Field Artillery Journal

May - June 1979

Field Artillery Journal

the journal of fire support

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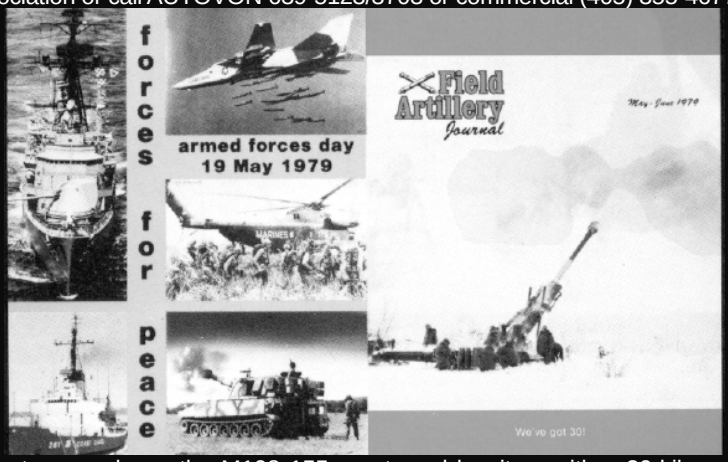

Front cover shows the M198 155-mm towed howitzer with a 30-kilometer range during cold weather testing. The back cover montage is a salute to the armed forces on their day which is celebrated on 19 May this year.

This is the last issue for LTC William A. Cauthen as Editor. The new Editor is MAJ John Dobbs who recently returned from Korea.

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On The Move. . .

by MG Jack N. Merritt

In the March-April issue of the *Journal* I discussed Division '86, the TRADOC-wide initiative to develop structures and organizations as a basis for analyzing our requirements for the Army of the future. Division '86 is being structured on a functional basis along conceptual lines laid out in the TRADOC Battlefield Development Plan. Most of the 10 functional missions contained within this plan are "traditional" missions that have been accomplished in one form or another since the Army has had divisional structures.

The battlefield interdiction mission, however, is a distinctly new mission for the Army. While we have always sought to disrupt the rear echelon where possible, battlefield interdiction is the carefully developed, deliberate attack of those enemy forces not yet involved in battle for the explicit purpose of influencing the outcome of the central battle.

Previous concepts for dealing with threat forces in the central battle, when viewed objectively in light of threat numerical and qualitative improvements, are being challenged by recent analyses. Threat forces facing NATO are organized, trained, and equipped for offensive operations. Should war occur in Europe, this enemy would attack to develop multiple axes of advance, each having objectives tightly coordinated in time and space. Along each axis, the threat will attempt to field a force four to five times superior in personnel and 10 to 15 times superior in materiel with massive armor assaults to lead the attack. Each attacking formation at battalion level and above is organized in echelon. These echeloned battalions, regiments, divisions, armies and fronts, carefully orchestrated in stylized commitment to battle, allow him to generate and sustain greater firepower and force ratios over the defense.

In a side-by-side comparison of current capabilities, our greatest current tactical war-fighting strengths lie in our superior antitank capability. Nevertheless, threat echelonment provides the numbers, if he is willing to accept the losses, to "pile on" and eventually win. Battlefield interdiction is aimed directly at countering this

potent doctrinal *capability* to commit fresh combat power into the central battle. Our goal in battlefield interdiction is to prevent the second echelons from being first echelon problems by disrupting and/or destroying the combat momentum of echeloned forces.

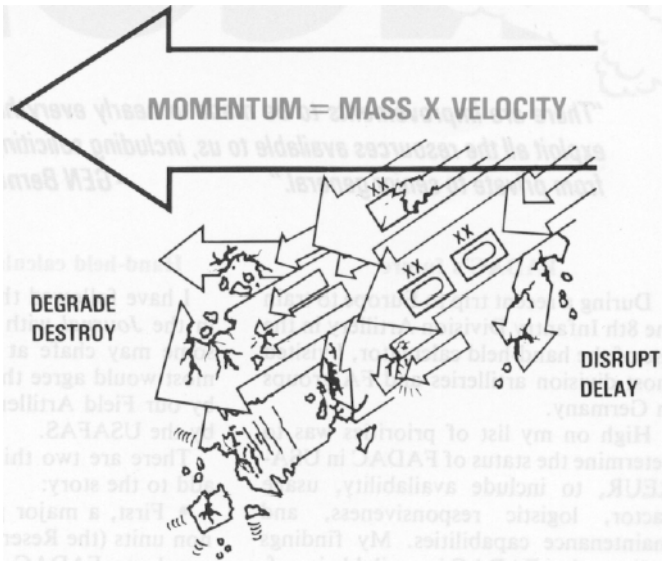
The pay-off from attacking the second echelons prior to commitment in the central battle comes from the fact that the threat is a highly structured force and relies on a closely orchestrated commitment to the battle. If we can upset this coordinated commitment of second echelon forces, we can degrade the threat's combat momentum. Two opportunities are available here; we can do this by attacking either his mass — that is, by destroying a portion of these forces — or by slowing his forward velocity.

Delay or reduction in speed of these forces may be adequate to alter the threat's arrival rate into close combat to levels acceptable to our combined arms team target servicing capability. On the other hand, a qualitative or quantitative reduction (or both) in his forces may be achieved. This would cause him to fight with smaller or less capable forces. Clearly then, battlefield interdiction is much more than the deep fires we called harassing and interdiction (H&I) fires which were intended to disturb the enemy and perhaps raise the risk of his use of selected terrain. The H&I technique lacked the rigorous analysis of targets and application of all the firepower assets contemplated in battlefield interdiction. Battlefield interdiction fires must have a clear purpose, be deliberately planned, and have a calculated pay-off.

Not so clear to us at this time is which portion of the threat's second echelon forces we should focus our interdiction efforts against. Certainly there are elements which can and should be destroyed. In a motorized rifle division, 68 percent of threat materiel are soft (e.g., trucks, commo vans, radars), 22 percent are light armored (e.g., SP artillery, BMPs), and only 10 percent are heavily armored. Thus the targets most vulnerable to attack by artillery munitions are those which either sustain the force with combat consumables, acquire targets, support the central battle, or orchestrate the deployment and commitment of the second echelon.

At this point in our analysis it seems that the highest and most easily accomplished pay-off from battlefield interdiction may come from the destruction, disruption, or delay of the "softer" 90 percent of the second echelon

• DEGRADE THREAT COMBAT MOMENTUM



— the light materiel or lightly armored targets — rather than the harder, albeit more potent, element of his force. This approach carries the plus that it minimizes his maximum advantage in fire support and combat service support. At the same time, the attack of the "softer 90" maximizes a strong advantage of ours — our very potent antitank capability. This way we strip away his tremendous advantage in indirect fires and support sinews and let his tanks arrive by themselves to meet our target servicing systems.

All alternatives will be rigorously examined as we develop our Division '86 structures. Whatever is done in interdiction, the measure of effectiveness must be related to the central battle.

Battlefield interdiction has broad implications for our organization, structure, and weapons in corps and division artillery. The implications in the development of new materiel — longer range weapons, improved target acquisition, and terminally guided munitions — are also clearly evident. I am convinced that the realization of the requirement to deal with the second echelons will have a major impact on our ability to win not only the first battle, but also the succeeding battles of the next war. The Field Artillery has a major role in winning those battles.

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

FADAC's future

During a recent trip to Europe to train the 8th Infantry Division Artillery in the use of the hand-held calculator, I visited most division artilleries and FA groups in Germany.

High on my list of priorities was to determine the status of FADAC in USAREUR, to include availability, usage factor, logistic responsiveness, and maintenance capabilities. My findings indicate that FADAC is available in sufficient quantities and is being used extensively. Multiple technical fire direction tasks must be accomplished simultaneously; the fact that FADAC is currently the best means to perform these multi-faceted operations is recognized and appreciated by the Field Artilleryman. The units are experiencing maintenance problems; however, in most cases these problems are no greater than those experienced with other items of equipment. Efforts are being made to insure that FADAC repairmen are identified and are being properly utilized.

In general, the supportability of FADAC is receiving renewed interest. It is recognized that the hand-held calculator (which is currently being evaluated as a supplement/backup for FADAC) has limitations which preclude it from having the capabilities of FADAC or the Battery Computer System (BCS). Therefore, it is evident that continued command emphasis, coupled with assistance from DA-level agencies, is necessary to keep FADAC operational until BCS is fielded.

The Field Artillery School is deeply involved in this problem and is concerned that we keep the FADAC system "alive and well" throughout the Field Artillery Community.

James W. Wurman
COL, FA
Director, Gunnery Department
Fort Sill, OK

Hand-held calculators for the RC

I have followed the saga of the HHC in the *Journal* with fascination. While some may chafe at the time involved, most would agree that a need identified by our Field Artillery units will be met by the USAFAS.

There are two things I would like to add to the story:

- First, a major portion of our cannon units (the Reserve Components) do not have FADAC. The likelihood of their receiving BCS is also remote. Consequently, the HHC, in whatever form, represents their *only* means of acquiring an electronic computational device. The FDO who must still rely solely on charts and sticks sees the HHC as representing much more than a back-up system — it represents a quantum increase in his section's capabilities.
- Second, I have not seen any mention of programs for the M114 155-mm howitzer. Believe it or not, the "pig" is still around in large quantities in the Reserve Components, Active Army, and Marine units. The HHC represents a major advance for the units without FADAC, and it would be a mistake not to make the HHC useful to so many for lack of a program.

Thomas R. White
MAJ, FA
Advisor, 103d Group
Providence, RI

The School has recommended that enough BCSs be bought to equip the Army Reserve and National Guard units, but funding has not been approved. In response to your second point, there is an HHC program for the M114 howitzer available from the Gunnery Department — Ed.

A negative response

Your reply to Captain Lutz (November-December 1978 *FA Journal*) on his suggestion concerning FA unit history does not answer the mail. Your reply carries a negative tone which implies the old supply sergeant syndrome, "we ain't got your size."

In the September 1964 edition of the *Army Information Digest,* there is an article "Distinctive Insignia of Active Army Artillery Regiments." The prints of the regimental crests were printed in full color. I think that the *FA Journal* could prepare an article in a similar layout and update all of the Redleg Community on our lineage.

Charles R. Weaver
LTC, FA
1st Bn, 94th FA
APO New York

We truly regret your perception that we gave a blasé response as we try to give honest, considered responses to every letter.

Captain Lutz is not alone in his suggestion and we've looked very hard at the question. There are approximately 250 Active and Reserve battalions. Lutz suggested running the battalion crest, lineage, and honors, plus miscellaneous data. A conservative estimate would be a half-page per battalion, or 125 Journal pages.

If you're suggesting simply the crest and motto as carried by the ***Army Information Digest,*** *that would be only about 12 pages. Other than a decorative page (would have to be done in black and white as we are not authorized to use four-color process), it is doubtful very many readers would be interested in more than two of the 250 units — their current unit and their favorite past unit.*

If we have missed your point or if you have a specific suggestion on how to handle this subject, we'd be happy to hear from you. — Ed.

13B is more than 105s

I have to comment on the November-December 1978 issue of the *FA Journal*. In the article about women in the Field Artillery and the tests conducted at Aberdeen Proving Grounds, the women were tested on the M101A1 and M102 and performed as well as the men, but only on these two weapons. Also, the women had to go through special conditioning for 10 weeks before starting the tests, and they didn't have to lift more than half their body weight. They also had a full crew, which in my three years as an Artilleryman, I have yet to see. Had they been tested on other weapons, such as the 155-mm, 175-mm, or 8-inch, the results would have been quite different.

I have worked on 155-mm and 175-mm weapons and I know from experience how hard the job is. If you can't lift more than half your body weight, you can't get anything accomplished. The 175-mm projectiles weigh 147 pounds and the 8-inch, 200 pounds, compared with the measly 33 pounds of the 105-mm round.

I would like to see the woman who could hump 15 of these rounds 10 meters from a 5-ton to an M548. If they worked on the M114A1, they couldn't function at all, because everything is manual. I would gladly work beside any woman who could keep pace with the 13B men, but you've got to find her first. Until the women can perform on *all* cannon artillery, keep them out so Uncle Sam can save some money and save the male 13Bs a lot of headaches.

Charles O. Geary
SP4
APO New York

*If you check the pictures on pages 12, 13, and 33 and on the back cover of that issue, you will note that the women **are** servicing the M114 155-mm weapon. Also, the story reports a three-week conditioning course which could conceivably be part of the 12-week basic entry training that all 13Bs undergo.*

*It should be mentioned again that the item in the **Journal** was about a totally unofficial and unsanctioned test.*

MOS 13B will probably not be opened to women due to the frontline proximity of cannon units; but, if it should, some special MOS identifier would be needed to limit assignment of women to lighter calibers. — Ed.

TACFIRE maintenance warrants

The chief computer from my FDC section has expressed an interest in the TACFIRE maintenance warrant officer position. If you have any information concerning how those slots will be filled, the schooling available and required, and procedures for application, I would appreciate it.

Kenneth C. Morris
CPT, FA
APO New York

Authority to procure warrant officer spaces to support TACFIRE has not been granted by Department of the Army. Until such authority is granted, no TACFIRE maintenance warrant officer position will be filled even though the position will appear in division artillery and FA brigade TOEs. The exception to this would be if an MTOE change authorized the positions to be filled from present MTOE assets.

When the positions are approved for fill, the MOS will be 287A0 (Data Processing Systems Technician), with an Additional Skill Identifier 3S (TACFIRE).

DA Circular 601-81 contains the necessary information for applying for warrant officer status, to include the time a particular MOS is open for applications.

To meet the requirements for 287A03S, a considerable background in electronics is required. — Ed.

Welcome mat is out

I am pleased that MG Jack Merritt spent a rewarding several weeks in France, Germany, and Great Britain sharing the tools of our profession with our allies ("On The Move," January-February 1979 *FA Journal*). I realize his time was limited and he couldn't visit all the places where US Field Artillerymen are stationed. If he had, he wouldn't have made the statement "In my visits to the V and VII Corps and the 56th Brigade, I saw dedicated artillerymen of all ranks and units at Pershing QRA sites where our missileers have the only operational mission in the Army . . . ." Although I know General Merritt did not intend to slight anyone, he did inadvertently overlook the Redlegs in the 59th Ordnance Brigade.

There are more than 1,500 artillerymen in the 59th Ordnance Brigade performing operational missions including two Pershing QRA units having missions similar to those of the 56th Brigade. If he had visited one of our units, I am sure that our "Chief of Artillery" would readily acknowledge the artillerymen in FA and ADA detachments, as well as the infantry, military police, and ordnance personnel in our ordnance companies who also perform an operational mission. The folks in the Southern European Task Force (SETAF) would also need the same recognition.

In addition to our operational mission, some other little known facts about the 59th Ordnance Brigade are:

- There are 25 FA company grade commands and 7 FA field grade commands.
- Almost all the German language positions in the FA are in the 59th Ordnance Brigade.
- The Brigade has more than 150 soldiers in MOS 15F (Honest John Crewman) still serving in their MOS.
- A 36-man detachment in our Brigade has more contact with its "Project Partnership" NATO unit in one day than a "pure US" V or VII Corps battalion has in a month. That's interoperability!

The artillerymen in the 59th Ordnance Brigade and SETAF need the recognition of the Field Artillery Community. I hope that General Merritt or other high-ranking Field Artillerymen can visit the 59th Ordnance Brigade in the future and shine a needed spotlight on our unique organization by writing about it in the *Journal.*

Kris C. Reinecke
MAJ, FA
557th Artillery Group
APO New York

Criticism "3200 out"

Congratulations on your November-December 1978 issue devoted to a discussion of feminization of the Field Artillery. When senior Defense Department officials equate differences in sex with differences in race to gauge combat ability, it is high time this whole question be given front page discussion. The *Journal's* opening of this discussion performs a most important service.

The ill-advised criticism of the *Journal* in the January-February 1979 issue is unjustified. The writers [of these letters to the Editor] should direct their spleen [wrath] to the Defense Department — the authors of this unsound project.

R. P. Shugg
BG (Ret)
Oakland, CA

Incoming

Thanks for SIANM assistance

I continue to be an avid reader of the *FA Journal.* The following letter is overdue, but I hope you can use it while the subject is still fresh in everyone's mind. "Dear Redlegs:

"Having recently completed the Special Inspection of Army Nuclear Matters (SIANM), I wish to use the *FA Journal* as a means to express my personal appreciation to Field Artillerymen everywhere for their cooperation and total support of this effort.

"I consider myself particularly fortunate to have been the Director of SIANM. First, I was provided a team of officers, civilians, and an NCO from agencies throughout the Army who proved to be an exceptionally talented, cohesive, and absolutely professional group. Secondly, we had the opportunity to visit a sizable cross section of the Army that included direct contact with more than 2,600 junior soldiers, NCOs, and officers who impressed us with their "can do" attitude and dedication. Everyone was enthusiastic about SIANM and provided an invaluable insight into every aspect of the Army's nuclear programs. Likewise, the letters we received from the many units and commands that we were unable to visit were equally important to the total effort. Additionally, this seven months was a tremendous learning experience and gave all of us a much better appreciation for how hard the entire Army is working to accomplish its many missions with minimal resources.

"The final report, a compilation of your candid comments and recommendations, was briefed to General Rogers on 29 December 1978. While the report contained 255 recommendations, he was asked to approve only two. General Rogers approved the establishment of a separate Directorate for Nuclear-Chemical Matters in DCSOPS and for DCSOPS to assume responsibility for all appropriate actions related to implementing the recommendations contained in the report. While there are many on-going actions related to the SIANM report, the impact of most may not be felt by units in the field for some time. Some changes have already taken place, while others are much longer range. I am confident, however, that they will come.

"During the inspection, the unanimous voice from the field was that this inspection was long overdue and that it was time we began to have more realistic training. While this attitude prevailed from PFC to General, there also seemed to be a reluctance to change. Granted, the inspection took place during the period that the new ARTEP and technical validation inspection were being introduced and the "new system" was still an unknown. Nevertheless, it was a concern to the team that action was finally being taken to help change an unrealistic situation and "the field" was afraid to change.

"Based on my SIANM experience, if I can get one message across to the Field Artillery Community, it is to say that the time for change is now. We felt a tremendous ground swell in support of the objectives of this inspection and I only hope each of you continues to press for the revolutionary changes needed to get these programs back on track. Having spoken to more than 70 general officers I can assure you that your senior leaders support such changes. I can also assure you that, in this period of transition, the Field Artillerymen who approach their nuclear tasks realistically and with an innovative spirit will have the support of their senior leaders. Commanders who are afraid to make this transition and continue to be afraid of the inspection are not the kind of leaders that we need to be training our soldiers for combat.

"As the DCSOPS Nuclear-Chemical Director, BG Vince Falter, and The Inspector General, LTG Richard Trefry, continue to strive for improved nuclear programs they will need your total support. Don't let them down.

"In closing I wish to publicly thank General Trefry for his foresight in recognizing the need to conduct the SIANM, for his guidance and counsel, and for the confidence that he placed in a team that thoroughly enjoyed the experience. I hope you recognize what a great friend he is to all of us. Believe me, he is there to help."

Keep up the good work — the *Journal* is a great magazine.

William H. Schneider
BG, USA
Hq, DARCOM
Alexandria, VA

Past prejudice

Congratulations on your publication of "Dilger — Artilleryman of Note" in the March-April 1979 *Journal.* In my opinion, he was the greatest of the Civil War era gunners. Although many of the Confederate units, such as the Stuart Horse and the Washington and Rockbridge Artilleries, are much better publicized, Dilger's Battery I, 1st Ohio, was consistently outstanding due mainly to Dilger's leadership and dedication.

As a footnote to the article, it might be pointed out that not only was Jackson's maneuver at Chancellorsville considered impossible by his corps commander, but it was evidently resented that a person of foreign birth pointed out Jackson's impending attack. Today this may seem strange, but at that time foreign-born soldiers fought and lived under a blanket of prejudice. Your readers may be interested in a fictionalized, but highly accurate, account of the foreign-born soldier in the Union Army in Bruce Lancaster's "Scarlet Patch."

Again, a most enjoyable article in a most professional journal.

Charles W. Treese
MAJ, FA
2d Bn, 110th FA (MDARNG)
Chantilly, VA

24th has 105-mm

On page 17 of the March-April *Journal* you mentioned that the 24th Div Arty was converting its 155-mm towed battalions to SP. The 24th has two *105*-mm battalions (not two 155-mm battalions) for direct support plus a composite battalion (155-mm/8-inch).

Brent Gaffney
2LT, FA
Fort Sill, OK

Follow-up on survey

As a Field Artillery officer 1 always read your *Journal* with much interest. In the January-February 1979 issue, on page 18, I found a few words on the PADS and the laser rangefinder in a survey.

The Belgian artillery is also looking forward to giving our surveyors new equipment. For this reason we are interested in your experience and would appreciate answers to the following questions.

- Have you decided to field the PADS and the AN/GVS-5 in the artillery battalions?
- How many of each do you plan to field for each battalion and in what type organization?
- Do you intend to give up the old survey methods and equipment when this new equipment is fielded?
- Do you intend to use a navigation system for the forward observer as most European armies intend to do, or do you think that the target area survey could

be done only with laser rangefinders (resection to locate the FO followed by intersections to locate the objectives)?

• What is the accuracy of the PADS (location and bearing) and of the GVS-5 (distance and bearing)?

I thank you very much in advance and congratulate you for the high quality of your publication.

J. Berhin
LTC, Belgian Army
Brussels, BE

Thank you for your letter. The following data should answer your questions as well as provide this information to other readers.

— Each 105-mm, 8-inch, and 175-mm ***battalion,*** *each separate cannon* ***battery,*** *and each missile* ***battery*** *will receive one PADS and keep one 5-man conventional survey party. Our target acquisition batteries (TAB) will have one PADS and two 8-man DME (distance measuring equipment) parties. Division artillery headquarters and headquarters battery will get two PADS and one 8-man DME party. When the General Support Rocket System is fielded, there will be one PADS per battalion.*

— The GVS-5 will be issued as follows: TAB—8; tank company fire support team (FIST)—1; every other type FIST—3; and cannon battalion—1.

— The PADS will have a two-man crew for each system. One PADS is sufficient to perform the position area survey in a responsive manner.

— As shown by the above issue plan, the conventional survey party will be used in areas not accessible to PADS, such as the target area base and sound bases. The five-man party will have a GVS-5, one azimuth gyro (SIAGL), one .2-mil theodolite, one DM-60 distance measuring device, two hand-held calculators, and other standard equipment. The eight-man party will have one SIAGL, three .002-mil theodolites, three distance measuring devices, two handheld calculators, and miscellaneous equipment.

— We hope to equip our FOs with either the Position Locating Reporting System or the Global Positioning System.

— The specified accuracy of the PADS within a 55-kilometer radius (except within 15° latitude of the poles) calls for:

• Horizontal position error less than 20 meters CEP and maximum radial error of 70 meters.

• Vertical position error less than 10 meters PE with maximum vertical error of 35 meters.

• Azimuth error not to exceed 1 mil RMS and maximum error not to exceed 3 mils.

— The GVS-5 accuracy at maximum range (10,000 meters) is ± 10 meters. Since the GVS-5 is hand held, there is no bearing or azimuth error involved.

Thank you for your letter and your interest in the ***Journal.*** *— Ed.*

Another view of LWSS

Our M109A1 units worldwide have experienced problems with the Army's Light Weight Screening System (LWSS), and each unit has its own technique for using the system. The method we used in the 1st Battalion, 2d Field Artillery (Germany), offers significant advantages.

In developing this method the following factors were considered of greatest importance.

• Concealment of the M109A1 and M548 ammo carrier.

• Crew size and 24-hour operation.

• Hasty and deliberate displacements.

• Collimator and panoramic telescope line of sight.

• Muzzle blast.

Our net configuration is made up of three hexagon and four diamond panels, assembled and packaged on either vehicle of the section. There is one additional hexagon carried on the front of the M109A1. The assembled pattern is shown in the accompanying diagram.

The additional hexagon is draped over the forward portion of the net between diamonds 1 and 2. Pieces of netting are attached to the tube and forward portion of turret, and then the job is complete.

Emplacement time is less than two minutes, and march order time is less than 90 seconds. With the net normally carried on the M548, emplacement is accomplished by unrolling the net from point A to both sides of the M548, and then rolling it over the M548 cab and over the howitzer. The sides are staked and four "butterflies" (placed as shown in the diagram) are used to raise the net. To march order, reverse the procedure.

The configuraion offers the following advantages over most other methods.

• The tube may be elevated to high angle or traversed 400 mils left or right of center without using personnel to move the net.

• The collimator may be positioned so there is always line of sight with the panoramic telescope.

• Muzzle blast has little effect on the LWSS, thus prolonging net life.

• Hasty displacements become a reality because vehicles can move from under the net after removing the front hexagon.

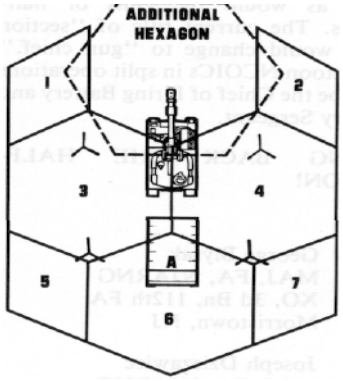
• Employment of .50 caliber machineguns mounted on the vehicles is possible.

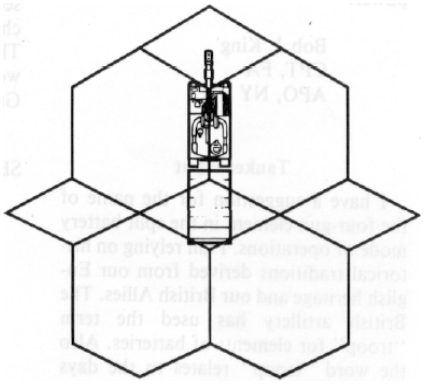
• 6400-mil missions may be fired by pulling on one halyard (between sections 3 and 4).

• The net may be packaged and carried on either the M109A1 or the M548 (preferred). Most of the net assembling (to include the scraps on the tube and turret) can be done in garrison.

One final note for European units — when you go to the field, paint those muzzle brakes OD and they will blend in much better.

Gordon K. Moore
CPT, FA
Fort Sill, OK





At left is the pattern recommended by Captain Moore. At right is the pattern suggested by the Field Artillery School, described in the January-February 1976 *FA Journal.*

More on the four-gun element

Letters continue to come in suggesting names for the two four-gun elements of the firing battery organization tested under the Division Restructure Study. While the School has selected "platoon" as the official name, heavy interest in the subject warrants sharing these ideas from our readers. — Ed.

"Fury of steel'

In the January-February 1979 *Field Artillery Journal,* the DRS article by Captain Knight was quite interesting and stimulating. I agree that eight-gun batteries are the coming organization of Field Artillery.

The purpse of this letter is to offer a name for the new four-gun element. First Sergeant William R. Channels, HHB, 5th Battalion, 112th Field Artillery, came up with a name that seems to fit — "Quadrelle." It is a French word that is defined as "a mace with four flanges (points or studs) that strike with the fury of steel four times over."

Alfred C. Channels Jr.
CPT, FA, NJARNG
5th Bn, 112th FA
Atlantic City, NJ

Cells . . . batteries

My suggestion is to call each four-gun element a "cell." Car batteries and flashlight batteries are composed of cells. These cells can function individually or collectively. The more cells, the more power.

In Field Artillery units, each four-gun "cell" can function independently or collectively and (as in flashlights) each cell adds more power. In our case, *fire* power.

Bob J. King
CPT, FA
APO, NY

Tanker input

I have a suggestion for the name of the four-gun element in the split battery mode of operations. I am relying on historical traditions derived from our English heritage and our British Allies. The British artillery has used the term "troop" for elements of batteries. Also the word "troop" relates to the days when the US artillery was horse-drawn and to the days of World Wars I and II when a battery consisted of four guns.

Finally, troop would fit in well as the sequence of terms go: section, troop, battery, and battalion.

In closing, I would like to say how much I enjoy your magazine. Though I am not an artilleryman, your magazine enables me to understand and keep abreast of new developments in your arm. After all, the better I understand your arm and how it functions, the better I can use your invaluable support when I face the Threat.

Jack C. Thomas
SSG, AR
6th Bn, 68th Armor (USAR)
Hershey, PA

Bring back the half-section

With reference to a new name for the four-gun element of the eight-gun battery, we feel the new name is not needed for the four guns, but for the individual gun.

Tradition dictates that, in any company-sized unit, the next lower designation be "platoon." Thus, the four-gun element should be a *platoon.*

Artillery tradition dictates that the next lower designation under a platoon is a "section." Thus, the two-gun grouping should be called a *section.*

The need for a name for the one-gun element can be filled with "gun," or our choice — "The artillery half-section!" The half-section has been missing from the Field Artillery long enough. Our Redleg ancestors cry for its restoration. So do we.

The two platoons would be named "left" and "right" (no change in terminology). The sections would be numbered, as would the guns or half-sections. The current title of "section chief" would change to "gun chief." The platoon NCOICs in split operations would be the Chief of Firing Battery and Gunnery Sergeant.

BRING BACK THE HALF-SECTION!

George Blysak
MAJ, FA, NJARNG
XO, 3d Bn, 112th FA
Morristown, NJ

Joseph Dziezawiec
MAJ, FA, NJARNG
S3, 3d Bn, 112th
FA Morristown, NJ

2-41st FA—"Can do"

We congratulate MSG Woody Anderson and the 1st Inf Div Arty for their fine showing in reenlistment (January-February 1979 *FA Journal,* page 35), achieving 140 percent of the Div Arty's reenlistment objective during 1978.

We would like for all Redlegs to know that the 2d Battalion, 41st Field Artillery, 3d Inf Div Arty, under the command of LTC Howard C. Eggleston, with the expert help of the Battalion Reenlistment NCO SSG Joseph J. Burge, achieved 378 percent of the assigned reenlistment objective during FY 1978 (101 soldiers actually reenlisted). This was the highest reenlistment percentage for a battalion-size unit in VII Corps.

And this is not the only major achievement of the 2d Bn, 41st FA, during 1978. Just to name a few:

- Highest score in 3d Div Arty on MET (CMMI equivalent) inspection.
- Div Arty Best Mess.
- CINCUSAREUR Certificate of Achievement for outstanding performance on a Certifying Nuclear Surety Inspection.
- Outstanding performance by the Redeye section (all Redeye personnel achieved a 100 percent score on aircraft recognition and 16 hits out of 18 shots in MTS firing).
- The best survey section in Div Arty.

The 2d Bn, 41st FA, is "A CAN DO TEAM — MISSION ACCOMPLISHED."

Sigurd E. Reuter
CSM, 2d Bn, 41st FA
APO, New York

Reunions

Members of the 280th Field Artillery will meet July 7 and 8 in San Mateo, CA. Contact Jim Tipton, 339 Anza St., Fremont, CA 94538.

The 255th Field Artillery Battalion will have a reunion September 1 and 2 in Scranton, PA. Contact Marvin M. George, 44 N. Jackson Avenue, San Jose, CA 95116.

The 93d Armored Field Artillery Battalion will hold a reunion 29 June-1 July in Pittsburg, PA. Contact Harry C. McGarvey, 14721 Fenton Road, RR 3, Morrison, IL 61270.

We've got 30!

by MAJ William Whelihan

After 10 years of development and more than 100,000 rounds of testing, the M198, our new 155-mm towed howitzer, is in the field.

For the first time since World War II, the Army has an all new 155-mm towed howitzer.

The M198 becomes the Army's first operational weapon with a 30-kilometer range capability. The significance of a 30-kilometer range capability is that we will be able to reach the second echelon of Warsaw Pact formations if they attack in accordance with their doctrine.

In addition to the increased range, the M198 is specifically designed to use all stockpiled, new, and developmental projectiles and propelling charges.

The "Thunderbolts" of the 1st Battalion, 73d Field Artillery, 18th FA Brigade, at Fort Bragg, NC, is the first unit to receive the new howitzer. The M198 will be replacing the old M114 and M114A1 towed howitzers in general support Field Artillery battalions of the infantry and air assault divisions and in corps general support battalions. It is expected to replace 105-mm howitzers as the direct support weapon in the light infantry division. The bulk of the planned production of M198s will go to Reserve Component units after designated Active units have received their allocations. There are no plans to put the M198 in Europe. The Marine Corps is also using the M198 in its division.

The M198 is a *fielded* capability, and this article reports the significant aspects of final operational testing of the production model howitzers.

The M198 has been under development since 1968, and final operational testing (Follow-on Evaluation, or FOE) of the production howitzers was completed in February 1979. The FOE was primarily a reliability test that assessed hardware improvements necessitated by earlier operational testing. Production validation testing continues through May at Aberdeen Proving Ground, MD, and Rock Island Arsenal, IL. This testing will provide a final validation of the tube wear and an erosion profile of the M199 cannon tube, as well as an evaluation of a chrome-plated tube and a road test of a new travel lock design. The chrome-plate modification is an attempt to improve on the current rated life of the tube — 1,750 equivalent full charge rounds.

Crews in M198 units can be identified readily by the unique helmet each of them will be wearing for hearing protection. The special safety device is the commercially produced DH-178 helmet, developed to meet the need for efficient hearing protection for artillery crewmen above the protection provided by inner ear plugs. The top zone propelling charges generate high pressure levels of impulse noise that are potentially hazardous to internal organs as well as ears if safety precautions are not observed. The DH-178 helmet includes internal electronics that permit normal conversation while cutting out the high energy noises coming from the cannon fire. An auditory localization feature also permits the wearer to determine from what direction the noise is coming.

The M198 has a thermal warning device on the breech that indicates whether the tube is in a "cool," "warm," or "hot" status. The direct readings from this device will govern rates of fire and determine which misfire procedures will be used.

New fire control equipment features tritium-illuminated level vials and easy-to-read digital micrometer knobs. Quadrant elevation can be set from either side of the weapon. The M137 panoramic telescope, mounted on precisely installed adapters, is aligned with

the M139 alignment device, insuring bore sighting of the pantel and eliminating the need for the familiar bore sighting test target. All fire control items have luminous level vials, reticles, and digital counters.

In the firing mode, the wheels of the M198 are lifted hydraulically about seven inches above the ground, bringing the carriage to rest on its firing base (a circular aluminum structure suspended under the lower carriage). Pressure to the hydraulic system is provided by manually operated pumps in front of the lower carriage. Once the weapon is laid for direction, it has a 400-mil left and right traverse capability.

A hydraulically operated speed shift permits rapid 6,400-mil traverse as the weapon is pivoted by the crew after the shift plate has been lowered into position.

A hydropneumatic variable length recoil system allows a maximum recoil length of 70 inches when the weapon is firing the M203 zone 8 propelling charge. The system is nitrogen charged and has a 54-pint oil capacity — 783 cubic inches of oil is displaced into the recuperator cylinder when the system reaches its maximum recoil length.

Aluminum box trails provide a means to carry a fire control equipment case, rammer staff and bell head, cased aiming posts, removable spades, and the firing base.

The breech is a screw block, interrupted thread assembly that includes the standard M35 firing mechanism and standard obturator pad and rings. A special obturator pad was introduced during testing to alleviate a sticking breech problem. It is anticipated that the standard pad that is used with the M109 will also be used with the M198.

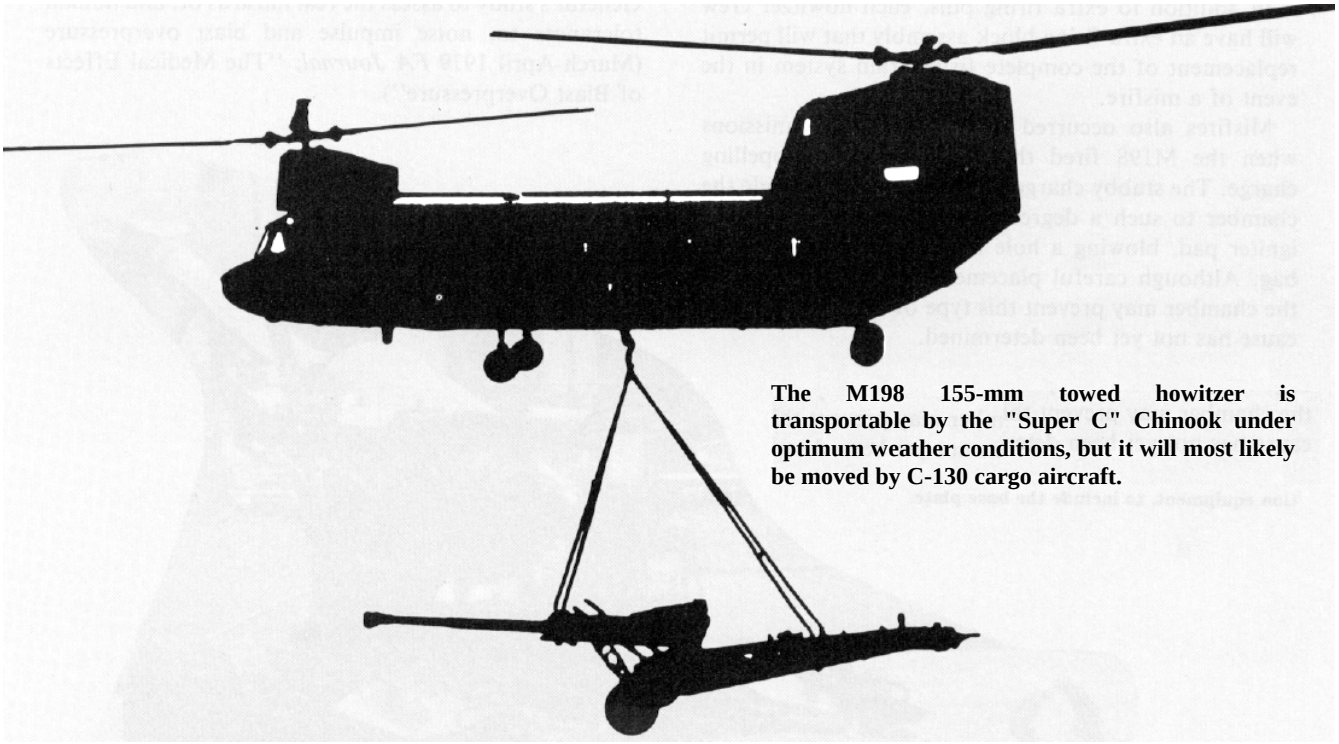
A maximum rate of fire of six rounds per minute has been demonstrated, although the stated rate is four rounds per minute. The weapon can fire two rounds per minute for 30 minutes and one round per minute thereafter in the sustained mode. The thermal warning device permits these rates of fire until it reaches a "hot" status of 350 degrees Farenheit or higher.

In October 1978 the Field Artillery Board field-tested an M198-equipped battery in a Force Development Test and Experimentation (FDTE) exercise. The objective of the field exercise was to validate the proposed personnel and equipment organization designed to support the M198 as a direct support weapon for the light infantry division. Two 72-hour scenarios required the unit to conduct 22 displacements and fire 3,600 rounds. The FDTE provided the first opportunity for operational testers to evaluate the capability of the howitzer crews to exercise the M198 as a full six-gun battery performing direct support tasks and missions. The FDTE results validated the proposed organization, although the evaluation was aided by ideal weather conditions at the test site.

You're looking down the business end of the M198 as a crew from the 1st Battalion, 73d Field Artillery, prepares to "get 30" kilometers. Note the protective helmets and the base plate which helps the crew traverse the 15,000-pound howitzer. (Photo by Charles Ray)

Of particular interest to observers during the FDTE was the impact of the M198's size and weight on crew fatigue and tactical mobility. The 11-man crew's ability to emplace, displace, and move with the howitzer was not significantly different from that with the M114A1. The crew's proficiency continued to improve as they became more experienced at handling the weapon. The primer mover, the M813 5-ton truck, was able to pull the M198 cross-country, although evaluators had hoped for some rain and mud to better assess the mobility. The size and weight of the howitzer reportedly did not contribute any more to fatigue than did manhandling camouflage nets, section equipment, or ammunition.

The FDTE determined that the M198 can do the job as a light division direct support weapon — giving the maneuver brigade commander a significant increase in range, ammunition effectiveness, and lethality from his direct support firepower assets.



The M198 155-mm towed howitzer is transportable by the "Super C" Chinook under optimum weather conditions, but it will most likely be moved by C-130 cargo aircraft.

Although the howitzer weighs more than 15,000 pounds, it can be emplaced and displaced easily by its 11-man crew. The scenario for the FDTE was 72 hours long, with each section moving 11 times and firing an average of 360 rounds. The prime mover was capable of pulling the howitzer cross-country with a full load of ammunition and section equipment on the vehicle under normal operating conditions.

The M198 is air-transportable by Air Force C-130. Several hundred board feet of lumber are required to support the howitzer as it is being pushed up the aircraft ramp and to support the weapon inside the aircraft. The roller floor panels must be removed from the floor of the C-130 to accommodate the M198.

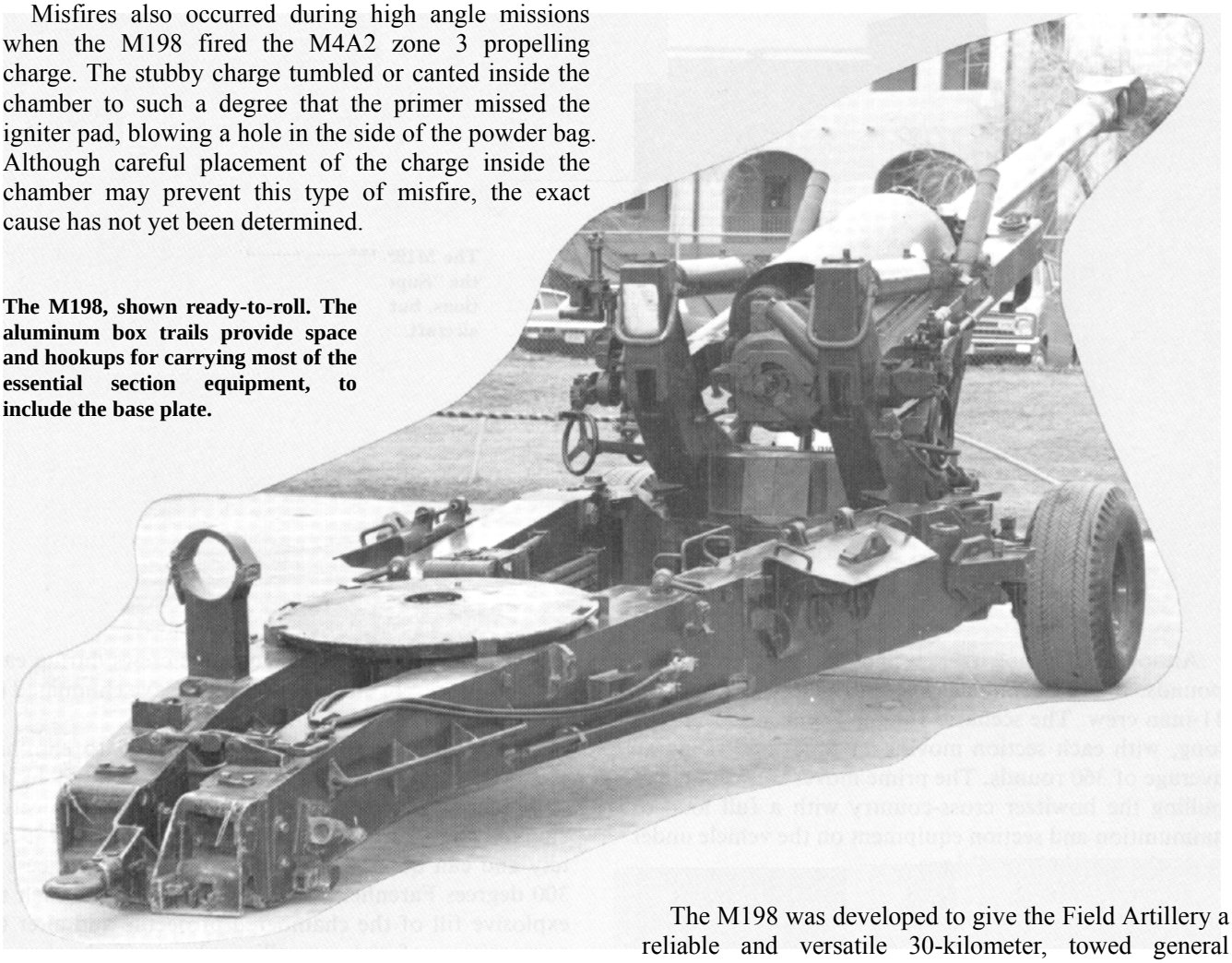
The M198 is within the lift capability of the CH-47 "Super C" Chinook helicopter. Because the maximum lift capacity of the current generation CH-47 is close to being matched by the weight of the M198 howitzer, air transportability may be restricted to the C-130 in less than ideal weather conditions.

Most hardware shortcomings noted during early testing have been eliminated. An engineering change to the breech assembly has eliminated a recurring problem of opening and closing the breech. Thermal expansion, brought on by the high temperatures caused by the higher zone propelling charges, had been the apparent cause of the breech problems. Although a "sledgehammer solution" was applied by some crews during early testing, the recent changes appear to have eliminated the problem.

Misfire procedures have been clarified to eliminate potential safety hazards that might be caused by the combination of a hot tube and a chambered projectile/charge. The chamber end of the tube absorbs heat rapidly and can quickly register temperatures in excess of 300 degrees Farenheit. Such temperatures can melt the explosive fill of the chambered projectile and alter the composition of the propelling charge if the powder charge is not removed within the time prescribed in the misfire procedures. Once the critical melting point has been reached, explosive ordnance disposal (EOD) personnel must be called to remove the projectile. On several occasions during final operational testing, crews had difficulty removing projectiles from the breech with the bell rammer. In those situations where misfire procedures prohibit the crew from firing the projectile, the supporting EOD unit must perform the removal. The EOD standard procedure is to detonate a small charge of C4 explosive in a water-filled tube. This action forces the round out and should not damage the tube. The assessment of tube serviceability, after a projectile has been removed by the above method, is accomplished with a pull-over gauge and a borescope at the direct support maintenance level.

In addition to extra firing pins, each howitzer crew will have an extra firing block assembly that will permit replacement of the complete firing train system in the event of a misfire.

Misfires also occurred during high angle missions when the M198 fired the M4A2 zone 3 propelling charge. The stubby charge tumbled or canted inside the chamber to such a degree that the primer missed the igniter pad, blowing a hole in the side of the powder bag. Although careful placement of the charge inside the chamber may prevent this type of misfire, the exact cause has not yet been determined.



The M198, shown ready-to-roll. The aluminum box trails provide space and hookups for carrying most of the essential section equipment, to include the base plate.

The potential hazard to howitzer crews introduced by exposure to the high energy blasts of the M203 zone 8 propelling charge have necessitated some extraordinary safety precautions with the M198. These precautions require that the crew leave the immediate vicinity of the howitzer when the M203 charge is being fired. A 25-foot lanyard is used by one cannoneer, and the remainder of the crew is positioned behind the trails (at least 25 feet form the breech) to minimize body exposure to the blast wave pattern. Additionally, only 100 exposures per man per 24 hours are permitted, and no firing is permitted below a quadrant elevation of 270 mils. The DH-178 helmet is also required to afford the double hearing protection.

These procedures may be altered or even eliminated depending on the results of The Army Surgeon General's study to assess the real hazards of, and human tolerances to, noise impulse and blast overpressure (March-April 1979 *FA Journal,* "The Medical Effects of Blast Overpressure").

The M198 was developed to give the Field Artillery a reliable and versatile 30-kilometer, towed general support weapon. It is heavy; but it has to be heavy to fire 103-pound projectiles 30 kilometers without incurring an unacceptable level of failures. Despite its weight, the M198 is designed so that as much of the weight as possible is handled by the hydraulics system — not by the crew. For cannoneers accustomed to handling M101A1 and M102 systems, the M198 may take some getting used to. The M198 should be appreciated for its real value — what it can do on the battlefield, and not be disparaged because of its size and weight. It should prove to be the capable and reliable performer it was designed to be — and, as of this writing, it is the first 30-kilometer field artillery howitzer in the hands of troops.

MAJ William Whelihan is assigned to the Office of the Cannon TRADOC System Manager and is the author of several *Journal* articles.

The *Journal* interviews . . .

BG Edward A. Dinges

Journal: *As an ex div arty commander in Europe, have your views of the School/field relationship changed now that you are the Assistant Commandant?*

Dinges: No, I don't think so. But I think we here at the School often get swept up in projects that are on-going and fast-moving, and it takes continual effort to keep foremost in our minds that we are serving a customer in the field and our efforts here can't be self-serving. We must make sure our equipment, tactics, and doctrine are those our units need to succeed on the next battlefield.

Journal: *Is the School being responsive, both with candor and in a timely manner?*

Dinges: I hope so and we try hard to give a candid, timely response. But a concern of mine is to watch that we don't overload the system either with materiel or doctrine so rapidly that it can't be assimilated properly. I think we've kept that pretty much in control, but some of the new weapon systems require time for construction and deliberate plans to be made before the equipment arrives in the field. We're anxious to get new ideas and equipment to the units, but we sometimes forget that we need to give them enough lead time on all the aspects of it.

Journal: *What is your reaction to Field Artillery soldiers' performance on the SQTs?*

Dinges: The test results bother me. We always hope to do better because we think we are something special and we think we've been doing our business pretty well. The beginnings of any new system are always tough, but I'm still optimistic that we're going to get there. I think we are going to stick with the tests we have, but we have to be realistic in looking at where the fault for low scores lies. There is a certain amount of difficulty in test construction, especially in the written component. We must write the test *to the target audience* that we have and we must express our questions properly. I think the hands-on component results have been pretty good, but, for the SQT to be a success, we must continually stress that the NCO is the first-line supervisor and his ability is translated to the soldier. If the NCO is not on solid ground and feels that he knows every aspect of the MOS, then it's difficult for him to impart his knowledge to his

Brigadier General Edward A. Dinges is the Assistant Commandant of the Field Artillery School. Before coming here in August 1978, General Dinges was the Assistant Division Commander of the 3d Armored Division. He was also Division Artillery Commander in the 3d Armored. General Dinges commanded the 8th Battalion, 6th Field Artillery, in Vietnam. A 1953 graduate of the Military Academy, he has a masters degree from American University and is a graduate of the Army War College.

soldiers and to insure that they are doing the job correctly. So it's kind of a joint effort — we have to keep stressing that our NCOs know their job, continue to improve themselves, and impart their knowledge to our soldiers. At the School, we must be sure that we are using appropriate skill level tasks and that we are testing the tasks correctly.

Journal: *What can you tell us about the organizational and operational concepts for the General Support Rocket System?*

Dinges: We're still analyzing the situation. There are a number of ways we could go with the battalion structure, and in our budget proposals we have a battalion structure. As we work on "Division '86," we are looking at both a pure GSRS battalion structure and a composite battalion of either two or three 8-inch batteries and one GSRS battery for each division.

Journal: *When is the FA brigade concept going to be implemented in our Active Army units?*

Dinges: We have only one in the Active force now — the 17th in Europe. [There is another cannon brigade — the 18th at Fort Bragg — but it was formed from a corps artillery, not an FA group.] The effective date for converting the other existing groups is September of this year. Equipment and personnel shortages have been the delaying factors. My observation of the 17th during REFORGER is that the FA Brigade is going to be a pretty good setup. I was disappointed that we hadn't provided them enough radios, and we are checking on that aspect of the TOE. Outside of the communication difficulties, the 17th seems to be operating pretty well and to have many of the capabilities that we are looking for as a complement to a division artillery.

Journal: *Where are we headed on the problem of training ammunition?*

Dinges: We are doing a lot of work on "what is the minimum required ammunition over a year's time." We are looking at all types of things to insure we do the most professional job possible with a minimum use of ammunition. That includes reviewing our ARTEPs to see which missions have to be fired with full-caliber ammunition and which missions can be evaluated with the M31 subcaliber training aid or dry firing. We are looking at a range of alternatives which include a low-cost indirect fire round, laser direct fire trainers, and observed fire trainers. There are other kinds of simulation devices as well, and we have to look at all kinds to find substitutes that will give us the same kind of training benefits as full-scale ammunition because the cost of ammunition is just going out of sight. We're also studying a training device simulation plan to see what we need in the future in this area. We have recently put into the field a laser device for direct fire training. If we can get a low-cost indirect fire round with a decent fuze on it and the cost stays fairly low, then we'll be able to get the noise and smoke for crew effect, plus the impact in the impact area, and we'll have a system with great possibilities.

Journal: *What do you see as the most beneficial doctrinal or training item on the horizon?*

Dinges: We talked previously about SQT results. One of the things that we've been the pioneer on is the idea of the "SQT in the Soldier's Manual." We found that people in good conscience, trying to prepare their soldiers for SQTs, developed their own "tests" based on what we gave as SQT tasks. When the real tests came out, there was little or no similarity between the two and, in some ways, soldiers were penalized. Our idea is to put the SQT questions *in the Soldier's Manual* that goes out to the soldier. The soldier can study the test and then we can mix up the order of the answers and change some things on the actual test but he or she will have the *format* and the way that particular task will be tested. That way, there's no guess work.

Right now there is a justified tendency to wait for the SQT notice to begin preparation. If we send the test out in the Soldier's Manual, the soldier will know that, by studying that test, he or she will know what's going to be asked. Whatever way we ask the questions, as far as changing numbers or changing the sequence of answers, the soldier will in fact have learned that test. Also, in the Commander's Manual, we will put the setup requirements for the hands-on components so that there will be no questions there. This concept is not something we can implement overnight — it's a long term goal that we are striving for.

Journal: *What was the most significant finding of your recent three-week visit to Europe on REFORGER?*

Dinges: I think that one of my significant findings was that it is still *so very difficult* to realistically play artillery, especially counterfire, in a non-firing field training exercise. The 3d Infantry umpiring group under Brigadier General Pearson, a Field Artilleryman, had more than 4,000 people in the field. The umpiring group had done some work with an indirect fire control center which they had hoped to make the nerve cell and solve the indirect fire problem. But it's still just not that simple to indicate where the fire is coming from; to determine if there is a target acquisition device aimed in that

position that would have picked up that fire; and to determine who is there receiving the incoming or counterfire. All those aspects are difficult and time-consuming, and again they depend on communications, time, and the people to do the job — it's very personnel-intensive. Therefore, we just don't have a handle on what the artillery contribution is. And it has a very negative effect on people's appreciation for what the artillery can do.

Journal: *Are you concerned about the shortage of staff and faculty for the School?*

Dinges: I don't think we can take any further cuts. We're now going through a round of civilian cuts which is a wrenching experience. We're down to the point where we are stretched so thin that any further cuts will impact on what we can and cannot do and, ultimately, will impact on the quality of the product that we put out in the field.

Journal: *What is your opinion of the practicality of having the counterfire mission at division artillery?*

Dinges: That was a good decision. The field understands the counterfire mission now and it is manageable the way we've got it organized. We are still short some of the ingredients that make it an effective system. We have divided the counterfire task into five subtasks — battle control, target acquisition, target processing, target attack, and target accessing, but there are still some deficiencies in some of the subtask areas. We won't have a completely effective system until we get the counterfire system up with developmental materiel actions that are on-going. The field recognizes the value of counterfire. I found on REFORGER that 20 percent of the missions fired were either counterfire or interdiction (interdiction being those longer range fires against second echelon forces). In REFORGER we utilized the Lance for the interdiction of some of the deeper targets. The Division commanders were *personally* concerned with the proper targeting of those weapons. The release of Lance rounds was for use against meaningful targets.

Journal: *Do you see any basic flaws in the overall counterfire doctrine?*

Dinges: No. Its success is really dependent on improving the equipment that we have to handle the subtasks. We are hurting for good target acquisition assets. The Firefinder radars, which are coming into the inventory shortly, will help. We just can't "see" far enough at the moment to make our counterfire mission completely effective.

One of the recent changes we've made which I saw handled very effectively in Europe was the addition of the Field Artillery Intelligence Officer to the all-source analysis center. He allows us a more responsive targeting capability since he can quickly pick out the appropriate field artillery targets and send them right down to the FSE and ultimately to the firing unit. In sum, I think the counterfire doctrine is understood and, as we get some of our new systems in the field, I see this to be a very effective contributor on the battlefield.

Journal: *You have devoted considerable time to attending meetings of the Close Support Study Group. Do you see any major changes to current fire support team organizations or SOPs coming from this study?*

Dinges: I think that FIST is appreciated in the field and it is moving along in good shape. Now we have to be sure that we're structured properly as we enter the era of laser designators for systems such as Copperhead and Hellfire. That's one of the main things that the study group is looking at. Are we putting too much on the FIST headquarters by the introduction of more equipment? As we bring TACFIRE into the system, are we staffed properly with digital devices and communication nets? Just how well will we function in the digital world? These are the questions the study group will answer.

Journal*: Are you discussing the forward observer vehicle in these meetings?*

Dinges: Yes, we are. Obviously, we want a vehicle without a unique signature. Also, as we come into the laser designator world, we need a designator under armor for survivability. The initial results of our analysis point us toward a vehicle such as the Infantry Fighting Vehicle and the Cavalry Fighting Vehicle. Such a hybrid of that vehicle for use by the artillery would insure that the FIST headquarters vehicle would not be singled out on the battlefield because it would look like the rest of the vehicles in the unit the FIST is supporting.

Journal: *Is Copperhead (and its lasers) "on track" or are there problems with it?*

Dinges: Yes. In any new system which goes beyond the current state of the art, there are problems as you get concepts organized, but Copperhead is "on track" now. The test firings have been right on the mark — *very* effective results. We're about to launch into the operational tests at Fort Carson. Now it's just a matter of making sure that results of developmental firings will be duplicated in an operational environment. We're confident that it will perform well.

Journal: *Has the School reached a position on the issues of survivability versus mobility? Can we "gun and run" with the limited terrain and afford the nonfiring time during moves?*

Dinges: You put your finger on what has been the dilemma. With the advent of TACFIRE and BCS, the capability to use terrain positioning will improve dramatically. As we go to eight-gun batteries and four-gun platoons, we spread those weapons a far greater distance than we ever have before. By spreading, we promote survivability, and TACFIRE and BCS can give accurate firing data and massing data even though we are spread. We are very sensitive to the fact that by spreading we can't afford to dilute our capability to mass. Obviously there still will be the need to move, but I think, with spreading and terrain positioning, there will be less need to move as frequently as in some of the projections associated with current section displacements in a firing battery.

The management of terrain is a problem we've been working on. On REFORGER, I saw this problem handled very effectively, especially with direct support battalions supporting a brigade. In most cases, the brigade commanders had outlined "goose eggs" for DS battalion commanders and had made it very clear that the priority of positioning in that goose egg went to the artillery.

Journal: *What would you like to accomplish while you are here?*

Dinges: I guess everyone always hopes that during their "watch" they will be able to make a contribution. I hope that, during my "watch," we can bring into the inventory this new equipment that's been so needed. I want to bring it in in a professional manner and get it fielded so that our forces really have a capability to "go at it" in a first class manner. I also want the "product" that the School turns out and sends to the field to be absolutely the best we can send within the time and money constraints that face us. I'm ever mindful of our responsibility in this area. We can have all the best equipment but, if our product in the way of officers and soldiers is not capable of handling that equipment, then we have failed in our mission.

Journal: *Priorities change week to week, but is there any one thing in the next six months that's going to have number one priority in the School?*

Dinges: No — no single thing, but one area that's been driving a lot of our efforts is Division '86 because it will structure the artillery of the future. It's important to all of us at Sill that we be able to articulate and justify the artillery's contribution to the central battle and the force generation battle.

Journal: *Thank you.*

Commanders Update

COL(P) James E. Drummond
III Corps Artillery

COL Donald R. Ellis
2d Infantry Division Artillery

COL Harry D. Pensler
210th FA Group

COL Arch H. Ely Jr.
Division Support Command
9th Infantry Division

COL William H. Rogers
School Brigade
Fort Sill, OK

LTC Paul J. Goldman
2d Battalion, 1st Field Artillery

LTC Michael J. Brokovich
2d Battalion, 5th Field Artillery

LTC Rufus B. Rogers
2d Battalion, 6th Field Artillery

LTC Stanford W. Hickman
1st Battalion, 7th Field Artillery

LTC Joseph W. Corder
6th Battalion, 9th Field Artillery

LTC Robert A. White
1st Battalion, 11th Field Artillery

LTC John J. Kelly
3d Battalion, 16th Field Artillery

LTC David L. Cole
3d Battalion 21st Field Artillery

LTC Robert A. Becker
1st Battalion, 22d Field Artillery

LTC James H. Cowles
2d Battalion, 28th Field Artillery

LTC Billie L. Hughes
2d Battalion, 33d Field Artillery

LTC George G. Collins
2d Battalion, 34th Field Artillery

LTC Walter R. Willms
1st Battalion, 37th Field Artillery

LTC Benson F. Landrum
1st Battalion, 38th Field Artillery

LTC James I. Warner
1st Battalion, 76th Field Artillery

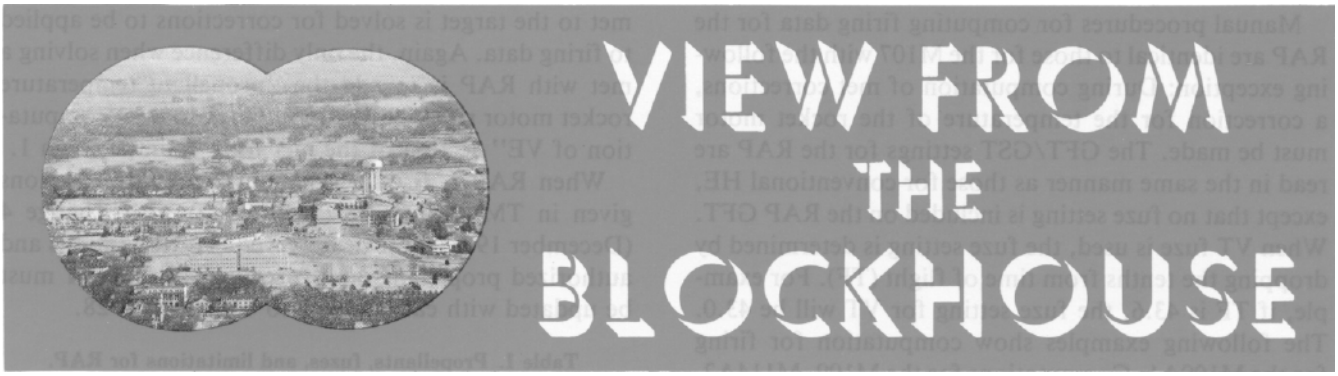
LTC Raymond J. Zugel
6th Battalion, 80th Field Artillery

LTC Harold F. DeBolt
2d Battalion, 320th Field Artillery

LTC Jackson C. Reavill
1st Battalion, 333d Field Artillery

LTC Richard M. Naab
557th Group

LTC Billy T. Brooks
570th Group



New department directors

The Field Artillery School Counterfire and Weapons Departments have new directors.

COL Jere Hickman, former commander of the 18th FA Brigade at Fort Bragg, NC, took over Counterfire Department from COL Phil Speairs who moved to III Corps Artillery Headquarters, located at Fort Sill.

COL Sam Ady moved up from Deputy Director to Director of Weapons Department when COL Jack Van Pool was selected to be the Fort Sill Director of Industrial Operations.

COL James Quinlan who was the TRADOC System Manager for Cannon has been named the Director of Combat Developments, replacing COL (P) James Drummond. COL Drummond has been selected for promotion to BG and has assumed command of III Corps Artillery.

FADAC mechanics

If FADAC mechanics are not being assigned to your Field Artillery unit, it may be that your personnel office is not requesting the proper MOS with ASI (Additional Skill Identifier). The proper MOS for FADAC mechanics is 31V10F7 which can be awarded only as a result of resident training at the Field Artillery School.

The F7 identifier is relatively new (Change 9, AR 611-201), and shortly after Change 9 was implemented, a MILPERCEN error resulted in all soldiers with a primary or secondary MOS of 31B20 (Field Communication Electronic Equipment Mechanic) being awarded MOS 31V10F7. As a result, there are soldiers in the field with MOS 31V10F7 who are not FADAC mechanics.

It is recommended that personnel records of incoming personnel with MOS 31V10F7 be screened to insure that they have completed the FADAC Mechanics Course at Fort Sill and are, in fact, assigned only to FA units where their skills can be utilized. (Mr. Dennis, CED)

Why aren't there target analysts?

The Nuclear Weapons Employment Division of Tactics/Combined Arms Department has received numerous inquiries concerning the lack of qualified personnel to fill slots requiring the additional skill identifier 5H. Statistics of the past two fiscal years reveal that eight Nuclear and Chemical Target Analysis Courses (NCTAC) have been offered. Of the 701 programmed spaces available, a total of 320 students attended the course. This is a less than 46 percent fill rate. Very few of the students attending were from FORSCOM units. A recently scheduled NCTAC class was cancelled by TRADOC because only one quota was filled.

The USAFAS self-paced resident and nonresident/resident courses are the primary means of attaining the ASI 5H for Army and Marine Corps artillery officers (see *FA Journal,* January-February 1979, page 15).

The next scheduled resident class is 3-79, beginning 12 July 1979. (MAJ Hall, TCAD)

Firing the 155-mm RAP

The M549A1 rocket assisted projectile (RAP) is now available to 155-mm units. A built-in rocket motor provides an extended range capability. The M549A1/M549 is fired only with "rocket-on." The "rocket-on" mode for the projectile is selected by removing the "rocket-off" cap prior to chambering the round.

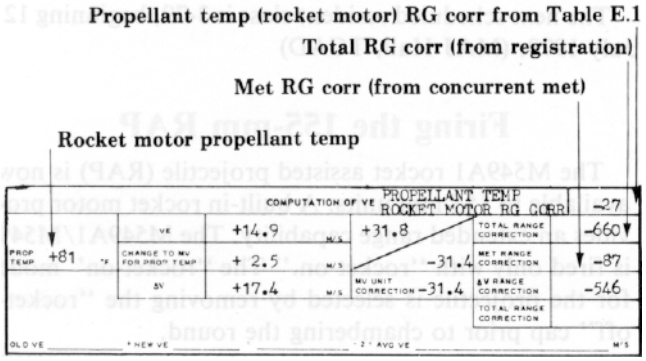
For shorter ranges, conventional high explosive (HE) rounds are used. Firing data for "rocket-off" RAP have not been published.

Since most RAP missions will be fire for effect, GFT settings should always be used. When developing GFT settings, one must keep in mind that corrections determined for ranges close to the maximum range for a charge are not reliable at shorter ranges. If met or registration data are not available, a GFT setting must be developed from the average battery VE, powder temperature, and rocket motor propellant temperature.

View From The Blockhouse

Manual procedures for computing firing data for the RAP are identical to those for the M107 with the following exception: During computation of met corrections, a correction for the temperature of the rocket motor must be made. The GFT/GST settings for the RAP are read in the same manner as those for conventional HE, except that no fuze setting is included on the RAP GFT. When VT fuze is used, the fuze setting is determined by dropping the tenths from time of flight (TF). For example, if TF is 43.6, the fuze setting for VT will be 43.0. The following examples show computation for firing for the M109A1. Computations for the M109, M114A2, and M198 howitzers are similar.

Problem 1: Determination of position constants after registration (concurrent met)—The met data correction sheet is worked as indicated in FM 6-40 except for the "computation of VE" and "met fuze correction" sections. The "met fuze correction" section is not used for RAP. The computation for the "computation of VE" section is completed as follows: Enter *Table E.1* of the TFT, charge 8R (M119A1) with a hypothetical entry range of 20,300 meters (expressed to the nearest listed range—20,000) and a hypothetical rocket motor propellant temperature of 81 degrees Fahrenheit (expressed to the nearest listed value—80). The rocket motor propellant temperature is assumed to be the same as the powder temperature. The ΔV range correction is determined by algebraically subtracting both the propellant temperature (rocket motor) range correction and the met range correction from the total range correction (– 660 – (– 27) – (– 87) = – 546 ΔV range correction).



Problem 2: Met + VE technique (met to target)—The best means for determining total corrections for all non-standard conditions is to register; however, it is frequently undesirable to register or to perform sufficient registrations to obtain corrections for the entire zone of fire. If one registration has been fired, corrections closely approximating additional registration corrections can be obtained by applying the met + VE technique. Subsequent mets are solved to keep data as current as possible. When no registration has been fired, a met to the target is solved for corrections to be applied to firing data. Again, the only difference when solving a met with RAP is to add the "propellant temperature rocket motor range correction" block in the "computation of VE" section of the met form as in problem 1.

When RAP is fired, the limitations and restrictions given in TM 43-0001-28 (April 1977) with Change 4 (December 1978) must be observed. The limitations and authorized propellants and fuzes listed in table 1 must be updated with each change to TM 48-0001-28.

Table 1. Propellants, fuzes, and limitations for RAP.

Propelling charges: 7R (M4 series at charge 7 only).
8R (M119A1 and M203A1 with M549A1 projectile only).

Fuzes: PD—M557 and M539; proximity—M732 only.

Limitations: M549 and M549A1

- The M549/M549A1 cannot be fired if the obturating band is missing or broken.
- There are no firing tables for "rocket-off" firing of the M549/M549A1, so they must be fired "rocket-on" only (rocket-off cap removed).
- The M549/M549A1 cannot be fired in the M199 cannon if origin wear in the cannon exceeds 0.093 inches.
- Use of the M119 propelling charge with the M549/M549A1 is prohibited. The M119A1 propelling charge is authorized.
- The M549 model cannot be fired with the M203 propelling charge.
- A 6,000-meter safety zone is required short of the target because of the possibility of rocket motor nonignition.

A letter from the Gunnery Department has been sent to all 155-mm units (battery level in the Active Army and battalion level in the Reserve Components) with specific details for requisitioning TFTs for RAP. If you have not received this letter, call or write the Gunnery Department. (SFC Evans, Gunnery)

8-inch M110A2 and the M404 ICM

The M404 improved conventional munition (ICM) for the M110A1/A2 8-inch howitzer has been safety certified subject to the following modifications which must be applied before firing:

- The boattail body joint must be pinned.
- The base plate must be torqued to 1,000 foot-pounds.
- The round cannot be fired with charges 8 and 9.

New GFTs, which include the ICM scale for charges 1, 3, 4, 5, 6, and 7, can be ordered using NSN 1220-01-038-2410. The GFT set includes a GFT for charges 8 and 9 without the ICM scale.

The new ICM firing table addendum, FT 8-Q-1, will be available in approximately one year. In the interim, the GFTs should be used to compute firing data.

The "combat emergency use only" procedures for firing the M404 given on page 25, March-April 1978 *FA*

Journal, may be used only when the GFT with ICM scale is not available and under "combat emergency." The procedures described in the article must be modified to reflect a higher burst height as follows:

1) Determine the high explosive (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 HE fuze setting and quadrant elevation (from step 1) to determine ballistic corrections for M404 ICM fuze setting, quadrant elevation, and corrections for 50-meter change in height. Consequently, the height of burst (HOB) correction is determined by multiplying the correction value in the 50-meter HOB column by six to obtain total HOB corrections for both the quadrant elevation and the fuze setting.

3) Add the ballistic corrections and total HOB corrections for fuze setting and quadrant determined in step 2 to the HE data in step 1 to get the ICM firing data. The following is a sample problem:

a. Given: GFT setting for an M110A1 battery:

GFT A: CHG 5, LOT XY, RG 8,700, EL 412, TI 28.8.
GFT DF CORR: L2.
LOT Y is propellant M1, green bag.
FFE ICM chart range and deflection: RG 9,100, DF 3240.
Site: + 5.

b. The initial HE data determined from the M110A1 GFT (8-Q-1) are TI 30.6, DF 3252, and QE 445.

c. 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).

d. The 50-meter height correction for QE 445 is + 6.8 and for fuze setting 30.6 it is +0.1. Total HOB corrections for:

QE = +41 mils; (6 × +6.8 = +40.8).
FS = +0.6; (6 × +0.1).

e. The ICM data to fire are:

TI 30.6; (30.6 + (–0.6) + (+0.6)).
DF 3252; (the ICM DF is the same as the HE DF).
QE 512; (445 + 26 + 41 = 512).

(SFC Evans, Gunnery)

Training literature update

The training literature boom that began in 1975 continues. The accompanying table reflects the current status of Field Artillery field manuals, training circulars, and ARTEPs. FMs 6-40-1, 6-59, 6-60, and 6-61 dealing with the Honest John system are still in effect, though the US Army has no more Honest John units. Those publications with an asterisk in the remarks section are being revised and comments from the field are invited. (LTC Evans, DTD)

Field Manual	Short Title	Current date	Remarks
6-1	FA TACFIRE		TBP Dec 79
6-2	FA Survey	Sep 78	
6-10	FA Communications	Mar 75	Rescinded by FMs 11-50 and 11-92
6-15	FA Meteorology	Aug 79	
6-16	Tables for Artillery Meteorology	May 61	To be replaced by FM 6-16 and 6-16-1 by Dec 79
6-20	Fire Support in Combined Arms Operations	Sep 77	*C1 TBP Feb 80
6-20-1	FA Cannon Battalion		TBP Oct 79
6-20-2	Div Arty, FA Brigade, FA Section (Corps)		TBP Mar 80
6-30	FA Observer	Aug 78	*C1 planned for FY80
6-39 w/C1	Pershing Organization	Jan 72	
6-40	FA Cannon Gunnery	Dec 78	
6-40-3 w/C1	Operation of FADAC	Apr 77	
6-40-4	Modern Battlefield Gunnery	Jun 77	Rescinded by FM 6-40
6-42(U) & 6-42-1(C)	FA Battalion, Lance	Aug 78	
6-50	FA Cannon Battery	Jun 78	*C1 TBP FY80
6-70 w/C1	105-mm How M102	Mar 70	
6-75 w/C2	105-mm How M101	Feb 63	
6-79 w/C2	105-mm How M108	Jan 63	
6-81 w/C4	155-mm How M114	Mar 62	
6-88 w/C1	155-mm How M109	Jun 74	
6-90 w/C1	8-inch How M2	Nov 62	
6-94 w/C1	175-mm Gun and 8-inch How M110	May 68	
6-120	FA Target Acquisition Battalion and Battery	Oct 67	Rescinded by FM 6-121
6-121	FA Target Acquisition	May 78	
6-122	Artillery Sound and Flash Ranging		TBP May 79
6-125	Qualification Test for Specialist, FA	Feb 72	
6-140 w/C1	FA Organization	Mar 73	To be rescinded by FM 6-20-2
6-141-1/2	FA Target Analysis and Weapons Employment	Feb 78	
6-161	FA Radar Systems	Jul 78	
6-300	Army Ephemeris	Jul 78	

Training Circular	Short Title	Current date	Remarks
6-1	TACFIRE	Jul 77	To be rescinded by FM 6-1
6-2-1	FA Survey	Dec 76	To be rescinded by FM 6-2
6-4-1	Threat	Oct 76	
6-4-2	Threat Organization	May 77	
6-10-1	FA Communications	May 77	
6-20-4	Counterfire	Feb 76	To be rescinded by FM 6-2
6-20-10	FIST	Dec 77	
6-40-3	M31 Trainer	Nov 75	
6-40-4	For For Effect	Feb 78	
6-40-6	FA Aerial Observer Team	Oct 76	
6-121-2	FA/ASA: A Targeting Team	Mar 76	

Training Text	Short Title	Current date	Remarks
6-20-7	FAC/FIST Operation		TBP Jun 79

ARTEP	Short Title	Current date	Remarks
6-105	105 DS Cannon	Jan 78	Revision TBP 4th qtr FY79
6-165 w/C1	GS Cannon units	Sep 76	Revision TBP 4th qtr FY79
6-302	HHB Div Arty, FA Bde (test)	Apr 78	TBP 3d qtr FY79
6-307	TAB	Sep 78	*C1 TBP 1st qtr FY80
6-365 w/C1	155-mm SP, DS	Feb 77	Revision TBP 4th qtr FY79
6-595	Lance	Sep 78	*Revision TBP 1st qtr FY80
6-615	Pershing (test)	Feb 78	TBP 3d qtr FY79

Lance TVI

The first edition of the Lance ARTEP has been sent to the field by pinpoint distribution. This new document contains nuclear training objectives based on FM 100-50 which are effective for training and evaluating by units.

The Lance system now joins the cannon systems which have been under the ARTEP/TVI concept for several months now. The Technical Validation Inspection (TVI) for noncustodial nuclear-capable Lance units under the standards in ARTEP 6-595 becomes effective 1 May 1979. DA message 011910Z March 1979, subject: "Change in policy for evaluation and certification of noncustodial Lance units," specifies that the units will be evaluated by the nuclear tasks in ARTEP 6-595 and will no longer undergo nuclear surety inspections. The TVI will look at technical operations, the personnel reliability program, and accountability in units that have accountability for nuclear weapons.

Comments concerning the ARTEP/TVI should be addressed to: Commandant, USAFAS, ATTN: ATSF-TD-CT, Fort Sill, OK 73503. Additionally, the ARTEP Hotline is available 24 hours a day by calling AUTOVON 639-2064. (SFC Dewald, DTD)

HHCs getting field test

A team from the Gunnery Department has returned from carrying 45 Texas Instrument hand-held calculators (model TI-59) to the 8th Division Artillery for a troop test. The calculators were modified to contain an artillery module (March-April 1979 *FA Journal*).

Five cannon battalions were equipped with the planned basic issue of calculators, and fire direction center personnel were given eight hours of instruction by the Gunnery team. The battalions will test the devices during training at Grafenwoehr this summer and complete questionnaires which will be used in final definition of the requirements for a standard HHC for the Field Artillery. (CPT Chaney, Gunnery)

Update on FMs 6-30 and 6-40

FM 6-30, The Field Artillery Observer, has been in the field for approximately nine months and is being reviewed prior to publishing Change 1. Input from the field is encouraged to achieve the broadest possible review. Comments on FM 6-30 should be forwarded to: Gunnery Department, ATSF-G-RA, Fort Sill, OK 73503.

Distribution of the new FM 6-40, Field Artillery Cannon Gunnery, is in progress. The new manual brings together all the new cannon gunnery concepts and procedures into one document and introduces three new forms for FDC use:

- DA Form 4207, 8-Inch Nuclear Computation.
- DA Form 4757, Registration/Special Correction Worksheet.
- DA Form 4758, Section Chief's Card-Computation Worksheet.

These forms are now available through normal AG publication supply channels. (SFC Ives, Gunnery)

Operations/Intelligence extension course

The US Army Institute for Professional Development has fielded the Operations/Intelligence NCO/Specialist correspondence course. This course is designed primarily to train sergeants and their assistants, occupying or planning to occupy operations or intelligence positions in Field Artillery, Armor, Air Defense Artillery, and Infantry battalions. This course offers valuable information supportive of tasks described in the 13W/13Y Soldier's Manual.

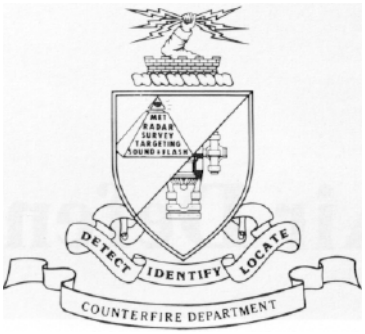
The course is unique in that it includes the registering of a supervisor with each student who enrolls. The supervisor, selected by the student or his commander, should have experience in operations or intelligence positions; however, this is not a prerequisite. The supervisor may be anyone willing to administer the subcourse tests and provide subject matter advice as necessary.

The course may be taken as a whole, or selected subcourses may be taken to augment knowledge and training as necessary. All subcourses may be validated if a soldier is able to pass a pretest concerning the subcourse material.

Additional information and enrollment forms may be obtained by writing or calling:

US Army Institute for Professional Development
US Army Training Support Center
ATTN: School Code 161 (Ops/Intel)
Newport News, VA 23628
AV 927-2468; commercial (804) 878-4716.

(CPT Bennett, DCRDT)



COUNTERFIRE SYSTEMS REVIEW

Shelter S-13A/MPQ-4A

Nonavailability of the operator shelter and blowers for the AN/MPQ-4A radar has delayed issuing the radar set to some units. The decision has been made to issue the radar without the operator shelter. Units receiving the AN/MPQ-4A without the operator shelter must insure that adequate environmental protection is provided for both the operator and the equipment. Failure to provide protection could degrade a unit's operational readiness and may result in injury to the operator. A small GP tent or a suitable shelter can be fabricated from available canvas material until standard equipment is received.

Error in the Army Ephemeris (FM 6-300)

Have you carefully checked your 1979 Army Ephemeris? It indicates the sun will start its southward journey on 22 June. Have no fear—the northern hemisphere will not have winter in August. There is an error in table 2 for the apparent declination of the sun. The sign of the daily change of the apparent declination in mils from 22 June through 21 December **should be changed to minus** (–). Fort Sill will publish an errata sheet for all units. However, in case your unit does not receive the errata sheet it is recommended you make a pen change to your FM 6-300.

The latest on met

Our present met equipment, the AN/GMD-1 Rawinsonde system, will probably be with us for at least five more years, since FAMAS, the replacement system, is not scheduled for fielding until FY84. A product improvement for the Rawin system, the OL-192, will be fielded this summer. The OL-192 consists of a desk-top programmable calculator, a tape reader-punch, and the met programs (software) to improve accuracy of the met messages produced by the artillery met section. Training materials for unit instruction will accompany the equipment. USAFAS will begin training operators and organizational maintenance personnel when the equipment arrives. Three-day resident courses for met personnel from the field will be conducted if required.

The OL-192 *does not* change the basic function and operation of the Rawin set. It simply provides a faster and more accurate means of evaluating and formulating raw met data. Because of the age of the Rawin system and the fact that the FAMAS will not be fielded until FY84, all personnel must emphasize and practice sound preventive maintenance and equipment handling procedures to minimize downtime on this system which is so essential to artillery accuracy.

Remotely piloted vehicle

The Counterfire Department has been designated as the proponent for the remotely piloted vehicle (RPV) system. This system includes a small, unmanned aerial vehicle with an onboard realtime TV camera and laser rangefinder/designator. The remotely piloted vehicle system will provide unmanned target acquisition, reconnaissance, and adjustment of artillery fires, as well as target designation and damage assessment up to 20 kilometers forward of the line of contact.

The RPV platoon will be organic to the target acquisition battery of the division artillery and will function under the staff supervision of the division artillery S3. The platoon will consist of a headquarters section and four RPV sections.

Suppression of Enemy Air Defenses

by LTC (Ret) Charles W. Montgomery

(USAF photo by Ken Hackman)

These four close air support aircraft are homeward bound, having just completed a successful airstrike on enemy armor formations somewhere in Europe. They were able to survive in the hostile airspace only with SEAD (pronounced SEE-AD) help from the supported land force.

If our aircraft (fixed and rotary wing) are to succeed against a modern enemy force, the enemy air defenses must be suppressed. Without suppression, our aircraft losses will be excessive or the effectiveness of these aircraft will be degraded.

Suppression of enemy air defenses (SEAD) operations may include temporary neutralization and short term degradation of selected air defense sites and supporting facilities. The overall goal for a corps SEAD is to reduce the attrition of friendly aircraft to an acceptable level by using both air and surface fire support means.

This article will discuss the Warsaw Pact antiair capability and suggest ways to reduce it.

SEAD support

An overall corps SEAD program combines the efforts of both air and surface elements of the force. It includes:

• **Lethal means**—These are the fires used against enemy air defenses and their associated equipment and facilities. These fires may be delivered by surface or air weapons alone or in concert. The use of these lethal means is managed by the fire support coordinator (FSCOORD).

• **Nonlethal means**—These may include electronic countermeasures, smoke, or chaff which usually complement the lethal means and are used to:

1) Limit the effectiveness of enemy tracking devices.
2) Reduce the risk of friendly aircraft recognition.

3) Confuse enemy air defense weapons guidance systems.

This article focuses primarily on uses of lethal means.

Targeting

The air/land force team at all levels, from the corps down to the task force, combines to locate and target enemy air defense weapons, radars, communication links, and control centers. Some of these targets come from the counterfire target acquisition effort.

The Air Force target acquisition means may include reconnaissance aircraft, side-looking airborne radars, real time sensors and data links, camouflage detecting film, drones, position locating equipment, airborne warning and control systems, and airborne observers (pilots and others). SEAD targets acquired by these Air Force means are fed to the land force fire support elements (FSE) via the US Air Force liaison representatives collocated with the ground force.

Army target locating means may include air and ground observers, sound and flash ranging systems, weapon locating radars, airborne photo/infrared devices, ground and airborne emitter locators, remotely piloted vehicles, and standoff target acquisition means.

"The plan"

Time and combat situations permitting, Army and Air Force counterparts jointly develop the SEAD plan for a corps. It is an all-out effort to reduce attrition rates to acceptable levels and to hold them at these levels while supported aircraft operate effectively and with relative safety. The plan identifies those segments of the enemy air defenses to be attacked and suppressed, in priority. The plan assigns fire support units to specific targets and synchronizes the uses of lethal and nonlethal means within the overall SEAD program.

Responsibilities

The collective SEAD effort of a land force (division or larger) is usually the responsibility of the G3 operations officer. He is assisted by the FSCOORD who plans and executes the fires (lethal) portion of the plan. Supported air elements (Air Force and Army aviation) and the G2 provide the bulk of the SEAD targets for attack. When directed to do so, the FSCOORD executes SEAD fires in accordance with command guidance.

The air defense umbrella put up by a Warsaw Pact force threatens friendly air operations in the forward areas. An orchestrated SEAD plan is needed to cut down this threat. For the FSCOORD, this means knowing the most critical targets and their priorities. For the fire support portion, the FSCOORD must understand the four basic employment principles and the types of weapons in use by the enemy.

The employment principles the enemy uses for his air defenses are:

- **Mass.** Weapons and weapon systems within a tactical unit are placed so that their combined fires can be concentrated on a single aircraft to increase the kill probability.
- **Mix.** Gun and missile units are mixed so that the limitations of one system are overcome by the capabilities of the other. Diversity of target acquisition equipment and redundancy are stressed to offset the countermeasures we use against them.
- **Mobility.** Highly mobile systems enhance the enemy's survivability.

Air defense weapons, ZSU-23-4 (23-mm).

Cannons	Maximum effective antiair range (kilometers) and capability	Acquisition means	Assigned to:
*ZPU-4 (14.5-mm)	1.4	Optical	ADA units of some mtz rifle regt/div
*ZU-23 (23-mm)	2.5	Optical	ADA units of some mtz rifle regt/div
ZSU-23.4 (23-mm)	Optical, 2.5	Radar/optical	ADA units in mtz rifle/tank regt/div
ZSU-57-2 (57-mm)	4.0	Optical/mechanized computing sight	ADA units in tank regt of tank/mtz rifle div
S-60 (57-mm)	Optical/mechanized 4.0 Radar 6.0	Radar and optical/ mechanized computing sight	ADA regt of tank/mtz rifle div
*Being phased out of some units.			
Missile systems			
SA-7 (GRAIL)	Low alt, slant range 3.5	Optical	Veh/helicopter mounted
SA-9 (GASKIN)	Low alt, slant range 7.0	Optical	ADA battery of mtz rifle/rank regt
SA-8 (GECKO)	Low alt, slant range 10-15	Radar	ADA regt of some mtz rifle/tank div
SA-3 (GOA)	Low to med alt, slant range 24	Radar	Army
SA-6 (GAINFUL)	Low alt, slant range 30	Radar	ADA regt of some rifle/tank div
SA-2 (GUIDELINE)	High alt, slant range 40	Radar	Army
SA-4 (GANEF)	Med to high alt, slant range 70	Radar	Army

Legend: ADA — air defense artillery; mtz — motorized; regt — regiment; div — division.

Figure 1. Warsaw Pact air defense systems.

(Photo of SA-4 (GANEF) in background, courtesy of *Truppendienst,* Vienna, Austria)

• **Integration.** Air defense weapon systems are incorporated throughout the depth of the enemy's formation—from well forward to deep in the rear.

The FSCOORD must know what weapons to expect at the various echelons of the enemy force. Figure 1 reflects the cannon and missile systems currently in use by Warsaw Pact nations.

Planning and execution

Using the three components of the fire support system, here is how SEAD fires are planned and executed.

• **Target acquisition.** The bulk of the targets come from air elements or the G2. These targets are augmented by those from FA and all-source intelligence means. Higher headquarters may also provide some SEAD targets.

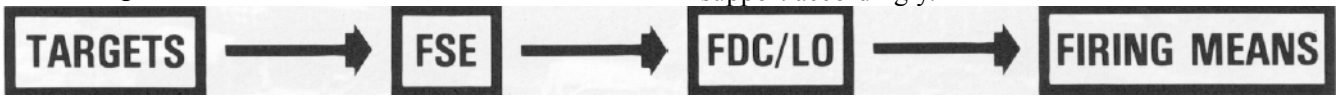
• **Weapons and munitions.** The fire support weapons to be used will consist of indirect fire weapons and armed aircraft. The munitions will be those common to the fire support effort.

• **Command/control/coordination.** The fires portion of the SEAD program is directed by the FSCOORD using command guidance.

Targets are sent to the FSE where they are analyzed and assigned. Mortar and FA targets are given to appropriate fire direction centers (FDC). Targets for available naval gunfire ships and for close air support aircraft are passed to liaison representatives present in the FSE.

At firing agencies, data is prepared and missions are usually placed in an "on-call" status, for use when needed (usually called for by airborne flight leaders under fire). This preparation allows weapons to react quickly when the need arises. In the plan for SEAD fires, new targets may replace older targets or may be added to the list of targets. Data for each assigned target is kept current. When command priorities for SEAD fires change, the plan changes accordingly.

Supported land commanders set priorities for fire support early in the planning stage. The FSCOORD must know and react to these priorities. If fire support weapons are engaged when the call comes in for SEAD support, the FSCOORD must know and react to these priorities. If fire support weapons are engaged when the call comes in for SEAD support, the FSCOORD must know which targets take precedence and provide support accordingly.



The SEAD program reflects the collective targeting for a corps. Rarely will it be necessary to fire the entire program. Usually, the need for SEAD fires will be localized in one area and called for in that manner. Figure 2 shows a corps SEAD program titled "TREES." In the zone of the 1st Division, subprogram OAK will be called for; in the zone of the 2d Division, it will be ELM. The corps will be responsible for the deeper targets in the area MAPLE.

Close and continuous coordination between the operations officer and the FSCOORD is needed to tie together uses of the lethal and nonlethal means for the SEAD program. Overall direction for this program comes from the operations officer, while the FSCOORD plans and executes the fire support portion of the program.

Requests to execute planned (on-call) SEAD fires may come from:

- The tactical air forces via their representatives collocated with FSEs.
- Army aviation via their personnel in the Airspace Management Element.
- Higher level ground headquarters.

In some combat situations, SEAD targets may be reported as targets of opportunity, requiring immediate fires. Such targets are treated like any other target, based on existing priorities.

With the scarcity of fire support weapons needed to meet the needs of today's combat, the SEAD challenge is like "another mouth to feed." Currently, the fire support coordinator must contend with the needs for close support fires, general support fires, counterfires, immediate suppression of antitank weapons, final protective fires, and harassing and interdiction fires. The amount of fire support available to meet these needs collectively is austere at best. Now comes the need for immediate SEAD fires on top of the existing requirements. Something must give. If available fire support is to remain at current levels, there just "ain't enough to go around." The ground commander is going to have to establish target priorities and use his fire support assets accordingly. SEAD is going to have to take its place in the line of "hungry mouths" waiting for fire support.

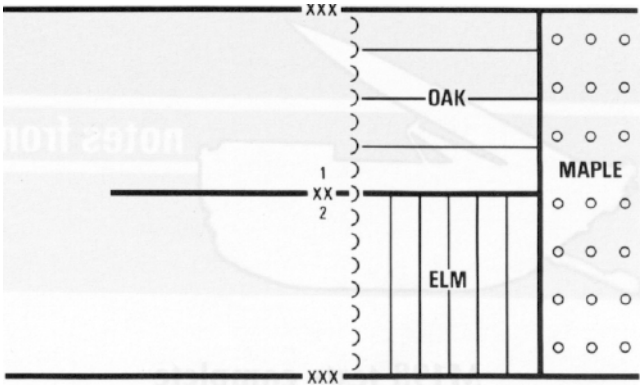


Figure 2. A corps SEAD program.

The joint SEAD system must be able to react responsively to the combat needs of supported aircraft. Responsibilities must be prearranged so each contributing fire support source knows, in advance, which on-call SEAD targets it has so the necessary preparations can be made. This will insure rapid reaction when the fire request comes in.

To win

The sophisticated battlefield of tomorrow will be dominated by high concentrations of enemy armor, artillery, and air defense weapons. For our land forces to win against these odds, they will need help from supporting air elements. To allow these air elements to operate successfully in hostile airspace, they must have SEAD support. This will require joint coordination between the air and land arms. A successful SEAD program enhances the survivability of our aircraft and, thereby, the survivability of the entire force.

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

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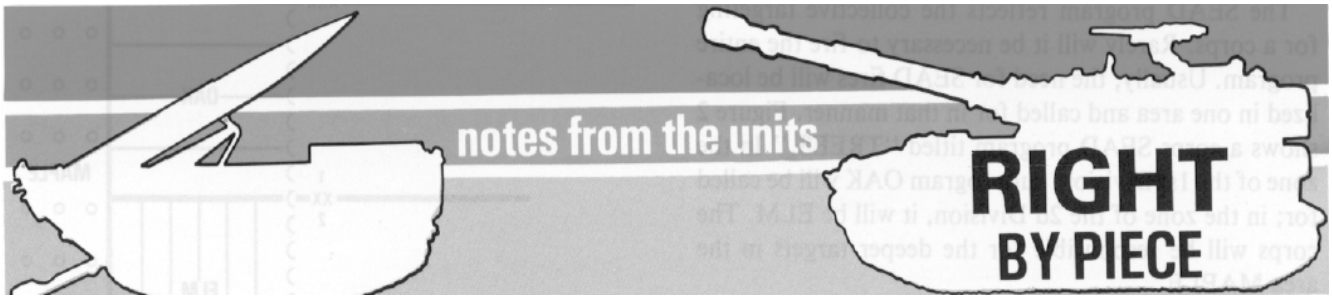


M198 tests complete

FORT BRAGG, NC—After 90 days and nearly 17,000 rounds, the formal field evaluation of the M198 155-mm towed howitzer is complete. The 1st Battalion, 73d Field Artillery, gave the new howitzer a real wringing out and the Army is now waiting for the official results.

During the tests to collect reliability and maintainability data, 170 moves and emplacements were made, 12 airmobile exercises were conducted, and 15 deep water fordings were carried out. The howitzers were towed nearly 2,500 miles on Fort Bragg ranges and the maneuverability of the long weapon in tight areas was one of the chief shortcomings noted by the crews. Approximately 3,400 rounds were fired with the maximum charge.

The post paper (the "Paraglide") interviewed some of the soldiers involved in the tests and got some comments that are not likely to show up in the formal test report but are relevant to the men who will eventually man these weapons.

"The howitzer is painted and is easier to maintain because there are no unpainted parts to polish [compared to the M114]."

"We used to carry our [section] equipment on the back of a truck and it was hard to find things, especially at night. Having the equipment mounted on the howitzer itself makes it easier to locate what we need."

"Because of its length and weight, the M198 is difficult to maneuver in tight spots."

25th Div Arty wins it all

SCHOFIELD BARRACKS, HI—When the votes were in for NCO of the Year and Soldier of the Year of the 25th Infantry Division, Div Arty had not only copped the top prize in each category, but also claimed runner-up spots in both.

SGT Eddie J. King (3-13th FA) was selected as NCO of the Year and SP4 Dennis Favors (1-8th FA) was named Soldier of the Year. Runners-up were SP5 Gilles Reames (D Battery (TAB), 26th FA) and SP4 Frederick Burns (2-11th FA), respectively.

Women now taking basic at Sill

FORT SILL, OK—The first female soldier to take basic training at Fort Sill has graduated, marking the final phase of fully implementing one station unit training (OSUT) at the Field Artillery Training Center.

The FA Training Center has been conducting the full 12-week combined basic and advanced individual training for male soldiers for a long time; but, because of the limited number of FA MOSs open to women, it was not practical to make all the changes necessary to incorporate women into the first eight weeks of Army training. Now that all but three enlisted MOSs in career management field 13 (Field Artillery) are open to women, the move has been made.

Private Barbara McDaniels, the only woman in a 150-soldier OSUT class, recently completed training as a Lance missile crewman. The biggest problem facing the female trainees is the lack of female uniform items available at the post's central issue facility; but, as the female population grows, the stocks of female uniforms will increase.

Private McDaniels' advice to women who will follow her is to maintain a high degree of motivation. "When the drill sergeants see that your efforts are honest and intense, they're always more than willing to help you out," she said.

7th Div Arty moves out

FORT ORD, CA—The entire 7th Infantry Division Artillery, including the Target Acquisition Battery, road-marched the 300 miles from Ford Ord to Fort Irwin to support the division's first major exercise of 1979.

Three weeks of training were planned for the 3,500 division soldiers at the Mojave Desert training site. While the div arty was at Irwin, the 2d Battalion, 8th Field Artillery, and the 6th Battalion, 80th Field Artillery, conducted battery-level ARTEPs in addition to supporting the maneuver exercises.

Most elements of the division flew to Irwin on Air Force C-141s, but div arty elements traveled by road, staggering convoys over a 10-day period.

Artillery battery in "Jack Frost"

FORT WAINWRIGHT, AK—Battery C, 3d Battalion, 319th Field Artillery, represented the 101st Air Assault Division Artillery during the Joint Readiness Exercise "Jack Frost" on the snowcapped mountains of Alaska.

Operating in four feet of snow, the cannoneers had very few problems because of excellent preparatory cold-weather training received at Fort Campbell, KY. The battery used proven cold-weather techniques for employing their six M102 105-mm howitzers. Plywood plates were used under the weapons' base plates to keep the howitzers from freezing to the ground. Instead of the aluminum stakes normally used to anchor the M102s base plate to the ground, iron stakes were made to penetrate the frozen ground. Special lubricants had to be used to prevent the breechblock from freezing, and special fluids had to be used to swab the tube.

In this white environment, parachutes were used to replace the usual camouflage nets, and a soap and water solution was applied to the weapon to provide a white covering over the olive drab paint.

The arctic mittens increased the time required to perform crew duties, but the supported units were pleased with the overall performance of the Artillery unit.

1st Div Arty on REFORGER

HAARDT, WEST GERMANY—Elements of the 1st Infantry Division Artillery returned to Europe for REFORGER '79, and the hospitality displayed by the people of the host nation was very gratifying. In a time when the United States and its military forces often are held in varying degrees of disrespect, the relationship between the Americans and their German hosts was unique and reassuring.

During REFORGER '79, Headquarters Battery of the 1st Infantry Div Arty arrived in the village of Haardt—population, 60. Div Arty was prepared to bivouac in tents when the villagers offered their homes and barns as more comfortable accommodations. A duck pen became a dining hall, and several attics became dormitories.

Part of the success for this assistance from the residents of Haardt goes to MAJ John Field, a Reserve officer assigned to Div Arty for REFORGER. Major Field, who is fluent in German, acted as the liaison officer between the artillery unit and the German soldiers, civilian police, and local citizens. When Div Arty was on the move, Major Field would precede the unit and coordinate with the Germans to explain what the American unit's purpose was and to arrange procedures for making the unit's visit as minimally disruptive of day-to-day life as possible.

"FIST of the 1st" Infantry Division on REFORGER '79 appears combat ready as they accompany maneuver units during exercise Certain Sentinel. The fire support team is made up of (left to right) PFC Larry Nance, PFC James Ausburn, Sp4 Robert Tanco, and SGT Larry Ozborn. (Photo by SP5 Gary Bloomfield)

An attic in a German farm house beats sleeping on the snow. Wall-to-wall sleeping bags cover the floor of this attic in Haardt, West Germany, where the 1st Div Arty bivouacked during REFORGER '79. (Photo by PFC Guadalupe Hernandez)

Right By Piece

TAC ASP for Lance

FORT SILL, OK—An improved method of training Lance units, the Tactical Annual Service Practice (TAC ASP), has been developed by the Field Artillery Missile Group Number 9. The TAC ASP is a Lance service practice conducted at White Sands Missile Range, NM. The TAC ASP is conducted in a tactical environment, designed in accordance with current TRADOC training concepts, and presents significant improvements in the evaluation and follow-up training process.

Past ASPs were scored tests conducted as nontactical exercises. Assembly operations were performed in administrative areas, live firing was conducted in a *technical* environment, and tactical considerations were *not* evaluated. Security, missile transport, and the stress of concurrent tactical and technical requirements were not a part of the ASP. The ASP score stood alone. Training managers used evaluation reports poorly, and unit commanders could not correlate ASP results with areas that needed training emphasis.

The TAC ASP has overcome these deficiencies. It is not a test and no "score" is given. It provides a diagnostic evaluation of the total unit mission capability that can be used by training managers to restructure their training. Upon completion of the TAC ASP, the unit is told about its accomplishments and weaknesses in all tasks. Future training can be realigned quickly to emphasize training where it is needed.

The basic structure of the TAC ASP concentrates on the performance of the *overall unit task*; that is, preparing and firing a safe and reliable missile. A series of individual and collective tasks are selected to evaluate the unit's ability to accomplish the overall unit task. Each of these tasks is performed under specific conditions and is evaluated by written standards. Each standard is assessed as being a "Go" or a "No Go." "Go" is assessed if the unit meets the written standard requirements. "No go" is assessed if the unit demonstrates a weakness in training or does not achieve the standard. The unit is awarded a "Go" if it fires a safe and reliable round, but receives a "No Go" if it doesn't. After the diagnostic process is applied to all evaluated tasks, the unit is made aware of those tasks that need additional training and those tasks that only require training to sustain the unit's performance level.

In addition to being a diagnostic evaluation, the TAC ASP is an evaluation of both tactical and technical tasks. At unit discretion, any task may be evaluated. Camouflage, security, convoy operations, and preventive maintenance are a few common tasks that may be selected. The tactical (common) tasks create a more realistic environment to provide a total unit assessment.

This evaluation concept is valuable for a variety of reasons:

- The TAC ASP is a snapshot of total unit training in terms of Army policy to "train as you will fight."
- The TAC ASP is the most viable method of evaluation because it dovetails with the Lance ARTEP. ASP tasks are extracted directly from the ARTEP. Training time is maximized since units do not train for two different evaluations.
- This evaluation method demonstrates to soldiers the training crosswalk between individual and collective tasks; individual tasks must be learned before collective unit tasks can be mastered.
- The TAC ASP provides another development in Lance training procedures with an evaluation technique that can be used at several levels of command for all types of evaluations. The platoon leader and battery commander can schedule and evaluate their own unit training by extracting tasks from the TAC ASP and can correct weaknesses internally. Higher level commanders through field artillery group and brigade level can formulate their own evaluations of any size unit through battalion level. The evaluation adaptability of this concept greatly facilitates combat readiness.
- The most important aspect of the TAC ASP is that the unit must act on tactical requirements while in possession of live missile rounds. The unit must pick up, assemble, transport, and fire a live missile in 24 hours. Evaluation of unit actions provides a valid assessment of the unit's firing capability, and that's what evaluation of training readiness is all about.

The TAC ASP is a dynamic multi-echelon training evaluation that culminates in the live firing of a Lance missile in a tactical environment. The principles are applicable to any unit in the Army. The TAC ASP is illustrative of, and vividly demonstrates, the application of the Army's new training doctrine by encouraging commanders to train as they will fight. (CPT Kent, FAMSEG)

FAM Gp 9 inactivates

FORT SILL, OK—After more than 17 years service, the Field Artillery Missile Group Number 9 will be inactivated 18 July. Since its activation on 15 March 1962, FAM Gp 9 has been home to Fort Sill's missile units and one of the few places, other than Europe, for Pershing missile soldiers to be assigned.

The Pershing battalion (3-9th FA) and the two Lance battalions (1-12th FA and 6-33d FA) will be transferred to the 214th Field Artillery Group located at Sill. The Field Artillery Missile Systems Evaluation Group will move from the control of FAM Gp 9 to the Field Artillery Center Directorate of Plans and Training.

The LAW does not have the accuracy nor the range to cope with the Warsaw Pact armored threat. (Photo by Thomas Casarez)

Redeye, the main air defense protection for the firing battery, is inadequate for the European battlefield.

"Bring back the M108 self-propelled 105-mm howitzer" is the recommendation to give our medium and heavy batteries a viable air defense/antitank capability. (Photo by E. H. Young)

Defending

by CPT Larry A. Altersitz

After talking for several years with fellow Redlegs about a future war in Europe, my conclusions are that we have two problems — air defense and antiarmor defense of the battery and insufficient equipment in our present TOEs for this defense. Here is the situation as I see it, along with some possible solutions.

Antiarmor defense

The scenario that most military planners envision for a European war calls for the NATO forces to begin attacking the Warsaw Pact forces in the covering force area (CFA) and beyond with long-range weapons that make the attackers deploy before reaching our main force. Then, as CFA units effect a passage of lines through the main battle area (MBA) to new positions, the full weight of available NATO arms stops the attack in the MBA. It's a nice plan, but we would be viewing the world through rose-tinted binoculars. If CFA or MBA units are penetrated in an armored assault, all rear units, especially artillery, will be in trouble. Fire support will be severely degraded if artillery batteries must displace to avoid armored forces, or worse, be forced to fight units equipped with direct fire weapons. All NATO artillery units are woefully vulnerable to any small armored or motorized force.

I don't discount the value or ability of our troops and equipment in Europe, but in Vietnam most artillery batteries were collocated with a company-sized infantry unit in a protected fire base. This was against a force consisting of *light infantry*, usually without on-call artillery and no armor. In Europe, at least one mechanized infantry platoon with antitank (AT) weapons would be needed per firing battery, with the remaining elements of that company on the perimeter of headquarters and service battery for defense. With the present doctrine of CFA and MBA defense calling for everything up on the line, where will that mech-infantry battalion for a div arty come from?

At present we do not have adequate AT defense at the battery/battalion

The Battery

by A. Altersitz

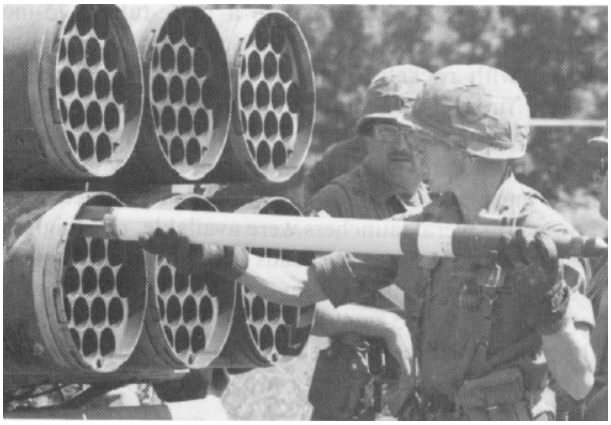
level. Only the 105-mm howitzer has a direct fire capability with AT rounds (HEP M327; HEAT-T M622), and one worries about the ability of any section to bring accurate fire on a firing, moving armored target. Our most numerous weapon (155-mm, SP) has no AT round, nor do the heavier general support weapons. Each battery now must depend on observation posts armed with light antitank weapons (LAW) and perhaps Dragon launchers for AT defense. If infantry platoons with AT weapons (Dragon, TOW, 90-mm/106-mm recoilless rifles) were attached, the situation would improve markedly. But that manpower restriction has been mentioned.

Possible quick fixes

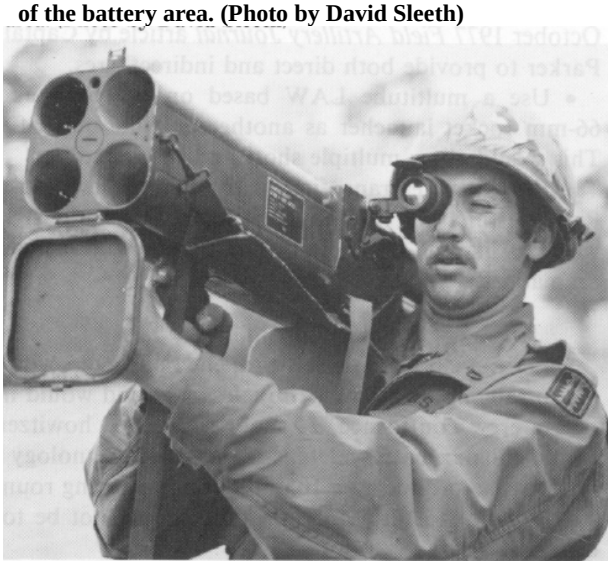
Here are several possible antiarmor quick fixes that could be implemented with existing equipment and little or no additional personnel.

• Upgrade one howitzer section's .50 caliber machinegun to a 20-mm or 30-mm automatic cannon, perhaps along the lines of the 25-mm Bushmaster cannon proposed for the Infantry Fighting Vehicle. Ammunition could be kept in modified .50 caliber trays at the gun and extra ammo carried in 25-round belts, linked as needed and stored in a permanent box on the gun mount. A burst selector could be added to control firing rates.

• Mount half the battery's M548s with high-velocity grenade launchers (HVGL) used on Cobra "chin" turrets. The 40-mm high-explosive dual-purpose (HEDP) is excellent against personnel carriers and can reach much farther with greater firepower than all the grenade launchers in a battery. The accuracy of the HVGL would be better than that of a LAW at ranges beyond 200 meters, and it would definitely have a much greater effect due to its 240-rpm rate of fire. Ammunition storage on the M548 could be eased by constructing ammo boxes on brackets on the front of the cargo area.



M200 rocket pods armed with 2.75-inch folding fin aerial rockets are possible aids in both antitank and air defense of the battery area. (Photo by David Sleeth)



One alternative for the current LAW is the 4-tube, 66-mm rocket launcher. (Photo by Phil Reed)

Should the Bushmaster 25-mm cannon (shown here mounted on an Infantry Fighting Vehicle) be added to one gun section of each 155-mm self-propelled howitzer battery?

• At observation posts, use a three-tube 2.75-inch folding fin aerial rocket (FFAR) pod on a .50 caliber tripod with rockets fitted with HEP or HEAT warheads, fired electrically by a sequential firing device. The surprise and shock of the 10- or 17-pound warheads hitting armored vehicles could disrupt many attacks. It is an inexpensive way to add enormous perimeter firepower. If several launchers were available, one might be loaded with flechette warheads to "button-up" attackers. A similar configuration could be mounted on the left side of the 155-mm, self-propelled howitzer tube at the support sleeve. A splash plate fixed to the turret face would be needed to protect the panoramic telescope and turret from the back blast.

• Use M200 rocket pods on pedestal mounts on various battery vehicles as described in the September-October 1977 *Field Artillery Journal* article by Captain Parker to provide both direct and indirect fires.

• Use a multitube LAW based on the four-tube, 66-mm rocket launcher as another possible quick fix. This would allow multiple shots and ease handling.

• Provide laser rangefinders for perimeter defense. Range estimation is always difficult. On stadia-sight weapons like the LAW, first-round hits would increase dramatically.

Future possibilities

Laser rangefinders on self-propelled howitzers would aid in ranging with direct fire telescopes and would increase crew confidence. A sabot round for howitzers would enhance battery defense. The sabot technology is not new, so producing a 105-mm armor-piercing round with a sabot to fill a 155-mm tube should not be too difficult.

The assignment of a TOW or Dragon platoon to each headquarters battery is a long-term solution. Six sections, each with two TOWs or four Dragon launchers on vehicles with trailers, would provide adequate coverage for a battalion and act as a short-notice antitank reserve to meet breakthroughs.

The vulnerability of NATO artillery to armored forces has been noted by many people. We cannot fulfill our mission of fire support for the ground-gaining arms if we must continually run from, or fight, armored personnel carriers and tanks that break through the MBA.

Air defense

NATO field artillery units can expect to be high priority targets for Warsaw Pact high-performance aircraft and armed helicopters. The air defense problems of a US division are acute. The division has 48 air defense firing elements in its ADA battalion, plus its organic Redeye teams. With these assets the commander must cover at least 10 maneuver battalions, all operations centers, the division support command, div arty, any attached units, all supply points, trains, and critical territory in his area of responsibility. Even with a *second* ADA battalion from corps or army, his assets are spread thin. With only one ADA firing element (a Vulcan or Chaparral) per company-sized unit, the organic ADA battalion will be pressed to cover the maneuver battalions. The air defense load can be lightened if field artillery units can defend themselves with organic weapons.

The air defense weapons organic to any artillery battalion are the individual small arms, M60s, .50 caliber machineguns, and Redeyes. The Redeye has a maximum effective range of 3,000 meters. The effective range of the small arms and machineguns is the burnout range of the tracers (1,100 meters for the .50 caliber). Volume fire is stressed in all material on unit level air defense, but we are unable to use our most effective means of volume fire — our howitzers. I propose other means and weapons to accomplish the air defense mission.

Possible quick fixes

The objective of air defense weapons is to provide volume firepower at enemy aircraft. If the weapons can also be used in an antitank role, so much the better. Here are some suggestions:

• Upgrade one of the howitzer section's .50 caliber machineguns to a 20-mm to 30-mm single-barreled automatic cannon. Volume firepower, adequate penetration, and kill assurance, plus a longer slant range, make this a superior air defense weapon.

• Have a 7.62-mm minigun mounted on an M548. With armor plate and good sights, you have volume firepower (4,800 rpm) and no new ammunition caliber added to the system. As an antipersonnel and antiarmor weapon, the 7.62-mm minigun forces vehicles to "button-up" and causes damage or destruction to exterior equipment.

• Install HVGLs, firing the standard antipersonnel grenades, on several M548s.

• Employ 2.75-inch FFARs on tripods or vehicles, firing high explosive or flechette rounds with variable time or time fuzes to throw up a curtain of steel. Fuzed for specific distances to cover the long axis of the battery, FFARs could be fired on command or by observation post guards.

• Claymore mines could be mounted on poles or trees around the battery perimeter to surprise low-flying aircraft. The Viet Cong used similar devices to deny landing zones to our helicopters.

• Use Copperhead rounds, fired at the command of forward observer or observation post personnel equipped with a laser designator, to attack slow-moving aircraft. If a procedure along the lines of immediate suppression were worked out, it might be useful.

• Employ an American M108 or a British "Abbot" 105-mm, self-propelled howitzer (fitted with extra armor, laser rangefinders, radios, and a small radar), using flechette and high explosive with VT fuzes, as a dual-purpose air defense/antitank weapon. This option is costly in all terms. Each howitzer would tow its own ammo trailer. The M622 and M327 rounds would be welcome in any battery for antitank defense. Light self-propelled howitzers are on motor carriages similar to those for medium howitzers so maintenance would be simplified. The light howitzer has a high rate of fire and ammunition capacity, the range is excellent, and they would not hinder the supported unit's ability to move. As air defense weapons, the light howitzer would be tied into the division air warning net and the supported battalion's command/fire net to take advantage of all target acquisition assets. Firing tables exist for the weapon, and to develop tables for air defense fire would not be insurmountable. Perhaps a ballistic computer tied in with the laser rangefinder could be used.

Future Possibilities

Development of canister/flechette rounds for medium howitzers for air defense and antitank use should be given serious thought. Something is needed to take advantage of a firing battery's main weapon, especially if we go to four-gun firing elements.

Perhaps a mini-Copperhead or an air defense missile could be fired from a medium or heavy howitzer, much like a Shillelagh missile is fired from a 152-mm gun-launcher. Directed toward a target by radar, laser, infrared, semiactive homing, or some other guidance system, the missile might give artillery units additional means to defend against air attack.

These ideas and comments are presented to stimulate discussion by members of the Field Artillery Community. The problems exist right now, and they will exist in any foreseeable European conflict.

CPT Larry A. Altersitz is the S1 of the 1st Battalion, 112th Field Artillery, New Jersey Army National Guard, Cherry Hill, NJ.

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Whence the 105-mm howitzer?

by Ms. Janice E. McKenney

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Could we have won World War II without the M101 howitzer? We almost had to try. The development and acquisition of the quarter-century mainstay of the Field Artillery was a mixture of politics, cost effectiveness, and hard military decisions. —Ed.

Representative Ross A. Collins: You are going to cling to the 75-mms?
General C. M. Wesson (Chief of Ordnance); Well, I suppose so, for the time being.
Mr. Collins: There are many people here in the Army who want to cling to them?
General Wesson: Yes; and it may be observed that we have a lot of ammunition for the 75-mms.
Mr. Collins: And that would be the only reason?
General Wesson: No. It has been greatly improved and is a splendid weapon. France has not abandoned it.[1]

12 March 1940

Throughout our history, Army officers have argued that Congress and ultimately the American people have been at least partially responsible for the Army's unpreparedness at the outset of our major wars. Some have claimed that the Americans' fear of permanent standing armies and their genuine antipathy for war influenced Congress to make parsimonious appropriations to the Army during peacetime, thus rendering the Army unprepared for war. The negligible danger of foreign invasion may also have been a contributing factor. And yet, in one instance it was the Army that was reluctant to adopt a new weapon. It was not until after the fall of France in June 1940 that the War Department made a concerted effort to replace the obsolete 75-mm gun with the 105-mm howitzer, the weapon that was to become the backbone of divisional artillery in World War II.

Because of conflicting views within the Army as to the proper role of the 105-mm howitzer, its adoption as a replacement for the 75-mm gun was delayed until after World War II began in Europe. In the years immediately after World War I, most artillerists had seen the 105-mm howitzer as a replacement for the 155-mm howitzer, the divisional general support weapon. But as the years passed and the 75-mm gun became more obsolete, many artillerymen wanted to adopt the 105-mm howitzer as a replacement for the 75-mm gun rather than for the 155-mm howitzer.

In World War I the armament of the divisional field artillery brigade consisted of two light 75-mm gun regiments (48 guns) and one 155-mm howitzer regiment (24 howitzers), plus a trench mortar battery. In furnishing direct support to the infantry, there were enough guns to provide one battalion (12 guns) for each infantry regiment. The 75-mm gun was a light weapon with a slightly longer range than the 105-mm howitzer, but its projectile was small and not very powerful, and its trajectory was flat. The 155-mm howitzer provided high-angle fire support for the division and counterbattery fire, but it was heavy and not as mobile as the 75-mm gun or the 105-mm howitzer. Even during the war, artillerymen saw the need for a weapon heavier than the 75-mm gun and for a howitzer lighter and more mobile than the 155 to provide high-angle fire. MAJ Charles P. Summerall, who had commanded the 1st Division's artillery at Cantigny and had risen to command V Corps, recommended that the divisional artillery brigade be increased by one regiment of 105-mm or 3.8-inch howitzers. Summerall felt that the light howitzer was indispensable in war and was especially suited for wooded areas and ravines. It was the best weapon for giving depth to barrages, and it had the same mobility as the 75-mm gun.

[1] **US Cong., "House Committee on Appropriations, Hearings Before the Subcommittee . . . on the Military Establishment Appropriations Bill for 1941," 76th Cong., 3d sess. (1940), 574.**

After World War I GEN John J. Pershing and others thought that the Army should be organized into small, highly mobile, hard-hitting units, but throughout the 20-year period before World War II, the divisions remained slow, large, not particularly hard-hitting, and not well adapted for maneuver. For field artillery, as well as for the division as a whole, the main problem lay in trying to balance the two important requirements of power and mobility. Writing in the years immediately after the war, theorists blamed the artillery for the positional warfare that had developed and felt that the solution to breaking the stalemate lay in surprise and forward movement with emphasis on the tank and machinegun. In reacting against positional warfare, they stressed mobility, smaller units, and less artillery.[2]

Suggestions for changes needed in the field artillery of World War I were incorporated in the report of the Hero Board which studied the experiences gained by the artillery of the American Expeditionary Forces (AEF). In December 1918 Chief of Staff Peyton C. March, a former artillery officer, appointed a board headed by BG William I. Westervelt to study the armament, caliber, types of materiel, kinds and proportions of ammunition, and methods of transportation to be authorized for a field army. The two reports, submitted in early 1919, became the basis for field artillery development for the next 20 years.

The Westervelt (or Caliber) Board based its recommendations on recent war experiences, relying heavily on the Hero Board's suggestions, the stocks of materiel on hand, and probable post-war reductions in appropriations. The board suggested that in addition to the 75-mm gun, a light field howitzer such as the 105 be substituted for the 155-mm howitzer in the division. Field artillery was supposed to be sufficiently mobile to neutralize the infantry of the opposing forces. Close contact with the supported infantry, forward displacement with reasonable facility, and sufficient ammunition supply were necessary to accomplish the task. The 155-mm howitzer was too heavy for these requirements, even though it was motorized.

After each branch of service had evaluated the reports, a general board (known as the Superior Board) met to incorporate the recommendations on organization and tactics. In the meantime, the Organizational Section of the General Staff was preparing outlines for TOEs based in part upon the growing belief that the AEF division (approximately 28,000 men) was much too large and unwieldy.

General Pershing felt that much of the Superior Board's report was based too heavily on the needs of

Battery C, 6th Field Artillery, used this 75-mm gun to fire the first shot leveled against the Germans by the American Expeditionary Force in World War I. The 75-mm gun "almost" fired the first shot of World War II.

positional warfare and not enough on a war of movement. Pershing thought the only way a mobile division could have its organic artillery with it at all times was to reduce the artillery permanently assigned to it. He suggested a division of 16,875 men that included one field artillery regiment of 75-mm guns rather than three regiments of 75-mm guns and 155-mm howitzers. This would have reduced the number of divisional artillery weapons from the 72 of the AEF division to 36, and placed the general support mission with the corps rather than with the division. The division which the General Staff contemplated had an approximate strength of 24,000 and included one field artillery brigade of two 75-mm gun regiments (48 guns). This plan conformed to Pershing's idea that the 155-mm howitzer should be eliminated from the division, but differed in that it retained the artillery brigade structure.

These points of disagreement seemed so important that the War Plans Division of the General Staff appointed the Lassiter Committee (named after its head, COL William Lassiter, also an artilleryman and former AEF general) to resolve the differences. Meeting in June 1920, the Lassiter Committee discussed the merits of the large AEF division and the smaller one recommended by General Pershing, taking into consideration that the increased range and mobility of artillery indicated that

[2]**Fred K. Vigman, "The Theoretical Evaluation of Artillery After World War I,"** ***Military Affairs,*** **16 (Fall 1952), 115-118.**

the forces of major foreign powers encountered in future warfare would be organized in great depth. Although the committee wanted a division that would insure mobility, the division's firepower and power of penetration were also important. A division of two infantry brigades and one artillery brigade was not as mobile as a division of one infantry brigade and one artillery regiment, but its mobility could be improved if auxiliary and smaller units were reduced, and it would have greater striking and penetrating power.

The recommended division had an approximate strength of 19,000. The committee decided to retain the artillery brigade with two 75-mm gun regiments — with the development of a light howitzer with the same mobility as the 75-mm gun, (as recommended by the Westervelt Board), the howitzer regiment would be reinstated in the divisional artillery brigade.

Although the improved plan of 1920 called for the eventual replacement of the 155-mm howitzer in the division by a new 105, there were those artillery officers who felt that the 75-mm gun should be the weapon replaced because of its flat trajectory and the small 75-mm projectile. During the war the United States and France had been the only major belligerents not equipped with a light field howitzer. Many artillery officers believed that from the standpoint of mobility, ammunition supply, and rate of fire, there were many advantages in adopting the light howitzer to replace the light gun.

To provide the weapons recommended by the Westervelt Board, the Ordnance Department constructed new weapons after receiving instructions from the Field Artillery branch. The Department would develop a pilot model, which would then be tested for technical qualifications and for its utility. If found satisfactory, the model would be adopted as a standard. The weapon would be issued to the Field Artillery School and to tactical units for extended field testing to determine its serviceability.

In the interwar period, however, insufficient funds caused more effort to be placed on modernizing the large stocks of existing weapons rather than on developing new ones. Efforts were made throughout the 1920s to produce a satisfactory 105-mm howitzer, but the economy made considerable production of new materiel and equipment almost impossible. Using captured German 105-mm howitzers as models, the Ordnance Department built two prototypes before the end of 1921. Unfortunately, the Field Artillery Board found both weapons too heavy (based on a six-horse draft), too clumsy to be easily maneuverable by a normal gun crew, structurally weak, and generally unsuitable for adoption.[3] Standardization of a 105-mm howitzer, M1, designed primarily for draft by horses or slow tractors, was accomplished in 1927. The Field Artillery Board found the weapon generally satisfactory. In 1929 the possibility of manufacturing enough 105-mm howitzers for use as divisional general support artillery seemed extremely remote, even though the new 155-mm models were more mobile than the old because of improvements in their carriages. Since there was a small increase in the budget that year, the War Department decided to reinstate the 155-mm howitzer in the division, while reducing the authorization for each corps artillery brigade by one 155-mm howitzer regiment.

In the crucial Army reorganization after World War I, GEN John J. Pershing (shown here visiting the 4th Division Artillery) wanted to cut divisional artillery to one regiment of 36 75-mm guns.

Although the War Department reinstated the 155-mm howitzer in the infantry division, interest in developing the 105-mm howitzer did not wane. Its development was hampered by an increased desire to have an all-purpose weapon for the infantry division — a weapon that would also be capable of performing as antiaircraft artillery.[4] In October 1931 four M2 105-mm howitzers

[3]**Ernest F. Fisher Jr., "Weapons and Equipment Evolution and Its Influence Upon Organization and Tactics . . .," monograph, US Army Center of Military History. Washington, 72.**

[4]**One should not confuse the all-purpose divisional gun with the infantry's desire for an "accompanying battery." In 1921 a howitzer company was added to the infantry regiment, although "howitzer" did not really describe the weapons in it.**

were delivered to Battery F, 1st Field Artillery at Fort Sill, OK, for testing. Although they expressed faith in the basic idea of the weapon, the Field Artillery School found the M2 unsatisfactory for a number of reasons. Nevertheless, after extended testing and some modifications, the M2 was approved as a standard on 23 May 1934. Because of reductions in allotments, however, its manufacture had to be eliminated from the program for fiscal year 1934.

Again in 1935 redesign of the 105-mm howitzer's carriage was postponed to enable the modernization of the 75-mm gun, the weapon that was fast becoming the Army's idea of an all-purpose gun. The modernization program for that weapon had been so successful that plans were made to equip all active divisional 75-mm gun batteries with new carriages by the end of fiscal year 1937. These modifications permitted high-speed towing and wider traverse, but they did not really improve the firing capacity of the gun. At the same time the program for modernizing the 155-mm howitzer carriages continued.

In the 1930s the Army again made efforts to reorganize the division in light of war experiences and recent developments in motorization, mechanization, airpower, and firepower. A grant from the Public Works Administration made it possible to increase the motorized equipment in both the National Guard and the Regular Army. The major western European nations and Japan had reorganized into smaller divisions, based on three infantry regiments rather than two brigades of two regiments each. In January 1936, Chief of Staff Malin Craig appointed a committee to study the modernization of the Army. The committee was to consider the recommendations of the chiefs of arms and services, the service schools, and other individuals; the organization of foreign divisions; and modern improvements in weapons and transportation. The tentative organization of the proposed division included one completely motorized field artillery regiment of one 105-mm howitzer battalion for general support and three direct support battalions, each with two 75-mm howitzer batteries and one 81-mm trench mortar battery. The light howitzer had recently been developed for direct support in the cavalry division.

Most of the armament was not available, however, and the committee suggested substituting available older weapons. Tables of organization were prepared and theoretically tested at the service schools and by small units. In September 1937 the 2d Division was directed to test the new divisional structure in the field. A basic criticism of the proposed division was its lack of sufficient artillery support.

BG Lesley J. McNair, commander of the 2d Field Artillery Brigade of the 2d Division, pointed out that the War Department reorganization committee had placed too great an emphasis on artillery in close support of the infantry. This emphasis was reflected in the number and organization of the 81-mm mortars and the substitution of the 75-mm howitzer for the 75-mm gun. He believed that modern artillery had great power in the individual projectile and that the key to success lay in the massing of fires on decisive points. Rarely in war, he reasoned, would there be sufficient artillery to cover all points thoroughly and continuously; therefore, fire should be massed on the most important targets. The procedure required centralized control, great flexibility in delivery, considerable range, and good communications. By using improved methods of fire direction and firing charts with fair accuracy, McNair thought that the gain in close support in the proposed division was more than offset by the loss in effectiveness of the artillery support as a whole. If artillery lost its power to mass fires over a wide front and was dissipated in local combat, then it would no longer exert the influence that had given it such importance in the past. McNair urged that close support weapons (the light howitzer and mortars) be kept at a minimum and direct and general support weapons at a maximum. The division needed more heavy weapons and fewer light ones.[5]

Others, too, had mixed reactions concerning the proper armament of the proposed division's artillery. There was a general trend to have weapons heavier than the 75-mm gun in foreign armies (the German army was rearming with a new 105-mm howitzer). Also, the modernized 155-mm howitzer with its high-speed carriage was much more maneuverable than previous models. Since many infantry officers still considered the 75-mm gun unsatisfactory for close support, some hoped that, if the 105 were ever introduced, it would replace the 75-mm gun instead of the 155-mm howitzer. Even though the United States showed increased interest in the 105-mm howitzer, there were still too many 75-mm guns (with ammunition) left from World War I. As an economy measure, these weapons were being modernized with new carriages. The project for developing a satisfactory carriage for the 105-mm howitzer was too low in priority to receive much attention while the 75-mm guns and 155-mm howitzers were being updated.[6]

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[5] **Memo, McNair to CG, 2d Division (8 April 1937).**

[6] **Ingles, "The New Division," 521-529; C. D. Roberts, "The Infantry Division," *Infantry Journal*, 43 (March-April 1936), 140-144.**

MG Robert M. Danford was Chief of Field Artillery during the critical pre-World War II years. "Economics" forced the United States to enter the war with the recently modernized 75-mm gun, of which there were large stockpiles.

By June 1938 new TOEs were prepared, and the 2d Division was selected for extended testing. Although the 1937 tests had shown that a four-battalion field artillery regiment presented no major tactical problems, the shortage of experienced commanding officers and the trend of foreign armies to increase artillery resulted in the regiment's separation into light and medium units. The light regiment consisted of nine 75-mm gun batteries, organized into three battalions. The medium regiment consisted of one 105-mm howitzer battalion and one 155-mm howitzer battalion. The armament of the proposed division thus consisted of 36 75-mm guns, eight 155-mm howitzers, and eight 105-mm howitzers, for a total of 52 weapons. The 1937 tests had shown that the 155 was superior to the 105 because it had greater firepower and greater availability. Still, the tests also pointed out that the 105-mm howitzer was a better weapon against personnel in the open. Despite the test results, Chief of Staff Craig reported that the project of supplying Regular Army divisional units with the modernized 75-mm gun was progressing and that of rearming the divisional units with the 105-mm howitzer had begun.

In June 1938 Chief of Field Artillery Robert M. Danford directed the Field Artillery School to study the 105-mm howitzer to determine what desirable characteristics the weapon should have and what the weapon's proper role should be in the division. According to the directive, the School staff was to choose between using the howitzer as the sole weapon in the division or as the accompanying general support piece for the 75-mm gun. But the staff instead suggested that a combination of 105-mm and 155-mm howitzers be adopted. As a substitute for the 155-mm howitzer, the 105, they felt, had little to recommend other than its increased mobility. The small gain in mobility, however, would be more than offset by the sacrifice in firepower. Noting experiences in recent wars, the staff felt that any reduction in firepower was unacceptable.[7]

Although the School's report stated that the proposition to have the 105-mm howitzer as the sole divisional weapon had much to recommend it, there would be great advantages in retaining the 155 as a general support weapon for increased firepower and for counterbattery fire, considered one of the best means of infantry support. If the 105-mm howitzer were substituted for the 155, it seemed very probable that the need for more artillery support would be severely felt. In conclusion, the report assumed that the 105-mm howitzer was the best and only substitution for the 75-mm gun, but noted that "In regard to the economic aspect of the situation it is realized that the large stock of 75-mm guns on hand cannot be scrapped at the present time. For any war in the near future they must be used."[8] The economic situation proved a deciding factor, for in December 1938 Danford warned the School that, if a war

[7] **"A Study of the 105-mm. Howitzer," prepared by direction of the Ch, FA, at the FA School (Sep 1938), US Army Field Artillery School Library.**
[8] **Ibid., 2, 17-19, 42.**

Table 1. Weapons characteristics as of April 1940.

Type	Weight of gun and carriage (pounds)	Muzzle velocity (feet per second)	Maximum traverse (degrees)	Maximum elevation (degrees)	Maximum range (yards)
75-mm gun, carriage M1897 (horse-drawn)	2,657	1,805	6	19	9,200 (6,930 maximum permitted by carriage)
75-mm gun M1897 carriage M2	3,250 (without shield)	1,805 (M1 shell) 1,755 (shrapnel) 1,950 (M48 shell)	85	45	9,200 (M1 shell) 9,760 (shrapnel) 13,500 (M48 shell)
75-mm howitzer carriage M3A1	2,000	1,250	45	50	9,200
105-mm howitzer, carriage M2A1	4,950	1,550	45	64	12,200
155-mm howitzer, carriage M1918	8,262	1,479	6	42	12,530 (shell) 10,835 (shrapnel)

erupted, the field artillery should expect to use the 75-mm gun, M1897 modified, since the project to equip the Regular Army units with the modernized weapon was near completion.

The attempt to realize the ideals of the Westervelt Board had resulted in the production and modernization of the 75-mm gun as an "all-purpose" weapon. The gun was a remarkable accomplishment in design, but in reality it was inadequate for either of its primary purposes. It did not have the necessary characteristics of a first-class antiaircraft gun, and it was too heavy and complicated for division-support missions. Its range had been improved but is trajectory was still flat and its projectile was not as powerful as that of larger weapons.

In the early months of 1939 Congress was planning its military appropriations for 1940. Noting threatening conditions in Europe, it was anxious to be prepared for a possible war. After the Bureau of the Budget had approved the authorization for modernizing the 75-mm gun, Congress tried to eliminate it. The report of the Senate subcommittee on appropriations contained the following statement:

> *The 75-mm gun is being supplanted in foreign armies with the 105-mm weapon, which has greater range and fires a heavier missile. Our Ordnance Department is developing such a gun and, undoubtedly, will be ready to go into production. If that is to be the weapon of the future, the committee questions the wisdom of continuing to spend large sums on the old 75s.*[9]

The War Department objected strenuously, stating that the range of the 105-mm howitzer was somewhat less than that of the 75-mm gun, that the 105 required a longer time to go into action, that the 105 had not been proved in battle, and that there were still about 3,500 French 75-mm guns with ammunition left over from World War I. Chief of Field Artillery Danford pointed out that replacing the 75-mm gun with the 105-mm howitzer would cost $87,500,000. This figure did not include manufacture of the 105's ammunition. The modernization program was reinstated in the Appropriations Bill for 1940.

Tests by the 2d Division were completed on 31 August 1939, and the preliminary report showed that the organization of the divisional artillery was sound. The Chief of Staff recommended the reorganization of five Regular Army divisions at peace strength under the new triangular structure. This recommendation was approved on 19 September 1939, but the new tables were slow in being published and some of the equipment was not available. As a result, the medium artillery was armed with the 155-mm howitzer rather than with the 105/155 combination that had originally been planned.

The reorganization committee prompted the Chief of Field Artillery in January 1940 to send questionnaires to each of the five triangularized divisions, in part to determine the policy for wartime production of the 75-mm gun and the proper armament mix for the division artillery. Of those answering the questionnaire, about 75 percent did not want the 75-mm gun in the division, the

[9] **US Cong., "Senate Committee on Appropriations, Hearings Before the Subcommittee . . . on HR 4630," 76th Cong., 1st sess. (1939), 4.**

most popular alternative being a mixture of 105- and 155-mm howitzers. Their reasons for desiring the mix were much the same as those stated by the Field Artillery School in 1938.

The following month Chief of Staff General George C. Marshall reported that progress had been made "in the important program for modernizing our field artillery weapons." Appropriations permitted 1,439 of the 75-mm guns to be modernized, and Marshall thought the modified piece especially suitable for fire against mechanized targets and unsheltered personnel. Still thinking in terms of a defensive war on this continent, Marshall noted that "concrete fortifications and masonry villages of European battlefields may dictate a need for a weapon firing of heavier projectile than . . . the 75-mm gun, but our forces would rarely be confronted with such targets in this hemisphere."[10] As for financial considerations, Marshall continued the reasoning of the previous year, stating that,

> *From a financial standpoint alone, the virtual junking of the 75-mm gun and ammunition and the expenditure of vast sums to equip the Army with the 105-mm howitzer and with the necessary reserve ammunition would be difficult to justify. The modernization of the 75-mm carriage costs $8,000 while the cost of the 105-mm carriage is $25,000. To substitute the 105-mm howitzer for the 75-mm gun would involve an expenditure of $228,000,000. . . . There is no 105-mm ammunition on hand, and we do have some 6,000,000 rounds of 75-mm ammunition valued at $60,000,000. To replace those 6,000,000 rounds by an equal number of 105-mm rounds would cost $192,000,000.*[11]

The War Department was aware, however, of the tendency in foreign armies to replace the light gun with a heavier weapon, so in March 1940 the Department adopted a standard 105-mm howitzer for production. Available funds provided for 48 of these weapons to be manufactured, and the Army planned to test these alongside the modernized 75-mm guns to determine their proper role. Congress was still not pleased with the Army's attitude concerning the 75-mm gun. Because of the situation in Europe, the production schedule was increased. The program for modernizing the 75-mm gun was to be completed by mid-1941, and the authorization for 105-mm howitzers was increased from 48 to 120

In May 1940 conditions in Europe worsened. The Allies, both in Europe and elsewhere in the world, were asking the United States to furnish weapons and supplies. The President and Congress included 75-mm guns as surplus items that were available for distribution, although the Army continued to protest, declaring that if war were to come soon, the 75s were the only plentiful weapon available. By June, 1,095 of the 75-mm guns had been sold as surplus (these, however, were not the modernized 75s), and orders were issued expediting the delivery of the 105-mm howitzers. At this time only 14 105-mm howitzers were available, while all models of the 75-mm gun totaled 4,236. Even though more 105s were authorized for production and many of the 75-mm guns were being declared surplus, the gun was still scheduled for use as the principal divisional direct support artillery weapon while the 105-mm howitzer was slated to accompany it as the general support weapon.

By June 1940 it became obvious that massive rearmament would be necessary. Manufacturing more 75-mm guns, weapons that had been in use for over 40 years and were only being modernized as an economy measure, was not the answer to the rearmament problem. In addition, the real need for heavier artillery weapons in the infantry division became clearly evident when reports prepared by Field Artillery officers during the maneuvers held in April and May became available for study. Almost unanimously, the officers recommended removing the 75-mm gun from the division artillery and substituting the 105-mm howitzer. While the Field Artillery branch was studying the reports, the War Department was planning to reorganize the triangular division, hoping to have its final decisions made in July. On 27 June 1940, two days after Germany concluded an armistice with France, the General Staff sent a memorandum to the Chief of Field Artillery, stating that the decision had been made to reorganize the division artillery with four battalions—three direct support battalions of 105-mm howitzers and one general support battalion of 155-mm howitzers. The War Department issued the reorganization orders for nine triangular divisions on 10 September 1940. Although the divisions were to continue using the 75-mm guns until the 105-mm howitzers became available (which did not occur on any large scale until 1943), the era of the long outmoded 75-mm gun in the division was over.

Although some critics have claimed that the War Department was too conservative in its approach to defense planning, the reasons behind its delay in adopting the 105-mm howitzer as a replacement for the 75-mm gun were more complex. At the end of World War I, the consensus in the Army was that the 105-mm howitzer should be developed and adopted as the divisional general

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[10] **US Cong., "House, Hearings on the Military Establishment Appropriations Bill for 1941," 4-5.**
[11] **Ibid.**

On 27 June 1940, the War Department decided to fight World War II with the 105-mm howitzer as the direct support weapon at division. Our first 105 model was light enough to be pulled by a half-section, but a truck as prime mover was more in tune with the times.

support weapon. As developments were made in the mobility of the 155-mm howitzer and in the perfection of a new 105-mm howitzer, the thinking changed. Those who wanted the howitzer to be adopted wished to see it used as a direct support weapon. The conflict delayed any decisions on the howitzer's adoption and contributed to the basic conservatism of the Army, caused by severe constraints in the budget. The large number of 75-mm guns and the vast amount of 75-mm ammunition on hand hindered the development of the howitzer. Because of prewar neglect in matters of procurement and research and development, the design and manufacture of the 105-mm howitzer could not be carried out overnight. In fact, the delay in producing the howitzer was not as long as it might have been because of the progress that had been made in developing the model adopted in March 1940. But the War Department, realizing that mass production could only be accomplished in a period of 18 months or longer and believing that it should be prepared for immediate war in the event of an attack, tried to plan for an Army that would be able to fight as soon as possible. After it was clearly evident, through the 1940 maneuvers and the German successes in Europe, that a weapon heavier than the 75-mm gun would be needed in the division, and after the War Department was assured by Congress that it would do all in its power to achieve massive rearmament as rapidly as possible, the Army readily adopted the 105-mm howitzer as the basic divisional field artillery weapon, one of the most outstanding achievements of World War II.

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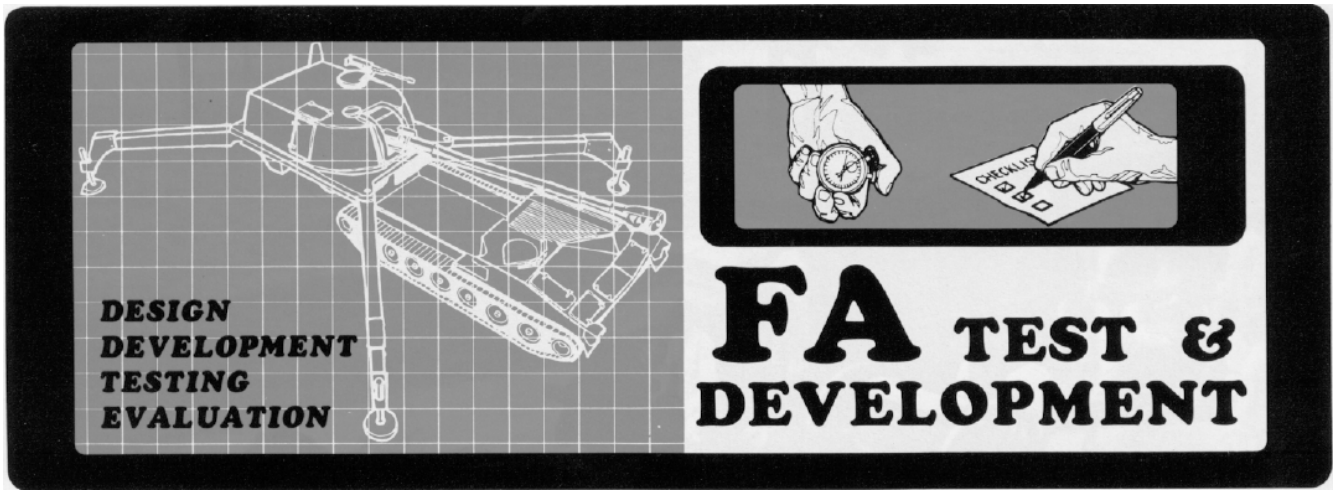


FY80 funds requested

The research, development, and acquisition (RD&A) portion of the FY 1980 budget for the Army has been delivered to Congress by Dr. Percy A. Pierre, Assistant Secretary of the Army for RD&A. Significant amounts of money requested for programs directly related to the Field Artillery include:

- $279.4 million for buying field artillery ammunition, mostly for increasing war reserve supplies.
- $144.8 million for continued development, design, and fabrication of the Pershing II missile system.
- $103.4 million to prepare the Mississippi Army Ammunition plant for producing 120,000 155-mm rounds per month.
- $94.8 million for 43 TACFIRE systems.
- $85.3 million to procure 155-mm white bag propellant charges.
- $72.3 million to complete the validation phase of the General Support Rocket System (GSRS) preparatory to awarding contracts. This includes firing 100 rockets.
- $70.6 million for procuring Pershing Ia missiles and related equipment.
- $61.9 million for procuring 1,764 rockets for GSRS and associated ground equipment.
- $54.7 million to procure 208 M198 155-mm towed howitzers.
- $46.4 million to buy 96 M109A2 155-mm self-propelled howitzers.
- $28.7 million for modifications to the M109 155-mm and the M110A2 8-inch self-propelled howitzers.
- $25.9 million for nuclear munitions work, mainly for the 155-mm and 8-inch systems.
- $25.4 million for producing 155-mm and 8-inch rocket assisted projectile components.
- $7.1 million to complete development testing of the Copperhead laser guided projectile.
- $6 million for developing a prototype forward observer vehicle.
- $5.7 million to procure 276 XM90 chronographs.
- $4.3 million to complete testing of the Firefinder radar sets.
- $4.1 million for continued modification of Lance missiles.
- $3 million for concept definition of a terminally guided warhead for the GSRS.

Firefinder systems in production

Hughes Aircraft Company will complete low-rate initial production by building 22 additional AN/TPQ-37 Firefinder artillery locating radar systems. The AN/TPQ-37 is designed to pinpoint the position of active enemy artillery weapons to enable effective counterfire to be returned within seconds.

Under a $77.4 million contract from the Electronic Research and Development Command, Hughes will produce the mobile Firefinder systems which can scrutinize the battle area with a beam that scans so rapidly that it forms a sensitive "blanket" across the area. Hundreds of "phase shifters" steer the antenna beams, which instantly spot any incoming projectile, or even many projectiles at the same time. The system then tracks the projectile's trajectory, and a small computer back-plots the trajectory to the firing weapon location — all automatically and within seconds. The Firefinder operator then passes the enemy weapon's location to TACFIRE for immediate counterfire.

The full-scale production decision for the AN/TPQ-37 is scheduled for mid-1980. The other component of the Firefinder system, the AN/TPQ-36 mortar locating radar, is currently in full-scale production and two systems have already been deployed. A complete Firefinder system for an Army division consists of two AN/TPQ-37s and three AN/TPQ-36s.

PII funded

Martin Marietta Aerospace has been awarded a $360 million contract for full-scale development of the Pershing II missile system, with the Orlando Division as the prime contractor. The test program for the new guidance system culminated in a series of highly successful full-scale missile flights at White Sands Missile Range, NM, in 1977-78.

Pershing II will incorporate a highly accurate terminal guidance system in a maneuverable reentry vehicle and will have a range well beyond the 400-mile capability of the Ia version. According to COL Larry H. Hunt, Pershing Project Manager, the extended range — along with the precise accuracy and smaller warheads — will offer greatly increased military effectiveness and strengthen the deterrent value of the weapons sytem.

The Pershing II terminal guidance system incorporates an all-weather radar-correlation unit that compares the live radar return with a pre-stored radar image of the target area. Continual automatic comparisons of the two provide control signals to maneuver the reentry vehicle to an accurate impact.

Pershing II represents the first major change in the missile itself since the Pershing surface-to-surface weapon system was first deployed to Europe in 1964. The new missile will take advantage of existing Pershing ground equipment to include the transporter/erector-launcher. This equipment has been continually updated with modular improvements to reduce reaction time and keep the system abreast of technology.

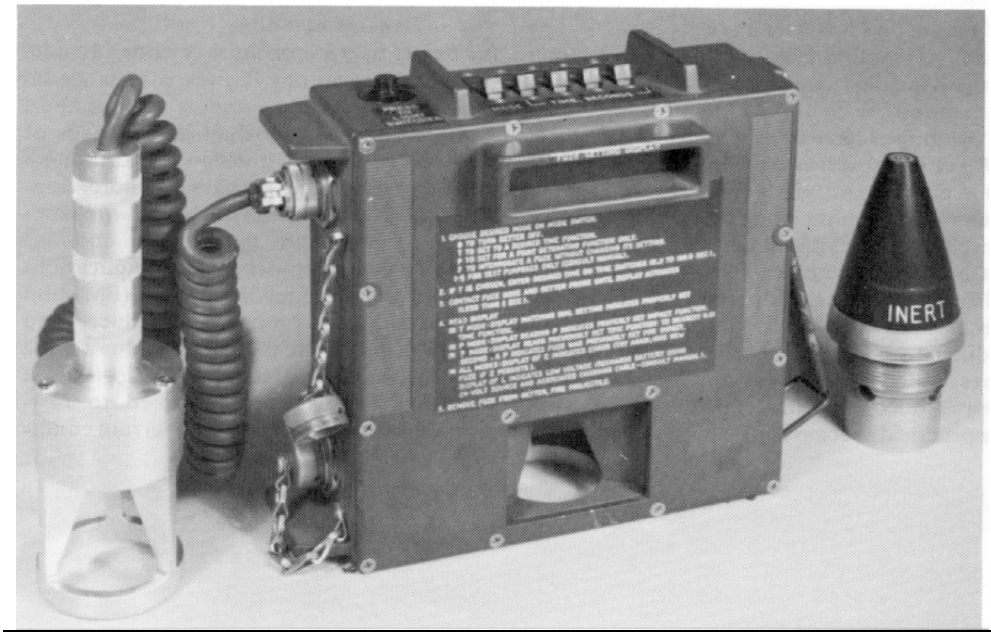
With the added range of PII and current positioning of our European Pershing batteries, the new missiles will be able to reach targets ***inside*** *the Soviet Union. The current PIa can only range the Warsaw Pact satellites. News reports and commentary by the civilian media see this as a major political issue for West Germany in its efforts to improve relations with east European nations. From a defense standpoint, the PII is seen as a companion or alternative to the cruise missile as a counter to increased numbers of intermediate range ballistic missiles in the Soviet arsenal. —Ed.*

Electronic fuze setter standardized

The Army has type-classified a new electronic fuze setter/fuze combination that is fast, accurate, and rugged. The M587/724/36 electronic time fuze system will be in the hands of troops by the early 1980s.

The system is composed of the M587 fuze for high explosive projectiles, the M724 fuze for submunition and canister rounds, and a seven-pound M36 electronic fuze setter (page 51, March-April 1977 *FA Journal)* which can be used to set either fuze. The fuze system is compatible with a wide variety of projectiles and cannons.

The M36 electronic fuze setter with an inert M587 fuze. The M587 or the M724 can be set by placing the nose of the fuze in the hole in the bottom of the fuze setter or by use of the wand at left if the unit prefers to mount the fuze setter to a wall of a self-propelled turret or on the trails of a towed weapon.

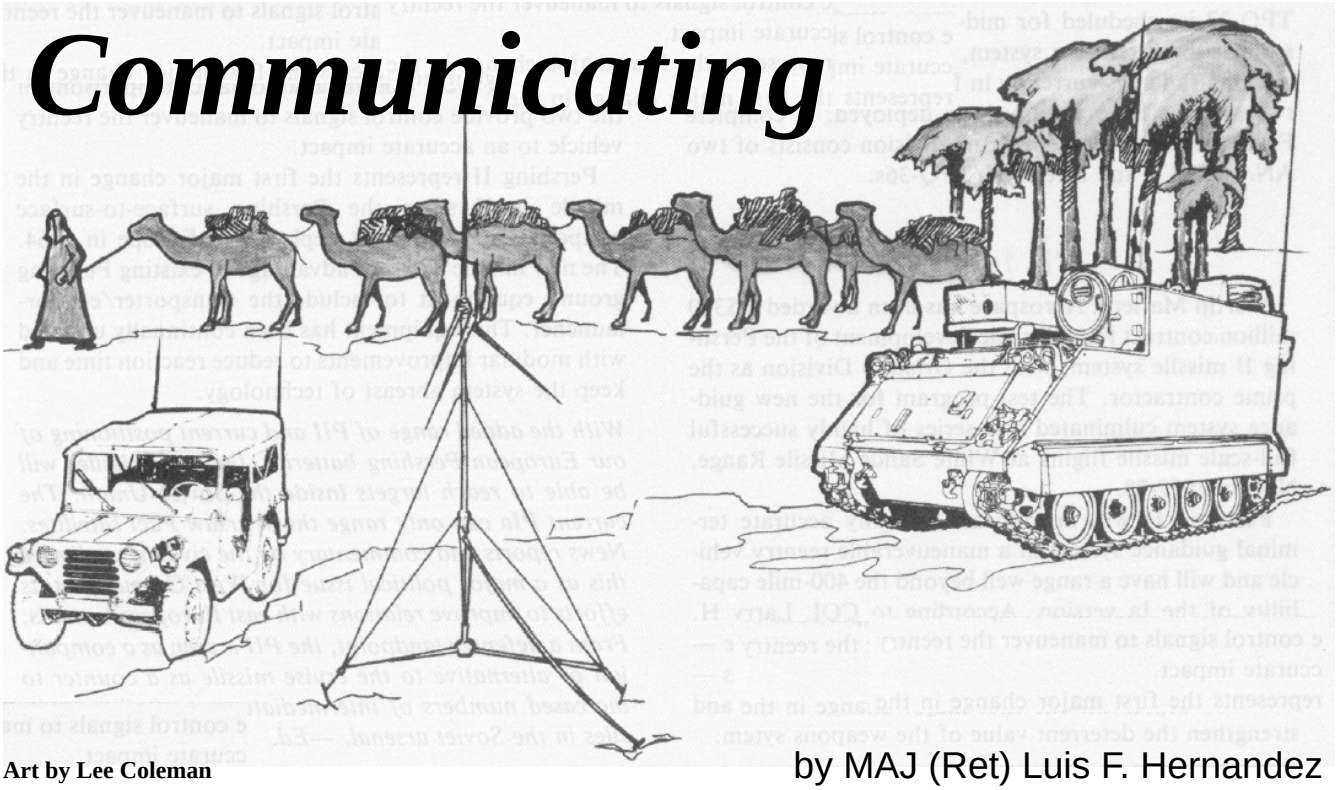


The system is the first all-electronic fuze-setting method to be accepted by the Army. There are no moving parts in either the fuzes or the fuze setter. Setting is not only rapid and exact, but the M36 also includes an automatic internal check of the electronics in both the fuze and the setter.

Reliability tests involving more than 2,000 rounds showed the system to be very rugged and better than 98 percent reliable.

Harry Diamond Laboratory developed the new fuzing system.

Communicating



Art by Lee Coleman

by MAJ (Ret) Luis F. Hernandez

In Desert Environments

With the important commitments the United States has throughout the world, it is essential that commanders and communicators be aware of the major communication problems confronting them in all environments. We must minimize these problems by ingenious planning, training, and use of all available tools of the trade.

This article covers some of the factors influencing the establishment and maintenance of communications in desert terrain and some of the expedients and lessons learned during the past two decades.

Desert terrain and climatic conditions have significant effects on communications. Most of the adverse effects can be overcome by thorough training, careful planning and selection of equipment, and good maintenance. Although most communication equipment is designed to maintain its capabilities over a wide range of environments, extreme weather conditions can cause equipment to perform poorly unless precautions are taken.

Desert operations are conducted under a wide range of daily temperature extremes. Wind-driven dust and sand particles will frequently reduce visibility. Foot messengers are normally impractical because of the great distances between units and the extreme heat. Motor messengers could be used extensively, but they must be able to master navigation techniques because of the lack of landmarks. Visual communications are generally effective over longer distances, although mirages and dust storms sometimes temporarily restrict their use.

General planning

Planning for desert operations must consider an adequate means of communications; however, reliance on any one means is inadvisable. Radios are smaller, lighter, and more easily installed than other means of communication with equivalent transmission distances. One of the most important advantages of radio communication is its mobility. On the other hand, wire communication is free from static interference and has proved to be vital for person-to-person communication. The planning range of frequency modulated (FM) and single sideband (SSB) radio equipment is reduced and downtime of signal equipment is increased due to the excessive heat, dust, and sand storms. Radio is used extensively because it is particularly suited to fast-moving situations. In consideration of the terrain conditions

and increased distances between elements of the field artillery battalion and the supported brigade, greater emphasis must be placed on employment of air relay, when available, and the automatic retransmission capabilities of the AN/VRC-49 radio set.

Security

In all military operations, but particularly in desert areas, radio discipline must be enforced to maintain security. The wide dispersion of units causes a high degree of reliance on radio as the primary means of communication. Thus, our radio communications become an especially lucrative source of information for the enemy.

Since conversations over ground-return circuits may be easily intercepted by the enemy, authentication systems or operation codes should be used, and the use of ground-return circuits supervised in the same way as voice radio sets. Wire lines should be laid away from oases or built-up areas to avoid sabotage or wire tapping. Communication personnel must be alert for the following indications of wire tapping and sabotage actions:

- Unfamiliar background noise.
- Footprints and test clips of foreign manufacture around test stations or wireheads.
- T-splices under culverts, bridges, etc.
- Sections of wire circuits cut out, short-circuited, or destroyed.
- Posts, lance poles, or trees holding wire lines cut down.

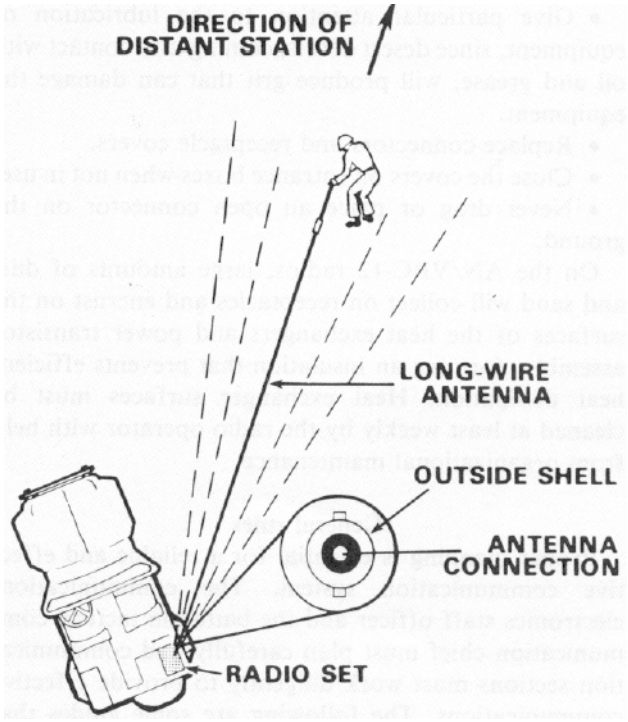
Antennas and field expedients

Transmission distance of FM and SSB radios may be extended by use of special field expedient antennas. Desert terrain provides a poor electrical ground, and, unless considered in planning, radio ranges may be greatly reduced. To compensate for the adverse effects of poor electrical ground, a grounding plate, a conductor, or a series of conductors should be used when constructing field expedient antennas with a ground connection. In some cases conductivity can be increased by treating the soil around the ground rod with highly conductive materials such as copper sulphate, calcium chloride, or salt.

For best results, antennas should be located on high ground. When radio set AN/GRC-142 is used at frequencies from 2.0 to 20.0 megahertz, the best range can be obtained by locating antennas near oases or subterranean water, but a longer than standard rod will be needed. Transmitters using whip antennas will lose one-fifth to one-third of their operating range because of the dryness of the ground. For this reason it is important to use complete antenna systems such as half-wave assemblies and vertical antennas with adequate counterpoises. One antenna that can be used to extend the range of FM radios is the long-wire antenna AT-984/G. This antenna is particularly desirable as a jamming counter-measure if properly oriented with the distant station. If the AT-984/G is not available, a field expedient can be constructed.

Desert terrain is particularly soft, loose, and sandy, which makes it difficult to find a place firm enough to permit proper installation of the ground plane antenna RC-292 or half-wave antenna GRA-50. Longer than standard guy stakes or anchors must be used to stabilize the antenna. Trees and other vegetation may be used but normally are very scarce in desert areas. When other types of anchoring devices will not work or are not available, a "deadman anchor" is the only solution. It

The only material required to construct a field expedient for the AT-984/G is a length of WD-1/TT wire of about 47 meters. Connect the long-wire antenna to the antenna base by baring the lead-in of the long wire (both conductors if a twisted pair is used). Stick the wire down inside the long antenna base or antenna connector and wedge it in place with a small piece of wood, rubber, or cork. Be sure that the bare ends of the conductors contact the center connection but do not touch the outer shell. Move the long wire slowly in an arc in the direction of the distant station until maximum signal strength is received.



AT-984/G field expedient.

is made by wrapping a rope, cable, or heavy wire around a large object (a log or a fuel drum filled with sand). The "deadman" is then buried in the sand.

Wire communication

Wire communications have limited effectiveness because of the demand for speed, mobility, and dispersion usually associated with desert operations. Also vehicle movement may disrupt wire communication by cutting wire lines. Overhead wire installation in command post areas is the least desirable method. However, if it is necessary to use wire, pole lines must be erected. Three poles are lashed together at the top in a tripod arrangement. This helps prevent lines from toppling during severe windstorms. Operations which must involve strenuous activity such as laying wire lines to the batteries and the maneuver brigade should be conducted at night or during early morning hours to preclude heat casualties. Buried field wire lines will give good service in the desert, but must be carefully plotted on the line route map and tied and tagged at frequent intervals, because shifting sand will cover the lines and make location and maintenance difficult.

Maintenance

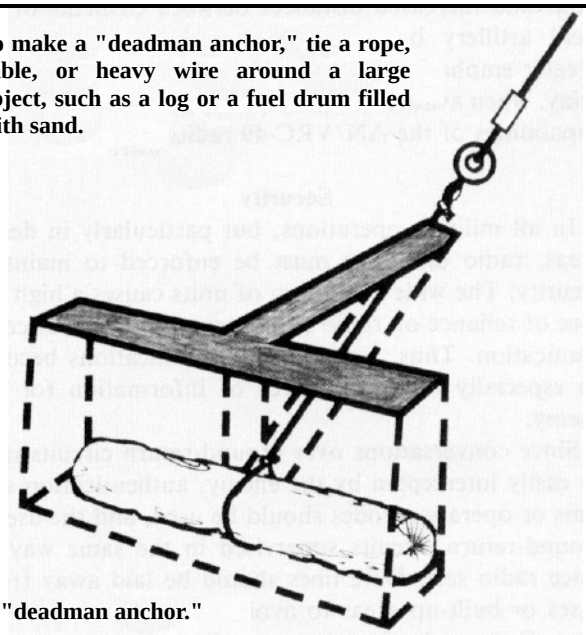
In desert areas, the maintenance problem is increased by the large amounts of sand, dust, or dirt that can enter the equipment. To reduce downtime:

- Keep sets in their dustproof containers.
- Make preventive maintenance checks frequently.
- Give particular attention to the lubrication of equipment, since desert debris, coming into contact with oil and grease, will produce grit that can damage the equipment.
- Replace connectors and receptacle covers.
- Close the covers on entrance boxes when not in use.
- Never drag or place an open connector on the ground.

On the AN/VRC-12 radios, large amounts of dust and sand will collect on receptacles and encrust on the surfaces of the heat exchangers and power transistor assembly, forming an insulation that prevents efficient heat dissipation. Heat exchanger surfaces must be cleaned at least weekly by the radio operator with help from organizational maintenance.

General rules

Proper planning is essential for a reliable and effective communication system. The communication-electronics staff officer and the battalion tactical communication chief must plan carefully and communication sections must work diligently to provide effective communications. The following are some guides that will apply in practically every case:



To make a "deadman anchor," tie a rope, cable, or heavy wire around a large object, such as a log or a fuel drum filled with sand.

A "deadman anchor."

- Base communication plans on the specific tactical situation and not on all eventualities.
- Install and maintain wire lines in the battalion command post and battery position areas, regardless of the expenditure of effort, time, and material. A complete wire system is essential for the coordination of perimeter defense and internal security of the unit.
- Place all wire lines away from roads or trails and at least 18 inches underground to prevent cutting by enemy fires.
- When time is limited, use "phantom circuits" to provide additional wire circuits between the battalion FDC and the firing batteries.
- Supplement wire with radio, even in base camps or assembly areas, so that communications may be maintained during periods of heavy shellings, bombings, or guerrilla raids, when wire lines may not be operative.
- Insure that radio operators are proficient in the construction of improvised or emergency antennas.
- Increase the supply of dry batteries to offset the high attrition rate caused by extreme temperatures and direct sunlight.
- If radio silence is prescribed, make provisions for a communication check after radio silence is lifted. Do not expect SSB radio sets to function properly immediately after considerable periods of radio silence due to changes in atmospheric and ionospheric conditions.
- Insure that SSB radio operators are proficient in CW operations.
- Take full advantage of remote capabilities.
- Operate generators and vehicle motors at sufficient intervals to avoid exhausting batteries. Times of operation

would depend on security requirements; i.e. noise discipline.

Conclusion

In any special type operation, an efficient and dependable communication system is difficult to install and maintain, but not impossible. Communications personnel at all levels must be familiar with difficulties peculiar to this type of operation, know their equipment and, most important, have a large bag full of field expedients.

Our communications equipment ranges from the sound-powered telephone at the firing battery to the sophisticated troposcatter, multichannel system of the Pershing battalion, but their installation and operation depend on the courage, alertness, endurance, professional knowledge, and competence of the operator. Providing him with desert-oriented training and conditioning, in addition to motivating him to achieve a high degree of self-discipline, is a responsibility of leadership.

MAJ (Ret) Luis F. Hernandez is the Training Specialist Supervisor of the Communications Division, Communications/Electronics Department, USAFAS.

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

Lance and the hand-held calculator

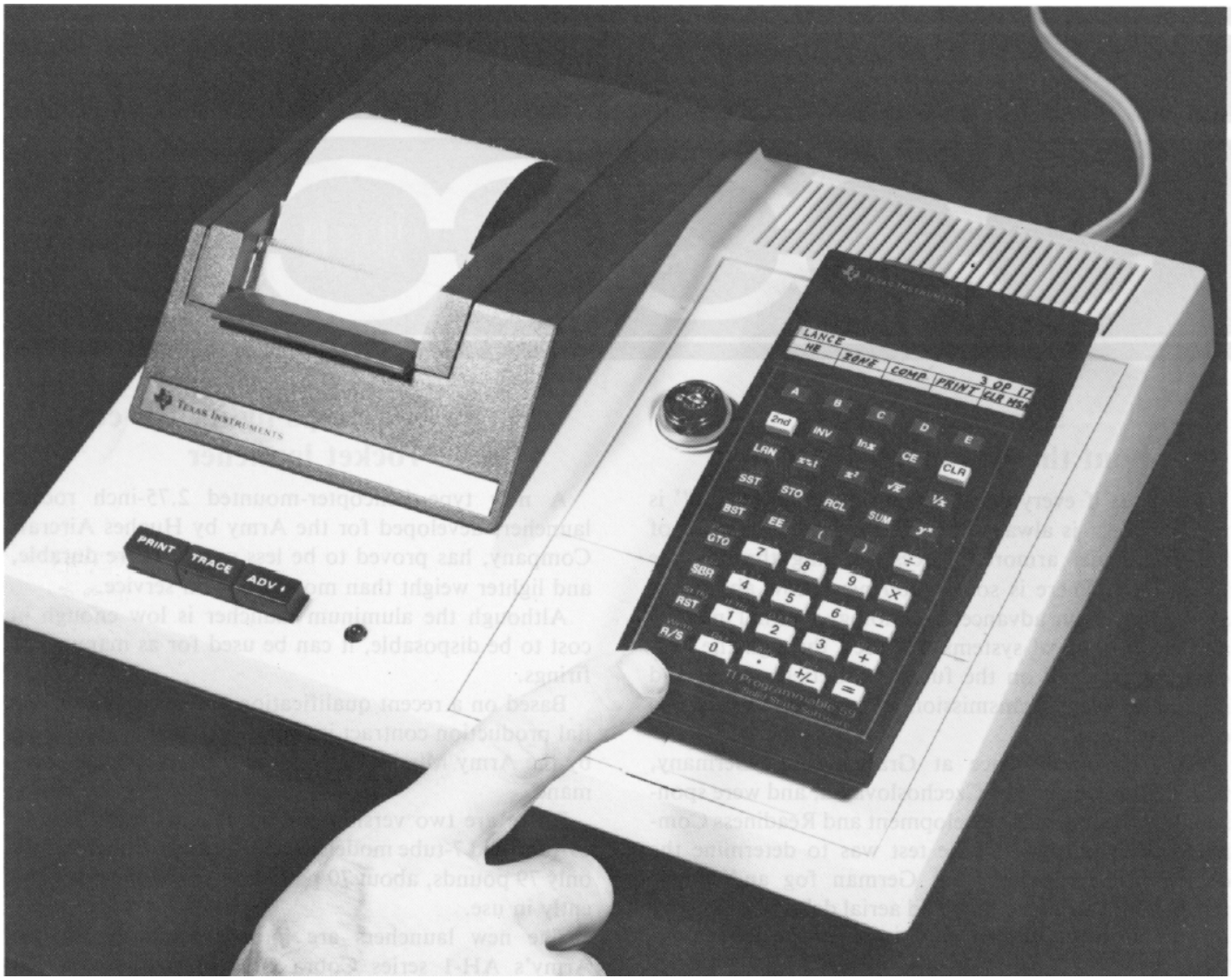
by SFC Shelton Alsup

Since its inception Lance has been hampered by dependence on the antiquated manual ballistic solution used as the secondary means of obtaining firing data. This method, using tabular logarithms and numerous mathematical operations, requires 20 minutes for an average computer to complete and is the cause of degraded system reaction time during periods when FADAC is non-operational. To alleviate this problem, the Lance Instructor Branch of Weapons Department, USAFAS, with input from the field, researched various calculators and determined that a card-programmable, hand-held calculator with a module for Lance would provide the best solution using off-the-shelf equipment.

Using the Texas Instrument hand-held calculator TI-59, a program was developed to eliminate the requirement for logarithms and Part 1 of the firing tables and to automate all required mathematical operations. With this calculator and program, Lance nuclear missions can be computed in three to four minutes, high explosive missions in four to five minutes, and zone-to-zone grid transformations in about two minutes. Currently, the program must be initially entered via the keyboard and then recorded on magnetic cards which come with the calculator. When power is turned off, the program is lost, but only seconds are required to reprogram the calculator using the magnetic cards. The program also provides a printout of firing data if the TI-59 is connected to a PC-100A printer/security cradle.

An instructional package, WL-CPHHC, Aug 78 (Programmable Hand Held Calculator Lance Missile Program Packet), provides users with general programming information, a program listing, a flow chart, and sample problems with keystroke-by-keystroke guidance for the solution of nuclear, nonnuclear, and zone-to-zone transformation problems. Fort Sill Form 123 (Test) has been printed and provides a simple flow chart to guide the operator through Lance ballistic computations and zone-to-zone transformations and serves as a record of firing data. Both the guidance package and forms have been forwarded to all US Lance battalions for comment.

To improve the utility of the calculator, the Lance program (along with cannon, mortar, and munitions effectiveness programs) was provided to Texas Instruments who constructed a hardwired module or "chip." These modules are being tested at Fort Sill and Fort Hood. When the calculator is equipped



The TI-59 and the PC-110A printer/security cradle.

with this gunnery module, the magnetic cards are no longer required since the program is not "lost" when power is turned off.

The Lance Branch of the Weapons Department is developing a new program that will result in the manufacture of a pure Lance module for use with magnetic cards. If this program is successful, firing tables will no longer be required to perform ballistic computations.

How does the Lance fire direction center operate when equipped with the card programmable hand-held calculator? If FADAC is operational, it should be used since it remains the primary means of obtaining firing data. Two independent operators use calculators to compute the mission to verify the FADAC solution. This is the secondary mission of the calculator. The calculator's primary role is solving the ballistic problem when FADAC is not operational. In this mode, two computers with calculators, working independently, determine firing data and the two solutions are compared to insure accuracy.

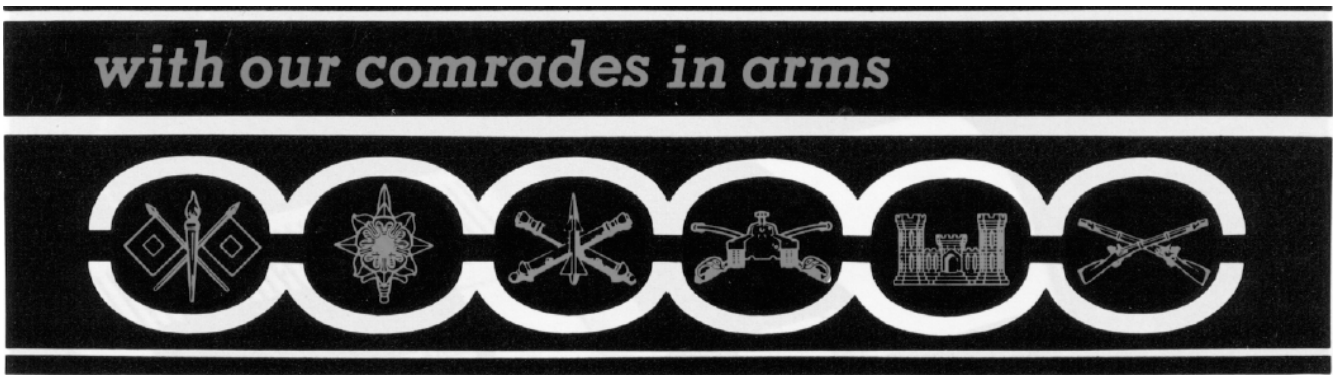
The TI-59 and the PC-100A printer/security cradle can be purchased through the General Services Administration. The following information is provided for anyone wishing to buy these items:

Item	NSN	Cost
TI-59	7420-00-T69-3395	$239.95
PC-100A	7420-00-T68-6738	$168.00

A letter requirement for these items has been forwarded to US Army Training and Doctrine Command and US Army Materiel Development and Readiness Command. If approved, this action will authorize procurement and issue of these items to all units.

Action is being initiated to change ARTEPs, Soldier's Manuals, and other training references to reflect the use of these calculators. In the meantime, use of the calculator is encouraged to avoid the degradation of reaction time when FADAC is not operational. Any questions on the Lance program should be addressed to the Lance Branch, Weapons Department, USAFAS, Fort Sill, OK 73503.

SFC Shelton W. Alsup is a fire direction instructor in the Lance Branch, Weapons Department, USAFAS.



Some *good* news about the European battlefield

Seems as if everytime the "European battlefield" is mentioned, it is always in some foreboding context of massive Soviet armored forces crashing through the Fulda Gap. There is some *good* news now about our ability to use our advanced technology thermal imaging and electro-optical systems to "see" through the obscuration expected on the future battlefield. Laser and millimeter wave transmission experiments were also conducted.

The tests took place at Grafenwoehr, Germany, within 30 kilometers of Czechoslovakia, and were sponsored by the Materiel Development and Readiness Command. The purpose of the test was to determine the degree of degradation that German fog and clouds mixed with battlefield dust and aerial debris would have on our precision guided munitions and target acquisition devices.

Results of the tests showed that battlefield dust dissipates more rapidly in Europe than in the US because of the indigenous moisture and vegetation. Another positive finding was that the Army's new tank thermal sight is compatible with the prevalent haze and fog conditions in Germany. Tested systems were even able to penetrate the massive dust clouds created by the firing of the 1st Battalion, 16th Field Artillery, simulating Soviet barrages.

More tests are scheduled for this summer.

XM1 to have German gun

The debate over which weapon to use as the main gun for the US Army's XM1 tank is finished. A German 120-mm has been selected, according to a statement prepared for delivery to Congress by Army Secretary Clifford Alexander.

Initial models of the new main battle tank will carry a 105-mm gun which will be replaced by the 120-mm tube at a later date. Schedules call for 110 XM1s to be produced in FY 79.

Hughes develops light, low-cost rocket launcher

A new type helicopter-mounted 2.75-inch rocket launcher, developed for the Army by Hughes Aircraft Company, has proved to be less costly, more durable, and lighter weight than models now in service.

Although the aluminum launcher is low enough in cost to be disposable, it can be used for as many as 32 firings.

Based on a recent qualification test program, an initial production contract is expected to be awarded soon by the Army Missile Research and Development Command.

There are two versions of the Hughes launchers — 19-tube and 7-tube models. The 19-tube launcher weighs only 79 pounds, about 70 pounds less than the one presently in use.

The new launchers are intended initially for the Army's AH-1 series Cobra helicopters and new advanced attack helicopters. Hughes also is studying modifications to permit the launchers to be adapted to fixed-wing aircraft.

Protection for storage sites

The Army has signed a $3.34 million contract with GTE Sylvania for development, fabrication, and testing of the Facility Intrusion Detection System (FIDS).

The FIDS will provide a system to protect nuclear and chemical weapons and other sensitive items against a variety of threats in many different environments. The system consists of a communication, control, and display system, and a variety of sensors and sensor test simulation devices. FIDS will be able to use infrared or ultrasonic motion sensors; ultrasonic, vibration, or switch type structure penetration sensors; and point sensors that detect intruder proximity to protected objects.

GTE Sylvania will design, build, and test three FIDS systems and write training manuals and technical data packages for the systems.

The Army will receive three prototype systems in the summer of 1980 for testing at Forts Belvoir, Huachuca, and Bragg.

Smoke screens for tanks

Smoke screens could provide a significant tactical advantage for the Army's M60-series main battle tanks on future battlefields.

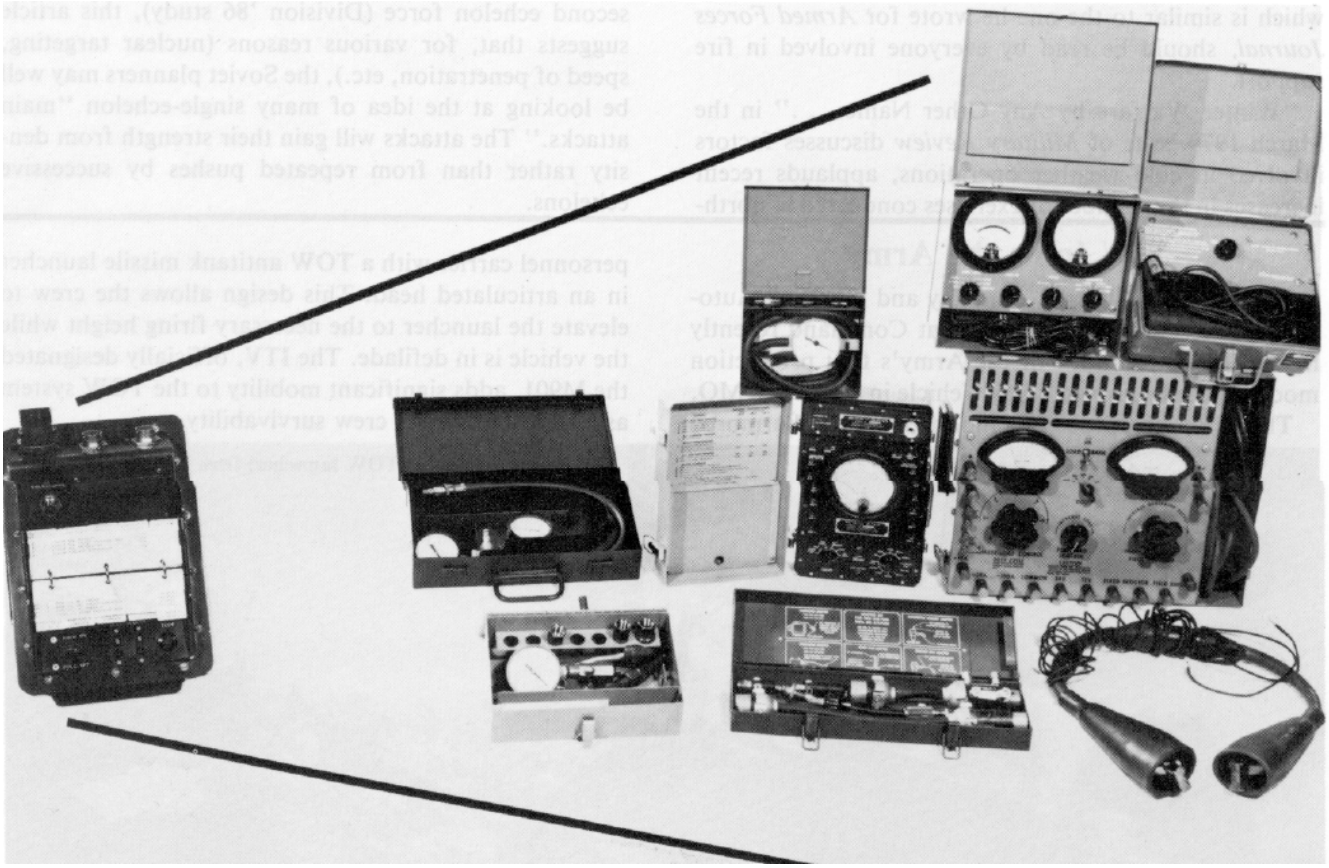
According to information gathered on the 1973 Middle East War, fewer armored vehicles would have become victims of antitank guns and missiles if they had been hidden from the enemy's view.

A vehicle engine exhaust smoke system (VEESS), being developed at Aberdeen Proving Ground, MD, will allow armored vehicles to effectively conceal themselves from visual observation. The VEESS uses the vehicle's engine and fuel pump to inject diesel fuel into the engine's exhaust system where it is vaporized and expelled. On contact with the surrounding air, diesel vapor cools and condenses to form a thick white smoke cloud. Tests have demonstrated that the resulting smoke screen effectively hides vehicles from visual observation as well as image-intensifying infrared devices.

A thousand VEESS modification kits are being produced for installation on M60A1 tanks in Europe. Efforts are also underway to provide kits for the M60, M60A2, and M48A5 tanks, the M88A2 medium recovery vehicle, the M728 combat engineer vehicle, and the armored vehicle launched bridge.

Vehicle maintenance aid

A $4,192,000 contract has been granted to RCA for initial production of Simplified Test Equipment for Internal Combustion Engines (STE/ICE). STE/ICE is a mechanic's diagnostic tool to test vehicle engine and accessory systems. It is compatible with virtually all automotive systems in the Army inventory and can perform more than 45 types of tests and measurements. STE/ICE provides pass/fail indications or measurements in units familiar to the operator (psi, volts, ohms, amps, etc.) through a digital display. In addition to measuring pressure, temperature, voltage, and current, STE/ICE will electronically perform a power test on gasoline and diesel engines without an external dynamometer.



The major component of the STE/ICE system, the vehicle test meter (at left), is shown with the items of equipment which STE/ICE will replace. Each Field Artillery battalion will be authorized two of these devices in its service battery battalion maintenance section.

Recommended reading

Major Don Griffin, who wrote "The Conventional/Nuclear ARTEP" in the September-October 1977 *FA Journal,* is the author of "Mass" in the February 1979 *Military Review.* In that article Griffin discusses the need for US battle planners to break our current defensive mind-set and study Soviet attack options other than the single penetration. Griffin argues that the single penetration has fallen from Soviet favor because that attack pattern offers a tempting nuclear target, loses surprise, and affords NATO the opportunity to localize the breakthrough.

Andrew Hull, author of an article on the evolution of Soviet artillery in the March-April 1978 *FA Journal,* has an article titled "Neutron Bomb Options" in the January-February issue of *National Defense.* This is a definitive piece covering the development and deployment options of enhanced radiation warheads. He also discusses the comic debate surrounding this valuable new nuclear warhead concept.

The February 1979 issue of *ARMY* has an article by COL (Ret) Trevor N. Dupuy which presents a unique analytical look at the relative lethality of current weapons compared to ancient weapons. This article, which is similar to the one he wrote for *Armed Forces Journal,* should be read by everyone involved in fire support.

"Winter Warfare by Any Other Name . . ." in the March 1979 issue of *Military Review* discusses factors involved in cold weather operations, applauds recent increases in the number of exercises conducted in northern climes, but concludes that we need longer exposures of larger units. The author reminds us that weather is neutral, affecting all combatants equally. Since the Soviet materiel and US materiel generally function equally, success will go to the side with the soliders that are mentally prepared for the cold environment and trained to take advantage of its unique aspects.

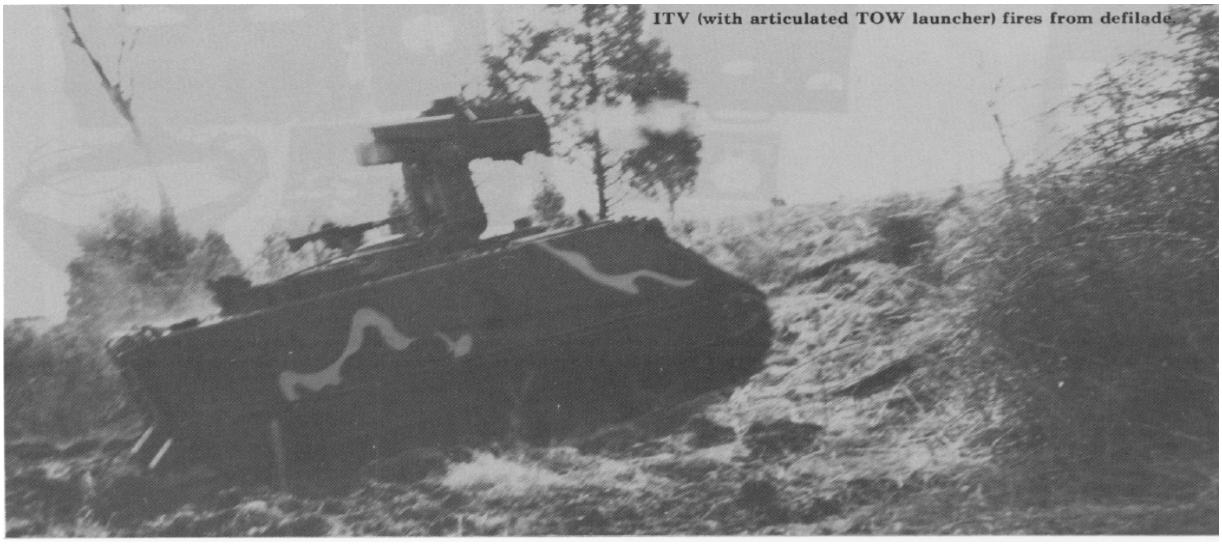
If you read LTC Montgomery's article on SEAD in this issue of the *Journal,* you may be interested in an Air Force captain's view of the subject in the February 1979 issue of *Aviation Digest.* It is definitely written from a "Blue suit" point of view. The author correctly drives home the need for more concrete SEAD joint doctrine and training. He writes that the Army and Air Force are going their separate ways in SEAD with each making assumptions that may not work in war and thereby cost lives.

The *International Defense Review* is often cited as the premier source of unclassified military information in the world. Its record for accuracy is difficult to match. Considering this, you should get a copy of Volume 12, Number 1, and read the "Soviet Army Wave Attack Philosophy — The Single-Echelon Option." With current US Army emphasis being devoted to the Soviet second echelon force (Division '86 study), this article suggests that, for various reasons (nuclear targeting, speed of penetration, etc.), the Soviet planners may well be looking at the idea of many single-echelon "main attacks." The attacks will gain their strength from density rather than from repeated pushes by successive echelons.

ITV joins the Army

The Emerson Electric Company and the Tank Automotive Research and Development Command recently held a joint "roll-out" of the Army's first production model of the Improved TOW Vehicle in St. Louis, MO.

The ITV is composed of a modified M113A1 armored personnel carrier with a TOW antitank missile launcher in an articulated head. This design allows the crew to elevate the launcher to the necessary firing height while the vehicle is in defilade. The ITV, officially designated the M901, adds significant mobility to the TOW system as well as enhancing crew survivability.



ITV (with articulated TOW launcher) fires from defilade.

FA to get more USMA grads

Combat arms quotas for the US Military Academy class of 1979 have been increased. In the class graduating in June, 233 will go into the Field Artillery, while 290 will go to Infantry, 148 to Armor, 120 to Engineers, and 101 to Air Defense. Another 218 (20 percent of the class) will go to seven other combat support branches.

The 1978 graduates were allowed to enter Finance and Adjutant General branches, and 48 cadets selected those options; however, these branches are closed to Academy graduates this year.

The Field Artillery drew only 150 cadets from the 1978 class.

Rangers looking for FISTs

The two Ranger battalions (Forts Lewis and Stewart) are looking for qualified soldiers in grades E1 through E7 with MOS 13F (Fire Support Specialist) to join their elite force.

Qualifications are listed in AR 614-200 and basically require that applicants be male, be in excellent physical condition, be either airborne or Ranger qualified or willing to undergo such training, and have a clean record. Soldiers who are airborne or Ranger trained may request assignment to a Ranger unit on the Enlisted Preference Statement (DA Form 2635) submitted direct to MILPERCEN, ATTN: DAPC-EPK-S. Soldiers who require training must submit applications through command channels.

Other MOSs being sought are 05B, 11B, 11C, 31V, 36K, 71L, 75B, 75Z, 76Y, 91B, 91C, and 94B. Ranks desired in these MOSs vary. Soldiers with these MOSs as primary or secondary, who meet the prerequisites, may apply. Check with your MILPO.

"Lump sum" re-up bonuses restarted

"Lump sum" reenlistment bonuses have returned as of 3 April. Unless soldiers ask for annual bonus installments, they will receive full payment at reenlistment, minus taxes.

The lump sum offer applies to soldiers collecting a Selective Reenlistment Bonus (SRB). Regular reenlistment bonuses are always paid in a lump sum because they are $2,000 or less.

Overseas extension may nix CONUS assignment

Personnel who extend past their "prescribed" overseas tour may disqualify themselves for assignment in CONUS prior to terminating their military service. Some soldiers mistakenly think they may return to CONUS if they meet remaining time in service requirements at their "normal" tour completion, but soldiers will not be given return CONUS assignments unless they have six months remaining service after leaving a long overseas tour area or three months after leaving a short overseas tour area, regardless of their original PCS date.

If soldiers voluntarily extend past their normal PCS and end up with less than the required six or three months remaining service, they may not return to CONUS.

Soldiers who do not meet remaining service requirements, but who want a CONUS assignment, should look into extension and reenlistment options available through unit reenlistment NCOs.

LTC board convenes early

Selection boards will convene 5 June, two weeks earlier than previously announced, to consider Army Promotion List officers on active duty for promotion to lieutenant colonel, AUS.

The earlier date also moves up the date for submitting optional "complete the record" OERs to arrive in HQDA not later than 29 May. The cutoff date, or "thru date," on such OERs must be 7 May.

Letters of communication to the boards will be accepted only from an individual in the primary zone. Letters should arrive at HQDA by 15 June.

Uniform regs revised

A complete rewrite of appearance and uniform regulations has been approved by Chief of Staff General Bernard W. Rogers.

Major policy changes in the revised regulations include specific language that reaffirms the Army's ban on handlebar mustaches and "flared" sideburns. The regulation also sets uniform policy on insignia wear for all uniforms.

TACFIRE —

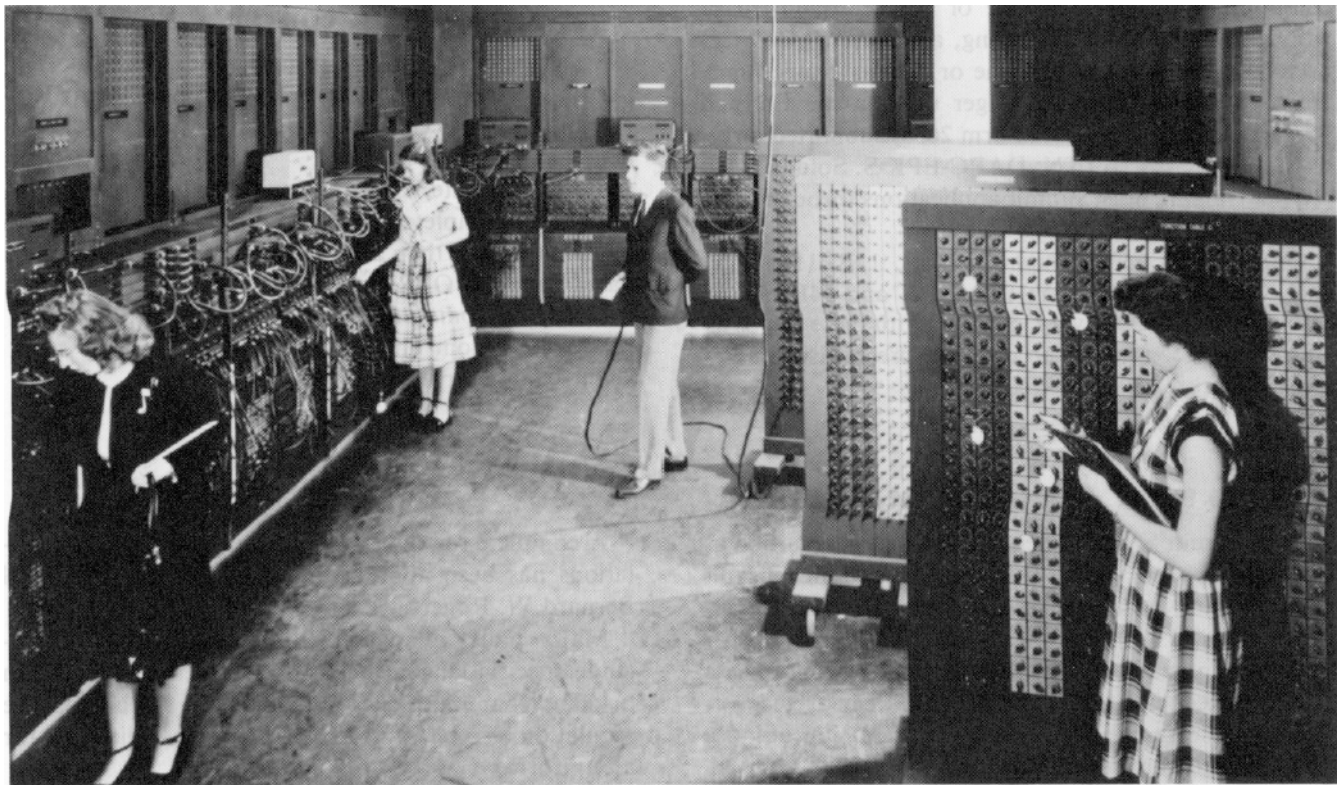
a quantum leap in FA data processing

by Edward D. Ray

On 19 October 1978, the Army Systems Acquisition Review Council approved full-scale production of the Field Artillery's Tactical Fire Direction System (TACFIRE). The real beginning of the long process leading to TACFIRE's approval occurred in 1946 when J. P. Eckert and Dr. J. W. Mauchly designed and built the Electronic Numeric Integrator and Calculator (ENIAC), the world's first all-electronic computer. ENIAC, a first generation computer using vacuum tubes to perform logic operations, was used to calculate ballistics data. Around 1956 an analog ballistics processor, the M15 gun data computer, appeared briefly. It was not quite clear in 1956 that digital computers (versus analog computers) were the wave of the future. Then in the late fifties came the Field Artillery Digital Automatic Computer (FADAC), the transistorized, second generation predecessor of TACFIRE. True to the lineage, FADAC calculated ballistics data.

Subsequently, TACFIRE was conceived in the late sixties as a third generation integrated circuitry computer. It will continue the ballistics calculation tradition while performing many other artillery functions. The rapid advance of computer technology has made TACFIRE's significance difficult to grasp. A comparison of FADAC with TACFIRE will provide a perspective of how far advanced TACFIRE is.

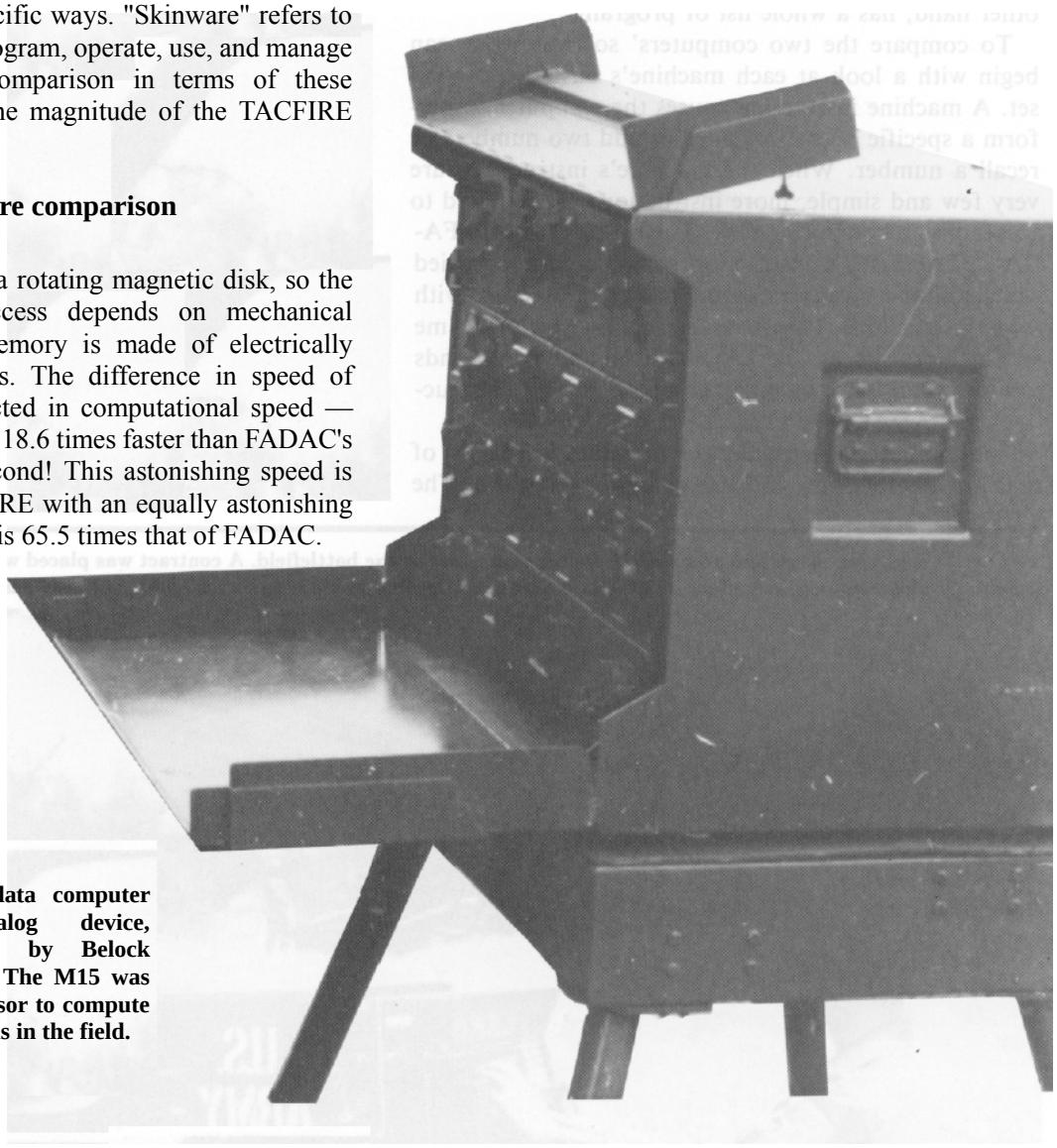
ENIAC, the world's first electronic computer, was built by the University of Pennsylvania under contract by the Ordnance Corps and was approved for service in 1946. It used 19,000 vacuum tubes, required 200 kilowatts of power, and weighed more than 30 tons. ENIAC was used primarily to compute ballistic tables.



Both FADAC and TACFIRE are computer systems, and computer systems consist of three "wares" — hardware, software, and skinware. "Hardware" encompasses the manufactured components of a computer system. "Software" represents the written procedures and the computer programs, which cause the hardware to react in specific ways. "Skinware" refers to the people who build, program, operate, use, and manage a computer system. Comparison in terms of these "wares" will point up the magnitude of the TACFIRE advances.

Hardware comparison

FADAC's memory is a rotating magnetic disk, so the FADAC's speed of access depends on mechanical rotation. TACFIRE's memory is made of electrically accessed magnetic cores. The difference in speed of memory access is reflected in computational speed — TACFIRE adds numbers 18.6 times faster than FADAC's 12,800 additions per second! This astonishing speed is accomplished by TACFIRE with an equally astonishing memory capacity which is 65.5 times that of FADAC.



The standardized gun data computer M15 was an analog device, manufactured in 1959 by Belock Instrument Corporation. The M15 was the first automatic processor to compute firing data for fire missions in the field.

Another significant hardware comparison can be made by considering input/output devices. FADAC's programs are input by punched paper tape, which is slow but adequate for small programs. TACFIRE's voluminous programs and data base are input at high speed via magnetic tape. FADAC's interaction with its operator is by "nixie" tube displays, keyboards, and a low speed printer. TACFIRE interacts through two television-like screens, a keyboard, and up to two medium speed printers. FADAC has no external devices. TACFIRE has a digitial plotter map, an electronic tactical display, and digital data terminals to provide remote communications. Remote equipment includes the forward observer's Digital Message Device, the Variable Format Message Entry Device, and the Battery Display Unit or the Battery Computer System. The main point of comparison here is the wide variety of man/computer interactions introduced by TACFIRE.

Computer-to-computer interactions are also introduced by TACFIRE. Several TACFIRE computers will exchange digital traffic to complement, control, and back up each other. The TACFIRE system envisioned for the 1980s will be a multicomputer array of fire control power, ranging from corps level, to division artillery, to artillery battalion, to artillery battery. FADAC, by comparison, functions singly without digital communications.

Software comparison

Consider now the software component of the Field Artillery computer systems. In a sense, the software of a computer system consists of SOPs written in the hardware machine's language of bits and words. FADAC has only one such SOP (or program). TACFIRE, on the other hand, has a whole list of programs.

To compare the two computers' software, one can begin with a look at each machine's basic instruction set. A machine instruction causes the computer to perform a specific operation, such as add two numbers or recall a number. When the machine's instructions are very few and simple, more instructions are required to accomplish a computing task. This is the case with FADAC. TACFIRE's instruction set is large and varied which allows a given computing task to be executed with fewer instructions. This saves instruction execution time and memory space. The TACFIRE computer responds to more than twice as many complex machine instructions as FADAC.

The computer's instruction set is used to build a list of machine instructions, called a computer program. The FADAC field program has about 5,500 instructions. The FADAC field program has about 5,500 instructions. To perform many additional artillery functions, TACFIRE's division artillery programs' instructions number 43.8 times those of FADAC.

Support software, i.e., software not provided to units in the field, should also be considered. FADAC was fielded before significant support software was available. TACFIRE, however, has several kinds of support software programs. There is a program which converts English-oriented language instructions into machine language instructions — in effect, this is a program which helps write other programs. There are programs used at the software support center which put together machine language program components into one large program for using in the computer in the field. There is a training support program which will be used to train TACFIRE operators. The TACFIRE support software will contain more than twice the number of instructions as the TACFIRE field program.

The ultimate purpose of both TACFIRE and FADAC software is to perform certain artillery functions. A list-to-list

FADAC brought the speed and accuracy of digital electronics to the battlefield. A contract was placed with Autonetics in 1958 for the design, development, and manufacture of FADAC. Still computing artillery ballistics, FADAC's life has reached 20 years.

comparison (figure 1) will show how much more TACFIRE can do.

TACFIRE (considering div arty and and battalion together):	FADAC:
Technical fire direction Survey Tactical fire direction Artillery target intelligence processing Ammunition and fire unit accounting Nuclear fire planning Nonnuclear fire planning Communications processing Meteorological data distribution Preliminary target analysis Chemical target analysis Nuclear target analysis	Technical fire direction Survey

Figure 1. List-to-list comparison.

Skinware comparison

As a final comparison, we now consider personnel. FADAC had three to five programmers to develop its first program over an 18-month period. Litton Data Systems (the TACFIRE development contractor) employed as many as 80 programmers of varying specialties in the development of TACFIRE over a period of some 10 years. FADAC post-deployment software support required three to five programmer personnel, whereas TACFIRE's post-deployment software support will employ over 50 programmer/analyst personnel.

Training times can provide an index for comparing personnel expertise requirements. The FADAC operator's course was one week; the TACFIRE operator's course is 10 weeks.

The ratio of time spent in TACFIRE versus FADAC training in the Artillery Officers Basic Course and the Artillery Officers Advanced Course remains to be determined. However, we predict a ratio of at least 10 to 1 for both courses.

The increased training requirement is reasonable considering the increased functional power afforded the TACFIRE user.

The TACFIRE computer will be used to assist in training its operator during formal school instruction and later on the job. Specific software is being written to accomplish computer-assisted instruction, and this assistance need never end. Also, the basic TACFIRE field programs — those which perform actual artillery functions — are designed to help train computer operators. Another comparison with FADAC will point out this fact.

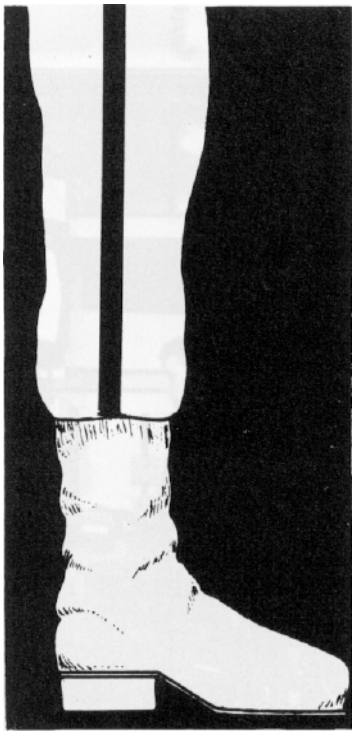
FADAC uses 13 numeric error codes which, when looked up in a table, inform the operator of the type of error he has made. Of course FADAC can only output numbers — it cannot "speak" in English to its user. TACFIRE, on the other hand, uses 665 English language error messages which tell the operator exactly what he has done wrong or warns the operator of possible trouble. This continual English-oriented interaction between the computer and the operator prompts and sustains operator training indefinitely.

TACFIRE will not be the last Field Artillery computer system. Technology existing today and on the near horizon will provide the means for a computer system with better maintainability, versatility, and survivability. Meanwhile, until TACFIRE is superseded by a new family of computer technology, we have, by far, the most powerful fire direction system the world has known.

TACFIRE goes beyond the earlier modeling of ballistic trajectories. This Litton-built, third generation machine digitally models the broad battlefield situation leading to, and including, ballistics.

Edward D. Ray (MAJ, USAR) is a Software Field Engineer for Litton Data Systems, prime contractor for TACFIRE.

Redleg Review



PATTON'S THIRD ARMY AT WAR, by George Forty, Charles Scribner's Sons, New York, 1979, 192 pages, $14.95.

Forty's choice of a title is apt. This is a story about an Army, not its Commander.

Its brightly-colored jacket gives a clue to the book's content—a GI's view of Third US Army's dash across the face of Europe. Had the text been by Ernie Pyle and the illustrations by Mauldin, the overview would have been about the same—how the war looked by the soldier who fought it. It's a story that needed telling, and Forty did it very well.

After what has to have been extensive research and screening, the author succeeded in coming up with a pictorial collection unequaled in any similar work. There are enough pictures of General Patton to satisfy his fans, but the real subject of the pictorial record is the soldier who fought under him. The war seen through the soldier's eye delivers a tremendous wallop. Even without any text at all, the photos with captions could have justified publication.

General Patton's complete mastery of the strategy and the tactics of armored warfare is attested by General Bruce C. Clark's foreword, wherein he credits Patton's employment of the armored division with rewriting the US Army's entire concept on the employment of armor.

The flexible use of armored power is graphically illustrated by Patton's 90-degree turn across another Army's front, in blinding snow and rain, to retrieve what was almost certainly a lost cause—the Battle of the Bulge. Forty's account of this textbook Army-wide exploit fails, on the basis of space allotted and emphasis, to render a true assessment of its impact on the war's outcome. By contrast, one is hard put to understand the extensive coverage given later in the book to a small village operation at Singling, along the Maginot Line.

Unhappily, the book includes an unnecessarily detailed account of Patton's ignoble folly—his decision to overrule the advice of staff and senior subordinate commanders and launch the abortive attempt to liberate the POWs at Hammersburg. The liberation attempt failed and tarnished Patton's reputation as an Armored tactician.

COL (Ret) W. A. Cauthen was Commander of the 639th AAA (AW) Battalion in Europe throughout World War II and his battalion was involved in the Battle of the Bulge.

A CREEK CALLED WOUNDED KNEE, by Douglas C. Jones, Charles Scribner's Sons, New York, NY, 1978, 236 pages, $8.95.

There is a danger in books that teeter back and forth skillfully between fact and fiction. The danger is that the casual reader may leave the book with a distorted notion of history.

Douglas C. Jones' work, *A Creek Called Wounded Knee,* is such a book. Jones, a retired Army lieutenant colonel, weaves fact and fiction so skillfully that only a person with a thorough knowledge of the affair, the so-called "battle" of Wounded Knee in 1890, can sort it out.

Jones' novel is about the Sioux's last effort (last at least until the recent Indian rights movement) to fight their way out of the White man's mold. It's an event that deserves both a novel and more scholarly attention. Jones does an admirable job of mixing the two, but the reader needs to realize that collectively the book is a novel, and not history. The settings are for the most part accurate and show thorough research. Many of the people in Jones' novel were real, but much of what they do in the book is only educated conjecture.

Unfortunately, the precise movements of the band of Miniconjou Sioux and the degree of influence the braves had on their chief, Big Foot, are unknown. The newsmen Jones describes are not the newsmen who covered the Wounded Knee incident.

Jones has written two other novels about the Sioux, *Arrest Sitting Bull* and *The Court-Martial of George Armstrong Custer.* The latter was rewritten for television, and, as a result, many Americans no doubt believe that Custer was court-martialed rather than left dead with all of his men at Little Big Horn.

Having done the research on three books involving the Sioux, as well as having access to graduate student research on Wounded Knee while a professor at the University of Wisconsin, Jones is well-grounded in the facts surrounding Wounded Knee. He picks an interesting point of view for his story—that of the newsmen who covered the incident. Jones does present an accurate picture of the confusion and lack of communication that resulted in the unnecessary slaughter of Indian men, women, and children. And, the novel clearly places the blame where it belongs—nowhere. Wounded Knee was an unfortunate incident where, through a series of misunderstandings, an entire band of people died in that remote corner of South Dakota on 30 December 1890.

It is a novel worth reading, but it is a novel. The basic story is accurate, but the details are the stuff from which novels are made. However, the final feeling one is left with—one of sorrow and hopelessness for the Indian cause at the time—is the same feeling left with those who read historically accurate accounts of the episode.

Commander George R. Kolbenschlag, USN, completed his Master's thesis on press coverage of the Battle of Wounded Knee while a student of Douglas C. Jones at the University of Wisconsin in 1970.

ON TO BERLIN: BATTLES OF AN AIRBORNE COMMANDER, 1943-1945, by James M. Gavin, Viking Press, New York, 1978, 336 pages, $14.95.

This is an excellent chronology of the 82d Airborne Division and its intrepid commander. Anecdotes of battles of this fine command are liberally sprinkled with first person experiences and the names of many participants. It is refreshing to read a book of such objectivity. General Gavin's critical assessment of events of the European Theater of Operations is devoid of chauvanism and lavish in its praise of other units to include their commanders and the soldiers who served in them.

The author pulls no punches in his treatment of such topics as American weaponry, British-American relationships, the less than fair treatment of some of our senior combat commanders, General Eisenhower's remoteness from the scene of battle, and the inability of the US Department of State to maintain its proper role vis-a-vis the War Department (Department of Defense).

Gavin is particularly critical of the lack of an adequate antitank weapon throughout the war. He points out that, despite the proven inadequacy of the bazooka, it accompanied troops to Korea more than five years after the fall of Germany.

Also just criticism was given the American antitank mine and the carbine, which could be jammed by a few grains of sand.

With one criticism, this reviewer takes issue. General Gavin states, "Our artillery was good, and artillerymen made much progress between wars learning how to mass fires, but we had nothing comparable to the German 88."

Generals Bradley and Patton are given high praise for their command capabilities and tactical judgment. On the other hand, the author points out Field Marshal Montgomery's reluctance to act with the same degree of urgency and daring as these two Americans. Nor does Gavin spare the Supreme Commander. Ike's remoteness from the field of battle may have exacerbated some of the problems the American generals seemed to have with Montgomery. Some of the delays in execution, lack of coordinated effort, and the disapproval of some of the more daring American plans are attributed in part to Ike's distance from the war arena.

The summary relief from command of MG Alan W. Jones of the 106th Infantry Division after the initial debacle of the Bulge is considered by General Gavin as a most inappropriate action. He states, "Once again I was struck by . . . how unfairly and thoughtlessly we treated some of our senior officers." He contrasts this treatment with that exhibited by the British who acclaimed as a hero the general who commanded the airborne division at Arnhem in Holland. Although he lost the battle and two-thirds of his command, he was decorated by the King.

Perhaps Gavin's greatest criticism is directed at the US Department of State. He points out that State had not developed a plan for the end of the war although that responsibility clearly belonged to them. Consequently, State was forced to accede to the War Department in carrying out foreign policy. "In subsequent years this has been allowed to grow in an alarming manner. Military people can rationalize almost any problem's becoming military and thus susceptible to a military solution."

General Gavin has written a very fine history of part of the operations of the European Theater in World War II. The last chapter entitled "Berlin in Retrospect," should be read by all students of American history, particularly American military history. His honest, straightforward appraisal of our government's functionings is most enlightening, if not frightening.

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

STRATEGY OF SURVIVAL, by Brian Crozier, Arlington House, New Rochelle, New York, 1978, 224 pages, $8.95.

Alexander Solzhenitsyn says America and the West have lost World War III; Brian Crozier says there's still time to prevent Soviet world hegemony—and a chance for Western victory.

Crozier, director of London's Institute for the Study of Conflict, devotes most of *Strategy of Survival* to demonstrate that the steady progression of Communist conquest—their gains in territory, resources, military might, and influence—is as if they have been waging and winning a world war. And, according to Crozier, world dominance is on the verge of so decisively tipping toward the East (perhaps as early as 1985) that the time has come for the West to act.

And how should the West act? Crozier's strategy is basic and common-sensical: Impose trade restrictions with Communist countries; increase military and financial aid to struggling second and third world states; maintain marked military superiority over the Soviets; improve political and military alliances to counter the spread of Communism; and possibly even support guerrilla wars in Communist territory. Interestingly, Crozier's strategy—like the Soviets' since WWII—is not directed toward confrontation or nuclear war, but toward actions short of direct conflict that he believes will stop, and eventually reverse, Communist conquest.

Western civil libertarians will undoubtedly take issue with Crozier's suggestions for internal control mechanisms—if they even accept his theory that in the era of detente and SALT the Soviets are striving for world domination.

Perhaps the greatest problem with books like *Strategy of Survival* is their need to spend a disproportionate amount of space to convince the reader that the threat is real and there is a need for counteraction. Ten of Crozier's eleven chapters are designed to do just that, with a condensed history of Communist actions since WWII, as well as documented examples of subversion, insurrection, and political actions in support of conquest.

Crozier pulls no punches in his indictment of Communist intentions, but he does so—not in the manner of the raving fanatic, but that of the persuasive academic. For that reason, *Strategy* is effective and its information can assist the arguments of those who support Crozier's point of view.

ILT John L. Plaster is Public Affairs Officer for the Minnesota Army National Guard.

FIVE CENTURIES OF FAMOUS SHIPS: From the *Santa Maria* to the *Glomar Explorer* by Robert G. Albion, McGraw-Hill, New York, 1978, 428 pages, $19.95.

So much of the history of the world is interlaced with ships and maritime adventures that reading this book of brief "biographies" of 162 of the dean of American maritime historian's favorite ships is a salty review of world history. Albion sails the reader through 428 pages of exploration, colonization, maritime disaster, mutiny, whaling ventures, and sea battles. Not only the ships, but the men who sailed them, make these two- to five-page vignettes good reading. The author's writing style makes the book easy to read, and he avoids the trap of unending minutiae about the ships themselves. Instead, he tells of ships with their personalities brought to life by men, by interaction with other ships and their crews, and by relationships to other contemporary events.

Robert Albion has been writing maritime history for over 60 years and, as the foreword says, was an established authority when most of us "were still playing with toy boats in the bath tub."

Five Centuries of Famous Ships is the kind of book that lends itself to either a reader who wants to gorge himself on tales of ships or one who prefers a light snack of maritime history. However, if read from "fore to aft" in its chronological order, it can give the reader a real sense of historical development.

In addition to the ships read about in school—the *Santa Maria, Mayflower,* and *Bonne Homme Richard*—this fine book also talks about ships like the *Dolphin,* whose happy crew returned to England in 1787 after having "experienced a delightful time" discovering Tahiti. The burning of the British revenue cutter *Gaspéé* near Newport by rebels from Providence in 1772 is described. It was a spectacular demonstration of colonial discontent on the eve of the revolution. And, there is John Cabot's little *Mathew* (sic), who made her way to the New World in 1497, just five years after Columbus, to give England its claim to North America. There were the Confederate raider's *Florida, Alabama,* and *Shenandoah*. The gallant whaler, *Charles W. Morgan,* is boarded by one-half million visitors annually at Mystic Seaport, CT, where it is preserved.

The book includes the *Titanic*, as it should, but it also includes the steamer *Sultana,* victim of a swollen Mississippi River in an even greater disaster that took the lives of approximately 1,600 passengers, most of them Union soldiers returning home from Confederate prison camps.

From the tiny *Mayflower* to the first nuclear-powered submarine, *USS NAUTILUS, Five Centuries of Famous Ships* is a fascinating book well worth the $20.

CDR George Kolbenschlag, USN, is currently Public Information Officer at the Navy Office of Information, Atlanta, GA.

CRISIS IN COMMAND: MISMANAGEMENT IN THE ARMY, by Richard A. Gabriel and Paul L. Savage, Hill and Wang, New York, 1978, 242 pages, $10.00.

The book's seven chapters are organized in the style of lectures, tied together by the common thesis that the United States Army and its officer corps are in need of significant reform. The argument for reform is based on the authors' study of our Army's performance in Vietnam and comparisons of that performance with other armies in other wars. The authors contend that the Army still exhibits tendencies which will undermine its ability to function effectively in combat, and many supporting arguments are included to stimulate the reader's interest. Gabriel and Savage cite the suppression of the 1970 Army War College study on professionalism and leadership as proof that there is little impetus for reform from within the Army.

The authors state that the Army in the field in Vietnam exhibited such a low degree of small unit cohesion, that by 1972 it was faced with two alternatives: accommodation with the opposition or eventual defeat. Indicators of this dire situation were extensive drug use, a large number of "fraggings," increasing desertion rates, and large numbers of combat refusals bordering on mutiny. Predominant among causes for lack of small unit cohesion was the alleged failure of the officer corps to provide leadership-by-example. Other contributing factors discussed are the fact that the quality of the officer corps decreased as its size increased, the rank-heavy force structure, the paucity of senior officers on the ground in combat environs, the presence of large numbers of officers in the "safe" base camps, the perception that the foot soldier's welfare was too often sacrificed by a self-serving platoon leader or company commander, the rotation policy of officers only serving six months "on the line" as opposed to 12 months for enlisted soldiers, and an awards system which served to undermine the morale of the troops rather than stimulate it.

The authors attribute the gradual development of the conditions which promoted decay mostly to the acceptance, by the Army as a whole and the officer corps in particular, of a code of ethics based on self-interest rather than group interests. The authors trace this phenomenon from its beginnings during World War II, through Secretary of Defense McNamara, to its present expression in the form of inflated OERs, up-or-out policies, over-education of the officer corps, and ticket-punching assignments.

In Chapter V the authors offer proposals for the reform of the Army. They call for a reaffirmation of the traditional military ethic of leadership and a renunciation of the ethic of the business corporation. They suggest the abandonment of the present Inspector General system and its replacement by an independent IG, responsible to the civilian authorities who control the Army. They propose the establishment of honor boards by local commanders to police the officer corps.

In the last chapter, entitled "Reform and the Search for Honor," the authors present a suggested officer's code which emphasizes the moral trust and responsibility placed on officers and stresses the relationship an officer should have with his subordinates. The "code" requires that an officer be true to his own ethical base and that no one be punished for telling the truth.

Even if one accepts the authors' general thesis—that there is a serious problem in the officer corps—one may question the degree to which that problem has eroded the fighting capability of the Army. But no officer should blithely assume that his corps has fully recovered from the havoc wreaked upon it by Vietnam.

CPT James Gebhardt, AR, is the Senior Tactical Officer of an Officer Candidate Company at Fort Benning, GA.

LAW, SOLDIERS, AND COMBAT, by Peter Karsten, Greenwood Press, Westport, CN, 1978, 204 pages, $15.95.

Peter Karsten's book is about the laws of war, the rules governing combat, and the reasons why war crimes occur. He expresses his conclusions and recommendations to reduce violations of the laws of war and "to increase the clarity and effectiveness of such laws."

The author dedicated the book "to Warrant Officer Hugh Thompson and those of his calibre throughout the world." Thompson was the Army aviator who saved the lives of several Vietnamese civilians during the My Lai massacre.

The book begins with a discussion of the laws of war; the increased concern for prisoners and noncombatants; and those who developed the laws of war.

Karsten discusses the following reasons for the development of laws of war:

• Avoid unnecessary destruction and suffering of the civilian populace to ease administering and governing of captured areas.

• Protect one's own combatants and noncombatants.

• Treat POWs and noncombatants fairly. Ill treatment hinders an end to hostilities by making the enemy fight harder to avoid surrender, torture, and death as a POW.

• Enhance domestic support of a country's war efforts.

Karsten then presents an in-depth analysis of why violations of the law of war occur. He analyzes the problem from two perspectives:

• The internal—the values and attitudes individuals bring into the military.

• The external—conditions that affect the individual, such as the combat environment, the quality of leadership, and the nature of certain weapons.

The author uses the 1968 My Lai massacre as a case study to discuss the effects of the values and attitudes of the participants, the combat environment, and the quality of leadership. He concludes that the type of soldiers likely to commit war crimes often come from a low socioeconomic status; are often raised in families where there is an aggressive, domineering parent; are frequently school dropouts; and, in general, are hardened by growing up in a brutal environment.

The author goes to great lengths to analyze the problems of weaponry and tactics involving the Vietnam conflict—especially the US policies of search and destroy, free-fire zones, B52 carpet bombing, and the use of herbicides, napalm, and cluster bombs. He criticizes these policies as eroding the principles of proportionality.

Karsten analyzes the problem of illegal orders and the crisis of conscience that soldiers experience. He presents numerous examples of illegal orders, describes how recipients responded, and analyzes the options of the recipient of an illegal order. The book concludes with five recommended actions for lessening the likelihood of war crime commission.

The book is interesting and well-researched, but some of the author's conclusions are not adequately supported by facts and some of his recommendations are somewhat idealistic. Notwithstanding, the book presents an excellent discussion and analysis of the laws of war and war crime violations and should be read by the professional soldier.

LTC John A. Turner, JAGC, is the Deputy Staff Judge Advocate for Fort Sill.

MOUNTING THE THREAT: *July 1944,* by John J. T. Sweet, Presidio Press, San Rafael, California, 1978, 142 pages, $12.95,

This book provides a detailed account of "Operation Goodwood," conducted by the British and Canadians as a prelude to the breakout of St. Lo. This battle was also the first major tank battle after the invasion of Europe.

Mounting The Threat is not an apology for General (later Field Marshal) Montgomery's operations, or the conduct of the British troops. Mistakes are referred to just as strongly as are good points. I found only one sentence of British propaganda in the entire book, and this was well compensated for by an accurate description of the general character of the British and Americans.

The author toured the battlefield with knowledgeable persons and uses many references from other books, placing them in perspective. There is, therefore, an enormous number of footnotes, an extensive bibliography, and some very useful appendixes.

At the time in question, Montgomery was commander of all Allied ground forces. The author recounts the planning of the Normandy campaign, pointing out Montgomery's modifications which seemed to be basically sound with the exception that he seemed to have forgotten his own air force requirements. This caused the RAF to be his first and loudest critic and probably contributed to the grumblings by top American generals involved. The author does credit Monty's planning for the destruction of the German Army at Falaise Gap and the early capture of Antwerp and Brussels.

The author describes the battle for the beachhead and the use of American forces. From the viewpoint of one who was there, his descriptions of the problems of Normandy are accurate.

I always considered myself fortunate to have been on the American front at the time, and I've read nothing to change my mind.

Two chapters contain detailed accounts of the battle code named "Operation Goodwood," covering every movement of every organization involved—their trials and tribulations and their mistakes.

The final chapter is an excellent summary, pointing out that Goodwood was the left jab setting the opponent up for the solid right at St. Lo.

The maps are not the best, but there are several good photographs of troops, terrain, and key personnel.

For Redlegs, it should be noted that the rolling barrage in preparation for the battle did not work.

Without directly mentioning it, the author showed that the British made the same mistake with their long-barrel (17 pounders) M-4s as the Americans did with theirs (76s). Our tankers knew it at the time, but higher headquarters never got the message that these weapons should not be deployed piecemeal.

This book points up very well the problems that can creep into an allied command, and it should be read by those working in Allied headquarters.

I had no problems working with the British, Australians, Japanese, or Pakistanis. Understanding is the key.

LT (Ret) Ralph R. Balestrieri was an artillery FO during World War II.

Correction

Please make the following changes to the article "FIST Fire Planning" in the March-April 1979 *FA Journal*:

Page 54, second paragraph, change target numbers 2802 and AB2801 to 7802 and 7801, respectively. In figure 1 (page 55) change AB2823 to AA2823 and the "down 400" should refer to serial 2 (target 2823).

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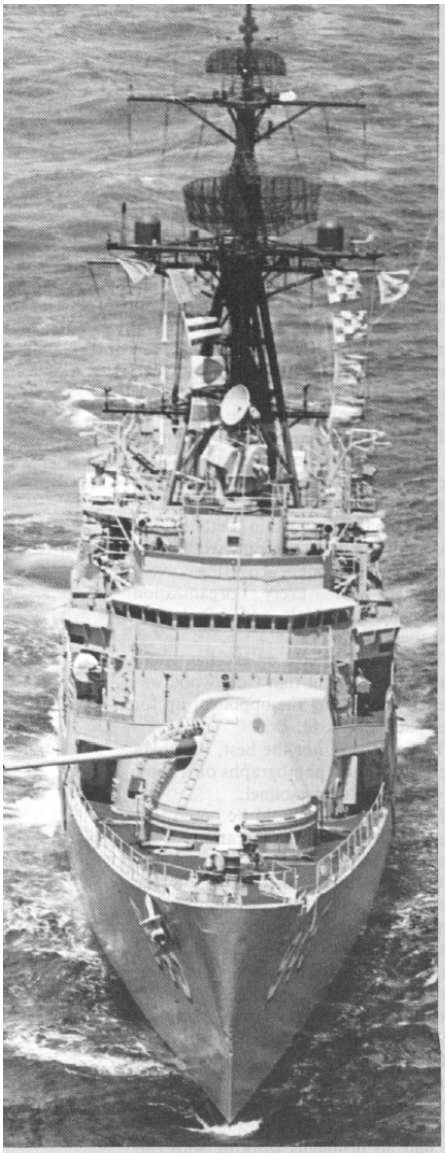

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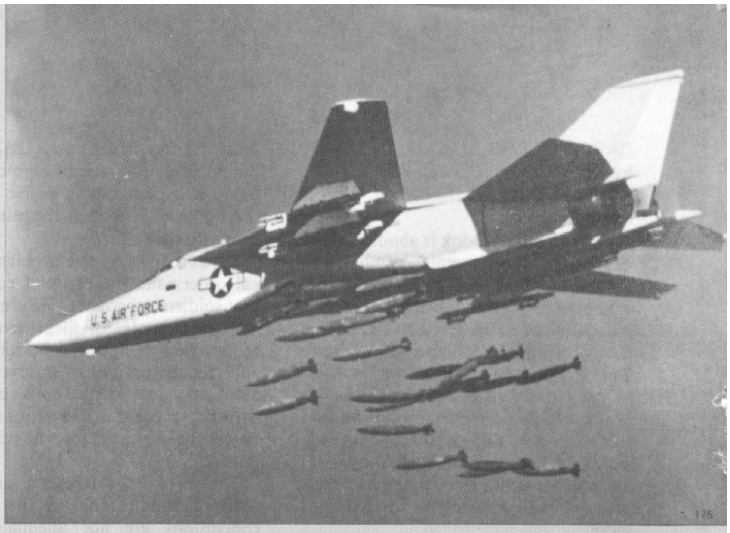

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