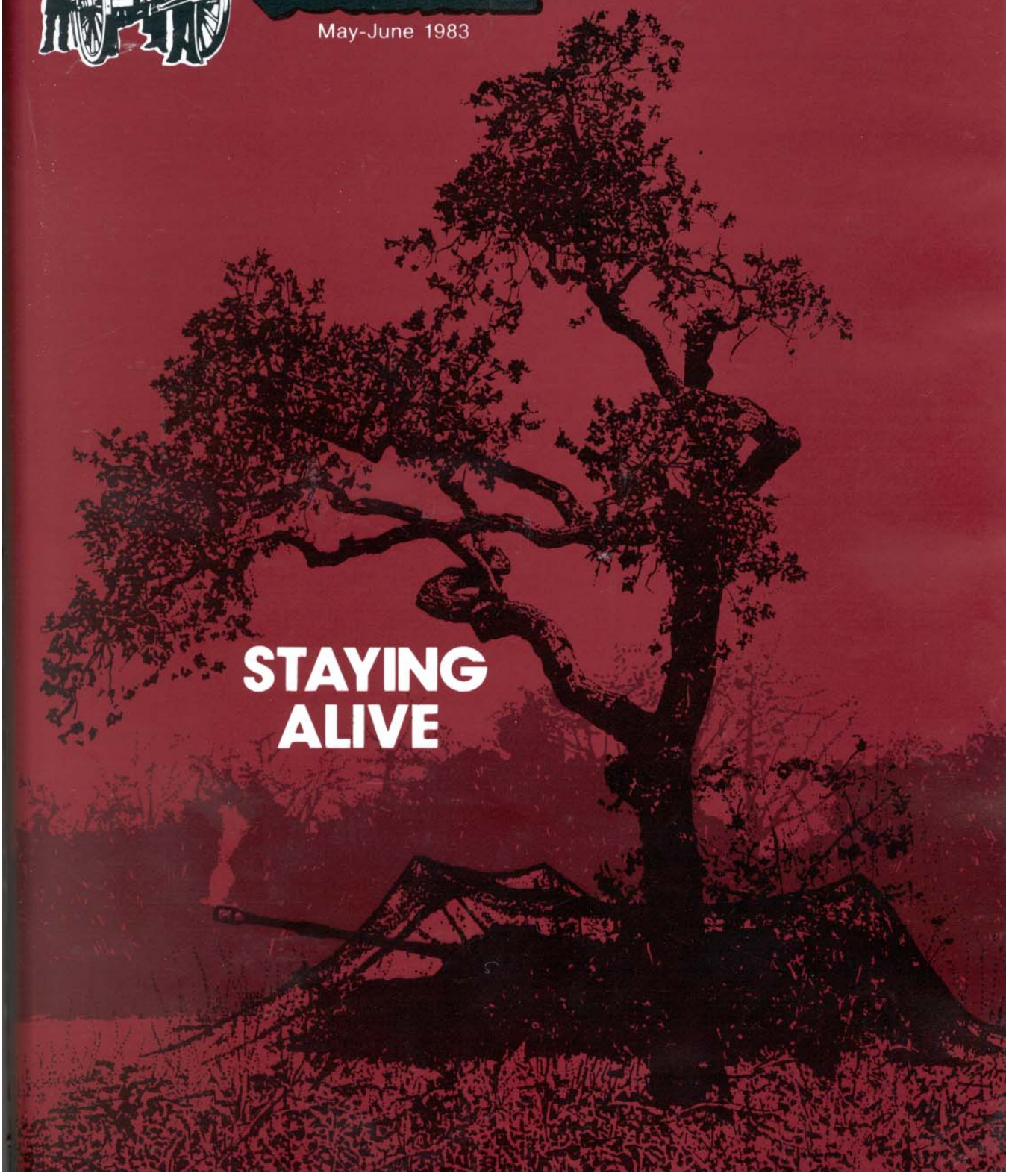
Field Artillery Journal

May-June 1983



STAYING ALIVE

THE JOURNAL OF FIRE SUPPORT

Volume 51 **May-June 1983** **Number 3**

ARTICLES

FEATURES

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

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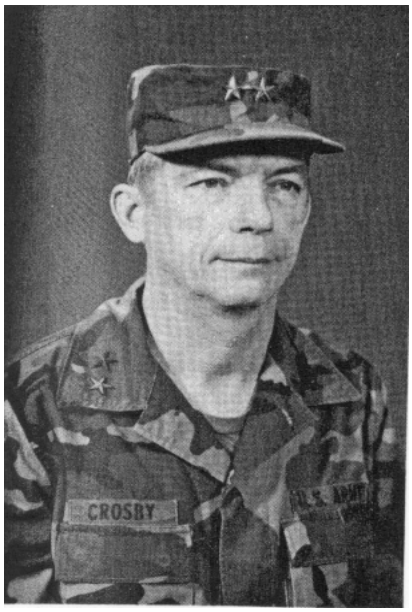
On the Move

MG JOHN S. CROSBY



The concept of standardization is not new to the Field Artillery Community or to the Army; but, as the Army brings new equipment into the force and starts to train on that equipment, standardization becomes increasingly important. The Chief of Staff reaffirmed our direction in 1980 when he established the Army Standardization Program. Every branch in the Army has now initiated measures to guarantee that there are standard tasks, drills, and procedures for the tactical, logistical, and administrative operations common to like units.

Why standardization?

Standardization enables us to concentrate fully on training as an organization — and that full concentration is needed if we are to win. It provides us with the means to meld organizations together so we can fight at the rapid pace the AirLand battlefield demands. On this battlefield, the field artillery's leaders will need more than their own individual skill and courage. They will need well-trained soldiers and crews who respond to the basic tasks at hand instinctively and who do so according to a set of common operational standards. Standardization clears up the needless confusion of doing similar actions differently and thus gives our leaders the time and flexibility to react to the tide of conflict and find the right tactic or technique to defeat the threat. Standardization does not prevent creative leadership — standardization makes it possible.

FA standardization game plan

Our long-standing Field Artillery standardization game plan has two distinct phases for eliminating nonstandard practices. Phase I calls for standardization of the fire direction procedures, crew drills, and observed fire procedures described in existing manuals, while Phase II calls for us to nominate and standardize any other procedures which would serve to make us more potent, more lethal, and more effective in the AirLand Battle.

Phase I is complete, and the entire Field Artillery Community shares the credit. We identified the nonstandard areas, developed and published tough and measureable standards, and are practicing these standards in field training. Cannon section drills for preparation for firing, conduct of fire, and march order are now standard. Cannon and Lance fire direction procedures for calls for fire, firing data computation, and fire commands to the weapons are now standard. Additionally, cannon fire direction procedures for the refinement and replotting of end-of-mission target data and for the layout of the fire direction center are now standard. Forward observer procedures for calls for fire, subsequent corrections, and end-of-mission refinement are now standard.

Phase II is a continuous and ongoing effort. The Field Artillery School Directorate of Evaluation and Standardization is in charge of coordinating these Phase II efforts within the School. The Tactics, Combined Arms, and Doctrine Department is the proponent for standardizing emergency action drills, fire support team procedures, and fire support officer/liaison officer procedures; the Gunnery Department handles fire direction procedures; the Target Acquisition Department tackles the target acquisition and survey procedures; and the Weapons Department develops crew drills and physical configurations.

Many of these standardized procedures have already been or will soon be published in appropriate field or technical manuals. For example, the standardized reduced crew drills for the M109A2/A3 and the M110A2 will appear in the next changes to the operator's manuals, due out in 1984. We have standardized loading plans for the M548 cargo carrier and for the M813 5-ton truck used as the prime mover in M198 howitzer sections. These loading plans and the prescribed camouflage techniques for self-propelled howitzers will appear in the new FM 6-50 to be published this fall. The new FM 6-40 — due out by early 1984 — will portray the standard M577 setup for fire direction centers with the FADAC/Battery Display Unit, FADAC/manual, or Battery Computer System/manual configurations. When these standardized procedures are included in a manual, they will be listed in a separate appendix and will be marked by an asterisk wherever they appear within the publication. Thus, our soldiers will have a quick and easy reference to the standards against which their leaders will measure their performance — all of which brings me to my final point.

Enforcement

Despite all of these favorable developments, I am concerned that the standard procedures are neither adequately practiced nor enforced. All too often, well-meaning individuals develop shortcuts which they feel are better ways of doing things. But such shortcuts create two problems: first, new members to a unit must be retrained to do things differently; and, secondly, the shortcut may result in unsafe practices. All leaders in the Field Artillery must be completely rigid in their approach to the enforcement of these standards: eliminate nonstandard procedures!

The job of standardization is, in truth, never completely done. Yesterday's lessons learned must be today's lessons taught. If you slack up on enforcement you will not be training as you must fight — efficiently, effectively, and safely. Your training program must always incorporate the standardized procedures in both individual and collective training. You must evaluate your training by the book, encouraging those who follow it and correcting those who do not. Current ARTEPs contain an appendix which lists and references standardized crew drills, and you should use it with the appropriate manual to evaluate your unit's ability to perform the standardized tasks. In the face of a constant turnover of trainers and trainees, you must insure the continuity of the established standards.

We have established standards and now need to enforce them with renewed vigor. Remember, however, that the Field Artillery School relies heavily on your suggestions concerning standards for areas which require them. Let us know your views through direct correspondence or through members of the Field Artillery Branch Training Team when they visit your area. (They are currently visiting the 2d and 25th Divisions and will spend this summer visiting Reserve Component units training at Fort Sill.) We must work together to improve our training and ability to fight and win.

Incoming

LETTERS TO THE EDITOR

Speak Out

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

Superb issue

I would like to take this opportunity to congratulate you on the January-February 1983 issue. You have returned the *Journal* to its rightful place — the artillery unit — and removed it from the echelons above corps. I cannot thank you enough. Every article was of benefit to "real" artillerymen — those in corps artilleries and below — and will contribute to our professional development. I have two other specific comments to make:

- First, Captain Green's letter in "Incoming" on the FIST battery echoes a concern in every FIST organization I have dealt with and provides a novel and sound solution for both providing the overhead for the FIST battery *and* relief to the S4. The FIST battery, however, needs no field mess team. I believe that a poll of experienced officers and NCOs would reveal massive support for Captain Green's idea, or a variant thereof, and would warrant immediate implementation.
- Secondly, I want to address the formulaic approach to problem-solving in Captain Zabecki's "A quick test for erratic rounds." Having had recent and extensive experience with field units, I strongly doubt that yet another chart (to be carried about in the shirt pocket with all the others) will survive 48 hours' worth of FTX, let alone the haste of extended maneuvers. The time savings of extensive reference and calculation, as opposed to sounder training, is highly debatable. More important for consumer benefit, but obscured by the formula's complexity, is a fact which should be included into doctrine; namely, that rounds greater than three probable errors from the mean can be considered erratic.

Thanks again for a superb issue.

Douglas M. Brown
CPT, FA
Columbus, GA

Reserve commanders update

My profound thanks for printing the Reserve Components Commanders Update in the January-February 1983 *Field Artillery Journal*. I also appreciate the news that it will be a continuing update.

Now that you have the list of commanders, may I suggest a way to take the burden of updating it off your back and place it where it should be? (I know that the Active Component update comes from MILPERCEN.) I suggest you request, through the National Guard Bureau and FORSCOM, that Reserve Component units transmit to you information on new commanders. Those units who wish their new commander to be recognized will notify the *Journal*.

It may be of interest to *Journal* readers to know why the Army National Guard list is so long compared to the Army Reserve list. The 1968 reorganization gave primary responsibility for combat and combat support to the Army National Guard, while the Reserves received the combat service support and training mission. As a result, many Reserve field artillery units were reorganized.

The reason there are 18 majors in an 05 command slot is that, in order to be promoted, Reserve Components officers must be in the slot of the next higher rank. In many instances, the time between assuming a position in the next higher rank and receiving the promotion is six months or more.

Finally, for those wondering about the "separate units" designation, those units are not all truly separate. Some, at least, are the direct support units for separate maneuver brigades (as an example, the 1-246th is direct support to the 116th Infantry (Stonewall) Brigade.) Others have a CAPSTONE trace to an Active Component division artillery or to an Active Component or Reserve Component field artillery brigade. They are in no sense lost units.

Eugene P. Moser, Jr.
MAJ, FA (USAR)
Hampton, VA

The Field Artillery School recognizes the importance of the Reserve Components to the total Field Artillery force. You are correct when you say that MILPERCEN provides the ***Journal*** *with the Active Component Commanders Update; but since Reserve Components command assignments are not managed by a sole source, the Field Artillery School's Directorate of Course Development and Training has written to all Reserve Components field artillery commanders and asked them to send notification when a change in command occurs. With a little help from Saint Barbara, the annual Reserve Components Commanders Update will be an accurate representation of the Redleg commanders in National Guard and Reserve Component field artillery units. — Ed*.

FA Journal helpful to students

I particularly enjoyed reading the January-February 1983 issue of the *Field Artillery Journal*. As a student attending the Officer Basic Course at Fort Sill, I found several of your articles to coincide well with our curriculum. Of special interest was Lieutenant Neil Ferguson's *"Quick Smoke Data Worksheet,"* which compiled the essential facts of quick smoke, eliminating the search through several pages of FM 6-40 to find this information. Likewise, Captain Joseph Rozmeski's article on the background of the FIST concept was informative as we have spent a great deal of time discussing the role of FIST. With articles such as these, the *Field Artillery Journal* is no doubt reflective of the needs and interests of all field artillerymen.

Kevin Couley Ruffner
2LT, FA
C Btry, FAOBC 1-83
OSB, USAFAS
Fort Sill, OK

Useful hand-held calculator programs

With the advent of the laser rangefinder, the use of polar plots by the forward observer becomes the simplest and fastest method of battlefield target designation. However, in an active electronic warfare environment, it is also the most dangerous method. The problem is to use the laser rangefinder to locate the target accurately, but then to transmit the data to the fire direction center in

the far less dangerous grid method. Table 1 is a program for the TI-59 which will do the job (I know that TI-59s are not standard issue to forward observers; but by merely changing mils to degrees, the forward observer could use the program on an inexpensive commercial calculator). There are at least two other possible uses for the system. An observer in the desert environment can accurately locate his own position despite the featureless terrain. Also, one man can perform a complete target area survey using a surveyed observation post, an aiming circle or theodolite for direction, a laser rangefinder, and a hand-held calculator.

On another subject, if we really are concerned with immediately impeding a mobile enemy headed toward us over flat, rolling terrain, we may want to disregard the vertical angle (VA) if it is below 190 mils for ranges of 2,500 meters or below 310 mils for ranges of 1,000 meters. As the computer program in table 2 demonstrates, to disregard vertical angles below those figures will not cause the center of impact to move beyond 50 meters from the target.

George W. Olney
CPT, FA (GAARNG)
Waycross, GA

Both the Target Acquisition Department and the Gunnery Department have reviewed your work and find it has much merit. — Ed.

Table 1. TI-59 program for target location.

This program should be placed on a magnetic card. A recommendation is to make two cards in case one refuses to program.

1. LRN	16. - RCL3)	31. +
2. 2d LBL A	17. + RCL5)	32. RCL 1
3. STO 1	18. INV 2d SIN)	33. =
4. 2d LBL B	19. COS	34. R/S
5. STO 2	20. X	35. 2d LBL 2d D'
6. 2d LBL C	21. RCL 5	36. ((RCL 4
7. STO 3	22. =	37. ÷ 17.77778)
8. 2d LBL D	23. STO 7	38. COS)
9. STO 4	24. R/S	39. X
10. 2d LBL E	25. 2d LBL 2d C'	40. RCL 7
11. STO 5	26. ((RCL 4	41. +
12. 2d LBL 2d A'	27. ÷ 17.77778)	42. RCL 2
13. STO 6	28. 2d SIN)	43. =
14. 2d LBL 2d B'	29. X	44. R/S
15. (((RCL 6	30. RCL 7	45. LRN

INSTRUCTIONS:

1. Input observer easting in five digits, punch A.
2. Input observer northing in five digits, punch B.
3. Input observer altitude in meters, punch C.
4. Input observer target direction, punch D.
5. Input slant distance (AN/GVS-5), punch E.
6. Input target altitude in meters, punch A'.
7. Punch B', read horizontal distance to target.
8. Punch C', read target easting.
9. Punch D', read target northing.

Note: The above program is for use if nothing is available to measure vertical angle (VA) and target height is obtained from a map spot. If a VA is available, substitute the following for B'.

(VA in mils ÷ 17.77778)
COS
X
RCL 5
=
STO 7
R/S

Table 2. Relationship between vertical angle and actual distance error.

FOR 1000 METER SLANT RANGE:

VA IN MILS	HOR DIST (m)	ALT DIFF (m)
10	999.952	9.81736
30	999.566	29.4482
50	998.796	49.0677
70	997.64	68.6682
90	996.099	88.2423
110	994.175	107.782
130	991.867	127.281
150	989.177	146.73
170	986.105	166.123
190	982.653	185.452
210	978.823	204.71
230	974.615	223.888
250	970.031	242.98
270	965.074	261.979
290	959.744	280.876
310	954.044	299.665
330	947.977	318.339
350	941.544	336.89
370	934.748	355.311
390	927.592	373.595
410	920.078	391.735
430	912.21	409.724
450	903.989	427.555
470	895.421	445.221

PROGRAM

```
 5 CLS
10 X = 10
20 LPRINT "FOR 1000 METER SLANT RANGE"
30 LPRINT "V/A IN MILS," "HOR DIST (m)," "ALT DIFF (m)"
40 Y = 1000*COS (.0009817477*X)
50 Z = 1000*SIN (.0009817477*X)
60 LPRINT X, Y, Z
70 X = X + 20
80 IF Y>900 GOTO 40: IF Y=900 GOTO 90
90 END
```

FOR 2500 METER SLANT RANGE:

VA IN MILS	HOR DIST (m)	ALT DIFF (m)
10	2499.88	24.5434
30	2498.92	73.6205
50	2496.99	122.669
70	2494.1	171.671
90	2490.25	220.606
110	2485.44	269.456
130	2479.67	318.203
150	2472.94	366.826
170	2465.26	415.308
190	2456.63	463.631
210	2447.06	511.774
230	2436.54	559.72
250	2425.08	607.45
270	2412.68	654.947
290	2399.36	702.19

PROGRAM

```
 5 CLS
10 X = 10
20 LPRINT "FOR 2500 METER SLANT RANGE"
30 LPRINT "V/A IN MILS," "HOR DIST (m)," "ALT DIFF (m)"
40 Y = 2500*COS (.0009817477*X)
50 Z = 2500*SIN (.0009817477*X)
60 LPRINT X,Y,Z
70 X = X + 20
80 IF Y>2400 GOTO 40: IF Y = 2400 GOTO 90
90 END
```

Blankets for protection

The survivability of howitzer sections is seriously threatened if adequate ammunition storage is not considered. For example, during testing sponsored by the US Army Material Systems Analysis Activity (AMSAA) at Fort Sill, stacked M4A2 powder canisters containing propellent were used as targets for .50-caliber machineguns firing ball ammunition. When hit, these unprotected canisters exploded, scattering metal and burning propellent to distances up to 250 feet from their original location. Clearly, there is a distinct possibility of catastrophic losses from incoming fire if stored ammunition is not protected.

A similar test was then conducted using 8-ply nylon blankets to cover the propellent canisters. The .50-caliber ball ammunition ignited both the propellent and nylon blankets, but the powder fires were initially small and could easily be extinguished with water. Additionally, any forceful scattering or explosion of canisters was limited to the immediate area of the stack. The effectiveness of a nylon blanket, however, depends primarily on its thickness (number of plies).

An 8-ply nylon blanket is currently in the Class IX system as a supply replacement part of the crew cover of a TOW-equipped M113 vehicle. The TOW-CAP (Cover, Artillery Protection) consists of a series of OD nylon blankets approximately 42 by 59 inches, each weighing less than 25 pounds, with seven grommet holes spaced down each side for tiedown purposes. The national stock number (NSN) for the nylon blanket is NSN 1440-01-033-6568 (part number: 11567437). The cost per blanket is $139.00 and can be ordered through normal Class IX procedures.

These blankets can be layered to achieve the equivalent protection of 16, 24, or 32 plies. For use in vehicles, the blankets can be tied together and laid directly on the powder canisters (M548 recommended employment) or tied to the frame. Four 8-ply blankets are needed to provide the equivalent of 16-ply protection for the ammunition compartment, while two blankets are required to wrap each wheel.

Blankets can also be designed by using nylon cloth (NSN 8305-01-025-4920), grommets (NSN 5325-00-202-2053), polyester thread, and a heavy duty sewing machine. (For specific instructions on blanket construction refer to "AMSAA Interim Note #13, Do it Yourself Ballistic Protection," June 1979, available from, Director, AMSAA, ATTN: DRXSY-CR, Aberdeen Proving Ground, MD 21005.)

These blankets have also been adapted to provide protection for several other systems. As mentioned in LTC Donald Griffins' article on survivability *(FA Journal,* September-October 1980), nylon blankets can be designed to provide ballistic crew shelter for the 8-inch howitzer M110 and to protect critical items such as collimators, TACFIRE equipment, and fuel pods.

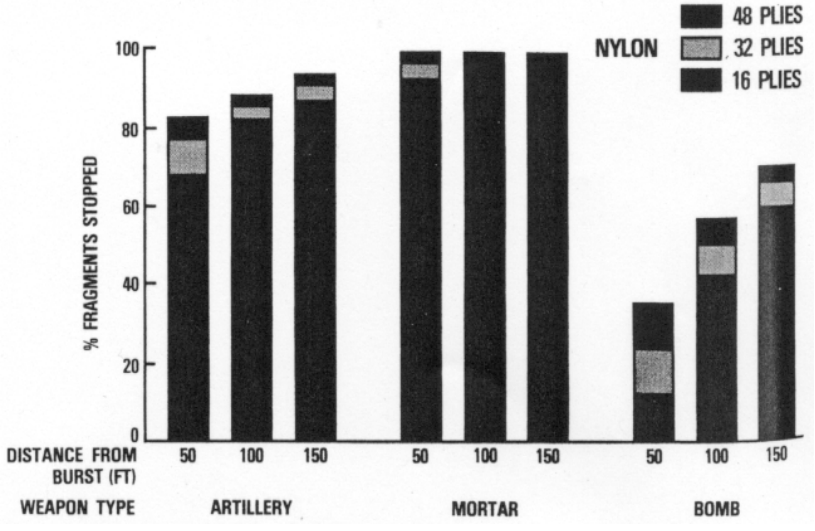
The advantage of blankets over sandbags for protection of ammunition or vital equipment is that they can be rapidly emplaced with a minimum expenditure of manpower. Sandbags combined with blankets can provide the mix necessary to protect men and equipment effectively with speed and minimal exposure of personnel. In an artillery environment that requires rapid displacements to survive, nylon blankets can assist in the sustainment of mission capability.

James E. Fletcher
CPT, FA
Army Materiel Test and Evaluation Directorate
White Sands, NM

The US Army Materiel Systems Analysis Activity (AMSAA) strongly supports the application and use of fabric armor as expedient fragment protection for personnel and materiel. The TOW-CAP was fielded as an interim measure to provide protection for the M113 TOW system. When the M901 Improved TOW Vehicle was fielded there was no longer a need for the TOW-CAP, and it is now considered obsolete. The NSN which you give in your letter for nylon blankets is for the blanket panel assembly used for the side and top of the TOW-CAP. Six of these blanket panels were layered together to provide 48 plies on the TOW-CAP. US Army Missile Command, which manages the TOW-CAP system, has approximately 275 of these blankets left in stock. While this is probably not sufficient to support widespread use, blankets can be fabricated by the user as outlined in AMSAA Interim Note #13.

AMSAA has suggested that an interim TOW-CAP-type shelter (as per LTC Griffins' article) should be deployed for the M110 system while the hard Crew Ballistic Shelter (CBS) is being developed, but this concept has a liability in that the fabric has the potential to absorb chemical agents between the fibers, thereby making decontamination difficult, if not impossible. The magnitude of this problem can be significantly reduced if the outer layers and edges of the armor blankets are made of a plastic (polyurethane, polyethylene, etc.) impregnated or laminated material. The contamination problem can be reduced even further if the armor can be covered with expendable plastic films or tarps. For example, the Canadian Army issues rolls of laminated Mylar and tape for use as a disposable expedient cover for equipment in the event of a chemical attack.

If armor blankets are to be considered for general use to protect ammunition, radios, vehicles, and other equipment, it would be worthwhile to consider making them of Kevlar rather than nylon. Kevlar can provide the same protection with less weight. Until recently Kevlar was too expensive to consider for general use. However, it appears that DuPont may offer a thicker fiber type Kevlar for about half the price of currently available Kevlar. - Ed.



Protection obtained from nylon blankets.

TI-59 in hipshoots

One of the many field artillery applications of the TI-59 calculator is its use for hipshoots. Although not mentioned in the reference notes which accompany the calculator, the use of the TI-59 for hipshoots is simple, is as quick as the manual computation of data, and is as reliable as the operator.

First, one merely recalls the constants according to the range to be fired (i.e., 2nd PGM 05 A), and then recalls the gunnery program and zeroes the battery easting, northing, and altitude, as well as the target easting, northing, and altitude. On the first round, the battery location is assumed to be the observer location; and the mission is conducted like a polar mission. Remember to enter the easting, northing, and altitude into the observer and battery files. Once the azimuth and range have been determined and sent to the fire direction center, the azimuth is entered in both the azimuth-of-fire and observer-target direction. Range is input in the usual manner. Since this is a polar mission, key B is pushed. Azimuth and range should flash (they should be identical to what was input, or an error was made). Then one selects the charge and computes. After the first round is fired, one enters the actual OT direction and continues the mission.

I have used the TI-59 for hipshoots with great success. It can be the primary means of calculation or a very reliable check of manual data.

Michael J. Jaye
2LT, FA
C/1-8th FA
Schofield Barracks, HI

Key terrain

I like to call survey data "key terrain" — terrain which yields a significant advantage over the enemy. With accurate survey, first round hits and massed fires can consistently be achieved, giving us a significant advantage over the enemy. In this way, survey data is analogous to key terrain.

The procedures for obtaining, controlling, and disseminating survey information are well defined in FM 6-2, Field Artillery Survey, and in all Field Artillery ARTEP manuals. Yet, in a peacetime training environment, there is all too often a false sense of security about survey control. The training area becomes too comfortable since commanders become familiar with firing positions, surveyors perform the same or similar surveys time and time again, and survey data is plentiful though often not well maintained or controlled. There are several ways to upgrade the training and the control of survey data, and in the 9th Infantry Division Artillery we began by updating the trig list.

The old trig list was made up of outdated sketches and data on plain sheets of paper. After verifying over 200 firing points and redrawing most of the sketches, we had the trig list printed on the proper form, DA Form 1959, (Description or Recovery of Horizontal Control Stations), in the proper format. We had a limited number of copies printed and placed in three-ring binders so that firing points could easily be added or removed. We then had all subordinate units sign for the copies on a control register to simulate the classifying of survey data in combat.

Additionally, we saw the need to educate subordinate units about the functions of the Survey Information Center (SIC) and its responsibility to report to the SIC all matters concerning survey data and information. In the field, SIC personnel were to conduct liaison visits and perform survey accuracy checks. The S3s, in coordination with their survey officers, were to challenge the surveyors, paying particular attention to the length of the surveys and the types of terrain over which they were to be performed.

The real challenge to developing good, sound training that will enable us to achieve success in war is the ARTEP. On our most recent ARTEP, the survey section received survey information in several different forms, forcing it to utilize different survey techniques. The survey section was evaluated on how well it reacted to the different types of information, and how well it accomplished its missions under the circumstances. The result was an exciting ARTEP that more closely simulated the uncertainties of combat conditions.

The more carefully we plan and implement survey training in peacetime, the better prepared we will be to engage enemy targets on the battlefield. If we can think of survey data as "key terrain," we can begin to understand its impact upon our ability to perform the field artillery's primary mission. Like the infantry, we should pursue our "key terrain" as though our lives depend upon it — one day they will.

Katharine G. Thomas
1LT, FA
Fort Lewis, WA

Feeding the troops

The US Army's concept of "train as we expect to fight" seems to overlook a key point: feeding the troops in the field. If deterrence fails and NATO engages the Warsaw Pact forces in Central Europe, those units that lack a three or four day supply of Meals, Ready-To-Eat (MREs) or C-rations and a 5-gallon water can *per man* are liable to be in serious trouble after a day of fighting. All available vehicles will be needed to carry ammunition, supplies, and replacements to the forward units and back-haul the dead, wounded, prisoners, and damaged equipment. A limited number of food service personnel will be engaged in sending water and rations forward; I see the rest of them either providing local protection for a tactical operations center or headquarters or filling out the manning within a battalion.

Perhaps C-rations/MREs and water cans could go forward in supply vehicles, and the empty cans could be back-hauled for cleaning and reuse. Enough water should go forward to permit decontamination as well as drinking. Perhaps water purification kits should be furnished to each squad or section, along with a chemical detector kit to insure that the water being considered has not been contaminated by enemy NBC weapons. This system would allow limited clean water capabilities for drinking and decontamination at the lowest level in a unit.

It may be that such measures are already in use in Europe — if they are, I would like to see them implemented during Reserve Components annual training, especially during field training exercises. By truly "training as we expect to fight" with regards to food service, our units will be better able to function in the high-intensity European combat environment that may exist in the future.

Larry A. Altersitz
CPT, FA (PAARNG)
Pittsburgh, PA

Current policy and OPLAN guidance in Europe and most other theaters directs the operational stockage of Class I supplies (normally a one-day stock at the unit, a two-day stock at division, a 10-day stock at corps, and so on). These operational Class I stocks are backed by theater war reserve stocks of C-rations and Meals, Ready-to-Eat. A commander will need to recognize the tradeoff effects of having his unit subsist solely on these rations while his cooks are pulling duty as guards or replacements.

Certainly, sole reliance on the unit's organic 400-gallon water trailer as envisioned under current doctrine does not seem adequate in view of recent findings that give the average water usage per man as 20 gallons per day in certain conditions. A commander does have the latitude of determining whether the purchase of five-gallon water cans ranks above other priorities in the expenditure of his unit operating funds.

In fact, much of your concern over field artillery combat service support and training seems to be concern over the commander's familiarity with these demands. He must, as you suggest, plan for the supply of water fit for decontamination and of water potable for human consumption from the division's four water purification units; he must plan for the availability of Halizone tablets as a water purification backup for the individual soldier; he must plan for the use of local water sources as a backup to division assets; and he must plan for the exercise of these events as they are outlined in the food services section and battery special teams section of existing ARTEPs.

As a last note, you will be interested in knowing that the Chemical School is working on a research and development item which will detect nuclear, biological, and chemical contaminants in water. — Ed.

Wrong fuze

The picture of the 1st Battalion, 29th Field Artillery, on page 45 of the January-February 1983 *FA Journal* is incorrectly described. The fuze setter for the M564 fuze is not the M27 fuze setter, but the M34 or M63 fuze setter (which has been recalled). The M27 fuze setter is used for VT fuzes only.

Robert F. Barry II
ILT, FA
XO, B Btry, 2-33d FA
APO NY

You are absolutely correct. The chief of section from the 1-29th FA was indeed setting a VT fuze with the M27 fuze setter. — Ed.

Reunions

697th and 698th Field Artillery Battalions and 79th Field Artillery Group Headquarters Battery — 4-6 August 1983 at the Holiday Inn West in Asheville, North Carolina. Contact Howard W. Green, Route 4, Box 214, Candler, NC 28715.

7th Field Artillery Association — 2-3 September 1983 at Salem Inn (Exit 2 off I-93, Keewaydin Drive), Salem, New Hampshire 03079. For further information, write to Mr. Harold F. Watts, President, 99 Rosemont Avenue, Manchester, New Hampshire 03103; or, Mr. David C. Foran, Secretary/Treasurer, 2800 Brown Pelican Avenue, New Port Richey, Florida 33552.

Hotline

QUESTIONS AND ANSWERS

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

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

Question: How can I obtain a fan, range-azimuth, scale 1:50,000?

Answer: *The fan, range-azimuth, scale 1:50,000, is available through any US Army training aids center. The stock number is TD 6-7-4, and it is requisitioned on DA Form 4103.*

Question: I noticed that the small unit transceiver is available according to the *FA Journal*. Is it to be authorized on a table of organization and equipment; if so, when will it be issued?

Answer: *The small unit transceiver, AN/PRC-68, is included in the J-series TOEs. It has been type classified standard and will be issued when available.*

Question: What is the latest on the field artillery's smart antitank munitions?

Answer: *The Copperhead II (fire and forget) projectile, which is in the early stages of development, will have the capability of homing in on the target without the use of a laser designator. The SADARM (seek and destroy armor) projectile is also in its early stages of development for 8-inch weapons. The SADARM will eject three submunitions, each on a separate parachute. In the descent stage, the submunition searches a portion of the target area in decreasing circles. The Assault Breaker Program has undergone some firing tests at White Sands Missile Range with two different missiles known as the T16 and T22. These missiles have the capability of being corrected in flight. When they arrive over the target area, they expel terminally guided submunitions which seek individual targets.*

Question: Is there a graphical firing table for the 4.2-inch mortar?

Answer: *Yes. The NSN is 1220-00-078-1988, and the part number is 10556427. The Army Armament Research and Development Command is the source for the Training Extension Course data package on this item.*

Question: Is there a projected date for the fielding of TACFIRE to separate howitzer batteries?

Answer: *TACFIRE will not be going to separate howitzer batteries. These batteries will receive the Battery Computer System. The fielding schedule is classified; however, units scheduled to receive the Battery Computer System are notified 18 months in advance.*

Question: Under the J-series TOE, will a field artillery battalion be upgunned; i.e., from a 6-howitzer battery to an 8-howitzer battery? Also, will division artillery get a target acquisition battery or a battalion?

Answer: *Under the J-series TOE, the 155-mm self-propelled direct support battalion will be upgunned to 3X8; and general support battalions will convert to 2X6 8-inch/1X9 MLRS. While the final objective Division '86 structure includes a target acquisition battalion, the target acquisition battery will be retained under the J-series TOE.*

Question: What is the reference for the gunner's test on an M110A2?

Answer: *The reference for the gunner's test on the M110A2 is FM 6-50 with change 1, appendix D, page D-4.*

Question: Can the M109-series howitzer be fired without spades? If so, what actions are required to insure platform stability? Are there any charge limitations? Also, can the howitzer be fired at 1,600 and 3,200 mil traverse from the azimuth of lay? Technically, is there any part of the howitzer subject to material failure for the howitzer fired without spades?

Answer: *The spades on the M109 were designed to stabilize the weapon in soils of low penetration; i.e., loose soil, sandy, and muddy terrain. Therefore, the spades will be used when the vehicle is firing off soils of low penetration. The spades need not be employed when the vehicle is firing (any propellant charge) off hard or firm surfaces. The determination for spade emplacement will rest with the battery commander. His judgment will dictate conditions under which the spades will or will not be used. Since the M109 vehicle is able to traverse 360 degrees, it is unnecessary to move the vehicle after it is emplaced on the spades unless considerable movement is required to reach the firing point. Firing to the starboard or port side of the vehicle with the spades in place should have no adverse effects on the spade. However, if conditions permit, it is recommended that the vehicle be moved off the spade before firing.*

Question: FM 6-40, page 7-23, has a picture of a sample DA Form 4982-1 for the M90 radar chronograph which shows a block for muzzle velocity (MV) corrections for nonstandard conditions. I understand how this value is obtained from table E in the tabular firing table if the square weight is standard; however, what happens if one calibrates with a nonstandard square weight? Have tables for all charges and all rounds been published? Also, how can a fire direction officer determine how many rounds per charge each tube has shot, as is required to shoot shell M454 using the meteorological correction technique? DA Form 2408-4 lists charges 1-6, 7, and 8 separately. What is the form number for the subsequent meteorological data correction sheet for the TI-59?

Answer: *Table E is not used to determine corrections for the M90 velocimeter. Muzzle velocity (MV) correction for nonstandard conditions is obtained from MVCT-90-1, M90 velocimeter correction tables. The Gunnery Department, USAFAS, provided those tables and instructions for their use to all units that received the M90 velocimeter. Units having the M90 and needing additional copies of the tables should contact the Commandant, USAFAS, ATTN: ATSF-GA, Fort Sill, OK 73503; AUTOVON 639-3901.*

Table 13-3 of FM 6-40 has two entry arguments: erosion EFC rounds and tube wear measurement. The tube wear measurement technique is the preferred method. The wear measurement is obtained from the periodic bore scope tests/pullover gage readings conducted by ordnance personnel. The only way the charge erosion life factor can be used as an alternate method is if the fire direction center has maintained a record of all rounds fired by charge for each tube since it was new. This method is usually impractical and is less reliable than the tube wear measurement technique. All new high-explosive tabular firing tables contain a table which lists the approximate loss in the muzzle velocity to use with the ordnance readings. The new FM 6-40, currently being staffed for field comments, clarifies this particular area.

A Fort Sill test met data correction sheet (FS Form 1301 (Test)) for use with the TI-59 contains both concurrent and subsequent met correction steps. The form is not being submitted for Department of the Army distribution; however, a copy of the two-sided form appeared in the July-August 1980 ***FA Journal,*** *on pages 17 and 18. This copy is suitable for local use. Most FDCs laminate their copy of the form and reuse it.*

Question: I have recently received my FADAC Revision 6 for rocket assisted projectile (RAP) and improved conventional munitions (ICM) computations. My current TI-59 module for the M110A2 is revision 4. When I use the same data for both the FADAC and the TI-59, the deflections agree; but the quadrant elevations can differ anywhere from 6 to 10 mils (dependent on chart range). Is there any method to correct or input a constant into a TI-59 so that the TI-59 computations will agree with the FADAC computations? Secondly, is there or will there be a revision 5 or 6 for the TI-59? If it is already available, is there a stock number under which I can order a new module for the M110A2?

Answer: *The TI-59 modules were designed to provide a backup capability for the fire direction center. They compute firing data based on a curve fit solution which is not as accurate as the FADAC computations. Another reason for the discrepancy in solutions is that while the TI-59 module is labeled M110A2, it actually produces M110A1 firing data.*

The best way to compensate for the difference in data is to register and compute the appropriate corrections for deflection, fuze, and range. Lacking registration corrections, one should use FADAC to derive a GFT setting and compute a deflection correction, fuze correction, and range K for input into the TI-59. With this input, the TI-59 data will compare closely to FADAC; however, shifts out of transfer limits or to the maximum ranges will cause disparity in firing data between the TI-59 and FADAC.

Only one M110A2 module has been produced. A second module for the M110A2 containing M509A1 (DPICM) and M650 (RAP) data will be produced by Texas Instruments in the near future. Although not currently available, the NSN and part numbers are NSN 1220-01-144-1461, part number 9349836.

Question: I am in an M110A2 firing battery, and I would like to know if I have to re-lay the battery for an out-of-traverse mission.

Answer: *The battery should only have to be re-laid for an out-of-traverse limits mission if the proper sight picture cannot be established on the aiming point. There currently is no reference which outlines procedures for out-of-traverse missions, but the Weapons Department is working on a recommended change to be placed in FM 6-50 and the appropriate technical manual.*

Question: What is the status of the laser rangefinder?

Answer: *There are two field artillery laser rangefinders:*

- *The Laser Infrared Observation Set, AN/GVS-5, has been fielded in the 24th Infantry Division (Mechanized) and the 82d Airborne Division. It will be fielded in USAREUR in the third quarter of FY83 and in the 101st Airborne Division (Air Assault) during the fourth quarter of FY83.*
- *The Ground/Vehicular Laser Locator Designator (G/VLLD). AN/TVQ-2, has also been fielded in the 24th and 82d Divisions. It is presently being fielded in the 9th Infantry Division; approximate fielding for USAREUR is FY85.*

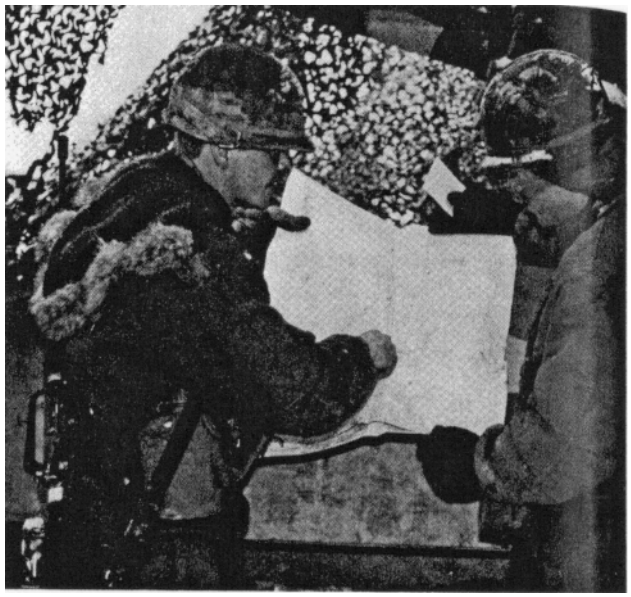
Question: Is there a difference between the fire support plans at division level or higher and those for brigade and battalion level operations? The examples in FM 6-20 are for a formal fire support plan by division level and higher.

Answer: *There are no separate formats for brigade and battalion fire support plans. Although the examples of fire support plans in FM 6-20 are written for the division level, the same format should also be used in preparing fire support plans at brigade and battalion levels.*

Your Right to Survive

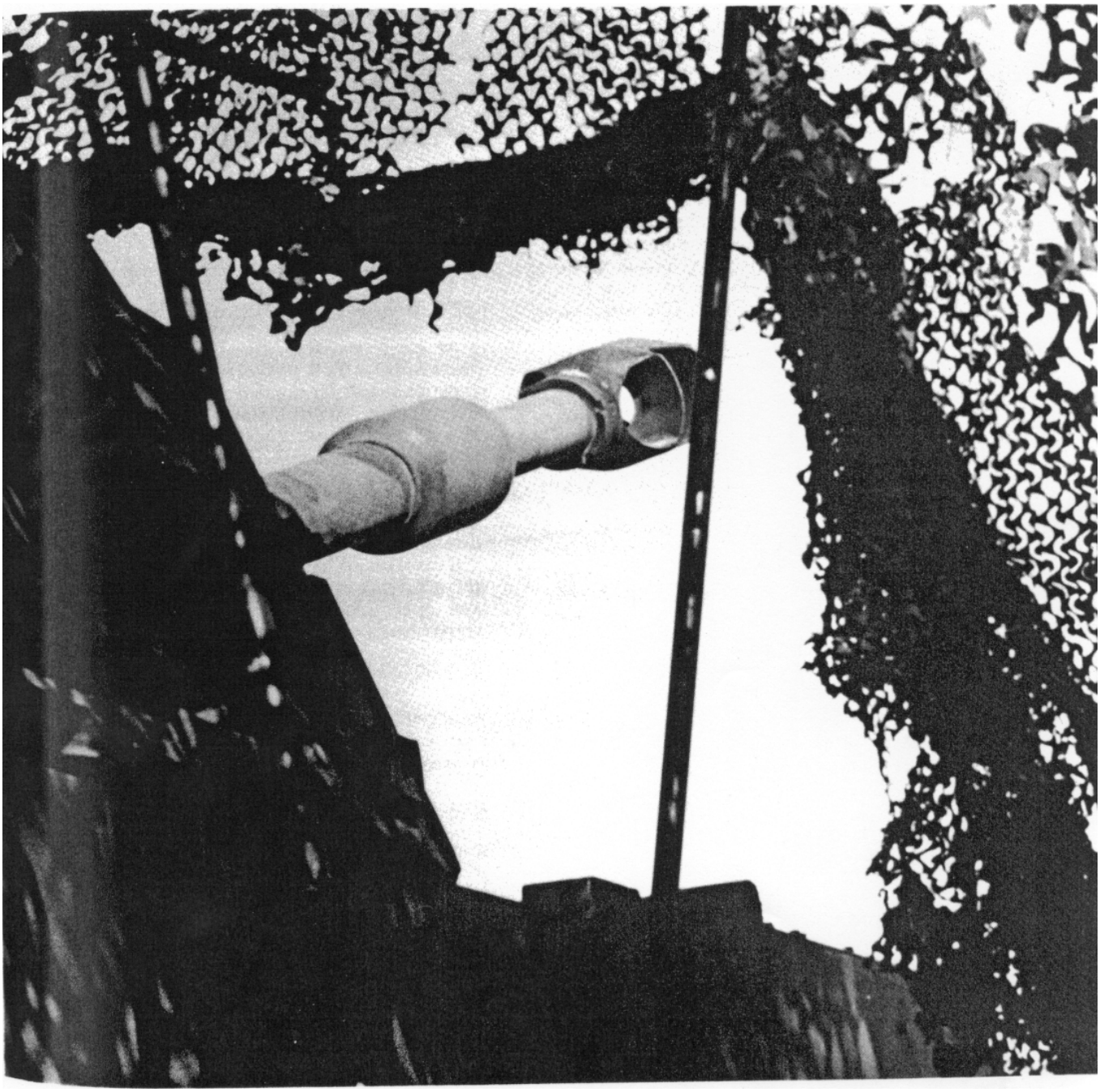
by Colonel Andrew J. McVeigh III

Our continuing analysis of potential force ratios and force multipliers in a European conflict has created a growing concern over the Field Artillery's ability to sustain adequate numbers of tubes in a high intensity conflict. We must recognize that the Field Artillery Community's refusal to approach survivability as a science and its continuing treatment of survivability as an art based on battlefield experience and the commander's good judgment exacerbate this problem. For even the commander's judgment, reflected candidly by the European Theater maneuver brigade commander, is tempered by the immediate needs of the Armor and Infantry Communities, which demand responsible, accurate, and sustained fire



(All photos by LTC William B. Clark)

support for their subordinate units. An artillery commander's decision to move frequently in order to survive immediately conflicts with the maximum availability of artillery fire and rear area coordination requirements of the maneuver commander. Discord arises if the artilleryman persists in moving to a degree that tube availability diminishes markedly, while the probability of destruction by counterfire greatly increases if we are coerced into continually providing maximum available fire to the maneuver commander. To avoid the stigma of being potentially non-supportive, the Field Artillery Community currently gives concerned lip service to survivability through movement, reflected by both major training area live tactical firing and maneuver rights training exercises virtually throughout USAREUR in divisional and corps artillery units. Split batteries, wide platoon fronts, and terrain gun positioning fare no better. Experience in Korea and CONUS indicates an even lower concern for counterfire due to the nature or proximity of the threat. Our artillery field manuals laud survivability; however, the current cannon unit tactics and procedures scarcely differ from those of 30 years ago when survivability could have been characterized as "firstest with the mostest." The well-documented opposing force radar detection and radio direction finding capabilities and potential tube ratios should indicate a requirement that we



systemically train to survive, supported by appropriate doctrine and procedures from TRADOC.

The prevailing attitude

Numerous articles have been published outlining the need for various survivability tactics for our cannon artillery. *Field Artillery Journal* articles have described randomly positioned howitzers firing independently throughout a battery area — "Survivable, Affordable, and Lonely" (November-December 1977) and "Battery Positions Are Out-of-Date" (May-June 1980). These articles have been presented as "thought pieces" or futuristic plans on the deployment of field artillery assets. In most every case, they describe what we should do after the acquisition and fielding of certain types of equipment. Other articles extol the merits of abnormally wide battery fronts and frequent moves — "Field Artillery Survivability" (May-June 1980).

It is apparent from travels throughout the Army and from discussions with artillery commanders worldwide and with members of the Field Artillery School staff that, except for a few isolated battalions, no action is being taken to alter our tactics. Artillerymen take note — the evidence shows that unless we get survivability-oriented tactics we will be a non-factor after the first day of the next war. If a war starts tomorrow, how long will your section, battery, or battalion be operational? If you move as a battery two to three times per 24 hours and have 50 to 100 meters dispersion between pieces, you can expect to have about 25 percent of your tubes operational after 16 hours in a European Scenario ("Letters to an Artilleryman," *Field Artillery Journal,* September-October 1980). Clearly unacceptable; yet this is how most of us train.

At Grafenwoehr, we see batteries in position, with no more than 150 meters across the front, stationary for as long as 24 hours. If indeed "train as we fight" is the jargon that we use to tell everyone how we train, then one can say, with some accuracy, "We will fight as we train." I say, "If you fight the way I see most of us train, you will not be fighting for long."

Now my message to you is simply that we must stop waiting for someone or something to fix all of the operational problems and challenges associated with survivability tactics — we must start with what we have, tax it to the limit, and continue to improve mission capability as more and better things come along.

Two-year RDTE completed

For two full years of research, development, test, and evaluation (RDTE), the three cannon battalions (one 155-mm and two 8-inch) in the 17th FA Brigade have been required to train and develop defensive plans using evaluative survivability tactics. They have already done away with battery positions as you know them and have reached a level whereby all three battalions can fire every bit as accurately and as rapidly as the best of you, move six times per day, and afford a realistic survivability rate in excess of 70 percent with more than 85 percent average tube availability at any one time. I have not been willing to publish anything until I had the facts to support that claim, but now I do. Survivability tactics are not futuristic — they are alive, well, and improving every day.

The concept of survivability tactics includes a number of actions which synergistically improve our ability to survive. We must assume that the enemy can acquire us when we move, shoot, or communicate. If acquired, he will be able to fire on us. We must make our acquisition difficult and when fired upon reduce the effects of his artillery to an absolute minimum. Given today's equipment and organization, the tactics we have successfully developed and rigorously evaluated look like this:

- **Consolidated support:** Our first concern is that firing batteries must be free to move rapidly. They cannot move and escape detection with long lines of ammunition, supply, maintenance, or mess vehicles. Put all your nonfiring elements into a *battalion consolidated trains* with the battalion executive officer in charge. The trains control maintenance contact teams, mermite chow, and resupply of ammunition, as well as taking care of any other tasks not unique to the firing elements. The II German Corps Artillery officers gave great praise to the 17th Brigade's two 8-inch battalions — the 1-30th FA and the 1-36th FA — for their phenomenal maneuver capability derived from using this organizational system during the Bundeswehr's multidivision exercise, Sharp Sword, which was held concurrently with REFORGER '81. The 1-18th FA (155-mm) used the battalion consolidated trains system in flawless support of the 1st Armored Division's 1-1st Cavalry Squadron diversion ploy during REFORGER '82.

Consolidated trains are the key to success. By reducing your tail, you become lean and mobile. Ammo and fuel resupply can be made at a roadside rendezvous position during a scheduled move; Lance units do it all the time. Keep the ammo trucks and tankers out of your gun position areas. They have an easily identifiable signature and cause you to be attacked quickly. Hot meals, mermited twice a day, are easy to manage. You probably will need a double set of mermite cans, but such an investment of Colex funds is clearly worth the benefits. When you fuel or rearm, also resupply your water and gas cans. Functions do not change, but organizational management certainly does. This is currently more efficient in all three of the 17th Brigade's cannon battalions than the standard configuration ever allowed.

- **Split battery:** With the equipment and organization you have today, *split your battery into two platoons* and further divide your leadership into two platoon headquarters. The first sergeant and chief of firing battery command one platoon; the executive officer and gunnery sergeant command the other.

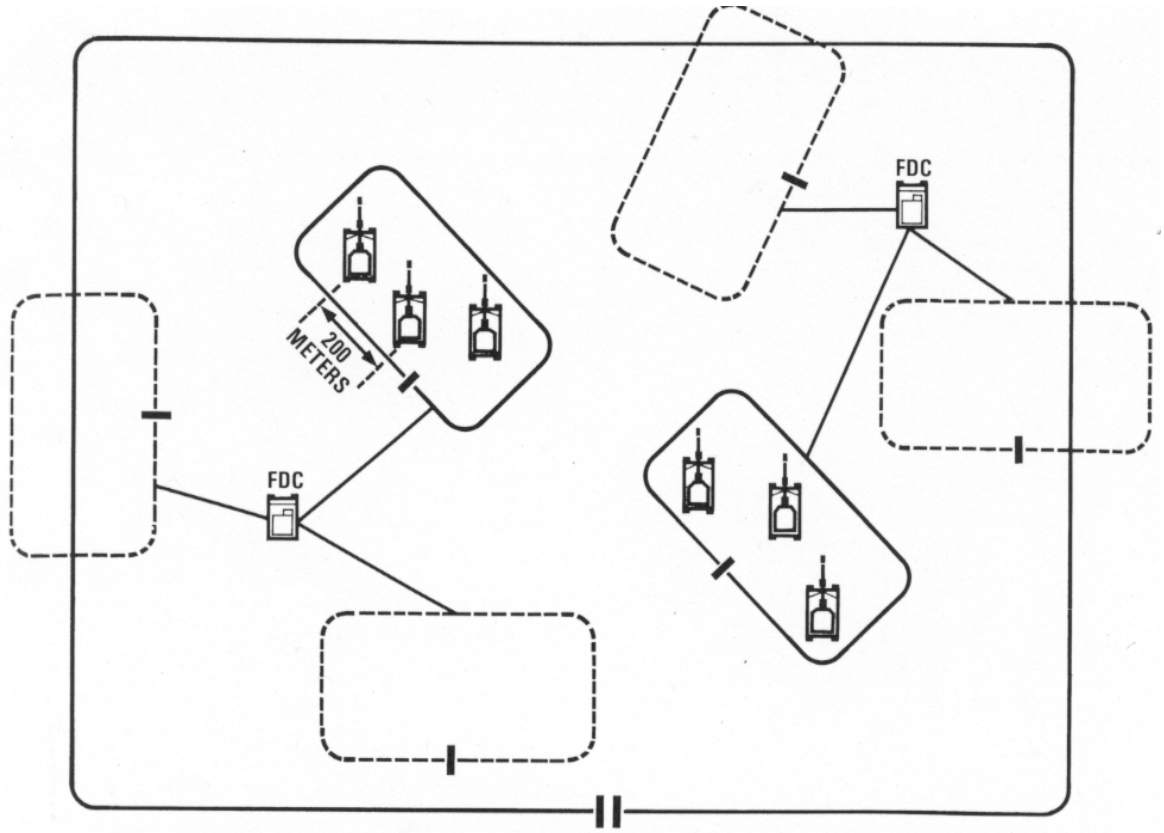


Figure 1. Battery position area with wide fronts and split platoons.

These platoons must be capable of independent reconnaissance, selection, and occupation of position (RSOP) as they move within the four-to-six square kilometer battery area in a sequence prescribed by the battery commander. Command and control enhancements are comparable to the improvement derived by Armor from smaller tank platoons.

There is no great difficulty in splitting the battery and using two platoons. There is some degradation in perimeter security, but I am willing to accept that risk given the very high counterfire threat. The first sergeant will initially want to be in both platoons or in the headquarters, but his experience is far too valuable to waste simply using him as a supervisor. We need him to command; we need his experience; we need to survive, and he is a very important part of that. Your NCOs will rise to the occasion. It is a tremendous enhancement to NCO professionalism to require NCOs to habitually operate independently as platoon commanders.

Moving by platoon is very simple and fast once you develop a plan, set a standard, and then train to it. Reconnaissance for the alternate/subsequent position by one of the platoon's leadership pair starts 30 minutes after the platoon is laid and ready. Wire communications are essential, and laying by voice should be forbidden. A platoon that cannot lay by telephone has not planned well since we must assume that we may be forced to be in MOPP 4. A basic rule should be, "If you cannot do it in MOPP 4, you cannot do it in war."

- **Spread your guns:** Keep a minimum of *300 meters between howitzers;* the greater the dispersement, the better. Make sure you position each howitzer where it is best concealed, *using terrain gun positioning;* and insure that the reconnaissance party — not the survey party — selects the orienting station! We no longer can afford the luxury of normal battery fronts. Survey firing charts along with terrain gun position corrections allow massing of any platoon combinations within a battalion.

- **Survivability moves:** As a minimum, *move each platoon every four hours*. These are short 500 to 1,500 meter moves. A battery occupies a battery area two to four kilometers in diameter. Within that area are several platoon firing positions (figure 1). The platoons move within the battery area a minimum of once every four hours. A well-trained platoon can make such a move in less than 20 minutes (from march order to laid and ready). Two DR-8s per section facilitate these deliberate occupations and an absolute reliance on an internal battery wire net. The fire direction center (FDC) normally is offset from the platoons and should be required to move every six hours.

Survivability moves often cause the professional artilleryman concern because of the amount of time an element will be out of action. Figure 2 shows that the percent of time available based on the time in position is much higher than one might imagine. A 20-minute move after a unit is in position four hours means that element was in position to fire 240 minutes of the 260

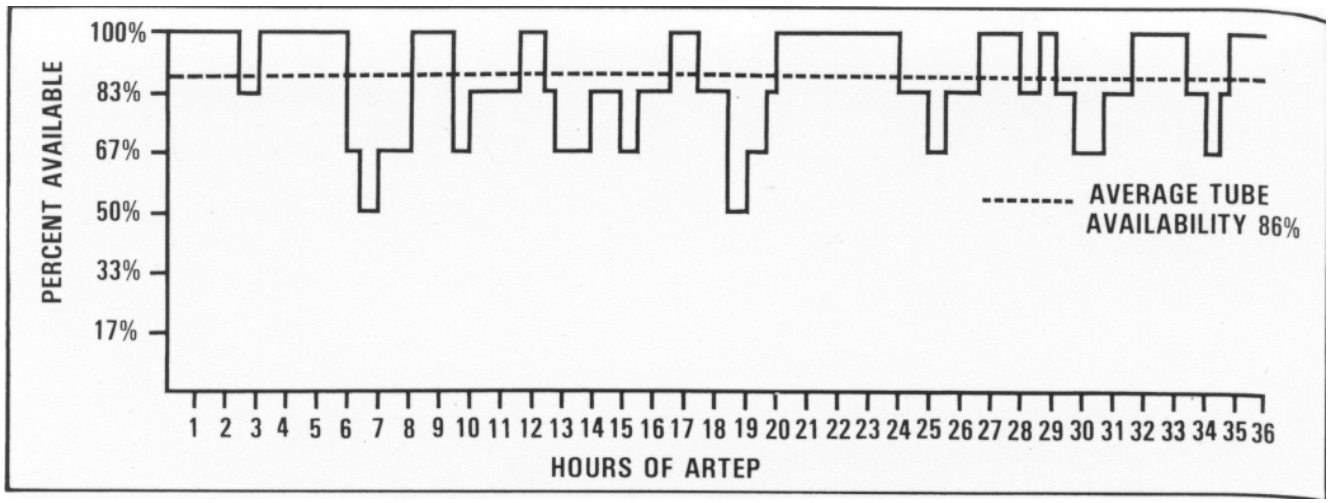


Figure 2. Battalion tube availability (8-inch battalion with 12 guns).

total or about 92 percent of the time. These moves do not just happen; we had to train hard to achieve the discipline required for a 20-minute move standard. To train to this movement standard allows many variations of the four-hour move consistent with the combat situation. As fatigue can destroy efficiency after about 36 hours, we require six accumulated hours of sleep per soldier per day. This is a leadership problem that, when mastered, affords sustainability.

- **Directional antennas:** Every AM and FM radio transmission from any fixed site in the brigade is made using *directional antennas*. A locally manufactured switching box has been developed so that we receive over an omni-directional antenna and transmit to the appropriate element over a directional antenna.

- **Platoon firing:** *Use platoon fire missions* massed from within a battalion or battalions by varying combinations of platoons from different batteries consistent with the selected method of target engagement. The documented use of platoon firing from standard battery positions in January 1980 by the 1st and 3d Armored Division Artilleries at Grafenwoehr demonstrated a tremendous degradation

of radar detection capability because of mass clutter. The split battery with wide platoon fronts enhances this clutter level significantly when using Q-4 state-of-the-art. Radar improvements reduce this clutter effect but make counterfire target selection more difficult as each wide platoon front howitzer now prints out as a battery center.

These methods will significantly enhance survivability. What you are concerned about is how to improve your unit's combat efficiency! There is absolutely no doubt about it — increased officer and NCO responsibilities, avid use of the ARTEP as a system, and rigid adherence to the Battalion Training Management System guarantee successful training results utilizing all of the tactics discussed above. None of these are new to the professional artilleryman except the directional antenna switching box. It serves no tactical purpose for us to survive if our supported units are being destroyed in place due to a marked reduction in fire support.

Let us examine the fire support standards met employing the above tactics to give you an idea of the success you can achieve. A 12-tube, 8-inch battalion was recently evaluated by the 17th FA Brigade. During the 39-hour period of continuous live firing evaluation phase, the battalion did the following:

- Fired 472 live battalion fire missions. Data was computed, and terrain gun position corrections were applied to all 12 pieces before the method of fire was changed to selectively fire one howitzer of the chief evaluator's choice. Every howitzer therefore fired at or just under 40 rounds each.

- Conducted 45 platoon moves. Although over 50 percent were expected to be under pure NCO command and control, a higher percentage actually occurred due to the periodic absence of the executive officer on nuclear related missions.

- Fired 92 percent of the rounds both within the ARTEP time standards and the ARTEP probability "box" utilizing, because we employed one-round fire missions, a 100 percent rule versus the standard 75 percent rule. All rounds were radar spotted and plotted.

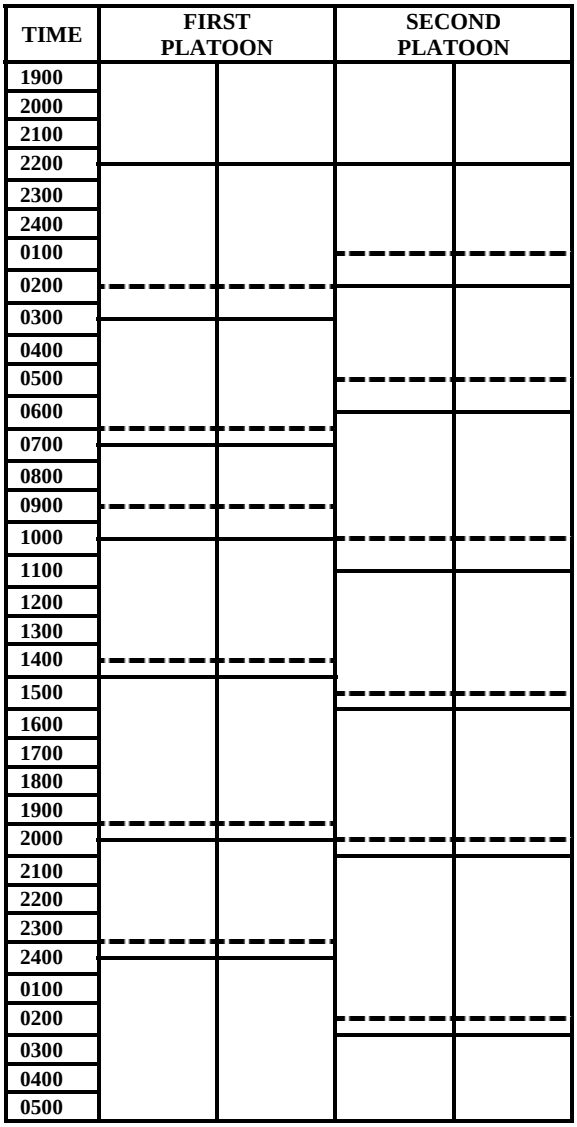


Figure 3. Battery movement and availability timelines.

• Maintained an 87 percent tube availability rate through this period of simulated high intensity combat. Figure 3 shows how we traced each platoon move. Note that evaluation safety time is stripped out. Tubes were out of action from march order until they were laid and ready. If wire communications were not established from the FDC to the howitzers, the platoon was *not* ready.

• Utilized long wire antennas for all AM and FM transmissions. Omni-directional antennas were used for reception utilizing a switching box.

• Fed two complete, hot meals to each soldier daily. One meal each day was hot C-rations.

• Made frequent preplanned and emergency ammunition resupply runs of five to ten rounds at a time, adequately exercising this system.

• Maintained a vehicle operational reliability rate of 100 percent.

Conclusion

The reason why these tactics are not more frequently used is threefold. First and foremost is that to be proficient using these survivability tactics requires a good unit training program, hard work, and a comprehensive ARTEP evaluation system. Today the evaluation portion of the artillery ARTEP is soft and in many instances staged. Secondly, the first concern of the maneuver arms of Armor and Infantry is continuous and accurate fire support for their engaged soldiers. Up to now, any attempt on the part of artillerymen to advocate survivability tactics has been seen as a fledgling, unacceptable reduction in required support. Finally, Fort Sill and the TRADOC components have clearly hesitated to demand such a tactics and doctrine array because it constitutes what appears on the surface to be a massive change with no assurance that it can successfully be accomplished by today's battalions. A two-year evaluation using three USAREUR cannon battalions is ample proof of attainability. The challenge is now to Fort Sill and the Field Artillery Community to institutionalize sound, effective survivability tactics in order that we might be counted as a survivor at the completion of the first battle.

(The author notes that Colonel John K. Holsonback, Jr.; Lieutenant Colonels William B. Clark, Harold L. Cooke, Ronan I. Ellis, David L. McKee, Dennis D. McSweeney, Richard L. Meredith, and Raymond T. Roe; and Major Leslie D. Brown assured quality, multi-echeloned training and evaluation during their tenure in the 17th Field Artillery Brigade and thus share the credit for the success of the survivabilty tactics.)

COL Andrew J. McVeigh III, FA, received his commission through the OCS and has served in both cannon and missile units. He possesses a B.S. degree from the University of Houston and an M.S. degree in public administration from Shippensburg State College and is a graduate of the Army War College. He has served in multiple capacities at the Pentagon and has been an OCS tactical officer and an ROTC instructor. He has commanded a firing battery in the 3-37th FA in Germany and a BCT company in the 9th Battalion, 2d (BCT) Regiment at Fort Jackson. He was the S3 of the 1-21st FA in Vietnam, the division artillery adjutant in the 101st Airborne Division Artillery at Fort Campbell, and the division artillery executive officer in both the 2d Infantry Division Artillery in Korea and the 1st Cavalry Division at Fort Hood. His battalion command was the 1-21st FA at Fort Hood. After serving as the deputy commander of the VII Corps Artillery, he assumed command of the 17th Field Artillery Brigade in Augsburg, Germany. He is currently the Director of the Directorate of Course Development and Training at the Field Artillery School.

(All photos by the author)

Wrestling with FIST

by Captain Patrick C. Sweeney

The Field Artillery Committee of the United States Infantry School is an island of red in a sea of blue, and from that island one can see the Infantry Community from a unique perspective. It is an excellent observation post from which to detect the current movements in the opinions of those "grunts" coming in from their time in the foxholes. For their Redleg brothers, these infantrymen have much to say about the fire support teams (FISTs) with whom they served; and it makes good sense for concerned field artillerymen to listen well.

Although there once was a great deal of opposition to the FIST concept, it now seems fairly well established in the ranks of the maneuver forces. Thanks to the education provided by the Field Artillery and Infantry Schools, one no longer hears accusations of field artillery empire building and cries about the maneuver commander's lost prerogative in the use of his mortars. Infantrymen know what the FIST is and what it is designed to do. There remains, however, adverse comments dealing with the application of that concept.

It was this criticism of the FIST that caused the Artillery Committee to attempt to isolate and quantify the reasons behind it. In order to capture the feelings from the foxhole, the Committee conducted a survey of three Infantry Officer Advanced Course (IOAC) classes — all three were in residence at the Infantry School at the time of the survey, though they were each at different stages in the course. One common denominator for all three classes was that they had completed their 23-hour block of instruction on fire support, which included a two-hour class on the FIST.

Survey population

The members of the survey population were Advanced Course students, not graduates. The bulk of their experiences of the FIST and related fire support matters came as the result of education in the field rather than in a formal service school environment. There were few Armor officers in the student population, and so their responses may not be a large enough sample from which to draw conclusions. Some of the officers had commanded, and some had not. Those who had been platoon leaders seldom were exposed to the full spectrum of FIST operations. (Accordingly, the responses shown on the survey reflect the opinions of those officers who were commanders, while displayed in parentheses adjacent to those responses is the input of all the students, to include officers with no command experience.) A summary of the survey population's composition is shown in table 1. What follows are these officers' responses to 15 probing questions on FIST and the implications to the Field Artillery (numbers reflect percentage of total responses).

Table 1. Survey population.

Total responses 236

Response breakdown

	Infantry	**Armor**
Command experience:	29	9
Platoon command:	195	21
Locales of FIST experience		
CONUS:	94	9
EUROPE:	80	11
KOREA:	19	1
HAWAII:	16	0
ALASKA:	4	0
PANAMA:	2	0

FIST manning

• Question 1: In your experience, when the FIST arrived in your company, what was its strength?

	90-100%	75-90%	50-75%	Less than 50%
Infantry	27.6 (17.6)	17.2 (26)	34.4 (33.9)	20.6 (22.3)
Armor	11.1 (19)	44.4 (47.6)	44.4 (33.3)	(0)

• Question 2: How often did your FIST have the authorized field artillery lieutenant as FIST chief?

	All the time	Most of the time	Seldom	Never
Infantry	20.7 (22.5)	41.4 (43.2)	24.1 (19.5)	13.8 (11.6)
Armor	11.1 (23.8)	66.7 (52.3)	22.2 (19)	0 (4.7)

• Question 3: If your FIST had no field artillery lieutenant assigned as FIST chief, was a qualified NCO filling the position?

	Yes	Sometimes	No	Not Applicable
Infantry	55.2 (51.1)	27.6 (22.7)	3.4 (3.7)	13.8 (22.3)
Armor	77.8 (66.7)	11.1 (14.2)	11.1 (4.7)	0 (14.2)

• Question 4: If you were in an infantry organization (infantry, mechanized, airborne, or air assault), how often did you receive all three platoon forward observer (FO) parties when the FIST came to your unit?

	All the time	Most of the time	Seldom	Never	Not Applicable
Infantry	27.6 (14.8)	26.5 (38.2)	27.6 (26)	20.7 (14.8)	0 (1.6)

It would appear that 20 percent of FIST organizations report to the maneuver company at less than 50 percent strength, while 48 percent of the infantry FISTs are arriving at the company without platoon FO parties. It was only a year ago that studies at Fort Polk revealed the need to enhance the capabilities of the three-man FIST headquarters by adding a fourth man. Yet, FISTs are reporting for duty with even fewer members than were present during the Fort Polk test. A FIST at 50 percent does not merely suffer a proportionate loss in combat power as would a maneuver platoon — it will not be able to accomplish its mission.

Radio availability

• Question 5: When the FIST arrived at your company, did it have the radios required for its mission (1 per platoon FO party, and 4 at the FIST headquarters)?

	Yes	Most of the time	Seldom	Never	Not sure
Infantry	58.6 (48.3)	10.3 (30.2)	10.3 (11.1)	20.7) (8.8)	0 (1.3)
Armor	77.8 (71.4)	22.2 (19)	0 (9.5)	0 (0)	0 (0)

If the platoon FO is without a radio, then he is of little use to the platoon leader. If the FIST headquarters is missing one or more radios, then the FIST chief becomes proportionally more a fourth FO than the maneuver company fire support coordinator (FSCOORD). In a dry-fire training environment, it may not make a significant difference to be short a radio or two; but the FIST chief will need them all during war, and he and his men will become proficient in the orchestration of fire support coordination on four radio nets only through experience in the field.

Field training exercises

● Question 6: When your company went on a tactical exercise, how often did your FIST go with you?

	All the time	Most of the time	Seldom	Never
Infantry	37.9 (56)	48.3 (51.1)	13.8 (21.3)	0 (1.3)
Armor	33.3 (38)	55.6 (57.1)	0 (0)	11.1 (4.7)

● Question 7: When you received your FIST during a field training exercise, how often did you receive the same personnel with whom you had trained?

	All the time	Most of the time	Seldom	Never
Infantry	31 (26)	37.9 (50.6)	27.6 (18.6)	3.4 (4.6)
Armor	44.4 (33.3)	44.4 (52.3)	11.1 (14.2)	0 (0)

Though there is a demonstrable improvement in FIST support of the maneuver company during field training, lack of rapport between the maneuver company and its FIST is still a sensitive area. Greater than 30 percent of the infantry companies seldom or never received the same FIST personnel on subsequent exercises; yet one of the features of the FIST concept was the habitual support of a FIST to the same company. Just as a maneuver battalion or brigade commander benefits from rapport with his fire support officer, so does the maneuver company commander benefit from a habitual relationship with his FIST. With that close rapport, the FIST chief can develop fire support standing operating procedures which streamline operations and make the organization more tailored — more responsive to the maneuver need. He will understand how his company commander operates, what his fire support needs are, and the level of knowledge which the company commander has of fire support. That this problem still exists is even more unfortunate when one realizes that field artillerymen have heard about it before. Take this comment from a National Training Center report: "Utilization of the FIST has been mostly poor. There are several factors contributing to this. Primary among these is that there is seldom a fire support SOP established, or, if established, either incomplete or not used. This lack of standard procedures compounds the normal confusion encountered in a fast-moving tactical situation." Or take this comment from the Fort Polk FIST evaluation team: "The infantry company fire support team interface was poor during the initial phase of the test. Although each element was knowledgeable of its mission, little interplay was noted. Again, as the test progressed, the players gained experience and teamwork improved. It would appear that the habitual infantry company-FIST relationship is required and must be exercised during training if an effective fire support system is to exist." There is much room for improvement in this area.

Maneuver understanding

● Question 8: Before attending the Advanced Course, did you have a full understanding of the FIST's mission, duties, and operation?

	Yes	Yes, for the most part	No	Not sure
Infantry	41.4 (28.3)	37.9 (49.3)	17.2 (20.4)	3.4 (1.8)
Armor	33.3 (19)	44.4 (61.9)	22.2 (19)	0 (0)

There remains a problem in education. The Infantry Officer Basic Course graduate knows generally what the FIST is all about. However, he is not armed with enough specific information to understand the detailed operation of the FIST headquarters — a mandatory task for a company commander. The FIST chief should be aware that if his company commander is not an Advanced Course graduate, the burden of FIST education falls on the FIST chief's shoulders. If a company commander does not understand the mission and capabilities of his FIST, then he will probably not make the most effective use of it.

Maneuver evaluation of FIST capabilities

● Question 9: Do you feel that your FIST could have accomplished its mission of planning for, coordinating, and adjusting fire support for the maneuver company during combat?

	Yes	Yes, with reservations	No	Not sure
Infantry	37.9 (33.9)	37.9 (49.3)	20.7 (12.5)	3.4 (4.1)
Armor	44.4 (52.3)	44.4 (42.8)	11.1 (4.7)	0 (0)

● Question 10: Using the ratings of good (G), average (A), or poor (P), indicate your FIST chief's general capabilities.

	Infantry	Armor
Land navigation	A (A)	A (A)
Map reading:	A (A)	A (A)
Fire planning:	G (G)	G (G)
Fire support coordination:	A (A)	G (G)
Use of mortars:	A (A)	A (A)
Adjustment of fire:	A (G)	G (G)
Understanding scheme of maneuver:	P (A)	A (G)
Physical capabilities (Kept up with the company):	A (A)	A (A)

• Question 11: Using the same scale, rate the E6 13F fire support noncommissioned officer in the FIST headquarters.

	Infantry	Armor
Land navigation:	A (A)	P (A)
Map reading:	A (A)	A (A)
Fire planning:	A (A)	A (A)
Fire support coordination:	A (A)	P (A)
Use of mortars:	P (A)	A (A)
Adjustment of fire:	A (A)	G (G)
Understanding scheme of maneuver:	P (A)	P (P)
Physical capabilities:	P (A)	A (A)

• Question 12: Using the same scale, rate the E5 13F platoon FO.

	Infantry
Land navigation:	P (P)
Map reading:	P (P)
Adjustment of fire:	A (A)
Physical capabilities:	A (A)
Radiotelephone operator procedures:	P (A)

• Question 13: Using the same scale, rate your FIST chief's knowledge of mortar employment.

	Infantry	Armor
Knowledge of mortar characteristics:	A (A)	G (G)
Knowledge of adjustment technique differences:	P (A)	G (A)
Use of mortars in the fire plan:	P (A)	A (A)
Kept mortar section updated on fire support matters:	P (P)	N/A

With two major exceptions — understanding the scheme of maneuver and knowledge of mortar employment — an infantryman was pleased with his FIST chief's capabilities. Again, comments from the National Training Center substantiate the two exceptions: "FIST chiefs seldom are familiar with the

specific fire support tasks for different missions, do not know how to employ or integrate 81-mm mortar sections, and have no familiarity with FM 71-1. Initially, mortars are underemployed. This improves during training. The reason for under-utilization is that FIST personnel 'think' artillery rather than the total indirect fire system."

Understanding the scheme of maneuver derives from service school education and the FIST chief's close relationship with the company commander. If the FIST chief does not accompany the maneuver company commander to battalion headquarters for the briefing of an order, then the FIST may not understand the scheme of maneuver well enough to properly integrate fire support into it. Further, if the FIST chief is not present when the company commander briefs his platoon leaders, then the FIST chief's capabilities as a fire support planner and coordinator are almost negated. The company commander should know better than to allow this to happen, but the FIST chief must be the driving force in insuring that it does not happen.

It would appear that maneuver company commanders either experienced very good FIST noncommissioned officers or very bad ones since few replies reflected the central ground of an average score. It also appears that for the most part weak fire support sergeants are seldom sent out by themselves. Perhaps many of the responses on the platoon FO were negative because of the infrequent attachment of the FO parties to the platoons.

Overall maneuver reaction to FIST

• Question 14: Overall, your general impression of the FISTs that you have worked with is . . .

	Very good	Good	OK	Poor
Infantry	41.4 (28.8)	31 (41.3)	6.9 (15.8)	20.7 (13.9)
Armor	44.4 (47.6)	33.3 (38)	11.1 (9.5)	11.1 (4.7)

• Question 15: If you had the authority to change the FIST concept in any way, what changes would you make?

	Infantry	Armor
Assign to maneuver unit:	48.3 (45.1)	33.3 (38)
Make FIST chief a senior lieutenant:	24.1 (14.8)	33.3 (14.2)
Bring back mortar FO:	6.9 (10.6)	0 (4.7)
Make company commander the fire support coordinator:	0 (0)	0 (0)
Make no change:	24.1 (26.9)	33.3 (42.8)

Despite the difficulties, there is a positive trend in the way the foxhole sees the FIST. Greater than 70 percent of the company command experienced students expressed a good or better impression toward the FISTs with which they were associated. None of the students wanted the duties of company FSCOORD back, and few saw the need for mortar FOs. However, almost half felt that the maneuver company could be served better by assigning the FIST to its supported company.

The evolution of the FIST from the earlier FO concept was described in the January-February 1983 *Field Artillery Journal* in "FISTs of Fury," and that evolution provides the maneuver company commander a quantum leap in fire support capabilities. But the concept will not work as well as it ought to until field artillerymen listen to and respond to the views of their infantry comrades. These questions and answers point out that there is work to be done — in making FIST assignment priorities consistent with those used for other elements of the direct support artillery battalion, in developing rapport with maneuver companies by stabilizing FIST chiefs with their habitual companies, and in continuing to educate FIST personnel in their business of coordinating all available fire support in a safe and responsive manner. Failure to be sensitive to these foxhole figures and to wrestle with their implications will mean that the FIST will never realize its significant potential.

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No requirement is more central to the AirLand Battle doctrine than the requirement for refined and coordinated targeting. Nevertheless, more than a year after the need became clear, there still exists no definitive guidance for an Army hungry for direction and becoming increasingly more impatient at its absence. Doctrine formulation is bogged down in unprofitable debates over who will rule the targeting roost, and the targeting concept will remain in these dark woods of contention until the participants in the formulation take a step back and begin to see the forest for the trees. In the broad view, targeting is clearly a combined arms process. It transcends the provincial purposes ascribed to it by those who argue that it is only a G3 function or only a fire support element function. Symptomatic of these parochial views are the ongoing deliberations over the location and control of a relatively new facility called the targeting cell. But the creation of new turf like this is not what is needed. Targeting commensurate with AirLand Battle needs is still possible within the parameters of existing staff responsibilities, if only the staff is fine-tuned to be adequately responsive.

The irony of it all is that the seeds of the current strife were sown in the initial document of AirLand Battle doctrine. A sense of urgency was clear back in 1981:

> *The question before the Army now is how to implement the concept [AirLand] quickly, especially that part which addresses extending the battlefield. While there are yet some questions, it is not likely that man-years of study will clear them up to the satisfaction of all concerned. The time for implementation is now.*

Within the context of extending the battlefield, the centrality of targeting the threat lead and follow-on echelons was also clear; but an ill-advised use of language was to turn the rollercoaster momentum of those early days into the tedium of the treadmill that the doctrine formulators now tread. All too unfortunately, the idea of a targeting cell was born:

> *. . . we are now entering a new dimension of battle which permits the simultaneous engagement of enemy forces throughout the corps and division areas of influence . . . What needs to be done . . . is to establish the targeting cell and staff it with people who are currently performing similar tasks elsewhere. We must bring the operations types and targeting types together.*

The authors of these words undoubtedly wanted to stress targeting tasks or functions, and so they should have. But in applying a collective name to these tasks or functions — the targeting cell — they unwittingly created the impression of novelty, of something different from previous targeting in kind rather than different only in degree. Or, to put it another way, they made a very human mistake — having invented a collective name for a grouping of functions, they began to believe that their invention was more than a name, that it was a real thing as well. Thus, they talked of the need to "establish" a targeting cell, when in fact they truly wanted only to establish targeting; the targeting cell had assumed an unfortunate importance. That the Army spotlight fell on the wrong area is evident in the Field Artillery System Program Review of June 1981.

A far-reaching investigation into field artillery requirements in doctrine, force structure, materiel, and training, this System Program Review sought to bring the fire support community face-to-face with AirLand Battle issues. Within the doctrine arena, the targeting process was of primary interest to the maneuver commanders, intelligence experts, and fire support personnel gathered together. What they were treated to was more than a name; the targeting cell was on the ground. Replete with state-of-the-art microprocessors, a targeting cell for the fire support element had become a reality. An action officer for the demonstration stated its purpose clearly enough:

> *. . . to demonstrate a targeting cell in the concept of the Extended Battle Concept with emphasis and impact on force structure, materiel, and training.*

It is easy to see the original error repeated here — the demonstration was first and foremost a demonstration of the cell and then a demonstration of the targeting functions. And, since the targeting cell was a thing, maneuver and intelligence personnel wanted to know as much about its subordination under the field artillery as they did about the targeting functions it represented.

Although the actual transcript of the resulting System Program Review discussions is classified, one gets a hint of the initiation of the now familiar narrow debates in the comments of another field artillery action officer in his after-action report:

> *Unfortunately, our efforts to indicate that what they were seeing was a target cell operation based on commander/G3 guidance was (sic) not well understood . . . we did not adequately convey the requirement for G3/ASIC [All Source Intelligence Center] enhancement . . . .*

The intervening months have been full of message traffic and coordination meetings which have sought some consensus on whether the targeting cell should be subordinate to the fire support element, G3 operations, G3 Plans, the G3 himself, or the All Source Intelligence Center. A change of name from targeting cell to Battle Coordination Team was yet another topic of debate. Indeed, the idea of "beefing up existing staffs to do the targeting function" surfaced, but met the same impasse as all of the other suggestions. The heritage of that original, ill-advised use of language has been to obscure the combined arms relationships inherent in targeting functions behind the cloud of a targeting cell which in truth is only a name.

The resolution of the impasse, the dispersal of the cloud, hinges on the answer to a very basic question: For whom is one targeting in the AirLand Battle environment? Is one targeting for fire support only, or for maneuver only? The upcoming revision of FM 6-20, *Fire Support in Combined Arms Operations*, provides a new definition of targeting which contains all of the elements of the correct answer:

> *The [targeting] process concludes with the commander's decision on which broad attack option will be used to engage the various targets — maneuver, fire support, electronic warfare, or a combination thereof.*

Targeting for the AirLand Battle environment does not require a change in the basic nature of the process — on behalf of the commander, one targets for all attack systems. The only changes in targeting are those required by the extension of the battlefield as far away from the forward line of own troops (FLOT) as 150 kilometers at division level and twice that far at corps level, by the technological advances which permit friendly eyes and ears to acquire targets throughout these large areas and to communicate them back to the targeteers, and by the increased demand for timeliness or responsiveness in transforming target intelligence into firing data. AirLand Battle targeting, in other words, is a different animal only in degree — not in kind.

The realization that the maneuver commander is still the object of the whole exercise may serve to crumble the parochial impasse. That such a basic understanding has not yet found its way into the debate on targeting is probably a function of the significantly less intensive nature of targeting prior to the advent of the extended battlefield. In those less intensive days, all of the required staff interfaces existed; and the G3 provided the commander of the

combined arms team with the staff's coordinated recommendations. The G2, in conjunction with the Military Intelligence battalion (communication, electronics, and warfare intelligence (CEWI)) staff officers produced and analyzed intelligence to refer to the G3. The fire support coordinator, with a representative in the MI battalion (CEWI) and his own intelligence assets (such as forward observers and target acquisition units), also produced and analyzed intelligence to generate targets for both indirect fire and maneuver attack and to develop and continually refine the fire support plan. The G3 took all of this information and insured that the coordinated recommendations fit the commander's guidance. But the entire process never received the pressure which the AirLand Battle doctrine placed on it — the volume of information was less intensive. The G2 usually dealt with G3 Plans and the fire support coordinator with G3 Operations. These routine interfaces tended to overshadow the occasional interfaces, and the various aspects of targeting operations often appeared separate and disjointed in such an environment.

But appearances are not reality, and the impressions of those responsible for the targeting process need to change. The intensity of AirLand Battle intelligence production allows for no occasional interfaces — all staff interfaces must be so routine, so practiced, that the entire targeting process is as responsive as it can be. The commander of the combined arms team will succeed to the extent that he is acting on current, rather than historical, intelligence. Far from needing a new layer of coordination — a targeting cell — the commander needs to refine the existing system, enhancing it with personnel and equipment adequate to improve its responsiveness.

The recognition that targeting functions continue to support the commander, no matter what one chooses to call these functions, certainly argues against creating a new organization. But what of these parochial battles? Everyone may be trying to target for the commander and be especially responsive, but who is responsible for what? Should the commander delegate overall responsibility for targeting to one staff section? Would that delegation make the system more responsive? The two elements with the greatest claims on responsibility are the G3 Section and the fire support element. Those who argue that the G3 Section should be delegated overall responsibility for targeting are essentially arguing for a force targeting element which would assume the tasks of the existing fire support element. The G3 would, in effect, be responsible for planning nonlethal electronic warfare and indirect fires for close support, counterfire, and interdiction, as well as for planning the maneuver attack option. The fire support element would simply cease to exist. This alternative seems an unlikey one, though. The fire support element currently has the best automated data processing system within the combat arms and essentially has its missions well in hand. It makes little sense to dismantle a successful fire support operation and delegate the responsibility to someone already committed to overall coordination of an integrated combined arms operation.

Those who argue that the commander should delegate the fire support element the overall responsibility for targeting are saying that in addition to handling standard fire support attack systems — mortars, field artillery, air support, and naval gunfire — the fire support coordinator ought to be responsible for deciding when, where, and how to use maneuver units and electronic warfare assets. While the new TRADOC Training Text 100-44-1, *Joint Suppression of Enemy Air Defenses (J-SEAD) Operations,* establishes the precedent of placing the coordination of J-SEAD electronic warfare assets under the fire support coordinator, it is improbable that any maneuver commander will allow the fire support coordinator to direct the movements and missions of maneuver units.

It seems clear that no *one* staff section could or should be responsible for the entire targeting process. All staff sections involved in targeting have their responsibilities detailed in FM 101-5, and the focus of the debate on targeting ought to change to what refinements in existing procedures would produce greater responsiveness. Are there adequate personnel to handle the increased volume of intelligence production? Are there areas where automation can replace time-consuming manual calculations? Have the procedures for the transformation of intelligence into firing unit data been streamlined? These are the types of questions which promise to be more productive than a debate over where a targeting cell should be located and who should control it. Each member of the targeting triad — fire support element, G3 section, and All Source Intelligence Center — needs to answer the questions according to the current demands of the traditional targeting tasks and submit notional manning and equipping recommendations to TRADOC for final consolidation. There are already many successful field artillery units which have devised such notional fire support elements in Europe and Korea.

The time to recapture a sense of urgency and immediacy is now. The November-December 1982 issue of the *Field Artillery Journal* contained an article entitled "Making a Targeting Cell Work," and the author lamented the fact that "guidance which would allow standard Army-wide employment of this doctrine has lagged behind the articulation of the concept." The broader view of targeting reveals the intrinsically errant direction of targeting cell discussions and points the way to the development of practical guidance on how best to enhance the existing staff to allow it to fulfill its traditional responsibilities to the commander of the combined arms team.

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View from the Blockhouse

FROM THE SCHOOL

Lance survey doctrine

The current Lance survey doctrine as described in FM 6-2 *(Field Artillery Survey)* and FM 6-42 *(Field Artillery Battalion, Lance)* states that the primary method of establishing direction will be the use of the Survey Instrument Azimuth Gyro Lightweight (SIAGL); and astronomic observation, simultaneous observation, and directional traverse follow in order of priority. Doctrine also states that the orienting line for the Lance battery must be accurate to 0.3 mil.

Due to the scheduled fielding of the osition and azimuth determining system (PADS) to Lance battalions, the US Army Field Artillery School (USAFAS) is taking action to change the Lance survey requirement of 0.3 mil to the PADS capability of 0.4 mil. The PADS will become the primary means of establishing position, elevation, and azimuth to the launcher positions. USAFAS analysis and evaluations indicate that this doctrinal change will not be significant in terms of weapon effectiveness. The proposed change for the Lance survey requirement is presently being staffed and will be disseminated to the field as soon as possible.

Field Artillery half-section commemorated

A ceremony at the Fort Sill Officers Club on 14 February 1983 featured the unveiling of the Field Artillery Museum Association's tribute to the field artillery half-section. The watercolor painting depicts the half-section on the move beneath Fort Sill's historic Medicine Bluffs and is the work of renowned author and illustrator Robert A. Gartland. With $40.00 color prints now available through the Museum Association at Fort Sill, each field artilleryman will have the opportunity to share in the Redleg esprit and valor symbolized by this beautiful work of art.

The field artillery half-section.

Change in M185 tube life

The US Armament and Materiel Readiness Command recently announced that the equivalent full charge (EFC) tube life for the M185 cannon tube used on M109A1/A2/A3 155-mm self-propelled howitzers had been raised from 5000 EFC to 6000 EFC. The computational factors for determining EFC life remain the same.

The Weapons Record Data Card (DA Form 1408-4) must be altered as follows to reflect this change.

- Change SPECIAL LIFE DATA in Block 4 to read *6000 EFC*.
- Add *1000.00* to REMAINING ROUNDS in column 10h.

NOTT is coming

TRADOC's Interim Heavy Division '86 New Organization Training Team (NOTT) is in the process of visiting each of the 10 heavy divisions within USAREUR and CONUS. The NOTT is an ad hoc briefing team which will provide transitioning units with information on the organizational design, design rationale, and tactical and organization employment considerations of the Interim Heavy Division '86 force structure. This effort is intended to support the DA transition plan and to provide an effective channel for the unit-to-school feedback which will aid the Field Artillery School in the development of evolving field artillery doctrine and how-to-fight procedures.

The team is composed of 31 individuals representing all TRADOC service schools and integrating centers. Two team members are field artillerymen currently assigned to the Doctrine Division of the Tactics, Combined Arms, and Doctrine Department.

At each division and brigade location, three distinct briefings will be conducted: a one-hour general Division'86/AirLand Battle overview highlighting major changes, a three-hour scenario illustrating those same changes in a tactical situation, and a three-hour briefing/discussion to the members of the various branches by their service school representative. The first two of these briefings will be presented to the general unit audience while the third briefing will be aimed specifically at field artillerymen.

The tentative briefing schedule is:

9-13 May ..... 3d Infantry Division (Mechanized)
16-20 May ..... 1st Armored Division
23-27 May ..... 8th Infantry Division (Mechanized)
30 May-3 June ..... 2d Armored Division, Forward; and
1st Infantry Division (Mechanized) Forward
6-10 June .....3d Armored Division
27 June-1 July..... 24th Infantry Division (Mechanized)
11-15 July ..... 1st Cavalry Division
18-22 July ..... 5th Infantry Division (Mechanized)
25-29 July .....2d Armored Division

Hearing protection requirements for M198 crew

The Office of the Surgeon General has just published *new* hearing protection requirements for the M198 howitzer crew. Until such time as these requirements are published in a change to the operator's manual, they are summarized below:

Foam ear plugs are the only hearing protection required. Here is a listing of the allowable number of rounds per 24-hour period by charge:

M203	12
M119A2	32
M4A2	144
M3A1	1,000

Note: These limits are mutually exclusive; e.g., 12 rounds of M203, *or* 32 rounds of M119A2, *or* 144 rounds of M4, *or* 1,000 rounds of M3 per 24-hour period.

In order to keep track of a mixture of rounds, the following point value per charge has been established for a 24-hour period (maximum of 1,000 points in a 24-hour period) as follows:

M203	83
M119A2	32
M4A2	7
M3A1	1

M110A2 loader/rammer headlink

The United States Army Armament and Materiel Readiness Command recently published the following information concerning the M110A2 8-inch self-propelled howitzer loader/rammer headlink.

Now that the M650 rocket-assisted projectile and other new generation ammunition for the M110A2 8-inch self-propelled howitzer are being supplied to the field, it is imperative that the large headlink, NSN 1025-01-041-438, be utilized exclusively on the M110A2 loader/rammer. The large headlink was installed on all M110A2 vehicles as part of a product improvement program during the 1975-1978 time frame.

If the smaller headlink, NSN 1025-00-051-9531, has been installed on the loader/rammer, it will damage the M650/M753 rocket motor nozzle. To preclude any damage, all units should inspect their loader/rammer to insure that it is the right one.

The size of the new loader/rammer headlink is 6 3/4 inches wide by 3 3/4 inches high. It is in the supply system and available for issue.

Brigadier General Donald E. Eckelbarger.

Farewell

On 29 April 1983, Brigadier General Donald E. Eckelbarger departed Fort Sill for his new assignment as the commanding general of the VII Corps Artillery. He has given the Field Artillery Community nearly 26 months of dedicated service as Assistant Commandant of the United States Army Field Artillery School, and the thanks and best wishes of all Redlegs go with him. Brigadier General Thomas J.P. Jones will assume duties as the new Assistant Commandant in ceremonies on 25 May 1983.

FA Test and Development

DESIGN • DEVELOPMENT • TESTING • EVALUATION

New navigation systems

A new technology, called Position and Direction Determining Land Navigations Systems, is being studied by experts at Aberdeen Proving Ground.

The new navigation systems are being created for modern state-of-the-art weapons. Currently, soldiers in the field must use external surveying instruments or use a map-spotting method to orient their artillery weapons. Their position is determined by finding grid coordinates on standard military maps or by having surveyors establish the positions for them. These methods are time-consuming, and there is chance for human error. They also expose the soldiers to a hostile or nuclear, biological, and chemical environment since the surveying equipment has to be set up in open fields. The Position and Direction Determining Land Navigation System eliminates these problems; it tells soldiers in the field where they are on the ground in terms of the Universal Trans-Mercator Grid System and in terms of grid azimuth, and the personnel never have to leave their vehicles.

The land navigation systems currently developed by the Army employ inertial grade gyroscopes in various configurations. The two most popular versions are the gimballed system and the strapdown system.

• The gimballed system uses a series of synchronizers, torquers, and servo-balancers to stabilize the gyroscope and sense its location in space. It is a free-floating gyroscope; the gyros rotate, but the platform remains stable.

The fire control processor of the Multiple Launch Rocket System employs a position determining system using a version of an inertial grade gyroscope called the gimballed system. The processor is the link between the human element and the electronics. It gets its information from a stabilization reference packet which is on board the vehicle.

• The strapdown system uses accelerometers to sense readings and then uses those readings to calculate its location by mathematical algorithms via a computer program. Its gyroscope is firmly "strapped down," but the platform rotates.

There are advantages and disadvantages to both systems, and different vehicles use different systems. The gimballed system is employed in the Multiple Launch Rocket System (MLRS), fire support team vehicle, Pershing missile guidance system, and remotely piloted vehicles. The strapdown system is employed in medium and large caliber self-propelled artillery weapons such as the M109 and M110 series vehicles, the Army attack helicopter, and the Sergeant York.

All strapdowns use a derivative of the technology employed in the position and azimuth determining system (PADS) which is currently used by Army surveyors. The PADS is a very accurate piece of equipment, but the recent land navigation systems provide sufficient accuracy to do the task at a lower unit cost which makes it more practical.

The Artillery Weapons Branch of the Materiel Testing Directorate is primarily responsible for evaluating land navigation systems in artillery vehicles. The branch is currently involved in evaluating the position determining system of the MLRS and in the summer will evaluate the strapdown system in the M109E4 Howitzer Extended Life Program (HELP) vehicle. This summer, the branch will evaluate a land navigation system for a counterbattery radar system.

Future efforts will be directed in establishing a second generation of land navigation systems that can be applied universally to various weapons pointing systems. If such a weapon direction reference unit can be developed, it will be a breakthrough in the field, allowing for the standardization of systems.

Further engineering effort is being applied to incorporate the Position Location Reporting and Joint incorporate the Position Location Reporting and Joint Tactical Information Distribution Systems Weapon System (DSWS). The DSWS, currently in the concept exploration development stage, is a 155-mm artillery weapon system composed of fire direction, self-propelled howitzer, and ammunition resupply vehicles.

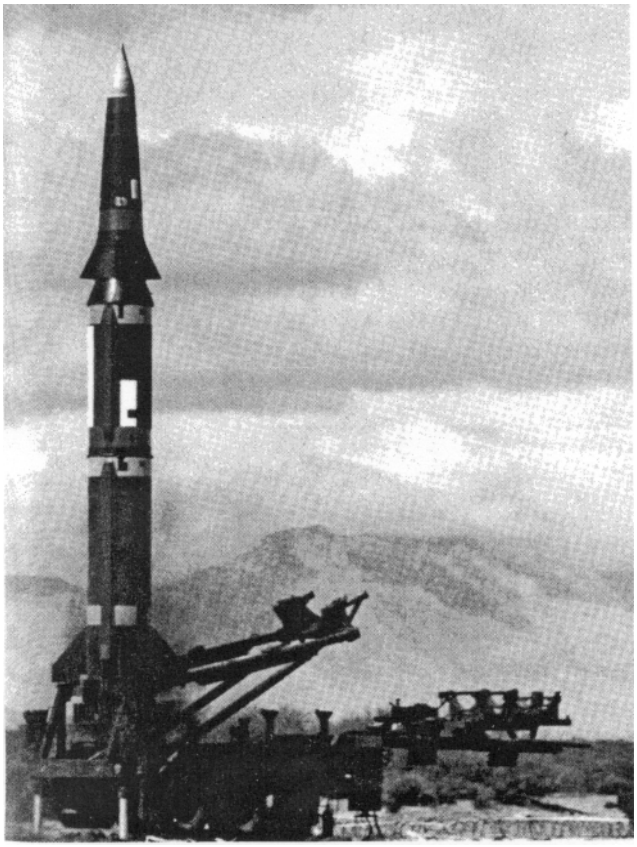
The PLRS/JTIDS hybrid system is an integrated command, control, and communications system which will replace the current land navigation systems. The current systems will then serve as the backup mode of operation. The PLRS keeps track of each vehicle in the system via radio contact. It also provides tactical radio communication and position location information, which allows all the vehicles in the system to orient themselves.

Weapon system support

Development of terminal guidance reference scenes for the Pershing II missile has been a major organizational priority the past few years. Last year marked a significant achievement in the area of weapon system guidance and fire control. The Engineer Topographic Laboratories accepted delivery of the last four developmental models of the Pershing II Reference Scene Generation Facility (RSGF). Produced under contract by the Goodyear Aerospace Corporation, this equipment is used to manufacture the machine-readable maps which will guide the Pershing II missile to its target.

The Engineer Topographical Laboratories also developed an operational data base for use in producing Pershing II reference scenes. The Defense Mapping Agency has completed production readiness testing of the computer system which was designed to convert existing digital topographic information into a data base that meets Pershing II targeting requirements. Having successfully completed temperature, humidity, rain, ice, and road testing, the RSGF will undergo sand, dust, and electromagnetic tests before it is fielded.

The Digital Elevation Data Dubbing Facility (DEDDF) also contributes to weapon system support.



This Pershing II missile, sitting on its launch pad, will carry a machine-readable map of a target area in its guidance system. Called the Reference Scene Generation Facility (RSGF), this technology marks a significant achievement in the area of weapon system guidance and fire control. (Martin Marietta photo)

This van-mounted computer system was delivered to US Army Forces Command last summer and will be used in support of the Firefinder to locate enemy gun positions. While the DEDDF was developed specifically for Firefinder, it might eventually serve other weapon systems as well.

Pershing II flight test successful

The third flight test in the Pershing II engineering development program took place in January at Cape Canaveral, Florida. The purpose of the test was to evaluate the missile's performance in a long range flight. Test objectives were achieved.

The Pershing II traveled almost 200 miles high and more than 800 miles out into the Atlantic Ocean. The missile reentry vehicle executed planned maneuvers during the terminal portion of the flight and came down in the planned ocean target area.

A 70 for the 90s

by Lieutenant Colonel R.C.F. Craven

Since the introduction of the M109, 155-mm self-propelled howitzers have been an important element of NATO's artillery. The highly mobile armoured vehicles of the infantry and armour require the artillery to keep pace in mobility and crew protection if it is to survive on the modern battlefield. For some time, there has been a rapidly growing concern throughout NATO over the concept of the future battlefield — what will it look like, say, in the year 2000; and what are we doing in the artillery world to move with the times? This situation was addressed by the United Kingdom and West Germany back in the 1960s and later by Italy; together the three nations jointly developed a new towed field howitzer FH70, followed by a new self-propelled howitzer SP70. A good deal of research went into this project, and that is where one should begin.

The future battlefield

Many studies concerning the nature of the future battlefield have been undertaken by NATO panels, independent panels, and individual armies which have helped shape NATO's weapons procurement. So have the interests of commerce, the rate of development of defence-linked technology, and the rate of change of associated operational policies. The AirLand Battle 2000 concept, which is a conscious attempt to suit the concept of operations and the characteristics of weapons systems to the postulated future battlefield environment, is a prime example of this type of far-reaching study.

In general, the Central European battlefield circa 2000 will probably be characterised by the following factors:

- ***Mobility.*** Engagements will be fast moving and fluid with no clearly delineated forward line of own troops (FLOT), which will result in undue exposure of supporting weapon systems to direct and indirect fire in quantities hitherto unknown.
- ***Firepower.*** There will be sophisticated combat systems with range, lethality, and employment capabilities far surpassing anything in service today.

Massive direct and indirect firepower from both aerial and land-based platforms will be synchronised for devastating effect.

- ***Combined arms operations.*** The inability of any one weapon system to produce desired effects, with the exception of nuclear weapons, will become more evident — hence, weapon systems will be integrated to create true combined arms groupings for widespread, dispersed operations.

- ***NBC environment.*** The necessity to use all elements of combat power at one's disposal will be very evident — including, of course, NBC weapons.

- ***The 24-hour battlefield day.*** Operations will continue, affected little by adverse weather and night.

- ***Command and control problems.*** The problems associated with command and control on the future battlefield will be considerable. If the expected intense level of electronic warfare materialises, the importance of combined arms grouping, integration, and comparable mobility is increased. Command and control of combined arms groups should be eased by on-board navigation equipment and new developments in digital communications.

In the light of these aspects of the battlefield of the future, it is clear that the scope for product improvement of existing weapon systems is limited to those with "designed-in" stretch potential.

Operational concepts for field artillery

Current and future operational concepts centre around the necessity to coordinate and synchronise both aerial and land-based combat resources and to make maximum use of deception techniques, manoeuvre, and shock action. The combined arms aspect is most important, as is the desirability to strike deep into the enemy's territory to prevent reinforcement of committed troops and force the reduction of the closure rate. Launching a deep strike with either indirect support, air manoeuvre units, or ground forces that exercise a high degree of manoeuvreability will pose immense problems for an enemy already involved in a first echelon battle. If the field artillery is to perform to the full in the combined arms role, it is very important that it possess some characteristics not hitherto required in the slower, slogging matches of previous conflicts. The field artillery must be able to manoeuvre as part of an all-arms team and possess mobility comparable to modern armour. In non-linear fluid engagements, the field artillery will require greatly increased protection from direct and indirect fire and air-delivered weapons. It should possess weapons that have a longer range than existing weapons and have a rate of fire that will ensure the maximum destructive effect during attrition and limited interdiction. Possessing all these aspects, the field artillery would cease to be "behind the lines" and would become an integral part of the combined arms team, getting quickly to the most appropriate positions to play its part to the full in the combined arms battle.

Implications for future artillery systems design

Once the characteristics of the future battlefield were clearly set out and future doctrinal requirements established, it was then the task of the equipment development fraternity to assess the type of weapon system that would operate most successfully in that environment — guided, ideally, by doctrinal principles. In this way, a series of equipment programmes best suited to future warfare could be established. There were a number of implications for weapon design that were inescapable and stood out clearly from any analysis of future conflict. These implications produced a number of fundamental weapon system characteristics, which in the context of self-propelled field artillery are the following:

- ***Reliability:*** When the required speed of manoeuvre, the dispersed nature of operations postulated for the future, and the need for increased protection are considered, reliability is of paramount importance. A weapon that cannot reach the battlefield in a fightable condition, exactly when it is required, with all of its counterparts, is of little value.

- ***Weapon effectiveness:*** The effectiveness of fire in the context of a self-propelled field artillery system is a function of range, rate of fire, diversity of ammunition types, reaction time, accuracy, and speed into and out of action. The weighting factor given to each aspect will vary nationally, but the end result should ensure that the highest rate of fire produces the maximum amount of explosive at the longest range in the shortest space of time and as accurately as possible.

- ***Range:*** The European requirement for maximum range is 24 kilometers with an unassisted shell and 30 kilometers with an extended-range shell — ranges significantly greater than the ranges of the majority of present-day close support equipment available in the armies of the United Kingdom, West Germany, and Italy. The increase in range is important for a number of reasons. With wide frontages, long range is required so that the maximum number of guns can be brought to bear against individual targets on the divisional or corps front. The extended range allows the engagement of targets in depth so that attrition of the enemy can start early in the battle; flank formations can be given increased support; and, finally, guns will be able to stand farther back from the forward line of own troops (FLOT) and thus increase their chances of survival against counterbattery fire.

- ***Compatible mobility:*** Individual high mobility is not of great value unless it is comparable with other systems within the combined arms group. Compatible mobility ensures the integration of a weapon system with its parent group and also ensures coordination of firepower of the appropriate standard to produce shock action. For artillery specifically, agility is all-important, with very short emplacement and displacement times guaranteeing the adherence of artillery to combined arms tactics and ensuring its involvement in the whole battle.

• ***Survivability:*** Increases in the effectiveness of white phosphorous weapons have meant considerable increases in the protection requirements for weapon systems involved in the first and second echelon battles. Protection is needed against multi-mode attack including direct and indirect fire systems, air-delivered weapons, and nuclear, biological, and chemical (NBC) attacks.

• ***Automation:*** The high rates of fire demanded by modern and future conflicts will necessitate a greater degree of automation than currently available. Automation is not only required for the actual loading and firing procedures, but it is also necessary to handle fire control data and the automatic laying equipment which will reduce engagement times to the effective minimum.

• ***Capacity for "stretch":*** Almost every weapon system produced in the Western world (particularly in NATO and certainly in the context of self-propelled field artillery) has undergone some form of mid-life improvement programme to cope with the rapid deployment of threat forces and their equipment. Engines and power plants should not be stretched to the limit as the weapon system leaves the production line for the first time — additional protection is likely to be required, along with new and heavier armaments, as well as increases in mobility. Guns should be able to withstand greater stresses and be able to fire faster as developments in ammunition occur. Chemical and other protective equipment should be such that it can be reconfigured with ease and upgraded to cope with developments in NBC. The list is endless, but a weapon system that is fully stretched on day one is unlikely to be fully effective on day two.

European approach to indirect fire support

Many NATO nations, including Germany, Italy, and the United Kingdom, were equipped with the M109 howitzer, a gun whose technology stems from the 1950s and which has given superb service in many theatres of war. However, this gun was originally intended to mount a 105-mm tube and weigh a maximum of 30,000 pounds. Great credit goes to its designers in that it has been stretched to 155-mm, can fire a 100-pound shell out to 18 kilometers, and has a current weight of 55,000 pounds. But, considering the requirements for a gun for the 1990s and beyond, the three countries did not believe the M109 series could be stretched any further; specifically, they did not believe the M109 could accommodate these changes:

• Increase its weight further to fire a heavier shell to a greater range — perhaps double the current range.

• Carry increased protection to allow it to stand and fight on the future battlefield closer to the FLOT to make full use of its maximum range and survive in an NBC environment.

• Have the instant agility and mobility to keep up with and support the new family of armoured fighting vehicles and still have the capabilities to fire in all directions if necessary.

• Enhance its hitting power through the use of the new range of ammunition and provide a high continuous rate of fire, with the ability to increase the rate for short periods (burst-fire capability).

Development history

In 1973, Germany, Italy, and the United Kingdom began the collaborative development of the SP70. All three countries recognized that a significant improvement had to be made in the major indirect fire support system for the future battlefield. (Indeed, NATO and the United States participated in this exercise and drew up a Basic Military Requirement leading to the agreed operational characteristics of the 155-mm gun of the future.) Under a binding trilateral aagreement, firms from all three countries were contracted to provide the hardware to develop a weapon — the SP70 — to meet these characteristics. (Even though the US was unable to join the collaborative programme at that time, there is in existence a 155-mm Quadrilateral Ballistics Memorandum of Understanding between the four nations which defines the internal ballistic parameters and the 155-mm family of projectiles.)

The trilateral programme completed its Project Definition Phase in 1973 and then embarked on a long and exhaustive validation phase. The development was divided between the three nations to make maximum use of existing technologies but with the aim of retaining as far as possible a systems approach. In outline, Germany contributed the ordnance, chassis, and main engine; Italy provided the elevating mass, hull, and auxiliary power unit; and the United Kingdom was responsible for the turret, ammunition handling system, and sights.

The validation phase began in 1973 and included the manufacture of five prototypes which became available in 1976 and were then subjected to a rigorous programme of travelling and firing. For instance, one of the prototypes covered 8,600 kilometers in the United Kingdom and then went on to do a further 2,400 kilometers in the cold trials in Norway. In Norway, firing was carried out at all eight charges to test the functioning of the equipment in temperatures below zero, where it was important to prove the efficient operation of the ordnance at the combination of low pressures and short recoil. Another of the five

prototypes underwent hot trials in Sardinia where the equipment was given another heavy test programme of travelling, this time over rocks and dirt, with plenty of dust to make life difficult. The prototype completed 1,600 kilometers under these conditions.

During the validation phase, prototypes fired 2,300 rounds and demonstrated the high standards of accuracy and consistency which had come to be expected of its towed forerunner, the FH70 (there are 424 FH70s in the hands of troops of the three countries). The information from both travelling and firing provided a solid basis of confidence on which to proceed to the maturation phase, or Phase B in trilateral parlance. The overall concept had been shown to be soundly based, and the equipment proved itself thoroughly. Development goals were met, and the tests ended without any major failures.

Here, then, was a gun with the required range to achieve early attrition and also with a rate of fire to provide massive fire support. Mobility trials confirmed that it possessed high manoeuvre capability and that it had a similar performance to both the M1 tank and the infantry fighting vehicle, and in all had the ability to support short action manoeuvres.

Technical description

Both the hull and the turret shell of the SP70 are made of aluminum and meet the requirements for protection against 7.62-mm armour piercing (AP) rounds, 14.5-mm AP cannon at 100 meters, and shell fragments from a 152-mm shell bursting at 10 meters. (Basic technical data is given in table 1.)

The interior layout has space for three crewmen on the right (the layer, the crew chief, and the magazine operator) and the charge loader on the left. The total detachment is five men, the driver being located forward in the hull. There are two turret hatches equipped with periscopes which allow the crew chief and charge loader all-around vision both day and night.

The elevating mass consists of the gun and cradle extension for both the loading system and cradle and the recoil mechanism. The mass is mounted on two trunnion roller bearings and a large saddle, which not only connects it with the turret but also blocks off the turret opening. The NBC seal is provided by a mantlet and mantlet seal. The SP70 provides full NBC collective protection for the crew with charcoal filters and a ventilation unit.

The elevation system consists of a combined balance and power elevator. Like the recoil system, this is an excellent Italian contribution to the SP70. The elevation system consists of a hydraulic cylinder which provides the power for both elevation drive and corrects the out-of-balance movement of the elevating mass; i.e., should there be any deviation of the gun elevation selected after the firing of a round, a compensator re-establishes the correct elevation angle, thereby allowing a high rate of accurate fire to be achieved automatically. Conventional power traverse is fitted, and there is a manual backup for both traverse and elevation should the power fail.

Table 1. SP70 technical data.

Item	Detail description
Ordnance	Monoblock, autofrettaged barrel with muzzle brake and fume extractor. Vertical sliding breech operating automatically during runout.
Calibre	155-mm.
Overall length (including chassis and barrel)	7.637 meters.
Barrel length (39 cal)	5.032 meters.
Combat weight	43,524 kilograms.
Turret material	Aluminum.
Firing mechanism	Mechanical, solenoid operated.
Recoil length	700-mm.
Ammunition	FH70 and all NATO 155-mm ammunition.
HE projectile:	
Weight	43.8 kilograms.
Range unassisted	24 kilometers.
Range assisted	30 kilometers.
Rates of fire:	
Burst	3 rounds in 10 seconds.
Rapid	6 rounds per minute.
Sustained	2 rounds per minute for one hour.

The internal ballistics of the gun meet the requirements of the Quadrilateral Ballistics Memorandum of Understanding; i.e., all charges may be used, and current and future 155-mm projectiles can be fired. The barrel is of autofrettage monoblock construction, fitted with a muzzle brake and fume extractor. The breech mechanism has a vertical-sliding block opening upwards; there is an opening cam which opens the breech automatically on run-out. The breech is fitted with a primer magazine which automatically ejects the spent primer and feeds in a new one.

Ammunition handling

On the outside of the gun is a shell replenishment gear with an extending arm which can be adjusted to collect a projectile at ground level or from the back of a truck. From this point onwards, the projectile is untouched by human hand; once it reaches the magazine in the turret, it is moved by the magazine hoist to its selected storage row and is then moved along the row by the action of the rigidly mounted pawls — hence the title "rigid pawl magazine." This magazine holds 32 projectiles and will take any of the current M107/M549/M483 family.

To transfer the projectile to the breech, the magazine hoist collects the projectile, which is pushed forward onto the shell transfer arm; and this arm — which is pivoted at the trunnions — swings into line with the cradle extension. Here the projectile is transferred to the ready-use tray. If the loading tray is empty, the projectile is automatically rolled farther onto the loading tray, ready for flick-ramming into the gun. The shell replenishment gear is capable of reloading the magazine at a rate of four rounds per minute, which means that the 32-round magazine can be filled in eight minutes. There are, of course, safety cutouts in the shell transfer arm to prevent injury to the external crew members during its operation. The cartridges are stowed on the left of the breech; and the cartridge loader completes the loading action, including the signal to close the breech.

For the first round, the loading tray is lifted hydraulically and swung into the loading position. Even before the movement has ended, a lever accelerates the projectile in a straight line on the loading tray. Once it reaches the optimum ramming speed, the projectile moves freely — irrespective of gun elevation angle — through the chamber and seats itself by virtue of its high kinetic energy. During this phase, the ramming lever swings back. The loading tray does not have to be lifted hydraulically for subsequent rounds of a mission since the gun, in running out, moves past a mechanical catch and lifts the loading tray with it. The SP70 has a burst-fire capability of three rounds in 10 seconds, which gives it an enormously powerful punch; the "rapid" rate will give at least six rounds per minute until the ammunition in the magazine is expended. For sustained fire, the normal procedure is to use "through-loading" from external ammunition supplies.

Sighting system

The indirect-fire periscopic sight is fitted with an electronic tilt compensator that records the tilt of the vehicle by means of sensors and converts this directly into correction signals which are automatically applied to elevation and azimuth as displayed in the layer's display unit. The eyepiece of the periscope sight is mounted in such a way that both the layer and crew chief can view in turn, thus giving the crew chief a means of checking the layer. The firing command is passed to the gun by means of data input/output units, which link the gun directly to the fire control equipment.

The direct fire day/night telescope sight is sited in such a way that it can be used by either the layer or the crew chief.

Chassis

West Germany did a splendid job on the development of the chassis and automotive aspects. The chassis is custom built by Porsche using proved Leopard tank components. The powerful diesel engine from the firm MTU gives the gun a level of mobility as good as that of a main battle tank, but it also provides two other major advantages: there is power to spare for any weight increases caused by future product improvement; and, secondly, being understressed for most conditions of use, its reliability is excellent. The power to weight ratio is better than 22 brake horsepower (bhp) per metric ton, with its turbo-charged, liquid-cooled, V8, 100-bhp diesel engine. The SP70 has a road range of 550 kilometers and a cross-country range of 420 kilometers. Since mobility is considered so important, the SP70 is designed to wade to a depth of over seven feet — it only takes pressing a switch and closing the driver's hatch, thanks in part to the equipment's effective NBC sealing. (The main characteristics of the SP70 chassis are shown in table 2.)

Product improvements

As it stands, the SP70 is a gun for the 1990s; but advances in technology do not stand still, and one must look beyond the 1990s. Future requirements have been formulated using information from the following sources:

- NATO Indirect Fire Study. (This NATO multinational exercise brought together scientists, engineers, analysts, and serving military personnel from many NATO countries. The study was one of six exercises aimed at forecasting the impact of new technology on the battlefield.)

Table 2. Characteristics of the SP70 chassis.

Item	Characteristics	Detail
Power pack	Weight	4,870 kilograms
Main engine	Type/description Output at 2,600 revolutions per minute	MTU MB871, 8 cylinder, turbocharged, diesel 736 KW (1,000 HP)
Gear box	Type/description	Fiat 237A, diesel, 26 KW (35 HP)
Automotive data	Fuel capacity Range Maximum speed Climbing ability	1,100 litres 420 km cross-country; 550 km on roads 67.7 km/hr (42.3 mph) 60% slope
Running gear	Type/description	Porsche running gear with torsion bar suspension

• Known work by the United States on future artillery systems, including M109 HELP, Maxi-PIP, and the division support weapons system.

• Human Engineering Laboratory Battalion Artillery Tests under the auspices of the Technical Cooperation Program.

• Quadrilateral Ballistic Working Group.

• Dialogues with users and the use of battlefield simulators from SALVO to Divisional War Game level to evaluate further weapon systems.

From these inputs and from the parallel activity of laboratories and industry on future technology, the likely areas for improvement have been formulated, though naturally further analysis will be required to determine the value of particular improvements. Broadly, the product improvements fall into the following main areas:

• Autonomy: On-board position and azimuth determination and ballistic computation.

• Automation: Automatic charge handling and gun control.

• Reduced vulnerability: Ammunition resupply by armoured limber (possibly FAASV), protection against bomblets, and reduced emplacement time (due to improved autonomy).

Other improvements of an evolutionary or a minor nature being integrated include:

• On-board muzzle velocity measurement.

• Shell fall-back detection.

• Bore temperature measurement.

The technology to produce these improvements is in some cases now well established; the systems are, or will be, in service in the time frame considered. In other cases, work is currently in hand to develop systems to allow for these improvements; i.e., modular charges to assist automatic charge handling. (Table 3 shows the comparative improvements which will be achieved by the SP70 PIP to take the weapon system beyond the year 2000.)

Table 3. SP70 product improvements.

Characteristics	SP70	SP70 PIP	Remarks
Maximum range: Unassisted Assisted	24 km 30 km	30 km 38 km	Improved survivability and target engagement potential
Rate of fire: Maximum Burst	6 rounds/min 2 in 5 secs 3 in 10 secs	6 rounds/min 2 in 5 secs 3 in 10 secs	Consistent due to automation
Max range error Max azimuth error	0.25 (PE) 0.4 mils (PE)	0.25 (PE) 0.4 mils (PE)	
Ballistic protection	50-mm Aluminum	50-mm Aluminum + antibomblet net	
Emplacement time Displacement time	120 secs 60 secs	25 secs 60 secs	Improved survivability
Ammunition stored on board (rounds)	32	32	Improved survivability
Replenishment rate for ammunition stored on board	4 rounds/min = 8 mins total	10 rounds/min = 3 mins total	
Crew: Internal External	5 3	3 3 (in ammunition supply vehicle)	Improved survivability
NBC protection	Collective individual fighting capability	Collective individual fighting capability	Improved survivability

Project status

With Phase A complete, designs have been refined and a further 10 prototypes have been made for the maturation phase — Phase B. The development plan has been made and a programme of trials set up for the following milestones:

- 1983 ..... Technical evaluation trials.
- 1984 ..... User trials.
- End of 1984 ..... Trilateral approval for introduction into service.
- From 1985..... Joint production under the responsibilities of German private contractor.

Summary

When compared to the equipment which the SP70 is to replace in the armies of the three countries, the SP70 undoubtedly has a vastly improved performance. Semi-automatic loading and fast ramming have increased the rate of fire substantially; with an unassisted firing range of 24 kilometers and a rocket-assisted projectile firing range of 30 kilometers, it meets the range requirement of the future battlefield. Automotively, the SP70's high power-to-weight ratio gives it mobility comparable to that of the modern battle tank and infantry fighting vehicles; and its improved reliability, availability, and maintainability make it now ready to meet the users' needs for the 1990s. But its potential does not end there. It is already into its maturation phase; and, with product improvements, it is undoubtedly a gun that will take European artillery beyond the 1990s and into the next century.

LTC R.C.F. Craven, RA, joined the British Army as an infantryman in the Queen's Own Royal West Kent Regiment. He later received his commission in the Royal Artillery from Sandhurst. He has seen combat service in Malaya, Borneo, Cyprus, and Northern Ireland and has served in both field artillery and air defense artillery units. He has been a gunnery instructor at the Royal School of Artillery and has commanded the British Army's Missile Firing Range. He is currently the British Liaison Officer to the United States Army Field Artillery School.

With Our Comrades in Arms

NEWS OF OTHER BRANCHES AND SERVICES

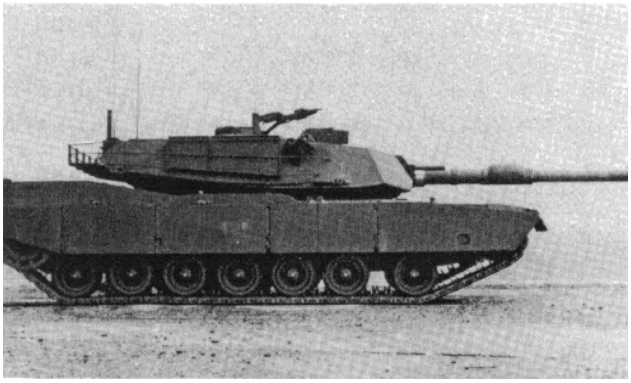
Abrams tank gets new look

If one replaces the standard 105-mm gun on the Abrams M1 tank with a 120-mm gun and adds a nuclear, biological, and chemical protection capability to it, the tank is not an M1 anymore—it is an M1E1, which is an improved version of the Abrams tank.

The General Dynamics' M1E1, currently in its full-scale engineering development program, has been at Aberdeen Proving Ground for two years for different phases of contractor testing.

Six tanks are scheduled to arrive at the Materiel Testing Directorate in June for prototype qualification testing for the government. Half of the tanks will be devoted to automotive, weapons, and fire control systems testing; and the other three tanks will be undergoing reliability, availability, maintainability, and durability testing.

The tanks are scheduled to log approximately 4,000 miles each and shoot some 800 rounds each. Testing is expected to be completed next year; and then the prototype tanks will undergo more ammunition, interchangeability, environment, and armor testing. (Patricia Deal)



The M1E1, an improved version of the Abrams M1 tank, is very similar to the M1 in design. The major difference is the larger gun — the 120-mm cannon.

Salvage those vehicles

When something happens to tanks or other fighting vehicles on the battlefield, they generally have to be removed; and that means a loss of strength and fighting power for the combat unit. But other ways to salvage those damaged tanks and vehicles and keep them in the battle are being generated by an Army team led by the US Army Materiel Systems Analysis Activity (AMSAA) at Aberdeen Proving Ground.

The activity has formed a Battlefield Damage Assessment and Repair (BDAR) Technical Manual Task Group to write pilot technical manuals for the Army. The manuals will detail procedures which could be used in emergency or battle conditions to repair the tanks or vehicles on location rather than removing them to a maintenance area.

Since time is limited in a combat situation, the repairs and adjustments detailed in the BDAR technical manuals are those which can be completed in two to six hours. These repairs will include many improvised techniques, some of which are rather unorthodox. For example, some of the improvisations outlined in the manuals will include by-passing switches, repairing broken radio antennas, and short tracking methods. Few battlefield fixes are expected to be permanent. After the battle, the tank will have to be refurbished properly.

Some of the improvisations can be performed by the crew with their limited tools, but most are aimed at the field maintenance teams which have the basic issue of tools.

New type autopilot

A McDonnell Douglas AV-8B Harrier II recently made a vertical landing automatically, controlled only by its autopilot.

Autopilots in conventional aircraft use airspeed information for input, but a hovering AV-8B generates no forward airspeed; thus, a new type of autopilot has been developed. Called a stability augmentation and attitude hold system, the unit uses new computer control laws to maintain the perfect balance of the AV-8B, which makes hovering and vertical landings much safer and easier than with the AV-8A Harrier and Harrier GR Mk 3, which are not equipped with autopilots. The AV-8B's improved handling qualities also help to eliminate the need for a ship serving as the airplane's landing pad to turn into the wind, a position normally required for landing conventional aircraft.

Other improvements in addition to the new autopilot which have helped to decrease the AV-8B's pilot workload by two-thirds include the airplane's larger supercritical-shaped wing, repositioned reaction control valves, larger wing flaps, and an advanced digital cockpit.

Autopilot lets AV-8 Harrier II land hands-off vertically. (McDonnell Douglas photo)

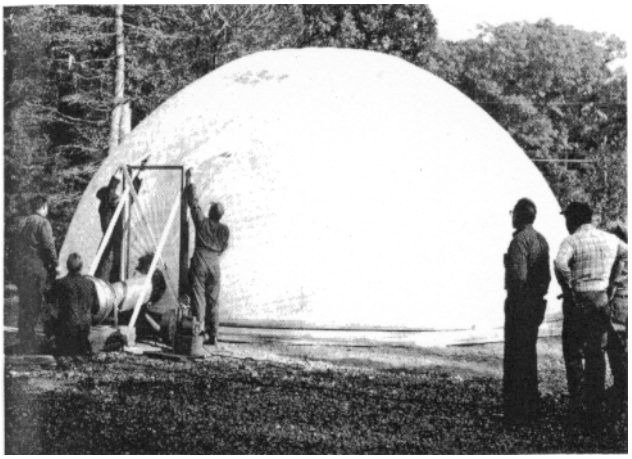
Australia to get Firefinder

Australia has awarded Hughes Aircraft Company a $44.8 million contract to build seven Firefinder weapon locating radar systems that can pinpoint the position of enemy mortars, artillery, and rocket launchers.

The Australian award includes delivery of a Firefinder trainer — a computer-driven simulation system which permits training of operators and maintenance personnel without requiring the use of a production radar or the use of live artillery fire.

Foam domes for housing

Commanders needing immediate housing for their field troops normally have one choice: canvas tents. During MOBEX 83, the Army's recent mobilization exercise, the Corps of Engineers Construction Engineering Research Laboratory (CERL) demonstrated a possible alternative to the tent — the foam dome.



CERL researchers and combat engineers prepare the form. (Photos by Ronald Nelder)

The CERL foam domes, which look like large igloos, are made by spraying liquid plastic onto an inflated plastic form. A dome 28 feet in diameter can house about 15 soldiers and takes three workers six to eight hours to build.

The domes cost about $3.50 a square foot — roughly the same as a medium size Army tent. The domes are sturdier than tents — and better insulated; in fact, the structures can be so airtight that care must be taken to be sure they are properly ventilated.

Foam domes start with a large plastic form banded to a circular base, and then a low pressure air blower is used to inflate the form. Doors and windows are framed and attached to the sides of the inflated form.

Starting near the ground, workers spray a brownish liquid mixture onto the inflated shell. Within less than a minute the liquid expands more than 30 times, turns into off-white foam, and then hardens. For colored domes, color pigment or dye can be added to the liquid before spraying. Enough one-half-inch to three-quarter-inch thick layers are sprayed to make a four-to six-inch thick wall, depending on the diameter of the dome. When

A CERL engineer sprays foam onto the shell.

the spraying is finished, the plastic shell is peeled off the inside walls; and the circular base is removed. All of the form work is reusable.

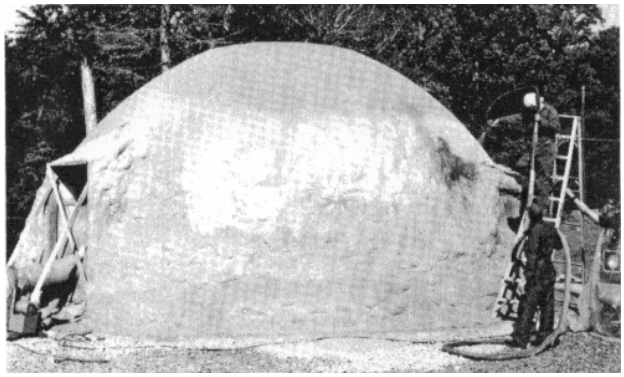
Simple hand tools are used to cut holes in the dome for plumbing and electrical cables. The foam is also available in aerosol spray cans for sealing the holes and for other repairs.

The domes are not without problems, however; for example, construction is hampered by strong wind, rain, or low temperatures. Also, the domes are difficult to move, since a dome 28 feet in diameter weighs about a ton. Thus, the domes appear to be more appropriate for base camps and training centers.

Foam domes could supplement "tent cities" during mobilization. Besides troops, domes can house kitchens, dining halls, classrooms, offices, and storage areas. The larger domes could even be used as theaters, chapels, or hospitals.

Shells up to 50 feet in diameter are possible without reinforcement. Domes larger than 50 feet in diameter are possible if the foam shell is sprayed with liquid concrete; and a second floor can be added for more space.

While foam domes are new to the military scene, the materials have been available commercially for several years. Foam domes have already been used as temporary housing for earthquake victims in Nicaragua, Peru, and Turkey. *(Engineer Update)*



The foam dome nears completion. A CERL co-op student and engineer trainee sprays foam from a ladder. A Fort Belvoir combat engineer lends a hand.

The Chemical Ingredients

by Captain Christopher J. Parker

A unit should be capable of performing all of its missions while in a nuclear, biological, and chemical (NBC) environment; therefore one of the most important functions of the chemical officer on a division artillery or battalion staff is the integration of NBC tasks into command post/field training exercises (CPXs/FTXs). Commanders at these levels are beginning to realize the need to incorporate NBC activities and events into CPXs/FTXs and are requiring their units to train for combat in a simulated NBC environment. Most line units now operate in full mission-oriented protective posture (MOPP) due to ever-increasing command emphasis. As a result, division artillery and battalion staffs better understand the problems of functioning in an NBC environment.

The chemical officer must insure that the NBC scenarios he develops provide realistic, appropriate training. There are some common sense techniques for making the most of each training opportunity. The first step is to obtain guidance from the commander and S3. Chemical officers often incorporate too many NBC activities into the CPX/FTX. The quickest way to lose credibility with one's commander or S3 is to try and change a combined arms exercise into an NBC exercise. Although NBC is probably the most important thing to the chemical officer, it is only one of the areas of concern for the exercise; and the chemical officer needs the whole picture.

While planning the scenario for a training exercise, the chemical officer should select only those NBC tasks which the unit needs to master. A good start point is the unit's ARTEP manual, which lists the required NBC tasks. The results of the ARTEP and the commander's analysis will further focus the list of tasks. If the unit successfully completed a six-hour full MOPP exercise last week, it may be time to move on to tasks related to a nonpersistent agent attack.

After determining what types of NBC tasks the unit needs, the planner should write a draft exercise scenario for the S3. He may see the need to alter a task to fit a CPX or FTX, or he may choose not to address tasks which are infeasible or will detract significantly from the exercise. This preliminary list of possible NBC tasks contains tasks that will be meaningful *and* feasible and afford the S3 with a good planning base from which to issue more specific guidance.

An extremely important and often overlooked step is staff coordination. One must take the time to meet with each primary staff member before making a final recommendation on which NBC tasks to incorporate into the scenario. The S2 scenario must give the enemy the capability to generate desired responses. For example, one ought not to select a task of reacting to an enemy nuclear burst if the intelligence estimate states that the enemy is nonnuclear capable. Close coordination with the S2 is essential to avoid a disparity between the intelligence information and the NBC events.

The chemical officer must learn what the S4's major objectives are for the exercise so that the NBC plan will not hinder his mission accomplishment. (An excellent way to demoralize a unit and unwantingly become the center of attention is to schedule a chemical attack during the first hot meal a unit has had in two days.) It helps to select tasks which will exercise procedures for transporting chemical equipment, such as overgarments, to the forward units. It is often a surprise to discover how difficult a seemingly easy task can be when one actually attempts it in realistic situations, especially if there has been little or no contingency planning.

The next staff member to meet is the S1. If he has a mass casualty requirement, it may be possible to schedule a complementary NBC event. Additionally, NBC tasks which cause the S1 to exercise his radiation safety (RS) category procedures require advance coordination because various elements of the unit will fall into different RS categories.

When coordination with the S1, S2, and S4 is complete, the chemical officer can revise the draft and return it to the S3. The S3 is the driving force behind the exercise and will have a constant impact on the plan. Good communication between the chemical officer and the S3 is imperative at this point, for they must think through each NBC task very carefully and evaluate how each event will affect the total exercise. This evaluation is no easy task — it requires time to iron out the impact of an NBC scenario on the entire combat arms exercise.

After the S3 has decided on the NBC tasks for the overall scenario, he or the chemical officer will brief the commander on the plan. With the commander's concurrence, the chemical officer can go back to each staff officer and let him know what tasks have been selected. This double check allows a second look for any coordinating problems that may have developed or were not obvious in the first meeting.


FLOOD

When this final staff coordination is finished, planning for the support requirements may begin. An ammunition request from similar exercises is a useful guideline for establishing the appropriate amount of Class V supplies. Early requests for other support requirements—vehicles, communications, and equipment — are a necessity. Past requests from similar exercises are useful guidelines for establishing appropriate amounts.

If the exercise is to be an external evaluation, the chemical officer should brief the evaluators prior to the exercise and outline the goals of the exercise. Their informal, on-the-spot critiques will be as important as the more formal written evaluation. The evaluators must be aware of the tasks, conditions, and standards inherent in the exercise scenario. The feedback and suggested corrective action will provide the participants the key to realizing the potential of the exercise.

Good communication between the chemical officer, S3, and commander is essential when evaluating the unit's capabilities. An overly demanding NBC task improperly placed in an FTX can do more harm than good. While it is important for a unit to learn to overcome the problems associated with NBC operations, it is also important to bolster the individual soldier's confidence in his unit's ability to perform its TOE mission. This increase in confidence cannot be achieved if the NBC tasks consistently cause the unit to fail its basic combat missions. In short, one must tailor the NBC tasks to the unit's capabilities and adjust them as the unit improves. More complex and demanding NBC events can be completed when the unit becomes proficient in the easier tasks.

In summary, the commander's guidance, task selection, event scheduling, and staff coordination are the most important considerations when a chemical officer integrates NBC tasks into division artillery or battalion FTX/CPX activities. Hard work and attention to detail in the planning stages will pay off. Well-planned NBC events added to such training exercises are the "chemical ingredients" which will prepare a unit to survive in an NBC environment.

CPT Christopher J. Parker, CM, received his commission through the Officer Candidate School. He has a B.A. degree in medical technology from Drake University in Des Moines, Iowa, and is a recent honor graduate of the Chemical Officer Advanced Course. He served as the chemical officer, 2d Brigade, 25th Infantry Division, in Hawaii and is currently the assistant division chemical officer for the 7th Infantry Division, Fort Ord, California.

Redleg Newsletter

ITEMS OF GENERAL INTEREST

Leave reminder

Each year soldiers unnecessarily lose leave because they are unaware of their leave entitlement. The Army's regulation on leave, passes, administrative absence, and public holidays (AR 630-5) states that leave will be charged starting on the date of departure and ending on the date of return.

If a servicemember works three-fourths (normally six to seven hours) of a normal duty day before departing on leave, that day is not chargeable as leave.

If he or she returns from leave on a non-duty day (Saturday, Sunday, or a public holiday), that day is not chargeable as leave.

If the servicemember does not work the conventional Monday-through-Friday week and returns from leave on a non-duty day, the duty day preceding the day of return carries as the last day of leave chargeable. If a soldier falls into this category, he or she should make sure that the following statement is typed in item 30 (remarks) of DA Form 31 (Leave and Pass Form): "Leave is not to be charged for the day shown in item 22."

For more details, read AR 630-5, paragraph 3-4C, or check with the local personnel services noncommissioned officer.

Evaluation reports to contain additional data

The Officer and Enlisted Evaluation Reporting Systems will be changed to include Army Physical Readiness Test (APRT) performance and height/weight data on EERs, OERs, and most service school AERs, effective 1 May 1983.

The change is made as part of the Army's continuing emphasis on physical fitness and weight control. Further, it allows the selection board to check a soldier's compliance with physical fitness and weight standards. Data will be entered as PASS, FAIL, or PROFILE; and the date of the most recent APRT or date the profile was awarded is also noted.

Height and weight, expressed in inches and pounds (example 71/185), will be entered on the evaluation form as of the last rated day covered by that report. The height/weight data will be followed by the word YES or NO to indicate the individual's compliance with the standards of AR 600-9, Army Weight Control Program, which was effective 15 April 1983.

The rater will be required to make narrative comments for APRT entries of FAIL or PROFILE and for height/weight entries with a NO indicating a weight that exceeds the standards of AR 600-9. The purpose of these comments is to explain progress in a weight control program, ability to perform assigned duties with a PROFILE entry, or medical exception to regulatory requirements.

The permanent change to the applicable regulations is being distributed to the field; however, APRT and height/weight data should not be placed on evaluation reports until the effective date (1 May 1983). After the effective date, evaluation reports will not be accepted without these entries.

In another recent change affecting OERs, the minimum period for complete-the-record OERs has been extended to require 180 calendar days in the same duty position under the same rater. This change became effective with an immediate action change, published 17 December 1982.

For more information concerning these changes, call AUTOVON 221-9610 or write to:

US Army MILPERCEN
ATTN: DAPC-MSE
200 Stovall Street
Alexandria, VA 22332

What became of old . . .?

Many active duty and retired field artillerymen would like to renew acquaintances with other military members, including those retired, but have lost track of their whereabouts.

The Privacy Act of 1974 normally prevents the military departments from releasing current addresses; however, each service operates a locator service which will forward an interested party's correspondence.

Here is how to do it. On one envelope, one must include a message or greeting and the name and grade of the person one is trying to find. In the upper left corner must appear the writer's return address, and a stamp goes in the upper right. This envelope must be locator service. The outside envelope must also include the writer's address.

Because there are so many people with identical names, accuracy of spelling and completeness of name is vital. It also is a good idea to send the locator service a data sheet in the outside envelope, listing what is known about the friend's service background, duty stations, schooling, dates, etc. This will help the locators to track the individual down faster.

Letters may be addressed to:

- Army: HQDA-DAAG-PSR, Alexandria, VA 22331.
- Navy: USN (NMPC-641E), Washington, DC 20370.
- Air Force: AFMPC/DOO3, Randolf AFB, TX 78150.
- Marine Corps: HQ USMC (MSRB-13), Washington, DC 20380.
- Coast Guard: HQ USCG (G-PS-1), Washington, DC 20593.

New MOSs closed to women

The Women in the Army (WITA) Study, released in November 1982, added 23 enlisted MOSs to the list of those closed to women. Four FA MOSs were on that list: 13R, Firefinder radar operator; 17B, FA radar crewmember; 17C, FA target acquisition specialist; and 82C, FA surveyor. As of 3 September 1982, the Army ceased recruiting in these MOSs, and reenlistment for women in these MOSs was not available after 28 February 1983.

There are only four entry level FA MOSs that remain open to women: 15D, Lance crewmember; 15E, Pershing missile crewmember; 15J, Lance operations/fire direction specialist; and 93F, FA meteorological crewmember. In addition, all three career progression MOSs for senior FA sergeants (13W, 13Y, and 13Z) remain open to women.

The transition period necessary to attrit women from the closed MOSs is expected to last from three to five years. However, efforts are ongoing to encourage women to reclassify now as opposed to waiting until ETS. The transition process, taking into account both the Army's readiness needs and individual career development and preferences, will be resolved in one of the following ways:

- A woman who enlisted under the Delayed Entry Program (DEP) for one of the closed MOSs will be offered a chance to renegotiate her contract. If she elects not to renegotiate, she will face separation because of the Army's inability to fulfill its contractual obligations.
- If she received her reenlistment control number before 28 February 1983, she will be encouraged to consider renegotiation for another MOS. If she chooses not to renegotiate, the Army will honor its reenlistment commitment for a last term of service in the closed MOS.
- If she is now taking initial entry training, she will also be offered a chance to renegotiate her contract. If she does not want to renegotiate, she will be allowed to separate from service. If she chooses to neither renegotiate nor separate, she will be permitted to serve the remainder of her current enlistment in the closed MOS.
- Women serving in the newly closed MOSs may serve the remainder of their current enlistment unless they apply for voluntary reclassification. Those who do not apply for reclassification and who want to remain in service will be required to select another open MOS upon ETS, or at the overseas PCS point if reenlistment is required to meet tour length obligations.
- Reenlistment and/or reclassification will be targeted to place affected women in one of the Army's shortage skills commensurate with the soldier's qualifications.

Each female soldier affected by these closed MOSs will soon receive a letter from the Deputy Chief of Staff for Personnel through the chain of command explaining the need for her to change specialty and describing the best three MOS options based on her qualifications, previous training, and Army needs. In addition, commanders will receive a separate letter with detailed guidance, background information, and implementing instructions.

The WITA Study Group did not address the female officer situation, other than to include recommended combat probability coding changes to authorization documents. The status of female officers will be a separate issue worked concurrently by the US Army Field Artillery School's Field Artillery Proponency Office and the Office, Deputy Chief of Staff for Personnel (ODCSPER). The professional development plan for female field artillery officers, a Field Artillery Functional Review issue, has been delayed until revised documents with adjusted interchangeability codes are published by ODCSPER.

First Sergeant Program

The Field Artillery First Sergeant Program has been in existence for almost eight years. During that time, many soldiers in combat support and combat service support MOSs who normally would not have served as a first sergeant were given that opportunity with the Field Artillery. Additionally, the program helped fill Field Artillery first sergeant positions during a time of extreme shortages. Overall, the program has been a success; however, since there are now sufficient Field Artillery master sergeants and promotable sergeants first class to fill all Field Artillery first sergeant and master sergeant positions in MOS 13Y, a recommendation has been forwarded to MILPERCEN to phase out this program. Personnel currently serving under the provisions of the FA First Sergeant Program will continue to serve their normal tour of duty for which originally programmed.

Commanders Update

COL Paul T. Weyrauch
1st Cavalry Division Artillery

COL James H.B. Peay
24th Infantry Division Artillery

COL Frederic H. Stubbs
101st Airborne Division Artillery

LTC James C. Welch
1st Battalion, 7th Field Artillery

LTC James Ferguson
2d Battalion, 12th Field Artillery

LTC Sterling R. Richardson
3d Battalion, 34th Field Artillery

LTC James M. Gass
2d Battalion, 41st Field Artillery

LTC Donald J. Parrish, Jr.
1st Battalion, 82d Field Artillery

Correction

The list of US Army Reserve Commanders in the January-February 1983 *FA Journal* contains an error: The commander of the 6th Battalion, 83d Field Artillery (under separate units), should be LTC Harold E. *Stites* instead of LTC Harold E. Seit.

The Soviet Man of Steel

Chief of Rocket Troops and Artillery

by Captain Scott R. Gourley and Captain David F. McDermott

Date — 16 April 1945; time — 0500 hours: Marshal Zhukov's First Byelorussian Front and Marshal Konev's First Ukranian Front are poised for the offensive. On order, 42,000 artillery pieces in massed formations commence firing on the German positions in the attack sectors. Before the day is over, they will have fired over 1,236,000 high-explosive shells totaling 100,000 tons of metal. For the defending Germans, the barrage is a crescendo of doom. For the attacking Red Army, it heralds the final drive on the heart of Nazi Germany — the city of Berlin.

Thirty-eight years later, Soviet military doctrine still emphasizes the massive employment of artillery in support of ground force operations; tactical concepts, however, have changed. Current artillery doctrine in the Soviet armed forces no longer prescribes only the physical massing of artillery *pieces* reminiscent of the tactics of the Great Patriotic War. Rather, the emphasis is on "mobility of firepower" — the ability to mass and shift artillery *fires* on a continual basis to support high speed offensive operations. Such a doctrine requires a versatile and highly skilled individual to bear the responsibility for controlling and coordinating these fires. This individual is the Chief of Rocket Troops and Artillery (CRTA), and any force which opposes the Soviets needs to understand the central role he plays.

The emphasis which the Soviet military places on field artillery, including battlefield rockets and missiles, is evident in its creation of the Rocket Troops and Artillery as a separate component of the Soviet Ground Forces. At the national level, the head of this arm — the Commander of Rocket Troops and Artillery — is a member of the Military Council of Command and Staff of the Ground Forces.

Weapons of the Rocket Troops and Artillery include tactical or operational rockets and missiles having ranges of less than 1,000 kilometers and are subject to Ground Forces control. When equipped with nuclear warheads, these delivery systems are considered to be the principal means for destruction of the enemy during Ground Force operations. The tube artillery systems are the organic artillery of the tank and motorized rifle divisions, to include antitank guns and antitank guided missiles, and the large-caliber guns and mortars of the Supreme High Command Reserve which are found at echelons above division or army level.

The man who assists commanders in the efficient deployment of artillery is the special staff officer known at regimental level as the Chief of Artillery and at higher levels as the Chief of Rocket Troops and Artillery. Below regimental level, artillery officers may be assigned to battalion staffs on an operational basis. The Chief of Rocket Troops and Artillery operates under a dual hierarchy of command; that is, in addition to being responsible to the commander of the tactical formation to which he is assigned, he is also directly subordinate to the CRTA at the next higher echelon. By making the CRTA at each command level equal in rank to the formation commander at the next lower level of command and by prescribing the deployment of artillery in accordance with existing field service regulations and command policies, the Soviet military minimizes the chances for chain of command conflicts.

The CRTA and his staff have comparable functions and responsibilities regardless of the echelon to which the CRTA might be assigned. These duties fall within three functional areas: command and fire direction, target acquisition, and ammunition resupply.

Command and fire direction

In the area of command and fire direction, the CRTA controls those artillery assets not assigned or attached to subordinate tactical units. He may also supervise the tactical operations of specific subordinate artillery units such as the regimental artillery groups (RAGs) and the divisional artillery groups (DAGs). In fulfillment of this task, the CRTA develops the artillery operations plan to include the receipt, tasking, and, occasionally, the positioning of newly assigned reinforcing artillery units. In his capacity as a special staff officer, the Chief of Rocket Troops and Artillery advises the division commander on these aspects of fire support:

- Nuclear fires allotted to the division, to include any plans for the integration of nuclear, chemical, and conventional fire support with tactical airstrikes.
- Fire support designed to clear passages through obstacles for assault troops.
- Assigned priority of fires for the neutralization of specific sectors within the enemy's defense.
- Details of the fire preparation, to include starting time(s), duration of fire, and phases of the fire preparation.
- Fire support measures for supporting the commander's scheme of maneuver.
- Plans for the partial decentralization of artillery control during the tactical operation, to include plans for the reinforcement of assault units with accompanying artillery in the form of RAGs and DAGs.
- Plans for artillery employment in support of the commitment of second echelon forces and reserves.

Any fire plans developed by a CRTA must conform to the tactical commander's guidance and must be capable of integration into the next higher echelon's fire plan. The highest echelon of command involved in an operation initiates the fire plan, which must be coordinated down to the regimental level. Therefore, fire support details developed by the division CRTA in support of the division commander's plans must be integrated into the fire plan developed by the CRTA at Army level. Likewise, the Army CRTA's fire plan, based on the Army commander's guidance, must be integrated into the Front's fire plan. Differences between the two fire plans at successive levels of command must be resolved by the lower level. In essence, a regimental CRTA's fire plan, once it has been sent up through the proper artillery channels, must eventually receive full approval at Front level. Although this centralized approach to fire planning might be somewhat cumbersome and unresponsive, it allows the various Chiefs of Rocket Troops and Artillery to determine which targets will be attacked and with what category of artillery systems. These determinations, in turn, allow them to advise the maneuver commander on the proper allocation of their artillery systems. As the tactical situation changes, the original fire plan will be updated and modified.

Target acquisition

Concurrent with the development and maintenance of the artillery fire plan is the CRTA's coordination of the effective employment of artillery reconnaissance assets in support of target acquisition missions. During the planning stages of the tactical operation, the Soviet maneuver commander will take his assigned CRTA on a reconnaissance of the projected area of operations. During this reconnaissance, the commander will instruct the CRTA regarding possible targets for preplanned artillery fire, to include engagement priorities and times of engagement. The CRTA will then integrate the targeting data into his fire plan, disseminate target information to artillery units under his control, and continue to update targeting information as it becomes available.

Ammunition resupply

Once the artillery has been organized for combat, the CRTA's primary responsibility becomes one of insuring ammunition resupply of committed assets and adequate repair and maintenance of major end-items of artillery-associated materiel. Ammunition resupply in this instance involves the determination and organization of artillery resupply requirements and resources for all types of ammunition (excluding tank main gun ammunition) based on the unit's operation plan. By virtue of his military schooling at the Higher Officers' Course at the Central Artillery Officers' Course/Marshal of Artillery V.I. Kazeskov Academy, the CRTA is also well qualified to supervise the repair and maintenance of weapons systems.

Location

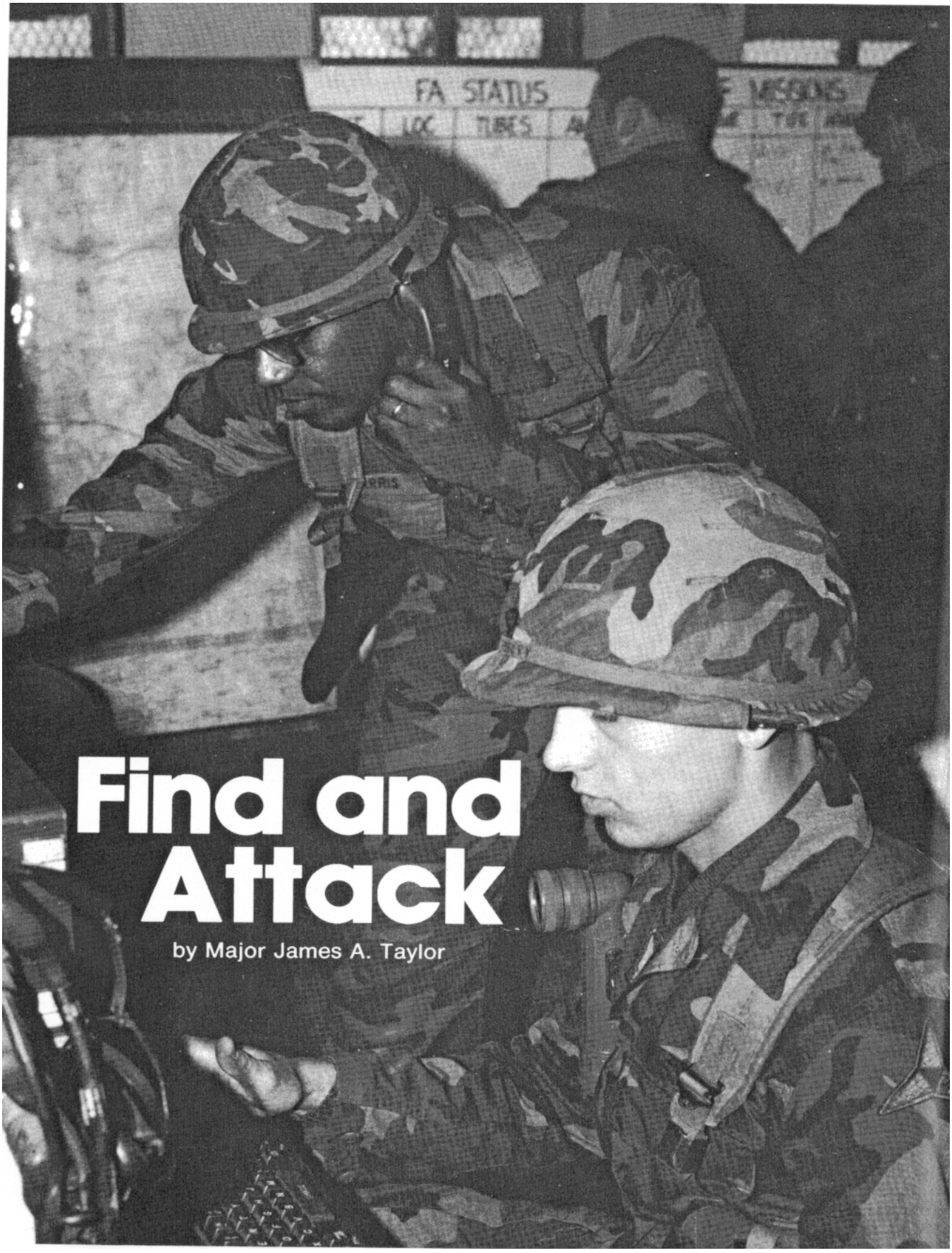
His importance to the overall success of Soviet operations makes the CRTA a lucrative target for opposing forces, and he is vulnerable. Due to the centralized nature of the Soviet tactical command, control, communications, and intelligence infrastructure, the CRTA has a moderate to high probability of detection due to his collocation with the assigned unit's main or forward command post. During offensive operations, the CRTA, particularly in a division, will most likely be located with the division commander at the forward command post. During high speed, fluid operations, both individuals also may occupy forward command/observation posts. Once accurately detected, the CRTA and his associated facilities could be effectively engaged by indirect fire systems due to his deployment either in a soft-skinned vehicle like the BTR-50PU or even in a tent in airborne units. The attack of the CRTA at the main command post would also, of course, offer the possibility of collateral target damage since other key members of the staff are collocated in the same area. Destruction, neutralization, or degradation of the CRTA and associated staff will reduce the amount of control and coordination exercised over RAGs, DAGs, and possible AAGs (Army artillery groups) and will thereby affect the effectiveness of the artillery support available to assaulting echelons, as well as the degree to which the CRTA is able to exercise operational control over division-level multiple rocket launchers (e.g., BM-21) and tactical surface-to-surface missiles (e.g., FROG-7). The situation would be further complicated by the concurrent disruption of the flow of target acquisition data resulting from the CRTA's diminished performance.

Conclusion

The Soviet military leadership is well aware of the value of a central artillery coordinating authority at all command levels. The CRTA is the man who makes Soviet "mobility of firepower" a reality, and knowledge of his power and his vulnerabilities is the first step in countering his threat.

CPT Scott R. Gourley, FA, USAR, received his commission from the University of California at Los Angeles. He is a graduate of the Field Artillery Officer Advanced Course. He has served in both cannon and missile Field Artillery assignments in USAREUR and is a former threat instructor at the Field Artillery School. He is currently a member of the IRR.

CPT David F. McDermott, MI, USAR, is the assistant S1, 4th Brigade (GST), 91st Division, (TNG), Presidio of San Francisco, California. He received his commission from USMA and has a Master's degree in business administration from St. Mary's College, Moraga, California. He is a graduate of the Military Intelligence Officer Advanced Course and served in intelligence assigments while stationed at Fort Hood, Texas, and Germany.



Find and Attack

by Major James A. Taylor

During World War II and the Korean and Vietnam conflicts, the US Army fire support system had sufficient assets to enable it to attack virtually every acquired target. However, the capability to identify targets beyond the range of the human eye did not exist to any great extent in Korea or World War II, and the guerrilla warfare of the Vietnam conflict did not truly test the target acquisition system. When the fire support system did acquire deep targets beyond the frontline fight, the target information was often so sketchy, inaccurate, or out-of-date that any attack was of questionable value.

In recent years, however, major advances have occurred in the intelligence and electronic warfare system's ability to see deep and identify targets. As the US Army faces the formidable and significantly more numerous Warsaw Pact forces, it will have to make use of these new assets to acquire more and better defined targets for attack. Clearly, targeting, which in the past three major conflicts was primarily a concept, must now become a reality.

For the past few years the concept of targeting has received increased attention and has been the subject of numerous written and verbal discussions. Arguments arise over the definition of targeting and over targeting responsibilities. To compound the problem, many field artillerymen are not familiar enough with targeting to appreciate its impact on operations and therefore do not care to give it proper attention. Perhaps a review of the concept of targeting will serve to focus current and future discussions.

What is targeting? The Commandant of the Field Artillery School approved a definition of fire support targeting in March 1982. "Targeting is a process based on the friendly scheme of maneuver/tactical plan and an assessment of the terrain and threat which identifies enemy functions, formations, equipment, facilities, and terrain which must be attacked to insure success. Targeting starts with the commander's guidance and continues through the development of a prioritized list of what targets are to be attacked, when they are to be attacked, why they are to be attacked, and what the conditions of success and failure are. The process concludes with the commander's decision of which option will be used to attack the various targets."

This definition reveals that targeting is not a single action, but rather a flow of actions which require consideration of the overall battle from both the friendly and enemy sides. It also requires a perception of the battle in the future and an ability to determine how that future battle can be shaped to one's advantage. Targeting looks for those targets or sets of targets which will return the greatest payoff for the fire support assets expended to attack the targets or which will cause the greatest harm to friendly forces if not attacked. These types of targets are known as high value targets or high payoff targets.

Once the high value targets are identified, there must be a system for determining the ability first to collect requisite information to allow attack of these targets and then the ability to attack them based on what is available and approved for use. This system produces a target list which consists of targets which can be both collected and, when collected, attacked. No longer can the intelligence and electronic warfare system be asked to tell the fire support system about every potential target on the battlefield. Information processing systems, whether manual or automated, will not be able to handle the anticipated volume; nor could the fire support system sort out the high value targets from the less important ones. The fire support system cannot attack every potential target which pops up on the battlefield. It must be more selective as to the targets it designates for attack and must require specific information on those targets to insure a high probability of success.

A couple of years ago the idea of a targeting cell which would orchestrate the whole process surfaced. This cell was to consist of experts in maneuver, fire support (all types), target acquisition, and logistics. Its primary output for the commander to consider was to be a prioritized list of targets with various attack options. The targeting cell, while a viable alternative, gave way to a return to more traditional staff roles. FM 100-5 states that, "To conduct a deep attack successfully, the fire support coordinator, the G3, and the G2 must cooperate fully. They must maintain proper emphasis on the deep battle during all phases of the operation." This statement embodies two elements of basic tactical doctrine — synchronization and unity of effort. For any operation to be successful, these elements need to be applied. Thus, the targeting function requires that special attention be given to synchronization and unity of effort; without them, key parts of the targeting process will be missing.

Each of the three players identified in FM 100-5 must understand their role in targeting and, as stated in FM 100-5, "cooperate fully." For targeting to be successful, it must support the scheme of maneuver and concept of operation. The concept of operation appears in the commander's guidance, and this guidance is taken by the staff and developed into a scheme of maneuver which is implemented by the G3. The G3 must be able to articulate requirements and conditions for the successful execution of the scheme of maneuver so that the fire support coordinator and G2 can identify those high value targets which must be attacked to support the scheme of maneuver. As changes to the scheme of maneuver occur, the G3 must keep the fire support coordinator and the G2 informed to allow them to adjust their targeting priorities.

The fire support coordinator and G2 must work together to identify the high value targets to support the scheme of maneuver. The G2, with his knowledge of the enemy's doctrine and capabilities and the current situation, must be able to predict the enemy's future courses of action if unimpeded and what his

likely course of action will be if certain targets are attacked. These targets must be analyzed to determine which ones will have the most effect on his operation and be most beneficial to the friendly scheme of maneuver. The fire support coordinator, with his knowledge of attack capabilities, must be able to eliminate from consideration those targets which are beyond current attack capabilities and estimate the effects on the targets which can be attacked. Together, the G2 and the fire support coordinator identify the high value targets to support the operation.

Once the high value targets are identified, the fire support coordinator must make a determination as to what fire support assets are available to attack specific targets, thereby enabling establishment of appropriate target criteria against which the G2 can place his collection effort. The G2 will understand how the collection requirement arose, what relation it has to the battle, and the high priority which must be placed on it. The G2 will also be sensitive to the requirement to provide information on the targets in a timely fashion. As the G2 provides the fire support coordinator with target information, the fire support coordinator must insure that it is processed expeditiously. The targets must be analyzed to determine the appropriate fire support asset to apply against them; then these targets are passed to the agency responsible for conducting the attack.

The targeting process varies in its perspective and orientation, depending on the echelon at which it is accomplished. At the brigade and lower echelons, targeting is more reactive in nature. The reaction may be due to an action of the enemy or direction of higher headquaters, but it is still primarily reactive. The orientation at these levels is more toward execution than toward planning. Target acquisition and fire support assets are allocated to support this effort. At levels higher than brigade, targeting becomes more active in nature; and orientation begins to shift toward more planning. Time becomes more critical, since more lead time is needed to plan attacks and acquire targets. At division level, there is somewhat of a balance between planning and execution, with occasional swings to one aspect of targeting or the other. At corps level, the focus is primarily on planning.

At any level, people are still the most important element in making targeting successful. The fire support system must make the most efficient and judicious use of available personnel. In future conflicts, the most important tasks for the field artillery will be those of fire support coordination and targeting; thus personnel selected to accomplish these tasks should be the very best available. A lieutenant should be assigned as a FIST chief only after he has proved to be an efficient assistant executive officer and executive officer of a firing battery. The best available captains and majors should be placed in the fire support officer positions at maneuver battalion and brigade levels, rather than using these positions as holding slots until a battery command or S3 job is available. The same holds true for the assistant fire support coordinators at division and corps levels. Additionally, these positions need some stability. The fire support officer/coordinator needs to be as familiar with the plans and the standing operating procedure of the maneuver unit as the maneuver S3/G3 is, and so an individual assigned to the position should remain in it long enough to establish himself.

The doctrine of the AirLand Battle speaks to all field artillerymen as it details how US resources will be stretched to the limit. In such an environment, field artillerymen must get the maximum use from each and every available asset; and the targeting process is a way of guaranteeing that they do.

MAJ James A. Taylor, FA, received his commission through the Officer Candidate School, is a graduate of the Command and General Staff College, and has a bachelor's and master's degree in business. He has served tours in Vietnam and Germany and was a battery commander in the 2-75th Field Artillery and in the 1-41st Field Artillery. He is currently the Field Artillery School project officer for the development of a training program for the computer-based Target Analysis and Planning System.

Right by Piece

NOTES FROM UNITS

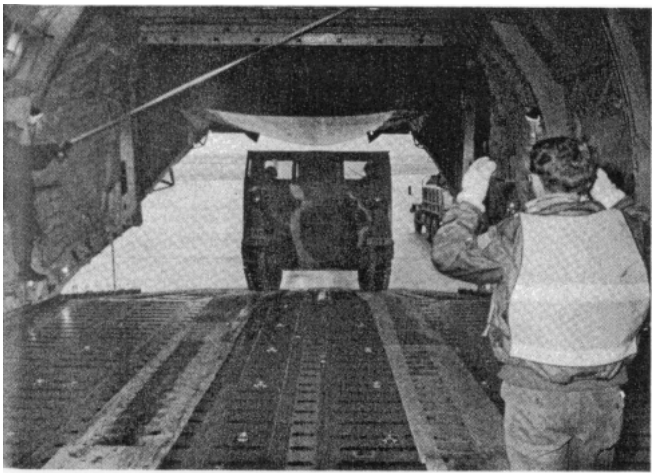
EDRE Dragon Team 3-83

FORT SILL, OK — The 2d Battalion, 12th Field Artillery, recently participated in the Emergency Readiness Deployment Exercise (EDRE) Dragon Team 3-83 evaluation, thus becoming the first 8-inch, general support howitzer unit to test its role as a member of the Rapid Deployment Force. The battalion was alerted by the XVIII Airborne Corps on the morning of 2 December 1982.

The deployment order directed the 2-12th FA to airlift two firing batteries, a battalion command and control element, and a direct support maintenance contact team from the 226th Maintenance Company. Alfa and Charlie Batteries constituted the firing elements. The 3d Battalion, 18th Field Artillery, acted as the backstop unit, providing required logistical support both at Fort Sill and at Tinker Air Force Base, the departure airfield.

This exercise evaluated all facets of the battalion's readiness plans. Once alerted, the 2-12th FA executed its H-hour sequence, the 48-hour scenario the unit had developed to prepare assigned personnel and equipment for strategic deployment. Ninety-four percent of assigned personnel were immediately deployable, and 100 percent of the assigned equipment and vehicles in the deploying batteries were fully mission capable and prepared for air movement by 4 December.

Unit vehicles were loaded with mission-essential equipment in accordance with contingency load plans and were checked for air transportability while at Fort Sill. Personnel and equipment then moved by road convoy the approximately 90 miles to Tinker Air Force Base, where final flight preparations and aircraft loading were accomplished.



An M548 cargo carrier moves up the ramp of a C-5A on shoring material designed to protect the aircraft floor from damage by vehicle tracks. An Air Force loadmaster guides the cargo carrier into position on the aircraft floor. (Photo by SP5 Mike Howard)

During an 18-hour period, elements of the 21st United States Air Force and the 60th Military Airlift Command Airlift Control Element airlifted the 2-12th FA elements in ten C-5A and eleven C-141B sorties. Personnel from the Tinker Air Force Base Mobility Control Center provided liaison between the deploying unit and the United States Air Force.

The leaders and soldiers of the battalion had prepared themselves and their equipment well. No aircraft loads were rejected by the aircraft loadmasters, and no aircraft delays were caused by the deploying unit. As a result, the Air Force was able to meet all of its time requirements.

Once at Fort Campbell, Kentucky, the 2-12th FA joined the 101st Airborne Division (Air Assault) and units from the 24th Infantry Division, 11th Air Defense Artillery Brigade, and the 82d Airborne Division for the EAGLE STRIKE III field exercise. Upon completion of this exercise, the battalion was airlifted back to Tinker Air Force Base. (1LT Martin Howard, Assistant S3)

Cold-weather training

FORT ORD, CA — Recently, 23 soldiers of the 1st Platoon fire support team (FIST), 1st Battalion ("Accurate"), 79th Field Artillery, of the 7th Infantry Division, deployed to Fort Wainwright, Alaska, for a month of cold weather training. Along with their supported infantry, the 1st Battalion, 32d Infantry ("Bearcats"), the artillerymen learned how to survive in the subarctic environment and use basic snowshoe and ski movement techniques.

The high point of the exercise for the artillerymen was the day-long combined arms live fire exercises (CALFEXs), during which the 13Fs adjusted mortar fires while infantrymen negotiated a live fire course with their direct fire weapons. Each line company and combat support company/headquarters and headquarters company (minus) went through the CALFEX course. All adjustment of fires was done from OH-58 helicopters since the terrain was too flat and featureless to allow observation from the ground. (MAJ Ken Martell)

Washington Artillery

NEW ORLEANS, LA — The date is 17 July 1861. The first battle of the War between the States is taking place at Manassas (Bull Run), and the enemy is on the move. The Washington Artillery's morning report shows 284 officers and men present for duty and an armament of 13 field pieces: six smooth brass 6-pounders, four 12-pounder howitzers, and three 6-pounder rifles. At Fairfax Courthouse, we can hear the enemy's guns as our advanced forces fall back steadily to cross to the south side of Bull Run. We

watch and hold the fords while our camps break up. The tents and baggage will be sent to Manassas under charge of the quartermaster, and we will have to rough it in the open air until this business is concluded.

About noon, we hear the boom of a big gun away on the left, and then another, and then the rattle of a volley of musketry. As the sounds increase in volume, we know the enemy is attacking one of the fords; but we cannot tell which one. The bugle sounds the assembly; and the cannoneers take their posts at the guns, ready for action if the Zouaves opposite prove troublesome.

Lieutenant Squires, the senior officer in command of the guns in that first skirmish, was to tell his story this way in his formal report:

> *Early yesterday morning, the three rifle pieces of artillery were ordered to move in the direction of Blackburn's Ford. Upon arriving at McLean's farm house, we were joined by two more guns of our Washington Artillery. Musketry fire soon opened along the banks of Bull Run, and our infantry became engaged with the enemy. Presently the rifles under Richardson opened fire — the first shots fired at the enemy by the Washington Artillery. These rifles were soon joined by the five other guns — making seven in all — and at it we went.*

General G.T. Beauregard, commanding general of the Southern forces in the battle of Manassas, was to offer this perspective on our performance:

> *Our artillery was manned and officered by those who, but yesterday, were called from the civil avocations of a busy city, New Orleans. They were matched with the picked artillery of the Federal Regular Army — Company E, 3d Artillery, with an armament, as their own chief of artillery admits, of two 10-pounder rifle Parrott guns, two 12-pounder howitzers, and two 6-pounder pieces, aided by two 20-pounder Parrott rifle guns of Company G, 5th Artillery. Thus matched, these young men drove their veteran adversaries from the field, giving confidence in and promise of the coming efficiency of this brilliant arm of our service. The skill, the conduct, and soldierly qualities of the Washington Artillery engaged were all that could be desired. The officers and men attached to the seven pieces already specified won their battalion a distinction which, I feel assured, will never be tarnished, and which will ever serve to urge them and their corps to high endeavor*.

Such was the auspicious introduction of the Battalion Washington Artillery into the Civil War, and it stands as representative of an esprit de corps and tradition that has survived 145 years. The Washington Artillery was organized in 1838 as a volunteer militia company in New Orleans. During the United States

Parade color bearers of the 1st Battalion, 141st Field Artillery, 256th Infantry Brigade.

"occupation" of Texas brought about by the act of annexation and the War with Mexico which followed shortly afterward, it first saw service as a battery of light artillery in 1845 and then as a company of infantry in 1846. On the eve of the Civil War, the Washington Artillery took part in the Confederate seizure of the Federal arsenal in Baton Rouge. During the Civil War, it served with distinction at Shiloh, Antietam, Fredericksburg, and the Wilderness. The Washington Artillery saw Federal service in the Spanish American War, on the Mexican border in 1916, in World War I in France, and in World War II in Italy, France, and Germany.

The Washington Artillery today is now a proud part of the Louisiana National Guard of the US Army. Currently designated "1st Battalion, 141st Field Artillery, 256th Infantry Brigade," it retains its sense of history and tradition through its museum of memorabilia at Jackson Barracks in New Orleans. It maintains its readiness through practical training. The soldiers of the Washington Artillery conduct four shoots per year, journeying to nearby Camp Shelby, where the artillery range is hilly enough to simulate combat conditions. Other drills during the year are held at Camp Villere, a small-arms firing range just outside the city limits of New Orleans.

Last year, Headquarters Battery received the Eisenhower Trophy — the first time in three years in the state of Louisiana that a unit had been presented the coveted award. In addition, two of the batteries received the difficult-to-obtain "superior rating." A century and a half of dedicated service continues unabated in the Washington Artillery — "Try Us." (Lieutenant Colonel (Ret) Armand J. Duplantier)

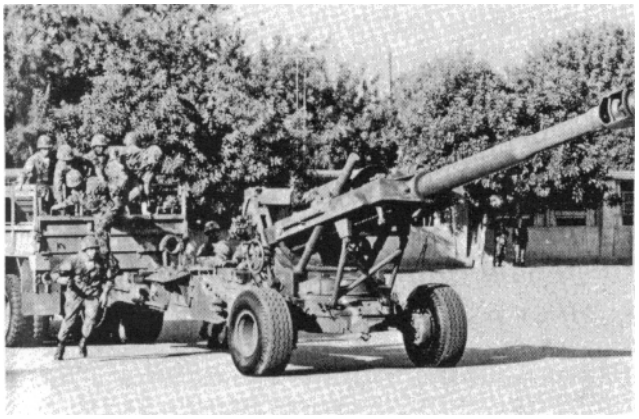
Marines get M198

CAMP PENDLETON, CA — The first M198, 155-mm, towed artillery piece was received by the 1st Marine Division cannoneers during a history-making Saint Barbara's Day celebration on 3 December 1982.

A hand-picked gun crew from Battery B, 1st Battalion, 11th Marines, accepted delivery of the gun, which replaces the 105-mm howitzer. Eventually, all of the regiment's aging fleet of 105s will be retired in favor of the M198.

The M114, a Korean Conflict-era 155-mm artillery piece which is still used by one battery of each of the regiment's battalions, will be retained for the present.

As the first West Coast Marines to get a crack at using the M198, Battery B crew chief Sergeant Leon Cooper and his 10 crewmen were enthusiastic. They recently attended a three-day, crash course given by a contact team from the US Army Field Artillery School to learn the operation of the weapon.



Cannoneers from B Battery, 1st Battalion, 11th Marines, enthusiastically receive their first M198. (Photo by SGT Keith Brumley)

New weapon for 1-6th FA

FORT BRAGG, NC — The 18th Field Artillery Brigade's 1st Battalion, 6th Field Artillery, is replacing its World War II vintage M114A2 155-mm towed howitzers with the newest howitzer in the Army's arsenal, the M198 155-mm towed howitzer.

The Brigade's 1st Battalion, 39th Field Artillery, and 1st Battalion, 73d Field Artillery, are already using the M198s. The 1-6th FA is the final continental US battalion to receive the new howitzer; only one battalion, which is in Hawaii, still has the M114A2 weapons.

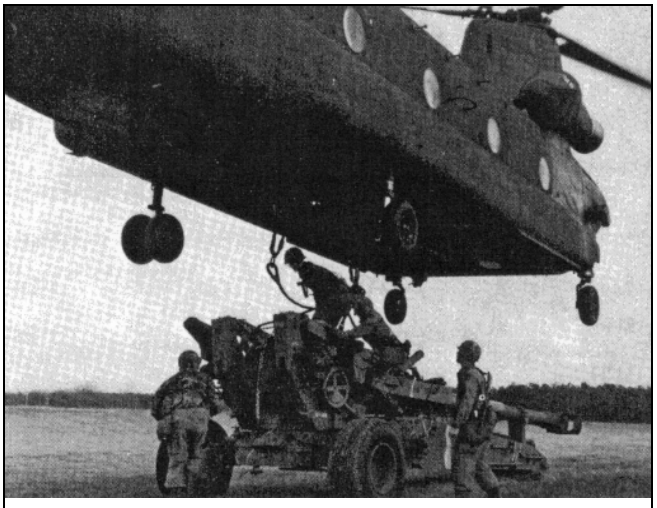
Fort Sill instructor Sergeant First Class Angel Torres trained the team chiefs on the M198; and the chiefs, in turn, will train their crews on the new artillery piece.

During the week-long training, soldiers who had never worked together were organized into artillery crews. With one and a half days of training, these crews beat an Army readiness and training evaluation program standard time of four minutes to emplace the piece.

Fort Sill instructor SFC Angel Torres (back to camera) briefs the supervisors of the 1st Battalion, 6th Field Artillery, on the capabilities of the M198 howitzer. (Photo by SP5 Patricia Phillips)

Even though the size and weight of the M198 far exceeds the older howitzer, the hydraulics on the M198 make it easier for the crews to handle. Physical effort is reduced, and so speed is greater even under varied conditions.

The new howitzers provide two significant improvements in the battalion's capability to support the XVIII Airborne Corps — an increased range capability and the ability to shoot ammunition not available for the M114A2. (SP5 Patricia Phillips)



FORT CAMPBELL, KY — Battling the downdraft from a CH-47"Super-Charlie" Chinook helicopter after slingloading an M198 howitzer are SGT Andrea Barnes, PFC Jon Porterfield, PFC Timothy Shumate, and SGT Kelly Thurston. All four soldiers are from Battery A, 2d Battalion, 31st Field Artillery, 101st Airborne Division (Air Assault). These soldiers along with 17,000 others were participating in Eagle Strike III, a joint-service training exercise held at Fort Campbell, Kentucky, in December last year. (Photo by SP4 Tom Jackson).

Memphis artillerymen mix with 194th

FORT KNOX, KY — Fifteen enthusiastic members of the Memphis National Guard, 3d Battalion, 115th Field Artillery, recently joined their counterparts of the 3d Battalion, 3d Field Artillery, 194th Armored Brigade, for four days of intensive training at Fort Knox, KY.

This was the first time the Memphis Guard had trained at Fort Knox. In the past, soldiers from the 194th traveled to Memphis to advise and evaluate the Guard.

During the field training exercises, each NCO from the Guard hooked up with his counterpart to learn and observe.

The 3d Battalion, 115 Field Artillery, is part of the 30th Armored Brigade (Separate) in Tennessee. The 194th Armored Brigade is also a separate armored brigade, and so the mission in the units are similar. (2LT Debra Bartels)

FORT ORD, CA — Members of C Battery, 6th Battalion, 80th Field Artillery, ram a round into the chamber of an M198 155-mm howitzer during a recent six-day familiarization exercise at Camp Roberts, California. The battery was a participant in Team Spirit 1983 in Korea.

Interoperability airmobile operation

HEMAU, WEST GERMANY — The Bundeswehr's Von Steuben Kaserne in Hemau, West Germany, is a quiet, small kaserne, located not far from Regensburg. This tranquil post, surrounded by farmland, rolling hills, and the typical wooded areas so predominant in the Bavarian region, is the home of the German 42d Rocket Missile Battalion.

Recently, the Von Steuben's tranquility was interrupted by the sounds of gunfire and artillery rounds coming from the nearby woods. A Cobra attack helicopter came in fast and low. It circled overhead and cleared a landing zone where security and advance forces could be dropped. This was the beginning of one of the most realistic Lance airmobile operations and interoperability exercises in the history of the 210th Field Artillery Brigade and possibly VII Corps.

Alfa Battery, 2d Battalion, 377th Field Artillery (the Lance battalion of the 210th), and the 4th Battery, 42d Rocket Missile Battalion, teamed up to cross-train for an airmobile fire mission and accompanying security operation.

The operation involved not only a Cobra, but also a Black Hawk, the Army's new utility helicopter, and a Chinook.

The Black Hawk transported the 10-man security squad, while the Chinook carried the Lance missile in the airmobile configuration with its 10-member launcher section. All aircraft departed Herzo Artillery Base for Hemau about 1300 hours. By 1400 hours, they were within range of the landing zone, which was 70 kilometers from their home base; and the terrain was totally unfamiliar.

From the forest surrounding the landing zone came the sounds of enemy fire. The fire mission had to be conducted quickly because the enemy was not far away.

While the Cobra cleared the landing zone, the Black Hawk and Chinook hovered nearby waiting for the all-clear sign to be given.

The Black Hawk deposited the security force and advance party. The firing point was secured, and the azimuth marker laid. The missile was positioned over the firing point and touched down within one meter of the survey stake. The Chinook landed, the launcher section ran from the aircraft, and the fire mission began.

Preparations had begun the day before when the 10-member security squad of the 4th Battery arrived at Herzo Base. Two of the German soldiers were trained as part of the 1st Launcher Section of A Battery while two American soldiers became part of the German security force.

Not only did soldiers from two different armies get to train together, but the airmobile operation was conducted under tactical conditions with tactical air support and with everyone in full combat gear. A tense, battlefield situation had been recreated. (Ruthann Sprague)

A German soldier followed by his American counterpart leave the Army's new utility helicopter, the Black Hawk, as they prepare to clear the landing zone. (Photo by Ruthann Sprague)

FDC simulates big-gun batteries

BAUMHOLDER, GERMANY — Simulating an artillery battery in a simulated war would likely require a tremendous strain of the imagination for most soldiers, but not for the artillerymen of the 8th Infantry Division (Mech) during Compass Point II-83. Rainy weather and muddy fields convinced them to keep their M109 self-propelled howitzers in garrison; so they simulated firing batteries by having each player battery set up its headquarters and deploy its fire direction center.

The field artillerymen simulated a fire mission all the way from a fire support team (FIST), through a battalion fire support officer and TACFIRE, to a battery fire direction center.

The main focus of the exercise was to practice and refine command and control procedures, but the field artillerymen also tested electronic countermeasure equipment and tactics and simulated supply and logistics requirements during the exercise.

Battery C, a target acquisition battery of the 333d Field Artillery, worked against members of the 108th Military Intelligence Battalion to see how capable they were in locating the Firefinder radar.

Even though the firing batteries were operating with about one-fifth their number of personnel, the exercise gave the fire direction personnel a chance to check their command and control procedures and their ability to deploy and arrive at the field location with the right equipment. (Bob Van Elsberg)

US unit receives German medal

PIRMASENS, WEST GERMANY — The 84th Artillery Detachment, 512th Artillery Group, 59th Ordnance Brigade, was presented the 2d German Korps Medal in January this year in recognition of their performance and cooperation with the host nation and the German Polizei during two civil demonstrations held in Grossengstingen last year.

German Lieutenant General Leopold Chalupa of the 2d German Korps presented the award to Captain Michael D. Plumbley, commander of the 84th Artillery Detachment.

Apollo retires

FORT LEWIS, WA — On 19 January 1983 at firing point 3209, the 1st Battalion, 84th Field Artillery, marked the end of an era in 9th Infantry Division fire support history. Brigadier General Bernard M. Herring, Deputy Commander/Chief of Staff, I Corps, fired the last round from one of the Army's oldest and most reliable field artillery weapons — the M114A1 155-mm towed howitzer.

"Apollo," as it has been named by the men of A Battery, 1-84th FA, is the oldest M114A1 in the 9th Infantry Division. It was manufactured at Rock Island Arsenal in 1943 as serial number 254. For the past 11

Crewmembers for gun A13 "Apollo," A Battery, 1st Battalion, 84th Field Artillery, stand at attention before firing the gun for the last time during "retirement" ceremonies for the gun. Crewmembers (left to right) are PFC Curtis T. Williams, SSG Steven G. Cromwell, PFC Ricky J. Gunn, SP4 Anthony C. Morgan, SP4 Artis L. Parker, and SGT William S. Summers. (Photo by Geary McSpadden)

years the howitzer has been a part of the life of A Battery. The symbolic retirement of Apollo was intended to honor all the M114s and crews that served them.

If Apollo could talk, just imagine the stories it could tell about happenings in the deserts of North Africa, the hills of Sicily, the vineyards of France, the forests of Germany, and the dense jungles of Vietnam. Apollo was there, supporting American soldiers.

Although Apollo is now retired and replaced by the M198, which can shoot more varied ammunition over much greater distances, the venerable old weapon will always be remembered by the soldiers who were supported by it and the field artillerymen who worked with it. (LTC Joseph DeFransisco)

SP4 Anthony C. Morgan, A Battery, 1st Battalion, 84th Field Artillery, swabs the gun after firing it during the M114's "retirement" ceremonies. (Photo by Geary McSpadden)

REFORGER Reflections

by Major (P) Carlos Langston, Jr., and Major Evan R. Gaddis

If the field artillery soldiers coming into Exercise Carbine Fortress (REFORGER '82) thought it was a crazy plan that would not work, who could have blamed them? After all, the advance publicity told them that Carbine Fortress would be the largest REFORGER exercise ever conducted — that it was a mammoth command and control exercise which would involve more than 73,000 soldiers from six nations; would include the most demanding of tactics, ranging from night passage of lines to airborne and air assault operations; and would exercise command and control from Central Army Group on down. For many participants, this was their first encounter with unfamiliar West German terrain. Well, the exercise is now history; and the skeptics have been convinced — Carbine Fortress was a smashing success. Field artillerymen of the VII US Corps came away with many new insights and innovations in the business of attacking, delaying, disrupting, and destroying the threat. Their experiences may well serve the ongoing efforts of their fellow artillerymen.

First, it is important to set the stage. The Carbine Fortress exercise took place in the vicinity of the city of Wurzburg in the Federal Republic of Germany. The scenario called for an initial two-division front with a simulated international border some 90 kilometers long. The entire exercise area encompassed over 11,000 square kilometers. There were two major threat avenues of approach located on opposite flanks of the VII Corps, which was the Blue exercise force.

The challenge of this scenario for Blue field artillerymen was readily apparent: they had to remain flexible to meet the threat's main thrust while simultaneously providing sufficient firepower across the front and interdicting the threat's second echelon forces. VII Corps Artillery had prepared to meet the challenge of the warfare simulated in Carbine Fortress by exercising the following traditional or innovative practices:

- An AirLand Battle targeting process.
- The use of microprocessors.
- The use of the Analytic Photogrammetric Positioning System.
- All-weather, day-and-night operations.
- Interoperability with NATO allies.
- The use of the Nike-Hercules.

An AirLand Battle targeting process

VII Corps Artillery's targeting system included input from the corps All-Source Intelligence Center, refinement of that input by the corps targeting cell (part of the corps fire support element), and subsequent attack by cannon artillery, Lance, air, electronic warfare, and other available weapon systems (figure 1). The corps All-Source Intelligence Center (ASIC) received intelligence input from a myriad of divisional, Army air, Air Force, and national sources. Though this flow of intelligence is nothing new in itself, VII Corps Artillery did make one modification. A special intelligence-cleared, field artillery officer was stationed in the corps ASIC on a 24-hour basis; and thus, while the intelligence community accurately and rapidly processed data to portray the threat picture, the artilleryman used his expertise to identify targets which could be attacked immediately and also any

areas likely to contain future targets (e.g., assembly areas, rail yards, and logistics sites).

The targeting cell within the corps headquarters was the focal point of the total targeting system; it brought together all the elements of the staff involved in fire support activities, to include the sections of the G3 air, the engineer officer, the air liaison officer, the nuclear biological and chemical officer, the electronic warfare officer, and other planners involved in the integration of fire and maneuver. It contained both an analysis branch and an intelligence branch. The analysis branch, located with the fire support element and composed of field artillery target analysts, translated the guidance from the commander into attack and targeting priorities and passed those priorities for target development to the intelligence branch, which was located in the ASIC.

Microprocessors

Once the ASIC passed a recommended target to the intelligence

(Photo by Ruthann Sprague)

branch of the targeting cell, the members of the intelligence branch further refined the target using a commercial microprocessor. The microprocessor permits extremely fast refinement — in fact, the system is so responsive that the time from the receipt of target intelligence to attack of the target is only a few minutes. It has a current, real-world, general defense plan data base which encompasses and displays the entire VII Corps area of operations and which is kept current through continual updating. (The Defense Nuclear Agency has been very helpful in building that data base.) To date, there are 63 different types of intelligence information logged and tracked on the microprocessor, and the data base is capable of even further expansion. Examples of intelligence items which are tracked by the microprocessor are air defense sites, assembly areas, and electronic intelligence sitings. Its large, quick recovery data base and its ability to centralize and focus on a specific area of interest make it extremely valuable to members of the targeting cell. For example, the normal video screen display shows a 200 by 200 kilometer area with all known major terrain features and known or suspected threat locations which have been entered into the computer. By simply depressing a button, the operator can focus on and display an enlarged video display of a 20-kilometer or 10-kilometer area. The enlarging process assists the assistant fire support coordinator (AFSCOORD) in determining where and how to attack the target. By depressing another button, the operator can display available firing units, weapons status, and the number of missiles or sorties required to meet the commander's guidance for destruction or neutralization of the target. The AFSCOORD can now make the strike decision; or, should he require additional information, he may request additional search from the ASIC. If the display indicates a point target, he may use the Analytical Photogrammetric Positioning System (APPS) to help him refine the target to strike accuracies.

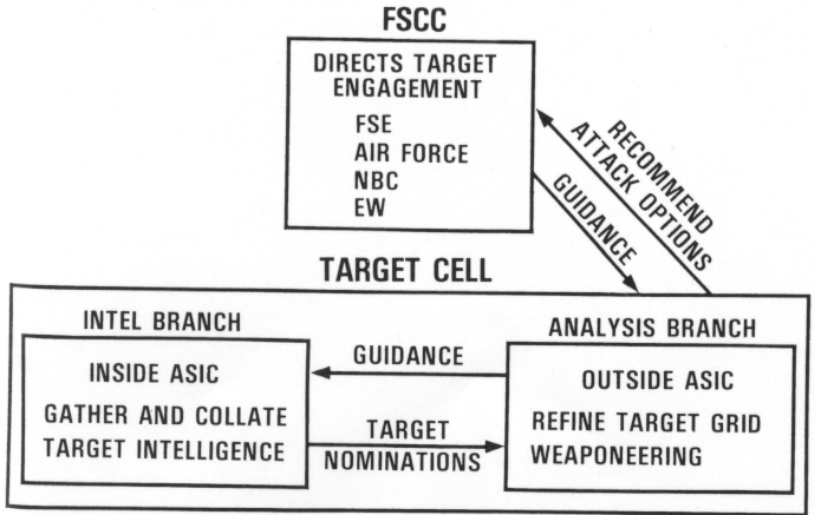
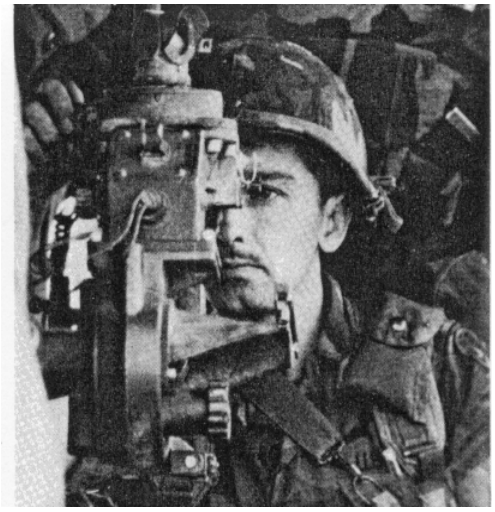
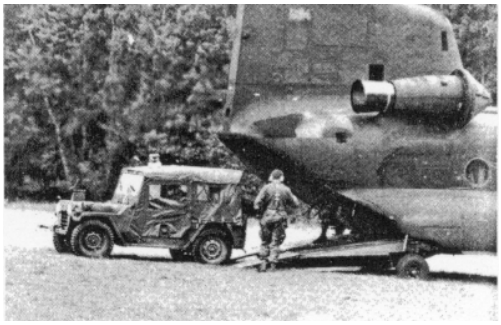


Figure 1. VII Corps targeting system.

APPS

The APPS is a high resolution, stereo vision, electro-optical, computer-assisted device which can perform survey from photographs or maps and can provide such data as the height and width of a dam or bridge (see "APPS: The Unsung Targeting Aid," November-December 1982 *FA Journal*). Like the microprocessor in the intelligence branch, the APPS has a large photographic data base which is filed and indexed for immediate





(Photo by Ruthann Sprague)

reference — the index is also stored in the microprocessor to permit the rapid location of the proper photo pairs. In the VII Corps Artillery, both the APPS and a trained operator are located in the targeting cell on a 24-hour basis.

The targeting process was extremely effective throughout the entire Carbine Fortress field operation. During the exercise, the targeting cell received more than 2,300 intelligence sitings, most of which constituted good, targetable information. Some intelligence reports were not usable because of aged data or insufficient accuracy of target location. Nevertheless, there was no lack of targets to attack; rather, the limiting factor was the number of strike assets available for employment in such a target-rich environment.

All-weather, day-and-night operations

The United States and NATO air forces performed extensively in Carbine Fortress. They were the most viable asset available for deep attacks. Though the detailed description of their tactics should deservedly be left to the "Blue Suiters," it is appropriate to highlight one lesson learned. Battlefield air interdiction is extremely important if there is to be an effective strike on the threat's second echelon forces. Consequently, there must be more improvement in the Air Force's adverse weather, day-and-night attack resources capability. All-weather, day-and-night fire support is necessary for the force fire support coordinator to do his job.

During the field portion of Carbine Fortress, there were two battalions of Lance on the Blue side and one battalion on the threat or Orange side. The Lance was responsive and was able to fill the all-weather gap when air assets were not available. However, three limiting factors concerning the Lance did surface. The first was the limited nonnuclear range, which must be extended for more effective attack of the threat's second echelon forces. The second factor was the need for a more lethal nonnuclear warhead that would be more effective against hard targets. The last, and probably most significant finding, was that the communication system available to the corps to command and control Lance is very austere and marginally capable of mission accomplishment. The VII Corps employs the Pulse Code Modulation Secure Telephone System (multichannel) to communicate with division and brigade users. While this system is extremely capable, there ought to be a sufficient increase in the number of user circuits or "shots" which are available to field artillery brigades and Lance battalions to permit continuous communications, especially when the field artillery brigades are required to move.

In the meantime, the VII Corps Artillery came up with an alternate source for insuring continuous Lance operations. The Lance battalion's organic liaison party and radioteletype equipment helped fill the gap nicely. The liaison officer provided expertise and knowledge about his battalion to the fire support element at corps; and, more importantly, the liaison party's radioteletype communication

provided an alternate and continuous means of communications to the Lance battalion. This backup system requires a liaison team at both the corps tactical operations center and the tactical command post; this is a resource-expensive method of insuring continuous communications and will remain as such until force modernization efforts can reduce the communications gap in other ways.

Some of the Lance success in Carbine Fortress may be attributable to a new concept called "the Lance Brigade," which was executed by the 210th Field Artillery Brigade. The VII Corps Artillery had long pursued various techniques for improving the command, control, and logistics support for the corps commander's hip pocket artillery, the Lance. In that vein, the VII Corps Artillery commanding general directed that the cannon battalions of the 210th Field Artillery Brigade be attached to the division artilleries and field artillery brigades which they were supporting. Upon detachment of the cannon battalions, both field artillery Lance battalions were attached to the 210th Field Artillery Brigade, which then assumed the mission of general support to the corps. Execution of the concept once again highlighted that single significant shortcoming — the need for more flexible and redundant Lance communications. A far-reaching benefit of "the Lance Brigade" is the training value derived by centralizing and focusing one entire field artillery brigade on the peculiar needs of the Lance system. Additionally, it is clear that having only one type of weapons system can make logistics easier to manage. Lastly, the organization may lend itself to the Army's regimental system and unit rotation program. The concept worked and is deserving of further study.

Interoperability with NATO allies

One of the demands of the REFORGER exercise was the requirement for rapid airmobile displacements by Lance batteries. These moves enhanced survivability and also extended the batteries' effective range. Interoperability with NATO allies, combined with the use of new US equipment, made rapid displacement possible. United States CH-47 helicopters were not available during Carbine Fortress, and so the corps artillery had to rely on the new UH-60 Blackhawk helicopters and on German CH-53s. (The UH-60's performance was outstanding and exceeded expectations; and the NATO allies once again demonstrated the quality of their national tactical training as German, Dutch, and Canadian field artillerymen performed their missions quickly, flawlessly, and professionally.)

Nike-Hercules

An old, but seldom used weapon system proved useful to the VII Corps Artillery in attacking the threat's second echelon forces. The Nike-Hercules, used in a surface-to-surface role, was very effective, very responsive, and reasonably mobile; and it filled the gap between the Lance and Pershing systems. The vast range and large explosive warhead organic to the Nike-Hercules system made it a most effective way of quickly and accurately attacking deep into the threat's follow-on forces. Its accuracy is phenomenal, and day and night moves were made without difficulty. Only slight personnel augmentation was required to allow the Nike crews to successfully and expeditiously accomplish their secondary surface-to-surface role as a corps support weapon. Pending the completion of force modernization actions which will provide the field artillery with a corps support weapons system, the Nike-Hercules is a viable alternative for filling the gap between Lance and Pershing.

Conclusion

In reflection, the VII Corps Artillery's experiences during Exercise Carbine Fortress led to the following recommendations:

- The VII Corps Artillery Headquarters and Headquarters Battery with its organic signal platoon is required for adequate command and control of corps artillery firepower assets.
- Lance must have better communications at corps level for command and control, and the Lance system should be improved to provide extended range and a land target-killing capability.
- The corps support weapons system is urgently needed to strike the threat's second echelon forces throughout the corps area of influence. Until this system is fielded, the Nike-Hercules is a viable alternative to fill the gap.
- Finally, "The Lance Brigade" concept is deserving of further study to determine the most effective means for the command, control, and communications of the Lance system.

Those who were skeptical about REFORGER '82 now have changed attitudes; field artillery innovations turned the tide. The soldiers of the VII Corps Artillery are part of the most formidable combat-ready fighting force in the world, and Exercise Carbine Fortress (REFORGER '82) was another opportunity to prove it.

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