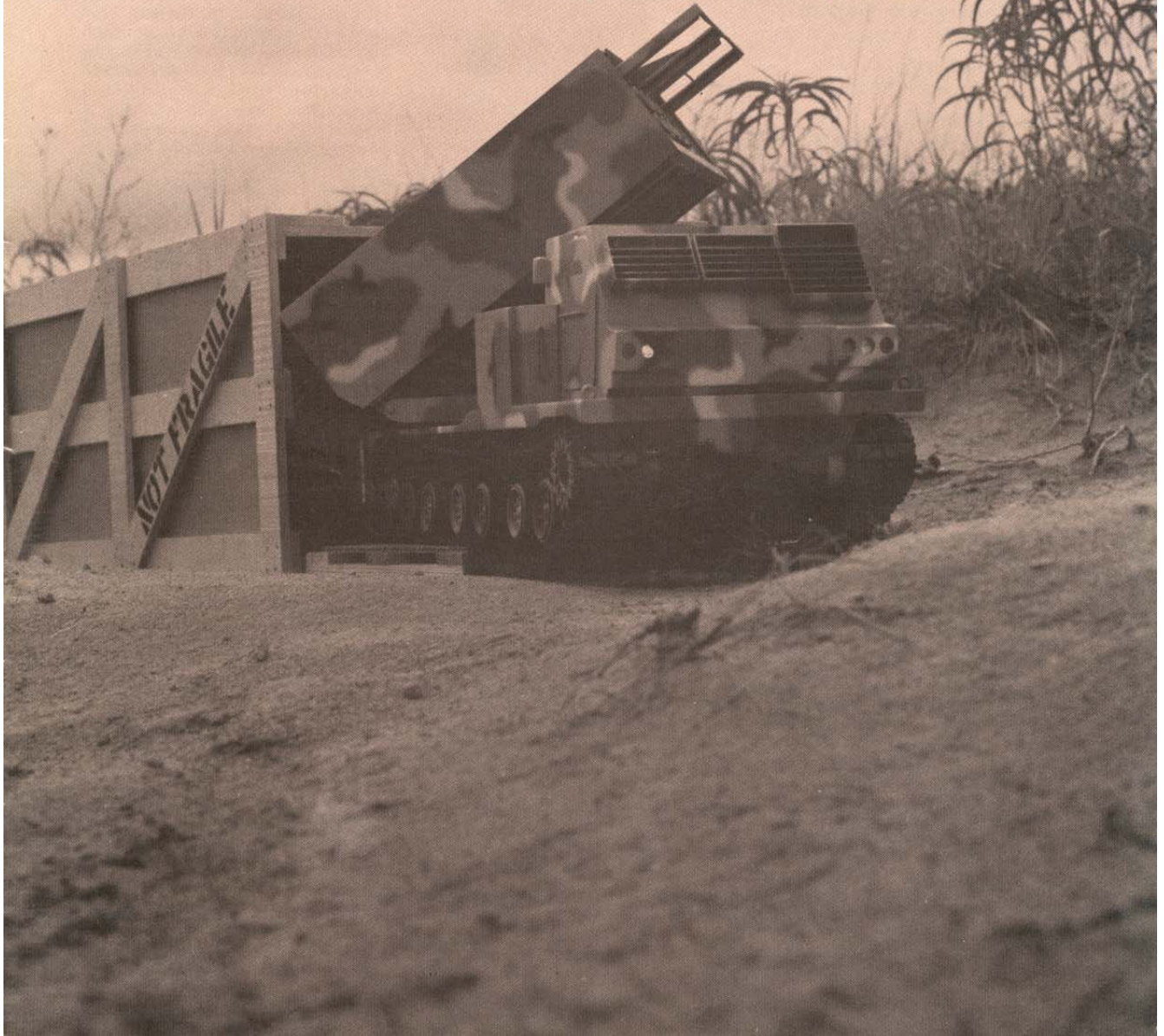


Field Artillery Journal



September-October 1983

SPECIAL DELIVERY



Field Artillery Journal



THE JOURNAL OF FIRE SUPPORT

Volume 51

September-October 1983

Number 5

ARTICLES

11 New Kid on the Block

by First Lieutenant Michael J. Cummings and First Lieutenant Stanley C. Preczewski

18 A Modest Proposal

by Captain James G. Taphorn

25 Trucking with the Duck

by Mr. Charles H. Bogart

32 Drilling with Lance

by Major Robert L. Richardson, Jr.

42 TOC-A-Toy

by Major James M. Johnson

45 Hard Life of Software

by Lieutenant Colonel (Retired) Troy L. Madison

48 The Fog of War

by Lieutenant Colonel Clayton R. Newell

51 Adding Ammo to the Fire

by Major (P) Bloomer D. Sullivan

FEATURES

1 On The Move

2 Incoming

10 Hotline

29 View from the Blockhouse

36 Fragments

38 Right by Piece

41 Commanders Update

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Your special delivery is on the ground and ready to open up. The "New Kid on the Block" is sure to get your attention, and it is not likely to go unnoticed by the enemy either. As we read about how the new kid shook down, we remember that we built this package on lessons from the past. As far back as December 1945, an interrogated German army artillery commander chided the US Field Artillery for inadequate studies on massed, saturating fires, "particularly with a view to using rocket weapons for the purpose." Now the present can one-up the past by wisely integrating its new kid into the family of fire support. The cover story is a step in that direction.

Another type of rocket launcher got its feet wet during World War II, and it is a strange bird to say the least. That story, plus another about a command and control innovation from a battalion in Germany, shows the many faces of trucks when artillerymen get hold of them. This issue also contains a modest proposal which is a must-read for anyone interested in the attack of moving targets. Lance battle drill surfaces as a proven training technique, and munitions materiel management as a tantalizing secondary specialty for any Redleg. There is a verbal roadmap which portrays the long route which automated tactical data system software must take to reach you in the field. And then there is the classic roadmarch to Grafenwoehr — if it did not happen like this to you at least once, then it should have.

Support your *Journal* as readers and as contributors. Offer your thoughts in the market of public opinion and see how well they sell. I answer all the mail; so make the *Journal* more and more your own. Catch the spirit!

Terence M. Freeman

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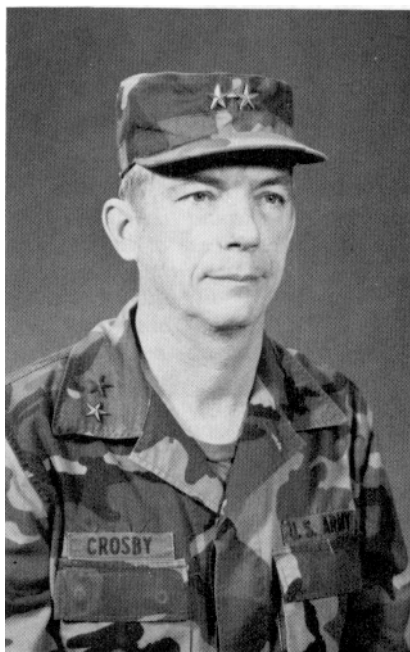
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Field Artillery Journal

On the Move

MG JOHN S. CROSBY



THE BASIC DEEP ATTACK SCENARIO IS A NEW CHALLENGE, BUT WE CAN MEET IT.

It is a fact that maneuver units engaged along the FLOT will receive most of the available fire support. But we still must be prepared to exploit opportunities *beyond* the FLOT. A successful deep attack, for example could influence the fight in the main battle area. But the chance for that kind of payoff carries risks, and that is why I want you to start thinking about this aggressive operation *now*.

There are many issues which fall out of the deep attack scenario. As the Combined Arms Center sees it, a brigade-sized armor and mechanized

infantry task force may strike 50 to 60 kilometers into the enemy's rear. From the onset, there are difficult determinations on allocation and command and control. How much artillery is right for the main battle area, rear area combat operations, and the deep attack? What field artillery headquarters element — the division artillery, a field artillery brigade, or a battalion group — is best to move with the deep attack force? And then there are the demands for detailed fire support and field artillery tactics, techniques, and procedures which are tailored to the deep attack. Given the parameters of FMs 100-5, 6-20, 6-40, 71-1, and 71-2, we need to determine exactly how we will support this operation. Here are some initial thoughts.

Movement to the objective

Field artillery will move with the deep attack force — we have the mobility and the range to support the entire operation. Under the command of a field artillery headquarters element, our task-organized force, to include target acquisition assets, will acquire and attack the immediate threats to the supported maneuver force. Meanwhile, in order to conserve its ammunition, it will make the most of fires from field artillery units remaining behind the FLOT and will target the route of advance with battlefield air interdiction, suppression of enemy air defense, attack helicopter strikes, and offensive electronic warfare.

Communications

Support planning for the deep attack merits special consideration. Maintaining communications will be tougher than usual. Long distances and intervening terrain will

render FM transmissions back to the main battle area ineffective and make high-frequency equipment the mainstay of this traffic. FIST chiefs and FSOs will coordinate communications links to main battle area field artillery units during the passage of lines and out to the limits of their range. Transfer of tactical fire control for mutual support or backup will be a standard requirement for the task force field artillery TACFIRE operators.

Logistics

Logistic operations will be taxing. Apart from the capture of enemy materiel, resupply will come by air or ground convoy; and field artillery support will be needed to protect both. Moreover, resupply haul capability will severely constrain the magnitude of our expenditures of resources such as ammunition. Recovery and repair take on special emphasis the farther the attack force goes beyond the FEBA. By carrying extra tow bars, making expedient field repairs, and cannibalizing irreparably damaged equipment, field artillery commanders can keep their units operational.

The challenge

The basic deep attack scenario is a new challenge, but we can meet it. Imagine the ins and outs of deep attack fire support, focus on exploiting its potential, and advise your maneuver commander accordingly — *before* he completes his plan of attack. Keep the Field Artillery School up-to-date on the results of your field training exercises so that we can better synchronize the deep, close-in, and rear battle requirements of AirLand Battle doctrine.



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.

Flexibility for survivability

The author of "Your Right to Survive" (*FA Journal*, May-June 1983) has not approached this subject in a completely scientific manner. He has analyzed but one method of survival; and, as such, the article demonstrates a biased and too simplistic approach to this important subject.

Let me say at the outset that I agree in essence with the major thrust of the content, especially the author's statement that "unless we get survivability-oriented tactics we will be a non-factor after the first day of the next war." The major fault I find in the article is that it pays little or no attention to the maneuver needs. There will be times when the techniques recommended by the author are not applicable because we need all of our guns in action for extended periods of time to support the scheme of maneuver. Also, the scheme of maneuver may dictate the ground dumping of ammunition for support of operations; and the author's recommended method of operation does not address that problem.

I also have reservations about the author's statement that "we require six hours of accumulated sleep." This is true only for short periods of time. Anyone who has participated in operations for extended periods of time will know that there is a severe degradation of efficiency if men cannot receive rest periods of adequate length and frequency — in my estimation, at least one *unbroken* block of six hours in any 24-hour period.

In regard to the ARTEP, the quantity of ammunition handled by the battalion was totally unrealistic. With each 8-inch projectile weighing at least 200 pounds, a major proportion of available manhours would be used handling ammunition. Ammo rates of fire for an 8-inch battalion are available in a number of studies:

	FM101-10-1	DIV '86	FSMAA	CSSMAA
Light combat	62	115	135	81
Intense combat	177	395	340	366
Midpoint	120	255	238	224

These figures all represent rounds per tube per day. Could it be that the author would have drawn different conclusions on the manpower fatigue level if these quantities had been handled?

In essence, the author is correct to take an aggressive stance on survivability. Lip service is being paid to it in the field. This is, however, a function of command responsibility, not of doctrine. Doctrine developed by the Field Artillery School gives commanders options in survivability techniques ranging from fully dug-in positions to movement. To force any particular commander to adopt one of these techniques would take away his flexibility and severely restrict his ability to command.

The author should be protectionist of the system that allowed him to develop and work a method which suited his unit's needs.

P.I. Rose
MAJ, Royal Artillery
Fort Sill, OK

The Combat Artillery Badge

In late 1943 the Combat Infantry Badge (CIB) was introduced, and the Combat Medic Badge made its appearance shortly thereafter. Ever since, there have been strong feelings among many members of the other combat arms for an equivalent award. There have likewise been strong feelings among many infantrymen to retain the uniqueness of their award. Discussion on the subject has continued over the years, but it probably reached its climax during the Korean War.

In 1950 and 1951 a war of words over a proposed Combat Artillery Badge (CAB) took place in the pages of the *Combat Forces Journal*. The first round in this written battle was fired by First Lieutenant Earl J. Lockhead, 52d Field Artillery, when, in December 1950, he sent the following letter to the editor:

Since the Combat Forces Journal is a combination of the

Infantry and Field Artillery Journals, I would like to use it to present the case of the combination soldier, the forward observer. We live, fight, and some die with the infantry. We are proud of having served with the infantry and would like the Combat Infantryman Badge to show our association with the infantry.

The only requirement that need be changed is the one stating that only infantry are eligible. We spend more time with the infantry than with our battery. We make river crossings with radios on our backs. We come under small arms fire for the combat part. We march for the infantry part. Now all that is lacking is the badge part.

I would like this badge for my driver who was killed by enemy artillery fire while with the infantry.

It is clear that a forward observer who has served with an infantry unit in combat might feel he deserved a CIB just as much as any infantryman. Many infantry commanders have agreed; and, hoping to slip the paperwork through in a group of other recommendations, some have even attempted to submit their forward observer for a CIB. Other infantrymen have strongly objected to the idea of giving forward observers a CIB, feeling that it diluted the meaning of the award.

A few months after Lieutenant Lockhead's letter, the *Combat Forces Journal* ran a letter from Captain John D.H. McDonough, 38th FA, which contained the first actual proposal for a Combat Artillery Badge. Captain McDonough suggested that the establishment of a separate CAB would protect the integrity of the CIB while giving just recognition to deserving artillerymen. Captain McDonough had specific requirements in mind:

Forward observers and members of forward observer sections, artillery liaison officers, and members of liaison sections

(which serve with the infantry battalions only) should be the only persons eligible. The other requirement should be that the individual must serve a minimum of 30 days, not necessarily consecutively, with a rifle company (in the case of FO sections) or with the infantry battalion committed to the line. Of course, some of the FO or liaison sections are casualties before they can complete the 30-day requirement; therefore, this requirement, in that case, should be waived if the individual has seen duty as a member of an FO or a liaison section during at least one engagement with the enemy. The proof of eligibility should be a certificate signed by the battery commander (for the FO sections) or by the artillery battalion commander (for the liaison sections).

Captain McDonough also proposed a design for the new award. Starting with the basic design of the CIB, he suggested changing the color of the bar from blue to red and superimposing the artillery's crossed field pieces over the wreath (figure 1).



Figure 1. CPT McDonough's proposed design.

In a follow-up editorial, the editors of the *Combat Forces Journal* committed themselves to the cause: ". . . we are going to get into this matter right away and thoroughly and come up with a plan and fight for it." The editors then went on to point out that other groups were deserving of combat recognition too: armor crewmen, combat engineers, and anyone forced by tactical circumstances to fight as infantry.

Thus, Captain McDonough's letter sparked a storm of controversy. Artillerymen wrote to support the proposal; infantrymen wrote to deride it; combat engineers wrote demanding just recognition; and Marine Sergeant Edward J. Hertinch wrote to say that he thought the whole idea of special badges was nonsense: "Why anyone needs special badges and special pay for his services I have no idea." Captain A.D. Cowan wrote suggesting that the field artillery follow the lead of the medics and adopt a unique, artillery design with "no infantry touch." Captain Cowan suggested using the basic red bar and wreath, and replacing the musket with a

single field piece (figure 2).

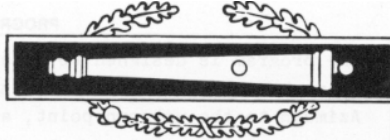


Figure 2. CPT Cowan's proposed design.

The most vehement protest to Captain McDonough's proposal was registered by First Lieutenant Ricardo Cardenas, 7th Infantry. He wrote:

I have just read your article on the so-called Combat Artilleryman Badge.

I don't like it. Don't muscle in on the coveted pride of the infantryman. I wear mine with a star on it. Make one similar to ours; and, as much pride as I have in mine, I will throw it in the first Korean river on my next patrol.

For all who would like so much to have a Combat Infantryman Badge, let me suggest that it doesn't take too much effort to find yourself in a foxhole as an infantryman.

As the controversy raged, some commanders in Korea took the matter into their own hands. Unofficial Combat Artillery Badges were manufactured in Japan and awarded by local commanders. The most common design consisted of a red bar, wreath, and crossed field pieces (figure 3), similar



Figure 3. Japanese-made Combat Artillery Badge awarded by some commanders during the Korean War.

to McDonough's design but without the musket. An embroidered version for the dress blue uniform was also put out by enterprising Japanese manufacturers (figure 4).



Figure 4. Japanese-made Combat Artillery Badge for dress blues.

Following the lead of the artillery, local armor commanders also began awarding unofficial Combat Armor Badges. The Combat Armor Badge consisted of the bar and wreath design with the armor crossed

sabers and a tank superimposed on the wreath. Versions with yellow bars (cavalry) and green bars (armor) were both used.

As the Korean war dragged on, the issue of special combat badges got mixed into the controversy over combat pay. And as the war wound down, the issue slowly disappeared from the pages of the *Combat Forces Journal* without ever being resolved.

During the Vietnam conflict the issue never really resurfaced with quite the same intensity — a particularly strange phenomenon considering the plethora of other unauthorized badges that emerged during the Vietnam War. Armor's quest for recognition was partially satisfied by the Vietnamese Army's Combat Armor Badge, which was awarded to many US tankers. Many forward observers still felt they were unfairly excluded from the CIB, and some infantry commanders still tried to slip their forward observers in for CIBs. But unofficial badges never appeared, and the question was never seriously discussed in the professional publications.

The questions remain. Is there a need for such an award? Should it only be restricted to fire support teams attached to infantry battalions? What about the fire support teams attached to armor and cavalry units? And what about firing battery troops who may become involved in highly lethal artillery duels in the modern counterfire environment? Or is there, as Marine Sergeant Hertinch wrote more than 30 years ago, no need for "extra advertisements?"

David T. Zabecki
CPT, FA (ILARNG)
HHB, 2d Bn, 123d FA
Rock Island, IL

Lance brigade

"REFORGER Reflections" *FA Journal*, May-June 1983) by Major (P) Langston and Major Gaddis prompts these reflections on our part. We agree, for example, that austere communication systems are a real problem in Lance. We also agree that the concept of "the Lance Brigade" has distinct advantages in training and logistics and could have tactical advantages if we can afford the manpower and equipment of an additional brigade headquarters with no other mission. However, if the allegedly inadequate nonnuclear range of Lance — 75 to 80 kilometers — is not adequate to engage second echelon targets, we wonder a bit about the tactical siting of Lance units or the extraordinarily deep location of the second echelon. Since the Lance nonnuclear warhead was not intended

to engage hard targets, we wonder why we need to improve on a dual-purpose improved conventional munition which is totally adequate for the attack of personnel, soft-skinned vehicles, and some hard targets such as truck tires, missile rounds, and radar antennas. We question whether "the Lance Brigade" will do anything for the unit rotation program because sufficient resources do not exist in CONUS to support Lance unit rotation; we fear that personnel assigned to a "Lance Brigade" headquarters will lose close contact with cannon artillery doctrine, training, logistics, and tactics; and we feel that unless a large number of Lance battalions are involved in "the Lance Brigade," it really is not needed since Lance positioning and targeting is furnished by the Corps Field Artillery Section. Finally, we feel obliged to comment that the only new and innovative idea brought up in this article is the use of the computer.

Harold Howard
CPT, FA
Mr. James Murphey
Fort Sill, OK

Performing hasty surveys with the TI-59

An old field artillery axiom on par with "on time, on target" is "always shoot your best data." That adage implies that not only must you compute firing data by the most accurate means available, but you must also locate yourself as accurately as possible in order to best utilize that firing data.

Ideally, a survey party should precede the firing battery into every firing position to provide that all-important accurate location. Realistically, however, that will probably not happen in every case because of the many times a firing battery may be required to move on the battlefield.

We have written a program for the TI-59 to determine the grid coordinates of an unknown point based on the input of a known point easting and northing, an azimuth to the unknown point, and either a measured distance or a measured 2-meter subtended angle. The program will also accommodate continuous subsequent legs. Intermediate grid coordinates are automatically registered; therefore, only input of new data to subsequent points is necessary. Unlike graphic traverse, which requires FDC plotting equipment, the only equipment required for this method is a TI-59 programmable calculator, an aiming circle, and a 2-meter subtense bar. For example, consider the following situations:

PROGRAM DESCRIPTION

The program is designed to determine the grid coordinates of an unknown point based on the input of a known point easting and northing, an Azimuth to the unknown point, and either a measured distance or a measured 2-meter subtense bar angle. The program can be used for continuous subsequent legs. New grid is automatically registered; user must only input new data to subsequent unknown point.

USER INSTRUCTIONS

STEP	PROCEDURE	ENTER	PRESS	DISPLAY
1	Enter Hasty Survey program	Map card	inv2nd write	1
2	Enter known point easting	EEEE	A	EEEE
3	Enter known point northing	NNNN	B	NNNN/0.05625
4	Enter 2-meter bar in mils		C	Distance fm known pt to unknown pt
	OR			
4	Enter measured distance to unknown point	DDD	E	Dist.x0.05625
5	Enter AZ from known point to unknown point	AZAZ	D	Direction in degrees
6	Initiate program		2nd A'	unknown point easting EEEEE
			R/S	unknown point northing NNNNN

Repeat as required for additional legs by input of 4,5,and6. Steps 2 and3 are done by calculator.

USER DEFINED KEYS	DATA REGISTERS (INV)	LABELS (Op 08)
*known pt easting 0	0	INV CLR CLR CLR CLR CLR
known pt northing 1	known pt easting 1	√/ [V] STO RCL SUM [Y]
*measured AZ 2	*known pt northing 2	EE [C] [D] [E] GTO [X]
*measured dist 3	*measured AZ 3	SBR [←] RST [→] R/S [←]
*initiate 4	*measured dist 4	[←] [→] CLR INV [←] [→]
	5	[←] [→] [←] [→] [←] [→]
	6	[←] [→] [←] [→] [←] [→]
	7	[←] [→] [←] [→] [←] [→]
	8	[←] [→] [←] [→] [←] [→]
	9	[←] [→] [←] [→] [←] [→]
FLAGS 0	1	2
	3	4
	5	6
	7	8
	9	

- 1) A battery has received an order to perform an offset registration from a location approximately 500 meters from the battery's firing position (for which you have a surveyed battery center).
- 2) At the location where the advance party has just occupied a new firing position, the battalion survey section has established an orienting station, the end of the orienting line, and a battery center with the position and azimuth determining system (PADS). After examining the terrain, you decide that the ideal location for battery center is approximately 75 meters from the surveyed location.
- 3) Your battery has just occupied the firing position mentioned above. After conducting a reconnaissance of the surrounding area, you choose an alternate

- battery position approximately 600 meters from your primary position.
- 4) You have received a warning order to move your battery to a new location. The order states that battalion survey will not be bringing survey control into your new position; however, a survey control point will be established near a road junction, approximately 400 meters away.
- The problem posed in each of these cases is to accurately determine the grid coordinates of an unknown point. The following hasty survey program for the TI-59 makes the task easier. Instructions are as follows:

- 1) Using the key list in figure 1, enter the hasty survey program. Turn the TI-59 on, press CLR, LRN, and enter each program step. After entering step 65, press LRN and RST. At this point you

PROGRAMMER _____

DATE _____

LOC	CODE	KEY	COMMENTS	LOC	CODE	KEY	COMMENTS	LOC	CODE	KEY	COMMENTS
000	76	LBL		055	44	SUM					
001	11	A		056	01	01					
002	42	STO		057	43	RCL					
003	01	01		058	01	01					
004	91	R/S		059	91	R/S					
005	76	LBL		060	32	x $\frac{1}{\square}$ t					
006	12	R		061	44	SUM					
007	42	STO		062	02	02					
008	02	02		063	43	RCL					
009	66	PAU		064	02	02					
010	93	.		065	91	R/S					
011	00	0									
012	05	5									
013	06	6									
014	02	2									
015	05	5									
016	42	STO									
017	10	10									
018	91	R/S									
019	76	LBL									
020	13	C									
021	55	$\frac{1}{\square}$									
022	02	2									
023	95	=									
024	65	x									
025	43	RCL									
026	10	10									
027	95	=									
028	30	TAN									
029	35	1/x									
030	42	STO									
031	05	05									
032	91	R/S									
033	76	LBL									
034	14	D									
035	65	X									
036	43	RCL									
037	10	10									
038	95	=									
039	42	STO									
040	04	04									
041	91	R/S									
042	76	LBL									
043	15	E									
044	42	STO									
045	05	05									
046	91	R/S									
047	76	LBL									
048	16	A'									
049	43	RCL									
050	05	05									
051	32	x $\frac{1}{\square}$ t									
052	43	RCL									
053	04	04									
054	37	P \rightarrow R									

MERGED CODES								
62	PA	DE	72	STO	DE	83	GT0	DE
63	FR	DE	73	RCL	DE	84	LR	DE
64	FR	DE	74	SUM	DE	92	INV	SBR

TEXAS INSTRUMENTS
1700 DOW STREET DALLAS, TEXAS 75201

should put the program on a magnetic card in the TI-59. A number 1 will be displayed when the card has been programmed. Once this step has been completed, you can program your TI-59 by simply turning the TI-59 on, pressing CLR, INV 2nd write, and inserting the preprogrammed card.

2) Enter the known easting (five digits) into data register 01 by pressing the A key.

3) Enter the known northing (five digits) into data register 02 by pressing the B key.

4) Enter the subtended angle (in mils) into data register 03 by pressing the C key. To determine this angle, set up the aiming circle over the known point and zero the scales. Send a runner to the desired location with a stake and a 2-meter subtense bar. (We use a camouflage pole

section with two strips of luminous tape delineating two meters. It works well at night.) Then simply turn the angle using the standard angle-measuring technique.

5) As an alternative to subtending an angle, a measured distance (in meters) can be entered into data register 05 by pressing the E key. The distance can be measured by taping or pacing; however, pacing should only be used when the terrain is relatively flat. (It must be noted that if you use a subtended angle, data register 05 will be empty and the E key will not be used. Conversely, if you use a measured distance, data register 03 will remain empty and the C key will not be used.)

6) Enter the azimuth (in mils) from the known point to the unknown point into data register 04 by pressing the D key. To

determine the direction, place the aiming circle over the known point and zero the scales. Set off the declination constant with the upper motion. Release the needle and center it using the lower motion. Lock the needle and refer the line of sight to the desired point with the upper motion. Read the azimuth from the azimuth scale and micrometer. For greater accuracy, do this procedure twice. If the azimuths agree within two mils, determine the mean; if not, repeat the entire procedure.

7) You now have all the data necessary to initiate the program. Press 2nd A, and the unknown point easting will be displayed. Press R/S, and the unknown point northing will be displayed.

To compute additional legs, input steps 4, (or 5), 6, and 7; and the calculator accomplishes steps 2 and 3.

We hope this program will assist you in performing hasty surveys and allow you to "always shoot your best data."

Arthur Bartell

Erik Helgesen

Thomas Maguire

CPTs, FA

2-320th FA

101st Airborne Div (Air Assault)

Fort Campbell, KY

Which weapon to use?

I read with great interest the excellent article "Split-Battery Defense" (*FA Journal*, January-February 1983) by Captains Buck and Sweeney, and I would like to add a few other thoughts to their discussion.

I found the news that Division '86 envisions a Dragon as part of each howitzer section encouraging. However, from all that I have learned about the Dragon, it is a demanding weapon that requires constant practice. Additionally, there are two factors which allow the target to evade the missile or disrupt the gunner's aim by firing at the launch site: a slow time of flight, which requires the gunner to track the target to impact; and the design of the tracker and launcher, which fixes the gunner at the point of launch. I envision that at any given time each platoon would have two Dragon gunners at the observation post/listening post, and the other two resting or working on the guns. It might get quite dicey to attack a recon element at less than 1,000 meters (assuming one has a means to accurately range the distance so that one is within engagement range and not out of wire).

If we are going to consider the use of medium-range antitank weapons, the

90-mm recoilless rifle would be a better choice: it is in the system, it takes less training, the range is nearly that of a Dragon, there are several rounds available, and the firer can move immediately after shooting. The rate of fire exceeds that of a Dragon by a considerable margin as well. In a similar vein, I understand that the Army is about to select a single-shot weapon to replace the LAW. My personal opinion is that we have once again demonstrated an uncanny ability to select the less effective, more costly, shorter-range option, while being completely oblivious to other possible weapons that might be adaptable to the mission. I have a candidate, and I have suggested it through channels: it is the hypersonic kinetic energy rocket, a multishot weapon under development by the Vought Corporation.

I do not see recon elements or enemy platoons as the primary danger to field artillery positions; the danger will be from enemy companies. The Soviets probably are not going to line up in textbook formation when the fighting starts. Their commanders will likely throw everything across the forward line of own troops or border the moment it starts. (Second echelon divisions may be in textbook formations to take advantage of the holes that will appear in the NATO lines; but massive firepower and maneuver elements forward would be the best tactic for the Soviets, or else they would invite defeat in detail.)

Finally, I believe that the use of hand-emplaced antipersonnel and anti-armor mines and preplanned final protective fires with FASCAM munitions from other artillery units must be considered by field artillery S3s. When was the last time any unit practiced emplacing mines, rather than telling the evaluators "we put the mines on the trail"?

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Find and attack

I would like to comment on Major James Taylor's article entitled "Find and Attack" (*FA Journal*, May-June 1983). Throughout the article, Major Taylor uses the terms "high value targets" and "high payoff targets" interchangeably. The key nuance involved in understanding the difference between these terms is missing. High value targets are viewed from the opposing force commander's perspective and are those elements of his operation which are critical to his success. High payoff targets are viewed from the friendly force perspective — those targets which when destroyed will

have a significant impact on the battle. High value targets *may* be high payoff targets but not necessarily so, and these terms should not be mixed.

Major Taylor does not get into micro-targeting decisions. The Allocation and Distribution of Fires Study recently completed for USAFAS by Vector Research, Inc., points out that there are really two categories of high payoff targets — immediate and deferred. Immediate payoff means the effect of attack will be realized in the immediate battle; deferred attack will result in the effect being felt later on in a subsequent battle. In addition to the complexities of targeting described by Major Taylor, this immediate versus deferred effects decision is a process which must take place. His point that the targeting process is complex and little understood is valid. The argument could be strengthened by pointing out this additional layer of detail within the decision matrix.

I concur with Major Taylor that in future conflicts the most important tasks for the field artillery will be fire support coordination and targeting. However, his conclusion that personnel selected to accomplish these tasks should be the very best available bears close scrutiny. As we increasingly automate all aspects of fire support and fire support coordination, the requirements for the "very best" people are rising at an exponential rate. All aspects of the mission are important. The decision as to where we place our very best people will likely not be made until we get a good feel for the environment in which we will operate with the advanced field artillery tactical data system (AFATDS).

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Powder temperature gage

Some have asked why the powder temperature gage, sometimes called the thermometer self-in or prop temp gage, NSN 6685-00-344-4063, is not listed as either a basic issue item list (BIIL) or an additional authorization list (AAL) component.

First of all, page 2-5 of AR 700-18 defines the BIIL as ". . . a list containing separately stock numbered ancillary items . . . which are essential to the installation and operation of the system or end item and will enable it to perform the function for which it was designed." Clearly, the powder temperature gage is not vital to a howitzer's function — a fact that is affirmed in FM 6-50 (page 14-6, paragraph 14-12b), which states: "At least two howitzer sections should be designated to

keep track of the powder temperature."

Another frequently asked question has been why the quantity of two thermometers was accepted. The Field Artillery School evidently feels that sufficient accuracy and reliability can be achieved by using the average propellant temperature readings of two thermometers. Further, if the powder temperature gage was made a basic issue item, all weapons would have to have one — a potentially expensive purchase. The February 1983 Army Master Data File (AMDF) lists the cost of the gage as \$73.49. In these times of monetary constraints, such a costly purchase ought not to be merely stored and not used. Most commanders hesitate to commit their operation and maintenance funds for nice-to-have items; the US Army Armament Materiel Readiness Command (USAAMRC) concurs and has mandated that these items be maintained at the discretion of the commander.

Why, then, is the powder temperature gage not included in the additional authorization list found in the -10 technical manual for the weapon? For an item to be included in the AAL, it must meet the criteria set forth on the first page of the appendix that lists the AAL:

- The item must be authorized, and the authorization must come from either a common table of allowances (CTA), modified tables of organization and equipment, tables of distribution and allowances, or joint tables of allowances.
- The item must not be one which must be turned in with the vehicle.

Does the powder temperature gage qualify under these criteria? The USAAMRC has authorized the battery commander to determine the number of gages needed in his battery, and CTA 50-970 authorizes one gage per gun; hence, the first requirement is fulfilled. The Army Master Data File lists the thermometer as a Class IX expendable item, which means it does not have to be turned in with the end item; hence, the second requirement is fulfilled.

If these reasons are not enough for putting the gage in the AAL, I would add one other comment. The Division '86 J-series tables of organization and equipment have been published and will become effective in November 1983. Units will then slowly evolve into the 3x8 concept with two fire direction centers and will require a minimum of four thermometers in accordance with FM 6-50. With the fielding of the division support weapon system (DSWS), each powder charge will be sensed; and the temperature will be fed

Field Artillery Journal

into the battery computer system. The DSWS will have the ability to act as an independent firing system, much like the Multiple Launch Rocket System does today. If the electronic system breaks down, a manual feed of propellant temperature will be necessary.

So, what am I leading to? The answer is simply a matter of economics. Since the thermometer does not qualify as a BIIL component but does qualify as an AAL component, it should be made a hand-receipt item and should be bought soon because the prices keep going up. For example, four years ago the cost of the thermometer was \$43.00; today the cost exceeds \$73.00, which represents an increase of 59 percent. In four more years, the same thermometer will probably cost \$120.00. Supply economy therefore dictates that action be taken to purchase the thermometers as soon as possible and establish accountability for them in firing units.

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FIST: reward or punishment

Consider this typical scenario. Cadet Jones is in his senior year of college — graduation and his ROTC commission are near — and he has been informed that it is time to make his branch selection. After some deep soul-searching, he has decided to become a field artilleryman and informs his professor of military science or tactical officer of his choice. His choice is met with enthusiasm, and he is assured that he will make an excellent Redleg. Unfortunately, the conversation does not end at this point. Cadet Jones is reminded, half jokingly and half sincerely, that his first assignment will in all probability be that of a fire support team (FIST) chief for the first 12 to 18 months. If he does his job well and proves his leadership abilities, he will then be considered for a battery fire direction officer (FDO) or executive officer (XO) position. So Second Lieutenant Jones heads for the basic course en route to his first assignment with the perception that he must first *pay his dues* as a FIST chief and then he will be afforded the opportunity to *move up* to a *better* position. His perception is reinforced by his peers while he is attending the Field Artillery Officer Basic Course; and, although the Field Artillery School is aware of this problem and has taken some very positive steps during the past year to remove it, Cadet Jones' perception becomes

fact after his initial interview with the battalion commander of his first unit.

The fact is that junior officers have leadership positions in all three aspects of the gunnery team (FIST chiefs or fire support officers, fire direction officers, and executive officers), and the position of FIST chief or fire support officer is certainly of no less importance than the other two. However, when asked which of those jobs he would prefer to have, a junior officer is least likely to answer FIST chief. The questions which must be answered are "Why is the job of a FIST chief perceived as undesirable, and what can be done to change this attitude?"

The perception that assignment as a FIST chief is undesirable or is merely a stepping stone appears to have perpetuated itself over the years. For future officers it begins with their summer training, continues through their counselling sessions with officers and noncommissioned officers, and culminates in their initial interview with the battalion commander of their first assigned unit.

If a unit has a shortage of officers, chances are that this shortage will be in the ranks of the FIST chiefs, while the positions of FDO and XO remain filled. An often repeated theme is that the fire support sergeant can do the FIST chief's job; while it is true that a good fire support sergeant should be able to perform most of the fire support coordinator/observer duties, that is only a part of what is expected of a FIST chief. A FIST chief provides the officer-to-officer link with the maneuver company commander and establishes the bond of confidence that is so vital in insuring that the maneuver commander never plans or executes an operation without considering and using all of the fire support means available.

Because of their lack of experience, the abilities of the fire support sergeant are often stretched to the limit. The relatively new creation of the 13F MOS has made for a small supply of experienced NCOs in this area. Consequently, even though the fire support sergeant is an E6 position, that job is often filled by a young E5. The inability of these NCOs to effectively coordinate the fires of 81-mm and 4.2-inch mortars, direct support artillery, naval gunfire, and close air support necessitates the presence of the FIST chief. The training given by a FIST chief in this area can aid the entire FIST section, and the increasingly technical nature of field artillery systems makes the job of FIST chief that much more important in the future.

To the young field artillery officer, the basic field artillery skills learned as a FIST

chief can be vital to his development. He is also in a position to learn the capabilities, limitations, and missions of the maneuver force. Maneuver and fire support are interdependent concepts. The mission of the field artillery is to support the ground forces, and no field artillery officer has a better chance to know what the maneuver force is doing than the FIST chief.

No field artilleryman has a better opportunity to develop basic leadership skills than does the FIST chief. It is one thing to march order and move a fire direction center or a firing battery and ride to the next position, but it is quite a different thing to motivate leg-weary, wet, and hungry observers to get up and carry their equipment over that next hill. The FIST chief alone is responsible for his soldiers, their equipment, and their accomplishment of the FIST mission. If he can master these responsibilities early, any job later on will seem that much easier.

The job of FIST chief is not only a necessary one, but is also one that affords the junior officer the opportunity to build a foundation of field artillery and leadership skills and to gain an appreciation of the mission to support the maneuver force. These advantages, however, must be stressed before and after the new officer arrives at his first unit. It is every field artilleryman's duty to present the true duties and advantages of a FIST chief in comparison to other jobs a junior officer might expect or desire to receive. Battalion commanders should consider assigning more experienced lieutenants to FIST chief positions and leaving the positions of FDO or XO vacant when officer fill is a problem. The field artillery mission is to support the maneuver forces, and they deserve the very best. Only through instilling early positive attitudes about being a FIST chief can the Field Artillery make the job, not only in perception but in reality, a desirable and prestigious assignment for junior officers.

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Schofield Barracks, HI

Reunion

102d Field Artillery (Massachusetts Army National Guard) — 26 October 1983 at the Camp Curtis Guild Armory in Reading, Massachusetts. All units from 1915 to present are welcome. Contact Major General J.M. Ambrose, National Guard Armory, 38 S. Common Street, Lynn, MA 01902.



DEPARTMENT OF THE ARMY
OFFICE OF THE INSPECTOR GENERAL
WASHINGTON, D.C. 20310

REPLY TO
ATTENTION OF:

19 August 1983

Editor
Field Artillery Journal
P.O. Box 33131
Fort Sill, OK 73503

Dear Editor:

I was chagrined to read Major Michael J. Speltz's article, Qualifying the Qualification, appearing in your July-August 1983 issue of the Journal. I was particularly chagrined and disturbed because after five years of intensive effort to educate the field and the Army leadership as to what the Nuclear Weapons Technical Inspection (NWTI) System is all about, his article indicates that he and his leaders appear to have learned so little about the system. Is anyone teaching young officers out there?

I do not blame Major Speltz for his misunderstanding of the system. There is no doubt in my mind that his perceptions are also shared by others in many units. Our inspection teams have found some and reported the same to me beginning in the summer of 1982. I do blame his leaders and I think it a sad commentary that our leadership does not seem to be able to articulate and execute an NWTI system that is relatively simple and straight forward.

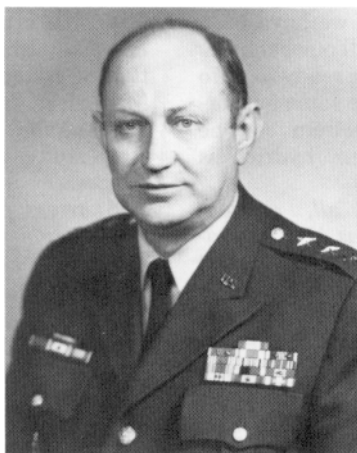
Let me discuss the problems I have in particular with the article: My first and foremost concern is everyone involved must realize that the NWTI system is required by Department of Defense Directives. It is not a Department of the Army program nor a Department of the Army Inspector General program. Neither the Army nor any other service, for that matter, has the authority to change the Department of Defense basic inspection requirements. Second, the sensitivity of nuclear weapons requires an independent assessment of the proficiency of our nuclear units. The responsibility for this independent assessment has been assigned to The Inspector General by the Chief of Staff. Would the author prefer some non-military civilian organization in or out of the Department of Defense to replace The Inspector General in this militarily highly technical inspection role? Although the Army has included commanders in the role of evaluators on the ARTEP for non-custodial units, there has never been any indication from Department of Defense, or any other organization with a responsibility in the matter, that they are willing to accept the sole assessment of any Commander as to the nuclear proficiency of his own unit. Third, it is obvious that the author, as well as many others, does not, repeat not, understand that the NWTI as required by Department of Defense is a standardization inspection. It is not, nor was it ever, intended to be an operational test or inspection. Department of Defense has set forth standardized inspection

criteria the sole purpose of which is to indicate the knowledge and proficiency of a unit to accomplish those tasks necessary to safely handle, secure and maintain nuclear weapons. Operational requirements are checked or evaluated through other vehicles such as the ARTEP or tactical evaluations. As a matter of record, a study done by the Office of the Assistant Chief of Staff for Force Development as long ago as 1966 determined the NWTI was not compatible with an ORTT.

The most distressing part of the article, however, concerns the "zero-defects" or the "close out" syndrome. It is apparent the emphasis on "close out" is alive and thriving in some organizations. This attitude prevails despite numerous briefings provided to general officers assuming command positions as well as the briefings provided by The Inspector General to every precommand course at Leavenworth. The major problem with the "zero-defects" or "close-out" attitude is that it causes units to waste time, money and other resources that have no relevance in the standardization requirements to ensure safe, reliable and secure rounds. Secondly, it causes units to train solely to "pass" (whatever that may mean) an inspection and not how they will fight in combat. Thirdly, there are indications that "close outs" have nothing to do with proficiency, but are a club used by commanders as a negative lever of leadership. Inspection experience has shown that those units who train professionally have no difficulty in successfully demonstrating the requirements of any NWTI.

The current NWTI System was derived from a detailed and exhaustive functional inspection of the Nuclear Program throughout the Army in 1978. The inspection system has been modified to insure the maximum training possible. The inspection requirements still remain within the standardization guidelines of the Department of Defense directives. This is our current system. Confident, practical, seasoned and mature commanders at all levels have stated repeatedly that it works well. We don't need a new approach - what we need is professional understanding of our current system.

If all commanders and those in positions of responsibility involved in nuclear matters who are still living in the past, however, gloriously masochistic it was, would expend an equal amount of study and effort to understand the present qualifying system, then maybe, perhaps just maybe, we might all concentrate on teaching proper training requirements that will lead us to true professional competence. In so doing, we will then be able to join the vast majority who no longer produce opera, but are well qualified to consider themselves Field Artillerymen.



Richard G. Trefry

RICHARD G. TREFRY
Lieutenant General, USA
The Inspector General

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 get the officer certification book?

Answer: The officer certification book you refer to is actually called the military qualification skill (MQS) II manual, which contains lieutenant's training.

The evaluation phase in the staffing of this manual will be conducted through November 1983. The Chief of Staff of the Army will then receive a briefing on the MQS II program in the second quarter of FY84, and his decision on the program is expected shortly thereafter. Printing and field distribution of these manuals will occur if the Chief of Staff's decision is favorable.

Question: What is the Field Artillery School's position on changing radio frequencies?

Answer: The Field Artillery School maintains that scheduled frequency changes are required to enhance communication security. These frequency changes should be planned around a prearranged time. The time schedule should be addressed in the operations order common to both maneuver and fire support elements. The actual change of frequencies is under the control of the net control station. At a convenient time, the net control station directs all stations to execute the frequency change. If an element not in the field artillery communication net needs field artillery fires and cannot contact artillery units on the appropriate frequency, the unit should attempt to contact the artillery unit on the old frequency.

Question: What is the latest Research and Analysis Division Information Note published by the Gunnery Department? The note I have is dated January 1982.

Answer: The Research and Analysis Division Information Note 1, dated January 1982, is the most current note. A new note will appear later this year.

Question: I have a question on the "Hotline" entry in the May-June 1983 FA Journal which addressed whether or not to relay the battery for an out-of-traverse mission. I am also in an M110A2 firing battery and cannot understand the question. It seems to me that if the battery howitzers are out of traverse limits (533 mils right and left of center of traverse), it would be absolutely necessary to relay the battery. The answer you gave was also not clear. If I cannot obtain a proper sight picture on the aiming point, then I cannot traverse the tube and again I would have to relay the battery. The only possibility I can come up with that would apply to the original question and answer would have to do with range firing where safety limit data is encountered. I would appreciate it if you could expand upon the original question and answer.

Answer: Many field artillerymen erroneously believe that it is necessary to relay a howitzer any time it comes off the spades. However, there is essentially no difference between coming off the spades and having displacement due to the shock of firing or due to traverse. It is true that in both of these instances the panel has moved from its original location and that this displacement must be compensated for. But as long as the panel is still within a reasonable distance of its original location (two meters or less), then it should be possible to establish a proper sight picture on the aiming post which compensates for the displacement. It probably will not be possible to see the collimator, but the distant aiming point and the aiming posts should still be visible.

Question: The local fire marshal says that calcium hydride, which is used to fill meteorological balloons, is dangerous and should not be used if at all possible. Therefore, we have been using helium tanks to fill our balloons. Right now we are getting ready to go to annual training. Is there some authority which says that helium can be ordered because calcium hydride is dangerous?

Answer: First of all, calcium hydride is not dangerous if used properly; but states normally do not permit its use due to restrictions by the Environmental Protection Agency. Commercial helium is much cheaper than calcium hydride, and active Army meteorological sections use CTA 50-970 as the authorization to order it.

Question: What is the sustained rate of fire for the M110A2 howitzer?

Answer: The sustained rate of fire, as shown on page 2-126 of TM 9-2350-304-10, is one round every two minutes.

Question: Is there an approved method to fire illumination projectiles at high angle? Granted that this is not a method that one would wish to use very often; but, under certain circumstances, it may be the only way illumination may be fired, especially in training situations where the impact area is small and one must take into account the range to impact of the illumination round. Most of the uses and principles of high angle fire for high explosive rounds also apply to firing high angle illumination. Also, since mortars fire illumination at high angle due to the nature of the weapon, there should be no reason why illumination cannot be fired high angle from a howitzer.

Answer: Change 10 to FT 105-AS-2 (dated 31 March 1981) provides the answer to this question — it does in fact contain high angle data for the M314A3 (M314A2E1) illuminating cartridge.

Question: Will the M198 155-mm towed howitzer replace the 105-mm howitzer in airborne and air assault divisions?

Answer: The M198 will replace all the M114A1 155-mm towed howitzers and the 105-mm howitzers in the light infantry divisions. The airborne and air assault divisions will retain the 105-mm howitzers. These two divisions are classified as special divisions, not as light infantry divisions.

Question: I am required to produce a staff study for graduation from the Infantry Officer Advanced Course and would like to address the training requirements necessary for the M47 Dragon medium antitank weapon in the Heavy Division '86 firing battery. Is there any information available on the integration of this weapon system into field artillery units? Have there been any considerations for the addition of Dragon tasks in the Soldier's Manuals? Your response will aid me in determining whether or not such a staff study would serve any useful purpose.

Answer: At the present time, the Field Artillery School has developed no M47 Dragon tasks for inclusion in the Soldier's Manuals. There is, however, a plan to integrate the Dragon into field artillery firing batteries on a basis of one per howitzer section. When this plan is adopted, there will be a need for Dragon tasks in the Soldier's Manuals; and your staff study could be very useful.

NEW KID ON THE BLOCK

by First Lieutenant Michael J. Cummings and First Lieutenant Stanley C. Preczewski

HE'S HEALTHY,
STRONG, LEAN,
FAST, AND, NOT
LEAST OF ALL,
GOOD LOOKING



Photo by Vought Corp

Field artillerymen have in all likelihood heard about the new kid on the Field Artillery block. For starters, he's healthy (123 men per battery); strong (nine launchers, each with the one-volley destructive force of three volleys of an 8-inch battalion); lean; fast; and, not least of all, good looking. Most of his equipment is brand new, straight off the design table. He's almost completely self-sufficient, with the organic assets necessary to operate independently for days.

The new kid's name is Multiple Launch Rocket System (MLRS). It has been decades since such a radical new weapons system dropped into the Field Artillery Community. Its accelerated development phase, completed in half the time (five years) it normally takes Army weapons systems to reach initial operational capability, culminated early this year with the movement of the eight-month-old MLRS pilot battery from Fort Sill to Fort Riley. Today the men of C Battery (MLRS), 3d Battalion, 6th Field Artillery, 1st Infantry Division (Mechanized), are ready to go to war with the vehicles and equipment comprising the Army's first MLRS firing battery.

American field artillerymen need to learn quickly about this new force which they will soon be seeing in *their* division artilleries. What goes on during a fire mission? What responsibilities do key personnel have? How exactly does a battery work? The following narrative is an in-depth introduction to the new kid and his field operations. (Table 1 will aid in deciphering some of the new acronyms.)

Shooting rockets at enemy targets successfully means first getting a firing platoon into a safe position area. Let's begin

the story by introducing the platoon leader as he pulls up in his jeep to commence his recon

"Hey lieutenant, where do you want survey control put in?" asks the position and azimuth determining system (PADS) E5 section chief. Squinting into the sunrise, the platoon leader eyes the two-grid-square area assigned him for occupation. In his mind he begins selecting six launch areas, two for each of the three self-propelled launcher loaders (SPLLs); a platoon headquarters area; an ammunition vehicle holding area (AHA); and ammunition reload points (RPs). Picturing this layout, he directs that platoon area survey points (PASPs) be placed on trails between RPs and launch areas to insure easy identification and accessibility. The PASP is extremely important to the SPLL. The PASP's grid information and its subsequent insertion into the SPLL's computerized fire control system (FCS) best equates to the laying of a howitzer. Without survey information, the SPLL will not fire. On board each SPLL is a stabilization reference package/position determining system (SRP/PDS) which contains north-seeking gyros similar to those in PADS. Each SPLL's SRP/PDS, once initialized and calibrated with the survey data from a PASP, will provide the FCS accurate grid location, altitude, and azimuth during its firing data computation and will also account for SPLL track wear, track tension, and track slippage on various terrain.

As the PADS section puts in a second PASP, SPLL 11 (1st SPLL, 1st Platoon) is arriving. The lieutenant greets the E6 section chief. "Sergeant, I want you to use those two areas near that tree line as your launch

Table 1. MLRS alphabet soup.

BCU — battery computer unit: The BCU is the fire direction computer and is the heart of the battery's FDC. It communicates digitally in a secure mode and in a variety of message formats. Communications are accomplished with TACFIRE, other BCUs, platoon leader's digital message device (PLDMD), and the SPLL's FCS. During a fire mission cycle, it selects a firing unit, sends it a call for fire (CFF), automatically updates its ammo status, and keeps battalion informed of all this as it is happening.

FCS — fire control system: Housed in the SPLL, the FCS coordinates and controls all electronic assemblies used during the launch cycle. Many elements compose the FCS, including the SRP/PDS and the fire control panel used by the gunner.

FDS — fire direction system: The FDC communications and computer network is comprised of a BCU, an AN/UGC-74A printer, a power distribution unit, secure devices (three VINSONs and a KG-31), and four AN/VRC-46 radios, all housed in an M577 command post vehicle.

HEMTT (pronounced HEE-MET) — heavy expanded-mobility tactical truck: This 10-ton, 8-wheel drive ammunition truck introduced to the Army as part of the MLRS package can haul four LP/Cs at once and an additional four when the heavy expanded-mobility ammunition trailer (HEMAT) is added. A crane with a lifting capacity of 5,400 pounds is attached to the rear of the HEMTT for use in loading and off-loading LP/Cs from the truck and trailer.

HOT/COOL/COLD: These are the three possible SPLL firing statuses. The crew of a *HOT* SPLL is ready to react instantly to a fire mission; i.e., the camouflage net is stored, the FCS is fully operational, and the crew is sitting in the vehicle cab. A *COOL* SPLL is a bit less prepared, and the FCS is in the "Silent Watch" mode, just eight minutes from a *HOT* status. A *COLD* SPLL is out of action for maintenance or operational reasons.

LLM — launcher loader module: The LLM is a box-like steel structure attached to the rear of the SPLL carrier which aligns, holds, and protects the two LP/Cs. It has two built-in booms which facilitate rapid loading and unloading of the rocket pods. The LLM also houses most of the SPLL's electronic components.

LP/C — launch pod/container: The LP/C is a 14-foot long, 3 1/2-foot wide, metal frame box which houses six MLRS rockets in their individually sealed launch tubes. The rockets remain factory-sealed until firing, an event initiated by the LP/C's electrical ignition system. Live LP/Cs weigh a little more than 5,000 pounds; the identically shaped LP/C trainers weigh 3,200 pounds.

SPLL (pronounced "Spill") — self-propelled launcher/loader: The SPLL is the basic firing unit of an MLRS battery and utilizes the same chassis as that used on the Bradley Infantry Fighting Vehicle. It weighs 27 tons, accelerates to 40 miles per hour, is fully tracked, and can fire all of its 12 rockets in less than 60 seconds.

areas," he shouts over the clamor of the SPLL's engine. The chief is also briefed on PASP, RP, and platoon headquarters locations. Quickly, SPLL 11 pulls over to one of the PAsPs and begins the sequence that will allow it to assume a *HOT*, or mission ready, firing status.

The chief eyes his new launch areas through his binoculars as the SRP/PDS processes the survey data. He locates several possible SPLL hide areas to use while awaiting fire missions from the battery. The green SRP light flashes to indicate a "go" status, and the SPLL leaps forward to its first launch area. The chief guides the E4 driver as he backs the SPLL into a suitable hide area just 150 meters from the firing point. Meanwhile, the E5 gunner performs rocket diagnostic tests and prepares to send a location and status (LOST) message digitally to the battery fire direction center (FDC). This LOST message informs the FDC of the carrier and the FCS status, the SPLL's grid location, and the number of rockets ready to fire. He is now *HOT*.

In the M577, which houses the fire direction half of the battery's operations center, an E4 fire direction specialist turns off the incoming-message alarm on his battery computer unit (BCU) and shows SPLL 11's LOST message on his computer's display; he then enters it into the BCU memory. "One-one is HOT with twelve in op-area Bravo," he yells to his section chief above the ever-present racket of the track's four radios, line printer, computer alarms, and generator. His E6 section chief is now aware that SPLL 11 is ready to accept a fire mission in the 1st Platoon's new position area with two full launch pod/containers (LP/C) on board. The chief writes this information in grease pencil on the acetated ammunition and SPLL status board. The status board, which shows the ammunition data and firing status for each of the battery's nine SPLLs, is the focus of the battery operations officer's attention. Perched on the track's ramp, the lieutenant notes that the 2d Platoon has only five LP/Cs (30 rockets) left to fire. He pivots and faces into the canvas track extension — the bustling nerve center of battery operations and logistics control. The battery commander uses the remoted battalion command/fire radio to tell the S3 about the battery headquarters' next move. The first sergeant uses the 8- by 5-foot situation map to show three privates from the supply section the best route to use for their morning chow runs to the firing platoons. Sitting at a field desk in the rear of the extension, the E7 ammunition platoon sergeant is speaking to a heavy expanded-mobility tactical truck (HEMTT) driver who has just returned from the corps ammunition supply point (ASP).

"Sergeant, we need some ammo at 2d Platoon as soon as possible!"

"Check!" says the platoon sergeant as he activates the SB-22 switchboard on the field desk and rings the ammunition platoon headquarters tent 200 meters away. There, an assistant ammo chief takes the call and swiftly sends two privates to their vehicle with instructions to break camouflage. In 20 minutes, the



Photo by Vought Corp

privates will be on their way to the 2d Platoon with eight LP/Cs.

SPLL 11 still draws attention inside the FDC. The battery display operator requests the launcher's next firing point data from the BCU in front of him. A LOST message addressed to SPLL 11 appears on the BCU display with the appropriate firing point grid filled in. (The SPLL's computer needs this information from the BCU to orient itself during its next fire mission.) After checking the message for accuracy, the fire direction specialist punches the computer's transmit key. A piercing, four-second burst of outgoing digital traffic screeches across the battery fire direction radio; a split-second later the digital acknowledgement comes back from SPLL 11 as it accepts the LOST message.

With SPLL 11 ready and waiting for a mission, the FDC chief turns his attention to the other messages in the BCU's input queue. The first one displayed is a free text (nonformatted) request from 3d Platoon headquarters for a verification of its ammo status. The status board supplies the first direction specialist with the numbers needed, and he types them at the end of the 3d Platoon's request. Re-addressed back to its sender, the free text message keys up the battery digital radio; and the 3d Platoon has its answer. "What's next?" queries the chief. A tap on the received-message key brings up a formatted meteorological (met) message received from battalion. "What a pain in the . . ." mutters the operator, knowing what is to follow. Executing the battalion's met message automatically re-addresses it to each of the other 12 subscribers (nine SPLLs and three platoon headquarters) in the digital net. Transmitting the messages ties up the net for the next three minutes.

The first sergeant, meanwhile, has finished briefing the supply drivers and, with one final verification of

the three platoon breakfast headcounts, sends them on their way. It is 0645, 15 minutes before shift change in the operations center. The FDC chief, who has been up since 2300, exits the track, wakes his other two section members, and then goes to sleep himself. Inside the extension, the operations officer updates the trace of the forward edge of the battle area (FEBA) on the situation map. The two 15Js remaining in the M577 keep radio traffic flowing. As the operations officer is talking to the commander about the S3's movement guidance, the fire mission light illuminates on the BCU panel.

"Fire mission, sir!" hollers the fire direction specialist. The display operator executes the request for additional fire (RFAF) message from the battalion FDC and waits while his computer considers range to target, fire coordination measures, downrange masks, and ammo status and location for each of the battery's available SPLLS. In three seconds a call for fire (CFF) message appears on the blank screen. "SPLL 11 has got the mission!" The lieutenant, now in the track, insures that the target is safe by checking its grid on the fire capabilities map. In addition to the target grid, the CFF message also indicates the number of rockets to fire, the time between rockets, the number of aimpoints in the target area, the number of rounds to be fired at each aimpoint, and the reload grid to which SPLL 11 is to proceed after the mission is fired. "Send it," the operations officer says. Less than 30 seconds after its receipt at FDC, the fire mission is at the launcher.

In SPLL 11's hide area, a loud alarm pierces the silence; and the fire control panel (FCP) illuminates the gunner's face with "Call for fire." The E5 gunner depresses a key, and automatically a digital acknowledgement of compliance is sent to the FDC.

"Hit it!" shouts the chief, and the driver of SPLL 11 slams the accelerator. The fan tower screams as 28 tons of steel lurch forward. Simultaneously, the section chief pops up through the commander's hatch and guides the driver to a suitable firing position. As the SPLL halts, the chief quickly eyes the surrounding area to insure that no personnel are within 350 meters of the SPLL and its awesome backblast. This action completed, he locks his hatch and directs that all steel window louvers be closed to protect the crew from flying debris and heat. Next, the driver over-pressurizes the cab to insure that no deadly rocket exhaust gases enter. He also hand pumps the suspension lockout to provide a stable firing platform. Skipping any of these steps endangers the lives of the crew and adversely affects the accuracy of the rocket.

The gunner, his eyes still glued to the fire control panel, orders the driver to pivot steer the SPLL to azimuth heading 5142 mils. (A constant comparison of actual and desired headings, provided by the SRP/PDS, is displayed on the screen.)

"Ten mils, five mils, one mil, STOP!" shouts the gunner to the driver. A key is depressed, and the fire control system begins calculating firing data for target AB0100. In less than 30 seconds, the gunner presses "Launcher Lay";

and the FCS provides the firing azimuth, elevation, and fuze settings for the target. In its computations, the FCS accounts for the latest met data, the SPLL's position from the SRP/PDS, and the pitch and roll of the SPLL. Surrounding crests have previously been entered into the FCS memory by the gunner. Quickly, the driver revs up the huge diesel engine to provide the 300 amps needed to swing the launcher loader module's (LLM's) rockets onto the firing data.

As the LLM approaches its exact firing headings, the computer instructs the gunner to "arm rockets." He does so. The LLM stops. "FIRE" is displayed on the screen. The gunner lifts a safety cover, flicks the toggle, and BOOM! The first of twelve 700-pound rockets is down range.

The screen indicates the release of each rocket while the LLM re-aims between firings to maintain deadly accuracy. Within 60 seconds, the last rocket is away, raining 7,700 shaped charges on a grid square. The gunner then directs the computer to stow the LLM in a travelling position and sends a mission fired report (MFR) digitally to FDC. This report contains time, azimuth, elevation, and quantity of rockets fired. "Let's go!" shouts the chief. Window louvers fly open, and the SPLL roars off to the reload point grid indicated in the initial call for fire. Only four minutes after the fire mission alarm, SPLL 11 is moving off the firing point on its way to reload.

Back at platoon headquarters, the platoon leader monitors SPLL 11's fire mission and closely examines the ammunition status board. He knows that SPLL 11's reload will deplete the ammo at Reload Point 1. (Prepositioning of rocket pods at each RP is a must in terms of speed since the SPLL's reload cycle is 15 minutes shorter than the HEMTT's cycle to off-load two pods.) Picking up the TA-312 connecting platoon headquarters to the ammunition holding area 300 meters away, he calls to his attached E6 ammunition section chief. "Sergeant, off-load two pods at Reload Point 1." Quickly, the crewmembers of HEMTT 16 begin dropping and stowing their eight section camouflage nets, a task they will complete in 20 minutes.

The navigator of HEMTT 16 directs the driver to Reload Point. 1. Day or night, he can easily find the location since it has been placed alongside the road or in a recognizable clearing. (The reload point must be large enough to accommodate the 65-foot truck/trailer combination and at least one SPLL and must have enough overhead clearance to allow proper erection of the HEMTT's 22-foot hydraulic loading crane and still allow enough room to deposit up to 18 live or expended pods.)

As the HEMTT enters the reload area, the navigator jumps out and guides the HEMTT into position, insuring that the driver does not jackknife the trailer. Within 25 minutes, crewmembers will set the outriggers for a stable platform, erect the crane, remove 24 ammunition tiedown straps, off-load two pods, stow the crane to assume a travel mode, and hit the trail.

After off-loading the last two of their original eight pods, the HEMTT 16 crewmembers are now ready to return to the battery. There, they will group with at



Photo by Vought Corp



Photo by Sam Orr

least two other empty HEMTTs and convoy to the corps ASP, some 70 kilometers away. First, however, the crew stops by the firing platoon headquarters, verifies the battery headquarters latest grid, receives a tactical briefing, and clears its route of march. In turn, the platoon headquarters informs the battery operations center of the HEMTT's departure. This notification formally returns command and control of the HEMTT to battery level, thus centralizing control of all battery vehicles in the maneuver area.

The supply Gama Goat dispatched from battery headquarters arrives with the breakfast meal just as HEMTT 16 is departing. The 1st Platoon's E7 platoon sergeant meets the driver and briefs him on how and where feeding will be handled in his area. The Gama Goat driver then informs him of what delights he has on board for him. These include all the necessities for sustained operations from toilet paper, water, and mail to engine oil, spare parts, and BA-30 batteries.

The driver, as instructed, sets up the serving line in a tree line 100 meters from platoon headquarters. He utilizes a checklist provided to him by the E7 mess sergeant located at battery headquarters. This list reminds him to unpack all the hot breakfast rations; disposable plates, cups, and flatware; C-rations (to be served for the noon meal); and the all-important hot coffee. Meanwhile, the platoon sergeant calls down to the ammo section instructing personnel to rotate through chow. Digital messages are sent to the SPLLS directing them to the Gama Goat's grid to pick up chow, water, and engine oils and then return to their hide areas. Special attention is used to insure that at least one SPLL remains HOT while the crewmembers of the others are eating. If tactically dictated, the E5 reconnaissance sergeant may use his jeep to deliver plates of hot food to the crews in their hide areas. Upon completion of the meal, the driver collects the empty water cans and all the trash from the previous



Photo by Sam Orr



Photo by Vought Corp

feedings, obtains a list of required supplies, and coordinates his route back to the battery. "Tell the cooks the food was great" shouts the platoon leader; adding, "I'll send word to the battery that you're on the way back."

Having consumed their last bites of breakfast, SPLL 11's crewmembers, currently in a COLD status, begin their morning preventive maintenance checks and services (PMCS). With the cab tilted forward, the driver easily enters the engine compartment to check fluid levels. "Hey chief, we've got a bad leak from one of the radiator hoses" shouts the driver. Verifying this fact, the chief crawls in the cab and switches to the voice net to inform his platoon headquarters. They, in turn, send a digital maintenance support request to the operations center and send a LOST message indicating the vehicle "INOP" so that the fire direction system does not select that SPLL for a fire mission.

The voice radio call is answered in the operations center by the ammo platoon leader, who also serves as executive officer and maintenance officer. He has just relieved his platoon sergeant from his shift in the track extension. While he is conferring with the operations officer on the best route for getting a radiator hose and a 63T mechanic out to 1st Platoon, the BCU operator in the M577 receives the LOST message from the 1st Platoon. He immediately updates his status board by placing an "X" (for COLD) in

SPLL 11's column. The two first lieutenants decide to send the track team (an E5 63T team chief and an E3 63T MLRS mechanic) in the first sergeant's jeep. To the fire direction specialist, the operations officer yells "What's SPLL 11's current grid?" The specialist copies it from the displayed LOST message and passes it out of the track. Meanwhile, the executive officer rings the maintenance section on the SB-22 switchboard and briefs the E7 motor sergeant on SPLL 11's location and requirements.

The track team rapidly gathers the tools required to remove the hose and obtains the replacement from the prescribed load list. Within minutes, help is on the way.

"B21, this is B40, we're short four meals out here again, over" blares the radio in the operations center. Once again, the 3d Platoon is short on meals — the day is turning out to be a normal one.

This has been a brief portrayal of typical operations in an MLRS battery, to include the occupation of a position; the preparations taken for fire missions at the battery, platoon, and section levels; the conduct of a fire mission, to include ammunition resupply; and, finally, typical examples of logistical support. A year's worth of these operations prompts the following observations by the users.

The operations center is undermanned. The operations officer has under him only five enlisted personnel (an E6, an E5, and three E4s or below) to handle battery fire direction and operations around the clock. At any given time, three people are required inside the M577 to man the BCU, status board, and radios. This leaves only the lieutenant and, on occasion, one other section member to work in the extension. The work-around procedure which C/3-6th FA developed was to use the ammunition officer, ammunition platoon sergeant, first sergeant, and even the battery commander to pull shifts in the operations center — answering voice radios, controlling ammunition resupply, updating the situation map, and making operations decisions. Obviously, this situation is undesirable. One logical answer is to beef up the operations section to nine men — an E7 operations sergeant, an E6, two E5s, and five E4s, or below. This additional manning would obviate the requirement for non-section personnel to work in the operations center, thus freeing them to do their own jobs and allowing the operations officer to do his. (The Field Artillery School recently recommended that the battery NBC NCO be used in the operations center and that an additional 15J be added to the battery FDC as an operations sergeant. Software improvements to the FDS should also help.)

A huge amount of digital and voice traffic is emitted from the battery operations center. This electronic signature unnecessarily endangers the other sections in the battery headquarters area. Given a nine-man section, the M577 operations center could separate itself from the battery headquarters by a safe distance

(400 meters? 1,000 meters?) and move often enough to insure survival. The ammunition, maintenance, mess, supply, and headquarters sections communicate infrequently via radio and could stay put for longer periods of time, becoming in effect a battery trains area. Orders from the operations center to these sections would be passed by short-range radios on low power or via landline to an action agent in the ammunition platoon headquarters or battery commander's tent for implementation. An MLRS system mechanic with an MOS of 13MS8, known simply as the "S8," is located in each platoon headquarters. His job is to diagnose and repair all LLM and FCS difficulties with the platoon's SPLs — no small task for a PFC or SP4 who is also slotted as the platoon leader's driver. These soldiers must be of the highest caliber since they must be able to decide whether to replace or repair \$150,000 computer components every day. The S8s should be the best enlisted 13Ms in the battery.

No manual procedures exist for computing firing data for MLRS. A SPL FCS is the only machine capable of computing firing azimuth and elevation; the battery FDC merely sends the SPL's calls for fire with the target grid, size, and type. At first blush this system might appear to be a drawback, but actually there are advantages to this redundancy. Even if the operations center and the three platoon headquarters are simultaneously knocked out of action, the unit can continue firing merely by sending target grids to the SPLs over voice radio. Battalion TACFIRE cannot talk digitally to the SPLs or platoon M577s, but they do not need to for placing steel on target. (In the future, the platoon leader's digital message device [PLDMD] will be capable of communicating with TACFIRE, nonsecure, and thus will provide a backup for the FDS.)

The SPLs and HEMTTs are, despite their mechanical problems, an operator's delight. The cabs are comfortable and warm in the winter. The HEMTT has power steering and is easy to maintain and service. The SPL has the ability to pivot steer, allowing it "to turn on a dime." Both vehicles have numerous informative indicator gauges on their panels, and both have fully automatic transmissions.


Survey requirements for MLRS are different from those for conventional artillery. Each platoon must provide its SPLs with a highly accurate grid reference for SRP/PDS updating and calibration, but the SPLs do not need surveyed direction. The PADS performs this mission beautifully, cranking out 13-digit grids as fast as the platoon leaders demand them. If PADS goes down (an uncommon occurrence), the platoon reconnaissance sergeant or platoon leader puts in his own PASPs using an organic aiming circle, TI-59 calculator with survey chip, and the three-point resection technique.

An MLRS firing battery is very decentralized. Enlisted personnel are given responsibilities not normally associated with their rank. The S8's decision-making duties have already been mentioned. In addition, there is one 63S HEMTT mechanic who, though only a private, makes

decisions for HEMTT maintenance similar to those made by the S8. Three 13M privates drive the Gama Goats which are the firing platoons' primary source of food, water, and class II supplies. These drivers must be well-trained map readers and must know the correct procedures for serving and accounting for rations. The ability to read a map is also essential for the 36 HEMTT drivers and navigators. The huge ammo trucks rotate between firing platoons, battery headquarters, and the ASP day and night and usually travel alone. Obviously, their getting ammo to its destination on time is key to successful MLRS firing operations.

POL resupply is a never-ending task; and a 76W private, driving a 2,500-gallon HEMTT fuel tanker, has this responsibility. Keeping the constantly moving SPLs and HEMTTs topped off means 18-hour days for this POL specialist, with long drives across unfamiliar terrain. He must refill the tanker every day or so at a bulk POL point; thus, the 76W must be a hard worker, good driver, and skilled map reader to make the battery POL resupply system work.

Three additional 13M privates are needed in the ammo platoon. As currently configured, the three E6s in charge of the ammo sections are also navigators for their individual HEMTTs. Instead of leaving their assigned firing platoon locations when their trucks are depleted of ammunition, the three section chiefs take their HEMTTs out of action so they may remain forward. Unfortunately, this means that only 15 trucks instead of 18 are resupplying the battery with ammunition. Adding a 13M private to each ammo section would put these trucks back on the road, thus easing the burden on the remainder of the ammo platoon and allowing the section chiefs to stay with the firing platoons. (The Field Artillery School recently obtained approval for the addition of three 13Ms to the ammunition platoon.)

So that is the new kid on the block, and it is easy to see why so many people in the Field Artillery Community are excited about his presence. German, British, French, and Italian allies are just as excited; for they have an equal partnership in the multinational MLRS development project. Of course, there are problems with this newcomer; and much tactical doctrine still needs to be worked out. But professional artillerymen take heed — the new kid is growing fast, and he is here to stay! 

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A MODEST PROPOSAL

by Captain James G. Taphorn

"The battlefield of the future should present great possibilities for the employment of artillery fire . . . both against stationary targets, such as the enemy's artillery, and moving targets, such as . . . mechanized troops. Do our present methods take full advantage of these possibilities; and, if not, what steps do you suggest might be taken to improve them?"

*Captain H.C. Bazeley
British Royal Artillery*

On the eve of World War II, Captain Bazeley challenged his contemporaries to re-evaluate and re-think many standard, accepted field artillery procedures, some of which had last been tested in combat more than 20 years before. He went on to propose a number of innovative techniques that would help the artillery adjust to a threat the world had never seen before — highly mobile, mechanized warfare. He realized that history is full of examples of armies that won a war and then allowed their doctrine to become stale, outdated, and consequently inflexible. Their blind adherence to military textbooks and manuals often resulted in a debacle on the first battlefield of their next war.

Fortunately, in recent years the US Army has shown a healthy willingness to question and reshape its doctrine, tactics, and procedures as necessary. The field artillery, for example, has adopted streamlined fire requests and fire commands, hasty survey, terrain gun positioning, and shoot-and-scoot tactics in the interest of enhanced responsiveness, effectiveness, and survivability. The advent of high technology has also brought about revolutionary changes for the artillery through such features as digital communications, automated fire control processing, and laser rangefinders, to name only a few.

One area that seems largely to have escaped the attention of the Field

Artillery Community during these years is the problem of engaging moving targets. Historically, the field artillery has performed most prominently in the attack of stationary targets, from medieval castles to trench lines and concrete bunkers. Even troops in the open, because of their extremely slow rate of movement and their inability to outrun adjusting artillery fire, could be treated as essentially stationary targets. The dynamics and lethality of the modern, mechanized battlefield, however, have drastically complicated the job of the field artilleryman in certain respects. The targets he acquires will no longer remain helplessly fixed while a leisurely adjustment of fire takes place. Fixed fortifications and troops in the open, in part because of the very ease with which they could be neutralized by the field artillery, have become an increasingly rare phenomenon on the close-in, mechanized battlefield. They have been replaced by target arrays of armored vehicles which possess both a hardness and a mobility undreamed of a century ago.

Since the end of World War II, the hardness of many combat and tactical vehicles has increased many times over, a fact due only in part to the technical improvements in armor protection, which in themselves have been impressive. More importantly, an increasing percentage of threat vehicles are undergoing a steady conversion from truck

or towed configuration (still a *soft* target) to armored wheel or track. However, the ability to defeat a *hard* target is only half the problem confronting the artillery, because that target is also *mobile* and likely to be moving (*or begin moving*) when acquired and engaged.

On the central European battlefield in particular, stationary targets, unless they are emitting, will not likely be found with any consistency by most of our present and developmental target acquisition systems. In a stationary posture, such targets will have taken advantage of natural cover and concealment, either inside tree lines or towns, and will no doubt supplement this protection with camouflage nets and other devices. These simple tactical measures are quite effective against ground surveillance (fire support teams), aerial surveillance (air observers and remotely piloted vehicles), and moving target indicating radars. Indeed, the artillery's only consistent target acquisition capability against active hostile artillery in a central European conflict is likely to be its counterbattery systems (Firefinder and sound ranging), and it has very limited capability against other types of stationary targets. Thus, the irony of the field artillery's position on the modern battlefield: it has a limited target acquisition capability against the stationary targets it can most easily defeat; conversely, it appears to have a substantially greater capability to find moving targets, which are the most difficult for it to engage.

The development of improved conventional munitions (ICM) has provided a significantly improved, although still quite limited, effectiveness against armored targets; but these munitions provide no remedy for overcoming target location error. While the target location error against a stationary target can be relatively easily zeroed by subsequent corrections, the adjustment of fire against moving arrays remains a substantially more difficult task within the confines of current procedures and system limitations — hence the artillery's keen interest in smart munitions, which acquire a target in flight and then automatically maneuver or steer to the target and deliver an armor-penetrating warhead on impact. Thus, even relatively large target location errors can be compensated for and adjust-fire missions turned into first-round, fire-for-effect missions. The laser-guided Copperhead projectile represents only a first generation capability in this regard. However, affordability considerations may very well prevent smart munitions from

becoming substantial portions of unit basic loads. Thus, a large percentage of moving target missions will in all probability be conducted with conventional munitions (high-explosive and ICM families) that do not compensate for target-location error.

Based on the need to attack moving targets, it is appropriate to examine what current field artillery training literature and field manuals have to say on the subject. Surprisingly, there is no task in ARTEP 6-365 (*155-mm Direct Support Battalion*) that specifically calls for the engagement of a moving target array. Furthermore, there are no procedures or guidelines listed in either FM 6-30, *The Field Artillery Observer*, or FM 6-40, *Field Artillery Cannon Gunnery*, to facilitate moving target attack. Thus, from the standpoint of artillery doctrine, the field artillery is left with a procedural void on the issue.

There have been, however, serious attempts in recent years to establish specific procedures for the engagement of moving targets and to quantify their effectiveness. These have taken the form of Human Engineering Laboratory Battalion Artillery Tests (HELBATs) conducted by the Human Engineering Laboratory. The HELBAT effort began in 1969 and to date has numbered eight separate tests which have been conducted in cooperation with the Field Artillery School. Summaries of several HELBATs have been featured in previous issues of the *Field Artillery Journal*, and it is not the intent of this discussion to repeat their procedures or results. However, as these tests represent the most significant effort in recent years in the area of moving target attack, it is appropriate to at least address their findings.

HELBAT 3, conducted at Fort Hood in 1972, was the first systematic attempt to analyze and quantify the artillery's effectiveness in the engagement of moving targets. The test evaluated fire missions using both the conventional procedure and a specially designed new technique. The second case involved the complete transfer of responsibility for the fire mission from the forward observer to the fire direction center (FDC). Under this concept, forward observers were equipped with a tripod-mounted tracking device that provided azimuth, distance, and vertical angle to moving targets at certain intervals. This device was essentially an early version of today's Ground/Vehicular Laser Locator Designator (G/VLLD). In order to process raw data from the observer, the FDC was equipped with a calculator for

determining target speed between successive locations and a photogrammetric facility which portrayed the path of the target on a contour display of the target area. Finally, the procedure required synchronized time for the forward observer and the FDC. Within a given mission, the observer would transmit time-tagged sightings on a moving target. Based on this input and on tactical and terrain considerations, the FDC would determine a predicted path for the target and establish a time and grid at which to intercept it. The study produced the following significant findings, which are extracted from its Executive Summary:

- The total system error (distance from mean point of impact of shot group to target) was 715 meters for the conventional procedure and 423 meters for the new technique.
- The forward observer had a target prediction error of 666 meters for conventional missions and 495 meters for the point predicted by the photogrammetric facility in the fire direction center.
- Total system response time for the conventional mission was 13.4 minutes from target acquisition to time on target as contrasted with 15.5 minutes for the new technique.

The study concluded that the artillery had no effective method for bringing indirect fire onto moving targets. Not surprisingly, HELBAT 3 also identified system response time as the largest single source of error among the many variables inherent in moving target attack. It attributed this inadequate system response time to several factors, notably the inability of the FDC to follow a mission in real time and the use of voice rather than digital communications, both in receiving data from the observer and in sending data to the guns.

With this in mind, HELBAT 4 was conducted in 1973 at Fort Sill in a direct attempt to minimize system response time and thereby improve effectiveness. As in HELBAT 3, this test evaluated two types of missions — conventional and automated.

- In the conventional case, the HELBAT 4 scenario included a standard forward observer party (no laser range-finders), a FADAC-equipped FDC, and voice communications. The observer was directed to estimate target speed and then predict an intercept point based on target speed, direction, and system response time.



Photo by Jim Skrogstad

Method of control was "At my command." The conclusions of this phase of the test reinforced those of HELBAT 3 about conventional procedures. While the mean radial error was reduced to 441 meters (against 715 meters in HELBAT 3), the test confirmed that conventional procedures and voice communications are ineffective against moving targets. Total system response times averaged an unacceptably high 14.5 minutes, consistent with HELBAT 3 findings.

- In contrast to the conventional mission, HELBAT 4's automated mission utilized a digital/computerized configuration very similar to that employed by TACFIRE units today. The observer was equipped with a G/VLLD that digitally interfaced directly into the FDC and had the capability to electronically time-tag its measurements. Fire commands were sent digitally from the FDC and received on gun display units. As in the automated HELBAT 3 mission, the observer functioned primarily as a sensor only and lased the target at intervals, thereby feeding polar plot data to the FDC in real time. Actual

control of the mission (i.e., the grid and the time to fire) was retained within the FDC and accomplished by the use of a complex predict routine within the computer which took into account gun reaction time and time of flight. The algorithm also made allowance for lasings received subsequent to the issue of fire commands. If this new input indicated that the target had changed course beyond a certain tolerance, the countdown to fire could be aborted and a new intercept point computed. The results of the automated missions were significantly improved over those of HELBAT 3. After errors by the gun crews and the forward observers were removed, the first round in each mission averaged only 188 meters (mean radial error) from the target. All remaining rounds averaged only 97 meters from the target, with the first fire-for-effect round only 71 meters. Furthermore, the total time from target detection to the impact of the round was reduced from 13.4 minutes to 2.5 minutes.

While the results of HELBAT 4 appear impressive enough, there are several

caveats that must be attached to its results.

- First, one must consider that a G/VLLD was used for all fire missions. The majority of fire missions initiated within the fire support team (FIST) will be by platoon observers who, of course, are not G/VLLD-equipped. Hence the HELBAT 4 automated missions only approximated those missions that would originate from a FIST headquarters or a separate observation lasing team.

- Secondly, the use of a G/VLLD implies target location by polar-plot techniques. As such, target location error is a product of the cumulative errors in the observer's own survey control (position and azimuth) and in the polar-plot measurement process itself. In an attempt to isolate the second part of this error, HELBAT 4 used surveyed locations and azimuths for all G/VLLD positions. Under actual tactical conditions, errors in the observer's position will be present, even if the G/VLLD is used to resect the observer's location. This issue surfaced during the G/VLLD Operational



Test II (OT II) at Fort Carson in 1977. When performing a resection from two known points, the G/VLLD was found to be highly terrain-dependent; that is, the accuracy of the resected position was directly dependent on the accuracy of the plotting of, and measuring to, the known points being utilized. There are, of course, other methods of self-location with the G/VLLD; but they were not evaluated during its OT II.

• Thirdly, there exists no capability within the digital message device/TACFIRE/battery computer system (DMD/TACFIRE/BCS) network for an observer to electronically time-tag target lasings or other input. Thus, there is no capability to compute accurately a predicted aimpoint. The lack of this capability is not due to an oversight but to a doctrinal decision to place control of the fire mission (when and where to shoot) with the observer. There are both advantages and drawbacks to this approach. The obvious advantage is that, while the computer can only geometrically extrapolate a grid and time to fire, the

observer is in a true position to anticipate the movement of the target based on terrain and tactical considerations. An observer tracking a convoy down a curved road, for example, can take into account the future movement of the target far better than a computerized predict routine based on previous lasings. On the other hand, the human capability to predict a future target location as a function of response time probably degrades seriously against a computer over longer intervals.

• The final caveat of HELBAT 4 is that its data was single-thread in nature, which means that only one mission was processed at a time and that fire direction personnel were free to devote their full attention to that one mission.

HELBAT 5 (1975) and HELBAT 6 (1977) expanded significantly upon the work of HELBAT 4 in the evaluation of automated procedures for moving target engagement. However, their results remain classified and so will not be discussed here.

Despite the caveats listed above, HELBAT 4 clearly demonstrated the

potential of a digital/automated fire control system to streamline response time against moving targets. The current TACFIRE system, however, due to a relatively slow processing and communications rate which presently results in queues of data awaiting processing or transmission at various nodes of the system, is recognized as having a limited capability to reduce response times over those in the manual/voice world. The TACFIRE follow-on evaluation (FOE), conducted at Fort Sill in 1979, gave some indication of the response times to be expected, both under normal and surge battlefield conditions. Table 1 summarizes the response times measured in the TACFIRE FOE for a direct support battalion. The values in table 1 represent mean response times in minutes. Response time started when the observer identified a target and stopped when he received an acknowledgement to his "End of mission" message from the battalion computer. Standard gun preparation times were included, and time of flight for all rounds was assumed to be 30 seconds.

Table 1. Response times in minutes.

	Mission type	Intense	Non-intense	Overall	Overall sample Size
Fire for effect	(urgent)	7.89	6.27	6.82	298
Fire for effect	(all missions)	8.40	6.85	7.44	604
Adjust fire	(urgent)	14.35	12.17	12.21	47
Adjust fire	(all missions)	16.04	13.25		119

The TACFIRE FOE also measured incremental times for all fire missions, from target identification by the observer through first round "shot." Approximately half of the response time (through "shot") was absorbed by the time between the transmission of the call for fire and the receipt of initial fire commands by the guns — typically, between two and three minutes. With regard to subsequent adjustments, however, TACFIRE showed significantly greater responsiveness than on initial calls for fire. During the FOE, TACFIRE demonstrated a fairly consistent capability to process subsequent adjustments in less than one minute. Although the BCS was not played in the TACFIRE FOE, its processing of subsequent adjustments is even more rapid. In a TACFIRE/BCS configuration, subsequent adjustments are relayed with minimal delay by TACFIRE to the appropriate battery. Here, the BCS operator can normally transmit fire-for-effect data to a four-gun firing platoon in about 20 seconds.

This series of tests, which addressed a variety of capabilities and limitations, resulted in the following conclusions:

- The artillery needs the capability to effectively engage moving targets.
- All indications are that only a digital/automated fire control system affords any possibility of providing the necessary responsiveness.
- The observer has no time-tag capability, and the TACFIRE/BCS network has no predict routine. The TACFIRE/BCS combination still provides somewhat lengthy response times to initial calls for fire; however, it is significantly more responsive to subsequent corrections.

Not addressed yet is the method of control, which is obviously critical in the engagement of any moving target. Ultimately, in any moving target mission, it is the responsibility of the observer to bring the fire-for-effect rounds and the target together at the same place and at the same time. The two variables, then, at the disposal of

the observer to attack a moving target are aimpoint location (place) and method of control (time). A brief examination of the existing methods of control is in order to determine their respective strengths and weaknesses with regard to moving target attack.

- "When ready," which the artillery has considered its standard method of control, provides very unpredictable and soft time lines for the individual observer. The response time at any node in target processing is beyond the observer's control; thus, he has essentially forfeited his control of a moving target mission with "when ready."
- "Time on target" (TOT), on the other hand, permits the observer to control precisely the time of firing; however, the time lines associated with TOT remain somewhat lengthy.
- Finally, "At my command" gives the observer the advantage of a shorter response time (relative to TOT); and hence the requirement to lead the target is correspondingly reduced.

All three of the above methods, however, share one common limitation; that is, the only variable being exercised is *time*, while aimpoint location is treated as a constant.

In contrast to any of the above procedures, the best method of control would appear to be one which gives the observer maximum flexibility with regard to both the time of firing and the location of the aimpoint. This method, herein referred to as an "At my command — update" procedure, gives the observer the opportunity to update the aimpoint location just prior to fire for effect. A typical scenario for a TACFIRE/BCS unit is described below:

- **Observer:** Stores from one to seven known points for his area of responsibility in the offline compose message files of the digital message device (DMD). These points are recorded on the observer's terrain sketch; and, ideally, at least one has been previously registered or fired upon. Upon acquiring a moving target array, the observer simply recalls, at his discretion, a known point toward which

the target is moving and then transmits it as the grid to fire. Method of control is specified as "At my command — update."

- **Battalion:** Reviews the fire mission request and assigns it to a battery. Also sends the message to observer (MTO) to include time of flight.

- **Battery:** Computes initial firing data and transmits fire commands to gun sections, to include "Do not load."

- **Gun sections:** Send "Acknowledge" to FDC. Prepare rounds for firing and set off initial firing data.

- **Battery FDC:** Upon the receipt of "Acknowledge" from the gun sections, immediately reports "Laid" to the observer.

- **Observer:** Updates the aimpoint location by use of a subsequent adjustment technique. The observer must essentially lead the target by the amount of time of flight specified in the MTO plus the additional reaction time, estimated here at 50 seconds. Method of control is changed to "When ready." (Note that the 50 seconds additional reaction time is based on these elements: 10 seconds for the observer to update location upon receipt of "Laid," 8 seconds for the transmission and processing time through TACFIRE to BCS, 20 seconds for BCS computation and for the data to be displayed at the guns, and 12 seconds gun reaction time to set off new data, load, ram, and fire.)

- **Battalion FDC:** Receives and automatically processes the subsequent adjustment and transmits it to the appropriate battery.

- **Battery FDC:** Computes fire-for-effect data, sends commands to the gun sections, and changes their status to "When ready."

- **Gun sections:** Set off new firing data, load, and fire. Report "Shot" to FDC.

- **Battery FDC:** Reports "Shot" to the observer.

It should be noted that "At my command — update" is not an existing option in the present DMD software. However, a minor change to a unit's tactical standing operating procedures (TAC SOP) could allow one of the seldom-used existing methods of control (such as "At my command — destruction") to represent "At my command — update." The BCS operator would then manually enter "Do not load" when transmitting the initial data to the guns.

Use of one of the existing "At my command" options without some modification, either of software or unit TAC SOP, is considered inappropriate

for a number of reasons. First, the current BCS software does not permit a howitzer in an "At my command" status to receive subsequent corrections. Secondly, if the mission involves the setting of a time fuze, a new time based on the subsequent correction could obviously not be set once the projectile is loaded. Finally, the use of "At my command" creates possibilities for either a cook-off, should a hot tube condition exist, or of having to extract the projectile, should the mission be ended for any reason before the round is fired.

The advantages of the "Update" procedure, in light of the system limitations previously addressed, are significant; and the drawbacks are minimal. First, this technique is not limited to G/VLLD users, but can be used by all members of the FIST. Further, it can be employed by other visual target acquisition systems as well, such as aerial observers and the remotely piloted vehicle. Secondly, it does not rely on a time-tag capability or predict routines within the fire control network, which involve additional cost and are likely to be used as crutches by observers. Thirdly, it takes advantage of the relatively rapid reaction time of TACFIRE/BCS to subsequent corrections and thereby allows the observer to lead the target by the shortest possible time. It also keeps the predict capability *and responsibility* with the observer, which is consistent with current artillery doctrine. Finally, and perhaps most importantly, the "Update" procedure is totally independent of system response time. Regardless of the time it takes the observer to receive a "Laid" from the battery, he is still leading the target by a relatively constant and small amount — approximately 50 seconds plus time of flight. Reaction time to "Laid" will on occasion be so long that the observer will have lost sight of his target. However, the possibility also exists that the observer will have acquired another target in the interim, in which case the mission can continue, but against a new target. The option also exists for the mission to be sent directly to a BCS, which would result in the fastest possible reaction time. However, this option should be exercised carefully, because of its associated lack of centralized control.

In summary, the bottleneck in the current TACFIRE/BCS network occurs during the initial call for fire. With the "Update" procedure, the initial grid sent by the observer is not critical; and an appropriate known


point may be recalled from the DMD in the interest of saving time. When the BCS operator sends "Laid" to the observer as soon as he receives "Acknowledge" from all of the gun sections, there is a further decrease in response time. The observer can send subsequent corrections to update his initial aimpoint at the same time that the gun sections are breaking out ammunition and setting initial data. The net effect is that the observer and firing battery can each minimize the time one spends waiting on the other.

Use of the "Update" procedure does not answer the question of whether to fire for effect on the first round; that decision will continue to be governed by existing criteria. However, the "Update" procedure does offer significant potential for reducing the effective error associated with all rounds fired, whether in adjustment or in fire for effect. Algorithms for estimating moving target location errors, generated by the US Army Materiel Systems Analysis Activity (AMSAA) in a 1980 study, account for the observer's ability to choose an aimpoint (based on target speed, direction, and response time) and to accurately map-spot the grid of that aimpoint.

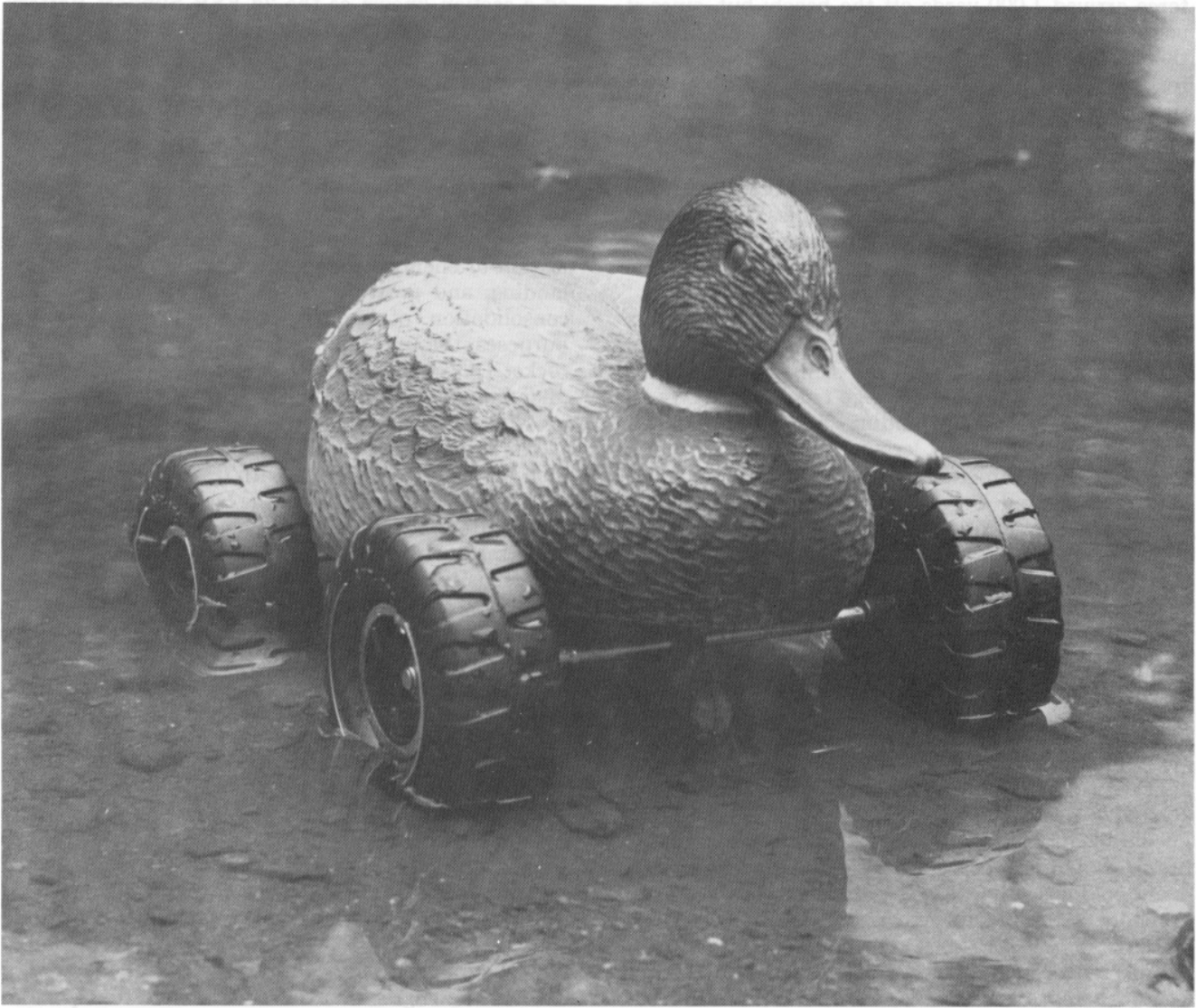
The Analysis Division, Directorate of Combat Developments, US Army Field Artillery School, used the AMSAA algorithms to quantify the relative difference in first-round accuracy for the "Update" procedure and an "At my command" mission with a three-minute response time. In sample scenarios, the algorithms showed that the "Update" procedure could substantially reduce the effective target prediction error at "Splash." (Target prediction error is the distance in meters between the aimpoint and the actual target location at "Splash.") For example, against a target moving at the rate of five meters per second, the "Update" procedure reduced the target prediction error from 509 meters (with "At my command") to 290 meters — an impressive reduction when one considers that the map-spot error constituted 242 meters of the total error and that the "Update" procedure therefore

reduced the error due to prediction and response time from 267 meters to 48 meters, which is within fire-for-effect guidelines. The problem of engaging moving targets is substantially less dependent on prediction and response time; rather, it is more dependent on an observer's ability to relate his map-sheet to terrain and on the delivery errors of the weapons systems.

As with any other task, the major key to success in engaging moving targets is realistic training. Currently, live fire against manned moving vehicles is virtually impossible because of range safety and other problems. However, innovative training ideas are rarely in short supply at unit level once a deficiency has been perceived. The use of remote-controlled vehicles on a 14.5-mm training range may be one answer.

As mentioned previously, the greatest potential for engaging moving targets lies with terminal homing munitions. However, since they are not readily available, the "Update" procedure appears to offer greatly enhanced effectiveness over existing procedures with conventional ammunition. Full implementation of the "Update" procedure would require software modification to TACFIRE and BCS, as well as the replacement of DMD memory boards so that "At my command — update" is an actual option for the observer. While such a modification to the DMD would be very expensive, the appropriate changes to TACFIRE and BCS would be relatively minor and could be routinely incorporated into subsequent revisions of software. Should it be determined that the expense in recalling DMDs is prohibitive, the use of "At my command — destruction" (or another existing method of control) would still appear to be a viable alternative. In any event, none of the software issues restrict a TACFIRE/BCS unit from using the "Update" procedure with today's field software. While the "Update" procedure should not be considered as a panacea for moving target attack, it is a modest proposal which does promise an improved capability to bring the field artillery's rounds "on time, on target." 

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TRUCKING WITH THE DUCK

by Mr. Charles H. Bogart

In 1942, the US Army formed within the Corps of Engineers four special engineering brigades (ESB), numbered 1 through 4, for the transportation of troops in shore-to-shore movements. These brigades, each consisting of three engineer boat and shore regiments (EBSR), were activated for the purpose of shuttling troops from England to France during the planned US assault on occupied France in early 1943 (Operation Roundup). With the substitution in 1942 and 1943 of the North African and Sicilian invasion in place of the landing in France, the 2d,

3d, and 4th ESBs were temporarily allocated to General MacArthur's Southwest Pacific Theater.

The 2d ESB, the first of the three units transferred to the MacArthur command, realized upon its arrival in the theater that naval gunfire support, one of the major components necessary for a successful amphibious landing, was not presently available in the theater and would not be available until some time in the distant future. The amphibious landing instructions called for naval fire support to lift from beach targets and shift to inland targets when the assault

force arrived 1,000 yards off the beach; but, since it usually took the assault force four minutes to cover those final 1,000 yards, the engineers of the 2d ESB realized that in the last four minutes of the assault they would come under heavy enemy gunfire with no effective means of neutralizing this fire. In addition, the 2d ESB learned that there was an almost complete absence of US Navy ships in the area. Fortunately, the 2d ESB had already undertaken studies to determine how to increase its organic firepower enough to neutralize enemy beach positions and support the continuation of the assault.

Since gunfire support was now an actual problem instead of a theoretical one, the 2d ESB began to experiment with various types of armaments on board their amphibious 2 1/2-ton cargo trucks (DUKWs — pronounced "ducks"); landing craft, mechanized (LCMs); and landing craft, vehicle, personnel (LCVPs). Initial upgrading of armament consisted of placing more and larger machine-guns on board the craft. It soon became apparent, however, that although the machineguns provided a large volume of gunfire, they lacked penetrating power. An attempt to substitute cannons for machineguns on the assault boats resulted in only limited success, for only the LCMs could withstand the recoil. In any event, a number of LCMs received an unauthorized conversion into gunboats (LCM(G)s) through the addition of 40-mm and 20-mm guns supplemented by .50-caliber machine-guns. These crafts, though they could provide a good heavy barrage of gunfire, still did not meet all of the 2d ESB's needs because their draft rendered them unsuitable for close-in support along many sections of the New Guinea coast where the Brigade was to operate. Thus, the search continued for a heavy armament suitable for mounting on the Brigade's DUKWs.

In April 1943 at a demonstration for Allied officers at Rockhampton, Australia, the 2d ESB unveiled a DUKW which pound-for-pound possessed greater firepower than any other amphibious or naval craft then in existence. This DUKW, in addition to its normal two .30-caliber machineguns, mounted a rocket launcher in her cargo compartment which was capable of firing a barrage of 120 4.5-inch rockets. Such a barrage was possible since the rockets had no recoil and thus did not affect the stability of the DUKW. The only problem presented by the rockets was the terrific heat they generated when fired, but the engineers solved this problem by partly flooding the deck under the rockets with sea water. It is true that the rocket DUKW was only a one-shot weapon since space did not permit the carrying of any spare rounds, but it more than compensated for this limitation with its mobility and the weight of projectiles it could place on a target. The lack of spare rounds was later overcome with the designation of a second DUKW or LCVP as an ammunition carrier. As a result of this test demonstration in Australia, the Southwest Pacific Theater headquarters ordered the 2d ESB to form a battery with four rocket DUKWs as part of their table of organization and equipment.

In compliance to these orders, the 2d ESB established a

section known as the 2d ESB Support Battery on 13 July 1943. The battery was under the command of the brigade's ordnance officer and was originally comprised of the four rocket DUKWs, twelve 1/4-ton amphibious trucks, and four LCVPs. Personnel to equip the battery, drawn from every section of the brigade, made the battery self-supporting. It was assigned the tasks of providing neutralization fire on the enemy's beach during the last 1,000 yards of the landing, rendering on-call fire support for the neutralization of enemy strongpoints encountered after the landing, and providing flank protection during the consolidation of the beachhead. For operational purposes, the unit was split into two sections of two rocket DUKWs each so that one section was always undergoing training and upkeep while the other was providing fire support.

The rockets fired by the DUKWs were standard 4.5-inch barrage rockets fitted with fragmentation heads. There was a proposal to arm the DUKWs with delayed and white phosphorous rockets; but it was never undertaken because the rocket fuzes were of a supersensitive propeller-type which, after exposure to handling, storage, and climatic conditions, often became ineffective despite inspections and cleaning before firing. In some instances, it became necessary to guarantee fuze activation by arming the rocket fuzes before firing instead of setting the fuze to arm after a flight of 120 feet from the firing projector.

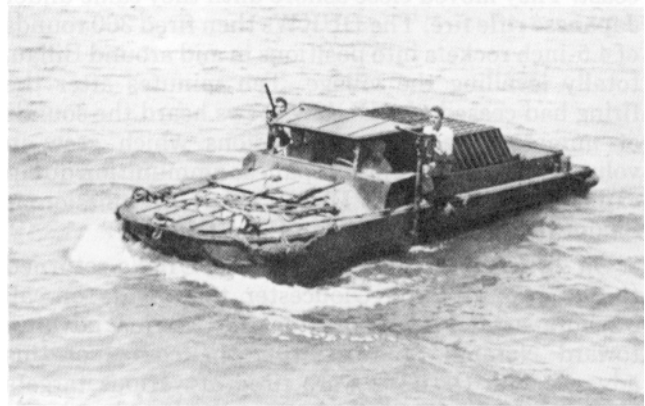
The first amphibious operation in which the rocket DUKWs played a part was the 15 December 1943 landing on Arawe Island off the southern coast of New Britain. The landing orders called for the initial assault to be made by the 112th Cavalry in landing vehicles, tracked (LVTs) operated by the US Marine Corps. This assault wave was to be followed by the 533d EBSR, 2d ESB, with its 16 LCVPs and nine LCMs supported by two rocket DUKWs and an LCVP. The engineer assault crafts were transported to Arawe from their staging area at Goodenough Island by the *USS Carter Hall LSD3* and the Australian transport *Westralia*. This operation was noteworthy not only because it was the first time the rocket DUKWs were to see combat, but also because it violated the 1942 Army-Navy agreement that the ESB would only conduct shore-to-shore operations. The US Navy's 7th Fleet (part of the Southwest Pacific Theater) apparently adopted the position that even though the engineer boats were being transported by ship, it was still a shore-to-shore movement because the boats were being picked up at one shore and being deposited at another.

The amphibious assault on Arawe Island was scheduled for 0630; but, due to various mishaps, a strong offshore current, and the different speeds of the boats in the landing assault wave, the assault fell behind schedule. The two rocket DUKWs, faced with a lag in the formation of the second assault wave, joined up with the first wave and pounded the landing area with 240 rockets. The first assault wave landed immediately behind the barrage and encountered little resistance from the Japanese defenders. It took too long to reload the rocket tubes in the DUKWs to

permit them to join up with the second wave as originally scheduled; but, they did, however, accompany the third wave in, although they did not fire since the friendly frontline position was no longer known. A critique of the Arawe landing operation contained nothing but praise for the role of the rocket DUKWs and recommended their employment in any future landing assaults. It also pointed out the fallacy of including different types of assault craft in the same amphibious landing wave since the craft's different speeds eventually caused the assault wave to lose its form. This last recommendation was particularly well received, and from then on all US amphibious assault waves were made up of the same type of landing craft.

With the assault forces landed, the rocket DUKWs became floating artillery. To compensate for their low speed (four knots in water), they were loaded on LCMs and incorporated into an LCM-LCVP patrol group investigating the surrounding islands. No Japanese were encountered by the patrol, and so the DUKWs undertook no fire missions. This situation changed, however, on 21 December when a hidden Japanese barge concentration was located in the waters off Mielelek. The commanding officer of the 112th Cavalry, fearing that the Japanese were gathering the barges for an amphibious assault behind his lines, ordered the 533d EBSR to destroy them. The rocket DUKWs were again mated with LCMs for transportation to the scene of the action. Once on station, the DUKWs fired 180 rockets which intelligence later reported had caused the sinking of one barge and serious damage to seven others. Eighty more rockets were also fired at the village of Mielelek, 500 yards inland, which intelligence had pinpointed as the barge base headquarters. After the firing, nothing was left of Mielelek but a few sticks and some plowed ground. This action was the last at Arawe which involved the rocket DUKWs.

The next amphibious assault for the rocket DUKWs was the Green Beach landing at Cape Gloucester on 23 December 1943 in support of the 1st Marine Division landing. Two LCMs of the 592d EBSR transported a section of the rocket DUKWs from Oro Bay to the landing area. The convoy with which they sailed formed up at Cape Cretin on 22 December and consisted of 12 landing craft, tank (LCTs); 14 LCMs; 5 landing craft, infantry (LCIs); 1 Halvorsen; and 2 LCVPs escorted by 2 destroyers, 3 submarine chasers, and 2 motor gun boats. Due to the slow 6-knot speed of the convoy, it arrived off the beaches later than planned; but a speedy formation of the landing waves allowed the landing to go off on time. Plans called for the shore bombardment to begin at 0715 and end at 0732 with an airstrike by B25s. The B25s were to bomb and strafe the beach until 0743, at which time the first landing wave, flanked by the two rocket DUKWs, was to be within 500 yards of the beach. At this point, the rocket DUKWs were to open fire on the landing zone, an area 300 yards long and 400 yards deep. This schedule was adhered to by all of the units but the B-25s which, slowed by a strong headwind, began their attack on the landing area just as the DUKW rockets began to arrive on target. Fortunately, while some B-25s



were holed, no direct hits were scored on them by any of the 240 rocket rounds. In the end, however, this impressive display of firepower proved to be unnecessary; for, when the Marines landed at 0748, they found that the beach was undefended. Since there was no further need for gunfire support, the rocket DUKWs were reloaded on the LCMs at 1900 for the return to Cape Cretin.

The rocket DUKWs were next in action on 27 December, which was one day after the initial landing at Yellow Beach on Cape Gloucester. The DUKWs were transported to the beach on board landing ships, tank (LSTs) and upon landing were assigned to the 1st Battalion, 1st Marines. The DUKWs were used ashore that day as mobile artillery to provide on-call gunfire support for the Marine advance on the Japanese airfield. The Marine battalion commander was so impressed by the support rendered by the two rocket DUKWs that he sent a letter of commendation to the 2d ESB praising the rocket DUKWs.

While one section of the rocket DUKWs had been operating with the Marines at Cape Gloucester, the other section was supporting the 34th Division's landing at Saidor on New Guinea in January 1944. The rocket DUKWs for this operation were attached to the 542d EBSR and were transported to Saidor from Finschhafen in LSTs. The DUKWs were no longer assigned to any of the assault waves since by now 7th Fleet had equipped enough LCIs with rockets to handle the assault support role. Thus, these DUKWs were not landed until 3 January 1944, one day after the initial landing. As had happened at the Yellow Beach landing at Cape Gloucester, the DUKWs were assigned the role of sea-going artillery support. Their first fire mission was posted shortly after they landed.

The order called for the DUKWs to support a combat patrol advancing west of the mouth of the Nankina River. The DUKWs were transported by LCMs to an area off of the river's mouth; in the meantime, radio contact with the patrol was lost and so permission to fire was not granted.

However, 5 January 1944, was to be a red-letter day for the DUKWs. They were ordered to blast the village of Biliau, from which heavy fire was being received by the advancing American troops. Intelligence reports stated that Biliau housed a Japanese radio station and supply base. LCMs transported the DUKWs down the coast. They moved close ashore until they came under Japanese rifle fire. The DUKWs then fired 360 rounds of 4.5-inch rockets into positions in and around Biliau, totally levelling the village. Ten minutes after the firing had ceased, the DUKW crews heard the sounds of numerous secondary explosions which grew in volume and intensity as a Japanese ammunition dump exploded. This was the DUKWs' last fire mission at Saidor before their return to Cape Cretin.

On 22 January 1944, the rocket DUKWs returned to the sea off Cape Gloucester to provide on-call offshore artillery support for the Marine advance toward Natamo Point. During the course of this advance, the DUKWs were fired at various targets along the shore. On 25 January, an offshore bombardment extracted the survivors of a Marine patrol pinned down across the mouth of a river by Japanese machinegun fire. The two Marines still alive were able to cross the river to safety under the DUKWs covering fire. Shortly after this action, the Japanese forces in the area began to retreat eastward into the interior; and the rocket DUKWs were withdrawn from action.


The DUKWs did not see action again until April when the complete battery supported the landing in and around Hollandia. The attack on Hollandia called for two simultaneous landings — one at Tanahmerak Bay, 25 miles to the west of Hollandia, by the 24th Division and its supporting two-rocket DUKWs of the 542d EBSR; and one at Humboldt Bay, Hollandia, by the 41st Division and its supporting two-rocket DUKWs of the 532d EBSR. Due to the number of LCIs and LCSs converted to mount rockets, the DUKWs were not used in the assault portion of the landing on 22 April 1944. The DUKWs attached to the Humboldt Bay force did see action, however, later that day when, in company with one LCM(G) and two LVTs, they took under fire Japanese gun positions situated on the peninsula dividing Humboldt and Jautefa Bay.

Because of the heavy mud in the landing area at Humboldt Bay, the rocket DUKWs were soon relieved of their combat support role and pressed into service with the LVTs to act as trucks for ferrying supplies inland. The mud, however, proved to be too deep for the DUKWs, which soon mired down. Later, when a more passable route was discovered, the DUKWs were once again used as trucks for moving supplies inland.

On 25 April, however, the rocket DUKWs were relieved of their transportation duties and resumed their shore

bombardment duties. Lying inland between Homboldt and Tanahmerak Bays was Sentani Lake, where the Japanese had built a series of airfields along the north shore. The lake, which stretched over 15 miles in an east-west direction, protected the airfields from an attack from the south, while the Cyclops Mountains protected the airfields from an attack from the north. As the 24th Division advanced east from Tanahmerak Bay and the 41st Division advanced west from Humboldt Bay, they ran into heavy resistance from Japanese forces. To flank these Japanese forces, an attack using DUKWs and LVTs of the 2d ESB was planned to advance over Lake Sentani and land behind the Japanese positions. Elements of the 3d Battalion, 186th Infantry, were therefore loaded on LVTs to cross the lake, land a mile behind the Japanese main line of resistance, and attack the airfield from the south. Support for the operation was being provided by two rocket DUKWs and two rocket LVTs. This flanking assault, an unqualified success, took the Japanese forces completely by surprise and caused a panic in the Japanese rear area. The enemy troops were now forced to fight on four fronts. Since the 3d Battalion, 186th Infantry, was now behind the Japanese force facing the 24th Division in the west and the 41st Division in the east, the Japanese broke contact and retreated to the Cyclops Mountains where they were hunted down. The Japanese retreat was further accelerated by the landing of the 2d Battalion, 186th Infantry, which was supported by rocket fire from the DUKWs located behind the Japanese holding off the 24th Division.

This operation marked the last use of the rocket DUKWs. By mid-1944, the DUKWs had been subjected to such intensive combat that they disintegrated beyond repair. No further rocket-mounted DUKWs were built since a 2d ESB study concluded that LVTs and LCM(G)s were a vital part of the support battery. The rocket DUKWs could be replaced by rocket LVTs, and the rocket LCVPs could be replaced by rocket LCMs. This change would make a more rugged unit since the LCVPs and the DUKWs did not stand up under rough treatment. The structurally sturdy LVTs also had the advantage of providing a more stable gun platform, could accommodate the mounting of small cannons as well as rocket racks, provided a degree of armored protection for their crews, were able to cross reefs and shoals which rocket DUKWs could not negotiate, and had better cross-country mobility.

The DUKW was thus relegated back to the role of a transport vehicle, and its control was returned to the engineer truck companies. Its gunfire support role was taken over by the LVT; but it did, however, have the glory of pioneering the concept of rocket bombardment in the support of amphibious operations in the Southwest Pacific Theater. 

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View from the Blockhouse

FROM THE SCHOOL

Journal notes

Many of the units and offices receiving free distribution of the *Journal* have not answered the address verification mailed in separate correspondence almost three months ago. AR 310-1 requires that these addressees be dropped from the mailing list until they verify their mailing addresses, and so unit commanders and staff officers who experience a disruption in the delivery of the *Journal* should send a verification as soon as possible. By the way, the majority of the free copies go to field artillery units in the Active and Reserve Components. Various headquarters and staff offices desiring free distribution must justify their requirement in writing before they are considered for addition to the mailing list.

One final note for the collectors out there. The US Field Artillery Association offers a package containing every *Journal* from 1973 through 1982 for only thirty dollars. It would make a great addition to any Redleg's professional library.

Professional libraries

All professional field artillerymen will be better able to achieve and maintain tactical competence if they are completely familiar with the contents of FM 100-5, FM 6-20, FM 6-40 with change 2, FM 71-1, and FM 71-2. These field manuals should be in every Redleg unit's professional library.

Meteorological training at the NTC

A meteorology section scheduled to deploy to the National Training Center (NTC) at Fort Irwin should do some prior planning and coordination so that it can support the operations and, at the same time, receive valuable training.

One preliminary decision involves equipment: the meteorology section can either transport its organic equipment or draw prepositioned equipment. Currently, the prepositioned equipment (a complete rawin set minus the OL-192 computer, a baseline check set, a radiosonde recorder, and a sizeable amount of expendable and nonexpendable items) is maintained by Boeing Services International, Equipment Support Division, Fort Irwin, California 92312; telephone AUTOVON 470-3374. This equipment could be used by as many as 20 different units a year; and it sometimes suffers from the treatment it receives from each using unit, the handling of inexperienced civilian caretakers, the possible unauthorized cannibalization of equipment, a shortage or absence of repair parts, and the lack of a direct support maintenance facility for repair. Rather than to contact Boeing personnel for an assessment of the operational capability of the rawinsonde system and other equipment, the best way for a unit to determine the operational readiness of the prepositioned equipment is to check with the last

organization that used the items and also to check the inventory of equipment on hand.

If the meteorology section must support operations at the NTC and at the home base, it will probably draw prepositioned equipment; but it still needs to ship its M109A3 shop van. A built-up van is a must because the NTC has no M109 vans for issue. If equipment at the NTC is not operational, the meteorology technician must arrange to borrow the necessary equipment from an affiliated National Guard or Reserve unit.

If the meteorology section operates a daily Air Weather Service (AWS) at the home station, the section can continue to support its AWS on Monday through Friday by contacting Detachment 7, 5th Weather Squadron, at the Bicycle Lake Airfield, AUTOVON 470-4327/4328, to set up a broadcast. The meteorology technician determines the best method for delivery of weather information; in some cases, it may be necessary to use a courier to deliver all messages.

In deciding how to support training at the NTC, the S3 and meteorology technician determine how the meteorology section is to support the mission. The only events when timely and accurate meteorology data are required are during the two live fire exercises. During these exercises, which last less than 36 hours, the meteorology section should position itself as far forward as possible to support the firing unit(s). The meteorology technician and chief of section should reconnoiter several positions and coordinate with the S3 before the initial occupation since the section may have to move before the end of the exercise. Moves should be conducted during periods of inactivity to insure that the message broadcast schedule is maintained.

The meteorology technician and his section chief also determine the type of training the meteorology section can accomplish during the dry fire force-on-force exercises. Artillery units compute many dry fire missions during this period; and, since the phase lines are changing faster than most units can move, the meteorology section must keep up with the changing battlefield to be of any use. It should establish itself in a fixed position and support the force-on-force exercise from that position. In this way, it has time to insure that all equipment is operational, can establish a flight schedule for the entire exercise, and can use free time to train personnel on all phases of desert operations.

The NTC offers the meteorology section a tremendous opportunity to exercise many soldier tasks that cannot be performed at the home station; thus, the section should establish some training goals before deploying to the NTC. (CW2 Campbell, TAD, USAFAS)

Unit basic loads

The article on unit basic loads (UBLs) in the March-April 1983 *FA Journal* ("Loaded to Kill," by Major (P) Bloomer D. Sullivan, Captain Francis D. Quirk, and Mr. Howard H. Rubin) generated much discussion and many inquiries, especially on the percentage distribution of Fire Support Mission Area Analysis (FSMAA) munitions. The FSMAA munitions mix figures quoted in figure 1 of the article were those which were expected to be fired within a given 24 hours. Though not intended to be so, this percentage distribution was interpreted by many readers to be a Field Artillery School position on the munitions mixture of the unit basic load. In fact, the FSMAA identified a recommended unit basic load (figure 1) for the Heavy Division/Corps '86 organizations which has been approved and adopted for use in Field Artillery School instruction, doctrinal publications, briefings, analyses, and planning.

M582 fuzes for 8-inch unit basic loads

In January 1983, a new gunnery computation procedure was implemented for the M422A1 8-inch nuclear projectile. All 8-inch cannon units and headquarters received copies of the USAFAS fielding package. The new procedure eliminates the need to fire the M424A1 high explosive (HE) spotter round to determine registration corrections for the nuclear round. Now, 8-inch units can register with the M106 high explosive projectile and apply ballistic corrections to HE firing data for the M422A1 projectile. This procedure requires the use of the M582 time fuze for the M106 registration. Some 8-inch units submitted requisitions for M582 fuzes for inclusion in their combat basic loads, but these requisitions were rejected due to an administrative error which has since been corrected. These 8-inch units should now resubmit requisitions for the M582 fuzes.

Type munitions	Percent of allocations		
	155- mm	8-inch	MLRS
High explosive	4 to 8%	3 to 20%	
High explosive rocket-assisted projectile	6 to 24%	8 to 12%	
Antipersonnel ICM	2%	2 to 8%	
Dual-purpose ICM	52 to 60%	60 to 85%	100%
Copperhead	2 to 4%		
Smoke/white phosphorus	4 to 8%		
Illumination	2%		
RAAM*	5%		
ADAM*	6%		

* Only the short self-destruct time munitions are included in the basic load; long self-destruct time munitions are drawn only as needed.

interdiction/counterbattery missions. Direct support (DS) and reinforcing (R) units, by contrast, require fewer long-range munitions such as HE RAP and a higher number of rounds that directly aid supported units; i.e., dual-purpose improved conventional munitions (DPICM), Copperhead, smoke/white phosphorus, and illumination.

- With the many different types of munitions in the inventory, especially for the 155-mm howitzer systems, there is a need to simplify the basic loads whenever possible. Moderate simplifications can be accomplished, with some risk of loss of flexibility, by dedicating special tasks, such as illumination and smoke, to specific batteries, thus eliminating the need for all units to carry the minimum number of highly specialized munitions. Also, with the current trend toward increased use of the 4.2-inch mortars to provide smoke and illumination, the 155-mm basic load could be altered to reflect the reduced demand for obscuration and night illumination support. A further consolidation can be achieved by substituting other munitions capable of accomplishing the same task. For example, DPICM can be substituted for antipersonnel improved conventional munitions (APICM). Although APICM may be up to 50 percent more effective against some personnel targets, a small loss of effectiveness on those few rounds eliminated will be more than made up for by easier ammunition handling. Eliminating the relatively small numbers of APICM from the DS battalions and giving increased percentages to the GS/GSR battalions is another way to accomplish the goal. As a general rule, if rounds are eliminated from a particular unit's basic load for simplification, they should be replaced one for one by adding to the most lethal munitions for the anticipated threat. For the armor-heavy threat, munitions of choice in priority are Copperhead, RAAM/ADAM, and DPICM.

- The percentages recommended above must be considered a goal for those designing basic loads in the near time frame. If ammunition of a particular type is unavailable, substitute with the next best munitions that can do the job.

- Consideration must also be given to the ability to supply ammunition when deciding on the type basic load for an artillery unit. Ammunition components are currently packed, stored, and shipped in typical issue quantities. Thus, the basic load recommendations might require adjustments to facilitate palletized bulk issues.

With the introduction of advanced precision guided munitions (PGMs) with an extended range capability in the 1990 time frame, DPICM and HE RAP in the basic load potentially could be reduced in proportion to the number of PGMs added to the inventory. Specialized munitions, such as smoke, illumination, mines, etc., will probably continue to fulfill specific requirements in spite of the introduction of smart projectiles. Much additional analysis must be done on the impact of these lethal systems before definitive guidance for basic loads for the 1990s can be given.

The basic loads suggested are derived from the expected number of munitions expended in the SCORES Europe I, Sequence 2A, 1986 Battlefield Scenario and are a compilation of the results of numerous analytical studies and wargames.

For purposes of this discussion, a basic load is defined as "that amount of ammunition necessary to allow a unit to accomplish its mission until it can be resupplied." The basic load, then, is designed to meet initial combat needs until normal resupply is accomplished. A unit's combat and organizational ammunition vehicles (howitzers, FAASVs, and trucks) must be able to carry the basic load in a single lift.

Two wargame models, FAST and ICOR, actually simulated a two-sided, force-on-force battle where current artillery doctrine was applied to the dynamic battle. The required ammunition expenditures, as dictated by the scenario situation, were tabulated by type round fired. The FAST model simulates firing the optimal munition for the target presented. Thus, these recommended loads are based on maximum overall effectiveness for the force.

- Note that bands of percentage allocation are provided for the most used munitions. These variations reflect different allocations based on unit mission and other local conditions. For example, general support (GS) and general support/reinforcing (GSR) units typically require a higher percentage of the high explosive rocket-assisted projectile (HE RAP) munition to accomplish their

Figure 1. Recommended percent of allocations of 1986 basic load.

Field Artillery software update

Formal qualification testing on the interoperability of TACFIRE master tape version 5 ended on 31 August 1983. The software contractor will conclude instructor and key personnel training on 9 September 1983. Then it will be time for the Field Artillery Board to conduct operational test (OT) II. Scheduled for 28 November 1983 to 27 January 1984, OT II is the last test of the software prior to its release to field units, currently scheduled for 16 March 1984.

Version 5 has added some significant capabilities to the previous version:

- It incorporates the corps field artillery section software.
- It is interoperable with MLRS version 3, BCS cannon version 5, Lance version 1, and FIST digital message device (DMD).
- It incorporates unclassified nuclear fire commands to batteries.
- It contains the capability to send an emergency patch software correction from Fort Sill to any user worldwide via automatic digital network (AUTODIN), teletype message, or automatic voice network (AUTOVON).
- It contains field artillery scatterable minefield density calculations which will determine the number and type of rounds and the number of aimpoints required to meet the commander's criteria.
- It incorporates the capability for division artilleries, field artillery brigades, and corps field artillery sections to send each other encrypted digital traffic and receive encrypted digital traffic from each other.
- It reflects FM 6-20's listing of the proper names for fire coordination measures.
- It contains an artillery target intelligence message format which can be transmitted to non-field artillery systems and preclude the transmission of intelligence information which does not meet field artillery criteria.

Lance study

At the request of the US Army Field Artillery School (USAFAS) and the Corps Support Weapon System Special Task Force, the US Army Training and Doctrine System Analysis Activity (TRASANA) conducted a Lance Initial Screening Training Effectiveness Analysis (ISTEA) in May of last year. One of the primary objectives of the ISTEA was to determine the training implications of the present Lance system in terms of hardware, soldiers, trainers, training programs, and training environment.

The proficiency of Lance personnel in the two Lance specific MOSs (15D, Lance crewmember, and 15J, Lance operations/fire direction assistant) in four US Army, Europe (USAREUR) Lance battalions was measured by a written skills and knowledge test, a written map-reading test, individual hands-on tests, and collective (crew) hands-on tests. In addition, instructors and students from seven MOS 15D and five MOS 15J advanced individual training classes were tested at the Field Artillery School.

Structured interviews were conducted with commanders and staff officers, a Lance ARTEP was observed, and unit maintenance and personnel records and monthly unit status reports were reviewed to determine the adequacy of training given to all Lance soldiers.

The analysis of the information obtained during this study revealed training deficiencies at both the training institution and unit levels. Improvements are needed in training support devices and materials, in the USAFAS programs of instruction, in unit training programs, and in standardized reduced crew drill procedures.

The Field Artillery School has published a Lance action plan which provides the direction to improve the Lance system. Included are actions to enhance individual and collective training; analyze and update the table of organization and equipment; rewrite FM 6-42, *Lance Battalion*; and explore standardization and frequency of inspections. The School will continue to coordinate with the USAREUR Lance units to improve the Lance system capability.

The results of the Lance ISTEA were published by TRASANA in TRASANA-TEA 3-83, *Lance Initial Screening Training Effectiveness Analysis*, Volume 1, dated January 1983. Copies have been distributed to all major Department of the Army agencies and Lance commands.

Help wanted!

The Field Artillery School's Directorate of Evaluation and Standardization (DOES) wants the help of units in the field. DOES is coordinating the standardization of tasks, drills, and procedures for tactical, logistical, and administrative operations common to like units. It is a fact that commanders in almost all Active, National Guard, and Reserve field artillery units have felt they needed to supplement the guidance in existing field and technical manuals and have therefore produced additional documents on drills, ARTEP guides, loading plans, and how-to-train and how-to-fight procedures. DOES needs copies of these documents so that action officers within the Directorate can determine the areas which most require standardization and then synthesize the best ideas in those areas. Documents should be sent as soon as possible to the Commandant, ATTN: ATSF-O, US Army Field Artillery School, Fort Sill, OK 73503.

M548 and M565 fuzes

In order to use up existing stocks of the mechanical time superquick (MTSQ) M548 fuze, the US Army Armament Materiel Readiness Command has authorized use of this fuze as well as the use of mechanical time M565 fuze with 155-mm M116A1 smoke and M485 illumination projectiles. The M548 fuze is for base ejection rounds only and is set in exactly the same manner as the M564 or M565 time fuzes are set.

Page 7-32 of TM 43-0001-28 gives the limitations and cautions for the MTSQ M548 fuze. (Clay Turpin, Weapons Department)

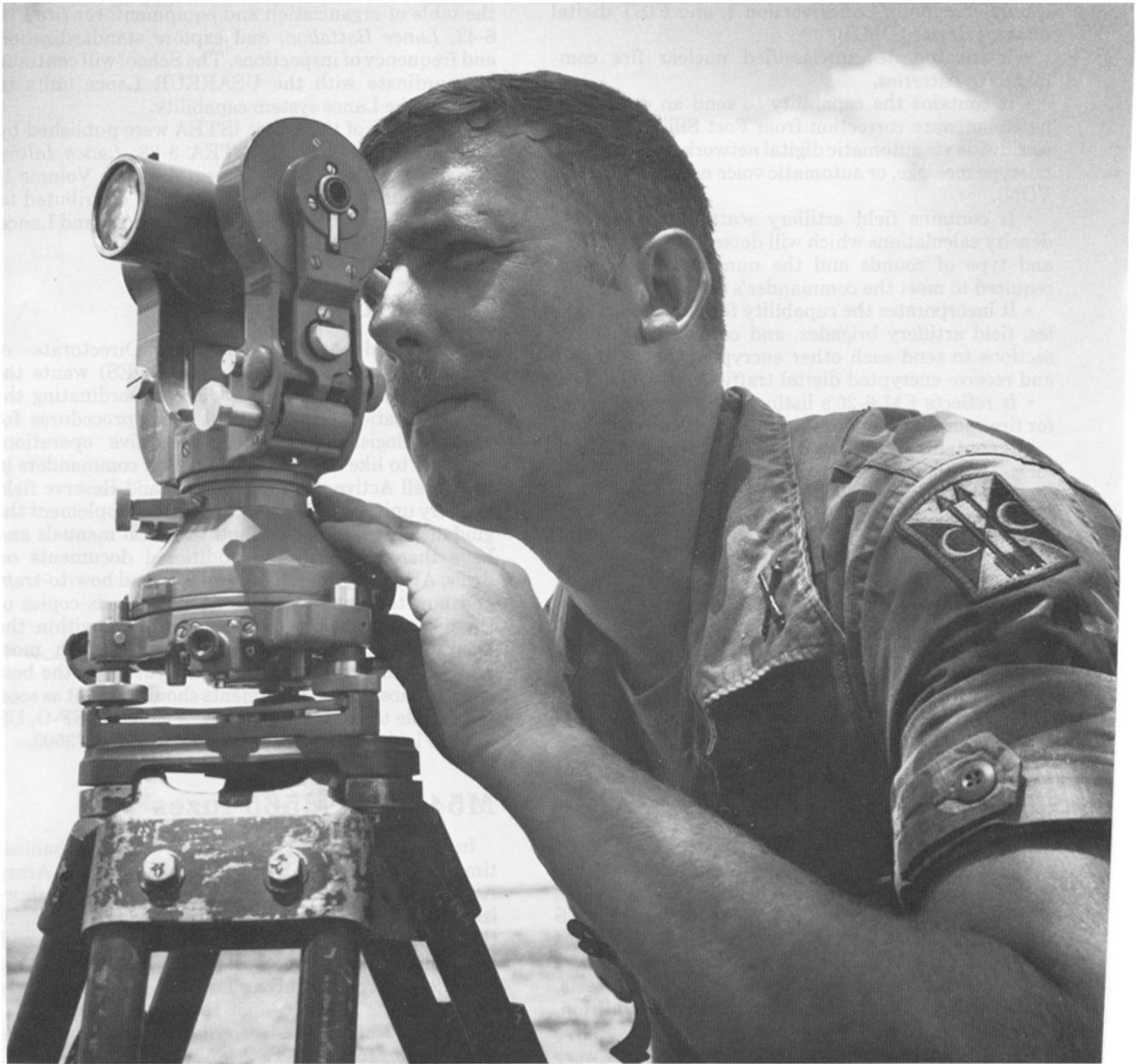
DRILLING WITH LANCE

by Major Robert L. Richardson, Jr.

Standardized team battle drill for the total Army is being formulated within TRADOC as part of the Combined Arms and Services Training Concept. As a result of this and other recent initiatives concerning standardization of training in the Army, it is appropriate that the success already achieved in the Lance battalions at Fort Sill be reviewed. For over three years, the members of the 1st Battalion, 12th Field Artillery, and the 6th

Battalion, 33d Field Artillery, have employed the "Lance battle drill" as a basis for collective training at the team level.

The primary purpose for developing the "Lance battle drill" was to produce a standard drill for the Lance firing team which would include a set of basic technical tasks in a logical tactical sequence. The Lance firing team, which is the nucleus for the conduct

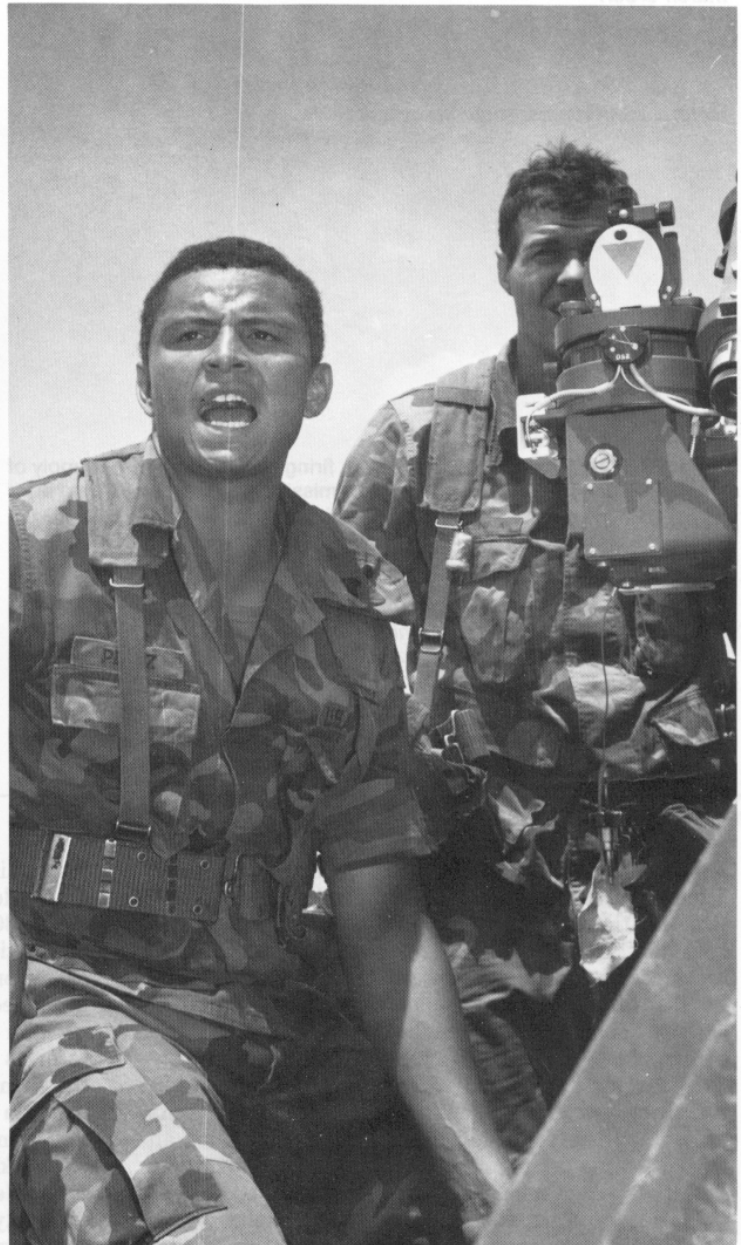


Photos by Jill Pohto

of all mission-essential technical operations, includes the firing platoon and an assembly and transport section. The essential tasks are those which require the team to transport, assemble, and fire reliable missiles while still maintaining its survivability. The sequence of the tasks reflect those coordination and control measures at team level that would be required when the battalion has been fully tasked to fire in support of the corps with a nuclear pulse of 12 rounds in less than one hour. From the pickup of a round at the special ammunition supply point to its delivery on the target, a firing team must be capable of completing its mission in any battlefield environment. This set of tasks (figure 1) thus becomes a battle drill which is the nucleus of the battery's continuous team training for

- Performance of preventive maintenance checks and services (PMCS).
- Reconnaissance of firing points and rendezvous locations (concurrent with assembly of round).
- Tiedown of a missile main assemblage and warhead section.
- Inspection and unpackaging procedures.
- Assembly of a nuclear round and loading on the loader transporter.
- Permissive action link unlock.
- Firing team march order (first fire mission).
- Transload operations.
- Fire mission.
- Firing team march order (final fire mission).

Figure 1. Tasks to be performed.



TASK	CONDITION	STANDARDS	+5 NO GO	0-5 NO GO
8. MARCH ORDER				
a. Displace from a firing point.	A fire mission has been completed and the SPL must be march ordered.	Place all MP switches in off and 0 position.	_____	_____
	<i>Note: The normal firing residue will include empty control surface containers, short umbilical cable (unserviceable), APU upper rod with green streamer and boattail cover. The SPL is positioned at a firing point so that it appears that the Lance missile has just been fired. The firing cable and the firing point security (M60) are still deployed when the firing platoon leader issues the command to march order.</i>	Inspect launcher for damage that would prevent it from being moved from the firing point.	_____	_____
		Reel in and secure the firing device cable.	_____	_____
		Traverse to center, depress and secure the launch truss.	_____	_____
		Correctly stow GSU, control surface container, boattail cover, and short umbilical cable.	_____	_____
	<i>Note: Submit reports required by unit SOP.</i>	Insure that canvas is stored and tied in the front.	_____	_____
		Perform post firing operations as soon as possible.	_____	_____
		March order SPL within 5 minutes after firing. Start: Missile has fired. Stop: SPL departs area (i.e., moves off the FP and evacuates to transload location).	_____	_____
		Depart firing point as rapidly as possible within 5 minutes.	_____	_____
b. Occupy a rendezvous area (LT only)	A firing section requires resupply of a missile at a rendezvous area after a fire mission.	Routes into the position facilitate rapid occupation.	_____	_____
		Position vehicles to allow rapid displacement.	_____	_____
	<i>Note: At the start of CSMO of the SPL the LT will be permitted to move from hide to rendezvous area and prepare for transload. Additionally, the platoon leader with advance party will be permitted to go to the second firing points at the time of CSMO.</i>	Maintain light and noise discipline. Enforce strict natural camouflage discipline. Cover all reflective areas.	_____	_____
		Secure the area as rapidly as possible.	_____	_____
		Maintain two-man control.	_____	_____

Figure 2. Extract from battle drill booklet.

Army Training and Evaluation Programs (ARTEPs), Technical Validation Inspections (TVIs), and Skill Qualification Tests (SQTs). Each task has its own conditions and standards; and it does not take long to recognize that the drill is detailed and greatly expands ARTEP and SQT tasks, conditions, and standards. (Figure 2 provides an actual extract from the battle drill booklet.)

A team prepared for battle drill initially locates in the firing battery area, and the sequence of events unfolds in the following order: Upon receipt of an authenticated firing mission, the platoon or team leader reports that his team is prepared to be evaluated. From that moment forward, the two-man rule applies until the completion of the evaluation. The main missile

assemblage and the warhead section are loaded on the loadcarrier and properly tied down. Up to 30 minutes is allotted to the team to perform preventive maintenance checks and services (PMCS) on its organic vehicles (1/4-ton, 5/4-ton, 5-ton, self-propelled launcher, and loader transporter).

Upon completion of PMCS, the platoon leader receives the location of the firing points to be used for the firing mission and must then perform route and position reconnaissance. Simultaneously, the tiedown of the main missile assemblage and warhead section is checked; and then the missile is inspected and assembled under the lightweight screen system. After assembly, the missile is transloaded to the loader transporter, and the team performs permissive action

link (PAL) unlock. Upon his return from the reconnaissance, the platoon leader issues orders necessary to fire two missions within the prescribed time. While the loader transporter departs for a rendezvous point to await transload operations, the firing team moves to the first firing point and sets up a launcher in a mode that indicates that a missile had just been fired. At this point, the second half of the battle drill begins as the leader barks "March order." The team quickly departs for the rendezvous point and performs the transload operations. The proof of the thoroughness of the leader's reconnaissance and orders lies in the team's ability to conduct simultaneous tasks in multiple locations. During the transload operations, the platoon leader or sergeant is preparing the second firing point for the next fire mission. Once the transload operations are complete, the firing team rapidly moves to the new firing point, conducts the firing mission, and then march orders from the area. The battle drill ends when all equipment is march ordered from the second firing point.

Battle drill should occur at platoon level in a close-in training area or in the field — not in the motor pool! Figure 3 lists the members of a firing team required for the drill. (A typical operation involves just 70 percent of the assigned strength available for training since there is no expectation or plan to fight at full TOE strength.)

- Platoon leader
- Platoon sergeant
- Firing section chief
- Assembly and transport section chief
- Gunner
- Launcher specialist
- Loader transporter operator
- Self-propelled launcher operator
- Driver/radiotelephone operator
- Five crewman

Figure 3. Firing team members.

The battle drill should take no more than half a day, and a good team can complete the drill in less than two and a half hours. If a team takes more than four hours to complete the drill, it should be required to train to the stated standard on its own time.

In addition to the equipment authorized by tables of organization and equipment (TOE), team personnel require the seasonal field uniform, load bearing equipment, protective mask, and individual weapons. Major items of equipment required are shown in figure 4.

The battle drill does not require that the entire battery position area be established, although it may be. As a minimum, one would expect to find the assembly and transport operation with the lightweight screen system erected. In addition, there should be two firing points separated by at least three kilometers. A rendezvous point with a suitable hide area for the loader transporter should be located between the two firing points.

- M6 training missile main assemblage (in container)
- M240 training nuclear warhead section (in container)
- Self-propelled launcher with all ground support equipment
- Loader transporter with sling beam and guide lines
- Extra-long wide-bed 5-ton truck
- 1/4-ton truck with radio
- 1/4-ton trailer
- M880 5/4-ton truck
- Lightweight screen system for assembly and transport area within battery position area

Figure 4. Major items of required equipment.

Since its inception, this drill has been the basis for the firing team's nuclear technical operations training, the basis for certification evaluations prior to annual service practice firings, the means to demonstrate technical competence in a tactical mode during a TVI following an ARTEP, and the standard drill used in competition to select the best firing team within the battalion/brigade. The drill does not include all tasks on which a team must be technically proficient (e.g., cancelled mission, misfire procedures, command disablement, or emergency destruction). Instead, it concentrates on tasks which do not generally occur in the more complex nuclear operations and leaves additional instruction and practice in those tasks to other training periods.

This battle drill is not applicable to Lance alone. The 214th Field Artillery Brigade at Fort Sill, the largest and most diverse artillery brigade in CONUS, has adopted this training concept for the howitzer, Pershing, and infantry battalions as well. A team drill is also under development for Lance surveyors.

The Lance community at Fort Sill is excited about battle drill — it believes in it and uses it. It has taken the old term "cross-training" and developed a drill which achieves the same objectives through a dedicated team effort. The results have increased the overall survivability and mission capability of Lance units by creating redundancy and depth in the performance of the critical tasks inherent in their primary battlefield mission. From maintenance to SQT scores, Lance units at Fort Sill have experienced an improvement in virtually every aspect of operations. Battle drill makes the future look bright. ☒

MAJ Robert L. Richardson, Jr., FA, received his commission through Officer Candidate School. A graduate of the Field Artillery Officer Advanced Course and the Army Organizational Effectiveness School, he was a battery commander in the 1-31st FA (Honest John) and in the 3-18th FA. He has served in field artillery and organizational effectiveness positions in the headquarters of the 212th Field Artillery Group, the V Signal Brigade, and the 214th Field Artillery Brigade. Most recently, he was the executive officer of the 6-33d Field Artillery(Lance) at Fort Sill, Oklahoma. He is now attending the Command and General Staff College.

Fragments

FROM COMRADES IN ARMS

Army receives TOW 2 production units

The Army recently received the first production units of the TOW 2 heavy assault infantry weapon system. This latest version of the combat-proven TOW (tube-launched, optically tracked, wire-guided) antitank weapon incorporates improvements to both the missile and its launcher. These improvements give the system greater lethality against the latest armor threats and increase its operating flexibility by enabling it to operate in smoke, dust, and other obscurants.

A TOW 2 launcher performance demonstration confirmed that modifications to the launcher design caused the system performance to exceed that of the hardware used in earlier development and operational testing. The performance demonstration included 36 missile firings which involved all three missile models — the basic TOW, the improved TOW (ITOW), and the TOW 2.

The TOW 2 missile carries a warhead that is both heavier and larger than the one carried by the ITOW. The warhead, which is an inch larger than the other two TOW payloads, occupies the full six-inch diameter of the missile. TOW 2 also has an improved flight motor with higher impulse so that there is no deterioration in range or flight time even though it weighs 47.4 pounds (21.5 kilograms) or 5.7 pounds (2.6 kilograms) more than the basic TOW. In addition, a thermal beacon has been added to the aft end of

the missile as part of the improved guidance system.

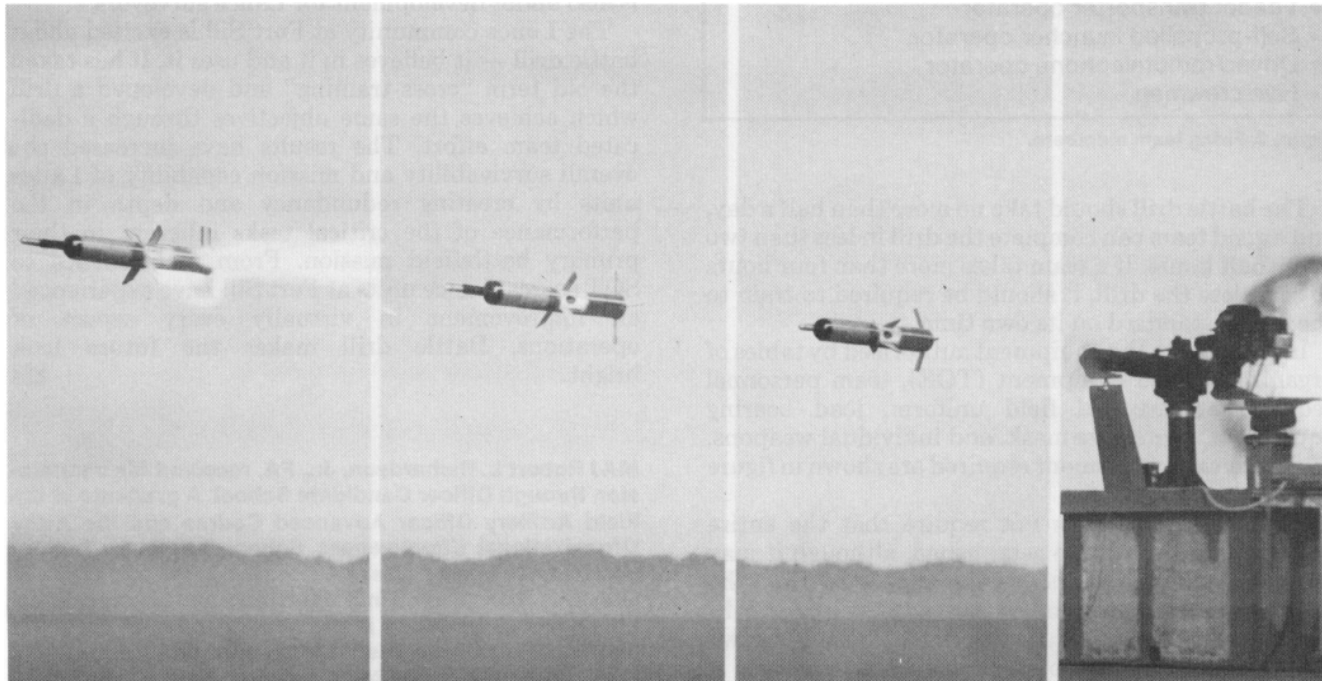
The TOW 2 launcher has the capability of guiding the TOW 2 missile precisely through battlefield obscurants, day or night. The modified AN/TAS-4A infrared night sight operates in parallel with the optical sight used to track the missile in daylight and clear visibility conditions.

Another major improvement in the launcher involves the replacement of the original analog computer in the guidance set with dual digital microprocessors which provide more accurate guidance, not only for the TOW 2 missile but also for the basic and improved TOWs. All three missiles can be fired from the TOW 2 launcher as well as from the basic launcher; but, when TOW 2 is fired from the basic launcher, there is some minor performance deterioration.

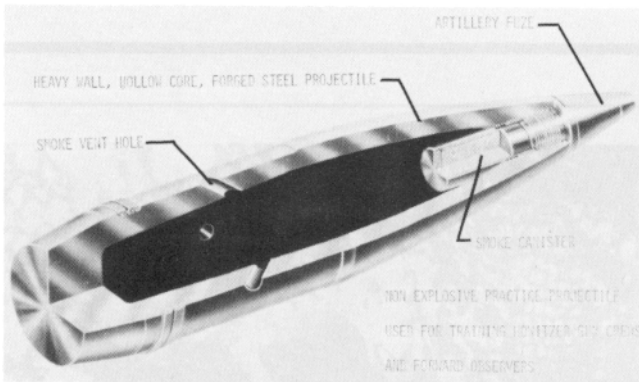
The quiet round

A nonexplosive 155-mm artillery projectile has been developed by the US Army Armament Research and Development Command (ARRADCOM) to replace the M107 155-mm high explosive shell and its 15 pounds of TNT. The new hollow M804 practice round has a smoke charge in its nose, and the smoke indicates where the fired projectile lands.

The shock waves caused by the explosion of standard 155-mm howitzer rounds in impact areas near civilian housing have resulted in numerous damage claims. Although the new projectile does not reduce the loud muzzle blast when a howitzer is fired,



In this right-to-left series of TOW photos, the launch motor (at right) has ignited with the missile still in its launch tube container. In the second panel, the probe, the missile's wings, and the tail fins are partially extended. Next there is a full extension of those elements. The leftmost panel shows the flight rocket motor as it ignites. (Hughes Aircraft Company photo)



Cutaway drawing of the M804 practice 155-mm projectile showing the smoke canister.

the elimination of explosion noise at the impact zone is expected to substantially reduce resident damage claims.

In addition to the noise abatement feature, the M804 is 28 percent less costly than its high explosive counterpart. Also, transportation costs are halved because of the nonexplosive nature of the new shell.

The M804 project is just one of several development programs in progress at ARRADCOM to provide nonexplosive training ammunition to replace other high explosive munitions that are now being used exclusively in training gun crews. (Philip Glick, ARRADCOM)



A TOW antitank missile streaks from the launch tube of the Army's new M2/M3 Bradley Fighting Vehicle system during recent tests. The TOW weapon subsystem for the vehicles, including an integrated day/night sight unit, is in full-rate production at Hughes Aircraft Company's Electro-Optical and Data Systems Group. The subsystems are being delivered on schedule at a rate of 50 per month to FMC Corporation, the vehicle developer and system integrator for the Army. (Hughes Aircraft Company photo)



The Army has awarded a contract to produce the first 15 M9 armored combat earthmovers (ACEs). The ACE has a rapid digging capability and is mobile enough to keep pace with the fighting force. It can travel at 30 miles per hour and can be transported in a C-130 airplane and dropped by parachute. The M9 gives its operator protection against small-arms fire, shrapnel, and chemical agents. It can build barriers such as antitank ditches; prepare defensive positions for armored personnel carriers, fighting vehicles, tanks, and artillery; and perform heavy digging tasks to overcome obstacles in its path. Selected combat engineer units are scheduled to receive the ACE in the fall of 1984. (Engineer Update)

Tactical water distribution sets

The US Army Mobility Equipment Research and Development Command has awarded a \$16.5 million contract for the production of 21 tactical water distribution sets for the Rapid Deployment Joint Task Force.

Each set consists of a 10-mile segment of 6-inch hoseline, a 600-gallon-per-minute pump, and fabric tanks capable of storing up to 20,000 gallons. In operation they will be used to deliver potable water to remote locations.



Six-inch hoseline and the 20,000-gallon fabric storage tank are part of the tactical water distribution set.

Right by Piece

NOTES FROM UNITS

M198 howitzer joins USAFATC

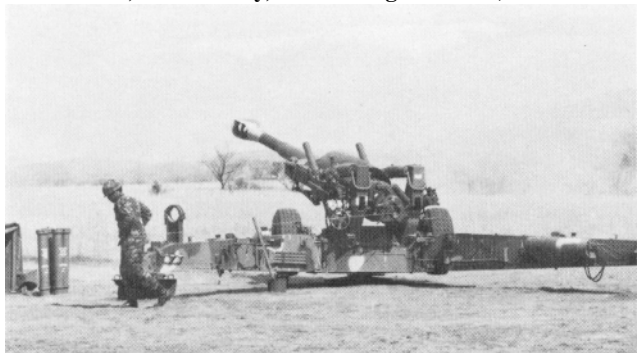
FORT SILL, OK — On 22 February 1983, the US Army Field Artillery Training Center (USAFATC) at Fort Sill received six M198 155-mm towed howitzers. Only two weeks later, a field artillery trainee, Private Nathaniel Farley, Jr., 2d Training Cannon Battalion, pulled the lanyard on one of these howitzers and sent the first round downrange.

Private Farley, who was undergoing 13B one station unit training at Fort Sill, was a member of the 3d Platoon of A Battery, which is part of a COHORT group training together prior to joining and forming C Battery, 6th Battalion, 80th Field Artillery, 7th Infantry Division, at Fort Ord, California. This platoon is the tenth COHORT platoon to undergo training at Fort Sill.

Private Farley and his fellow platoon members trained under a test program of instruction which provided more rigorous and realistic preparation for future duties. By extending the end-of-cycle testing to include a 60-hour extended live fire exercise, evaluators were able to examine the individual soldier's mastery of his field artillery and basic soldier skills in the field. (LTC Thomas R. White, Commander, 2d Cannon Training Battalion, USAFATC)



Personnel from 2d Training Cannon Battalion receive a briefing on the M198 towed howitzer. (Photo by SSG Manuel L. Bencomo, Alfa Battery, 2d Training Battalion)



A trainee from the 2d Training Cannon Battalion pulls the lanyard to fire one of the newly received M198 howitzers. (Photo by SSG Manuel L. Bencomo, Alfa Battery, 2d Training Battalion)



FORT CARSON, CO — Private First Class Winthrop Walker of the 1st Battalion, 20th Field Artillery, checks the collimator during tactical exercises at Fort Carson. (Photo by 1LT David Burns)

Reserve unit completes battery ARTEP

BOISE, ID — An artillery battery of the Montana Army National Guard demonstrated a significant degree of readiness in a recent battery-level external ARTEP. Howitzer Battery, 1st Battalion, 63d Armored Cavalry Regiment, of Harlowton and Lewiston, Montana, reached the milestone during its annual training this year at Gowen Field, Boise, Idaho.

The 30-hour ARTEP included 15 live-fire and five dry-fire missions, one night and two daylight occupation missions, and more than five road movements of 5,000 meters. The cannoneers fired some 460 rounds of high-explosive, white phosphorus, and illumination ordnance in the five-day period which included preparation for and completion of the ARTEP.

According to evaluators from the 3d Armored Cavalry Regiment from Fort Bliss, the battery was successful in all 20 of its assigned missions. The battery special weapons team — singled out by the evaluators as extremely proficient — had only three days of training time in the field prior to the ARTEP. Evaluators also highlighted the readiness of the unit's fire support team and mess section. Its service support facilities and its perimeter defense activities were particularly noteworthy. (CPT Peter D. Fox, 1-163d ACR)

Exercise Quick Thrust '82

FORT STEWART, GA — Elements of the 101st Airborne Division, Georgia National Guard, 18th Airborne Corps; the 9th US Air Force Tactical Air Command; and units from the 24th Infantry Division (Mechanized) participated in Exercise Quick Thrust at Fort Stewart, Georgia, last November.

Designed to validate many of the principles of the AirLand Battle, Quick Thrust proved to be a dynamic, fast-moving exercise. It employed Army and Air Force assets to interdict enemy targets deep within their own boundaries, and this interdiction proved to be a decisive factor in the eventual defeat of enemy forces. The concept of combining heavy and light forces was tested, as well as employing the deep attack as a means to reduce and neutralize oncoming enemy forces.

The 101st Airborne units made an air-assault onto enemy flanks and inflicted telling blows before being whisked back to friendly lines. Of note was the insertion of airmobile field artillery to support these attacks.

Fire support personnel were engaged in the vital task of fire support coordination at all echelons up to the division fire support element (FSE). Their intense involvement added a great deal of realism to the exercise by the inclusion of numerous close air support and joint air attack team missions. Units from the 24th Division Artillery engaged targets simultaneously with Air Force A-10s and Army Cobras. These operations highlighted another overall objective of Exercise Quick Thrust — effective airspace management. (Airspace management and air defense assume extraordinary proportions when the airspace becomes as congested as it did during Quick Thrust.)

The employment of all available fire support assets to combat attacking enemy forces was the responsibility of the division

FSE. The FSE personnel employed conventional, nuclear, chemical, and electronic warfare to deplete advancing enemy formations before they could be introduced into the current battle. The effective use of these fire support assets permitted friendly forces to defeat enemy forces in contact — a sound stratagem rooted in the precepts of the AirLand Battle. The effective use of field artillery assets during the current battle, as well as the deep battle, proved a viable combat power multiplier.

Throughout the exercise, the division artillery tactical operations center (TOC) fought the counterfire battle, planned fires in support of all operations, and deployed assigned units in accordance with their mission. The TOC duty officers constantly maintained an accurate picture of the battlefield and repositioned field artillery assets to support the battle. Target acquisition assets, provided by G Battery, 333d Field Artillery, were a valuable source of accurate information. Additionally, the AN/MPQ-25 radar was invaluable for producing frequent targets for engagement and for monitoring likely avenues of approach during darkness.

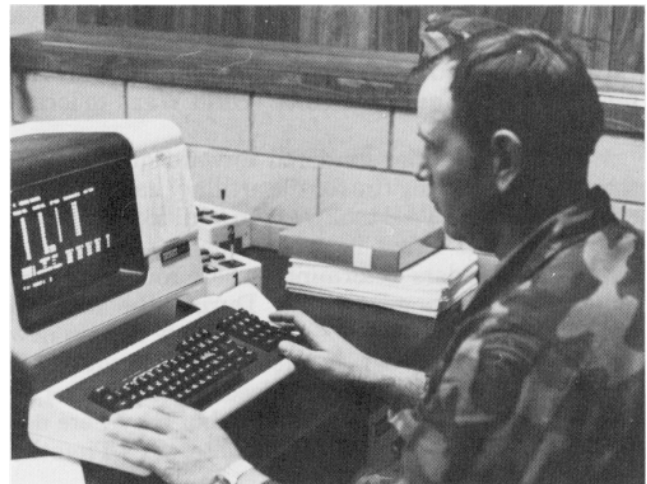
To add realism to an area frequently ignored — logistics — field artillery units were forced to conduct field resupply of food, fuel, and ammunition. In one instance, an aerial resupply of individual combat meals was effected for the 2-35th FA. Supporting Air Force and Georgia Air Guard resupply and airlift capabilities were also tested frequently.

Although Quick Thrust '82 was short in duration, it embodied many sound principles in its planning and execution. It reinforced many aspects of the AirLand Battle, since planning for the deep battle as well as the current battle was ongoing. The greatest lesson learned was an old one — that the Army and Air Force working in unison can defeat their mutual enemy. The concept of the AirLand Battle is a practical one, and Quick Thrust '82 put it to the test. (CPT Kenneth R. Gerhart, 24th Infantry Division (Mechanized) Artillery)

FORT ORD, CA — M198 crewmembers from C Battery, 2d Battalion, 8th Field Artillery, prepare to fire one of their new howitzers during a training exercise at Camp Roberts. (Photo by Tim Guthrie)



FORT CAMPBELL, KY — Sergeant First Class Rodney Reynolds, 1st Battalion, 321st Field Artillery, programs the training set, fire observation for one of its many modes. The new audio-visual computer training system can simulate day and night battlefield operations as well as visual characteristics of smoke and illuminating ammunition. The system is capable of training 30 people at a time in a classroom. (Photo by SP4 Philip H. Jones)





FORT RILEY, KS — Sergeant Theodore Meadows of Headquarters and Headquarters Battery, 1st Battalion, 7th Field Artillery, 1st Infantry Division (Mech) Artillery, scopes out the impact area for targets during a recent training exercise at Fort Riley. (Photo by William J. Griffith)



GRAFENWOEHR, GERMANY — Members of Battery F, 333d Field Artillery (TAB), are interviewed by Lieutenant Terri Taylor, 148th Public Affairs Detachment (IDARNG). In March this year, the 3d Armored Division Artillery played host to 11 National Guardsmen from the 148th. The Idaho-based journalists, photographers, and radio-TV crews spent six days with the Redlegs and covered a variety of activities, to include the 2-3d FA and 1-40th FA ARTEPs, the 2-6th FA chemical decontamination exercise, the 2-27th FA TACFIRE operations, and the target acquisition battery's radar section training.

Charlie TAB trains with 8th Div Arty

GRAFENWOEHR, GERMANY — The soldiers of C Battery (Target Acquisition), 333d Field Artillery, supported the 8th Infantry Division (Mechanized) Artillery during density training in Grafenwoehr early this year. Battery C found the targets, and the division artillery shot them.

The target acquisition battery (TAB) used passive and active systems to locate hostile fire. Sound and flash platoon forward observers, positioned over a few kilometers, located enemy firing points to within 100 yards. The sound and flash platoon also used sound ranging, a technique used since World War I to locate enemy fire.

When bad weather hindered forward observers in their job of adjusting fire for the artillery batteries, the radars of Charlie TAB took over. In addition to finding the location of firing batteries, the AN/MPQ-4 or AN/TPQ-37 radars determined where rounds landed and helped units adjust fire. During the division artillery exercise, Charlie TAB used only its two new AN/TPQ-37 Firefinder radars. Some Charlie TAB soldiers received training in Vilseck on the battery's new AN/TPQ-36 Firefinder radars, but they were not used in this particular training exercise. (SP4 Timothy Canny)



Private First Class Jose Peralta, an AN/TPQ-37 radar operator with Battery C (Target Acquisition), 333d Field Artillery, bore-sights the radar antenna during an 8th Infantry Division (Mechanized) Artillery training exercise. Peralta is one of 11 soldiers who work together as the crew for the Firefinder radar. (Photo by SP4 Timothy Canny)



FORT ORD, CA — Sergeant Julio Santiago demonstrates a ground surveillance radar during a tactical tutorial presented by the 107th Military Intelligence (CEWI) Battalion. The tutorial emphasized the role of the All Source Intelligence Center and state-of-the-art direction finding and jamming equipment. (Photo by Larry Willens)



FORT RILEY, KS — Private First Class James Crosby and Private First Class Robert Mendivil, both of Battery C, 1st Battalion, 7th Field Artillery, 1st Infantry Division (Mech) Artillery, Fort Riley, work up a fire mission in support of the unit's recent Forward Observer School. (Photo by William J. Griffith)



FORT CARSON, CO — Private Russell Souders of the 1st Battalion, 20th Field Artillery, waits for the command to ram a projectile during recent training at Fort Carson. (Photo by 1LT David Burns)

Commanders Update

COL Daniel I. Whiteside
18th Field Artillery Brigade

COL James F. Lynch
75th Field Artillery Brigade

COL Dennis R. Runey
Grafenwoehr Training Area

LTC Howard J. Von Kaenel
1st Battalion, 2d Field Artillery

LTC William B. Clark
6th Battalion, 10th Field Artillery

LTC Nick C. Harris
1st Battalion, 11th Field Artillery

LTC Leroy Zimmerman
3d Battalion, 18th Field Artillery

LTC Terry R. Creque
1st Battalion, 22d Field Artillery

LTC Edwin N. Simpson
1st Battalion, 30th Field Artillery

LTC Robert J. Bezek
2d Battalion, 37th Field Artillery

LTC Douglas J. Middleton
1st Battalion, 41st Field Artillery

LTC Paul J. Muller
2d Battalion, 42d Field Artillery

LTC Lewis M. Bishop
1st Battalion, 81st Field Artillery

LTC Carlos C. Langston, Jr.
570th Army Artillery Group

LTC David M. Anderson III
5th Composite Training Brigade

LTC Arthur G. Lozeau
3d Battalion, 3d Basic Training
Brigade

LTC John F. Murray
96th Combat Assault Battalion
(Airborne)

TOC-A-TOY

by Major James M. Johnson

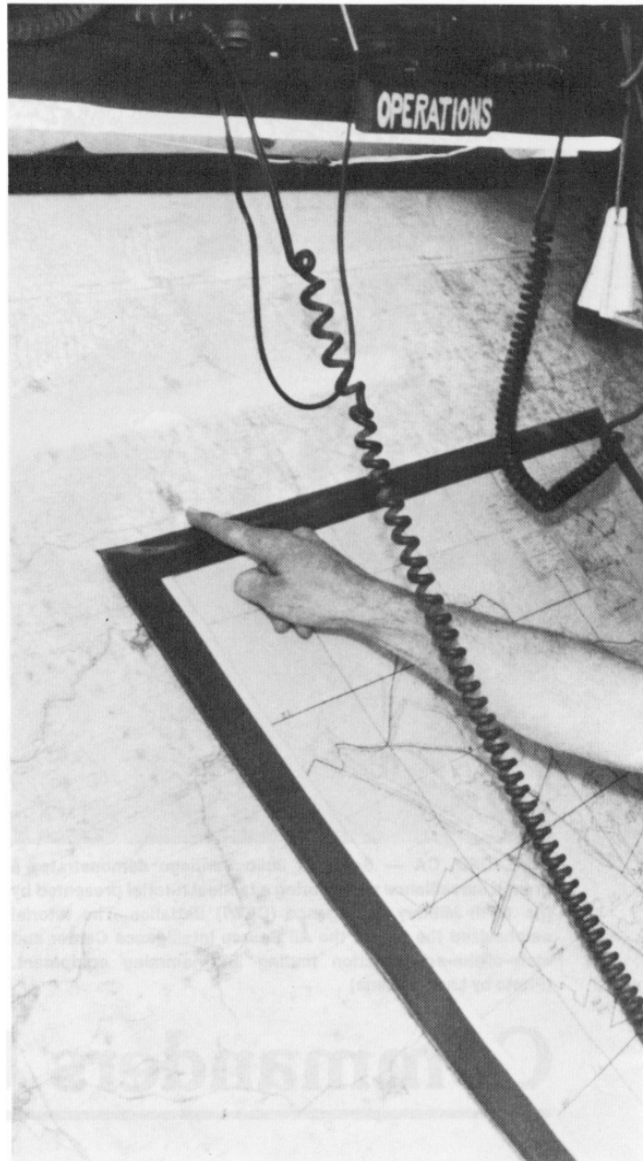


The ability to command and control howitzer batteries during displacements without disrupting the delivery of fires to supported maneuver forces has always been a challenge for field artillery commanders. The 2d Battalion, 78th Field Artillery, the direct support battalion (155-mm, self-propelled) for the 3d Brigade, 1st Armored Division, stationed at Warner Barracks, Bamberg, Germany, is testing a new concept — an artillery tactical command post (TAC CP) — that alleviates many of the problems inherent in controlling the movements of subordinate units.

Since World War II, the United States Army has, as a matter of faith, equated mobility with the use of tracked vehicles. The current family of self-propelled howitzers and command post carriers has given field artillery battalions cross-country mobility equal to the maneuver units which they support. This generalization about mobility has led to an operational compromise in the use of the tactical operations center (TOC) that has over the years degraded rather than added to the overall capability of a field artillery battalion. As a result, commanders have had to jury rig a jump TOC or TAC CP that disrupts the operations of the main TOC during movements, without providing a commensurate gain in command, control, communications, and intelligence (C³I) support.

The 2d Battalion, 78th Field Artillery, has approached the problem of jumping the TOC by using a wheeled vehicle that allows rapid displacement along the excellent road nets of Western Europe with virtually no loss of control or tactical fire direction. The TAC CP, fondly referred to as the TOC-a-Toy, is a modified M185A3 shop van acquired by the battalion in July 1982.

The commanding general of the 1st Armored Division and the division artillery commander authorized the battalion commander to retain the van for



one year to test its capabilities for improving C³I. In less than two weeks, talented members of the battalion converted the shop van into a command and control center that was first tested during REFORGER '82. The van allowed the S3 and the assistant fire direction officer, while in a jump mode, to position and direct the fires of three organic firing batteries, three howitzer batteries of the 3d Armored Cavalry Regiment over which the battalion had operational control, and the 8-inch self-propelled batteries of the 3d Battalion, 37th Field Artillery, which had a reinforcing mission. At one time in the exercise, the TOC-a-Toy replaced the TAC CP of the 3d Armored Cavalry Regiment when a communications failure degraded the regimental commander's ability to command the squadrons of the regiment. The merits of the concept were revalidated in October 1982 during the battalion's ARTEP.



All photos by author

The traditional approach to displacement has been to jump the S2's M577A2 forward with the advance party of the headquarters battery or to position the jump facility with one of the firing batteries. Both solutions have involved the dismantling of a part of the TOC (fire direction center, operations, and S3 tracks) which resulted in a lengthy period of time during which the complete TOC had to operate at diminished capability. The time required for setup and the ensuing disruption of operations when the three tracks linked up after movement pointed out time after time that another alternative was needed.

The TOC-a-Toy has allowed the 2-78th FA to utilize a completely operational TOC and a TAC CP similar to that of infantry and armor battalions. Two off-shift operations personnel and two off-shift fire direction center (FDC) personnel jump forward to the new TOC site or an alternate location along existing roads and set up in five minutes or less. The current operational status is passed by secure

voice; a radio check is made with higher headquarters; battery FDCs are contacted on the battalion jump fire direction net (FD4), which each FDC monitors on an auxiliary receiver; and the TAC CP takes control until the TOC has moved and become operational.

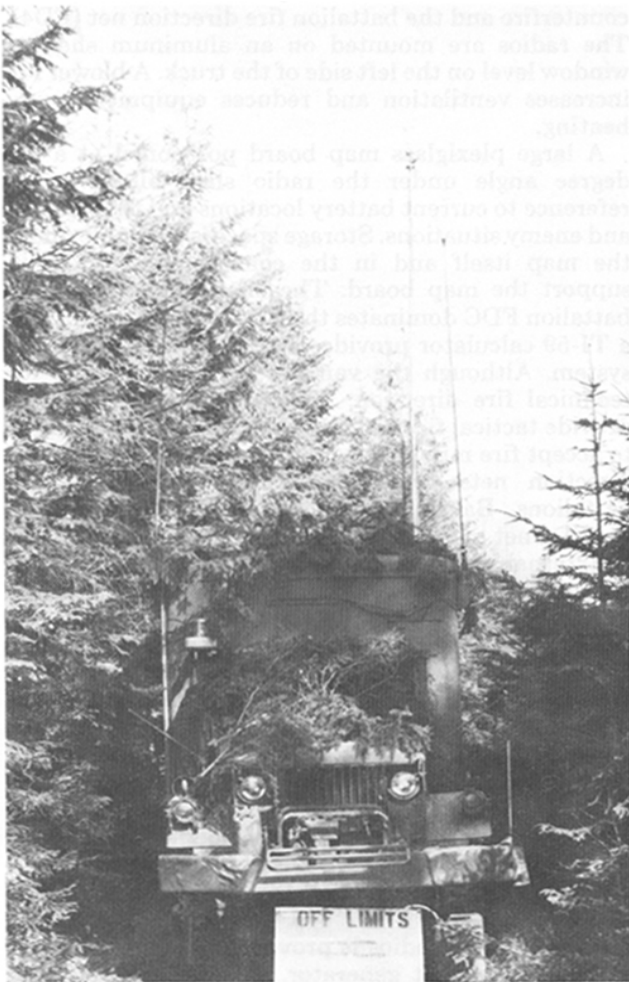
Alternatively, the TAC CP, because of its mobility, can increase the survivability of the TOC by displacing and operating for a period of time at other locations to change the communications signature. A wire team accompanies the vehicle to provide local security. During REFORGER '82 the TAC CP maintained control several hours each day from several locations. As a result, the TOC was protected; and the frequency of TOC displacements was reduced.

The characteristics of the truck facilitate the accomplishment of the operational missions. The van is divided by a plywood wall into operations (2/3 of the space) and FDC (1/3 of the space) compartments. An open doorway allows the battalion S3 and assistant fire direction officer (FDO) to oversee activities in both areas. Two radios are in each section. Operations personnel monitor the secure battalion command/fire (CF1) net and the 1st Armored Division Artillery command/intelligence net. Fire direction personnel monitor the division artillery fire direction net for counterfire and the battalion fire direction net (FD4). The radios are mounted on an aluminum shelf at window level on the left side of the truck. A blower fan increases ventilation and reduces equipment overheating.


A large plexiglass map board positioned at a 45-degree angle under the radio shelf allows ready reference to current battery locations and the friendly and enemy situations. Storage space is available under the map itself and in the console constructed to support the map board. The check chart from the battalion FDC dominates the FDC compartment, and a TI-59 calculator provides a backup for the manual system. Although the van has these accessories for technical fire direction, it is designed primarily to provide tactical fire direction. Battery FDCs continue to accept fire missions from forward observers on fire direction nets dedicated to respective maneuver battalions. Battalion mass missions are processed on the FD4 net.

External conveniences mounted on the van are really time savers. For example, a whip antenna is mounted at each corner of the roof; and two OE-254 antennas are raised at opposite corners. The heads (without antenna elements) and three sections of the antenna mast are constantly in place, strapped to the corners of the van. The antenna elements are stored in metal tubes affixed to the sides of the truck. A ladder, welded to the rear of the van, allows an individual to climb on the roof and emplace the elements. As soon as these elements have been mounted, the antennas are raised to operating height a section at a time from the ground. No guy wires are necessary.

Power for the radios is provided by a 1.5-kilowatt, alternating-current generator. The front bumper of



the truck was moved forward 22 inches to make room for the generator mounting. The battalion maintenance technician rewired the electrical system to allow the use of alternating current for electrical outlets and fluorescent lights over the maps. Additionally, the control box of the van rectifies the current to charge the batteries and power the radios. Once the grounding rod is in place, the van can operate for hours as a self-contained unit.

The fielding of TACFIRE may force a reexamination of the TAC CP concept. In the interim, the experience of the 2-78th FA indicates that there is a place for a wheeled TAC CP in direct support artillery battalions in Europe. For the future, serious consideration should be given to equipping a jump TAC CP with a variable format message entry device, which will allow the battalion commander to maintain command and control of his own battalion during displacements without passing functions to a mutually supporting unit. With or without TACFIRE, the benefits of the TOC-a-Toy as a solution to the problem of displacement far outweigh the costs since the need for continuous command and control brooks no compromise. 

MAJ James M. Johnson, FA, is a graduate of the US Military Academy and received his M.A. and Ph.D. in history from Duke University. He is a former instructor and assistant professor of military history at USMA. He served as S3 and Bravo Battery commander with the 1st Battalion, 2d Field Artillery, in Germany; as the HHB commander with the 1st Battalion, 38th Field Artillery, in Korea; as the REFORGER action officer, ODCSOPS, USAREUR, Heidelberg, Germany; and as the S3 of the 2d Battalion, 78th Field Artillery in Germany. He is currently attending the Naval Staff College in Newport, Rhode Island.



Photo by Sam Orr

Hard Life of Software

by Lieutenant Colonel (Retired) Troy L. Madison

The days of voice command and control are numbered. The field artillery has entered the digital world of automatic data processing (ADP) with a speed few Redlegs would have thought possible. TACFIRE, the battery computer system (BCS), the fire direction systems (FDSs) of the Multiple Launch Rocket System (MLRS) and Lance, the Firefinder radars, and the fire support team (FIST) digital message device (DMD) — ADP is at the core of each of them, and they are *now* or will very soon be *in the field*. Few field artillerymen fear their arrival, but many fear that their proliferation will create a babble of digital tongues which no

one can understand. The concept of interoperability is the field artillery's hedge against such an eventuality.

When one talks the language of ADP, interoperability is the real-time capability of different ADP systems to exchange and process error-free data without any requirement for operator intervention or action and to produce understandable, usable information. The responsibility for insuring that the concept is realized within the field artillery rests with the US Army Field Artillery Center.

Once a tactical automatic data processing system

has been conceived, designed, developed, tested, and released to field artillery units, the Field Artillery Center oversees the continuing performance of the system software. (*Software* is the term for applications programs internal to the ADP system which cause it to produce the data required.) The existing procedures to support software changes — whether to incorporate new weapons and procedures or to correct any detected errors — have their basis in the requirement for all elements of the system to be interoperable in real time. The manager of these procedures at the Field Artillery Center is the Training and Doctrine Command (TRADOC) Combat Developments Software Support Facility (CDSF). This facility analyzes fielded system software, decides what changes are necessary, and schedules the implementation of required changes. It provides all of this information to another Field Artillery Center agency — the Field Software Support Group, which has the contractor support to do software changes. The procedural flow required to accomplish a software change and get the new capability into operating programs is shown in figure 1, and interoperability depends on following this process without deviation. Each version of system software is the starting point, or baseline, for the required changes that follow; and the complete history of the system configuration is managed by the Combat Developments Software Support Facility.

System software must change over time in order for it to remain responsive to user needs in any combat environment. The following list portrays those events which keep the field artillery tactical ADP systems' software in a dynamic state of change throughout the software's life cycle.

- The introduction of new doctrine or procedures.
- The introduction of new computer hardware.
- The introduction of additions or changes in the ADP data base required to support new weapons or ammunition.
- The introduction of supporting systems with which interoperability must be maintained.
- The correction of programming errors in previous software versions.
- International agreements and Joint Service interoperability requirements.
- The introduction of additions or modifications to support intra-Army systems interoperability.
- The demands of the fielding schedules for new interoperating subsystems.

As mentioned earlier, each master tape version for each system has its baseline in the previous master tape version for that system; and the members of the CDSF exercise extreme care in the preliminary design, the detailed design, and the code-debug phases of



Photo by Sam Orr

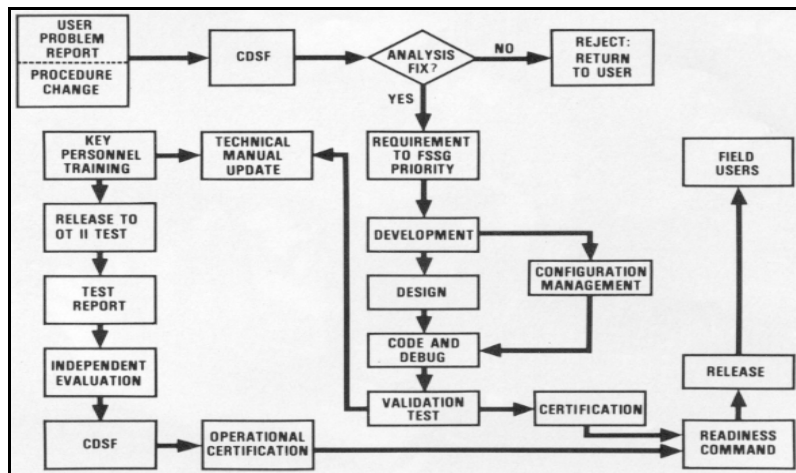


Figure 1. Field Artillery ADP software change process.

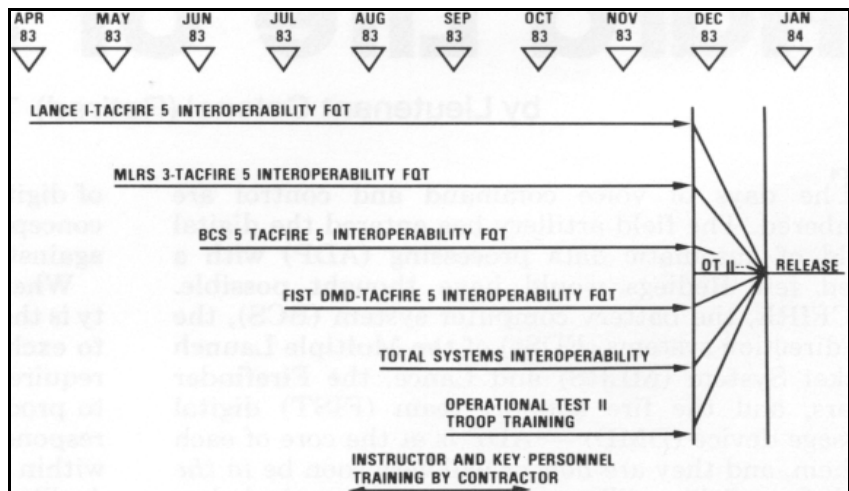


Figure 2. Field Artillery ADP software testing schedule.

software development in order for the master tape to be interoperable with other ADP systems and with the follow-on baselines. (In the code-debug phase, the Field Software Support Group programmers change the language of the field artillery into computer language and then insure that the software program does what it is supposed to do.) A new master tape version goes into production every six months and has a lead time of 18 to 21 months before its scheduled completion. Once the detailed design is completed for the early phase of tape production, the Field Software Support Group designers move on to the next master tape version. Meanwhile, Field Software Support Group programmers begin the work of code-debug. Their work is followed by validation and verification of the master tape by an independent testing agency; and then the ADP system is released to an operational test scenario to insure operational suitability, trainability, and supportability.

One can gain a better understanding of how this process of change really occurs through an examination of the current schedule of events which will result in the fielding of completely interoperable software by January 1984. Presently, the TACFIRE master tape version 4 is in the hands of troops. The battery computer system cannon master tape version 4 is now being fielded with that system, as is the Multiple Launch Rocket System fire direction system master tape version 2 with its system. The TACFIRE master tape version 5 is currently in the code-debug phase; and the software baseline for the start of its design was TACFIRE version 4, BCS cannon version 4, and MLRS FDS version 2. In addition to incorporating this baseline, TACFIRE version 5 must be capable of interoperating with the BCS cannon version 5, the MLRS FDS version 3, the Lance FDS version 1, and the FIST digital message device implementation in TACFIRE and BCS.

The schedule for this effort from start to fielding is shown in figure 2. Each separate system's software version is tested for interoperability during formal qualification testing (FQT) and during total systems integration testing — both tests occurring in a laboratory environment. All software systems then must make it through a field operational scenario in which military personnel operate the systems. Each of these tests is called an operational test II (OT II), which is the test of engineering development prototype equipment prior to any production decision. Complete interoperability must be demonstrated using tactical communications before the new software is released to field users.


Following successful testing, the Communications and Electronics Command must certify the correctness of the software and its configuration management; and TRADOC must certify the trainability, the operational suitability, and ballistic safety considerations. The Communications and Electronics Readiness Command will then release the new software to fielded units. The new master tapes, supporting documentation, and technical manuals will be distributed through national maintenance points.

The issue of new software is a push process — in other

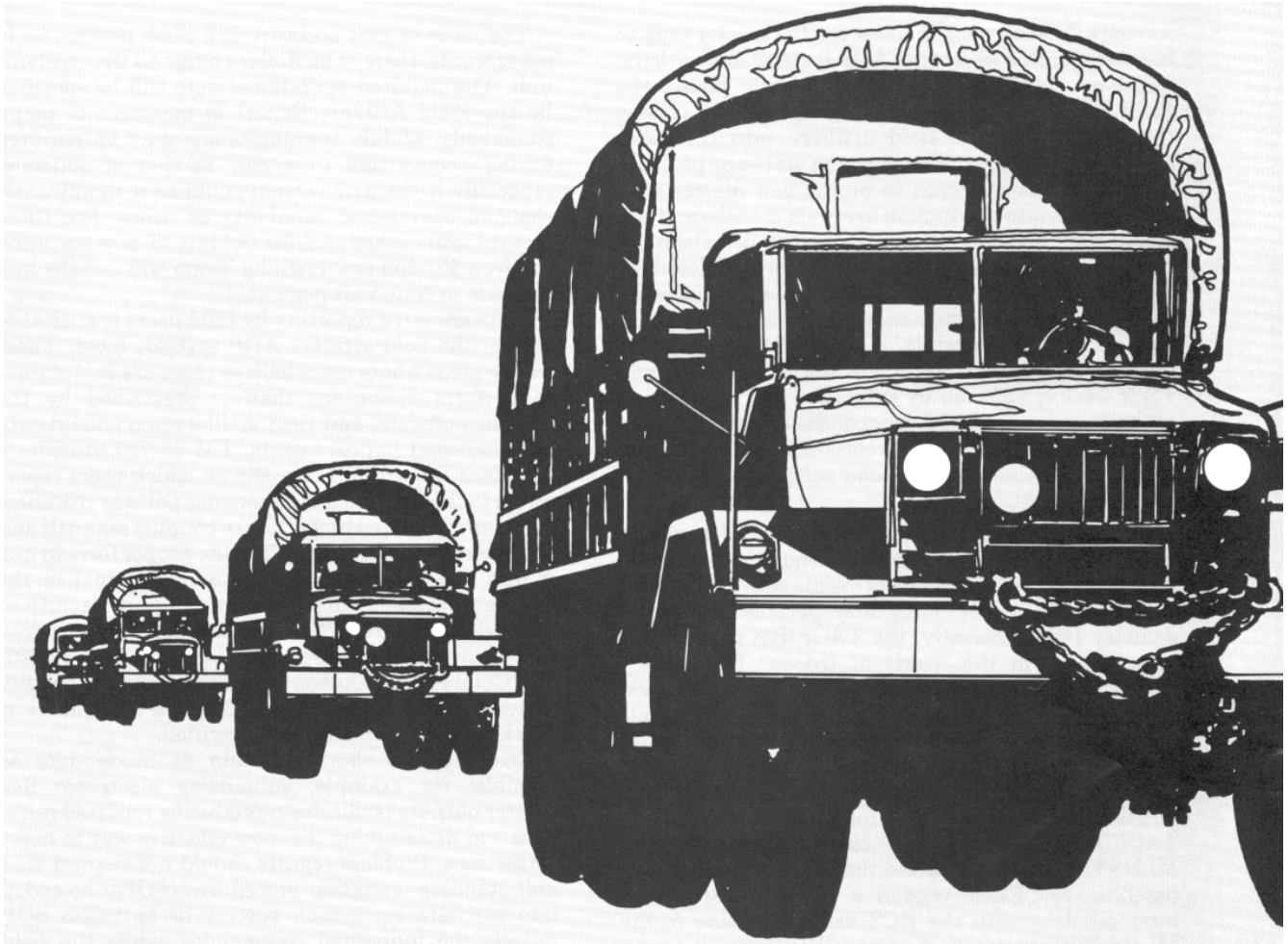
words, there is no dollar charge to the receiving unit. The required operational date will be specified by the Field Artillery School in messages to major commands. Mobile training teams may be required during conversion to a new version of software, especially if the new version contains a significantly changed operational capability or usage. For those tactical units scheduled for fielding of new software, the New Equipment Training Team will use the new software to train unit personnel.

Software error reporting by field users is critical to getting the field artillery ADP systems fixed. There will be areas where users believe there are better ways to perform operations than is prescribed by the existing software, and field artillerymen should submit suggested improvements. TM 38-750 provides a Standard Reporting Form 368 on which users report errors to their national maintenance point or readiness command; for reporting errors in training manuals and field manuals, DA Form 2028 is the proper form to use. A new telephone hotline is now operational in the Combat Developments Software Support Facility at Fort Sill for reporting field artillery software errors — a 24-hour recorder operates on AUTOVON 639-5607. The Combat Developments Software Support Facility systems software manager will respond to inquiries as quickly as the problem can be verified.

Error reports should contain as much data as possible; for example, submitting electronic line printer outputs facilitates reproducing reported problems and determining the most effective way to make corrections. Problem reports should not request that unit standing operating procedures (SOPs) be coded into software since each battery or battalion SOP reflects the individual commander, while the field artillery ADP systems must remain completely interoperable for deployment with all field artillery units.

Future issues of the *Field Artillery Journal* will certainly reflect the growth and dominance of ADP-assisted command and control. That such systems must be interoperable is the understanding which is the bedrock of the entire concept. Insuring that interoperability is a reality in the digital world will require that field artillerymen communicate continuously in the voice world — the field users must talk to the Field Artillery Center software managers and help them keep the systems in step with the constant change in doctrine, procedures, hardware, weapons, ammunition, and the like. If field artillerymen continue to make life hard for their system software, it can be molded to meet their needs. 

LTC (Ret) Troy L. Madison, FA, served in the Army during World War II and the Korean Conflict eras. In addition to his combat assignments, he was an instructor in the Tactics and Combined Arms Department, US Army Field Artillery School (USAFAS). He received his B.A. from Auburn University and his M.A. from Oklahoma University. Currently, he is employed as a Department of the Army civilian in the Tactical Data Systems Division, Directorate of Combat Developments, USAFAS. He has been involved in TACFIRE development since 1968.



The fog of war aptly describes the confusion of battle. As a callow young second lieutenant, I found myself confused by another type of fog — the early morning variety familiar to anyone who has spent time in Germany. As the executive officer of Bravo Battery, a self-propelled artillery unit, I was to be in charge of the battery as it moved as part of a battalion convoy to a large training exercise in the German countryside. This fairly common and routine activity did not initially cause me any undue concern, but by the end of the road march I had formed a very literal view of the fog of war.

Because units move all over Germany to conduct training, day-long road marches are not uncommon. There are a few basic rules which I dutifully followed to organize the battery for the road movement.

First, I considered the number and types of vehicles which would be in the convoy. The howitzers themselves were tracked vehicles, so they went by train. This left 5-ton ammunition trucks as the largest vehicles to move by road. At that time, those vehicles were always kept loaded with our basic load of ammunition which had to go with us wherever we went, to include field exercises.

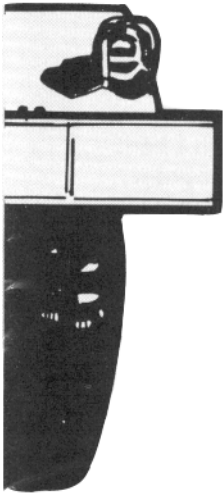
There were four of these 5-ton trucks in the battery; but, since there was about 40 tons of ammunition in the basic load, each truck carried a 100 percent overload. This overload was not a problem as long as the trucks stayed on hard-surfaced roads because the 5-ton rating was based on cross-country movement. However, since the training exercise would require cross-country movement, I needed more ammunition carrying capacity; and I got it in the form of two 11-ton tractor-trailers from a nearby transportation battalion. The basic load was rearranged so that each of the trucks carried their proper cross-country load.

In addition to the six ammunition trucks (four 5-ton and two 11-ton) I had 10 other vehicles. These were four 2 1/2-ton trucks, three 3/4-ton trucks, and three 1/4-ton trucks or jeeps. The first principle of convoy organization is to put the heavier vehicles in the front so they can set the pace. That was easy: first the 11-ton trucks and then, in order, the 5-ton, the 2 1/2-ton, the 3/4-ton, and finally the jeeps.

The second principle is to have radio communications between the front and rear of the convoy for control. That too was easy, but it would violate the first principle because the only vehicles with radios were my jeep, which would lead, and the fire direction

THE FOG OF WAR

by Lieutenant Colonel Clayton R. Newell



center (FDC) in a 2 1/2-ton truck. So, the FDC ended up in the rear for communications.

A third principle is that a maintenance capability should be at the end of the convoy to assist with any mechanical breakdowns along the way. In consonance with that principle I put the maintenance section, in its 2 1/2-ton truck, behind the FDC. I was thus left with two fairly large trucks at the end of the convoy. The order of vehicles was a bit unsettling. It seemed that each time I tried to apply one of the principles alleged to insure a good convoy I violated one of the other principles.

Even though the order of march varied from the ideal, I did comply with the principle to insure that every driver knew the route and destination. Each vehicle had a strip map showing the route, which was primarily along the German turnpike system, the autobahn. I also made sure that each driver knew which vehicle to follow, but this precaution proved to be a mixed blessing because some drivers put their emphasis on the map while others concentrated on following the vehicle ahead.

On the appointed day, drivers briefed and ready, we set out in the wee dark hours of the morning. Bravo Battery was to move, very sensibly, behind Alfa Battery and ahead of Charlie Battery, with 30-minute intervals between batteries. The first hour of the move was uneventful. Then we entered the fog.

It was not a very dense fog, or even very widespread; but it initiated a chain of events which kept me thoroughly confused for the entire day. As we approached a major autobahn intersection, the sergeant in charge of the ammunition section, riding in the first 5-ton truck, lost the truck in front of him in the fog. He also momentarily lost track of where he was going and took a wrong turn onto the intersecting autobahn. I say momentarily lost track because he shortly recovered his sense of direction, realized his error, and spent most of the rest of the day driving at a high rate of speed trying frantically to catch the rest of the battery.

Unfortunately he was not alone. When he turned, all of the 5-ton trucks turned with him. He was their leader; and regardless of maps or instructions from a second lieutenant, those drivers followed their leader.

Fortunately, the driver of the first truck behind the ammunition section was the supply sergeant; and he elected to follow the map, not the vehicles in front. At this point I was literally in a fog and had no idea what had happened. The only people who did know had no way to tell anyone else.

As the convoy drove out of the fog, I could see behind me that four trucks were missing; and my mind entered a fog of its own. My reaction was to slow down so the missing trucks could catch us. That was the wrong thing to do.

A fuel stop, scheduled to take 20 minutes, was fast approaching. Charlie Battery was only 30 minutes behind us, which meant that I could lose only about 10 minutes before my problem would also have an effect on Charlie Battery.

My trucks did not catch us before we finished the fuel stop; but due to our reduced speed, Charlie Battery did. The rest area had been selected based on the size of one battery, not two. Therefore, when Charlie Battery started into the area, we had to exit rapidly, in a somewhat confused state.

With four trucks missing and my mind firmly in a fog, I hastily led the battery back onto the autobahn — too hastily as it turned out. It was my turn to momentarily lose track of where I was, and I missed the next intersection. As opposed to the supply sergeant's error when he turned instead of going straight, I went straight when I should have turned.

The 11-ton tractors and their trailers dutifully followed my lead, as did the next two trucks in line. The supply sergeant may question when the ammunition sergeant makes a wrong turn, but not when the executive officer does. The remainder of the battery, having been delayed at the fuel stop due to traffic, did not see us miss the turn and so went the proper direction, following the map in the absence of a truck to follow. They, however, believing themselves to be lagging behind, increased their speed in a misguided effort to catch up.

I had now reduced my convoy from 16 vehicles to five, and those five were going in the wrong direction — a situation calling for drastic action.

What I took was desperate action. If there is one thing that is drummed into your head about driving on Germany's autobahns, it is that U-turns are absolutely forbidden and are punishable by the severest measures. Somehow, in the fog, that little tidbit of information escaped me as I considered possible courses of action.

It is actually anticlimatic to report that a U-turn was successfully accomplished on the autobahn with two 11-ton trucks loaded with ammunition and two 2 1/2-ton trucks loaded with miscellaneous equipment. There is no doubt in my mind as I reflect back that the patron saint of second lieutenants, whoever it might be, was watching out for me that day.

All the drivers smartly executed the U-turn, however ill-conceived; and my rapidly diminishing force lost very little time getting on the proper road again. In the meantime, the remainder of the battery was working hard to rejoin their theoretical leader — me.

The 5-ton ammunition trucks, by now a semi-independent operation, had joined Charlie Battery at the fuel stop. Their relief at catching the rest of the battery was short-lived when they discovered it was the wrong battery. The sergeant, figuring that he would rather drive too fast than be completely lost, moved around Charlie Battery and continued the pursuit of Bravo Battery.

By now the entire battery was moving along at a great rate of speed. The only good thing at this point was that all of the trucks were running very well and that there were no drop-outs to further confuse the issue.

Each of the sub-convoys was rapidly trying to catch somebody. I was trying to catch that part of the battery I knew had to be in front of me. They, in turn, were rapidly trying to catch me because they thought I was still in front of them. The ammunition section was trying hard to catch me, a task made more difficult by my trying to catch the rest of the battery.

While engaged in this multiple pursuit I came close to coming out of the fog. I knew that one-third of the battery was ahead of me, one-third was with me, and presumably one-third was behind me. If, I thought, I could catch the one-third ahead of me, then I could slow down and maybe the one-third behind me would catch up before we reached our destination. That way we could arrive "sort of" together, although a bit muddled.

As I clutched at this straw, a call on the radio from the FDC, which was leading one portion of the battery, threw me abruptly back into the fog. They reported proudly that they had rejoined the rest of the battery and that all was well. The report confused me once again. Even though I was still in a fog of my own, the countryside was clear and sunny; and there was no trace of anyone behind me. In any case, I knew that part of the battery had to be ahead of me.

Later, I learned that they had actually joined the rear of Alfa Battery. They remained there until Alfa Battery reached their destination and found an extra six trucks in line. Thus, I had managed to get both other batteries


involved in my adventure.

Meanwhile, as I pondered the location report sent by the FDC, we had our only vehicle mishap — the canvas top on my jeep very slowly ripped apart. While relatively minor, it had a profound effect on me. From one side of the jeep to the other a large tear moved slowly above my head until the front half fell down to effectively block all vision to the front, and the rear half flapped merrily in the breeze. My ever-alert driver slowed down immediately and, followed by the few, albeit large, trucks still with us, pulled into the nearest rest area.

Unfortunately the rest area was a bit small, and the two 2 1/2-ton trucks had to remain outside on the shoulder of the autobahn, which was not all bad as it turned out, because as we pulled off the road, the valiant efforts of the ammunition sergeant finally bore fruit. He and his trucks were right behind us. Had he not recognized the supply truck and the mess truck parked on the side of the road, he would have missed us completely.

Fortunately, he had the presence of mind to slow down and wait for me to catch him. After a brief bit of surgery on the top of my jeep, I was back on the road with most of the battery reunited. Even though I had no idea where the rest of the battery was at that point, I planned to simply continue to our destination and sort things out there. I did hope the battery commander would be sympathetic with my having lost part of his command, but I had my doubts.

As I dubiously led the remnants of the battery off the highway into the assembly area to meet the battery commander and the advance party, the fog in my head lifted. The rest of the battery was coming down the road toward me. They had been found tagging along behind Alfa Battery and were sent off to find their own home. We all arrived "sort of" together; and the battery commander, glad to see that everyone made it safely, did not question me too closely about how my day went.

It was not until I had the chance to talk to all of the drivers and sergeants involved that the events of the day became clear in my mind. Even as I look back with the benefit of 20/20 hindsight, I am not sure what I would have done differently that day. I do know, however, that when I read about the fog of war there is no doubt in my mind about its aptness, both literally and figuratively. 

LTC Clayton R. Newell, now an infantryman, started his career as a field artilleryman. He received a B.S. degree from Arizona State University and a Certificate of Graduate Study in the History of Policy and Strategy from Old Dominion University. He served tours in Vietnam and Germany and is a graduate of the Command and General Staff College. He was a field artillery battery executive officer, tactics instructor, and battery commander. His infantry assignments include those of company commander and battalion S3 and S4; in addition, he has been a division G3 staff officer and a TRADOC staff officer. He is currently an assistant TRADOC systems manager at Fort Huachuca, Arizona. He has had material published in *Army and Military Review* magazines.



ADDING AMMO TO THE FIRE

by Major (P) Bloomer D. Sullivan

A good deal of an officer's values get wrapped up in the selection of an additional specialty, and rightfully so. After all, the choice of an additional specialty code (SC) is an important and significant selection for officers since they are likely to spend several years in it and their success or failure will directly influence their total career opportunities.

There are some official guidelines for officers contemplating this choice. Chapter 2, DA Pamphlet 600-3, *Officer Professional Development and Utilization*, indicates that "by the completion of eight years Active Federal Commissioned Service (AFCS) all officers will have had a [additional] specialty designated. The designation of an officer's [additional] specialty will be based on the officer's desires and qualifications, consistent with the needs of the Army." It goes on to note that, "the selection of a [additional] specialty is a key

aspect of not only meeting stated Army requirements but enhancing an officer's professionalism and motivation toward his or her future in the Army." It also points out that restrictions on selection of an additional specialty are few and that an officer should make known his or her choice by the time he or she attends the advanced course.

Given both the personal considerations and the regulatory guidelines involved in the selection of an additional specialty, why should a field artilleryman seriously consider making Munitions Materiel Management, SC 75, his or her informed and reasonable choice? A closer look at the makeup of SC 75 is a good place to begin in answering that question.

Specialty code 75, like most specialty codes, is comprised of subspecialties, or Specialty Skill Identifiers (SSIs).

• **SSI 75A, munitions materiel management, general:** Serves as commander or staff officer in units

or activities requiring management skills in both conventional and special (nuclear and nonnuclear) munitions.

• **SSI 75B, conventional munitions materiel management:** Commands units or serves as staff officer in units engaged in conventional and nonnuclear special ammunition support, to include such functions as supply, maintenance, surveillance, and stock control.

• **SSI 75C, nuclear weapons materiel management:** Commands units or serves as staff officer in units or activities engaged in nuclear special ammunition support, to include such functions as supply, maintenance, inspection, stock control, and security involving nuclear weapons and associated tests, training, and handling of equipment.

• **SSI 75D, explosive ordnance disposal:** Commands or serves as staff officer in units or activities responsible for explosive ordnance disposal (EOD) operations or control. EOD functions include locating, rendering safe, removing, and subsequently disposing of or salvaging unexploded conventional and special explosive ordnance, to include biological, chemical, and nuclear munitions.

It is with SSIs 75A, 75B, and 75C that a field artilleryman is most likely to find a related and professionally rewarding home. The field artilleryman is aware that ammunition supply and ammunition management are an integral part of the field artillery's success or failure. In any given theater, the field artillery consumes from 70 to 75 percent of the ammunition tonnage shipped to that theater. The field artillery is also the most technically demanding of the ammunition resupply system customers since it has the greatest potential number of fuzes, propelling charges, and projectile permutations and combinations which must be provided on a flexible (demand) basis. Thus, the field artilleryman — whether as battery commander, battery executive officer, battery assistant executive officer, or battalion ammunition officer — possesses a job entry level familiarity with the ammunition resupply area that

Table 1. Munitions Materiel Management (SC 75) Course content.

Conventional munitions	Ammunition maintenance and field storage	Explosive safety and transportation	Wholesale munitions management	Ammunition logistics	Nuclear munitions
Artillery ammunition. Mine warfare munitions. Air-dropped munitions and improved conventional munitions. Small rockets and missile systems. Class V components and large rockets and missiles. Demolition material. Foreign munitions.	Ammunition inspection and surveillance. Ammunition maintenance. Examination, surveillance, and maintenance. Storage of ammunition in the theater of operations. Role of the ammunition staff officer. Ammunition supply point internal operations.	Storage of ammunition in CONUS. Class V transportation planning and management. Ammunition drawings.	Munitions research development test and evaluation. Ammunition National Inventory, Control Point. Ammunition production base. Ammunition procurement and production management. Ammunition maintenance management.	Ammunition service in the theater of operations. MILSTRIP in ammunition. Ammunition distribution and stockage requirements. Operational and training ammunition forecasts. Ammunition stock control. Standard Army ammunition.	Army nuclear weapons program. Nuclear surety. Nuclear weapons physical security. Nuclear weapons safety. Storage of nuclear weapons. Transportation and courier responsibilities. Nuclear weapon accident and incident control. Stockpile accountability. Nuclear control orders. Nuclear surety inspections.

may be difficult to replicate for any other logistics-oriented specialty. With this background, the field artilleryman is no newcomer to ammunition handling, safety requirements, transportation, storage, requisitions, or ammunition supply point (ASP) operations.

By selecting Specialty Code 75 as his or her additional specialty, the field artillery officer would be able to build on this experience base by attending a 14-week course at Redstone Arsenal, Alabama — the "home of missiles and munitions" — located in the north central Alabama city of Huntsville. This course, which is one of the major tracks of the Ordnance Officer Advanced Course, has a 435-hour program of instruction (POI) and has six major subcourses. A selected topical outline of each of the subcourses is shown in table 1. This munitions materiel management course also includes extended scenario computer simulations, individual research projects, industrial/government facility tours, and guest speakers. A few opportunities are available for graduate schooling in chemical/explosive engineering, metallurgy, physics, business administration, procurement, and industrial management. An additional

Table 2. Typical officer assignments in SC 75.

Lieutenant/captain	Major/lieutenant colonel	Colonel
Production control officer (shop officer) Company commander Special ammunition staff officer Army National Development and Readiness Command (DARCOM) product/procurement manager DARCOM research officer Service school instructor Ammunition plant executive officer S4	Company commander Battalion materiel/operations officer Battalion executive officer Battalion commander Ammunition plant commander Division ammunition supply officer Staff officer, ammunition branch JCS Assistant Chief of Staff, G4 Munitions staff officer, HQDA	Division support command commander Arsenal commander Support group commander Special ammunition command (brigade) commander Project manager DARCOM plans and analysis officer Division chief, office of the Deputy Chief of Staff for Logistics, DA

opportunity for experience is presented by the highly competitive training-with-industry programs where selectees work in the day-to-day business world as a member of the commercial explosives industry for a year.

Given that the field artilleryman has the experiential base in the field artillery and the knowledge base provided by this course, where is he or she likely to be assigned?

and what would be the type of responsibilities incurred? A diverse range of jobs is available to officers in the munitions field since they perform a variety of functions throughout the ammunition lifecycle from development through production to disposal. At the field level, positions are available in the companies and battalions storing and issuing ammunition to the combat arms user. At the wholesale

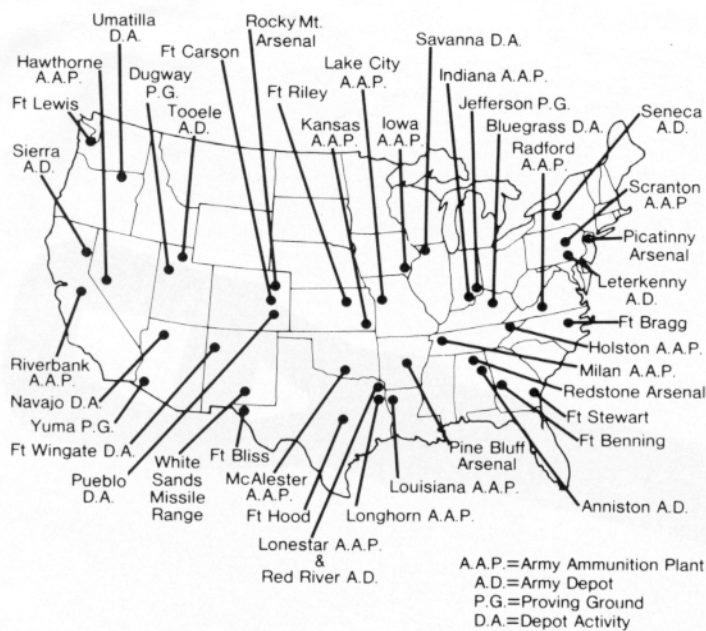


Figure 1. Potential CONUS locations for SC 75 assignments.

level, officers are required in all phases of research, development, production, and inventory management of munitions. Ammunition plants, proving grounds, and depots all have officer positions. Some typical jobs available to officers are listed in table 2.

The greatest percentage (33 percent) of SC 75 officers are assigned to US Army, Europe (USAREUR), where they fill a broad spectrum of staff and command positions. Almost 25 percent of the Specialty Code 75 officers are serving in US Army Forces Command (FORSCOM) units; and frequently assigned posts are Fort Hood, Texas; Fort Bragg, North Carolina; and Fort Lewis, Washington. The US Army Development and Readiness Command (DARCOM) has numerous positions (20 percent of all SC 75 authorizations) at the various ammunition plants and storage depots throughout CONUS, with concentrations at the Picatinny Arsenal in New Jersey and the Rock Island Arsenal in Illinois. Approximately 11 percent of the authorized SC 75s are at US Army Training and Doctrine Command (TRADOC) activities such as the Missile and Munitions Center and School at Redstone Arsenal, Alabama, and the US Army Logistics Center at Fort Lee, Virginia. The balance of the SC 75 position authorizations

(11 percent) belong to a variety of activities, with concentrations at DA and Joint Staff; Eighth US Army, Korea; and US Army Western Command, Hawaii. The geographical locations of potential CONUS assignments are shown in figure 1.

Since most of the ammunition manufacturing capacity is either at government-owned/government-operated or government-owned/contractor-operated plants, the opportunities for civilian employment in this particular field are closely tied to the Federal Government's civilian ammunition specialist career program — although there are opportunities within civilian industry, particularly in the transportation arena. Currently there are some 435 civilian ammunition specialists identified in the various Army commands with the majority (75 percent) located within the Army Armament Materiel Readiness Command. This career field relies

heavily on input from the military ammunition career fields (enlisted and officer) and provides constructive credit toward advanced grade structure placement based on military experience.

Clearly, SC 75 provides the field artilleryman with the choice of an additional specialty that can meet many personal and professional goals. It has a great deal going for it:

- It is an important skill, and the Army needs the field artilleryman's expertise in the area. Field artillery weapons consume over 70 percent of the Army's ammunition, and the field artillery uses the most complex combinations of sophisticated munitions; yet there are currently only 16 field artillerymen with SC 75 at 03 through 06 grade levels against a total of 653 requirements.

- It is one of the few logistics-oriented additional specialties that builds upon the experience readily available to most field artillerymen.

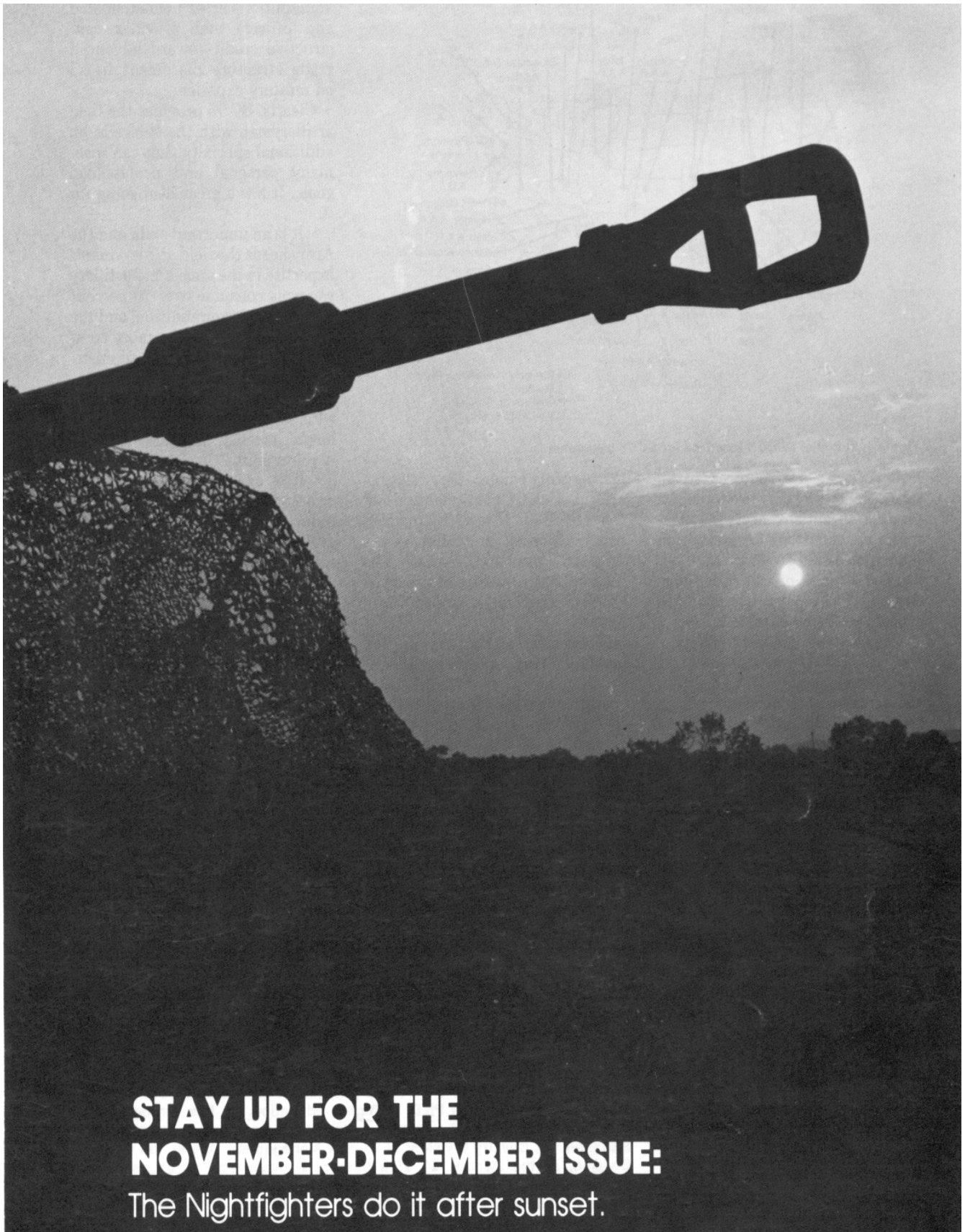
- It is a specialty that offers flexibility in assignment location in both CONUS and other-than-CONUS long and short tours.

- It is a rewarding specialty that has important day-to-day challenges and directly affects the outcome of battle.

- It has a meaningful training program which allows a field artilleryman to obtain on-the-job experience that will be very attractive to the civilian business community.

When a field artillery officer confronts the decision on the most attractive alternate specialty, he or she should realize that field artillery gunners and munitions managers are kindred professionals and that in this instance no harm will come from adding ammo to the fire. ☒

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