other with aluminum armor); both models, however, were developed as air transportable systems so that airborne troops could use them as either assault or antitank weapons. The 310-mm gun and the 400/420-mm mortar also seems to have been a departure from World War II

Table 2. World War II tank destroyers (1942-1945).

Designation	First year identified	Chassis	Caliber/type	Purpose
SU76	1942	T70 light tank	76-mm	Tank destroyer & later infantry support
SU122	1942	T34 medium tank	122-mm howitzer	Tank destroyer
SU76M	1942	T70 light tank	76-mm	Infantry support (SU76M had improved motive power)
SU152	1943	KV1S heavy tank	152-mm howitzer	Tank destroyer
SU85	1943	T34 medium tank	85-mm tank gun	Tank destroyer
SU100	1944	T34 medium tank	100-mm naval gun	Tank destroyer
JSU122	1944	Joseph Stalin heavy tank	122-mm gun	Tank destroyer
JSU122S	1944	Joseph Stalin heavy tank	122-mm tank gun	Tank destroyer
JSU152	1944	Joseph Stalin heavy tank	152-mm	Tank destroyer

practices since they were evidently intended to provide indirect fire support — a role indicated in part by their relatively light armor protection. It should also be noted that the 310-mm gun was special in that it was capable of firing both nuclear and conventional rounds. The 1957 Moscow May Day parade also displayed a 122-mm gun mounted on a T54 tank chassis in a configuration reminiscent of World War II tank destroyers.

Another 420-mm mortar, possibly an improvement of the 1957 mortar, was disclosed in 1960. Two years later, two new SP systems appeared in the May Day parade. One of the new systems was the ASU85, another air transportable SP artillery piece. Like the ASU57 which it replaced, the ASU85 apparently was intended to carry

out the dual purpose of antitank and assault missions. During this period, the Soviets also developed another 100-mm SP gun which they revealed in May 1962. Although the intended use of this weapon was never disclosed, it may have been another attempt to produce an upgraded tank destroyer.

Soviet satisfaction with the seven prototypes which came out between 1957 and 1962 can be gauged in part by the extent of their production and deployment. Only the ASU57 and ASU85 were extensively produced and used. The 310-mm gun, the 400/420-mm mortar, and the 420-mm mortar were fielded in only very limited quantities, and the two systems which may have been tank destroyers (the M1957 122-mm and the M1962 100-mm)

Table 3. Systems of the 1950s and 1960s.

Designation	First year identified	Chassis	Caliber/type	Purpose
ASU57	1957	T70 light tank	57-mm antitank gun	An air transportable assault and antitank gun for airborne troops
122-mm SP gun M1957	1957	T54 medium tank	122-mm field gun	Unknown (possibly a tank destroyer)
310-mm SP gun M1957	1957	Joseph Stalin heavy tank	310-mm	Fired nuclear and conventional rounds
400/420-mm SP mortar M1957	1957	Joseph Stalin heavy tank	400/420-mm mortar	Probably, heavy infantry support and destruction of heavily fortified positions
420-mm SP mortar M1960	1960	Unknown	420-mm mortar	Probably, heavy infantry support and destruction of well fortified positions
ASU85	1962	PT76 light tank	85-mm gun	An air transportable assault gun for airborne forces
SU100	1962	T54 medium tank	100-mm gun	Unknown (possibly a tank destroyer)

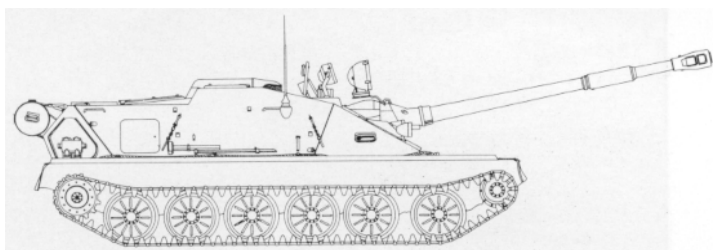


Soviet 76-mm gun SU76.

were not introduced into the Soviet operational inventory.⁵ Consequently, this period marks a departure from the previous one in that the operational concept of specialized tank destroyers was abandoned in favor of special-purpose SP artillery weapons (e.g., air transportable systems and tactical nuclear artillery).

A possible explanation of why the Soviets ceased producing SP guns as tank destroyers is found in a book entitled *Tanks and Armored Troops*, by A. Kh. Babdzhanyan, Chief Marshal of Soviet Armored Troops. Babdzhanyan, discussing worldwide SP artillery developments, may have been commenting on Soviet experience too when he noted, "In peacetime, when enough time is available for the design and development of perfected tank models, this method of creating SPAs (producing SP guns as substitutes for tanks) is hardly desirable; hence, their production was discontinued in all countries."

There are several other potential explanations for Soviet conservatism in introducing new SP artillery designs in the late 1950s. For one thing, many of these new designs may have fallen victim to Khrushchev's

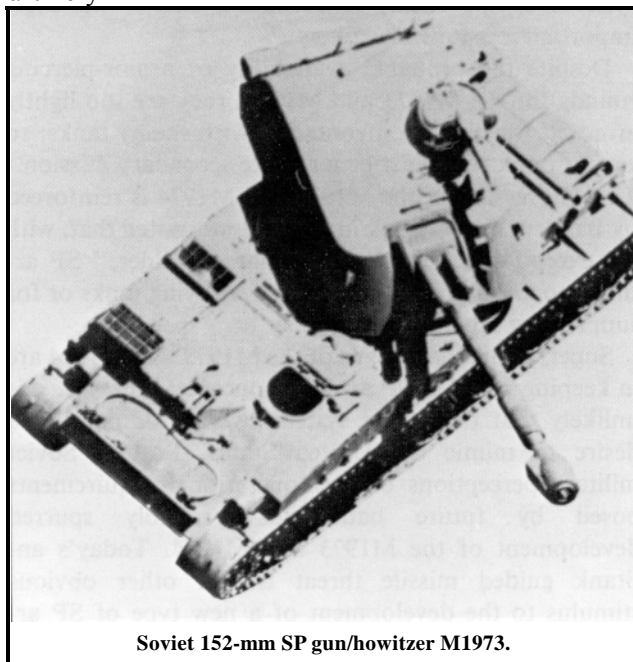


Soviet 85-mm gun ASU85.

desire to reduce defense expenditures — mostly at the expense of the ground forces. Also, Soviet military doctrine of the time was not stressing mobility to the degree of present doctrine, and so the fielding of SP artillery similar to that deployed in the West may have had a low priority within overall ground forces materiel requirements.

SP artillery for the 1970s

After an 11-year hiatus, the Soviets introduced two more SP artillery pieces (table 4) in 1973 and 1974. Both these weapons diverged from designs of the previous periods in that they incorporated fully-enclosed turrets which could rotate 360 degrees. The M1973 152-mm and the M1974 122-mm SP guns were also unique in that they combined both larger caliber guns with relatively light armor protection.⁶ In contrast to Soviet SP artillery



Soviet 152-mm SP gun/howitzer M1973.

designs of the previous three decades, Soviet designers did not use an existing tank chassis on the basis for the new guns. Rather, they devoted considerable resources to building chassis especially for the M1973 and M1974.

Even though Soviet military journals have not directly discussed the roles of these new weapons, it seems clear from oblique references that the M1973 and M1974 were intended to support infantry and armor units in offensive actions. The new armor support

⁵ The M1962 100-mm SP gun, was not used by Soviet troops, but appeared in limited quantities with East European forces. So, perhaps it was never intended for the Soviet army.

⁶ There is some discrepancy between US Army sources and information published by non-Army sources. These non-Army sources usually designate the 122-mm as the M1973 and the 152-mm as the M1974 — just the reverse of Army sources.

Table 4. Systems of the 1970s.				
Designation	First year identified	Chassis	Caliber/type	Purpose
M1973	1973	Modified SA4 Ganef transporter	152-mm (probably gun/howitzer)	Infantry and armor support
M1974	1974	Somewhat similar to PT76 light tank	122-mm (probably gun/howitzer)	Infantry and armor support

function was not for direct confrontation with enemy tanks as during World War II. Instead, the new SP guns were probably built to provide mobile firepower which could suppress US crew-served antitank missile systems at the point of the Soviet attack. Such a mission for artillery is indicated by Lieutenant General of the Artillery, V. Koritchuk, in the June 1975 issue of *Military Herald*, "As we see, combatting the antitank systems of the enemy is becoming one of the most important missions of artillery."

Despite the probable availability of armor-piercing rounds for the M1973 and M1974, they are too lightly armored for direct confrontation with enemy tanks; so any antitank role must be a remote secondary mission.⁷ This impression of the M1973 and M1974 is reinforced by Babdzhanyan's book in which it was noted that, with the exception of the West German "Widder," SP artillery today is not produced for destroying tanks or for suppressing other armor targets.

Superficially the designs of the M1973 and M1974 are in keeping with US SP artillery concepts; however, it is unlikely that the Soviet systems were prompted by a desire to mimic the United States. Rather, Soviet military perceptions of new operational requirements posed by future battlefields probably spurred development of the M1973 and M1974. Today's antitank guided missile threat is one other obvious stimulus to the development of a new type of SP artillery. In addition, the Soviet emphasis on speed of the offensive, particularly at the point of attack, seems to provide a further rationale for concepts of the type embodied in the M1973 and M1974. The new systems, unlike traditional towed artillery, will have the added ability to keep pace with advancing Soviet armor columns. The Soviet assumption that battle areas of the future will be radioactive may have also stimulated the design of SP artillery systems, wherein the crew could function in an enclosed, protected, environment.

Conclusions

Soviet operational and design priorities for SP artillery guns have varied considerably since the 1930s. In fact, the preceding analysis of Soviet equipment suggests four distinct periods:

- From 1930 to 1941, the Soviet military was interested in SP artillery which equally emphasized infantry and armor support functions.

- From 1942 to 1945, the emphasis shifted to development and production of specialized tank destroyers which had only a limited secondary role in infantry support actions.

- From the 1950s through the early 1960s, Soviet SP artillery designers concentrated on developing special-purpose weapons. Only two systems were developed which could be used as tank destroyers, but these systems were not fielded.

- During the 1970s, the Soviet military seems to have turned to lightly armored, but heavily armed, systems which could provide assistance to infantry or armor units. Direct antitank operations, however, seem possible only as a remote secondary mission.

Although the inconsistencies in Soviet SP artillery development priorities are obvious, the reasons for these changing priorities are obscure. Unfortunately, no Soviet writer directly addresses the rationale for shifting design objectives; nevertheless, it is possible to offer at least a few potential reasons for such Soviet weapons acquisition behavior.

(Continued on page 33)



Soviet 122-mm SP gun/howitzer M1974.

⁷ Christopher F. Foss, *Jane's World Armoured Fighting Vehicles* (MacDonald and Jane's, London, 1976), p. 357.

The *Journal* interviews . . .

MG Albert B. Akers

Journal: Sir, of all the accomplishments of the School in your 3½ years, what one thing do you consider most important or take greatest pride in?

Akers: First off, I'd like to make the point that nothing the School has done should be attributed to me personally, but rather to the members of the Fort Sill team, military and civilian. If I had to cite the most significant accomplishment that this team has brought about, it would be the teamwork and spirit of cooperation and harmony, the tearing down of the "red fence," and the beginning of open, direct communication with the field. The field and the School should have a continuing direct dialogue. We should not agree on everything. We can disagree without being disagreeable. We should explore new ways to fight and win, through conferences, meetings, and written and telephonic communications. Fostering this teamwork and keeping this essential communication open is paramount in my opinion.

Journal: Is there any one thing you wanted to do that wasn't accomplished?

Akers: I would like to have seen developed a real, viable combined arms ARTEP (Army Training and Evaluation Program). The first letter that I wrote to the Training and Doctrine Command in July 1975 was on this subject and we still have not been successful. I think the reasons are simple. It is a tough nut to crack. It is very, very difficult to develop an ARTEP that brings together the elements needed to evaluate all the members of the combined arms team. But if you really believe we must train the way we are going to fight, then you *must* have a combined arms ARTEP. It is something we have to attack and defeat in the coming year if indeed we are going to follow through on what the Chief of Staff of the Army says — that training has to be the number one priority in the Army. I believe that, and one of the ways to accomplish that goal is to develop, implement, and keep alive a combined arms ARTEP.

Journal: There are still those who think the ARTEP is a product-improved ATT and do not believe the ARTEP philosophy. Why is this new philosophy important and can the concept succeed?

Akers: General Rogers, the Chief of Staff, enunciated the Army's philosophy on ARTEPs very well and



Prior to leaving Fort Sill in January to assume his new duties as Director of Materiel Plans and Programs, Office of the Deputy Chief of Staff for Research, Development, and Acquisition, DA, MG Albert Akers granted an interview with the *Journal*. General Akers was the Assistant Commandant for 30 months under three commandants and was promoted to his present rank on 13 January 78. During his assignment to Fort Sill, the Field Artillery evolution became a revolution with an explosion of programs and concepts in the areas of doctrine, training, and materiel that will have profound effects on fire support for the next quarter century.

clearly in May 1977 when he talked about the importance of the ARTEP. The ARTEP is basic to our understanding of the difference between the ATT which basically drove the unit through peaks and valleys in its training, and the new philosophy which says you must be trained and ready to fight on any given day. Any peaks and valleys that occur now are minimized because the ARTEP is being employed continually as a diagnostic tool — as an assist for the commander, and that includes the noncommissioned officer. It would seem to me that the ARTEP philosophy should pervade every aspect of training that a unit is involved in. The ARTEP *will* succeed because it is the best way to evaluate our state of training and guide commanders to corrective training to achieve combat readiness.

Journal: Concern is being voiced over the multiplicity of special purpose munitions being developed and that their introduction into the inventory may affect our ability to carry enough "iron shells." Are we becoming oversophisticated at the expense of being able to provide close support to the maneuver elements?

Akers: No, I don't think so. On this issue, there are traditionalists, conservatives, and liberals — and each has their place. It is vitally important that the Field Artillery take full advantage of the opportunities offered by technology. To me it seems very logical to explore possibilities of defeating an enemy at 15,000 meters and beyond as opposed to defeating him in the direct fire mode. But we *cannot* and *must not* forget the close support battle. The combined arms team is essential to future success on the battlefield, and we understand the Artillery's role as a full-fledged member of that team. At the same time, we must capitalize on the opportunities to defeat the enemy at longer ranges. That is what FASCAM (Family of Scatterable Mines), CLGP (Cannon Launched Guided Projectiles), and indeed TACFIRE is all about. If the United States Army does not take full advantage of technology, we run the risk of falling behind not only our adversaries but our allies as well. This has serious ramifications for us on the next battlefield.

Journal: Each element of TACFIRE — the battalion and div arty computers, the VFMED, and DMD — is so critical to the Field Artillery's success in a future war. Are you concerned about the budgeting or developmental aspects of any element of that system?

Akers: We *need* these new systems. It does no good to improve the quantity, quality, and the range of our weapons and ammunition if at the same time we fail to upgrade our ability to control and command these weapons. At the present time the "choke point" is in "command and control"; and that is why TACFIRE is so essential to the Field Artillery System. We must make our case within the Army, at DOD, at OMB, and in Congress on the need for improving the Field Artillery

as a system if the Army is to reach its potential as an effective force in the 1980s.

Journal: Admittedly there hasn't been much official word from the Division Restructure Study, but what do you see as the major impact of DRS on the Field Artillery?

Akers: The Division Restructure significantly upgrades the Field Artillery in the "heavy" division. It is hardware-driven. The effectiveness of the Field Artillery in the restructured division is tied very directly to TACFIRE and BCS. Our analyses and studies show that the division of the 8-gun battery into two platoons is an effective way to improve our survivability and disrupt the enemy's target acquisition capability, and yet does not impede the uniqueness of US Field Artillery — our ability to mass quickly and effectively. So I am a strong supporter of DRS based on the studies I have seen and participated in. The final judgment will have to be made in the field, based on testing by the 1st Cavalry Division.

Journal: Is the ARTEP for nuclear units going to become a reality?

Akers: By nature I'm an optimist. I feel that we will come as close as possible to the objective that has been laid out with the current leadership that exists within the Army today. This leadership understands the need to change the way we have conducted NSIs in the past. Army leaders are conversant with the nuclear albatross that has been hung around the Artillery commander's neck for the last 20 years and recognize that we must be decisive to bring into proper perspective the nuclear training of the Field Artillery. Basically, our objective with the noncustodial units is to place battlefield nuclear requirements within the ARTEP philosophy. It says simply, "we must train the way we are going to fight."

Journal: We frequently hear that the Field Artillery unit commander's prime responsibility in the next war will be the survivability of his unit — staying operational long enough to deliver his fires. What should unit commanders do to enhance their survivability?

Akers: In the last two wars that this country has fought, counterbattery has not been a major factor; nor has enemy airpower. So in the last four to five years we have had to rethink the whole problem of the survivability of fire support on the battlefield. Survivability becomes increasingly important when you are fighting outnumbered and each single tube or launcher is key to the outcome of the battle. Survivability is a state of mind — a mental set, if you will. It requires close teamwork and understanding by every soldier within the fighting element. Camouflage, offset registrations, dummy positions, firing only at significant targets, movement when necessary, false radio transmissions, tight radio discipline — all are elements that must become part of

training. Attitude, state of mind, determination to survive — a good commander will bring his unit through.

Journal: It seems we are about to make a quantum jump in our ability to acquire targets with the FIREFINDER radars but we still have only limited tubes/launchers. Is an inability to attack all the lucrative targets going to create havoc in tactical fire direction?

Akers: I think what you really are asking is do we need TACFIRE, because what TACFIRE does is provide us, through digital transmissions, the ability to quickly sort out significant targets from those that aren't. We'll be able to determine rapidly whether to shoot at a target or not. Our guns must remain silent — and unlocated by enemy target acquisition — if significant action is not taking place. Because of limited quantities of munitions, problems inherent in ammunition resupply, paucity of tubes and launchers, we must choose very carefully where and when we will shoot and every round must count. So in short, the new radars are essential, along with TACFIRE, to eliminate the command and control bottleneck.

Journal: In moving counterfire responsibility to the division artillery commander, how can he convince the division commander, who really sets the priorities, to take full advantage of our range in lieu of attacking a lesser but more visible and immediate close support threat?

Akers: The counterfire doctrine stems directly from the Army's capstone manual, FM 100-5. Accordingly, the responsibility for the close support fight and the counterbattery fight rests with the division commander, not the div arty commander. The division commander is seized with making the tough decisions. He is the man to whom time and space factors are paramount — he is the man who sees the entire battle most clearly. His chief advisor on how fire support is to be employed is, of course, the division artillery commander. And I see the division artillery commander in combat as being very close to the division commander, able to advise on the capability of the artillery to meet the varying situation. I do not see a problem in the division commander making judgments, because if his troops are being hit heavily by enemy artillery, or the battle is hotter in two of the three brigade areas, he will be fully capable of determining where to allocate his fire support. A lot depends on the teamwork, competence, confidence, and professionalism of these two men. It all comes back to training — if the division has trained in a combined arms environment, then I'm confident the division commander will make the right decision based on the recommendation of the div arty commander.

Journal: Under the counterfire doctrine with all of the nondivisional artillery now responsive to the division, how can the corps commander influence the battle?

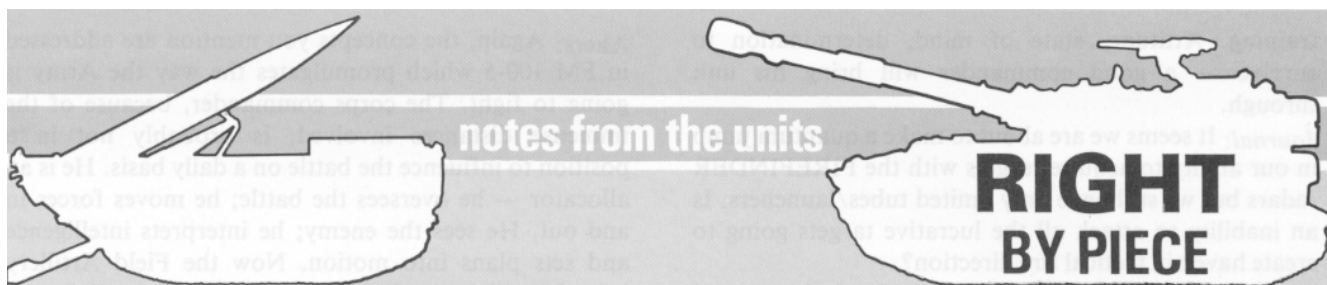
Akers: Again, the concepts you mention are addressed in FM 100-5 which promulgates the way the Army is going to fight. The corps commander, because of the immense distances involved, is probably not in a position to influence the battle on a daily basis. He is an allocator — he oversees the battle; he moves forces in and out. He sees the enemy; he interprets intelligence and sets plans into motion. Now the Field Artillery brigades will not in all cases be attached to the divisions. The corps commander will have a string on them. He can pull the brigades away and place them where he wants. He also has tactical air and other elements of combat power. If the battle lasts longer than the heralded "30 days," other combat elements — more artillery units — will enter the corps and be allocated by the corps commander.

Journal: Thank you.

Akers: There are a couple of things I'd like to add before I say "farewell" to the unbelievably rewarding job I've had here in the School.

One very important thing is that this *Journal* belongs to Field Artillerymen worldwide. It does not belong to the School, the Commandant, or the Assistant Commandant. The *Journal* must continue to present varying views from a variety of sources, both from the Active Army and the Reserve Components. It's the way we learn and understand the views of others. Doctrine is not written in stone. In fact, doctrine at any one time reflects the opinion of 51 percent of those involved. Consequently, in the worst case, 49 percent may disagree. We must keep the avenues of communication open so that varying viewpoints can be presented and we can all read and think about the issues. I would like to see more articles — more letters to the editor — from the fine noncommissioned officers in the Army. Many of these soldiers are thoughtful men with considerable experience in a variety of units. They should not hesitate to write and espouse their views, for certainly they have a vital stake in the future of the Field Artillery.

Finally, the fact that I am leaving is not important. The team at Fort Sill has never been better. We are now in a posture where good soldiers of all ranks want to come here. The letters from the field have never been of greater volume. The momentum within the Field Artillery which stems from the field is vital to the future success of our operations. One of the things that we have done here is to insure that any idea developed here in "buffalo country" was fully exposed and tested in troop units — had mud slung on it, so to speak. That must continue. We must continue to tell the artillery story of how we fit into the combined arms team. I am fully confident that the future of the Field Artillery is upon us and that there are vital days in the remaining years of this decade if we are to reach the potential that technology offers us in the 1980s.



Artillerymen celebrate on shores of Lake Michigan

FORT SHERIDAN, IL — MG Jack N. Merritt, Commander of the Field Artillery Center, traveled to the shores of Lake Michigan to participate in a unique celebration of the Field Artillery's 202d birthday.

Thirty miles north of Chicago and south of the Wisconsin border sits historic Fort Sheridan. Once a famous cavalry post, Fort Sheridan is now the home of the Army Recruiting Command and US Army Readiness Region V. This year, Fort Sheridan hosted a Field Artillery Ball and tribute to Saint Barbara which embodied the true spirit of the "Total Army." In attendance were some 100 gunners and their ladies from the Active Component, the Reserve Component, and the retired community.

The ball, co-hosted by the Midwestern Regional



The Order of Saint Barbara Medallion is presented to BG Floyd C. Adams Jr., USAREC Deputy Commander, by MG Jack N. Merritt, Commandant of the Field Artillery Center, as BG Wilbur J. Bunting, 86th US Army Reserve Commander, observes.

Recruiting Command and Readiness Group Sheridan, ARR V, saw Redlegs from Wisconsin and Illinois share good friends and good spirit in what is hoped will become an annual affair.

General Merritt was the guest speaker, and he also inducted three gunners into the Order of Saint Barbara:

- From the retired community LTG (Ret) Charles E. Hart, former Artillery School Commandant and CG, Second Army, was reinducted into the order at the age of 73.
- From the Reserve Component was BG Wilbur J. Bunting, Commander 86th US Army Reserve Command, Arlington Heights, IL.
- From the Active Component, was BG Floyd C. Adams, Deputy Commander USAREC.

New artillery raid record set

FORT CAMPBELL, KY — Redlegs of B Battery, 320th Field Artillery, 101st Airborne Division (Air Assault), teamed up with the "Pachyderms" of A Company, 159th Aviation Battalion, to break the division record for an artillery raid.

The dynamic duo took the banner home by shattering the two-year-old record of seven minutes, 14 seconds. Their time was six minutes and 18 seconds.

The mission of an artillery raid is to airlift artillery to a forward location to place a critical target within range of the 105-mm howitzer, attack the target rapidly, and airlift the battery from the firing point before enemy counterfire can be delivered. Going "cold turkey" into an area in six minutes and 18 seconds is quite an accomplishment.

A lot of muscle power is required in an artillery raid as the soldiers must manhandle the large howitzers to achieve record time. The second hand on the timer started when the lead Chinook touched down at the landing zone. Seconds later, guns, men, and equipment raced against the clock.

Once set, the crews received a fire mission and fired four rounds per gun. Mission completed, the Chinooks were called back where the 3,300-pound howitzers were loaded back into the helicopters. Timing stopped when the last Chinook lifted off the ground.

The record-breaking artillerymen feel they can do a better and faster job the next time out. The artillery and air units received duplicate awards, called the "Rapid Raider," for their team performance.

Survivability practiced

SCHOFIELD BARRACKS, HI — Working under the maxim that "If the enemy can find you — he can kill you," the 2d Battalion, 11th FA, recently practiced camouflage discipline in an area poorly suited for natural concealment.

Equipped with the new lightweight camouflage screening system (LCSS), the battalion was located 7,000 feet above sea level at the 25th Infantry Division training area on the big island of Hawaii, where there is little or no vegetation due to the lava covered terrain.

With the LCSS, the unit camouflaged itself from the air as well as ground level. Gun positions, vehicles, machinegun positions, observation posts, and individuals manning the positions were camouflaged.

The LCSS can be partially open in any one of four quadrants to permit multidirectional fire missions. The howitzers can be concealed within 60 seconds after "end of mission." Survivability can be enhanced by using maximum position dispersion and employing terrain gun position corrections.



Can you spot the 10 camouflaged positions? We've helped by circling one of them. The battery is employed in a "V" configuration — Ed.



A new canopy being tested by the 41st Field Artillery Group will protect crewmen from the shrapnel of incoming rounds landing as close as 50 meters. (Photo by David Beebe)

Cannon cover works in tests

BABENHAUSEN, GERMANY — Artillerymen on today's battlefield must be able to deliver a high volume of fire even when receiving incoming rounds. The "open deck" design of today's heavy artillery provides no crew protection from hostile fire.

A protective canopy for the self-propelled howitzer is one solution to the problem. It provides protection from shrapnel of artillery rounds exploding as near as 50 meters.

The 41st Field Artillery Group is experimenting with the concept using a device designed to protect TOW firing crews from shrapnel. The nylon canopy is attached to the winterization kit of the 175-mm gun.

It was anticipated that the canopy would vibrate loose because of recoil during firing. The device remained in place on a 175-mm gun during a recent ARTEP. Also, the canopy of the 2d Battalion, 5th Field Artillery, didn't falter through two days of moving and shooting.

Recommendations have been made to have a protective canopy designed and fielded for the 8-inch/175-mm artillery pieces to insure that fire support is continuous even when the artillery unit is under attack.

Right By Piece



Men of the 1st Battalion, 92d Field Artillery rush to prepare their M110 8-inch howitzer for firing during the recent 2d Armored Division Artillery hipshoot super-bowl competition. (Photo by Jorge Ramirez.)

Artillery super bowl at Hood

FORT HOOD, TX — "Hell's Fires," otherwise known as the 2d Armored Division Artillery, recently held a super bowl-type contest between its best batteries, demonstrating their abilities to get off the road rapidly and neutralize a target.

Batteries competing in the "hipshoot" were C, 1-14th FA; C, 1-3d FA; C, 1-16th FA; and B, 1-92d FA.

Each battery took its turn weaving around a back road and out into an open field where a call for fire was received from a forward observer. Then the mad scramble for firing positions began. Dust shot up into the air as the self-propelled howitzers churned forward into various positions in the field.

Soon the first howitzer was laid and began adjusting for the entire battery. The ground shook, and clouds of smoke rose as the battery blasted away at the distant target.

The winner was the 1-16th FA, scoring 86.8 of a possible 100 points. The 1-14th FA, was runner up with a score of 84.6. Because of a malfunction in one of their weapons, the 1-3d FA scored only 47.9. The 1-92d FA was not scored because they were using 8-inch howitzers as opposed to the 155-mm howitzers of the other units.

A large crowd, including the artillerymen's wives and children, observed the shootout from a nearby mountain vantage point.

The hipshoot super bowl culminated a season-long intensified training program through the div arty. Striving for speed, accuracy and professionalism, firing batteries rehearsed the techniques necessary to deliver supporting fires while the unit was enroute to a new location. Battalions then conducted an elimination competition to identify the best battery as their respective super bowl representative.

Anyone interested in conducting similar training may contact the 2d Armored Div Arty, Fort Hood, TX 76544 for a copy of their plan, grading sheets, etc. - Ed.

Desert combined arms training for 1-5th FA

FORT RILEY, KS — Redlegs of the 1st Battalion, 5th Field Artillery, 1st Infantry Division Artillery, recently supported division troops in Exercise "Devil Strike" in the Fort Irwin, CA, desert. The six-week exercise included almost every element of combat arms, with live fire close air support being provided by the Marine Corps and Air Force.

Opposing forces for the exercise included the 2d Battalion, 63d Armor, which took the offensive against the dug-in 1st Infantry Division troops and their supporting artillery. Barriers of training mines were laid, trenches dug, and barbed wire strung by the engineers. A Fort Bliss based unit provided air defense, and an airborne infantry battalion from Fort Bragg added a vertical envelopment threat, providing realistic training.

Fort Irwin's 640,000-acre training site allowed the integration of the several kinds of combat arms units to work with and against each other in a rough desert environment.



A 155-mm SP howitzer of the 1st Battalion, 5th Field Artillery, prepares to fire during Exercise "Devil Strike" at Fort Irwin, CA.



A Molotov cocktail sails toward the target during artillery-infantry cross-training at Fort Bragg.

King and Queen still happily married

FORT BRAGG, NC — The enduring relationship between the Redlegs of the artillery and those "grunts" of the infantry has been flourishing at Fort Bragg. C Battery, 1st Battalion, 39th Field Artillery, and C Company, 2d Battalion, 504th Infantry, have been cross-training in their combat roles.

Starting in June of 1977, the units engaged in machinegun, hand grenade, light antitank weapon, and field expedient antiarmor training. The Redlegs in turn trained the infantry on the towed 155-mm howitzer and then answered their call for fire.

Placing each other in the "aggressor" role, Charlie Company made a night airborne assault on the Charlie Battery position.

Gaining confidence in the combined arms team has been very beneficial in the training programs of both units. It just shows that a happy marriage exists between the King and Queen of Battle in the XVIII Airborne Corps.

Safety NCO program outlined

BAUMHOLDER, GERMANY — Safety procedures for service practice firing in the 8th Infantry Division Artillery now require each section chief to safety his own weapon. The battery executive officer is responsible for the firing battery while the officer-in-charge is responsible for those safety requirements associated with the chart and the computations of quadrant and deflection limits.

Each NCO is sent to range safety briefings and completes a locally designed safety course and a safety

Right By Piece

test. The test is designed specifically for unit weapons and available training areas. A 90 percent score is required before certifying a section chief.

Assumption of safety duties by the NCOs is compatible with the section chief's responsibilities for skill qualification test training and the unit's NCO professionalism program.

Advantages that have become apparent from the NCO safety program are:

- Firing is faster.
- The "safety lag" upon occupation appears to be shorter.
- They train as they will fight.

Kids get together with weather

FORT HOOD, TX — Fifty-seven elementary school children recently took a first class tour of the 2d Armored Division Artillery's meteorological section to find out how the weather is predicted.

The children were shown several balloons and were told how the balloons are filled with gas and set free with a little box called a radiosonde attached to them. They learned that the radiosonde transmits the temperature, air pressure, humidity, and wind speed to a machine on the ground that makes a printout of atmospheric conditions.

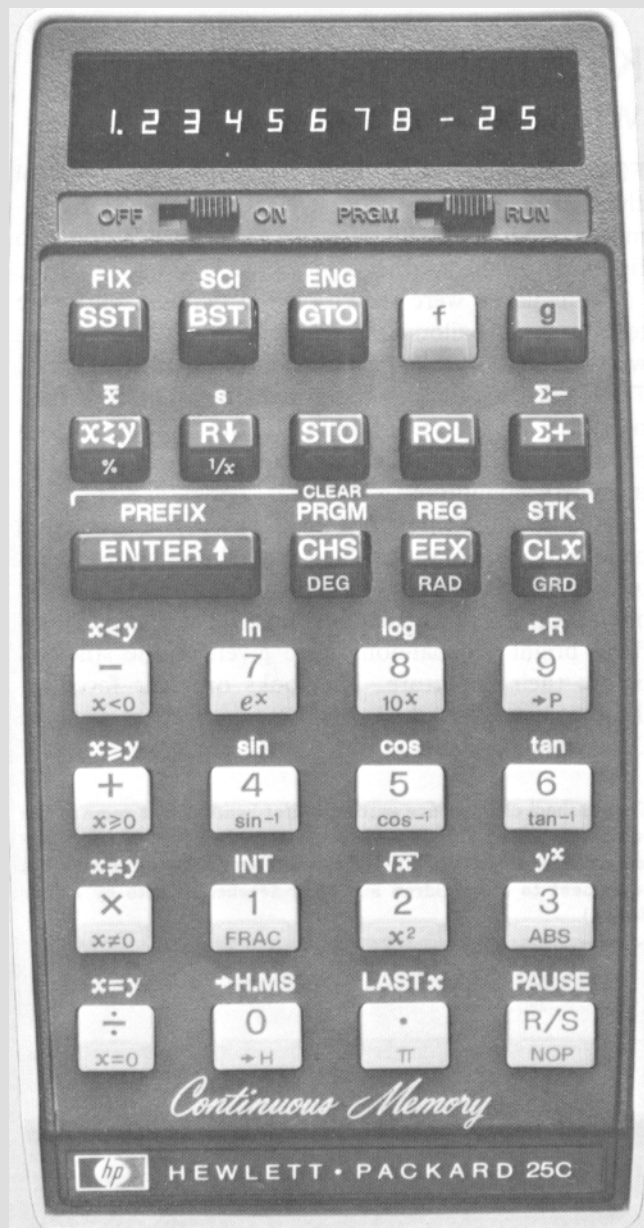
After this, the children were taken outside to watch a balloon being released. When the balloon got too high to see, section workers picked up the children one by one so they could watch it through a scope. Helium-filled bright red balloons were given to the students before their departure. The looks on their faces indicated that they had spent too short a time at Disneyland.

These school children are getting a first-hand look at some of the equipment used by the 2nd Armored Division Artillery meteorological section. SFC Madison Cunningham explains the equipment to the children and their teacher. (Photo by Edgar Reyes.)



Calculators And The Field Artillery Mission

by CPT Thomas H. Barfield



HP-25C calculator (photo courtesy of the Hewlett-Packard Company).

With continuing emphasis on speed and accuracy of fire in today's field artillery, fire direction procedures must be constantly reviewed and improved. But the character of tomorrow's war will never be known far enough in advance so that primary equipment and techniques can be concentrated upon, to the exclusion of alternate and emergency methods. Thus, such reviews should examine not only the actual process of fire direction and its relationship to field artillery employment doctrine, but also how modern technology can aid the artilleryman in maintaining his responsiveness and accuracy of fire, regardless of circumstances.

When one examines current research and development goals, fire direction procedures, and future employment doctrine objectively, it is clear that fire direction procedures are to be centralized at battery and battalion levels. Moreover, studies are now underway to determine the feasibility of increasing the firepower of the division artillery by adding two guns to each firing battery in direct support battalions. To achieve the troop and equipment survivability necessary to remain combat effective, tactical doctrine will probably call for the habitual employment of two 4-gun platoons operating as a split battery. The shift to split-battery operations will place a heavy burden on both personnel and equipment in the firing battery, and the fire direction center (FDC) will be one of the sections particularly affected. One solution to the problem would be to augment the current battery FDC so that it too could be split to support separate gun platoons. Unbelievably, this can be done without additional personnel, and at a cost of less than \$1000 per battalion!

To survive on the modern battlefield, units must be able to disperse widely, camouflage completely, and operate effectively with long and tenuous supply lines. Furthermore, war in Western Europe is likely to be very fluid, characterized by rapid offensive and retrograde operations. Unstable situations such as these will tax command and control capabilities at every level to the limit. Developments such as TACFIRE and the Battery Computer System (BCS) will increase considerably the commander's ability to deliver timely and accurate fires, but the two data systems force centralization of fire

direction at battery and battalion levels. If artillery batteries are required to split into two platoons, the vulnerability of the FDC is increased tremendously. The extensive communications network the FDC must maintain to allow both platoons in the battery to take advantage of the central computer makes targeting by the enemy a simple matter. Radio, rather than wire, would probably be used, and reliable radio communications are extremely vulnerable. In the absence of either wire or radio communications between platoons, the only current alternative is to use the manual firing chart.

It appears unlikely that an artillery fire direction system, dependent on a single computer such as the BCS or TACFIRE, can be completely reliable and continuously responsive under the circumstances anticipated in a European war. Furthermore, the ease with which radiation-emitting devices can be located and targeted, suggests that an FDC, with its heavy use of radios, cannot long survive. Wire communications, though relatively secure, cannot be used effectively in a fluid environment over the distances required to maintain adequate dispersion in a nuclear exchange.

What must be planned for, then, is separation of the battery FDC into two fully capable teams, one of which would be assigned to each of the firing platoons. Each platoon would be able to maintain its own internal ability to compute firing data whether in position or on the move. The equipment issued to the separated FDC team must provide the same flexibility and responsiveness as the equipment issued a full FDC, but be lightweight and much more compact.

One device, a \$160 programable calculator available on the civilian market, can replace the firing chart, increase the speed with which range and deflection data are generated, and serve as a backup computational means for FADAC and all replacement computers. This device is the HP-25C pocket calculator, manufactured by Hewlett-Packard. The calculator can be held in a man's hand and offers numerous built-in functions which can be executed from the calculator keyboard, or through a user-defined program up to 49 steps in length. Furthermore, the HP-25C does not lose its program when turned off. Such a small, lightweight calculator could be of great value to the artilleryman, not only to serve as a horizontal firing chart, but also to calculate high-burst or mean point-of-impact registrations, terrain gun position corrections, hasty survey, replot, and simultaneous observation for directional control.

The calculator cannot solve these problems simultaneously, because its limited program capacity precludes programing the solution to more than one problem, unless the programs are short. However, some problems can be solved manually from the calculator

keyboard without affecting a stored program. The process of keyboard-program simultaneous operations is fast, easy, and straight-forward (instructions are included in the HP-25C owner's manual). A two- or three-man mini-FDC could produce all required firing data using a calculator at least as fast as they could using the manual system.

Such problems as meteorological corrections, nuclear delivery, special ammunition corrections, and executive officer's minimum quadrant elevation could be quickly solved in equation form as well as the present tabular form. If used imaginatively, and not bound by preconceived notions about the limitations of programable calculators, such items as the horizontal chart, the M17 plotting board, the artillery fire control set, the military slide rule, and logarithm tables could be replaced by commercial calculators. Further, calculators could make "jump" FDCs or battery operation centers more compact and mobile. Finally, with careful planning, the use of hand-held calculators gives the commander the opportunity to maintain a 24-hour capability in his FDC with the existing one-shift TOE strength.

Advantages of the calculator as a backup computing system

Inclusion of a fire control calculator in the battery FDC offers advantages not otherwise attainable. Most importantly, it offers an emergency capability for processing fire missions during road marches and during an offset registration. The calculator is small enough that a chart operator/computer and all his equipment could ride with the battery executive officer and be ready to process 6,400-mil fire missions within seconds. For emergency missions, the only data needed are the battery and target locations; the azimuth of fire is calculated using those grid coordinates.

A programable calculator could provide an important interim numerical computing capability until TACFIRE is in use and also provide an independent means of fast and accurate computation for split-battery operations. This will become a more important factor as larger batteries come into existence. In the battlefield environment of the future, the calculator can provide a convenient (lightweight, no external power source, no manual firing chart) and secure (minimum FM voice communication) method of conducting offset registrations. Experience has proved that the electronic calculator has significant advantages over the manual firing chart.

Budgetary restraints are often the principal determinant in the selection or adoption of equipment and materiel. In raw cost alone, the HP-25C calculator costs

Table 1. HP-25C firing chart program.

Display		Key entry	Display		Key entry
Line	Code		Line	Code	
00			25	14 41	f X<Y
01	23 07	STO 7	26	13 29	GTO 29
02	22	R↓	27	22	R↓
03	23 06	STO 6	28	13 30	GTO 30
04	24 06	RCL 6	29	41	-
05	24 01	RCL 1	30	74	R/S
06	41	-	31	22	R↓
07	24 07	RCL 7	32	15 51	g X≥0
08	24 02	RCL 2	33	13 36	GTO 36
09	41	-	34	24 05	RCL 5
10	15 09	g→P	35	51	+
11	74	R/S	36	32	CHS
12	22	R↓	37	74	R/S
13	24 04	RCL 4	38	15 09	g→P
14	71	÷	39	21	X↔Y
15	31	↑ENTER	40	24 00	RCL 0
16	32	CHS	41	24 04	RCL 4
17	31	↑ENTER	42	61	x
18	24 03	RCL 3	43	51	+
19	51	+	44	21	X↔Y
20	24 05	RCL 5	45	14 09	f→R
21	02	2	46	23 51 07	STO + 7
22	71	÷	47	21	X↔Y
23	51	+	48	23 51 06	STO + 6
24	24 05	RCL 5	49	13 04	GTO 04

approximately \$160, while a higher capability calculator (the HP-67) costs about \$495. In contrast, the standard battery manual FDC set costs \$687 (\$363 for the plotting set and \$324 for the artillery fire direction set).

In time required to set up and deliver reliable firing data, the electronic calculator is clearly superior. The calculator can be ready in two to three minutes for complete 6,400-mil capability, but the manual chart requires from 10 to 30 minutes to set up one battery position for 6,400-mil capability. Additional time is required to plot observation posts and mark azimuth indexes. Coordination measures such as coordinated fire lines and no-fire areas could be placed on a 1:50,000 battle map since the calculator does not have the capability of storing this information. The battle map could also be used to get the target altitude for computing site.

Speed and accuracy of calculations is a first-priority consideration in selecting an auxiliary computational device. The calculator is as fast as an experienced chart operator for six-place grids — faster for eight-place grids. For subsequent operations, the calculator is at least as fast as a chart operator. In terms of accuracy, the calculator is accurate to one meter whereas the manual chart is accurate to 10 meters.

For any auxiliary or supplemental system of fire direction, especially in emergency operations, prime

factors are size and weight; i.e., the ease and convenience with which the system can be transported and used. The electronic calculator weighs less than one pound and easily fits into an ammunition pouch. The calculator equipped FDC (i.e., calculator, battle map, forms, pencils, GFT set, etc.) will fit into a standard brief case. On the other hand, the manual FDC set weighs at least 50 pounds and is packed in either two or three bulky packages which require at least a jeep and perhaps a trailer for transport. In foul-weather operations, the calculator set can be protected inside a jeep or under a poncho; the manual system is too bulky to be used inside the jeep and usually is placed on the jeep hood for operations.

Ideally, an auxiliary system requires little special training beyond that necessary for the primary system. Since the sequence with which the initial grid, observer direction, and subsequent corrections are processed is the same for the calculator as it is for the manual chart, a trained chart operator can learn to use a calculator in five to six hours. This includes grid, polar, and shift-from-known-point missions; loading a calculator program; reviewing a stored program for errors; and correcting errors in a stored program. One battery chief computer in my battalion was able to use the firing chart program, unassisted, after only two hours of instruction. Similarly, a battery fire direction officer learned to use the program in about an hour. Neither had used a programmable calculator previously. The

Table 2. HP-25C register usage.

R ₀ — OT direction (mils)	This direction must be manually stored by the operator each time the observer sends his direction. Normally this quantity will change with each mission.
R ₁ — Battery easting (5 place)	The data in these registers must be updated and manually stored each time the battery moves.
R ₂ — Battery northing (5 place)	
R ₃ — Azimuth of fire (mils)	
R ₄ — 0.05625	Conversion factor — degrees to mils
R ₅ — 6400.0	Constant used to calculate deflection.
R ₆ — Target easting (5 place)	Data is stored in these registers automatically. Register contents can be recalled to yield a "final pin location" for massing or replot.
R ₇ — Target northing (5 place)	

Note: The program does not need the OT direction except for subsequent corrections. This means that, for adjust-fire missions, the observer is not required to send his direction in the initial call for fire.

Table 3. Key sequence for grid fire missions.

STEP	INSTRUCTIONS	INPUT DATA	KEYS			OUTPUT DATA
1	DO PRE-OP CHECK					
2	SELECT DISPLAY		f	FIX	O	
3	INITIALIZE PROGRAM		f	PRGM		
4	INPUT TARGET COORD	E_{IGT}	↑			
		N_{IGT}	R/S			RANGE
			R/S			DEFLECTION
			R/S			AZIMUTH
5	STORE OT DIRECTION	OT DIR	STO	O		
6	PERFORM FOR $i = 1, \dots, n$					
	INPUT OBSERVER					
	CORRECTIONS	DEV CORR	↑			
		RG CORR	R/S			RANGE
			R/S			DEFLECTION
			R/S			AZIMUTH

Note: The preoperation (PRE-OP) check consists of a review of storage registers 1 through 5 for proper contents as shown in table 2 and the execution of a check problem similar to the one in table 5. If the check problem does not execute properly, review the program and compare it with the listing shown in table 1.

calculator keystroke sequence is a simple, easy-to-follow operation, requiring no special expertise in mathematics, engineering, or computer programming.

In summary, an auxiliary fire direction system built around the hand-held calculator offers highly desirable flexibility for normal operations, especially when the battery is split into two platoons. It would provide an even more important emergency capability, should circumstances require it. At the same time, the calculator can increase the speed with which certain problems such as meteorological corrections, horizontal chart data, terrain gun position corrections, and hasty survey can be computed. Furthermore, hand-held calculators allow the FDC to maintain a true 24-hour capability without additional personnel. In short, the advantages and usefulness of hand-held calculators to the artillery are limited only by the imagination of the user.

Firing chart program using HP-25C calculator

The following program and explanation illustrate how the HP-25C can be used to supplement or replace the horizontal firing chart. The details of actually loading the program are not covered, since those steps are clearly explained in the owner's manual. The calculator does not possess a mil mode for trigonometric operations; so the degree mode is used for all computations. Both the observer-target (OT) direction and the azimuth of fire are stored in mils and then are converted to degrees when needed in the calculations. This permits the operator to review all the stored data without having to convert any of the quantities.

The firing chart program, shown in table 1, will generate range from the battery to the target, deflection to the target, and grid azimuth from the battery to the target for grid, polar, and shift-from-known-point missions. The program will also calculate subsequent range, deflection, and azimuth from input observer corrections — the same data generated on a manual firing chart for most fire missions. Azimuth is displayed as a negative number to distinguish it from deflection. Quadrant and fuze setting are obtained using graphical firing tables. As with the manual firing chart, registration corrections derived from a calculator-assisted registration would be placed on the graphical firing tables and would not be incorporated into the calculator program.

Caution: It is recommended that the azimuth be displayed each time data is calculated. If the program is terminated each time deflection is calculated, an error will occur if subsequent corrections are attempted. All subsequent corrections must be entered at the RUN/STOP (R/S) instruction in line 37 of the program. If azimuth is displayed, the program will be at the correct point to receive the observer's adjustments.

Table 2 lists the data stored in the eight addressable registers of the HP-25C. Like the program, this data will remain unchanged after the calculator is turned off. The data must be updated periodically as indicated in the table. The keystrokes required to obtain firing data for grid missions are shown in table 3 and for polar and known-point missions in table 4. The procedures are simple, and, with a small amount of practice, speed and accuracy can be achieved.

Table 4. Key sequence for polar/known-point missions.

STEP	INSTRUCTIONS	INPUT DATA	KEYS			OUTPUT DATA
1	DO PRE-OP CHECK					
2	SELECT DISPLAY		f	FIX	O	
3	INITIALIZE PROGRAM		f	PRGM		
4	STORE OBSERVER /	E_{OBS}	STO	6		
	KNOWN POINT LOC.	N_{OBS}	STO	7		
5	STORE OT DIRECTION	OT DIR	STO	O	GTO	38
6	INPUT DEV CORR					
	FOR POLAR, DEV CORR=0	DEV CORR	↑			
7	INPUT RANGE CORR.	RG CORR	R/S			RANGE
			R/S			DEFLECTION
			R/S			AZIMUTH
8	FOR ADJUSTMENTS, DO STEP 6, TABLE 3.					

Note: The preoperation check consists of a review of storage registers 1 through 5 for proper contents as shown in table 2 and the execution of a check problem similar to the one in table 5. If the check problem does not execute properly, review the program and compare it with the listing shown in table 1.

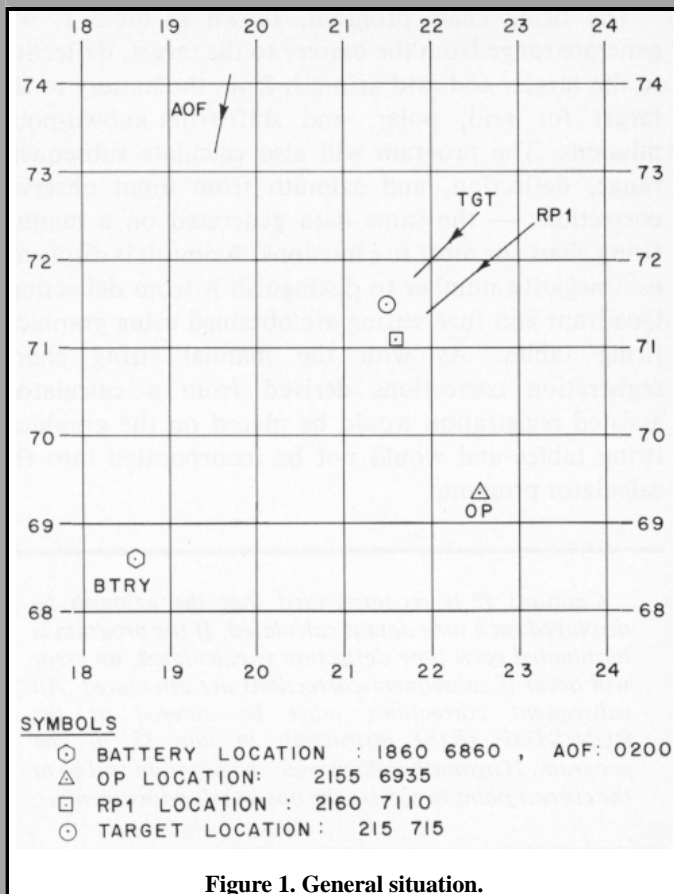


Figure 1. General situation.

Caution: To avoid computational errors when firing across a "00" grid line, precede the lower grid coordinate by a "1." For example, if the battery is located at 982 713 and is firing at a target located at 016 756, enter the target easting as "101600." The same is true for northings and battery grid coordinates.

The program contains an infinite loop which is used to maintain the status of target location during program execution. At the end of a fire mission, an "end of mission" key sequence is used to reset the program

pointer to step 00. The sequence is "f PRGM." In order for the next target location to be stored properly, "f PRGM" must be pressed at the end of each mission. Prior to the next mission, if the "final pin location" is desired, the operator can manually recall the contents of R6 and R7 and record the target easting and northing for massing or replot.

Figure 1 shows a typical situation for a firing range or battlefield. The firing data obtained from this situation is shown in table 5, using the key sequences shown in tables 3 and 4. To insure that the program has been correctly loaded, a "check" problem of this nature could be used to detect and correct loading errors.

For emergency missions, the azimuth of fire is not initially stored in R3; it is ignored. The operator stores only the battery coordinates and enters the target location as described in table 3 or table 4. The range and azimuth will be calculated correctly, but the deflection will be incorrect (due to not having a correct azimuth of fire in R3). Once the initial azimuth is calculated, it is changed to a positive number, stored in R3, and used to determine the instrument reading for the aiming circle. Deflection to fire is 3200. In this manner, the program almost pulls itself "up by its bootstraps."

This program works and offers significant computational aid for FDCs today and will still find use in the future as an adjunct to TACFIRE. ✉

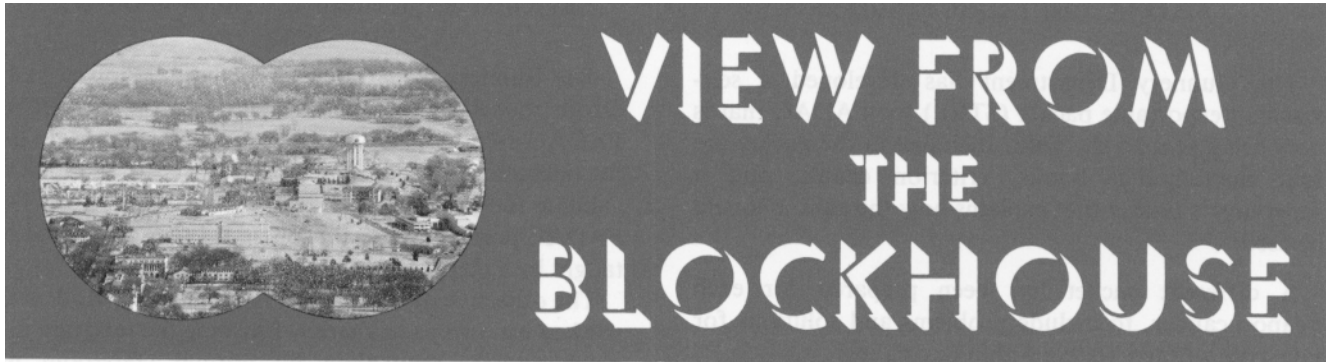
CPT Thomas H. Barfield is assigned to the 2d Battalion, 20th Field Artillery, where he has served as a battery executive officer, battalion special weapons officer, fire support officer, and is currently Service Battery Commander.

The School does not endorse any particular brand of calculator. For the status of School actions in the exciting world of hand-held calculators, see "View From The Blockhouse," this issue. — Ed.

Table 5. Firing chart program results based on situation in figure 1.

Mission	Initial/subsequent data	OT direction (mils)	Range (meters)	Deflection (mils)	Azimuth (mils)	R. (meters)	R. (meters)
Grid	Grid 215715	5,940	4,101	2,600	(-)800	21,500	71,500
	L100, + 400		4,158	2,701	(-)699	21,235	71,816
	R50, -200		4,125	2,651	(-)749	21,368	71,658
Polar	Distance 2400	5,940	4,110	2,601	(-)799	21,503	71,509
	L50, -100 OP location: 22556935		4,030	2,581	(-)819	21,501	71,398
Known point	From RP1						
	R100, + 400	5,880	4,094	2,601	(-)799	21,492	71,498
	R100, + 100 RP1 location: 21607110		4,218	2,618	(-)782	21,530	71,634

Note: Battery location: 18600 68600
Azimuth of fire: 0200



ICM and the M110A1

Many 8-inch M110 howitzer units have now converted to the new M110A1, long tube howitzer. A question in the minds of most 8-inch unit commanders is "How do I fire ICM with these new howitzers?" Currently there are no M404 ICM firing table addendums or ICM scales on the GFTs for the M110A1.

Due to problems with the M110A1 M404 ICM firing program, Ballistic Research Laboratories predicts it will be at least July 1978 before M404 firing data for the M110A1 is complete.

Until that data is available, there are "combat emergency use only" procedures for firing ICM from the M110A1 howitzer. These procedures are as follows:

1) Determine the HE M106 firing data from the M110A1 TFT or GFT (8-Q-1).

2) Enter the M110 (short tube) ICM firing table addendum (FT 8 ADD-A-1) with the HE fuze setting and quadrant elevation (from step 1) to determine ballistic corrections for the M404 ICM fuze setting and quadrant elevation.

3) Add the ballistic corrections for fuze setting and quadrant determined in step 2 to the HE data in step 1 to determine the ICM firing data.

The following is an example problem: Given: GFT setting for an M110A1 howitzer battery —

GFT A: CHG 5, LOT XY, RG 8700, EL 412,
TI 28.8.

GFT DF CORR: L2.

LOT Y is propellant M1, green bag.

FFE ICM chart range and deflection: range
9100, deflection 3240.

Site: + 5.

The initial HE data determined from the M110A1 GFT (8-Q-1) is TI 30.6; DF 3252; QE 445.

The ballistic corrections for ICM determined from the M110 firing table addendum (FT 8 ADD-A-1) are + 26.1 mils for quadrant (enter table A with QE 445) and -0.6 fuze setting increments for the fuze setting (enter table B with fuze setting 30.6).

The ICM data to fire then is:

TI 30.0 (30.6 - 0.6).

DF 3252 (the ICM DF is the same as the HE DF).

QE 471 (445 + 26).

Calculator advances may solve gunnery problem

The use of a hand-held programmable calculator as a backup to FDC operations may soon be a reality. Due to recent technological advances in this field, it is now possible to program hand-held calculators to solve the gunnery problem.

In an effort to validate the use of these calculators, a concept evaluation test was conducted by the Field Artillery Board, and an independent evaluation of the Board results was made by the Gunnery Department.

Results indicate that the hand-held calculator as a backup to FDC operations is a sound concept; the calculator-produced firing data were accurate within transfer limits of the charges tested for the HE projectile. A draft letter requirement is being staffed within USAFAS to start procurement action.

During the testing, several commercially available calculators were used. The programs developed for these calculators were based on the M109A1 weapons system firing the HE projectile. Since that time, as a result of the interest shown from the field, programs for the M101A1, M102, M109, M110, M110A1, and M107 with the HE projectile have been developed.

To assist those units and individuals interested, the School has prepared an information packet. In addition to providing programming information and operational procedures, the packet is intended to generate feedback from the field which will help in the development of a hand-held programmable calculator that can be used by all artillerymen. Interested persons may obtain the information packet by writing to: Commandant, USAFAS, ATTN: ATSF-G-RA, Fort Sill, OK 73503.

View From The Blockhouse

FADAC instruction exported

The Gunnery Department has developed a self-teaching exportable packet (STEP) for FADAC that is now being sent to the field. Included in the packet are four instructional books, criterion exams, and a supervisor's packet that explains how the packet should be used.

A different packet has been prepared for each weapon caliber, to include problems and solutions for each type weapon system within that caliber.

Although FADAC procedures can be learned from the STEP alone, the packet is designed to be used in conjunction with the draft FADAC User's Manual (DTM 9-1220-221-10/CL) so that a full understanding of procedural theory can be learned. The FADAC User's Manual is scheduled for distribution this March.

The packet was validated by 13E AIT students. Their average completion time was only 39 hours, and they had few problems with the material.

The purpose of the FADAC STEP is twofold. First, there is presently little FADAC instructional material in the field. There is a definite need for the material so that 13Es can prepare for the SQT. Second, a study has shown that only 29 percent of 13E AIT graduates become FADAC operators, and only a few of those operate a FADAC within the first six months after graduation. Consequently, they forget most of what they learned in AIT and require retraining in their unit.

The STEP provides an instructional packet that the soldier can use with little supervision. It will save training time and release FADAC assets from the School to be used in the field.

Help for M36 chronograph operators

The M36 chronograph is an important tool in achieving accurate predicted fire by frequent updating of weapon muzzle velocities. Several units have asked for help in training soldiers on M36 operation. Based on these requests, USAFAS will begin giving each 13E AIT student a "hands-on" orientation of the setup and operation of the M36.

Although these procedures are outlined in TM 9-1290-325-12/1, the Gunnery Department is producing a pocket-size pamphlet that will include setup and operating procedures.

Self-paced gunnery instruction started

The Gunnery Department is currently involved in an effort to self-pace some instruction for officers in FAOAC 1-78. One group of about 70 officers is taking the manual portion of gunnery in the self-pace mode to validate the program and determine its feasibility. The FADAC portion of the subcourse for this group will be taught by a platform instructor.

The objective of this project is to allow the student to work at his own pace, thereby finishing the program in a much shorter time than by normal classroom instruction. Two instructors are working with the test group to monitor individual progress, administer examinations, and provide instruction and assistance as required.

Student study guides have been prepared for each manual class that is taught. Study material consists of films, programmed texts, and field manuals. The student completes the study material and then takes an examination. If the student passes, he moves to the next class; if not, he restudies the material he did not pass and retakes the exam. At the end of the program, the student will take a final comprehensive gunnery exam.

Since the Gunnery Department considers the self-pace method an effective way to train, it is monitoring the program closely. If the self-pace program is successful, the student can receive quality training with less time spent in the training pipeline.

OSUT possible for 13E

USAFAS has started testing the one station unit training (OSUT) concept with 13E students. The test will consist of 40 to 50 students and will begin with basic training and continue through 13E MOS training. The idea is to save both training time and money and still produce a skill level 1 qualified 13E. The course will be structured after the 13B OSUT that has been successfully conducted by the Artillery Training Center.

Presently, 13E soldiers may receive their basic training at one of several different posts, but must receive their AIT at Fort Sill. Under OSUT, the transportation expense of "double" movement of these troops is eliminated. The 13E soldier now receives seven full weeks of BCT, about one week of out/in processing from BCT to AIT, and an average of six weeks AIT, for a total training time of 14 weeks.

With OSUT, the out/in processing time is eliminated. Currently, the 13B OSUT program is 12 weeks; this is the goal for 13E OSUT. USAFAS believes that the 13E MOS OSUT will be successful.

Course prepares Signal Corps officers for tactical units

While most people may know that Fort Sill is the home of the Field Artillery, they may not be aware that it is also the home of one of the finest Signal Corps (SC) courses available in the Army today. This is the Communications/Electronics Staff Officer Course (CESOC).

One of the most difficult and challenging assignments for the SC officer is to a maneuver unit or an artillery unit. In a Field Artillery battalion this means assignment as either a communications platoon leader or a communication/electronics staff officer. These jobs are difficult for the SC officer since he is not trained for duty in tactical communications in his basic course and there is little time for on-the-job training when the SC officer reports to his non-Signal unit.

To non-Signal unit commanders, the officer with "crossed flags" means an end to their communication problems but, unless this SC officer has attended the CESOC, those commanders could be disappointed.

The CESOC is nine weeks and three days long and is the only course of its kind available for tactical communicators. The course objective is to prepare Signal Corps officers for assignment as C/E staff officers at battalion through brigade level in non-Signal Corps units and Combat Signal Officer SSI 025A.

CESOC graduates will be proficient in a myriad of SC-related skills required for communications in non-Signal units. Such skills include supervising the installation, operation, and maintenance of the unit communication system; selection of good communication sites; organizational maintenance of communication equipment; training unit personnel in communication procedures and security; training message center personnel; and a thorough knowledge of supply procedures.

Students at CESOC also receive a general knowledge of organization, mission, and employment of Field Artillery, Armor, and Infantry battalions and brigades and their communications requirements. Each Field Artillery battalion is authorized two SC officers, a communication/electronics staff officer, and a communication platoon leader.

A large portion of the CESOC student input comes directly from the Signal Officers Basic Course, but there are a number that come directly from the non-Signal units. Any military personnel office can furnish information regarding enrollment in CESOC.

It is recommended that the commander waiting for a lieutenant from the Signal Officers Basic Course send his new lieutenant through CESOC before he reports to his unit. Though the training will require an additional 9 to 10 weeks, the commander can be confident that his Signal Corps lieutenant will arrive with a thorough knowledge of the job that awaits him.

FA officers task lists fielded

The Field Artillery Lieutenant's Manual has been distributed to Active Army and Reserve Component units, Army-wide, down to battery level, and is being issued to all FAOBC classes, starting with class 10-77.

The origin of the manual was a task analysis of FAOBC and the four follow-on courses — Cannon, Lance, Pershing, and Target Acquisition/Survey. Because of this and our limited experience in developing soft-skill supervisory tasks, many of the task statements in the manual are classroom oriented.

Users should not be dismayed by the number of tasks listed in the manual. Three-fourths of the tasks (all task numbers starting with the numeral 1) are enlisted skill level 1 through 3 tasks that were included in accordance with TRADOC guidance on officer training.

A planned revision of the manual will reflect current TRADOC guidance and added experience among task developers. This should reduce substantially the number of tasks, listed in the manual, produce better-defined tasks, and orient the tasks toward real-world situations. Supervisory tasks will be treated as such, not couched in terms that express classroom objectives.

Respondents to the questionnaire at the back of the manual should be aware that DA and TRADOC are currently conducting comprehensive studies on officer education and training, including the feasibility and desirability of officer qualification testing at appropriate times in their careers.

The Field Artillery School has been nominated to develop a pilot model for the TRADOC study. If the nomination is approved, the revised task list for lieutenants, as well as an on-going analysis of FA captains' tasks, will form the basis for development of the pilot model.

Whether the USAFAS does or does not develop the pilot model, all FA officers, O1 through O6, can expect to see most of their tasks laid out for them in some form of a task list in the not-so-distant future.

View From The Blockhouse

FAOAC validation

Working under the principle that officers with different backgrounds and degrees of experience need not undergo identical training during the FA Officers Advanced Course in order to achieve the required level of proficiency, the School has implemented the Baseline Objective Program.

Under this program, students are allowed to take pretests at the beginning of the course to demonstrate their knowledge of the subjects. Each academic department provides the students with advance information about the type and scope of the pretests, the minimum passing score, and the instruction from which the student will be excused if he passes the pretest.

Officers who achieve a satisfactory score on the pretest are excused from a specific amount of instruction in that department and from the exam on that portion of the instruction. Students who "validate" a course receive a final grade for that block of instruction equal to the highest grade achieved by students who take the regular exam.

Figure 1 summarizes the Baseline Objective Program as administered to FAOAC 2-77:

Subcourse	Grade Points	Number of classroom hours student excused from	Number of students passing exam
Gunnery	280	240	11
CED (hands on)	-	6.8	162
CED (written)	35	10.4	29
Counterfire (targeting)	85	20	2
Counterfire (survey)	35	28	6
T/CAD (maneuver)	90	68	0
T/CAD (FA tactics)	170	96.3	0
T/CAD (NWED)	30	29.6	0
Weapons (FB)	45	15.5	36
Weapons (maint)	65	39.6	*

*Students validated specific subjects by class

Figure 1

In addition to relieving students from the requirement to sit through classes on subjects already mastered, this program allows officers to make significant contributions to the solution of problems throughout the School.

Students in FAOAC 2-77 undertook a number of projects, such as evaluating the use of hand-held calculators in gunnery computations, the development of tasks for inclusion in the Captain's Manual, simplification and standardization of safety data computations, work on the product improvement package for the M102, applications of the Dunn Kempf war game, and the writing of a training circular.

By using officers who have "validated" portions of the FAOAC to undertake useful projects, the School is able to make better use of the professional officer. At the same time, students are given the opportunity to expand their perspective by working in various departments at the school.

Officers coming to the FAOAC should take pretests in any areas in which they have expertise. Often, a short review of the subject will be enough to "validate" a course and allow the student to make his assignment to the FAOAC more challenging and rewarding and more productive for the School and the Army.

CMF 13 Job Books fielded

Army job books for career management field 13 (Field Artillery), will be in the hands of NCO supervisors by April 1978. The high priority job books will be delivered to Active Army, USAR, and National Guard units at the same time.

The books are an informal training record in which NCO supervisors can record each soldier's progress in accomplishing those critical tasks listed in the Soldier's Manual during the preparation for the SQT.

Job books for the following MOSs are scheduled for delivery by 1 April: 13B, 13E, 13F, 15D, 15E, 15J, 17B, 17C, 82C, and 93F.

A subscription to the Field Artillery Journal will reach you under even the best concealment!



Write: Field Artillery Association
Field Artillery Museum
Fort Sill, OK 73503

Or call: Area code 405 351-4775
AUTOVON 639-4775



COUNTERFIRE SYSTEMS REVIEW

WO radar course cancelled

A resident course of instruction for Field Artillery Radar Technicians (4C-211A), announced in the previous edition of the *Journal* to begin this year, has been cancelled due to funding and manpower constraints. Future announcement will be made should the course be reinstated.

SIAGL problem surfaces

A recently discovered problem with the heat shield on the Survey Instrument, Azimuth Gyro, Lightweight (SIAGL) has caused discontinuation of the instrument's use until further notice.

The heat shield gives off a vapor which coats the moving parts of the instrument causing malfunctions and overheating. No danger to the operator exists. Initial investigation revealed that the problem was in the 93 SIAGLs purchased in the first buy. The message to all units having those instruments advised them to discontinue use immediately to prevent further damage to these SIAGLs.

A second purchase of 200 SIAGLs is being made. Instruments in this group do not have the heat shield problem.

Firefinder fielding scheduled

First production models of the Q-36 (mortar locating radar) and Q-37 (artillery locating radar) will be deployed to the field in the early 1980s. Priority of issue is to target acquisition batteries (TABs) in the USAREUR and at Fort Sill. All USAREUR TABs will receive the Q-36s and Q-37s by the early 1980s followed by CONUS units and Reserve units.

All division TABs, except airborne and airmobile with no TOE changes, will receive two Q-37s and three Q-36s to replace the current five AN/MPQ-4A radars. The airborne TAB will have five Q-36s and the airmobile will have three.

Production models will be designed so that both the Q-36 and Q-37 may use the same computer shelter. The radars will incorporate many hardware and software innovations that will significantly increase the survivability of the radars in a fluid, active electronic warfare battlefield.

The Counterfire Department will begin instruction (maintenance and operator) in September 1979 for personnel to support the fielded production systems.

Final testing for photolocator

Operational Test II field testing of the Army's new photolocator system will be conducted by the Field Artillery Board from April to July 1978 with fielding scheduled for 1979.

The photolocator will provide division artillery with accurate survey control, serve as the division survey information center (SIC), and produce divisional trig lists. It can compute any survey problem in seconds with its Hewlett Packard 9825A calculator.

Accurate target locations can be determined by comparing reconnaissance photographs to the system's data base, giving the division SIC a new dimension in counterfire.

Commanders Update

COL Donald E. Eckelbarger
3d Armored Division Artillery

COL Elmer C. May
42d Field Artillery Group

LTC John P. Dooley
2d Battalion, 31st Field Artillery

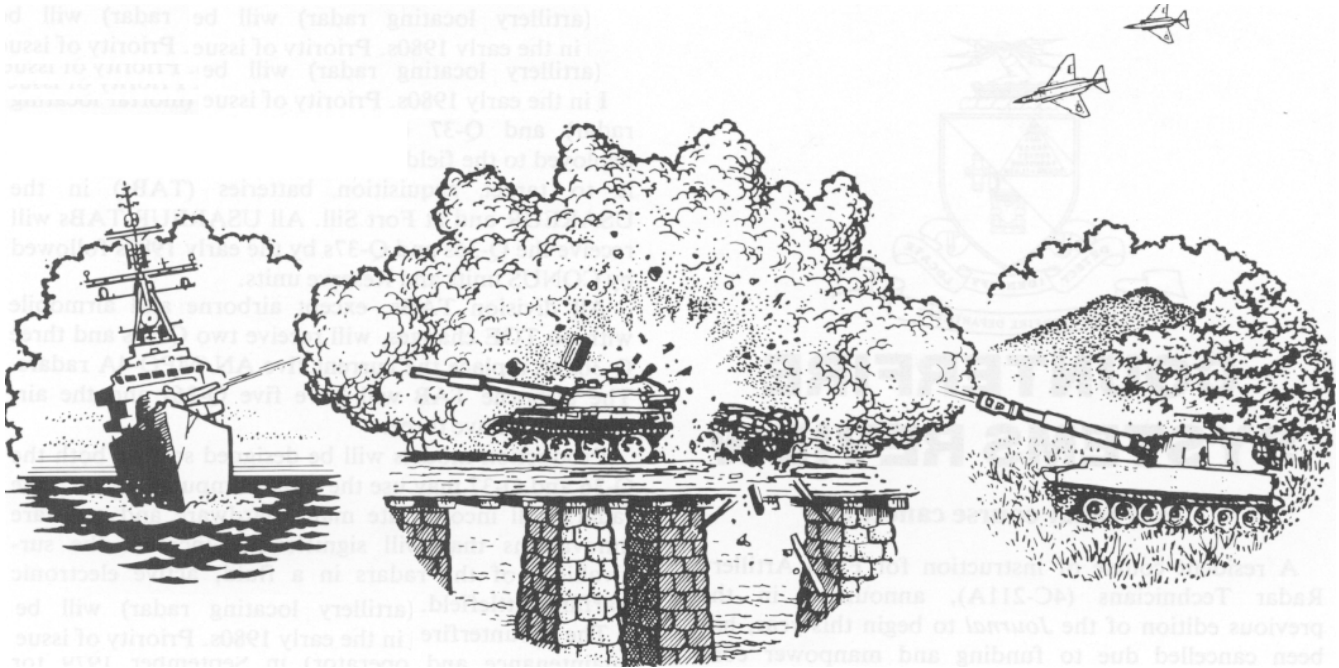
LTC Jean D. Reed
1st Battalion, 39th Field Artillery

COL Giac P. Modica
Field Artillery Missile Group 9

LTC Jerry C. Harrison
1st Battalion, 29th Field Artillery

LTC Curtis L. Lamm
1st Battalion, 73rd Field Artillery

How much



Art by Donna Covert

by LTC (Ret) Roy E. Penepacker
and Mr. Lonnie R. Minton

is enough?

You are a direct support battalion fire direction officer and a fire support team (FIST) observer has just called for fire for effect on a target described as "infantry company in open." The observer requested ICM and you must decide how much ammunition to expend. What basis do you use for that decision? Unless you have recently studied weapons system effectiveness data, the answer is probably that you "winged it" or relied on a battalion SOP for the answer.

This problem is not new; the fire direction officer (FDO) has wrestled with it for years. Far too often the solution has been that we fire a certain standard expenditure and rely on the observer to tell us if we need more. That solution can lead to wasted ammunition and reduced effects because the best solution — ammunition and fuze combination plus volume of fire — was not available. This is not to imply that weapons system effectiveness is a precise science — it is far from that. But a better solution than intuition is needed on the future battlefield where every round must count. In addition, there are missions in which there is no observer to inform us of the effects on the target.

Help for the FDO is on the way. A giant leap forward will occur when the TACFIRE system is fielded. The computer programs will evaluate each target and

provide a recommended solution for the FDO's approval or modification. But, what do we do until TACFIRE arrives?

6-141 Manuals

There are three sources currently available which provide information on the effectiveness of munitions on a target. The first is a series of field manuals which present doctrine for the optimum employment of nonnuclear field artillery munitions. The FM 6-141 series are entitled "Field Artillery Target Analysis and Weapons Employment: Nonnuclear." The 6-141-1 manual is unclassified, and the 6-141-2 manual is used as a classified supplement containing lethality and effectiveness data. The scope of the manuals includes:

- Comparative effects of weapons systems.
- Characteristics and capabilities of field artillery weapons and their associated high explosive (HE), chemical, and improved conventional munitions (ICM).
- Typical targets and suggested methods of attack.
- Target analysis.
- Lethality.
- Probabilities, delivery accuracy, and dispersion errors.

In short, the manuals provide the FDO or fire planner with the basic principles of munitions employment and an understanding of the effectiveness to be expected in typical situations.

JMEMs

A second source of effectiveness data is the Joint Munitions Effectiveness Manuals (JMEM). Why does the word "joint" appear in the manual titles? Perhaps a few words of explanation are needed for one to understand the background which led to the publication of these manuals. Before 1960, the development and use of techniques for measuring weapons effectiveness was a highly individualized procedure for each of the armed services. When joint service study groups tried to use these data, they found they could not compare systems from different services because of incompatibilities in data. Direction for a program to remedy this situation was given by the Joint Chiefs of Staff. In 1967 a subgroup of the Joint Technical Coordinating Group for Munitions Effectiveness (JTCG/ME) was established to produce effectiveness data for surface-to-surface weapons. This subgroup, composed of civilian and military personnel from the Army, Navy, Marine Corps, and Air Force, is responsible for developing standardized weapons effectiveness data to be included in the Joint Munitions Effectiveness Manual for Surface-to-Surface (JMEM/SS) weapons. In addition to the JMEM/SS, other subgroups of the JTCG/ME established were the JMEM/Air-to-Surface, JMEM/Air-to-Air, and JMEM/Surface-to-Air. Subgroups were also established to standardize target vulnerability data, a battle damage assessment and reporting system, systems effectiveness, and joint aircraft attrition.

JMEMs have been published to provide lethal area data, delivery accuracy data, reliability data, etc. These published data, as well as unpublished data provided by the various working groups, are used to produce effectiveness data which are published in pamphlets. These pamphlets are influenced by tactics, doctrine, threat, etc. Field Artillery School personnel participate in the various working groups to insure that data are provided for field artillery systems. Army representation in the JMEM/SS subgroup is presented in figure 1.

There is a separate effectiveness manual for each weapon system. Data are presented in tabular form for numerous targets, environments, projectile-fuze combinations, deployment techniques, etc. The effectiveness data are presented as fractions of casualties/damage expected as a function of range, size

Deputy Chief of Staff for Operations, DA
 US Army Training and Doctrine Command
 US Army Field Artillery School
 US Army Infantry School
 US Army Armor School
 US Army Materiel Development and Readiness Command
 US Army Armament Research and Development Command
 Ballistics Research Laboratories
 Large Caliber Weapons Systems Laboratories
 Chemical Systems Laboratories
 US Army Armament Materiel Readiness Command
 US Army Test and Evaluation Command
 US Army Materiel Systems Analysis Activity
 Defense Intelligence Agency
 Concepts Analysis Agency

Figure 1. Army membership in the JMEM/SS subgroup.

of target, number of volleys, battery formation, etc. The manuals are updated as more targets and employment techniques are evaluated, and new manuals are published as additional weapons systems are fielded.

All JMEM/SSs are in the FM 101 series (figure 2) and may be requested on DA Form 17 from Director, US Army Materiel Systems Analysis Activity, ATTN: DRXSY-J, Aberdeen Proving Ground, MD 21005.

Effectiveness Data For –	
Howitzer, 105-mm: M101A1	FM 101-60-2
Howitzer, 155-mm: M109	FM 101-60-3
Howitzer, 8-inch: M110	FM 101-60-4
Howitzer, 155-mm: M109A1	FM 101-60-14
Howitzer, 175-mm: M107	FM 101-60-5
Mortar, 81-mm: M29	FM 101-60-1
Mortar, 4.2-inch: M30	FM 101-60-7
Rocket, 762-mm: MGR-1B	FM 101-60-8
Tank, 105-mm: M60A1	FM 101-60-12
Guided Missile, Surface Attack: MGM-52C	FM 101-60-18
Infantry Direct Fire Weapons	FM 101-60-16
Weapons/Ammunition Characteristics	FM 101-61-2
Safe Distances	FM 101-62-1
Lethal Areas	FM 101-62-2
Fragmentation Data	FM 101-62-3
Ammunition Reliability	FM 101-61-3
Indirect Fire Accuracy, Volume 1	FM 101-61-5-1
Basic Effectiveness	FM 101-60-17
Weapon System Reliability	FM 101-61-7

Figure 2. Published effectiveness pamphlets.

Targets for which effects data are published are:

- Personnel: standing, prone, and crouching in foxholes.
- Radar van.
- Artillery rockets and launchers.
- Gun/howitzer.
- Tank.
- Truck.

Targets to be included are:

- APC.
- Bunkers.
- AA missile sites.

GMETs

A third source of effectiveness data is the Graphical Munitions Effects Tables (GMET). The practical limitations on the use of the JMEM pamphlets restrict the FDO's reference to them and, to some extent, their use by fire planners who usually have more time to perform their target analyses. The GMET provides easily available effects data in the form of a slide rule of standard graphical firing table size. Three of the four GMETs are classified CONFIDENTIAL because they contain actual effects data for the M102, M110, and M109A1 weapons systems. The fourth GMET, the training edition, is unclassified. However, the format and method of use are the same as that for the classified tables. All the GMETs are expendable items authorized by Common Table of Allowances 50-970. The cost of the items is chargeable to unit operations and maintenance allowance funds. Table 1 contains the national stock numbers and descriptions for use in ordering these items.

The GMET contains effects data for use against personnel targets in the offense or defense. The user can determine the average number of battery or battalion volleys required to achieve a specified level of casualties

National stock number (NSN)	Description/basis of issue	Quantity authorized
1220-01-021-7278	(C) Scale, Graphical Munitions Effects (GMET-JMEM) f/M102: Btry FDC, 105-mm btry Bn FDC, 105-mm bn HHB, div arty HHB, FA Gp HHB, Corps arty/Field Artillery sections (FAS), HHC, Corps..... USAFAS.....	2 6 4 2 2 10
1220-01-021-7279	(C) Scale, Graphical Munitions Effects (GMET-JMEM) f/M109A1: Btry FDC, 155-mm btry Bn FDC, 155-mm bn..... HHB, div arty..... HHB, FA Gp HHB, Corps arty/FAS, HHC, Corps2 USAFAS.....	2 6 4 2 15
1220-01-021-7276	(C) Scale, Graphical Munitions Effects (GMET-JMEM) f/M110: Btry FDC, 8-inch..... Bn FDC, 8-inch HHB, div arty HHB, FA Gp HHB, Corps arty/FAS, HHC, Corps USAFAS.....	2 2 4 2 2 15
1220-01-021-7277	Scale, Graphical Munitions Effects, Training (GMET-JMEM): Btry FDC Bn FDC..... HHB, div arty..... HHB, FA Gp HHB, Corps arty/FAS, HHC, Corps USAFAS	2 6 4 2 2 100

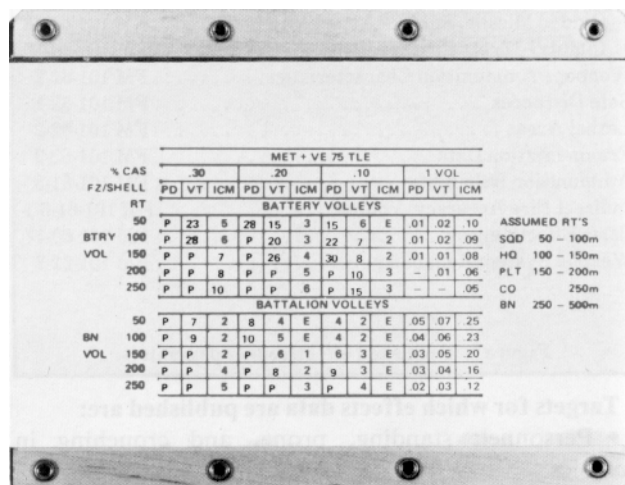


Figure 3. Portion of Graphical Munitions Effects Table.

against personnel in the open or the average effectiveness achieved with one battery or battalion volley.


Each side of the GMET contains five blocks in identical format. The blocks contain data for observer adjusted fire and for met plus VE fires with target location errors (TLE) of 0, 75, 150, and 250 meters. Provision is made for TLE of up to 250 meters and for three levels of effects in addition to the one volley effects (figure 3). Data are provided for target sizes of 50 through 250 meters, in 50-meter increments, for both battery and battalion volleys, for high explosive (HE) and antipersonnel improved conventional munitions (ICM). The cursor is labeled with the target radii (RT), percentage of casualties (% CAS), fuze/shell combinations (FZ/SHELL), and assumed radii for target elements such as squad, platoon, etc.

The assumptions used in constructing the GMET are listed at the edges of the GMET. If other conditions exist, such as the use of terrain gun positions or met data more than two hours old, the user must make appropriate adjustments to the volume of fire required.

To use the GMET, merely slide the window of the cursor over the applicable block, e.g.; Met plus VE, 75-meter TLE (figure 3), and determine the ammunition and volume of fire required. (A detailed description of how to use the GMET is given in Annex L of the recently published FM 6-20, "Fire Support in Combined Arms Operations".)

Personnel assigned to 8-inch battalions may wonder if the present M110 GMET is valid for the M110A1. There will be some difference in the effects data because of the difference in range capability; however, those units should requisition and use the M110 GMET until the JMEM/SS working group finalizes their data on the M110A1.

These sources of effectiveness data provide standardized and accepted information to military schools

as text reference material, to military planners as source data, and to military headquarters and schools for use in field manuals and studies. In addition, the GMETs provide a significant increase in the FDO's or fire planner's ability to determine in *real time* the answer to the question that must be answered in the heat of battle — How much is enough? 

Revisions of the FM 6-141 series will be published in early 1978. Units which do not receive the manuals through their pinpoint accounts should requisition copies on DA Form 17 through normal channels. — Ed.

LTC (Ret) Roy E. Penepacker is a military research analyst in the Tactics/Combined Arms Department, USAFAS.

Mr. Lonnie R. Minton is a mathematician in the Directorate of Combat Developments, USAFAS.


Evolution of Soviet Self-Propelled Artillery (*Continued from page 12*)

For one thing, the diverse emphasis in developments reveals that the Soviets had an ambivalent attitude toward the very concept of SP artillery. On the one hand, Soviet military policymakers were interested enough to devote resources to creating prototype systems, but, on the other hand, these prototypes were primarily of auxiliary systems (e.g., tank destroyers, air transportable systems, or nuclear artillery) during the 1940s, 1950s, and 1960s. Such behavior suggests that Soviet weapons policymakers never really considered SP artillery of major importance.

The shifting design objectives and operational requirements of these four periods also reflects changing evaluations of battlefield missions, desired force structures, and projections about the nature of the enemy threat. For instance, when enemy tanks seemed the paramount threat, SP artillery designs emphasized tank destruction. Later, as the potential threat changed, SP artillery designers no longer stressed the development of tank destroyers.

It is also important to realize that SP artillery in the Soviet Union lacked an organizational champion. For example, with the exception of a brief period during World War II, there were no design bureaus devoted exclusively to SP artillery. Instead, SP guns were designed on an *ad hoc* basis by either tank designers, artillery designers, or a combination of both tank and artillery designers working in concert. Therefore, there was no design organization to provide consistency of design emphasis or to push for the adoption of SP

artillery systems. In addition SP artillery systems were seldom assigned to artillery units, and so Soviet artillery commanders had little incentive to champion their creation and adoption. This is in marked contrast to the situation in the United States where artillery troops had every reason to exercise their bureaucratic clout in behalf of SP artillery systems.

The shifting design objectives and operational requirements of the four periods were therefore not merely capriciousness, but rather the result in part of Soviet organizational processes. At the same time, Soviet SP artillery developments were also affected by constantly changing operational doctrines, threat perceptions, and the secondary importance of SP artillery concepts. Consequently, all these factors have combined to affect the direction and to retard the pace of Soviet SP artillery development as compared to that of the United States and its European allies. 

Andrew W. Hull is a researcher for International Studies Center, Columbus Laboratories of Battelle Memorial Institute. Mr. Hull's research has been centered on Soviet research and development policy and management. He has undertaken numerous tasks regarding Soviet technology planning and development and has contributed to a study of Soviet defense mobilization capabilities, aimed at suggesting arms control measures that would exploit Soviet weapons development and production practices.



The optimum shell/fuze combination matrix: A guide for issuing an effective fire order

by CPT Larry D. Aaron

The battery fire direction center has just received an observer's call for fire. The fire direction officer, in deciding how to engage the target, must quickly study the current tactical situation to include the type of terrain in the target area, the target posture, and the location of all friendly elements. He must hurriedly consider the amount and type of ammunition available, apply the commander's guidance to this situation, and consider the effectiveness of the appropriate ammunition. The culmination of this sequence of target analysis is the issuance of a fire order.

To complete this fire mission within ARTEP time standards, the fire direction officer (FDO) is allowed no more than 30 to 45 seconds to conduct his target analysis and issue a fire order. The time constraints force a hurried and often incomplete analysis procedure. The usual solution is to fire a couple of battery or battalion volleys of improved conventional munitions (ICM) or high explosive (HE) with variable time (VT) fuze and let the observer tell the fire direction center (FDC) what happened. Little or no use is made of the field manual, *Field Artillery Target Analysis and Employment: Nonnuclear* (FM 6-141-1); the CONFIDENTIAL field manual, *Field Artillery Target Analysis and Employment: Nonnuclear* (FM 6-141-2); or the appropriate *Joint Munitions Effectiveness Manual* (JMEM). Because FM 6-141-2 and the JMEM are classified, and therefore generally less accessible, and because of the average FDO's unfamiliarity with the contents of the manuals, little

use is made of any effectiveness data when a target of opportunity is engaged.

The use of JMEM data is a necessity for effective surprise fire and for minimizing time loss and ammunition waste for maximum artillery influence on the battlefield. To achieve this, the FDO and the fire support officer (FSO) must be thoroughly familiar with effectiveness information and must use this knowledge to assist the ground gaining arms.

The effectiveness data in its current field manual format is useful to the fire planner. He has the time to search the manuals for the appropriate table or graph in order to make a comparison of each shell/fuze combination's effectiveness for the particular target. The FDO, however, does not have the time to use the JMEM or FM 6-141-2. To him the manuals are cumbersome and practically useless.

The Field Artillery School, in an effort to provide assistance to the FDO and the FSO, has developed the Graphical Munitions Effects Table (GMET). This GMET allows a rapid selection of the appropriate number of rounds of ICM or HE with fuze VT or PD (point detonating) to achieve a specific effect against personnel targets of various sizes. The GMET is a step in the right direction, but has several limitations:

- The GMET considers only personnel targets (although it is unlikely that the FDO will be engaging strictly personnel type targets).
- The shell/fuze combination selection is limited to two shell types (although a unit's basic load contains

many other types of conventional ammunition).

- The GMET used in combat is classified.

In an effort to overcome these limitations, an optimum shell/fuze combination matrix was developed. It is based on all available effectiveness data for the conventional ammunition an FDO may want to use against various materiel and personnel targets. The design of the matrix (figure 1) is still in its infancy and improvements to the matrix are being made as testing continues.

The matrix does not give percentages of effects for all targets but, rather, provides a ranking of optimum shell/fuze combinations in order of effectiveness. To further enhance the FDO's ability to select not only a suitable *volume* and *type of ammunition*, the matrix

indicates when to mass fires by giving area coverage for a battery one round and a battalion one round.

The type targets are divided into two groups: personnel and materiel. Under each major type, there are examples of each target for which there is effectiveness data, including the assumed size of each target. To the right of the target categories, are columns listing the conventional ammunition an FDO might have available. Listed beneath each shell/fuze combination is a letter indicating the relative effectiveness of that combination compared to other combinations used against that target. The letter "A" indicates the optimum and each subsequent letter indicates relatively less effectiveness. An asterisk indicates that the shell/fuze combination will not produce significant

Personnel targets	Size (meters)	Shell/fuze combinations							Remarks
		HE/PD	HE/TI	HE/VT	HE/CP	WP/PD	ICM(AP)	ICM(AP/AM)	
Squad/small patrol Small unit headquarters	50	E	D	C	*	E	B	A	*Shell/fuze combination is not appropriate to produce a signifi-number of casualties or amount of damage.
Platoon	50	E	D	C	*	E	B	A	
Company	150	E	D	C	*	F	B	A	
Battalion	250	E	D	C	*	F	B	A	
Observation post	250-500	*	D	C	*	*	B	A	
Command post	50	E	D	C	F	E	B	A	
Command post	50	E	D	C	F	E	B	A	
Materiel targets									
T-55 tank	50-250	B	D	C	*	E	*	A	1. Converged sheaf increases percent damage until radius of target exceeds 150 meters for all materiel targets. 2. FDO must know equipment characteristics to equate other materiel targets to ones listed.
APC	50	B	D	C	*	E	*	A	
MG bunker	50	B	E	D	A	*	*	C	
Radar van	50	D	C	B	*	E	*	A	
Medium truck	50-250	B	D	C	F	E	*	A	
FROG	50	B	C	B	E	D	*	A	
FROG transporter	50	B	D	C	F	E	*	A	
140-mm rocket launcher	125	B	D	C	E	F	*	A	
152-mm howitzer	125	B	D	C	E	F	*	A	

Notes:

1. HC/TI, with maneuver approval, can be used in conjunction with HE or ICM to increase the enemy command and control problems and consequently may indirectly increase the effect of HE or ICM on any personnel target.
2. All targets are considered in open terrain as opposed to wooded or marshy terrain. If the target area is wooded, the use of HE/VT may achieve an excessively high airburst. If the target area is marshy, effects of HE/PD are greatly reduced.
3. For all personnel-type targets, one-half are considered standing and one-half are considered prone on the first volley of fire for effect; all personnel are considered prone on subsequent volleys. If the personnel are crouching in foxholes, ICM(AP/AM) will have very little effect.

Figure 1. Optimum shell/fuze combinations for engaging personnel and materiel targets (155-mm howitzer M109A1).

Expected area of coverage (meters)*		
ICM(AP)	Square	Circle (radius)
Btry ①	266 x 266	150
Bn ①	390 x 390	220
HE	Square	Circle (radius)
Btry ①	275 x 275	155
Bn ①	390 x 390	220
*Density of coverage is not considered.		

Figure 1. Expected area of coverage (meters).

Expected fraction of casualties (personnel)			
If the target radius equals 50 meters, then:			
	ICM(AP)	HE/VT	HE/PD
Btry ①	.15	.05	.03
Bn ①	.35	.16	.11
The expected fraction of damage against materiel targets, if engaged by a battalion one round of the optimum of ICM(AP/AM), will be 0.03 or less except for trucks which is slightly larger, but much less than the expected fraction of personnel casualties.			

Figure 2. Expected fraction of casualties (personnel).

effects against that target until the volume of ammunition required becomes prohibitive. If the same letter is repeated for two combinations, the effects achieved are relatively equal.

Figure 2, which is used in conjunction with figure 1, indicates the area that is covered by either a battery one round or a battalion one round of ICM(AP) (antipersonnel) or HE. There is an entry for the relative size of a square or a circle that will be covered (density of fragments within that area is not considered). The table indicates to the FDO when he may have to mass fires, fire a converged sheaf, or employ sweep and/or zone fire to sufficiently cover the target.

Figure 3 is also used in conjunction with Figure 1 and lists the expected fraction of casualties (EFC) from a battery one round or a battalion one round of either ICM(AP) or HE with fuze PD or VT. Data are given for a personnel target with a 50-meter radius. The figures are from the unclassified GMET. The actual classified figures are easily obtainable, but the listed figures are close enough to give an acceptable estimate and are much better than a guess.

For example, the FDO plans to fire shell HE with fuze time (TI) against a personnel target which has a radius of 100 meters. By referring to figure 1, he determines that HE/TI is more effective than HE/PD but less effective than HE/VT. Figure 2 shows that, when firing HE, a battery will cover a radius of 155 meters, which is larger than the target. Density of coverage will be achieved by either massing other batteries or by firing several battery rounds in effect. He then refers to figure 3. There are no specific figures for shell HE with fuze TI; however, it will be between HE/PD and HE/VT. The effects (percent of casualties) for a battery one round HE/TI against a target of 50 meters radius can be determined to be between 0.03 (3 percent) and 0.05 (5 percent). The radius of this target is twice that listed. The FDO doubles the rounds required to achieve the same effects (this technique includes errors, but is acceptable for estimates). The FDO now knows that a battery two rounds of HE/TI will achieve between 0.03 and 0.05 fraction of casualties if the target radius equals 100 meters. Assuming that the FDO will want to neutralize the target — that is, achieve 10 percent or 0.10 fraction of casualties — he must increase the number of volleys. If he again doubles the volleys, he achieves from 0.06 to 0.10 fraction of casualties. If he triples the volleys required to achieve 0.03 to 0.05 for a target radius of 100 meters, he achieves from 0.09 to 0.15 fraction of casualties for six battery volleys.


The same procedure for battalion volleys reveals that a battalion two rounds will achieve between 0.11 and 0.16 fraction of casualties. The FDO sees that, for the

same number of rounds, he can achieve slightly better effects and cover a larger area if he masses the fires of a battalion.

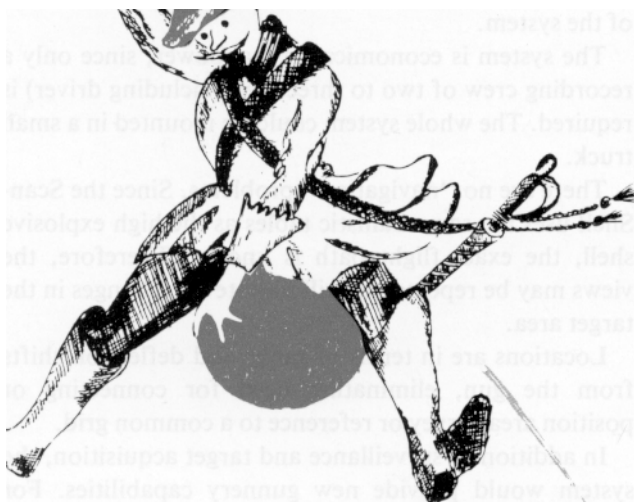
There are several notes at the bottom of the matrix to explain the basis of its data. An additional note alerts the FDO that, when engaging materiel targets, the expected fraction of damage (EFD) will be 0.03 or less for a battalion one round (or battery three rounds). This indicates that a large number of rounds must be fired to achieve neutralization even when the optimum shell/fuze combination of ICM(AP/AM) (antipersonnel/antimateriel) is used.

If the target is a 152-mm battery, the FDO must first determine, based on the ammunition available and the commander's guidance, whether to neutralize the equipment or the personnel. It is easily determined that the area of coverage will be sufficient for either HE or ICM. A quick check reveals that employing the optimum of ICM(AP/AM) will require in excess of a battalion three rounds to neutralize (0.10 EFD) the equipment if the target radius is only 50 meters. The same volume of ammunition, however, is excessive to destroy (0.30 EFC) the unit personnel. The effects data for a battalion three rounds is determined by multiplying the effects achieved for a battalion one round by three.

In this case, the volume of ammunition required to neutralize the equipment is so large that the FDO has decided to attack the target as a platoon-size personnel target because of the relative size of the battery position. Referring to the matrix and to the ammunition available, the FDO decides that ICM(AP/AM) is the optimum shell/fuze combination. If that ammunition is limited, the second best would be ICM(AP). Because ICM(AP) has little bonus effect of damage to the equipment, the FDO must then decide between HE/VT and HE/PD. The decision is made to fire HE/VT because the degree of effectiveness is larger, the number of rounds required is less, and a bonus effect which, although not indicated, can be expected against the equipment. Using the effectiveness data from the table, the FDO decides that a battery three rounds of HE/VT will be sufficient to neutralize the personnel and issues his fire order.

The matrix will assist the FDO in his target analysis procedures. It is easier to use than the JMEM and is of a broader scope than the GMET; therefore, a copy of this matrix is included in the new FM 6-20 and FM 6-40. None of the data in this matrix is classified; consequently, accessibility is not a problem. This matrix will make fire order decisions in the next battle more realistic. 

CPT Larry D. Aaron is an instructor in the Gunnery Department, USAFAS.



The Baron rides again

by COL (Ret) Arthur R. Hercz

When that inveterate story teller, Baron Muenchhausen, wanted to see what was going on behind the enemy lines he hopped onto an outgoing cannon ball as it cleared his gun. On the way over, it dawned on him that he might be shot as a spy; so he switched to a passing enemy cannon ball and returned to his own lines. For the modern artilleryman who, like the Baron, still wants to see over the farther hills, the foregoing procedure is hardly recommended. However, it includes some ideas that are useful and which can be improved on by modern technology.

Some 15 years ago at the University of Michigan's Willow Run Laboratory (Environmental Research Institute of Michigan), a brainstorming session of engineers concerned with battlefield surveillance was considering various vehicles to carry their sensors into target areas behind the enemy lines. The various existing vehicles, such as manned aircraft, remotely piloted vehicles, ground sensors, etc., were all discussed. Each had its particular application, advantages, and limitations. What was needed was a simple vehicle, readily available to the using units, easy to control, all weather, not vulnerable to enemy counteraction and requiring minimum special training. These requirements seemed to describe what the artilleryman had readily at hand — his projectiles.

Although at first blush this idea of observing from a "cannon ball" sounded rather Muenchhausenish, it offered some definite advantages, so a study of the idea was undertaken. The more it was developed, the more feasible and useful it appeared to be. Technical

developments since that time have improved the practicality even more and have further reduced the estimated cost.

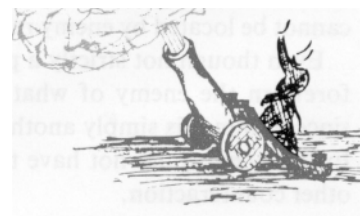
What evolved from these lengthy studies was the Scan-Shell system (figure 1). In describing the Scan-Shell system, it should be noted that artillery projectiles advance about two to three meters per projectile rotation. With one or more detectors looking out of the side of the projectile in a narrow beam, the ground is scanned in successive transverse strips. The resulting signal generated by the detector(s) is telemetered to a station in our own artillery area. This receiving station is mounted in a small truck where the operator can observe on an oscilloscope the view from the shell in real time. Simultaneously a printout is produced (figure 2), which appears like a strip photo covering a useful area about 1,000 meters wide.

By use of a mid-range infrared detector, it is possible to go our friend Muenchhausen one better by being able to observe equally well day or night. "Hot" targets, such as vehicle engines, recently fired guns, etc., would stand out prominently against the terrain image.

How would this system operate? At the fire direction center (FDC) the gunnery officer selects the area to be looked at. This choice might be based on a location suggested by one of the other surveillance systems, a suspected target or interdiction area, or simply a systematic search of the enemy area.

Conventional firing data for a single round are sent to a battery or an offset piece, indicating Scan-Shell as the ammunition. A suitable range is set well beyond the area to be observed.

— tomorrow's TA?



The recording truck with its antenna is in the general vicinity of the FDC. Additional recording units can receive the signals simultaneously (TOC, division or brigade headquarters). When the round is fired the recorders are started. The view of the ground as seen by the projectile can be monitored on an oscilloscope during flight. The printout is ready for use about the time the shell lands.

The FDC would have two or three overlay templates corresponding to the various standard range settings. These templates would compensate for any distortion of the printout caused by ballistic factors and would indicate directly the range and deflection shift for any target found on the image. Such data can be applied directly by the FDC in ordering fire for effect or, if necessary, can be converted to grid location by routine methods.

No new techniques need to be learned to make full use of the system.

The system is economical in manpower, since only a recording crew of two to three men (including driver) is required. The whole system could be mounted in a small truck.

There are no "navigation" problems. Since the Scan-Shell uses the same ballistic tables as the high explosive shell, the exact flight path is known. Therefore, the views may be repeated at will to note any changes in the target area.

Locations are in terms of range and deflection shifts from the gun, eliminating need for connecting or position area survey or reference to a common grid.

In addition to surveillance and target acquisition, the system would provide new gunnery capabilities. For example, infrared detectors show up freshly turned

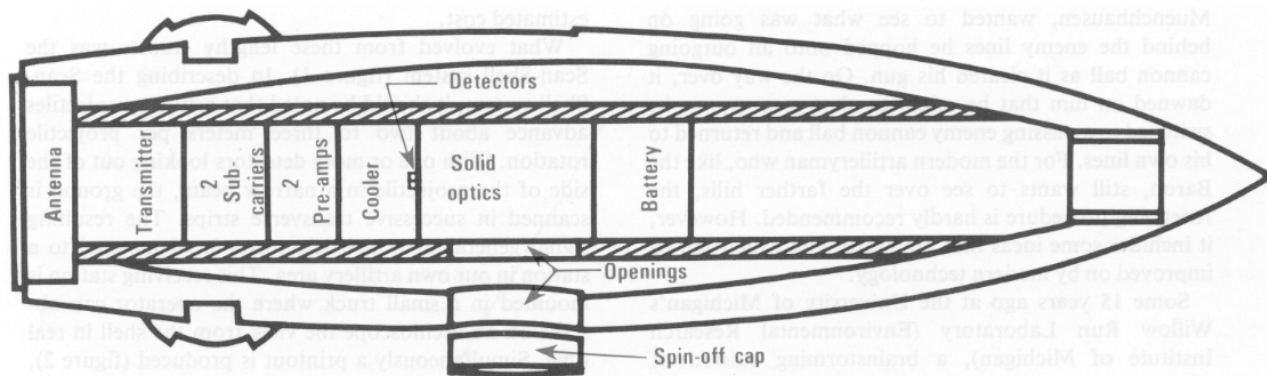


Figure 1. Schematic of Scan-Shell with two detectors (155-mm).

What advantages can justify adding another type of ammunition to our inventory when we already have several proven target acquisition systems?

This system is under direct control of the final user without requiring special flight clearance or other coordination. It is as readily available as any fire mission.

It is available in all weather, day or night.

The projectile is invulnerable to countermeasures. Transmissions are on the air only for the time of flight and can be jammed only with considerable difficulty.

The recording station, having only a passive receiver, cannot be located by enemy radiation detectors.

Even though not strictly a passive system, it does not forewarn the enemy of what target is to be attacked, since to him it is simply another shell passing overhead. Even so, he would not have time to seek cover or take other counteraction.

earth, such as shell craters. Deviation of previous high explosive shells from their target could be measured directly in range and deflection, so that precision adjustments could be conducted on otherwise inaccessible targets.

It could confirm data from other TA systems and could assess damage. An overall saving of ammunition could be realized because of more accurate location and confirmation of target seconds before firing.

An observed fire chart could be "shot in" with one round to include areas not directly observable.

Some interesting points came out of the engineering study.

Suitable ballistics are available in conventional firing tables; i.e., most effective trajectory, high rate of spin, adequate stability of the projectile, etc.

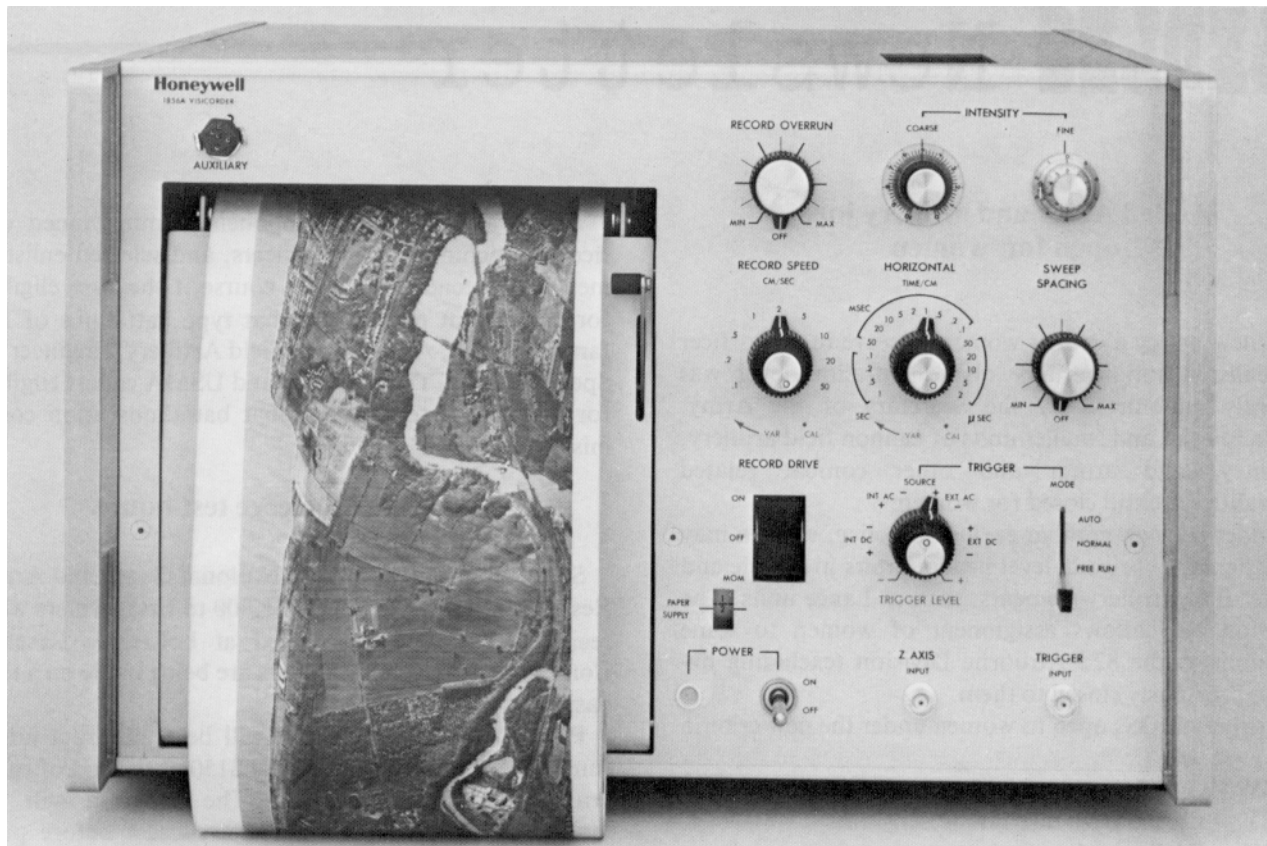


Figure 2. Photo strip printout produced by recorder (courtesy of Honeywell Test Instruments Division).

Standard trajectories eliminate any "navigation" problems, such as may be encountered with remotely piloted vehicles.

The normal spin of the projectiles provides the scanning element without requiring moving parts. In other infrared scanners, this is an expensive mechanical component.

Modification of the shell case would not be a major engineering problem. Projectiles with "windows" are fired routinely by Harry Diamond Laboratories. Components can be designed to withstand the shock of firing just as variable time fuzes are. Telemetry data from shells in flight is also routine procedure.

Nearly all the necessary components required for the system already exist and are in use for other applications. These include detectors, telemetry equipment, and oscillographic infrared recorders. Since the original study was made, several of the problem areas have been solved for commercial applications.

The detector and electronics components would be the same for all cannon projectiles from 105-mm up, and there would be plenty of room left for a fuze and

some explosive if that should be desirable. A range-deflection template would be designed for each caliber.

In production, it is estimated that the cost of each round would be little more than the corresponding high explosive round.

In material costs and manpower, this system would be more economical than any of the existing indirect observing systems.

Like the Baron's flight, the Scan-Shell does not exist. However, as already mentioned, it has been extensively studied and all aspects have been analyzed. Also some preliminary tests, including an improvised test firing at Dahlgren Proving Ground, were completed years ago. The idea is perfectly feasible and can be developed at reasonable cost. Yet there seems to be no official requirement for such a system; so, like Muenchhausen, it remains in the story book. ❏

COL (Ret) Arthur R. Hercz, a former director of the Counterfire (Target Acquisition) Department, now lives in Ann Arbor, MI.

REDLEG Newsletter

Added Army and artillery jobs open for women

A new policy allowing women to serve in any officer or enlisted job specialty above battalion level was recently announced by the Secretary of the Army. Battalion size and smaller units of cannon field artillery, infantry, and armor and other combat related specialties are still closed for women.

Under the new combat exclusion policy, women may be assigned to brigade level headquarters in missile and rocket field artillery elements, such as Lance units. The decision also allows assignment of women to some positions in the 82d Airborne Division (excluding div arty), previously closed to them.

Artillery MOSs open to women under the new criteria are:

13W — FA Target Acquisition Senior Sergeant
13Y — Cannon/Missile Senior Sergeant
13Z — FA Senior Sergeant
15B — Sergeant Missile Crewman
15D — Lance Missile Crewman
15E — Pershing Missile Crewman
15F — Honest John Rocket Crewman
15J — Lance/Honest John Operations/Fire Direction Specialist

82C — Field Artillery Surveyor
Remaining closed to women are:

13A — Officer, Cannon Field Artillery
13B — Cannon Crewman
13E — Cannon Fire Direction Specialist
13F — Cannon Fire Support Specialist

All but seven of the 46 MILPERCEN managed officer specialty codes are open to women. The new policy applies equally to Active Army and Reserve Components.

Ranger training

Ranger training is designed primarily to provide prerequisite training for individuals who are designated as replacements for Ranger or Special Forces battalions and secondarily to provide skill and confidence training for the combat arms.

Active and Reserve Component commissioned officers, noncommissioned officers, and selected enlisted men may attend the Ranger course if they are eligible for assignment to close combat type battalions of Infantry, Armor, Air Defense, Field Artillery, Engineer or Special Forces. Those ROTC and USMA cadets eligible for assignment to close combat battalions upon commissioning may also attend.

Guard and Reserve test bonus

Selected units of the Army National Guard and Army Reserve will be paying up to \$1,800 to first-termers who reenlist for six years. Aimed at bolstering Reserve Component strength, payments are being made on a test basis through September.

Payment of the top bonus will be made by a lump sum of \$900 at reenlistment and \$150 at the end of each year of satisfactory service. The program will be monitored closely to measure its success before permanent bonus payments are sought for all Reserve Component units.

CONUS re-up option test

A test program will allow first term soldiers stationed in CONUS to reenlist for another CONUS station during 1978. The program may be expanded to more MOSs and all first term soldiers if the test is successful.

Soldiers must meet the following requirements to qualify for the reenlistment options:

- Have a social security number ending in 1, 3, 5, 7, or 9.
- Be a first term in grade E6 or below.
- Have a position open at the station of choice, by grade and MOS.
- Must re-up for three to six years.
- Must not already possess assignment instructions.

The option is available to eligible soldiers in 13B and 82C MOSs.

Unit reassignment or change in grade or MOS will void station guarantee and subject soldiers to assignment to fill DA's needs. The test program is not open to soldiers serving overseas.

Your career counselor has more information on the new option.

RA integration

MILPERCEN receives many questions daily concerning integration into the Regular Army. Complete information concerning the program is contained in AR 601-100 and the current DA Circular 601-71.

The RA Selection Board for commissioned officers meets twice annually (April and September for 1978). Each board is announced, and an application cutoff date is established by a DA Circular in the 601 series. The cutoff date is normally 60 days before the board convenes to allow time to prepare applications for presentation to the board.

All applications should be sent to the Accessions Branch, Officer Personnel Management Directorate, (DAPC-OPP-P), 200 Stovall Street, Alexandria, VA 22332. Completion of two years commissioned service by the convening date of the board is a prerequisite for application. Additionally, if selected, the officer must complete three years service prior to appointment. Other eligibility requirements are age and education:

- An officer is age-eligible if his years of active federal commissioned service subtracted from his current age is less than 29.
- The minimum education requirement is completion of at least two years study at an accredited college or university or a two-year college equivalency certificate (AR 621-5). The education center is an excellent place to start if you are interested in an RA commission but do not meet the minimum educational requirements.

Competition for selection is extremely keen. Selection rates have varied between 30 and 40 percent for the last few boards. There is no penalty attached to non-selection, however. Application packets are returned to the officer and may be resubmitted after one year.

Reserve officers face screening

Screening of Army Reserve officers for release from active duty began in January and will continue semiannually for an indefinite period according to a recent DOD announcement.

Reserve officers to be screened will receive personal, written, advance notice of criteria to be considered so that they may submit appropriate records. The DA Active Duty Board will recommend either retention on active duty, release from active duty, or discharge from the Reserve program.

Microfiche records

MILPERCEN recognizes that some officers and enlisted soldiers may have concerns and reservations about microfiche records. The mailout program and quality control period will give a soldier up to 12 months in which to ascertain the initial completeness and accuracy of his/her fiche OMPF before the hard copy documents are destroyed.

The most important factor for the individual soldier to consider is not the form in which records are maintained — paper or microfiche — but what the records contain. Personal review of the fiche OMPF should dispel any doubts or concerns about its content.

The microfiche conversion was begun to improve administration, management, and utilization of military personnel records and to save resources — time and money. As the conversion progresses, all HQDA boards will be using microfiche records to make promotion selections, RA and school determinations, command-designee selections, etc.

With the microfiche system, establishment of a duplicate security file at an alternate site is now possible to safeguard against loss or damage by fire or other catastrophe.

If a person leaves active duty and has a reserve obligation, his microfiche file will be transferred to the Reserve Components Personnel and Administration Center in St. Louis, MO, or the National Guard Bureau in Falls Church, VA, for continued maintenance. Plans and programs to convert reservists' records are currently underway.

LT to CPT: longer wait

First lieutenants will have to wait longer for promotions to captain, under a policy which took effect 1 February, DA officials have announced.

The increased time in service (TIS) requirement will be 54 months instead of the current 48-month requirement. Extending the TIS period from 48 to 54 months will be a gradual increase over an 18-month period.

Officials say the change was a "trade-off" between having to extend the TIS requirement or lower manpower strength. They added that several advantages will accompany the change, including time to allow lieutenants to gain more experience, giving promotion boards a better understanding of lieutenants' qualifications and allowing officers to better forecast expected promotions.

Redleg Newsletter

Foreign Area Officer Specialty

Artillerymen who have had Foreign Area Officer (FAO), Specialty Code 48, designated as their alternate specialty may receive assignments throughout the world in security assistance, psychological operations, attache affairs, civil affairs, and political-military affairs.

Developmental training includes the six-month FAO course at Fort Bragg and functional courses in psychological operations, civil affairs, and security assistance.

Many FAO positions, but not all, require specific regional expertise. Selected officers are provided the opportunity to participate in a graduate program in area studies, in language training at the Defense Language Institute, and in an in-country training program under the supervision of the attache in the geographic region of study.

Selection for these programs is competitive and normally is limited to captains and junior majors. Officers who desire to compete for regional specialist training programs need to apply early for this training. They also must plan for professional development needs in their primary specialty to insure that the developmental goals of both specialties are fully integrated. Because some of the training programs are long, officers are encouraged to consider self-study language programs or degree completion, either full time or through off-duty education.

For additional information, officers may consult DA pamphlet 600-3, Officer Professional Development and Utilization (chapter 28), and contact their respective career management divisions:

LTC Division — LTC W. Rodger Waldrop 221-9799
MAJ Division — MAJ James Bigelow 221-9765
Combat Arms Division —
MAJ Haspard Murphy 221-7818

OER appeals

An OER appeal must be submitted within two years of the "THRU" date reflected on the DA Form 67-7 in question. Meanwhile, the five-year time limitation on the submission of OER appeals of reports rendered on DA Form 67-6 and earlier report forms remains in effect.

Reports beyond this time limitation are not subject to appeal if MILPERCEN can determine conclusively that the officer knew the OER in question had been in his official record for at least two years.

ROTC scholarships for enlisted soldiers

Active duty soldiers now have the opportunity to finish college and earn a commission — all at Army expense. Army ROTC is now accepting applications for two-year college scholarships to become effective school year 1978-79.

These scholarships pay full tuition, books, educational fees, and provide a living allowance up to \$1,000 a year for each year the award is in effect. Soldiers may also be eligible for GI education benefits in addition to the scholarships.

Following graduation, the soldiers will be commissioned as second lieutenants with four-year active duty obligation. Complete details on this program are contained in AR 145-1. Applications for school year 1978-79 must be requested by 15 April 1978 and be submitted by 1 May.

USMA prep applications

The United States Military Academy Preparatory School (USMAPS) is now accepting applications for the class of 1978-79. Applications should be completed as soon as possible as final selection will be made in early June.

Further information can be obtained by writing: Commandant, USMAPS, Fort Monmouth, NJ 07703, or by calling AUTOVON 992-1807 or commercial (201) 532-1807. Information is also available in AR 351-12 and DA pamphlet 351-2.

Notice given before reenlistment

Soldiers who reenlist for CONUS schools while overseas will get assurances of attending them but may be involuntarily extended from one to six months in overseas assignments to await the start of their school dates.

Under a policy recently announced by MILPERCEN, soldiers will be notified of any delays in school assignments before they reenlist. The delays are created in coordinating dates for return from overseas with school starting dates, leave time, and reporting dates for permanent assignments.

The Field Artillery MILPERCEN team

PERSONNEL ACTIONS
Company Grade



MAJ William H. Ott

ASSIGNMENTS CHIEF
Company Grade



LTC James V. Slagle

PROFESSIONAL DEVELOPMENT
SPECIALTY MONITOR

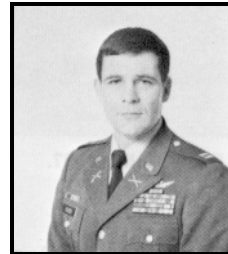


MAJ Frank Laster

LIEUTENANT ASSIGNMENTS



LTC Ronald E. Coleman
CONUS



CPT Joseph W. Eszes
CONUS



MAJ Glen D. Skirvin
OVERSEAS

CAPTAIN ASSIGNMENTS



MAJ James M. Gass
CONUS



MAJ Charles B. Tiggle
OVERSEAS

MAJOR ASSIGNMENTS

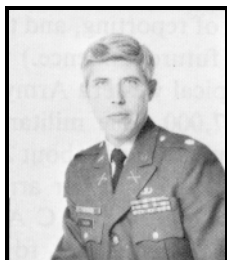


MAJ Joseph A. Siraco
CONUS

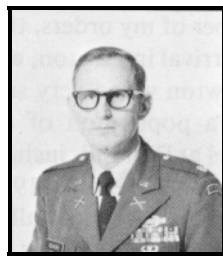


MAJ Ned W. Bachelder
OVERSEAS

LIEUTENANT COLONEL ASSIGNMENTS



LTC Thomas P. Easum
Jr. CONUS



LTC Leslie E. Beavers
OVERSEAS

COLONEL ASSIGNMENTS



LTC Roderick L.
Carmichael A to K



LTC Uri S. French
L to Z

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Snow Hall in 1927.

FIFTY YEARS AGO

by COL (Ret) Numa P. Avendano

In August 1927, as a second lieutenant, I received Special Order No. 113 directing me to report to the Field Artillery School, Fort Sill, OK, on 13 September 1927 as a student in the Battery Officers' Course.

I had been commissioned in July 1925 and was married a year later. In 1927 at age 25, I was full of vim, vigor, and vitality and was eager to attend the Battery Officers' Course. The Director of Gunnery was MAJ Jacob L. Devers who had manifested great interest in me at West Point from 1920 to 1922 and, consequently, had become my mentor. For more than 57 years, General Devers (now retired) has been my dearest friend.

Saturday, 10 September 1927, my wife and I left New Orleans by train — the type of train seen today only in western movies on television. It had a wood burning engine, one baggage car, and one passenger car dirty with cinders. The train was overcrowded and stopped at every station. The temperatures were in the high 90s, but, in those days, military men were required to be "dressed" — cap, blouse, Sam Browne belt, necktie, breeches, boots, spurs — and, of course, unbuttoning one's blouse was unheard of.

There was no direct service to Fort Sill, so we traveled overnight to Houston, the next day to Dallas, then overnight to Oklahoma City, and on Monday the 12th, at 1300 hours, we reached Lawton. As we detrained, we looked for a taxicab (there were five in Lawton — model "T" Fords). The driver took us to a residence that had been recommended, the home of Mrs. R. D. Trosper and her sister, Miss Healy, at 713 D Avenue, (At this time, I invite attention to the number "13" which has been so closely associated with my life — the number of my orders, the date of reporting, and time of our arrival in Lawton, and our future residence.)

Lawton was a very small typical western Army town with a population of about 7,000. The military personnel at Fort Sill, including students, was about 2,000.

On 13 September 1927, the day after our arrival, I had breakfast and walked to the corner of C Avenue and 4th Street, in front of the Midland Hotel, to board the trolley car which served Fort Sill.

The headquarters of the Field Artillery School was in a World War I temporary building called Snow Hall, located north of the present McNair Hall. I was pleasantly surprised to see several 1923 West Point

graduates whom I'd known as cadets when I was in the Field Artillery Detachment at West Point in 1920 and 1921. Among these officers was E. W. "Ned" Searby (for whom Searby Hall is named) who later became a brigadier general and was killed in World War II. Some of the first lieutenants and captains and most of the majors in this group were veterans of World War I, and all second lieutenants looked upon them with great respect, especially the captains and field grade officers whom we considered "elderly" because they were in their late 30s or early 40s. In those days, it was customary for higher ranking officers to address all lieutenants as "Mister."

In the Advance Class, there were such distinguished majors as Clift Andrus who commanded the 1st Infantry Division in 1944 and later became Fort Sill's Commanding General; Stanley E. Reinhart who as a captain had been my battery commander and attained fame in Europe, commanding the 65th Infantry Division; L. P. Collins; and F. W. Honeycutt.

The School staff and faculty included BG George L. Irwin, Commanding General; LTC William P. "Bull" Ennis, Assistant Commandant; LTC George Tyner, Commanding Officer of the 1st Field Artillery; MAJ Jacob L. Devers, Director of Gunnery; MAJ Joseph M. Swing, Director of Tactics; and MAJ H. L. Jones, Director of Animal Transport.

In the days of horse-drawn field artillery, officers were expected to be good horsemen as well as good gunners; therefore, much emphasis was placed on horsemanship and gunnery.

Horsemanship instruction included equitation (riding), animal management, driving and draft, horseshoeing, etc.

Gunnery in the old days was made very mysterious. We had to study laws of physics, probability, geometry, trigonometry, etc. We had to deal with two angles — phi and omega — in the adjustment of fire. The names of the angles gave them a sinister aura and generated a tremendous fear among the students. Several students requested extra instruction, and CPT (later BG) Stanley Ott was detailed to give it. His introduction was: "Gentlemen, I know what your problem is — phi and omega. Am I correct?" We all replied in the affirmative. "Very well," he said, "we are going to change the names of the angles to A and B." Then he explained the relationship of the angles and how they were used in adjustment of fire with lateral observation. He was a great instructor. We had no more problems.

Captain Ott had two sons. One of them was David E. Ott, Commanding General of Fort Sill until October 1976. David is now a lieutenant general and commands VII Corps in Germany.



From left to right: LTC William P. "Bull" Ennis, Assistant Commandant of the Field Artillery School; BG George LeRoy Irwin, Commandant; and LTC George Tyner, Commander of Troops. Visible by General Irwin is a "shooting stick," used by high-ranking officers as a seat in the field. This photograph was taken by COL (then 2LT) Numa P. Avendano at Fort Sill in 1927 during a field exercise on the East Range near Dodge Hill. Colonels Ennis and Tyner are wearing the equitation uniform, and General Irwin is wearing the standard uniform (worn for everything except duties pertaining to horses).

In those days, the uniform of the day for all troops (staff, faculty, and students) was:

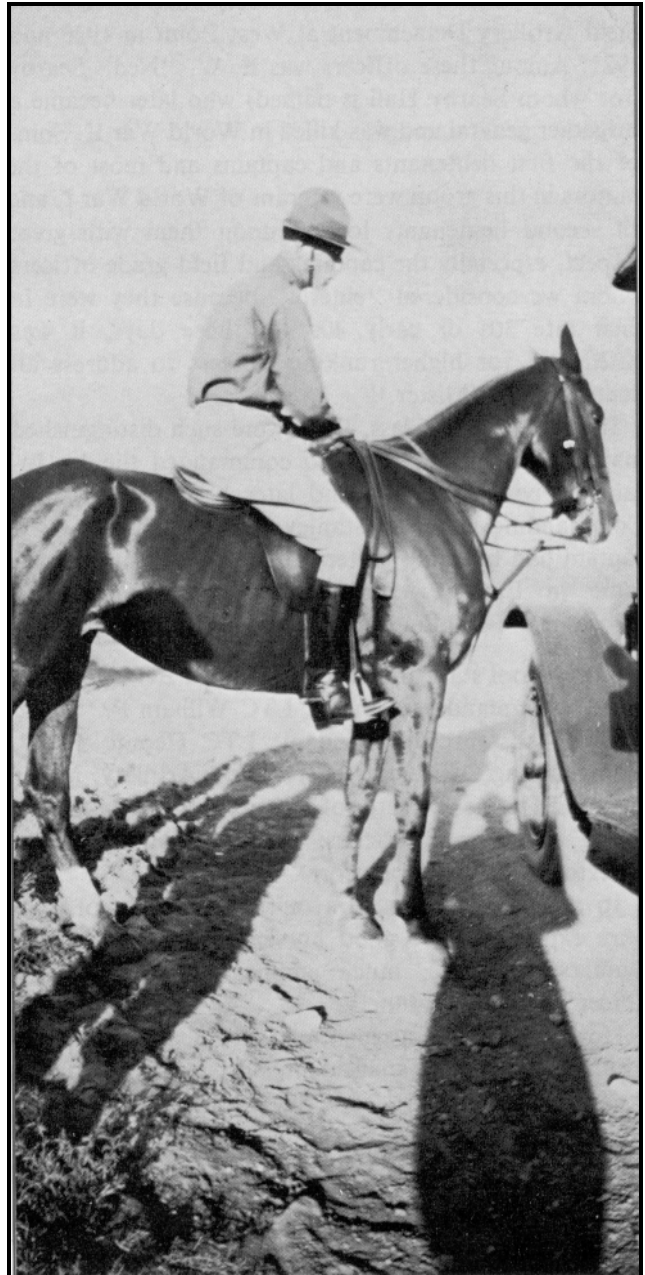
- For classroom instruction and firing — cap, blouse, Sam Browne belt, breeches, boots, and spurs.
 - For equitation and anything pertaining to horses — campaign hat, OD wool shirt, necktie, breeches, boots, and spurs.
- The boots had better be well-shined too, because Colonel Ennis would definitely let a person know when

his boots were not properly shined. Indeed, no one wanted to run afoul of "Bull" Ennis! Those who did never forgot it. It was alleged that one person took his own life; however, it was not because of a trivial matter such as unshined boots, but because of the excessive use of liquor, which was strictly against Federal Law — the infamous Volstead Act in force from 1919 to 1933.

The Battery Officers' Course schedule was rigorous with only a few minutes between classes. The Section Marcher stood at the classroom door and at the appointed time would report, "Sir, the section is present," or "So-and-so is absent." The name of any late comer was sent to Colonel Ennis and the student had to report to him.

One very cold morning at equitation, CPT F. D. Couden was having trouble bridling his horse. The horse was refusing a cold bit. I went to his aid, applying a trick which I had learned at West Point. I took the bit in my cupped hands and blew warm air on it for about 30 seconds, warming the bit, and then the horse readily accepted it. Being a good Samaritan delayed me for the formation. There stood the instructor with notebook and pencil in hand. When Captain Couden and I went to Snow Hall at noon and read the bulletin board, our names were listed to report to the Assistant Commandant at 1235 that date! Colonel Ennis asked Captain Couden why he was late at the formation. Captain Couden started to explain and mentioned that I had helped him, but he was not allowed to finish. He was "chewed out" up one side and down the other and was told that excuses were nothing but alibis, and so on for about 10 minutes. Then the AC sounded off, "Mr. Avendano, come in." Believe me, he had a voice that was well known throughout the Field Artillery! I went in, saluted, and remained at attention. He said, "You were three minutes late at equitation formation this morning. Why?" Not only had I learned my trade at West Point, but I had heard Captain Couden's fate. I answered, "No excuse, sir." He looked me straight in the eye and said "That's all. Dismissed." I left the Assistant Commandant's office thanking my old sergeant, "Smokey" Pete Lawrence, for teaching me that excuses and apologies are signs of weakness.

In equitation, there was a long-established custom that when an officer was "policed" (thrown off a horse) he had to put a dollar in the "kitty." Dollars were scarce in those days — second lieutenants earned \$125 per month. During the first two weeks, more than half the class had been policed, and we soon had enough to buy a few bottles of bootlegged bourbon. We had a party in the BOQ (building B9, just south of the then Snow Hall), and invited our favorite equitation instructors, Captains Lattimore and Shea.



Equitation instructor, Captain (later Colonel) Lattimore, is wearing the equitation uniform which consisted of campaign hat, OD wool shirt, necktie, breeches, boots, and spurs.

In handling horses, there are always comical incidents, even though sometimes injuries did result. Once, while we were fording Medicine Creek, my horse decided to take a drink; he lowered his head quickly with a hard pull, which dismounted me over his head, and I landed flat on my back in the creek. I had to finish the ride wet, had to pay a dollar, and was the source of a lot of laughs. Also, I had to wear those wet clothes the rest of the day because I lived in town and, since I was of small stature, I could not borrow any that fit.

We had one and a half weeks of classroom gunnery and then went to the firing point. In those days, the method of fire used was called "the battery commander's method." It implied that the battery commander (the officer firing) would conduct fire from an observation post with the battery (four pieces — French 75-mm or 155-mm howitzers) about 400 to 600 yards away. A reference point that could be seen by the observer and by the battery was selected (usually the blockhouse on Signal Mountain for the West Range, and the water tower in Elgin for the East Range). The deflection was computed for the battery by the parallax method, and the range was estimated or measured on a map. The only instruments we had were an aiming circle and field glasses. All officers were directed to prepare data for a given target (we were allowed three minutes); then the instructor would select the officer to fire the mission. We were allowed three or four salvos for adjustment and one or two volleys for effect. If an officer could not complete the adjustment within a certain time, the instructor would give the problem to another officer.

Major Devers, Director of Gunnery, kept his eye on me. Whenever I had a "U" on a shoot, I would receive an "invitation" to report to him; consequently, I was always careful and tried very hard. One day Major Devers visited the firing point, arriving in his World War I Dodge touring car. The instructor called us to attention and reported to the Director. Major Devers looked around and said to the instructor: "Where is Mr. Avendano?" I felt the blood leaving my head, figuring that he was calling on me to fire. I reported to him and he said, "Numa, if you and Lolita are not doing anything tonight, come to dinner at seven." What a relief!


The Army was very small in those days — about 175,000 enlisted men and 12,000 officers, all volunteers. The social life was concentrated in the Officers' Club dances and the Artillery Hunt rides and breakfasts, creating friendships that lasted a lifetime. Very few lieutenants had automobiles, but there were always friends to take us places.

The second Saturday after classes began, the Commanding General had a reception at the Officers' Club. The blue uniform had not been reinstated since World War I, so our OD blouse, Sam Browne belt, breeches, boots, and spurs were acceptable at social functions. In the receiving line were General and Mrs. Irwin, Colonel and Mrs. Ennis, and a Major Y Hata of the Japanese Imperial Army who was attending the Advance Course. As we went through the line and introduced our wives, Major Hata would bend at the waist as was the Japanese custom.

One of my very dear friends, COL Everett Williams, who was a gunnery instructor as a captain at the school in 1927, was captured at Corregidor in 1942 along with General Wainwright. Colonel Williams told me he saw Hata (then a major general) in the Philippines and that Hata recognized him and talked to him about Fort Sill. Colonel Williams said that Hata was one of the cruelest Japanese officers that he had encountered.

I also met CPT Louis J. Fortier of New Orleans at the reception in 1927 and we became very close friends. One of his World War I anecdotes was about a job he was given while acting as executive of his battalion. With a small detail, he was told to "police the picket lines." He was wondering how to do it quickly when he saw some Frenchmen picking up manure in baskets. He asked one of the Frenchmen, who happened to be the village mayor, if he knew of other farmers who could use the manure. The mayor said he would be glad to buy the manure and would get the farmers to collect it immediately. Captain Fortier had the area quickly policed, he was paid for the manure (the money went into the battalion fund), and he had satisfactorily accomplished his mission!

Another officer whom I admired very much was MAJ Joseph M. Swing (World War II commander of the 11th Airborne Division and, in 1949, Commanding General of Fort Sill). On a very cold, windy day, Major Swing had us on a tactical ride. Each officer was given a map, taken to the vicinity of Dodge Hill, and turned loose to select an observation post and a gun position. I was galloping to my area when my horse stepped in a prairie dog hole and took a complete somersault with me around him. I was flat on my back but holding onto the reins and here comes Major Swing. "Is that horse all right?" he said. "Yes sir, apparently so." Then, he said, "Are you all right?" Horses first was the way it was in those days.

These have been some highlights of my first tour at Fort Sill, which will always be engraved in my mind. Not many of the officers of that era are living today, but many of them were, indeed, great men. I can say, without fear of equivocation, that every officer I came in close contact with at Fort Sill has become a dear friend of mine. Many of these officers have retired and are living in Lawton. That is why my wife and I moved to Lawton in July 1975, and we love being a part of the Lawton-Fort Sill military community. 

COL Numa P. Avendano retired from the Army in 1962. He lived in New Orleans, LA, before moving to Lawton in 1975.

Gun & Run

by CPT Allan M. Resnick

As was aptly stated by LTC William W. Breen in "Survivable, Affordable, and Lonely" (*FA Journal*, Nov-Dec 77), today's battlefield can be characterized in a number of ways, not the least of which is its tremendous lethality. This is of particular importance to the US Field Artillery against whom the threat can target literally hundreds of rounds when they can locate us. Preliminary results from LEGAL MIX V (a study to determine the FA system requirements in materiel, doctrine, and organization for the 1981-1986 time frame) indicate losses on the order of 39 artillerymen per fire unit during a 14-hour battle. (A fire unit is an artillery element capable of receiving, processing, and executing a call for fire.) This study included use of terrain gun positioning (TGP) for our artillery units. However, TGP is not enough; new tactics must be developed that can conserve skilled artillerymen. Colonel Breen's concept of operation is the logical employment of new materiel, but development and fielding of a weapon system that can employ this concept will require a long time. Tactics, however, can be implemented quickly. One of these tactical concepts, not a new one I might add, is "Gun and Run,"

Description

Currently, the battalion commander gives the battery commander an area to occupy (often called a "goose egg"). Within this area, normally 1 to 1½ kilometers wide, the battery commander selects a primary position for his battery to occupy as well as an alternate position, should the primary one become untenable.

Employing the Gun and Run concept, the battery commander or his representative would select at least four position areas within a "goose egg," perhaps 2½ to 3 kilometers wide (figure 1). The position that the battery is to occupy initially would be designated as the primary position. Battery personnel would identify position areas initially by a witness stake or a range pole. A battalion survey party would provide survey control to these positions with priority to the primary position. The firing unit would occupy one of these positions at a time. After

occurrence of a certain event, the unit would move to another position area within the goose egg. The unit would continue this system, trying to avoid establishing a pattern. The elements that would move would be the guns, accompanying vehicles (M548), and possibly the FDC. If the battery has any overhead (such as mess, maintenance, or ammunition), the overhead would remain static on the periphery of the goose egg.

The Gun and Run tactic is flexible enough to allow the commander to use any of three options or adopt other criteria. For example, the trigger to initiate a move could be the occurrence of any of three events:

- The firing of a certain number of volleys (which can be determined either analytically or empirically).
- Attack by enemy counterfire.
- The passage of a given amount of time, which could again be determined either analytically or empirically.

Requirements

Foremost among the requirements for this tactic is a weapon system that can be emplaced or displaced rapidly, almost entirely restricting this tactic to a self-propelled system. Survey techniques to provide control to these locations (and there would be about 12 of these locations in a three-battery battalion) would also have to be rapid. On the developmental horizon is a position and azimuth determining system which should provide an answer to this requirement. The lack of this equipment is not a death knell for the Gun and Run

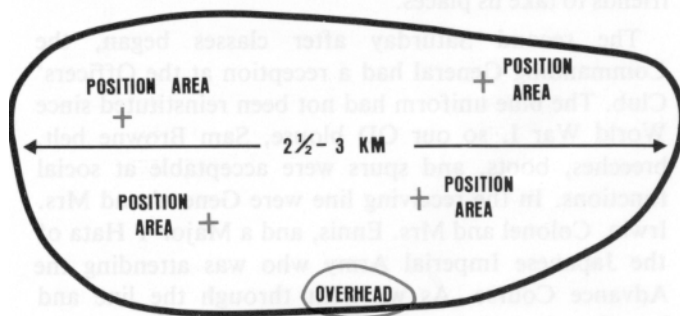


Figure 1. Gun and Run employment.

tactic — there are a number of hasty survey techniques that the battery can employ, though they are admittedly less accurate. The fire unit must have a fast-laying capability, probably a minute or less. In the "out years," a gun alignment control system will provide this capability. But this requirement can be met today with a slight loss in accuracy by using the distant aiming point method of lay.

Finally, this tactic requires that the goose egg, within which the battery will move, be free of other units. There are two reasons for this: first, to minimize interference with the movement of the battery; and, second, to protect a friendly unit from enemy fire directed against the friendly battery. Today, however, "real estate management" is on a management-by-exception basis — only when two units are occupying the same area does the "owning" commander intercede.

Advantages

Paramount among the advantages of Gun and Run is the resulting improvement in survivability. For once, we will be able to "throw a monkey wrench" into the threat's counterfire system; the enemy will have to decide who and how to attack by counterfire.

Even if the threat eventually acquires all the locations, he is forced to decide whether to:

- Fire the normal amount of ammunition on all locations (which would greatly increase his expenditures and overtax his logistical tail).
- Reduce the expenditure of ammunition for each location (thus reducing our expected casualty levels).
- Be more selective of his counterfire targets (which will improve our chances of survival).

In any event, the Gun and Run tactic will confound the enemy's system and cause him to stop, think, and decide — a process that will slow up and, hopefully, overload his command and control.

This tactic is particularly inviting for a multiple fire unit battery. The direct support battalion of the Division Restructure Study may employ such a battery — two fire units of four guns each. A battery so configured, employing Gun and Run, could provide continuous fire support and improve its survivability by "flip-flopping" its fire units.

This tactic can provide the framework for using some of the more exotic simulator devices now on the drawing boards. As the unit occupies each position area for the first time, it could leave behind a remotely activated cannon launch simulator. After the unit has occupied each position area once or twice, it can activate these simulators in unoccupied position when it fires, thus reducing the value of any real-time acquisition or sensor cue potential for the threat.

Disadvantages

Gun and Run is not without disadvantages. By moving as frequently as this tactic suggests, there may be a degradation in weapons availability. However, when one considers that this non-availability due to movement is in lieu of attrition, and because of the relatively short duration of this non-availability, our artillery units should experience an overall improvement in weapons availability. Also, because of this increased movement, more stress will be placed on the automotive components of the weapon systems and there will be an increase in POL usage.

The Gun and Run tactic may eventually fatigue the cannoneers, though this should be minimized with the current philosophy of keeping ammunition and equipment on board.


This tactic may offer the battalion command and control system some operational challenges with regard to some of the more mundane functions (e.g., resupply, messing). Also, the increase in movement may offer a greater aerial signature for the enemy to detect. Finally, this tactic requires that more of the main battle area (MBA) be devoted to the field artillery — a potential disadvantage when one considers the existing concern for fitting all the necessary units into the MBA.

Despite these disadvantages, it is felt that when the fire of a full fire unit is required, it is more likely to be delivered by a unit that employs this tactic than by one that does not.

Conclusion

The Gun and Run tactic was evaluated in LEGAL MIX V. Using a two-sided, dynamic, computer-assisted model, it was found that the effects of our artillery fires were improved by 20 percent because of reduced personnel and weapons losses.

A similar tactic was proposed a few years ago but was not adopted because of weapons availability considerations. Gun and Run overcomes these shortcomings by use of modern equipment and techniques.

This tactic, in no way, is meant to clash with Colonel Breen's "randomly distributed artillery force" concept; it is a complement to it, providing for a smooth transition to new weapons systems. Gun and Run should receive serious consideration in the attempts at improving the survivability of our artillery. 

CPT Allan M. Resnick is assigned to the Doctrine Team, Directorate of Combat Developments, USAFAS, as an ORSA Staff Officer.



Pershing II on target

The Pershing II (PII) missile system has completed its third firing in a scheduled series of six (*FA Journal*, May-June 1977, p. 39). These firings are a part of the advanced development phase testing for PII and will validate the guidance system and the feasibility of delivering a nuclear earth penetrator warhead for attacking hard, point targets. Initial firings have been successful.

This is significant even beyond the validation of a field artillery missile system, as these flights represent the first time that the US has successfully fired a terminally guided ballistic missile. The PII not only carries its inertial guidance system throughout its flight to control the new reentry vehicle, it also carries its own radar to conduct radar mapping.

An on-board computer compares the radar mapping data with a stored reference image of the target area and directs corrective maneuvers for achieving pinpoint accuracy. The PII is our most accurate missile to date and will allow us to attack targets with near surgical precision.

Ballistic similitude tested

A test concerning the ballistic similitude of the standard M107, 155-mm high explosive projectile and the new M483A1, improved conventional munition projectile was recently concluded by the Field Artillery Board.

During the two-month test 985 M107 projectiles fuzed with the M557, M564, and M582 fuzes and 923 M483A1 projectiles, fuzed with the M577 fuze were fired.

The current method of employing the M483A1 is to

conduct a high-burst registration fuzed with the M577 fuze. A high-order detonation is achieved by removing the expulsion charge and installing a spotting charge (self-registration charge) onto the base of the M577 fuze. Registration corrections are then determined and applied in the normal manner.

The present method of employing the M483A1 projectile is costly, and requires conducting an additional registration. If the trial methods of using the M483A1 are feasible then a cost and time savings would be realized.

The purpose of the test was to collect data on the accuracy of the current method of employing the M483A1 and two trial methods of employment using registration corrections obtained from an M107 registration using the M557, M564, or M582 fuze.

Testing was done in two phases. Phase one involved a high-burst registration using the M107 fuzed with either the M564 or M582 fuze. GFT registration corrections were determined and applied in the normal manner. Using the M483A1 fuzed with the M577 fuze, transfer missions were fired by applying deflection, time, and quadrant correction factors extracted from a trial firing table (TFT) addendum prepared by the Ballistic Research Laboratory.

Phase two involved a mean point-of-impact registration using the M107 fuzed with the M557 fuze. Registration correction factors for the M107 were determined from a concurrent met using the FT 155-AM-1 TFT.

All test data will be analyzed to determine the feasibility of the trial methods of employing the M483A1 projectile.

Busy Board for 1978

A busy 1978 schedule awaits the Army Field Artillery Board which serves as the user testing agency for Field Artillery systems. A variety of items including small battery radios, large computer systems, and ammunition products will be tested.

Since any testing schedule is tentative in nature, the following Field Artillery Board tests are projected for 1978:

- Automated M109 howitzer — scheduled for February, will examine three levels of automation for the M109.
- Photo Locator/Analytical Photogrammetric Positioning System (PL/APPS) — This test (April through August) will examine the improved APPS (which uses stereo pairs of cartographic quality imagery combined with general tactical imagery) in a survey mode operating in a controlled environment.
- Position Azimuth Determining System (PADS) — This test (March through June) examines the capabilities and limitations of this surveying system.
- Improved M548 cargo vehicle (also known as the stretch 548) — (March through April), will examine the proposed changes to handling ammunition in the M548.
- T136 track — (April through August), will examine a new track system for the M110 howitzer along with 14 other product improvements.
- XM736, 8-inch, VX, projectile — (April and May), will examine ammunition handling and the effects in the target area.
- XM710, 105-mm, ICM, projectile — (May), will test ammunition handling.
- XM587E2/XM724 electronic time fuze with the XM36E1 fuze setter — (May), will test the man-machine interface with the fuze setter as well as the accuracy of the fuze setter/fuze combination in firing.

Pilotless recon craft tested

Initial flight testing of the Army's Remotely Piloted Vehicle (RPV) was recently conducted at Fort Huachuca, AZ, by the Seeker Platoon from Fort Sill's Field Artillery Board. The RPV is an unmanned aircraft controlled by radio for reconnaissance and target acquisition.

The RPV achieves flight from a truck-mounted launcher which works on a catapult principle. It is retrieved with nets. An on-board camera transmits a live TV picture of the area the RPV is flying over. Crew members monitor the TV picture to detect, identify, and establish coordinates of enemy targets as they appear on the screen.



Crewmen prepare to launch the RPV. Upon completion of its flight it will be landed in the net at right.

Objectives of the test at Huachuca included determining the flight capabilities of the RPV and its effectiveness in a tactical modern battlefield. Some 47 successful flights were made in a three-month period with only three crashes in which no one was injured.

The Seeker Platoon will participate in additional testing of the RPV System at Fort Bliss, TX, during the spring of 1978. The objectives of this testing are to investigate the vulnerability of the RPV to enemy air defense weapons and to demonstrate the RPV's capability to illuminate targets for laser guided munitions.

One of the sensor packages available is a laser designator which should project the necessary laser energy at a tank for homing of a cannon launched guided projectile.

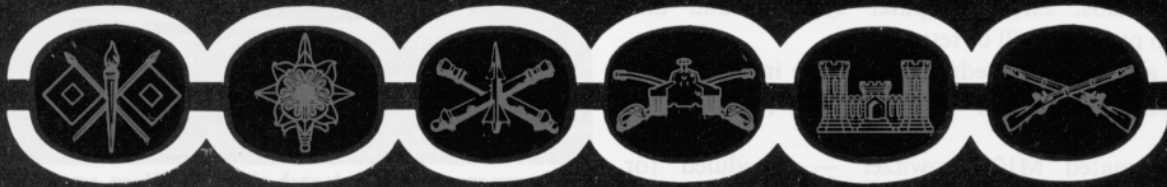
Lightweight field wire

A Concept Evaluation Test was conducted recently by the Field Artillery Board to evaluate the feasibility of using a lightweight field wire at artillery battalion and battery echelons.

The wire tested was a 39-gage twin conductor with a wax impregnated, nylon braided jacket. In this configuration, the wire is approximately the size of heavy fishing line, weighing approximately 3 pounds per mile and having a tensile strength of 65 pounds. The size of a 500-meter roll is 7 inches in length and 2 1/8 inches in diameter. The wire cannot be repaired or spliced except at the adapter ends. Presently, the wire is manufactured in rolls of 100, 300, and 500 meters with adapters at each end for connection to various equipment.

During the Board's test, the wire was used in the various communications systems found at battery level. It was also tested under actual field conditions on training exercises conducted by A and C Batteries, 2d Battalion, 36th FA, and A Battery, Training Command Battalion. The Field Artillery Board provided its report to TRADOC on 31 December 1977.

with our comrades in arms



GSRs fired

Vought Corporation successfully launched its first general support rocket system (GSRs) demonstration rocket at White Sands Missile Range, NM, 5 December 1977, less than three months after being selected by the Army as one of two contractors in a development competition.

This launch gave Vought an opportunity for early evaluation of the launch tube, rocket interface, and rocket ballistics. Earlier, the company fired two short-range GSRs demonstration rockets at Redstone Arsenal, AL.

Vought is in competition with Boeing Aerospace under a \$30 million contract which calls for fabrication and testing of the GSRs system. The Army will select one contractor for final qualification and initial production of the system, at the end of the 29-month validation phase program.

The first General Support Rocket System (GSRs) rocket is launched at White Sands, NM.



Lance contract awarded

A \$35.4 million contract was awarded recently by the Army Missile Materiel Readiness Command to Vought Corporation to produce 360 Lance missiles and support equipment.

This contract extends Lance production into the 1980s and is the second awarded to Vought since Congress decided that Lance should be fielded as both a nuclear and nonnuclear battlefield weapon.

In addition to the Army which has Lance battalions stationed in the United States and Europe, the missile has been purchased by Belgium, Great Britain, Israel, Italy, The Netherlands, and West Germany.

TNT used as filler

Composition B, long used as the filler for artillery projectiles, is being replaced by TNT in some rounds for use with new weapons designed to achieve greater ranges.

Officials from the Cannon Artillery Weapons Systems Project Manager's office prefer Composition B explosive over TNT because of its greater effectiveness. However, the use of Composition B, as currently manufactured, has not been fully qualified and certified for use with higher propelling charges.

For example, the new top zone charge (M203) for the M198 towed howitzer cannot be used with the Composition B-filled M549 projectile. It can, however, be used with the TNT-filled projectile (M549A1).

An extensive program is underway to improve the Comp B explosive to allow it to be used with higher

performance propelling charges. It is expected that this program will be completed within two years, at which time the use of Composition B will be reinstated.

The switch from Composition B to TNT is an interim measure and does not represent a trend with Army projectiles.

Dual-purpose warhead tested

A dual-purpose warhead has been developed and successfully tested by the Naval Surface Weapons Center Dahlgren Laboratory. It can penetrate "soft" targets, such as sandbagged bunkers, or will detonate on impact against harder targets like metal or masonry.

The warhead, designed for the shoulder-launched, multipurpose assault weapon (SMAW), will penetrate a maximum tested depth of nine inches of reinforced concrete or 40 inches of sand and timber.

New smoke to conceal armor

A protective smoke system for use on the M60A1 tank and other armored vehicles is being adapted by the Army. The new smoke grenade and launcher system, designed by the British, provides a smoke screen within two seconds, compared to present systems that take from eight to ten seconds.

Armored vehicles equipped with the system will carry 24 phosphorous smoke grenades which can be fired in groups of six or 12. The smoke screen is designed to prevent delivery of aimed fire against the armored vehicles.

Tanks in Europe will receive the system first and US-based equipment will be converted when NATO requirements are completed. The Army's decision to adopt the British smoke system supports its program to standardize equipment with that used by other NATO nations.

Air defense guns into development

A new Division Air Defense (DIVAD) gun system is being developed to replace the Vulcan system. Two companies, General Dynamics and the Ford Aerospace and Communications Corporation, were selected to develop separate proposed systems. Both companies proposed two-barrel gun systems. One, by General Dynamics, will be a 35-mm and the other, by Ford, a 40-mm system.

The Army will allow the two firms 29 months to fully develop the proposed systems. When prototypes are developed, a test phase will determine which firm will be awarded a production contract.

DIVAD will provide low altitude air defense in forward combat areas. It will be an all-weather, radar-directed system and will be mounted on a modified M48A5 tank chassis. A DIVAD battalion will be assigned to each Active Army division.

The new system will augment the Roland missile system which is replacing the Chaparral.



Artists concepts of both the Ford (left) and General Dynamics versions of the Division Air Defense system.

With Our Comrades In Arms



M88A1 medium recovery vehicle.

Medium recovery vehicle delivered

Modernization of the Army's medium recovery vehicle fleet passed a milestone with delivery of the first new production M88A1 by Bowen-McLaughlin-York Company of York, PA.

The M88 modernization program is aimed at producing an improved vehicle and upgrading the performance of existing vehicles. Program objectives include replacing the gasoline engine with a diesel engine, a modified version of the engine now used in the main battle tank; increasing the operating range; increasing spare parts commonality with the main battle tank; and improving the reliability, availability, and maintainability.

Additionally, a two-cylinder diesel engine-driven generator set with power takeoff has been installed that provides no-load retrieval and pay-out of winch cables and boom and spade operation.

The program consolidates the new production of M88A1s and the conversion of existing M88s. The same company will perform both jobs. Fielding the M88 began this year.

Recommended reading

Two articles in the November issue of *Military Review* magazine should be of interest to Field Artillerymen. The first, *Soviet Techniques for Combat in Builtup Areas*, by C.M. Donnelly of the Royal Military Academy, stresses the necessity of combined arms support, particularly in builtup areas. "This is . . . contrary to a tendency in some western military circles to assume that street fighting is the sole prerogative of the infantry," according to the author.

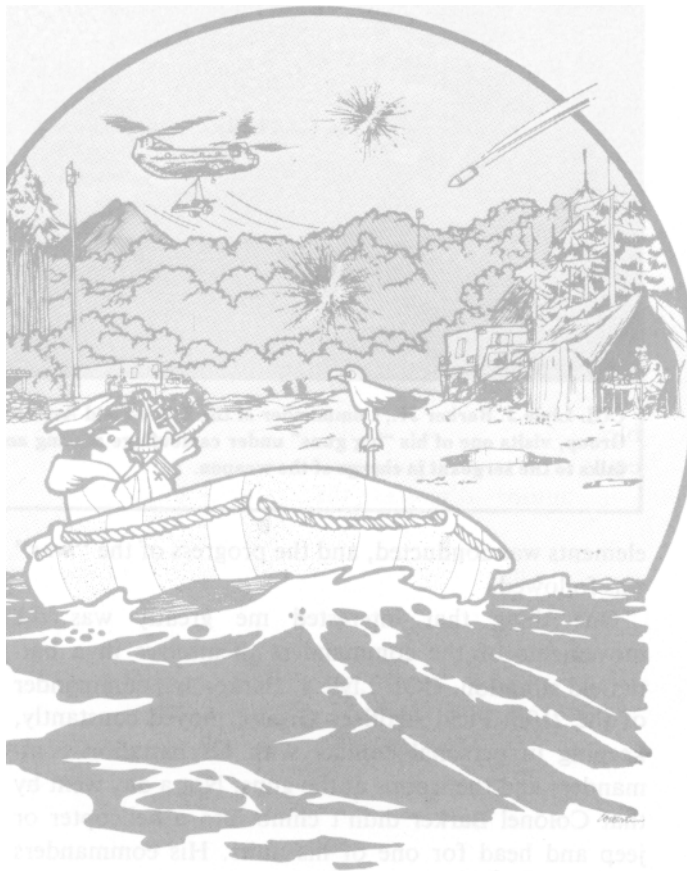
In the second article, *Cold Weather Warfare: What Would Happen?*, COL Francis King of the Army Operational Test and Evaluation Agency presents a bleak scenario of what cold weather can do to men and equipment when fighting is necessary in frigid climates. The author discusses the handicaps to logistics, mobility, and medical care and the physiological and psychological problems of personnel in an environment we are not well prepared to face in battle.

Infantry magazine for November-December 1977 carries an article called "Leave The Radios Home," which emphasizes the danger to us of our own radio transmissions in combat. The article describes an infantry brigade exercise using runners, signal flags, light guns, and heliborne couriers in place of radios.

Then check *ARMOR* magazine's November-December 1977 issue for an article by the editor of *Infantry* which discusses the debate between these two branches concerning which one will have pronency for mechanized infantry.

Army Logistician magazine's January-February 1978 issue contains a piece by LTG Howard H. Cooksey, USA (Ret), comparing US and Soviet combat materiel in Europe. Cooksey, who retired as Deputy Chief of Staff for Research, Development and Acquisition, says that while the US is recovering from the drain on its equipment sent to Israel in 1973, "the Soviets have more, by several magnitudes, of virtually every major piece of combat hardware that armies employ, with the exception of transport helicopters. To make things worse, their equipment is, in most cases, equal to or better than that of what used to be known as the best-equipped Army in the world — ours." The quantity of Soviet artillery is listed as many more than the US while its quality is considered equal or better according to the article.

At Sea



Art by Donna Covert

with the Field Artillery

by Cdr D. L. Davidson, USN

(Photos by Cdr D. L. Davidson, USN)

Lost.

At sea.

That's how I felt.

Being a Navy man, I have at least some knowledge of ships, Navy tactics and strategy, the ways of the sea . . . and Naval artillery.

But in the woods, in a tent, with green instead of blue uniforms, and with rain the only water around me, I was lost.

I had the privilege of spending a good portion of a recent exercise, Carbon Edge, with the 210th Field Artillery Group in the woods of southern Germany. I even took some leave to do it. Crazy? Maybe — but for me, very educational. It was a rare opportunity to learn something about the operations of another service — the type of opportunity I would recommend any service member take advantage of, given the chance. Today the services are working more and more closely together, and a professional officer should take advantage of any chance to learn something about the other services and their capabilities.

Carbon Edge was a field training exercise (FTX) under the NATO Autumn Forge umbrella. Autumn Forge is the nickname for the series of military exercises conducted by the Allied Command Europe each year. All NATO nations with military forces committed to the defense of Europe are scheduled to participate in this program. A number of national, multinational, and NATO exercises of varying size are held throughout Europe each autumn. The concept of combining many exercises under a cohesive NATO umbrella was developed by GEN Alexander Haig, who is both Supreme Allied Commander, Europe (SACEUR) and Commander in Chief, US Forces in Europe (USCIN-CEUR).

Autumn Forge 1977 involved thousands of troops from many NATO countries. One aspect of Autumn Forge, the deployment and redeployment of reinforcing troops from the United States (known as REFORGER), brought some 12,000 troops from the continental US to participate.

Exercise Carbon Edge was a very realistic war game. Orange forces representing the "bad guys" and using Warsaw Pact tactics opposed the Blue forces ("good guys"). The scenario called for the Orange to attack across a fictitious border and for the Blue to fall back and establish a holding position, then regroup and eventually counterattack, pushing the Orange back over the border. All elements of warfare were involved: artillery (naturally), armor, infantry, close air support,

air delivery of tanks and men, logistics, communications, etc. Carbon Edge lasted for 11 cold days.

Yes, the days were cold. There was very little rain, but that was fortunate, not only because there was less maneuver damage on the drier land, but also because moving the big guns of the 210th would have been much more difficult on wet soil.

How was it for a Navy man living with an artillery group? Different. But there were similarities in artillery fire and naval gunfire — terminology was similar; targeting was similar; techniques were similar. Even the problems of establishing and maintaining good communications were similar.

In what ways was it different? Well, the tent didn't pitch and roll. Instead of seeing the sky, I saw mostly the trunks of very tall trees that obliterated the sky. The trees made nights even darker and the days colder. But they also provided good cover, the type that a ship can't find . . . and shouldn't, under normal circumstances!

My first night was the greatest challenge. I was used to night operations, but on ship at least I could get from one point to another at night in a dimly lit, interior environment. In the woods, one was constantly running into tent guy ropes, commo lines, or trees. In the pitch dark, things look (or feel) different, and it is easy to get disoriented, even in a small artillery headquarters camp. Just about the time you get used to finding your way from your tent to the operations van, the group pulls out and moves to another location — either to confuse the enemy or to get within good communicating distance of its firing batteries.

The moves were efficient. That alone was impressive because the group headquarters had to move its entire self-contained operation, including some 75 vehicles, 110 men, communications, intelligence, operations, messing facilities, chaplain, corpsmen (medics), administrative functions, and so on — a massive effort. The group headquarters battery commander was constantly out searching for new, suitable sites in case the next move came suddenly.

And once the group relocated, I had the same problem again at night — couldn't remember where things were or behind which tree the operations van had been hidden.

I also had some mild moments of mind-searching trying to remember the password each day so I could get into the operations area where the "nerve center" vans were located. From these vans, intelligence was collected on the Orange forces, movements of the artillery battalions were directed, planning with other



COL Llyle J. Barker Jr., Commander of the 210th Field Artillery Group, visits one of his "big guns" under camouflage netting and talks to the sergeant in charge of the weapon.

elements was conducted, and the progress of the "war" was followed.

One thing that interested me greatly was the movements of the commanders themselves in a battlefield situation. COL Llyle J. Barker Jr., commander of the 210th Field Artillery Group, moved constantly, keeping in personal contact with his battalion commanders and the troops at the guns. Not a day went by that Colonel Barker didn't climb into a helicopter or jeep and head for one of his units. His commanders were also on the move and frequently covered the miles necessary to come to the group headquarters for liaison.

I talked with many "persons" in the 210th — I say persons because there were two women. Women in combat situations is a subject still under discussion in the Army, so I won't comment except to say that, in this "pseudo wartime" environment, I noticed that the use of "expressive" language was toned down.

I also talked to the men who set up the internal communications systems. I had not realized that each primary tent had to be connected with all the others and with the operations van, the intelligence van, the commander's van, etc. And it all goes through a central switchboard. Each move meant that miles of wire had to be strung through the woods in short order. (At least on board ship all the internal communications are already in place, and they stay that way when you move!)

It didn't take long to learn that the field artillery moves first class — with tents, cots, and hot food! Since the Navy normally provides comfortable sleeping

facilities and hot meals, I didn't give this much thought until I found out that some of the infantry units on the exercise went for long periods sleeping on the ground and not getting any hot meals except, occasionally, heated C-rations.

One of the unique aspects of this exercise was the way in which it was controlled. The controllers — some 2,000 of them — weren't in place to spy or to tell you what you did wrong. They only evaluated what you did and told you just what effect your actions had. For example, when an artillery mission was fired, the controller in the battery area noted all the required data (your target information, azimuth of fire, type of weapon used, etc.), and passed it to a counterpart controller on the "other side" who evaluated where the shell would have impacted, what kill radius it would have, and eventually reported how much damage would have been accomplished.

In this way, units, personnel, and weapons were realistically put out of action and could not be used. The period of "dead" time was based on how long it would take to replace that man or that piece of equipment on the frontlines, normally a period ranging from 6 to 12 hours. At that time, the "killed" person or weapon could be put "back into action."

It will be a long time before all the reports and data are evaluated from Carbon Edge, but interim feelings are that the exercise was a total success. The men and




Artillery staff officers confer with the controller (white head and arm bands) assigned to their unit. Some 2,000 controllers throughout the exercise helped increase the realism of the maneuvers.

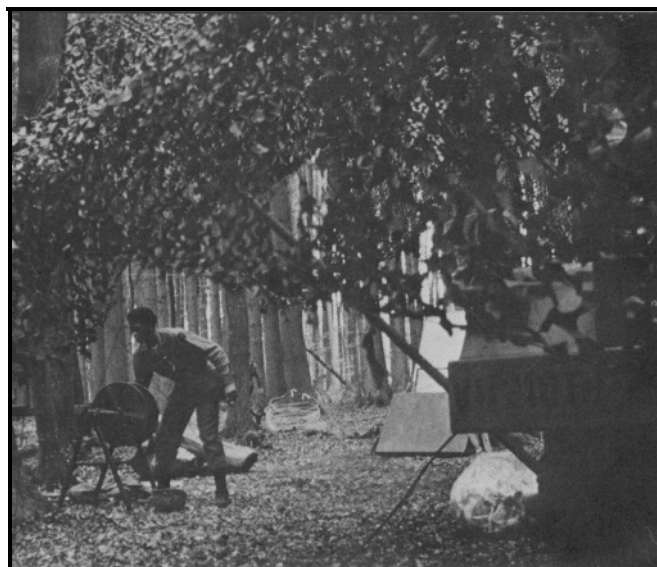
the commanders seemed to gain a maximum amount of training value from the conduct of the maneuvers. The chance to exercise and test weapons and equipment was a welcome one. The men obviously took to the field with gusto. Even though they were shivering from the cold, most of the men were glad for the chance to show what they could do. And they did it well, from all appearances.

Perhaps one of the "bennies" to come from this exercise is that the other side — the *real* Orange forces — know what we can do and that we can do it well. Such a demonstration of effective deterrence and readiness made this large exercise worthwhile.

For my part, I learned a lot about Field Artillery operations. Maybe next time I'll try an armored unit, even though riding in a tank might make me seasick!

The 210th Field Artillery Group invited me to an exercise they will be having in January, probably in the snow — comparing that to a warm ship, I'm not sure I'll accept. But I am glad we are on the same side, fighting for the same principles. I was reassured of the professionalism throughout the US military services.

All US military services are on the same team, even though we Navy people do feel "at sea" on land. 



Communications within the headquarters camp is a big, essential task. Here, specialists break down and roll up the internal lines in preparation for another move.

Cdr D. L. Davidson, USN, is assigned to the Public Affairs Office, Headquarters, US European Command.

Decontaminate and

by CPT Kenn Riordan

The 56th Field Artillery Brigade has pioneered the employment of a decontamination device which will significantly contribute to the survivability of any unit exposed to a nuclear, biological, chemical (NBC) attack. With an investment of approximately \$27.00 per kit, a unit can develop its own decon capability.

This field expedient device, the Goldstein Apparatus, was named for its inventor, CPT Leonard Goldstein, who formulated the idea after reading about a similar Soviet apparatus. The simple, but effective, apparatus consists of the following components:

- Oil gun, pneumatic, 1-quart capacity, model 390, pistol type, NSN 4930-00-222-2975.
- Plastic or rubber tubing with an inside diameter of 1/4- to 5/16-inch and a minimum length of 30 feet.

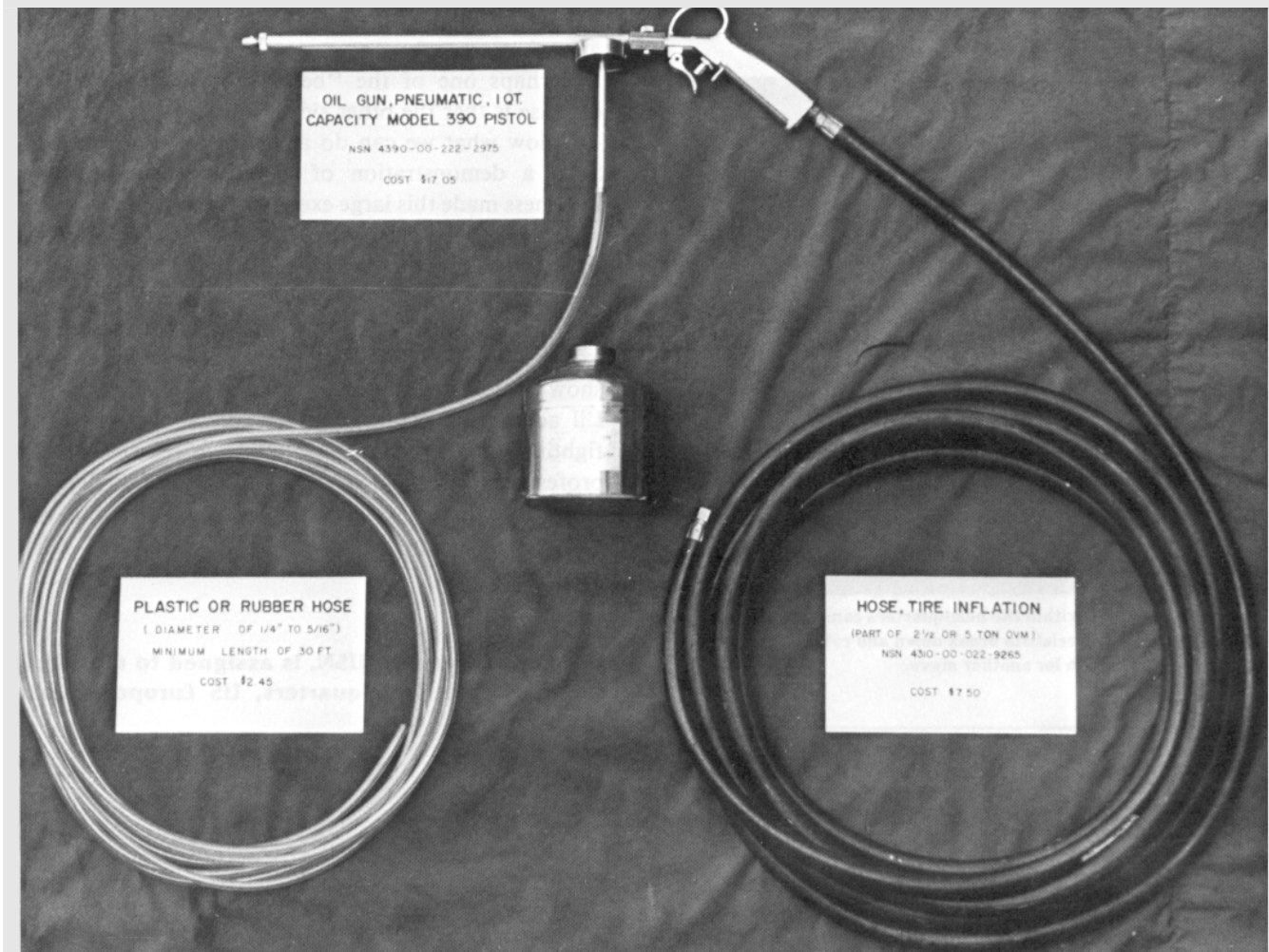
- Hose, tire inflation, 5/8-inch diameter (found in all 2½- and 5-ton basic issue items kits), NSN 4310-00-022-9625.

- The appropriate decontaminant, such as 5-gallon containers of premixed DS2, NSN 6850-00-753-4870.

One end of the tubing is inserted into a 35-gallon drum or other suitable container of decontaminant, and the other end is connected to the siphon tube of the gun which is exposed by removal of the screw-on tank. The tire inflation hose runs from the truck air system to the handle of the gun which produces a spray, creating a scrubbing action with sufficient force to penetrate small openings.

The first unit to employ the decon apparatus was the 1st Battalion, 81st Field Artillery, during their NATO

Goldstein decontamination kit.



Survive!

Tactical Evaluation in September 1976. The contaminated victim was a Pershing battery suffering from a persistent nerve agent chemical attack. Eight devices were used to form a vehicle decon line, composed of a decontaminant spray station and a rinse station. Nearby, a personnel decon line ended in an improvised shower area.

The process was time-consuming, but results of the exercise proved encouraging. In one and a half hours, 13 vehicles and 90 personnel were decontaminated. With 32 decon devices forming four vehicle lines, the battalion can effectively decontaminate a Pershing battery of approximately 70 vehicles and 215 personnel in two hours, or mission-critical equipment and personnel in one hour.

The 56th FA Brigade SOP now tasks the battalion NBC officer and the chemical staff NCO to organize and equip personnel of headquarters and service batteries to construct the decon station in a position out of the downwind hazard fan and en route to the contaminated unit's next position. The contaminated unit's decon teams should be part of the advance party to reconnoiter the decon station position, determine the least contaminated route of march, and assist the battalion decon squad.

The device will be included in the next edition of TM 3-220 (Chemical, Biological, and Radiological (CBR) Decontamination) and is being considered for adoption throughout NATO.

For those units in the rear combat zone, this device provides an additional margin of safety to guarantee accomplishment of the mission. Experience has taught us that we cannot expect 100 percent decontamination of a Pershing battery in a period of time that would not disrupt accomplishment of its critical role in providing a nuclear deterrent for SACEUR and NATO. But, we have significantly enhanced our capabilities to decontaminate and our chances for survival in an NBC environment.

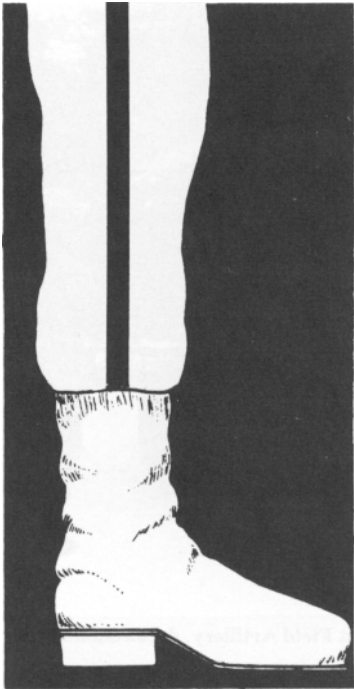
When the article was written, CPT Kenn Riordan was serving as the Assistant S3 and NBC Officer with the 56th Field Artillery Brigade. He is now attending the Infantry Officer's Advanced Course, Fort Benning, GA.



Personnel of 1st Battalion, 81st Field Artillery, decontaminating a vehicle.



The decon line ended in an improvised shower area.



DECISIVE BATTLES OF THE CIVIL WAR, by LTC Joseph B. Mitchell, Fawcett Publications, Inc., Greenwich, CT, 1955, 224 pages, paperback \$1.25.

In his foreword Colonel Mitchell states his two basic ideas in writing this book are to present a short history of the Civil War and to place its campaigns and battles in modern, up-to-date surroundings. The accomplishment of this first mission is doubtful, since the book lacks the depth expected of a history. That it chronicles the battles and campaigns is unquestioned, but there is no mention of the political, economic, and social mores of that trying time. This is a minor point, however, and in no way detracts from the excellent reading.

Using current road maps with their familiar United States route markers to portray the strategic and/or tactical deployment of the opposing forces makes for refreshing and interesting study of these many engagements. No doubt the author achieved his second objective.

A short synopsis of each encounter, giving the number of troops involved and the losses suffered by each side, provides ready reference material. These concise, accurate comments of some very important segments of our nation's maturation are easily comprehended. Salient details are provided without lavish embellishment and

Redleg Review

without being boring or tedious.

Colonel Mitchell relates many anecdotes in a pithy and forthright manner without a great deal of extra verbiage, a trait enjoyed by few authors. He remains within the bounds set by his title and his foreword.

Rightly, he devotes more space to Gettysburg than to most of the other episodes. This battle, tactically indecisive but strategically conclusive, is generally recognized as one of the turning points of this great internecine struggle. In depicting this imposing, violent event in that utterly destructive war, the author does it completely in a short, succinct but comprehensive study of the pertinent details.

This book would be a welcome addition to the repertory of the student of military history. Included is an excellent bibliography for those readers interested in further investigation of this exciting era.

One flaw, for which only these inflationary times can be blamed, is the absence of color on the fine maps accompanying the text. They are still splendidly done, nonetheless.

COL Howard F. Brown resides in East Greenwich, RI.

F-4 PHANTOM, by Bill Gunston, Charles Scribner's Sons, New York, 112 pages, \$8.95.

F-4 Phantom is one of the greatest success stories of modern times. Conceived in 1953 and first flown in 1958, the F-4 was met with remarks such as "ugly, grotesque, sheer brute force, no finesse," but within four years it had set more world records for speed and performance than any aircraft in the history of aviation.

The F-4 is not only fast and maneuverable, but comes equipped with a powerful radar and has the ability to carry an ordnance load of 18,000 pounds. Small wonder that it took on specialized aircraft and for years beat

them at their own game! In so doing, the F-4 became the standard against which all fighter aircraft are judged, and only in recent years has it been bested in specialized roles. More than 5,000 Phantoms have been built, and they served in the armed forces of a dozen countries.

It is still the mainstay of the USAF's Tactical Air Command and is easily the most important fighter in the free world. Mr. Gunston's book, *F-4 Phantom*, tells the story of the F-4 from initial design to the present.

It is well written and informative and should be a welcome addition to the library of anyone interested in the weapons of modern war.

COL Warren E. Norman is the Senior US Air Force Representative at Fort Sill.

MILITARY VEHICLES OF THE WORLD, by Christopher F. Foss, Charles Scribner's Sons, New York, 1976, 192 pages, \$7.95.

Cargo type vehicles, in service with armies throughout the world, are covered in considerable detail in this latest of several books by the author on military materiel.

Both tracked and wheeled vehicles are included in the book, and the reader will find the majority of vehicles in frontline use listed. Other vehicles used for general Army work such as buses, fire engines, and highly specialized engineer equipment are not included.

Full technical details on each vehicle are supplied wherever possible. This includes length, width, wheelbase, track, weights (loaded and empty), load area, engine details, crew, speed, range, fuel, gradient, turning radius, fording capability, and tire size. Metric measurements are used for all data. The trend in many nations toward military purchase of civilian type vehicles and components as an economy move is noted by the author.

This volume added to Mr. Foss' other works on armored fighting vehicles and artillery plus his forthcoming book on infantry weapons will enable the reader to obtain a comprehensive set of volumes on most current military equipment. — Asst. Ed.

MY ENEMY, MY BROTHER, by Joseph E. Persico, The Viking Press, New York, 1977, 246 pages, \$10.95.

Much more than just a military engagement when the Confederates met the Union forces at Gettysburg, this battle was fought in the heart and mind of each participant. Persico has captured the emotional pulse not only of those in uniform, but also of the townspeople and farmers of the previously quiet Pennsylvania countryside.

Letters, diaries, memoirs, feelings and attitudes have been reconstructed to relate the human struggles in battle. The glory and agony — the humor and horror — are presented in such a manner that the reader can almost feel a part of the combat. And yet, the facts concerning the meeting of two large armies which changed the tempo of the war have not been altered. Facts are skillfully entwined into a remarkably realistic human interest story.

This is an excellent book which tells of the individual: His hope and despair, waiting for death, and thanksgiving for being able to witness the dawning of another day. The hell of battle is shown in the mental anguish of those that clashed with the enemy and clashed with themselves during the early days of July 1863.

SFC Robert R. Cordell is the Admin NCO for the Army ROTC unit, Northwestern Oklahoma State University, Alva, OK.

SMALL ARMS OF THE WORLD, Eleventh Edition, by Edward Clinton Ezell, Stackpole Books, Harrisburg, PA, 1977, 671 pages, \$20.00.

Ezell's *Small Arms of the World*, - Eleventh Edition, is a complete revision of W. H. B. Smith's firearms classic copyrighted in 1943. The book contains descriptions and illustrations of military and sporting arms from 42 countries including NATO rifles and NATO and Soviet machineguns. Also included are new trends in rifle development and major new developments in machineguns and pistols, silenced weapons, sniper

rifles, and firing port weapons.

Accompanying the descriptions and backgrounds of the weapons are, in most cases, photographs and, in some cases, cutaway schematics.

The book is divided into two parts. Part I describes small arms developments since 1945, and Part II is a basic manual of current weapons. A complete index at the back of the book lists the weapons individually and by country.

Though not all the photographs are of the highest quality, one can visualize what the weapons look like. The descriptions are written in simple, concise language.

Small Arms of the World is a thorough reference book for the small firearms enthusiast and for military personnel who are interested in, or have a need-to-know about, foreign weapons. — Managing Editor.

POW: A DEFINITIVE HISTORY OF THE AMERICAN PRISONER-OF-WAR EXPERIENCE IN VIETNAM, 1964-1973, by John G. Hubbell, Reader's Digest Press, 1976, 633 pages, \$15.00.

On 5 August 1964, Navy LTJG Everett Alvarez ejected from his battle-damaged A-4 and was captured by the North Vietnamese, becoming their first American prisoner-of-war. Over the next nine years hundreds of other Americans joined Alvarez as POWs. Until now their story largely has gone untold.

The recent publication of John G. Hubbell's *POW: A Definitive History of the American Prisoner-Of-War Experience In Vietnam, 1964-1973* finally and comprehensively tells that story, to include the base indignities, the solitary confinement, the starvation, the continual torture, and the brutal beatings suffered during captivity.

Denied the protection of the Geneva Convention or even inspections by the International Red Cross, the POWs were at the mercy of their Communist captors — and their captors often proved to be unmerciful. Hubbell's book documents carefully executed torture, from mere beatings to dislocating shoulders with ropes, which causes excruciating pain without incriminating scars.

Many POWs broke under torture and confirmed what was demonstrated during the infamous Spanish Inquisition: Given enough pain, a human being can be coerced into admitting or fabricating nearly anything.

Part of the occasional humor in *POW*

is provided by propaganda statements given after reaching the limits of physical resistance. SSG Dennis Thompson, a captured Green Beret, when forced to write a propaganda statement on his compassionate treatment, wrote:

... It has been brought to my attention, after my captivity, that the Vietnamese people have been revolting throughout their 4,000-year history. The Vietnamese people have proven themselves to be the most revolting people I have ever met in my life. I hope that soon the Vietnamese Communists and all those who have taken care of me and my friends as prisoners will get what they deserve. . . .

The Communists accepted it.

Seldom did interrogators demand military information. They wanted propaganda statements they could use to shape world opinion through the international press.

Hubbell does not pass lightly over those captives who willingly helped their captors, but neither does he indict them. He correctly points out — much to the surprise of many returning POWs — that the Code of Conduct doesn't carry the weight of the law; violations are not subject to prosecution. A recent Department of Defense level review of the Code did not recommend any changes.

American soldiers and airmen could learn much from this book, especially covert methods of prison communications and techniques for evading interrogators' demands. It will definitely counter the "Hogan's Heroes" myth of life in a POW camp.

Based on nearly 200 detailed interviews with former POWs, Hubbell has written a readable, chronological history of the POWs heroic resistance and their undying faith in America.

This book is dedicated to the Americans who died in captivity, several of whom are mentioned in the text. The publisher, Reader's Digest Press, has announced that all proceeds from the book will go to the POWs and their families.

ILT John L. Plaster supervises public affairs for the Minnesota Army National Guard.