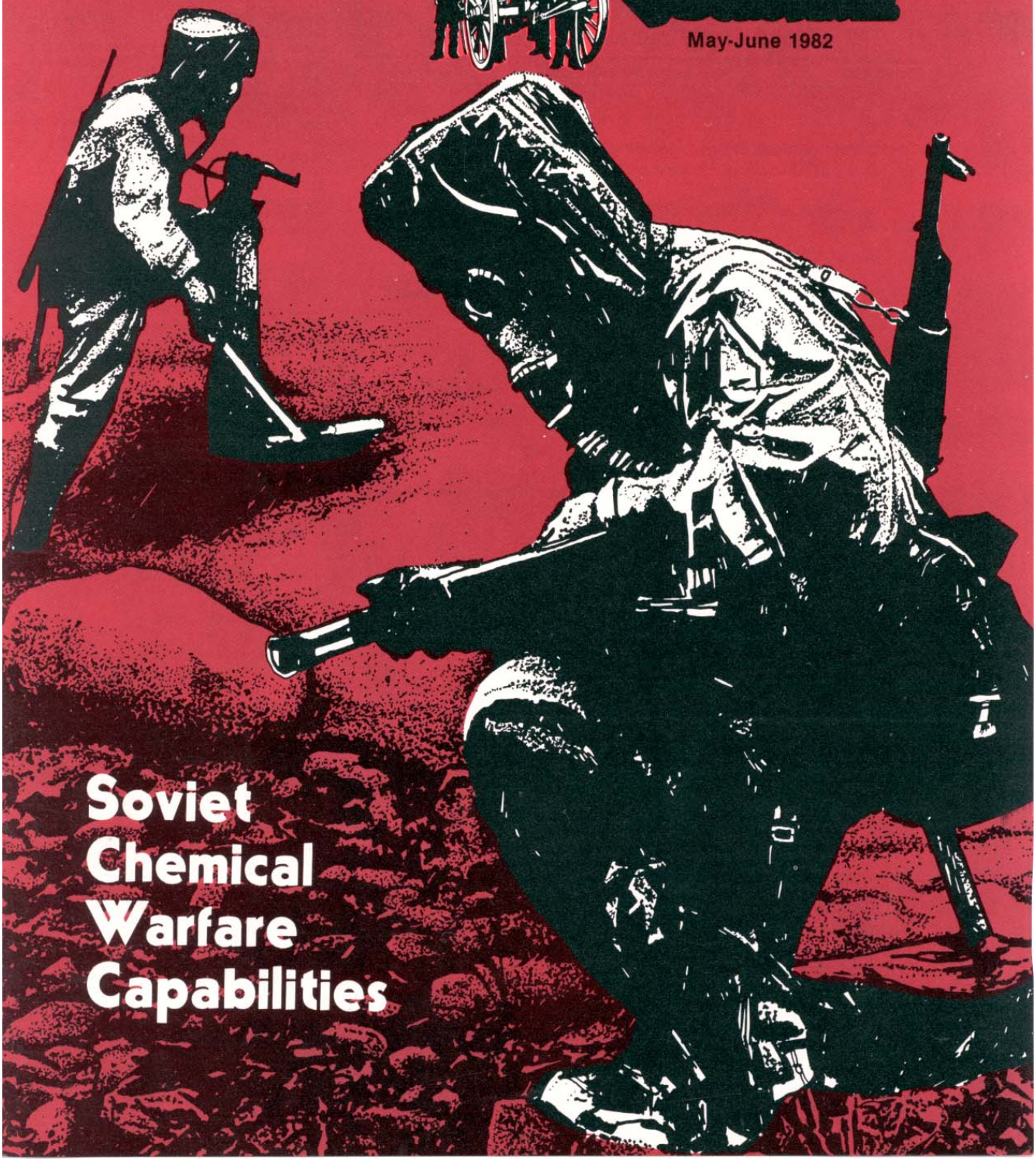
Field Artillery Journal

May-June 1982



Soviet Chemical Warfare Capabilities

Field Artillery Journal

THE JOURNAL OF FIRE SUPPORT

Volume 50 May-June 1982 Number 3

ARTICLES

FEATURES

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

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On the Move

MG EDWARD A. DINGES

In recent months, some questions have been raised on the role of the fire support team (FIST) chief—specifically whether his primary role is that of a "shooter" or fire support coordinator? The answer is simple: the FIST chief is first and foremost a fire support coordinator. He must, of course, be qualified as a shooter—and he ought to be the best observed fire trainer on his team. But, his real contribution to the battle comes not from his skill in adjusting fires, but from his ability to integrate the maneuver company commander's fire support assets with the scheme of maneuver. Indeed, those assets constitute more than half of the company's total combat power!

Results of gaming simulations and the recent FIST test at Fort Polk confirm that our greatest challenges are not finding targets to shoot or someone to adjust the fires, but rather deciding *which* targets to shoot, *when*, and *how*. As an example, the FIST chiefs at the Fort Polk test were "shooters" in only 59 of over 1,482 mortar and field artillery missions (four percent).

The question on the role of the FIST chief goes to the heart of the field artillery's mission to effectively employ *all* fire support for the maneuver commander from company level through corps. Although this responsibility is clearly stated, I fear that we sometimes become so wrapped up in our role of delivering artillery fires that we tend to neglect some aspects of our fire support coordination responsibilities.

As field artillerymen, we must "sell" fire support—not only field artillery, but also mortars, naval gunfire, and air support—and its integration into the combined arms operation. I believe we all need to "pull" harder and louder in selling fire support to our maneuver colleagues.

Here at the Field Artillery School, about half of the Officer Basic Course program is now devoted to fire support functions. Furthermore, we are placing increased emphasis on the dynamics of fire planning, the role of the FIST chief vis-a-vis the company commander, and the fact that FIST and FSO personnel must aggressively pursue their missions. In turn, our sister branch schools have been asked to emphasize the integral role of the FIST team with maneuver forces in fire support coordination and planning. Additionally, we will be asking various commanders shortly for your good ideas to help us develop an exportable package on how to better integrate fire support and maneuver training. As I explained in my last column, we are also vigorously seeking to develop training devices that will more realistically simulate the contribution of indirect fires.

As I recently discovered during a visit to the National Training Center, the key to real understanding of fire support rests squarely on the practicing field artilleryman—particularly the battalion and division artillery commanders. At the same time, the maneuver commander must know the capabilities and limitations of the fire support system to include FIST, FSO, and TACFIRE. Where does the maneuver commander get his knowledge? His fire support coordinator—the battalion or division artillery commander should be his principal advisor. He must "sell" the maneuver commander on *his* fire support teams and sections and their importance in the integrated battle.

When we are successful, we then see maneuver commanders demanding that fire support be totally integrated into their training and battles as well as insisting that subordinate commanders are properly employing their fire support assets. Our fire support teams and sections are not the artillery forward observers and artillery liaison officers of the past—they are the maneuver commander's means of fire support. Observation and liaison functions are only a part of their overall mission. As field artillerymen, we must understand this and make certain that maneuver commanders know it also.

For these teams and sections to be truly effective, they must be properly trained and employed. The Field Artillery Officer Basic Course concentrates primarily on fundamentals. Its course length does not allow for extensive practical application; it does, however, provide the graduate with a firm basis for further development. Quite simply, the basic skills and knowledge which the lieutenant

receives here will require further polishing by maneuver and field artillery commanders in the field.

Training of fire support personnel must be in conjunction with maneuver training, and we must insure that they are properly employed in such training. The brigade fire support coordinator—the direct support battalion commander—must observe that training. As the brigade commander's advisor he must see that the FIST is, in fact, in the company commander's "hip pocket," and that all fire support—not just field artillery—is integrated into the training every step of the way.

Sometimes we tend to use the FIST, and particularly the FIST chief, as an "artillery forward observer,"—especially in our own live firing exercises—and unwittingly this casts him improperly for his greater duties of fire support coordinator. I'm not saying FIST chiefs shouldn't be shooting for you, but rather that we must make certain we look at it as sharpening but one of their required skills.

In short, I'm asking your help in "selling" fire support to the ground-gaining arms. In turn, we here at the Field Artillery School will continue to seek ways to improve the integration of fire support. If you have good ideas along this line, share them with us by dropping me a note.

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.*

Experienced fire support personnel needed

In response to CPT John B. Gavalas' letter entitled "A Reasonable Doubt in Fire Support," in the January-February 1982 *Journal*, I agree with his conclusion that we artillerymen must start placing our most experienced officers in fire support coordination slots. Green lieutenants really don't have enough time in service to "sell the artillery" to their maneuver commanders because they have not had time to comprehend the entire artillery system. I don't want to knock second lieutenants but, even if they are fully qualified, a maneuver commander rarely believes everything a second lieutenant says until the lieutenant has demonstrated a great deal of proficiency.

The mission of the Field Artillery is to support the ground-gaining arms, and the rating we receive from our maneuver brothers is directly proportional to our ability to advise on and coordinate all available fire support means. Having served as a forward observer (FO) and fire support officer (FSO) in Vietnam and stateside, I feel I am qualified to say that not everyone is a natural FO/FSO. I recommend that we select only experienced officers to fill positions as artillery representatives with the maneuver forces and that these officers be screened to determine their ability to handle difficult situations.

Captain Gavalas is correct in his reference to a lack of concern on the part of commanders to fill fire support coordination slots. My stateside duties as an FSO were always in addition to the primary duties of my staff job.

Artillery commanders at all levels should remember that their reputation, as well as that of the Field Artillery, does not rest solely on their batteries' ability to shoot quickly and accurately, but also on the timely and accurate advice given by their fire support representatives at the maneuver command posts.

David R. Campbell
MAJ, FA
Saudi Arabian Field Artillery School Advisor
APO New York

Utilization of fire support assets

It appears that a trend is developing in the Army to fragment the fire support system into separate and independent activities. Some recent examples of this have surfaced in Joint Air Attack Team (JAAT) operations, Joint Suppression of Enemy Air Defense (JSEAD) actions, battlefield interdiction efforts, and targeting cell activities that occur outside the fire support elements. Each of these activities usually "borrows" from the resources of the fire support system and degrades it accordingly.

In military operations, a system is defined as "any organized assembly of resources and procedures united and regulated by interaction or interdependence to accomplish a set of specific functions." Fire support is one such system. It is made up of the following subelements:

- Target acquisition.
- Weapons and munitions.
- Command, control, and coordination (C3).

By Army doctrine, the Field Artillery is charged with managing the fire support system; to do so effectively, fire support coordinators (FSCOORDs) work full time at each supported maneuver company and higher headquarters. This responsibility is defined in AR 10-6, FM 101-5, and FM 6-20; but, too often, today's writers and planners for AirLand Battles tend to ignore the existing system and its managership. Instead they use these subelements of the fire support system most convenient to their immediate needs. Frequently, this detracts from the overall effectiveness of fire support.

If the fire support system is to be successful in combat, the effects of separate (independent) actions on the system must be considered. The FSCOORD must be consulted early when plans are being made for independent uses of fire support assets.

Charles W. Montgomery
LTC (Ret)
Lawton, OK

King of Battle?

Artillery *is* the greatest weaponry the Army has. But, how does an artilleryman convince a nonartilleryman of this fact? How can we expect someone to look up to the artillerymen and know the advantages of training exclusively with fire support tactics and operations in mind, when we don't send them our best representatives?

According to the MTOE, a division fire support coordinator is the division artillery commander, substantially assisted in his fire support liaison and advisory duties by an assistant fire support coordinator. This assistant fire support coordinator (an 0-5) has a full time job of actually performing his day-to-day duties, which include planning and coordinating battle plans and operations during combat field training exercises and also during garrison duty. Even though there are other field grade and company grade officer slots to make up the fire support element, the staff is too small. Based on the MTOE, the fire support element can't keep up with the maneuver operation shifts when the same artillery personnel have to operate continuously. For example, the brigade fire support element must operate a jump fire support section and a main fire support section. The maneuver operation section has ample quantity of officers and soldiers to maintain effective operations continuously (and I mean continuously) with shifts. The fire support element has to manage with its available manpower which, in effect, downgrades the actual effectiveness of the fire support element as well as the importance of artillery and fire support in maneuver eyes. In short, humans mandate sleep and rest in order to be effective and efficient continuously.

Also, how does a colonel perceive a lieutenant or even a captain attempting to counsel him on fire support when the position mandates the experience and expertise of at least an artillery major? When will we make adjustments to maximize the safety of our fighting elements? We, as artillerymen, must *sell* our knowledge and expertise, thereby giving maneuver commanders confidence in the ability of artillery to provide adequate support.

The fire support team (FIST) and fire support element at each echelon

are solely responsible for all fire support planning and coordination (attack helicopters, Air Force fire support, naval gunfire and aircraft fire support, chemical and biological warfare, organic fire support (mortars), air defense artillery, tank firing indirect fires as well as conventional and nonconventional artillery delivery means, etc.). The elements of the combined arms team, to include the Air Force, Navy, and NATO forces, must complement each other on the future battlefield. I am frightened to predict the outcome of a conflict, battle, or war without the maximum utilization of the King of Battle.

The way we train is the way we fight and, as long as we consider fire support a minor requirement, we are going to receive a slap in the face on the future battlefield.

Byron K. Watson
CPT, FA
Fire Support Intel Off
1st Cav Div Arty
Fort Hood, TX

Fire support for the combat support company

In all likelihood, the battalion scouts will be the first friendly forces to detect the approach of an opposing forces (OPFOR) threat directed against a maneuver battalion. It is also envisioned that the antiarmor platoon will engage the enemy with its organic weapons, as far forward of line of own troops (FLOT) as is tactically feasible.

The judicious and timely use of fire support, especially at this crucial time, can positively affect the tide of battle. Unfortunately, current doctrine does not provide for the deployment of fire support teams (FISTs) with the most forward elements. Nor is the targeting and adjustment of indirect fire systems emphasized in the training of the combat support company (CSC).

In order to close this apparent gap in support capabilities, we initially reassigned, on a case-by-case basis, a forward observer (FO) party or FIST from a line company to the CSC. This configuration proved ineffective and was discarded; therefore, we began training the scouts and antiarmor personnel in the integration of indirect fire into their scheme of maneuver. This concept has given us the desired results—the ability to rapidly engage the enemy at a considerable distance from our defensive positions.

I would appreciate any comments or experiences that you, or any of your readers, might have regarding the provision of fire support for the combat support company.

Martin Gidansky
CPT, FA (NYARNG)
Fire Support Officer
2d Bn, 104th FA
Jamaica, NY

Your premise that the battalion scouts will be the first to detect the approach of an opposing force is shared by the Field Artillery School. The first task of the scout platoon is to "see" the enemy and the battlefield (FM 71-2); additionally, ARTEP 71-2 states that the scouts must be able to call for and adjust fires (mortar and artillery). Close Support Study Group II studied the need of an FO party for the scout platoon and concluded that the fire support tasks can generally be accomplished within the scout platoon without a dedicated FO party. When the task force commander directs, the FSO may alter company FIST/FO organizations to provide an FO party for the scout platoon. This flexibility must be recognized, although it is not doctrinally stated. The FSO then must be actively involved in the scout training program.—Ed.

More on M16 subtense table

Captain Teeples' article (M16 Subtense table, pages 21 and 22, January-February 1982, *FA Journal)* goes a long way toward solving the problem of the two-meter subtense bar. The use of the M16A1 rifle for determining distances for piece displacement is an outstanding idea and results in one less piece of equipment for the advance party to carry.

Although the distances obtained from his tables are probably accurate enough for TGPC (terrain gun position correction) purposes, I can see some units trying to carry Captain Teeples' table one step further and use it for hasty surveys. All must be aware that this will result in inaccurate survey since the use of the mil relation formula for this purpose has an inherent inaccuracy built into it. The subtense tables in FM 6-50 are based on trigonometric functions, not the mil relation formula found in FM 6-30.

The inaccuracy is due to the fact that there are actually 6283 mils in a circle, not the 6400 mils the artillery uses for ease of computation. Assuming that the width of one meter at a distance of 1,000 meters will subtend an angle of one mil, this may be shown by using the formula for the circumference of a circle, 2 r (2x1000x3.14159265). Since our survey instruments use the assumed 6400-mil system, the *actual* distance that one mil will subtend at 1,000 meters is 0.9817476 meter (6283/6400), not one meter as we all assume.

To add further accuracy to Captain Teeples' table, all values should be divided by this correction factor of 0.9817476. This could easily be factored into the program to increase the accuracy of the values.

The mil relation formula was designed for observed fire, not survey. A corrected formula for TGPC would look like this:

$$\frac{(0.975)(1000)}{(\text{mils})\,(k)} = R \text{ or}$$

$$\frac{975}{(\text{mils})\,(k)} = \text{distance to the piece}$$

where k equals the correction factor of 0.9817476.

These corrections will make the distance measured with the aiming circle more accurate (within the limits of the circle). Granted, the factor is small, but with distances between pieces increasing, any potential error must be eliminated, especially if it is built in to the system.

James R. Koch
CPT, FA
Assistant Professor of
Military Science
Bryant College
Smithfield, RI

Remote antennas

On page 52 of the March-April 1982 *FA Journal*, Major Rigby stated that radio transmitters should not be used at the logistics site location. Instead, "a *remote antenna* positioned at least two kilometers away should be used to keep from pinpointing the activity of the logistics raid site."

I believe Major Rigby meant to say "a *remote radio* positioned at least, etc., etc." Although Department of the Army and civilian industry have been trying hard, they have not yet developed a tactical antenna system capable of being remoted to a radio set that far away.

Luis F. Hernandez
Supv Tng Instr
Comm Div, CED
USAFAS
Fort Sill, OK

Verifying boresight by standard angle on the M110A2 howitzer

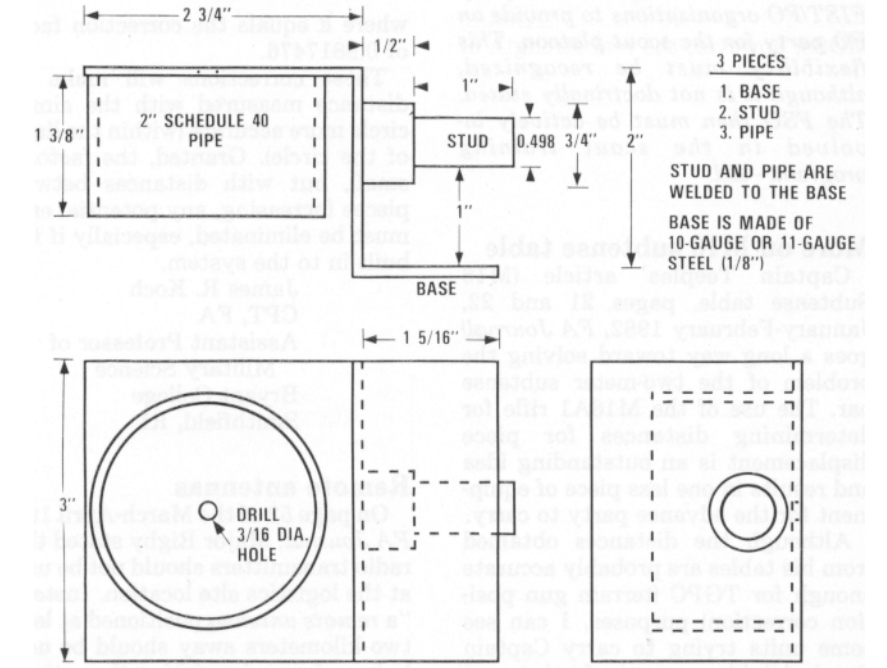
In response to 1LT William E. Pape's letter (November-December 1981 *Journal)* requesting information on verifying boresight of the M110A2 howitzer, I am forwarding a method successfully used by our unit.

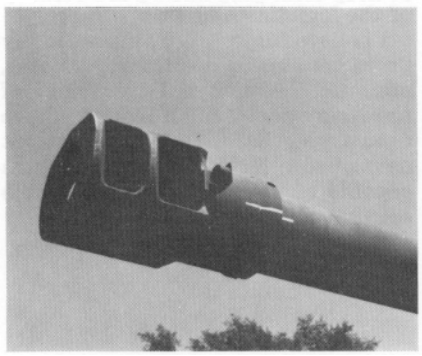
The procedure to obtain the standard angle was adapted from another weapon system; i.e., the 155-mm towed howitzer. A standard angle alignment device was then fabricated to obtain an aiming point on the left side of the muzzle brake. (See sketch and photographs.)

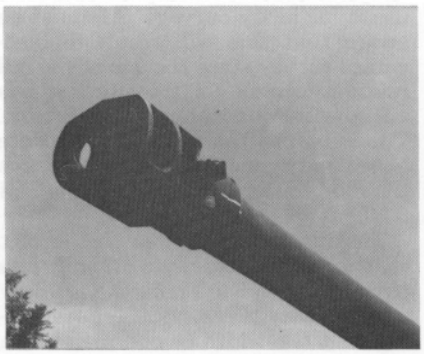
- Witness marks must be scribed or painted from the muzzle brake to the tube to insure that the brake has not moved or rotated.
- When a standard angle has been obtained, the device must stay with that particular tube since it is mounted to an unmachined surface.
- The device cannot be left on the tube during firing.
- A piece of tire inner tube is used to insure that the device is held in against the shoulder on the alignment stud to the surface of the muzzle brake.
- A flashlight can be inserted into the pipe for use during hours of darkness.

Jon L. Trost
CPT, FA (MNARNG)
D Btry, 1-175th FA
Olivia, MN

The device mentioned in your letter was informally evaluated by the School's Weapons Department and was found to be eminently satisfactory. Additionally, it might be of interest to our readers to know that the device has been submitted to US Armament Materiel Readiness Command for evaluation. The device is expected to be authorized for fabrication pending receipt of the M140 alignment device.—Ed.







Nuclear qualified

Based on a program formulated in February 1981, the 1st Battalion, 113th Field Artillery, NCARNG, now has the distinction of having more ASI 5H qualified officers than most Active or Reserve Component Field Artillery battalions.

To achieve this qualification, each officer was required to complete a nonresident phase comprised of five nonclassified correspondence courses, supplemented by seven night classes conducted by the Field Artillery Team from Readiness Group Bragg. The next phase was the resident phase, which is classified and normally conducted at the Field Artillery School at Fort Sill, OK. In order for our part-time officers not to be absent from their civilian occupations, a mobile training team (MTT) came to Charlotte from Fort Sill and conducted the classified phase from Wednesday through Sunday. The 1st Battalion now has 13 qualified officers.

Three additional officers, plus two officers from the 24th Infantry Division, have also completed the course.

At the initial briefing in February 1981, the officers were advised by the commander that this was the toughest course in the Army School Program. Everyone is now a believer after successful completion.

Basil L. Haunn
2LT, FA
1st Bn, 113th FA
Charlotte, NC

Recognizing a need for more ASI-5H qualified personnel in Active and Reserve Component units, a test program was begun in late 1979 to send one or two instructors (mobile training teams) to a unit location to conduct the Phase II (classified) portion of the Nuclear Chemical Target Analysis Resident/Nonresident Course (NCTAC-NRR). Based on nine such visits, several conclusions have been made regarding this type of instruction.

- *First, it is a valuable method of helping units to acquire critical 5H qualified personnel, in that the funds required for one or two instructors to travel to a unit are much less than that required to send a larger number of students to Fort Sill. However, as your organization learned, for the instruction to be successful, units should plan on conducting in-depth study halls/classes during the Phase I correspondence course to insure that*

all students have an understanding of the concepts presented in the course material.

• Second, before this type training can be conducted, a unit must have classroom and storage facilities which are approved for SECRET RESTRICTED material as outlined in AR 380-5; otherwise, this training cannot be conducted at the unit.

Units must pay all expenses for the mobile training team, and the instructors must be available. As such, there will be no mobile training teams scheduled until FY83. For additional information, please call AUTOVON 639-6025 or write to: Commandant, US Army Field Artillery School, ATTN: ATSF-CA-NW, Fort. Sill, OK 73503.—Ed.

The challenge of Pershing

If you are a motivated, dedicated, professional field artillery officer looking for a new challenge, ask for an assignment with Pershing in Europe. Regardless of what many think, Pershing units *are* part of the field artillery and they do everything that most field artillery units do on a regular basis, plus more! They shoot, move, and communicate over wide areas and train in all the basics of reconnaissance, selection, and occupation of position (RSOP). Since the Pershing is a long-range weapon, the unit must return to CONUS (Cape Canaveral or White Sands) for live fire exercises. Otherwise, all other aspects of training are conducted in Germany. Additionally, the Pershing battalion has a real-world, 24-hour-a-day, Quick Reaction Alert Mission on a continuing basis and maintains a combat ready strike force. No unit in Europe is more prepared for war.

During the past several years I have all too often heard officers speak negatively about Pershing duty. In most cases, these negative comments were a result of a lack of knowledge or understanding of the system. There is no question that Pershing duty is tough which in turn creates an uneasy feeling among many officers that a Pershing assignment could be the "kiss of death" for their careers. The facts are, however, that officers who have the basic qualities can make it in Pershing, and those who are successful can handle anything in future assignments. It is a system that builds great confidence in one's ability.

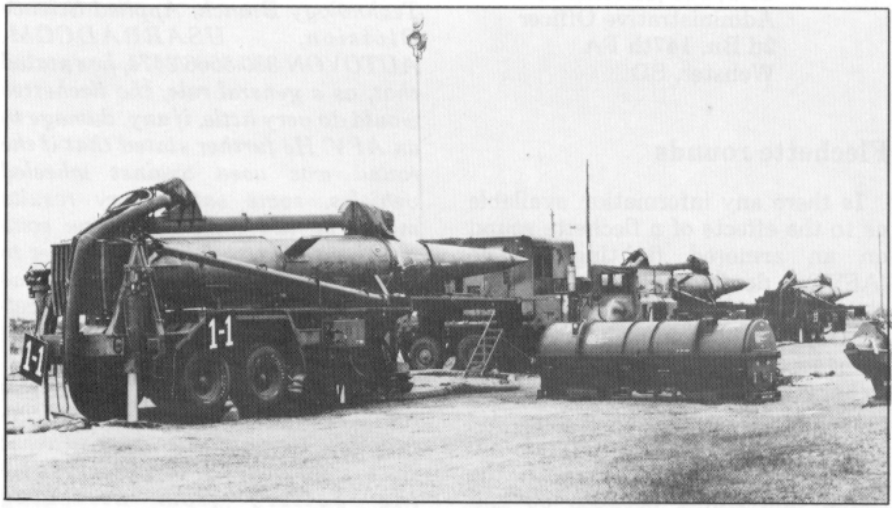
As a field artilleryman I consider myself fortunate to have served in all our active FA systems from 105-mm, 155-mm and 8-inch to Lance and Pershing. While my tours in cannon units were professionally rewarding, my tours as a Pershing battery and battalion commander have been the most challenging and rewarding.

A Pershing missile battalion has soldiers from more than 60 different MOSs; however, the real strength of the unit lies in the 15Es who are without question among the most dedicated, hardest working soldiers in our Army. Officer representation includes men and women from the Field Artillery, Ordnance, Military Intelligence, and Signal Corps. Additionally, the battalion is authorized 18 warrant officers of several specialties, the majority of which are Pershing missile technicians. As such, where else can an officer work with such a diverse group of soldiers?

Learning in a Pershing unit is an ongoing process as new technical procedures, modification and replacement of equipment, and changes in tactical concepts dictate that officers work extremely hard at self-improvement. The mightiest weapon in the US Army field artillery arsenal, with its devastating strike capability, requires a high degree of maintenance and training to maintain the directed readiness posture of our deployed Pershing battalions. Dedicated officers are essential to our success.

Officers with whom I am now associated in Pershing are real professionals. They are among the best I have known, and it's time that the entire Field Artillery Community recognize the importance of their assignments. Tremendous job opportunities exist for those officers wanting to add variety to their military career. It is an exciting life with Pershing in Europe! Come join our ranks!

Ronald P. Forest
LTC, FA
Commander
3d Bn, 84th FA
APO NY



Reunions

280th and 281st FA Battalions—10-11 July 1982 in Los Angeles, CA. Contact Norman and Anne Larson, 27940 Ridge-bluff Court, Rancho Palos Verdes, CA 90274.

Society of the First Division—64th Annual Reunion, 7-11 July 1982, at Lake Placid, NY. All members of the First Infantry Division in World War I, World War II, and Vietnam are welcome. For further information, contact the Society of the First Division, 5 Montgomery Avenue, Philadelphia, PA 19118.

Battery D, 83d Field Artillery—14-15 May 1982 in Fayetteville, NC. All members and former members who served at Fort Bragg, NC, in the 1930s are welcome. Contact CW3 (Ret) Roy T. Hargrove, Route 2, Box 178, Summerfield, FL 32691.

79th Field Artillery Regiment (79th FA Gp Hqs, 697th and 698th FA Bn)—August 6-8 1982 at the Holiday Inn, Coliseum, in Hampton, VA. Contact LTC W. R. Vivian, 36 Inglewood Drive, Hampton, VA 23666.

Credit due

I appreciate your publishing the article, "The Artillery Position Directory: Moving Fast to Mass" in the March-April 1982 *FA Journal*, and thanks for the courtesy copies. I would like, however, to share the credit for that article with CPT Norm Blankenbeckler, my former S2 who is now on the faculty of the Infantry School. It was my intent that his name be included as an author when the article was submitted.

A Military Intelligence officer, Norm knows as much about artillery as some of our better artillery officers. I would appreciate your acknowledging him in the next edition. Thanks again for printing the article.

Bruce P. Holmberg
COL, FA
Commander
3d Inf Div Arty
APO NY

I apologize Norm; but, since there were no authors listed on the article, our assumption was that your former boss had written the material. In any event, I certainly appreciate your efforts as well as Colonel Holmberg's in support of the ***Journal****.—Ed.*

SQTs—a positive attitude

During the past several months, I have read many articles highlighting individual comments on the subject of Skill Qualification Tests (SQTs). Most were negative, to include an article stating that the US Congress was going to delete all funding for SQTs for FY82.

Through much prodding by our brigade and battalion commanders, we approached the SQT challenge several years ago with a somewhat hesitant, yet positive, attitude. Oh, it wasn't easy, since SQTs then were not fully developed or even tested, particularly for the Reserve Components. Also, the different MOSs were not tracked, and most of our personnel were required to take evaluations on equipment they had never seen, let alone had a chance to train with. The first year we evaluated some 80 13Bs with results that were not too impressive; yet, we continued to train in SQTs and tried to overcome some of the problems in the system.

I recently read another article stating that the current SQT program is not appropriate for use in the Reserve Components. I assume that the individual who authored this material was talking specifically about his own unit or set of MOSs in his unit. I say this because I have seen the results of several SQTs taken by our personnel this past fall, and most indicate a vast improvement and some of them must be considered outstanding.

During the past test cycle for 13Bs, we had E7s getting in the high 90s in a hard level 4 evaluation. Additionally, we had entire howitzer sections score above 70 in their individual skill levels while 94Bs and 91Bs scored in the high 90s and even a few 100s.

To achieve these scores, training must have been conducted in our units, along with home study by our soldiers. And, I can't believe that the moment the SQT evaluations were over, each of these soldiers immediately forgot all they had learned.

Last fall our battalion received the Joseph T. Kerwin Award as the Outstanding National Guard Battalion in the nation. I mention this only because a lot of people have asked us what we did to deserve such an honor. No one thing can really be pointed out as the secret for success—yet if you wanted just one, it would have to be *the positive attitude* of our personnel.

Yes, SQT in its current form is not perfect, but not too many things are. Yet, I feel that the SQT is one of the best training tools we can give our leaders to use in training the individual soldier. SQTs and ARTEPs work alone and together to give us goals and standards, and I personally feel they have been especially good for our battalion and the Reserve Components.

Orville D. Roberts
CPT, FA (SDARNG)
Administrative Officer
2d Bn, 147th FA
Webster, SD

Flechette rounds

Is there any information available as to the effects of a flechette round on an armored fighting vehicle (AFV)? I don't mean to imply that the AFV is either stopped or destroyed; I am more interested in damage to vision blocks, antennas, exterior fuel tanks, lights, machineguns, sights, main guns, antitank guided missiles, etc. I am assuming a frontal shot with the round functioning between 50 and 100 meters from the AFV and the turret aimed at the howitzer. I would imagine that some of the flechettes must strike vulnerable parts of the AFV. Would this decrease firing battery vulnerability or merely force the commander and driver to expose themselves in order to continue an attack?

If an AFV is blinded, firing battery survival increases due to less aimed fire coming at it. A stopped or slowed AFV would also be a better target for antitank weapons and allow more rapid displacement to an alternate position with fewer problems for the battery. Perimeter defensive positions with claymore mines might also have a similar effect on attackers if the flechettes work. Can you help me in this matter?

Larry A. Altersitz
CPT, FA (PAARNG)
S2, 1-107th FA
Pittsburgh, PA

Currently, there is no information available describing the effects of a flechette round on an armored fighting vehicle (AFV). (The flechette round is the M546 antipersonnel projectile for 105-mm howitzers). Although the flechette round is extremely effective against enemy personnel in the open, very little if any effect would be achieved against a "buttoned up" AFV.

Specific 105-mm rounds that are available to stop or destroy armored fighting vehicles are the M1 HE round, the M327 HEP round, the M622 HEAT-T round (type classified, but not in production yet), or the M60 white phosphorus round. Any of these would be more destructive to the AFV than the flechette projectiles.

Mr. Al Birman, Munition Technology Branch, Applied Science Division, USARRADCOM, AUTOVON 880-5566/2474, has stated that, as a general rule, the flechettes would do very little, if any, damage to an AFV. He further stated that if the round was used against wheeled vehicles, some satisfactory results might be tire failures, engine compartment penetration, and damage to wiring and ignition harness. But as previously mentioned, there are better rounds to attack these types of targets.

The bottom line is that the flechette round should be reserved for appropriate targets; other more efficient rounds are available to protect the firing battery from attacking AFV.—Ed.

Hot Off the 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: What is the primary duty of the battery executive officer (XO)? There is a discrepancy between the XO's Handbook published by Fort Sill and FM 6-50. According to the Handbook, the battery XO's primary duty is that of the principal fire direction officer which indicates that he will spend a majority of his time in the fire direction center; FM 6-50 indicates that the XO ordinarily commands the firing battery portion of the battery, which is his traditional role.

Answer: *Both FM 6-50 and the XO's Handbook are currently being updated and as such will no longer conflict. The XO's Handbook is not meant to imply that the XO will spend the majority of his time in the fire direction center (FDC). As the tactical commander of the firing battery, he is responsible to the battery commander for the FDC as well as the gun line and all facets of firing. He should position himself where he can best control the battery.*

Question: Where can I obtain a two- or three-minute promotional film on the capabilities of Copperhead, dual-purpose improved conventional munitions (ICM), and the family of scatterable mines (FASCAM) ammunition?

Answer: *The last five or six minutes of MF 6-5997 (a 16-mm film entitled "M198 Towed Howitzer") shows the functioning of ICM, DPICM, FASCAM, and Copperhead projectiles as well as a proposed new smoke projectile and a new high explosive (HE) round. The film may be obtained from the Project Manager, CAWS, ARRADCOM, Dover, NJ 07801 (Mr. Dan Fortini, AUTOVON 800-2234/3935).*

Question: How do you compute manual sight for high angle safety without using the GFT/GST?

Answer: *The GST* ***is*** *necessary to compute the angle of site. To compute site for high angle safety without the GFT, the following four steps are used:*

- *Using the C and D scales of the GST, compute the angle of site.*
- *Extract the comp site factor from the TFT, Table G, Column 12 or 13.*
- *Multiply the comp site factor by the angle of site. This yields the complementary angle of site.*
- *Add the complementary angle of site and the angle of site, paying attention to the plus or minus signs. This yields the site. Round to the nearest mil using the artillery round-off rule. If the vertical interval is positive, the site will be negative and vice versa.*

Question: Are there any 175-mm howitzers in the Active Army inventory? If so, how many and where are they located?

Answer: *There are no 175-mm units in the Active Army, Army Reserve, or National Guard inventory. All 175-mm units have been converted to 8-inch M110A2 howitzers or other caliber weapons.*

Question: Can individuals purchase the modules that go in the TI-59 hand-held calculator?

Answer: *The modules used in the TI-59 hand-held calculator are US Government property and are therefore not authorized for sale on an individual basis.*

Correction

Reference the Hotline piece in the January-February 1982 *Field Artillery Journal* regarding muzzle velocity correction tables for the M90 velocimeter: The MVCT M90-1 and the Muzzle Velocity Tables is one publication. The correct title of this publication is "MVCT M90-1, Muzzle Velocity Correction Tables to Compensate for Differences in Projectile Weight and Propellant Temperature for Radar Chronograph (Velocimeter) M90" (November 1979). In addition to assistance provided by Aberdeen Proving Ground, these tables can also be obtained by writing to:

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

German/United States
Field Artillery Interoperability Training

by MAJ Louis J. Hansen

With the current Army focus upon preparing for land combat in Western Europe, a major unit priority should be German/United States interoperability training. As emphasized by GEN George S. Blanchard, a former Commander in Chief, United States Army, Europe (USAREUR), "It is incumbent on all military professionals to understand what interoperability means and . . . to make it part of our daily way of life." Since the majority of the Army is either located in Europe or oriented upon reinforcing that theater through a contingency mission, there are few units that are not affected. A major focus of training in both units and institutions should be upon language skills, Standardization Agreement (STANAG) content, and doctrinal differences between US forces and our NATO allies. Within the field artillery, objectives should include a knowledge of differences in field artillery missions, fire mission format, target lists, overlays, and communications.

In most units, interoperability is just another popular buzz word which has not yet been incorporated into substantive training. Even in USAREUR where interoperability should be a way of life, emphasis and capabilities vary greatly between units.

Why the lack of substantive emphasis? Reasons are as numerous as there are training distractors or constraints: lack of funds, lack of qualified trainers, lack of command emphasis, competing priorities of more urgent necessity for peacetime survival, etc. Training managers generally do not realize the extent of the problem, and opportunities for combined training are frequently missed because partnership unit training schedules conflict.

Within USAREUR, the number of US personnel who speak German is woefully inadequate. Although Gateway and Headstart Programs are mandatory, they do not provide enough depth to significantly assist interoperability. The Bundeswehr has compensated for the problem by requiring all of their field grade officers to demonstrate proficiency in English as a prerequisite for promotion. Recognizing that their counterparts speak English, most US commanders and operations officers are complacent about improving their German beyond the level of "Wo ist der Bahnhof?" Thus, subordinates are also content to busy themselves with other priorities. They know that a command post exercise (CPX) or a field training exercise (FTX) requiring interoperability occurs infrequently and that the allies always send along a liaison officer who is fluent in English. Since we make it through these exercises without *too* many problems, why create another priority when we already have so many that are all "number one"? Leaders fail to recognize that both units have consolidated whatever personnel and equipment they need to insure that the CPX is successful. Most of those personnel and equipment, however, would not be available for liaison purposes in wartime.

The language program and Project Partnership, designed to correct these deficiencies, represent a step in the right direction, but only a step. For many units, Project Partnership is active only at the social level where interoperability training occurs primarily at the officer and noncommissioned officer (NCO) clubs. Social interchange is desirable, but it doesn't replace meaningful training. When units do progress beyond the raising of beer steins to an activity, which perhaps could qualify as training, it is often no more than a superficial demonstration of mutual camaraderie accompanied by broad press coverage and high-visibility "attaboys." The degree to which it enhances interoperability often has not even been considered.

The goal of most USAREUR units for language training is 100 percent attendance at Headstart or Gateway I level, but few Gateway I graduates can contribute significantly to interoperability. Even soldiers with two or three years of classroom German require extensive in-country practice to understand colloquial German and military terminology.

Narrowing the scope of the discussion to the field artillery, most USAREUR units have a partnership unit with whom they conduct some limited training each quarter. In most cases, this training is on a limited scale involving a limited number of personnel from each unit. For example, a battalion might send several fire support team (FIST) parties to a major training area (MTA) when their partnership battalion is there training. Seldom does training progress to the level of a joint battalion CPX or FTX involving major segments of both units, where equipment, doctrinal, and language difficulties become evident.

Many battalions are now required to process a German fire mission as part of their ARTEP evaluation. With the aid of an acetate form and a simplified word list, most battalions manage to muddle through the one mission on the ARTEP. Even that limited goal is not always accomplished with ease. Citing the experiences of several battalions observed recently at Grafenwoehr, one had to station a FIST NCO in the fire direction center (FDC) for the evaluation since no one else could process the mission. Another managed adequately as long as the mission was sent by another American using the same form and word list, but he had problems if any other terms appeared or if a "real" German soldier sent the mission. Another battalion had a soldier who spoke German fluently and he did an admirable job; unfortunately, he could never leave the FDC since he was the *only* member who could process a German mission. A fourth battalion was probably the most amusing: hearing the German mission coming in on their counterfire net, they appeared confused for only a moment and then reacted swiftly — by sending in an MIJI (meaconing, intrusion, jamming, and interference) report!

Despite these shortcomings, most units feel that they can accomplish a mission requiring interoperability without undue difficulty. They don't recognize that the German fire mission format is different, that their doctrine for engagement of targets is different, and that they don't routinely authenticate

fire missions as required by US doctrine. In fact, a German forward observer probably wouldn't even be able to talk to them on the radio without significant prior coordination. If provided with a Communications Electronics Operation Instruction (CEOI), he would have to be trained in its use, just as a US forward observer would have to be trained to use a German CEOI. The characteristics of the German FM radio represent another complicating factor because only certain frequencies and squelch settings can be used to communicate with a US unit. Finally, German radiotelephone procedures, to include the use of low-level codes, are different.

Within CONUS, units do not have the advantage of a partnership unit, nor do they have many personnel with language or interoperability skills. It is difficult enough to keep shots current, to conduct USAREUR drivers' training, and to stay on top of the intricacies of deployment, drawing POMCUS stocks, etc.; thus, interoperability training is seldom even considered. Since it isn't important enough to be addressed to any extent in TRADOC schools, it isn't important enough to survive the hostile training environment. Besides, who would teach it? Few of the trainers have even been to USAREUR. Of those who have been, few are sufficiently qualified by virtue of language ability and interoperability experience to supervise a unit training program. The S3 may be willing, but he's probably never been to Germany either. Consequently, he puts greater priority on the missions more essential to the immediate survival of the unit. Besides, he's heard that the allies are generally adept at speaking English and "doing things our way." Although the current ARTEP provides for a possible German fire mission, the FDC can always figure out how to do one before the next evaluation — and if they don't, it isn't a Level I mission anyway. Since "the old man" doesn't speak German, it's unlikely that he'll emphasize it much.

There are some units in USAREUR conducting progressive, challenging interoperability training. They work regularly with their partnership battalion, with whom they also share a wartime relationship. Their liaison teams are designated, trained, and stabilized in their jobs long enough to be effective. Major training area schedules are arranged so that both units can train there together, and joint standing operating procedures (SOPs) are available to cover differences in doctrine, terminology, and symbols.

What are some of the differences between US and German artillery procedures? Let's begin with differences in doctrine and procedures. German standard tactical missions bear some resemblance to US missions, but the similarities may be misleading. The Germans also assign direct support *(unmittelbare feuerunterstutzung,* or UF) and general support *(allgemeine feuerunterstutzung,* or AF) missions, with meanings similar to those contained in FM 6-20. Reinforcing *(feuer verstarkung,* or FV) also exists, with some similarities, but those seven inherent responsibilities are not universally understood. Each must be discussed in detail before any operation. The general support reinforcing (GSR) mission does not exist in German doctrine *per se,* although a similar mission could be tailored if each of the seven responsibilities were prescribed in advance.

The Standardization Agreement (STANAG) is NATO's attempt at standardizing procedures wherever possible between allies. Although STANAGs have not been agreed upon to cover every problem area, those that are available are extremely helpful references. Unfortunately, few US units train by them or even know their contents; however, German units are generally familiar enough with them that they can comply when required. It is unusual for either nation to adapt their own national doctrine to conform to a STANAG, although many of the newest US field manuals contain an annex with STANAG information. The STANAG represents a step in the right direction, so if you are not familiar with them, have the operations sergeant get them for you. Ask for STANAG 2887 to research FA tactical missions and check the safe for classified STANAGs.

Another significant difference becomes apparent the first time you see a German operations overlay. Their symbols are different! Not only are many of the symbols and control measures unrecognizable, but some of the familiar ones have different meanings. You may finally figure out that the uncomfortably small goose-egg labeled "233-01" is the primary position area for your battalion. The arrow with the "FV" over it from your goose-egg to the one labeled "305-01" means that you are reinforcing the 305th (GE) Artillery at that location. That's a start! The other differences are too extensive to deal with in this article.

What about the "call for fire"? Any differences other than language? Unfortunately, yes. Although STANAG 2144 prescribes a standard format, neither Army routinely follows it. German observers have been trained to send missions in English using the STANAG format, but they are not always easily understandable. Another difference is that the German observer routinely sends a "fire order," while a US observer sends a "fire request" which is subject to higher-level approval.

Additionally, German units normally do not authenticate fire missions or conduct registrations, nor do they have improved conventional munitions. They shoot fewer rounds for a given target, but their firing batteries move at least as often as US units.

A German fire plan corresponds fairly closely with our fire support plan, so fire planning is similar. Target list worksheets contained in STANAG 2029 are generally used by German units but, unfortunately, the formats vary substantially from those contained in FM 6-20 used by US units.

In the area of technical fire control, major differences exist. A German unit may have an M109, but it would be an M109G on which the fire control equipment, breech, and track are all different from ours. Also, computation of firing data is different

since the Germans use azimuth bearing sights. "Deflection" is not in their vocabulary.

Some similarities in equipment exist. In addition to the M109, some German units may have the M113 (APC), the M577 (command carrier), the M110 (175-mm), or the Lance missile. Some interchangeability of parts and ammunition is possible.

Communications are possibly the most significant problem area since interface does not presently exist with multichannel communications. The potential exists for making amplitude modulated radio teletypewriter (RATT) equipment interoperable by converting the US RATT from their current 60 words per minute to the 66 used by the Germans and other allies. Unfortunately, the RATT used by most German field artillery units is VHF/FM, not AM.

Although FM radios are interoperable, the capability is limited. The frequency range of German FM radios (26.00 to 69.95 MHz) overlaps, but is not identical with the US frequency range (30.00 to 75.95 MHz). The German radios operate only in "OLD" squelch and do not have secure voice capability; therefore, their units experience significant interference when operating near US units, since their "high" power setting of eight watts coincides with the US "low" power setting. It is not surprising then that the US "high" power of 35 watts would cause interference, especially when combined with secure sets. In spite of the differences, operating in a common net with a German unit is possible if US units operate in the OLD squelch position (low power) with all AN/VRC-12 radios and in squelch OFF position with AN/PRC-77 and AN/GRC-160 radios (which do not have an OLD squelch setting). Net control stations will have to check periodically to insure that they have not "lost" their AN/PRC-77 stations, since communications with them will not be as good as when both are using NEW squelch.

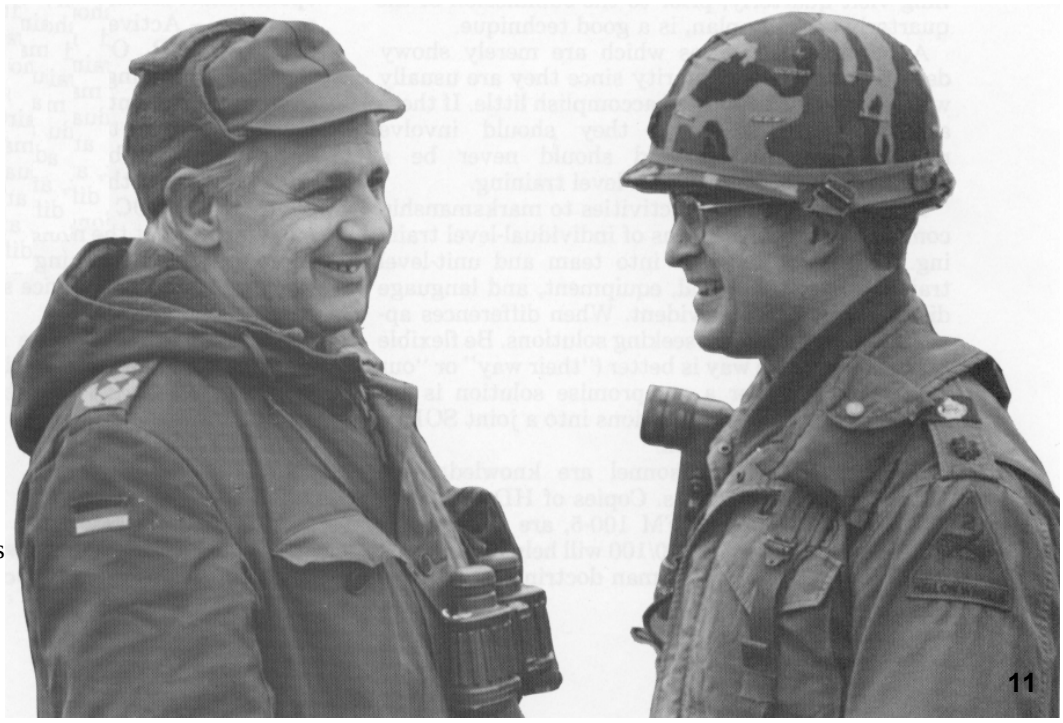
Other useful communications assets available to the German artillery battalion include their 20 motorcycle messengers which compensate somewhat for the lack of FM secure voice capability. Wire and the German Bundespost (telephone system) are also used as alternate forms of communications. The new AUTOKO-NETZ communications system provides an excellent hardened automatic switching capability for higher levels of command (above brigade).

Recommendations

By this time, you're probably wondering where to begin this interoperability training. The first step is to order the references you'll need such as ATP-35 and the STANAGs you don't have. Check the newer field manuals for STANAG information, and contact the TRADOC liaison officer to the German Artillery School for technical reports of interest to all field artillerymen. (These reports are listed in the Index of Technical Reports available from the TRADOC Liaison Officer, Germany, ATTN: ATFE-LO-GA, Box 115, APO NY 09080.) Technical Report T-21-80, entitled "The German Field Artillery: Basic Reference Data for Americans," contains a gold mine of information. Other useful references include the VII Corps Interoperability Handbook (dated 15 Jun 78) and TM 30-506 (GE-English/English-GE Dictionary).

Check with the Education Center on available self-paced language courses (Headstart or Gateway), and get as many of the books (levels I through IV) as possible for your unit Learning Center. (Make a copy of any accompanying cassettes for your Learning Center.) Determine which soldiers in the battalion have language skills, and program classes for key personnel who need language training. If an instructor is not available from within the battalion, have the Education Center hire one. Once everyone has completed level I, have key personnel (from FDC, FIST, FSO, and operations sections) complete levels II and III on a self-paced basis. Identify an instructor for level IV (Military Terminology) so that he will be qualified to teach others.

Assign the additional duty of interoperability officer to one of the staff members, perhaps to the person who most likely would be the liaison officer in an interoperability situation. Have him read and consolidate



all reference materials so that he can subsequently teach the other leaders of the battalion. Once classes have been conducted, have him design a CPX which will emphasize key teaching points. If possible, use actual German maps and overlays. Incorporate lessons learned into the unit field SOP and into ARTEP training and evaluations.

Many additional initiatives can be undertaken by USAREUR units; for example:

- A joint SOP can be drafted with a partnership unit.
- A CPX or FTX with a German unit could be undertaken at least semiannually and more often for units with an immediate wartime interoperability mission.
- Language and interoperability training should be incorporated into unit training programs.
- FIST, FSO, and FDC personnel should be heavily involved.
- Liaison personnel should live and train with their partnership unit for periods of at least a week in duration on a periodic basis since it takes that long to gain an appreciation for doctrinal and procedural differences. Lessons learned can then be shared with other members of the battalion.
- Personnel selected for liaison positions should be screened, trained, and then stabilized for a reasonable period of time.
- Commanders, S3s, and Project Partnership officers should continually ask themselves what upcoming training activities could be enhanced with allied participation.

Keep in mind that German units also plan well in advance and are under even tighter fiscal contraints than most US units. As such, they may not be able to participate in your unit's activities if they are not given ample notice. The commander must set the tone for the level of interaction desired. He should do this as a formal, scheduled office call with the partnership commander. Scheduling such a planning visit quarterly, prior to the submission of the quarterly training plan, is a good technique.

Avoid joint activities which are merely showy demonstrations of solidarity since they are usually wasteful of troop time and accomplish little. If these activities are necessary, they should involve minimal participation and should never be a substitute for combined unit-level training.

Do not limit training activities to marksmanship competition or other forms of individual-level training. Rather, branch out into team and unit-level training where doctrinal, equipment, and language differences are more evident. When differences appear, be imaginative in seeking solutions. Be flexible in deciding whose way is better ("their way" or "our way") and whether a compromise solution is appropriate. Incorporate solutions into a joint SOP or interoperability handbook.

Insure that key personnel are knowledgeable about STANAG contents. Copies of HDv 100/100, the German version of FM 100-5, are available in English. Reading HDv 100/100 will help in gaining a better appreciation of German doctrine.

Working together will undoubtedly give you many new ideas which will enrich your unit's training. Even the best unit can learn by watching a professional ally in the field. Many ideas gained from such training can be initiated at unit level; others require action at a higher level and should be forwarded as suggestions.

Division artillery, group, and division headquarters must insure that interoperability training is given a high priority. Once scheduled, the training has to be protected from the myriad of last-minute requirements which often force a unit to scale down its intended level of participation.

Service schools should incorporate more interoperability and language training into officer and NCO courses, and elective credits should be allowed for language training. Interoperability training extension course (TEC) lessons are needed throughout the Active and Reserve Components of the Army. In Europe, an interoperability course at the NATO School in Oberammergau would be especially welcome.

The Department of the Army needs to commit funds for additional language training for officers and NCOs en route to Germany. Personnel managers need to do a better job of identifying language requirements in units, keeping track of personnel with language skills and insuring that they are equitably distributed.

Summary

In spite of many recent strides in interoperability training throughout the Army, we still have a long way to go. Some people feel that training problems are not as great in the Field Artillery Community as they are in other branches, but there is no room for complacency. The first step in improving the situation is for leaders at all levels to recognize that a problem exists which has a significant impact upon operational readiness. The problem applies to all Army units — Active and Reserve — not just to those in USAREUR. Once the commanders determine that they are going to support the measures needed to improve our interoperability, training programs must be designed to correct shortcomings. Means of evaluation must be devised for incorporation into ARTEPs and other measures of current performance. TRADOC and other higher headquarters must insure that the necessary resources are provided to make the training effective and to institutionalize it into the service schools on a progressive basis.

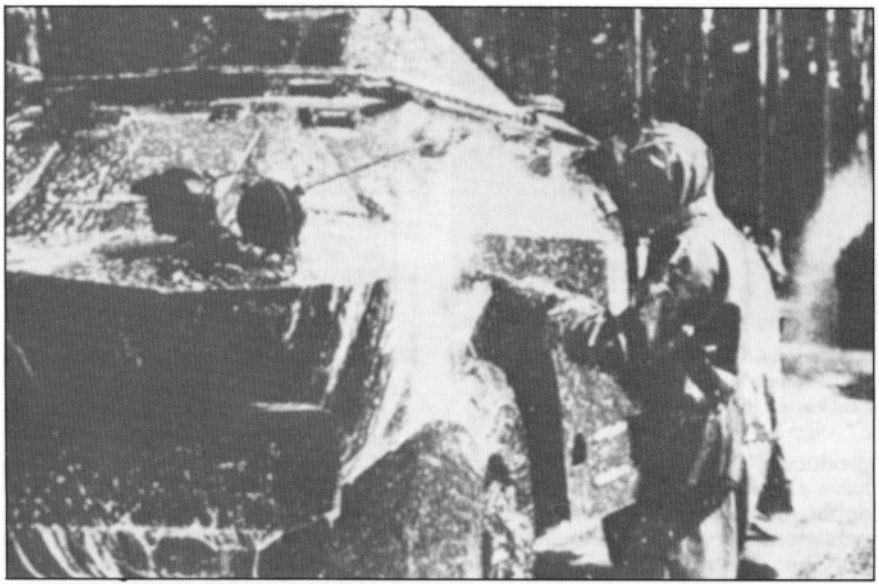
A failure to make these necessary changes now may not be significant until the first battle of the next war — then it will be too late.

MAJ Louis J. Hansen is assigned to Headquarters, US Army Training and Doctrine Command.

Soviet Chemical Warfare Capabilities

by Charles J. Dick

SA-2 launch crews practising procedures during a simulated chemical attack.



A BRDM-2 at a decontamination point receiving treatment from a soldier using a DKV apparatus. A manual method like this has to be employed in order to ensure that the more inaccessible areas, e.g., wheel arches and suspension units, are properly decontaminated.

Anyone trying to assess the Soviets' chemical warfare (CW) capability without reference to classified sources faces considerable problems. These, however, do not arise when looking at their defensive preparations. There is an abundance of Soviet books and articles on the subject, not to mention analyses of equipment, especially that captured in the Middle East wars. It is the Soviets' offensive capabilities and doctrine that cause the problems. Not one word is published in Soviet open sources which even admits (save by implication) that they possess CW weapons at all, never mind discussing their use. Lacking primary sources, the analyst has to resort to expedients. He can examine Soviet perceptions of the threat, as set out in their CW defense literature, to see how they consider CW weapons are best used. He can add to that Western studies on the characteristics and effectiveness of agents known to the Soviets, and he can use, preferably with great caution, the various official and unofficial defense experts' estimates as to Soviet CW holdings; since these are invariably assertions unsupported by evidence, their reliability cannot be unquestioned. In the end, the analyst is forced into a series of educated "guesstimates."

The characteristics of CW weapons and their military use

This article will deal only with chemical agents generally believed to be held by the Soviets. Incapacitants such as the riot control agents CS, CN, and DM are not dealt with, for they are unlikely to be used in preference to lethal agents in a major conflict. Similarly, hallucinatory incapacitants such as the LSD-based BZ are omitted because, not only is it not known whether they were ever developed by the Soviets, but also because they have proved too unpredictable in their effects for military purposes. Defoilants, too, have been left out as their utility in a major war would be marginal, quite apart from the fact that they have no antipersonnel value. In fact, even as it stands, the list of agents is arguably too long. Phosgene and the vesicants, the main chemical agents of the First World War, extensively stockpiled in the Second, must be considered at least obsolescent. So too is *Tabun,* the first nerve agent to be discovered and acquired by the Soviets when they captured the German production plants in 1945. However, given the Soviets' reluctance

A chemical-reconnaissance soldier, in full NBC protective clothing, takes an air sample using a PKhR-63 detection and identification kit. The vehicle is a BRDM-2 of the East German army. The well prepared trench, from which the suspect smoke is issuing, would seem to indicate that CW exercises are frequently carried out.

Casualty evacuation from a T54/55, under NBC conditions. The absence of external fittings, coaxial armament and fume extractor on the main armament, as well as the number of soldiers standing around, show that this is an instructional period.

to throw away anything still serviceable, stockpiles of these old agents may still be held. In 1945, the Soviets also captured stocks and production facilities for *Sarin*, and at least the chemical formula for *Soman*, both of which are more advanced agents than *Tabun*. These are almost certainly two of their standard agents. Whether they have chosen to produce VX is not known. That they have the ability to do so is not in doubt, but they may use some other persistent nerve agent instead. Mention has been made in the Soviet military press of VR-55, which may well be a more persistent form of *Soman*. It is worth noting in this context that the Soviet nerve agent antidote is more effective against *Soman* than the NATO atropine equivalent. This probably suggests that the Soviets regard *Soman* and any derivatives as important agents.

Chemical warfare agents can usefully be categorized not only by their physiological effects but also by their potency and by their persistence. The latter two are dealt with in tables 1 and 2. Some agents, e.g., choking and blood agents, can only be disseminated as gases. (Technically, these are in fact highly volatile liquids which evaporate almost instantly

Box 1: Soviet chemical defense

Recognizing the potential of CW, the Soviets very wisely make extensive preparations for chemical defense. To put this into perspective, it is not, despite the impression given by some Western commentators, a new development. During the First World War, the Russian Army suffered heavy casualties from CW, possibly as many as those of all the other combatants combined. The Red Army's Chemical Service was formed in 1918, and its mission of chemical defense was taken very seriously in preparing the Army for the next war. From June 1941 right through to the end of the Great Patriotic War, the High Command took the German chemical-warfare threat very seriously. The Chemical Service was reorganized and continuously improved. Hard-pressed commanders who used their chemical-warfare troops for other purposes were rapped over the knuckles, as were those who became blasé about the threat and failed to look after their CW defense equipment. Chemical-defense training was carried out throughout the war: during the Battle of Kurst, for instance, troops of the Steppe Front wore their respirators for eight hours continuously, while in the winter of 1943, 40,000 men of the Kalinin Front underwent mustard gas contamination in order to practice decontamination drills.

Today, all Soviet troops are issued with very efficient protective clothing and personal-decontamination and medical-countermeasures kits. They are trained constantly in their use. Tanks, APCs, command, signals and workshop box-bodied vehicles, and even the cabs of logistics vehicles are equipped for full collective protection with seals and positive-pressure filter ventilation systems. Every vehicle and crew-served weapon has a portable decontamination kit to accompany it, and the crews are practised in its use. Collective protection shelters and/or the means to construct them are issued to organisations whose efficiency will be unacceptably degraded by having to work in full protective garb (e.g. command and medical posts). They are also used for resting and feeding, in rotation, the personnel of subunits compelled to remain in a contaminated area. Details of some common items of equipment can be found in Box 2.

The VKhV

The defensive measures taken by individual soldiers, sub-units and units are supplemented by the work of the VKhV (Voenno Khimicheskaya Voiska—Military Chemical Forces). This massive organisation is a separate arm of the Ground Forces, commanded by a colonel-general. Three military schools supply officers for the VKhV, and there is a military academy for officer postgraduate training. In all, Colonel-General V.K. Pikalov's VKhV numbers 80,000-100,000 specialist troops. The higher figure (see *IDR* 1/79, p. 11) would not seem at all unreasonable if the nominal establishments of all VKhV sub-units, units and training establishments are added up. Contrary to common Western belief, these chemical troops are trained and equipped purely for chemical defense. There may be a partial, and minor, exception to this rule. The VKhV may still look after smoke and flame equipment. However, delivery of chemical ammunition is not its concern. This impressive array of NBC defense personnel does not end here, and other arms add to the defensive effort. The engineers are responsible for water purification and any site preparation necessary for decontamination facilities. The medical services decontaminate and treat casualties, and the rear services are responsible for supply.

Dedicated chemical-defense units and sub-units exist at all levels from Front down to Regiment. Some of their equipment is dealt with in Box 3. The composition of the Front brigade and the Army battalion is far from clear. Almost certainly, their organisation and strength will vary according to the formation's strength and task – much as

do artillery and engineer groupings. Each tank and motor rifle division has a chemical defense battalion of 170 all ranks with 66 vehicles, 32 of them being decontamination vehicles. This battalion comprises two vehicle and equipment decontamination companies, one personnel and clothing decontamination company and one AFV decontamination platoon. Each regiment has a chemical-defense company of 26 all ranks with nine vehicles, six or seven of them being for decontamination. The smaller airborne division and regiment have, respectively, a decontamination company and platoon.

VKhV troops deal with levels of contamination which are too great for units to cope with using their own resources. They also carry out thorough decontamination where a unit has only had the time or resources to execute partial decontamination, i.e. just enough to keep the unit in action for a limited period. Their role is an important one, helping to fulfil two of the basic principles of operational doctrine and tactics. They help to maintain or restore the combat effectiveness of the fighting troops, and they help to maintain the speed and momentum of the advance by reducing to a minimum the delays imposed by enemy CW strikes.

The Soviets expect the enemy to use persistent agents in the rear, against second echelons, reserves, units or sub-units manoeuvring out of contact, in areas in which the enemy does not expect to operate. Vast zones of contamination will also be created along traffic routes being used by resupply columns and fresh troops moving up. Thus reserves will be neutralized, at least for a time, and the commitment of fresh units delayed, for such units will (with the permission of the regimental or higher formation commander) halt and carry out full-scale special treatment. A motor rifle battalion column would be held up for two hours or so by the need to decontaminate after a VX spray attack by four fighter-bombers. Even units well forward are likely to be subjected to contamination, either by enemy attack or by having to advance through a barrier of persistent agent created by the enemy to cover his withdrawal, or indeed by moving through areas attacked previously by their own forces. If at all possible, sub-units of the first echelon affected by V agents (particularly in winter) should be replaced immediately by reserve or second-echelon troops and withdrawn for full-scale special treatment. It can easily be seen why the Soviets consider it essential to have VKhV troops available through the depth of their deployment. This includes groupings (their size being governed by the scale and urgency of the task) deployed well forward: descriptions of exercises have sub-units being decontaminated within 10-12 km of the line of contact.

Another aspect of the VKhV's defensive effort — easily as important as decontamination — is reconnaissance. Plainly, timely warning of the approach of a vapour hazard, or of the existence of an area of contamination, will reduce casualties. It is also necessary to establish the extent of areas of contamination in order to determine whether they can be avoided, whether a decontaminated path can be driven through them, or whether to direct a decontamination group to treat sub-units as they emerge on the other side having driven through. Each divisional reconnaissance battalion and regimental reconnaissance company has a platoon of four BRDM rkh vehicles. These specialist CW reconnaissance vehicles are added to patrols by the unit chief-of-staff with the specific task of detecting and reporting any chemical threat and marking the boundaries of contaminated zones and/or routes through them. They deploy throughout the depth of the unit or formation. They are seen with the most advanced patrols (quite possibly seeking out areas affected by their own attacks) and with columns far to the rear in case of enemy interdiction strikes. Each unit and sub-unit maintains a communications link dedicated purely to air and NBC warning.

Chemical reconnaissance is, of course, an all-arms responsibility. Twenty BRDM rkh vehicles alone could not provide the sort of coverage considered necessary by the Soviets for a divisional area. Each sub-unit, down to platoon level, whether in the first echelon, the second echelon or in reserve, is required to conduct CW reconnaissance. At platoon level, this may imply merely the posting of an ordinary soldier upwind as a chemical-alert sentry. Fully protected, he would rely on a change in colour of detector papers or powders to give warning of droplets or vapour. Each company, however, has a detachment specially trained to detect and identify CW agents using the VPKhR kit. Thus even small sub-units are in a position to establish the existence and nature of a threat and send warnings downwind by radio and/or signal flares.

Awareness of the chemical threat should be high amongst Soviet soldiers. DOSAAF, the huge "civilian" voluntary organisation which claims a membership of over 12 million men and 3 million women, teaches military and military-related skills to the Soviet citizen and it conducts basic NBC defense instruction and training. All members receive 20 hours of classroom teaching and do field exercises involving the use of protective clothing, first aid and decontamination. They are all expected to achieve the basic PVKhO qualification (Protivo-Veshchestvo Khimicheskaya Oborona — Anti-Chemical Defense). Those who have not been DOSAAF members will probably still have received some similar training as a result of civil-defense preparations. Thus many, perhaps most, soldiers know at least the rudiments of the subject and are familiar with defensive equipment when they are conscripted. Once serving, a substantial amount of combat training is done in protective clothing. (This not merely prepares the soldier for CW, but also helps in the important process of physical hardening.) Nor is the soldier advised to cheat in coping with contamination, for live (albeit diluted) agents are sometimes used in training, and smoke, possibly even toxic smoke, is extensively used.

Reading Soviet literature, one cannot help but be impressed by the awesome scale of their preparation for CW. However, organisations and equipment are only as good as the personnel manning them. There is plenty of evidence in the military press that there are important deficiencies in training. There does not seem to be a single, army-wide standard operational procedure for reacting to a possible chemical attack: this will cause difficulties when sub-units are hastily married up on the battlefield. As troops do not wear the all-arms protective suit at all times (because of its debilitating discomfort), they are vulnerable to a surprise, on-target liquid attack. Even if the new, impregnated suit can cope with this threat, and it seems unlikely, it will presumably have to be discarded as soon as possible after the attack, having become contaminated. Complaints about lack of realism in training schemes and lack of effort on the part of the troops are levelled at almost all aspects of the Soviet Army's training. However, it should be noted that deficiencies in CW training are potentially more costly than inadequacies elsewhere, given the hazard posed by even minute quantities of a nerve agent.

While the Soviets do undoubtedly have their problems in preparing their troops for CW, it would be foolish to overrate these difficulties as a deterrent to their first use of chemical weapons. Three points should be borne in mind here. Problems in training that are recognised as such can be corrected, and doubtless the Soviets are making strenuous efforts to do so. With all its imperfections, their chemical-defense effort is enormous, and their equipment, with the arguable exceptions of the personal protective suit and mask, is excellent. Lastly, NATO's level of preparedness, in terms of organisation, equipment availability and training standards, is generally well below that of the Warsaw Pact, even in the crucial Central Region. In this context, it should be borne in mind that first use may give a huge, perhaps decisive, advantage.

when their carrying munition impacts.) Others are disbursed in liquid form either as droplets, in the case of thickened agents such as the vesicants, VX or (probably) VR-55, or as a sort of colourless mist if dispensed by aerosol or if the agent is volatile. Thus *Sarin*, the volatility of which approaches that of petrol, disperses more readily in vapour form than VX, which is somewhat like heavy motor oil.

Plainly, a gas forms no contact hazard; it has to be inhaled to cause damage. A vapour is most dangerous if inhaled, but it can also affect exposed skin and eyes. It will have a limited ground contaminant effect, at least in the impact area of the delivery munitions. Both gas and vapour will drift downwind, posing a hazard until wind and/or evaporation reduce concentrations to below casualty-producing levels.

Droplets, on the other hand, being much heavier than air and of low volatility, fall to the ground to produce a continuing contact hazard. They are not merely dangerous to exposed skin or eyes, for they can soak through ordinary combat clothing or boots to attack percutaneously. The contaminated ground will continue to present a danger until evaporation and reaction with chemicals in the soil reduces the agent concentration below casualty-producing levels. As evaporation proceeds, a small downwind hazard is created, the degree and extent of the danger depending on the amount of agent delivered and the rate of evaporation.

High toxicity is a prized feature in a chemical agent. It brings two substantial advantages. First, troops may find that they have been subjected to a casualty-producing dose before they have realized it and taken defensive measures. Second, small amounts of agent go a long way while still retaining the ability to cause casualties. This means that large areas can be affected, in the case of persistent agents for some time, with a relatively small expenditure of ammunition and therefore of logistic effort. Table 3 shows the sort of area which would be affected by a 155-mm howitzer battery firing the nonpersistent nerve agent *Sarin.* By contrast, the same battery's mean area of effectiveness using HE would be about six hectares (15 acres). One milligram of *Sarin* is a lethal dose, while less than half a milligram of VX is needed to kill. *Soman* falls somewhere in between. Of the other agents available, hydrogen cyanide has some attraction, despite delivery problems, because it is very fast acting and because, being much lighter than air, it is non-persistent and leaves the target area safe for attacking troops minutes after the strike. It also greatly degrades the performance of the respirator filter. Thus a blood agent attack, followed immediately by a strike utilizing another non-persistent agent or more hydrogen cyanide, could cause heavy casualties.

A whole variety of means is available to disseminate CW agents so that targets throughout the enemy's depth can be engaged using agents with the optimum degree of persistence. Missiles, free-flight rockets or aircraft with bombs or spray tanks can strike deep into the rear, while artillery and heavy mortars can hit targets in the forward area. Chemical mines can complicate the task of attacking troops. In conducting a chemical attack on troops provided with efficient defensive equipment, it is desirable to deliver large quantities of agents in a very

short period of time, preferably less than one minute. Surprise is also highly desirable to delay the enemy's adoption of defensive measures and thus increase his casualties. Chemical surprise might well be achieved by exploding a missile warhead high up, at about 1,500-2,000 m, creating a rain of VX or VR-55 droplets over a wide area. It can certainly be achieved by aircraft using spray tanks, for they do not have to overfly their target, instead releasing their vapour upwind to drift down on to the enemy.

A degree of chemical surprise can also be achieved by an air or artillery strike. Chemical munitions can have about 50 percent of the fragmentation effect of HE. A large number of such rounds impacting together may well create dense chemical concentrations, yet so stun or confuse the enemy that they do not don their respirators immediately. The multi-barrelled rocket launcher is thus an ideal delivery system (a battalion of 18 BM-21s can put down 720 rounds in 20 seconds). However, ordinary tube artillery should not be despised. A US estimate holds that a battalion of 18 155-mm howitzers firing a *Sarin*-round salvo into two hectares (five acres) can expect to inflict 40-50 percent casualties on troops in the open or in open trenches if the troops are fatigued or under stress and carrying, but not initially wearing, respirators. If the same troops were only mildly active, the casualty rate would still be 15-20 percent, though it would fall to 8 percent for well rested and prepared troops, some already masked up. Casualty rates for troops in ventilated vehicles or trenches with overhead cover would be about half those for troops in the open.

It would be highly misleading to dwell solely on the potential of CW without looking at its drawbacks. All chemical weapons are influenced to some degree by the weather. Wind direction is obviously crucial in any decision on the employment of nonpersistent agents. The weight of attack required and the extent of the downwind hazard, indeed whether a strike is possible at all, are determined by the strength and constancy of the wind. High temperatures will increase the rate of evaporation and reduce the area affected by the vapour. The temperature gradient (vertical variations in air temperature between heights of 50 and 200 centimeters from the ground) will also help to determine the rapidity and degree of dispersion of the agent. Rain, by increasing the air's turbulence,

Table 1: Estimated potencies of selected CW agents

		Agent aerosolized or vaporised over target					Liquid agent sprayed on to target		
		To incapacitate		To kill					
		Respiratory ID-50 (a) mg-min/m^3	Time to effect	Respiratory LD-50 (b) mg-min/m^3	Percutaneous LD-50 (b) mg-min/m^3	Time to effect	Density of contamination for area denial kg/km^2	Percutaneous LD-50 (b) mg/min absorbed	Time to effect
Phosgene	(CG) (c)	1,600	3–12 h	3,200	NA	3–24 h	NA	NA	NA
Mustard	(HD)	200 (d)	4–6 h	1,500	10,000	4–24 h	10,000	4,500	4–6 h
Hydrogen Cyanide	(AC)	NA	NA	5,000	NA	½–15 min	NA	NA	4–6 h
Tabun	(GA)	100	1–10 min	400	40,000	10–15 min	2,000	1,000	1 h
Sarin	(GB)	55	1–10 min	100	12,000	2–15 min	NA (e)	1,700	NA
Soman	(GD)	25	1–10 min	70	10,000	1–15 min	1,000	1,000	½–1 h
Agent VX	(f)	5	1–10 min	36	1,000	4–10 min	300	15	½–1 h

Notes: (a) Dosage estimated to incapacitate half those exposed to it.
(b) Dosage estimated to kill half those exposed to it.
(c) As gases, hydrogen cyanide and phosgene are only effective through the respiratory system. They disperse downwind and cannot contaminate ground.
(d) For eye injury.
(e) Sarin vapour disperses so rapidly that, save in very cold conditions, it is not suitable as a ground contaminant i.e. it is effectively non-persistent.
(f) The performance of agent VR-55 may be roughly similar.

Table 2: Persistency of selected liquid CW agents (a)

Agent		Weather conditions		
		Sunny, around 20ºC, light breeze	Wet and windy, around 10ºC	Calm, sunny, lying snow, around – 10ºC
Mustard	(HD)	2–7 days	1½–2 days	2–8 weeks
Tabun	(GA)	1–4 days	½–6 h	1 day–2 weeks
Sarin	(GB)	¼–4 h	¼–1 h	1–2 days
Soman	(GD)	2½–5 days	3–36 h	1–6 weeks
Agent VX	(b)	3–21 days	1–12 h	1–16 weeks

Notes: (a) The length of time for which contaminated ground/equipment may present a potential contact hazard.
(b) The persistence of VR-55 may be somewhat less.

reduces the effectiveness of vapour concentrations.

Clearly, the delivery of persistent agents is somewhat less weather-dependent. However, the time during which such agents pose a contact hazard will depend on the rate of evaporation, soil, and precipitation. Rain can wash away liquid agents (incidentally, contaminating water courses and, therefore, drinking water), while snow can smother contamination.

Ground, too, has its effects. Vapour tends to move around hills, down valleys, and collect in hollows. It tends not to penetrate forests to depths much greater than 300 meters, but to concentrate in front of the forest with some agent flowing over the trees to reach the ground's surface again up to half a kilometer beyond the other edge. On the other hand, liquid contamination tends to last longer in dense vegetation or in porous soils. The influence of ground and weather must introduce complications and uncertainties into a commander's planning. (This problem must not be exaggerated. The accuracy of modern micrometeorology and the widespread availability of artillery met radars like the Soviet *End Tray* and *Bread Bin* will reduce the margin of error.)

A big question mark for the planner must be the efficiency of the enemy's chemical-defense equipment and, more difficult to estimate, training. If both are good, a very high degree of invulnerability can be achieved. Thus, there is even less guarantee of the suppression or neutralization of defenses than there is with conventional HE. It might therefore be considered unwise to rely purely on CW to pave the way for assault units. The prudent commander will only regard

Table 3: Influence of weather on the performance of Sarin

(Figures quoted are for a battery of 155-mm howitzers)

Weather conditions	Wind strength	Mean area of effectiveness, hectares (a)			Downwind hazard km (b)
		–20ºC to 0ºC	0ºC to 15ºC	Over 15ºC	
Early morning, late evening, or heavily overcast day	Light air	144	144	144	3
	Slight breeze	144	144	144	5
	Gentle breeze	72	96	144	10
Windy weather, day or night	Moderate breeze	29	48	72	25
	Fresh breeze	13	20	29	75
Sunny or slightly overcast day	Light air	48	57	57	1
	Slight breeze	29	36	48	1
	Gentle breeze	18	20	29	1
Calm night	Light air	144	144	144	45
	Slight breeze	144	144	144	75
	Gentle breeze	144	144	144	120

Notes: (a) Largest target over which 50% casualties are likely among unmasked personnel.
(b) Distance downwind of MAE over which a severe to moderate hazard may occur (a moderate hazard being one which produces mildly incapacitated casualties).

Table 4: Effects of CW agents

Agent type/name	Method of attack on body	Effects	Rate of action
Nerve:			
GA *(Tabun)* GB *(Sarin)* GD *(Soman)* VR-55 VX	All by inhalation, ingestion or percutaneous absorbtion. G-agents most effective if inhaled.	Disruption of nervous system particularly vision, muscular coordination and breathing.	Inhaled or ingested 1–2 min. Percutaneously minutes to hours depending on concentration and protective clothing.
Vesicants:			
HD (Mustard) HN (Nitrogen Mustard) L (Lewisite) HL (Mustard Lewisite) CX (Phosgene Oxime)	Skin contact or ingestion – though internal damage can be caused if inhaled. (Droplets will penetrate ordinary clothing)	Burning or blistering of skin tissue. Mouth, nose, throat and lungs could be damaged permanently.	HD and HN: 12 h L, HL and CX: 1–2h
Blood agents:			
AC (Hydrogen Cyanide) CH (Cyanogen Chloride)	Only by inhalation of vapour.	Prevents the blood from taking up oxygen. Circulatory and respiratory failure.	In high concentrations these agents act in a few minutes.
Choking agent:			
CG (Phosgene)	Only by inhalation of vapour.	Causes lung-damage leading to drowning as lungs fill with fluid.	Severe delayed effects after 2–4 h

it as a supplement to normal artillery preparation. It must be noted, however, that this argument does not apply to a demonstrably ill-prepared foe. Nor does it apply to persistent agents used in the interdiction or harassment roles.

The military potential of CW is clear. Against ill-trained and/or ill-equipped troops, chemical attacks would be devastating. If the First World War is any guide, even reasonable equipment and training will not prevent heavy casualties. In 1917, 7.2 percent of the casualties on the Western Front were chemical casualties (mainly phosgene), while in 1918, with the introduction of vesicants on a wide scale, the proportion went up to 15 percent. This is an impressive figure, as well under half that percentage of shells were chemical-filled. It is not surprising that the British staffs were demanding in August 1918 that 20-30 percent of their ammunition should be chemical. While defensive equipment has improved greatly since then, CW agents have improved even more with the development of nerve agents. Of course, the effectiveness of chemical weapons is not to be measured solely in terms of numbers of casualties inflicted. All troops for a significant distance downwind of a strike have to don at least respirators to cope with air contamination (table 3). This will reduce their efficiency significantly. The excellent British S6 respirator degrades vision by 25 percent and voice communication by two-thirds and has the same effect on the wearer as carrying an extra 9 kg. Troops who find themselves in an area contaminated by a persistent agent are in an even worse situation. They must wear protective clothing constantly. The resultant degradation of performance can only be fully appreciated by those who have tried to dig in, load vehicles, or do other heavy work when fully protected; by those who have tried to exercise even simple manual skills wearing rubber gloves; or even by those who have tried to communicate by radio while wearing a respirator. Such activities as eating, drinking, exercising the bodily functions, and sleeping are difficult and dangerous. Obviously, an attack by a persistent agent will have a marked effect on, for instance, a headquarters, a logistics unit, or a combat unit preparing to defend some vital ground. Even when the tactical situation allows the target unit to move, it will carry its contamination with it. The move and the subsequent decontamination will consume precious time and energy. Thus, chemical attacks may be used to harass units, creating difficulties out of all proportion to the amount of ammunition expended. Similarly, persistent agents can be used to deny ground, or at least to impose severe penalties on units occupying it, as well as for interdiction, forcing delay for decontamination on troops obliged to pass through the contamninated area. Lastly, the offensive use of chemical weapons can bring a great, if intangible, benefit to an army well versed in CW. An enemy less well prepared, psychologically and in terms of training, will suffer a possibly serious decline in morale when attacked by chemical weapons.

Soviet offensive use of chemical weapons

It has been argued by some analysts that the Soviets' massive defensive CW effort (see Box 1) is merely part of their preparation for their own offensive use of CW weapons. According to these analysts, the main task of the VKhV (Military Chemical Forces) will be the location of contamination caused by its own side's chemicals and its subsequent removal from the vehicles of advancing Soviet units. This is a somewhat extreme position to take up. While it is small, the CW capability of the French and the US forces in Europe is not entirely negligible (France and the USA are the only members of the North Atlantic alliance which stockpile chemical weapons). Moreover, NATO could undertake chemical rearmament. However, it is certainly true that a reliable chemical defense capability is a *sine qua non* for any army contemplating the initiation of CW. It is

Box 2: Individual protective equipment

The standard respirator is the ShM, a rubber protective mask covering the whole head and connected to a canister filter by a rubber hose. A double outlet valve aids safe canister changing. An anti-dim set prevents the eye pieces from misting over. There is a communications version for signallers, officers, etc. with a diaphragm voice emitter. Another version, the ShMS, has provision for optically corrective lenses, making it possible to use binoculars, rangefinders, etc. For casualties with head wounds, there is the ShR, which includes a double air intake to prevent suffocation from clogging by vomit or blood. These respirators, with associated accoutrements, weigh 2 kg. They are heavy, uncomfortable and visually poor. However, a new, more comfortable respirator with canister attached is reported to be on issue.

There are basically three types of protective clothing. The L-1 is a two-piece protective suit consisting of a jacket with attached hood, trousers with integral over-boots, plus gloves. The L-1 is designed to be donned quickly and is issued to reconnaissance troops. The OP-1 is a one-piece garment with hood, and can be worn as a cape, a coat or, with buskins and gloves, as an overall. Since they are made of butyl-rubber-covered cotton fabric, both suits give protection against liquid agents. However, unlike the L-1, the OP-1 is not airtight, and impregnated undergarments are necessary to give protection from vapour hazards. Both the L-1 and OP-1 weigh 3 kg, more than twice as much as the British Mk 3 NBC suit. Both are hot and uncomfortable and reduce combat efficiency. However, a new, impregnated combat suit may now be on issue. This would give protection against vapours, although the OP-1 would still be needed to give protection against liquid contamination. Special protective clothing for decontamination personnel consists of a rubberized one-piece suit worn over the L-1 with heavy rubber boots and gloves. This 6.5-kg ensemble should only be worn for 1½-2h at temperatures of 15-19°C, for half an hour at 25-29ºC, or for 15-20 min at temperatures over 30°C (though working time can be prolonged by wearing a one-piece cotton coverall soaked in water). Reserve respirators and protective garments are held on the basis of 1 per 10 men.

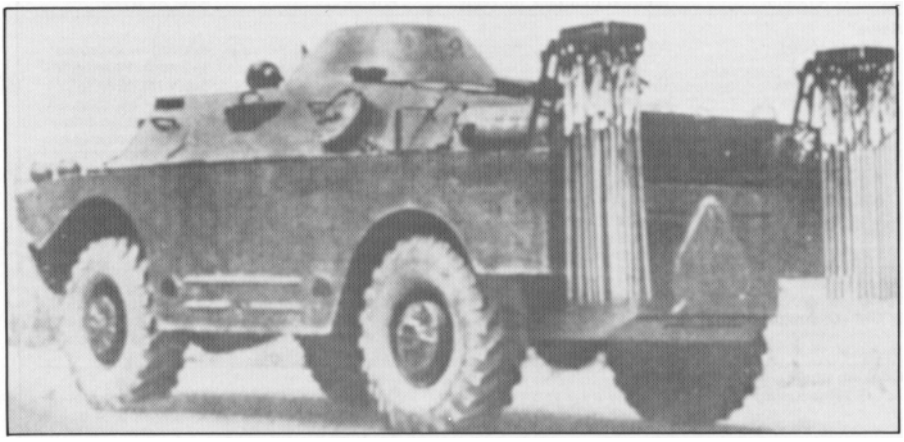
Each soldier is issued with a personal medical kit, such as the MSP-18. This contains a morphine-based pain-killer syrette, an eye dropper for washing out eyes contaminated by nerve agent, a syrette and ampoules to counter hydrogen cyanide poisoning, five *Nemikol*-5 nerve agent antidote syrettes and six tablets to counter the effects of lung irritants in toxic smoke. It is interesting to note that protection is given against hydrogen cyanide and toxic smoke, and that *Nemikol*-5 is used to give protection against *Soman* (as well as the VX and *Sarin* countered by the NATO atropine). This suggests that hydrogen cyanide, toxic smoke and *Soman* are standard Soviet weapons, for they are not held by NATO forces.

In addition, each soldier carries an IPP personal decontamination kit, containing solutions to deal with both nerve agents and vesicants, which is used to treat small areas of skin (up to 500 cm^2). The soldier's decontamination kit for clothing and personal weapon is the IDP. If IPP and IDP prove insufficient, his sub-unit has a PKhS decontamination pack with which to help him.

Collective protection

All modern Soviet AFVs, command, signal and workshop vehicles and logistics vehicles have air filtration systems to keep out toxic agents. These are generally more advanced than their Western counterparts (where these exist at all). However, an NBC seal cannot be preserved for ever, so the Soviets recognise the necessity of providing collective protection facilities, in which work can be carried on unburdened by wearing protective clothing, or in which troops may eat and rest. These are seen as particularly important for medical-aid posts, communications and command centres and for troops defending a contaminated area. A wide variety of chemical-defense shelters is available. An example is the PP-2, which consists of a rubberized fabric (with windows) stretched over a collapsible wooden frame. The 3 × 3 × 2-m room is entered via an air lock, and a filtered-air overpressure system keeps the air inside pure. Soviet manuals also give instructions for the setting up of improvised shelters, including improvements to the humble shelter trench, and many filter and overpressure systems are available for different sizes of shelter.

therefore quite probable that the Soviets believe their CW defense capability to be good enough to ensure that they will give out much more punishment than they will receive, particularly in view of NATO's very limited offensive capability, at least in a short war (only five percent of the US supply of chemical weapons is at present pre-stocked in Europe). They probably also believe that chemical weapons, unlike nuclear ones, can be used without provoking a nuclear response from NATO. Evidence to support the view that chemical weapons are now regarded as conventional is necessarily circumstantial. However, interest in CW still waxes in the open Soviet military press, while the attention paid to the other "weapons of mass destruction" (nuclear and biological) has waned somewhat over the last decade. Moreover, recent major exercises have featured the use of chemical weapons unaccompanied by nuclear weapons.



A BRDM-2 rkh (also known as the BTR-40PB rkh) showing at the rear of the vehicle the marker flags which can be fired into the ground to mark safe lanes or contaminated areas. This vehicle also carries a GSP-11 automatic chemical-agent detector-alarm and a PPKhR chemical-agent detector. These are mounted externally on the superstructure just above the right rear wheel arch. When not in use, the flag pickets and firing devices are wrapped and stowed on each side of the rear hull roof of the vehicle.

Chemical weapons have many attractions for an army on the offensive — attractions which are inevitably increased if the opposition has a limited retaliatory capacity, is poorly equipped, and/or is poorly trained for CW. The most obvious advantage, it should be stressed, comes from the ability, with relatively small ammunition expenditure, to inflict large numbers of casualties without any concomitant devastation of terrain. Even against well trained and equipped troops, a surprise attack (achieved, for instance, by combining DW agents with HE), is likely, according to many experts, to inflict about 20 percent casualties (depending obviously on meteorological conditions, weight of attack, etc.). However, on certain targets, a chemical attack is attractive even if it promises a much lower attrition rate. Unlike HE, persistent chemical effects are not transient. Key enemy units or installations may have their efficiency impaired and their morale sapped by a slow but steady stream of casualties and by the necessity to live and work for long periods in full protective gear.

Delivery means

The Soviets possess the ability to attack NATO throughout its operational depth with an agent and delivery system more or less tailor-made for the task. Delivery means are summarized in table 5. Basically, any mortar or artillery piece over 100-mm calibre is suitable for chemical delivery; the larger the round, the greater the proportion of agent carried. Approximately five percent of the weight of an HE/chemical shell fired by a gun or howitzer is chemical fill. Given the importance of building up large agent concentrations in the shortest possible time, this low proportion is a drawback in using gun systems, particularly those below medium calibre. However, their range and accuracy are compensating factors. Base ejection shells carry more agent but lack the surprise value of a fragmentation round. Mortar bombs

Box 3: Decontamination equipment

Non-specialist equipment

All equipment is accompanied by decontamination apparatus, and the crew is expected to be able to decontaminate the equipment, at least partially, and continue in action until full decontamination is possible. Small crew-served weapons, e.g. machine guns and mortars, are cleaned with the PM. DK kit, while the ADK is used on artillery pieces. In both cases, scrapers are used to remove dirt and grease, then nerve-agent and vesicant decontaminants are applied. Both kits can be refilled from decontamination vehicles. Prime movers and logistics vehicles carry either the RDP-4V, an 8.5-litre backpack spray and brush set, or the DK-4 which uses vehicle exhaust gases to spray decontaminant, or the IDK-1, a set of attachments for the standard 20-litre jerry can. All three can be refilled.

Possibly used by ordinary combat troops, or possibly by VKhV specialists, is the DKV decontamination system. This comprises 78 fire extinguisher type tanks, each with a capacity of 30 litres, carried in a truck and trailer. Decontamination solution is sprayed on to the equipment or vehicle being treated and scrubbed over the surface with an integral brush. A truck requires 1-2 cylinders and a tank 2-3. The cylinders can be refilled from an ARS-14.

Military Chemical Forces equipment

Should massive contamination occur, overburdening a unit's or sub-unit's own resources, or should a commander wish to make sure that decontamination has been accomplished really thoroughly, the chemical-defense troops are called in.

A vehicle and equipment decontamination company has ten ARS-14s (replacing the older ARS-12U), whereas the regimental chemical-defense company has three. Mounted on a ZIL-131 chassis, this truck carries 2,700 litres of decontamination solution (excluding any extra drums that may be carried on additional racks). Eight hoses may be used simultaneously, to either side of the vehicle, to treat up to eight large vehicles. Provision is made for using hot exhaust gases to thaw ice and frozen agent in winter. One fill can decontaminate 13 tanks, 14 APCs, 16 trucks or 50 medium guns. The ARS-14 is also used for road or terrain decontamination, using a DN-3 wide-spray nozzle to the front or rear of the vehicle. Terrain decontamination can also be accomplished by using dry decontaminants (e.g. chlorinated lime) or even by using flame. The company also has trucks and bowsers to make up additional decontaminant solution.

An armour-decontamination platoon has two ARS-14s and two TMS-65s. The latter consists of a modified MiG-15 gas-turbine engine (model VK-1F) on a *Ural* 375 E chassis. The engine and the operator's cabin are mounted on a turntable and can be elevated and lowered. Two 1,500-litre tanks are carried on the vehicle, with another 4,000 litres being towed behind in a bowser trailer. The TMS-65s work in pairs, 50 m apart on opposite sides of the road. They subject a slowly moving column of contaminated vehicles to the hot blast of the engine's exhaust, into which is injected decontaminant solution. Treatment of each vehicle takes 1-3 minutes, depending on the type and degree of contamination. The TMS-65 is particularly effective in freezing conditions, though the decontamination achieved is often incomplete. However, the ARS-14 is the principal decontamination equipment for vehicles.

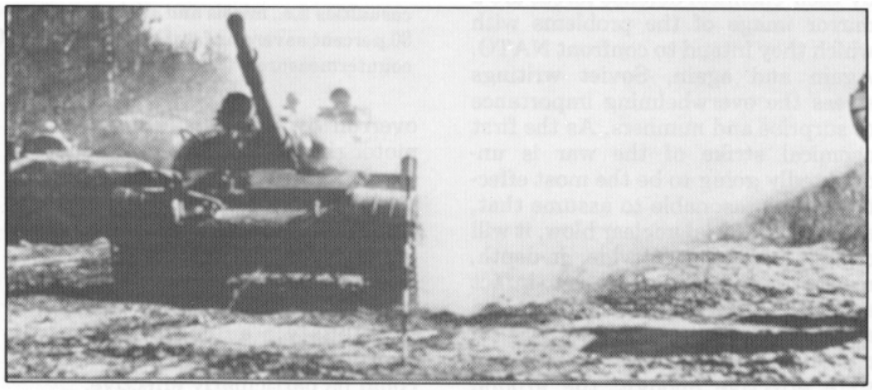
A clothing and personnel decontamination company musters one ARS-14, four DDA-53s and four DDA-66s, the chemical-defense company of the motor rifle regiment having four DDAs and that of the tank regiment having three. The DDA-53, also known as the ADA, is variously based on the chassis of a GAZ-51, GAZ-63 or ZIL-130. It is used for steam decontamination of clothing and shower decontamination of personnel. It comprises two steam chambers and a boiler, hoses and a portable shower unit. Water is obtained either from a natural source, an ARS-14 or a collapsible water tank. Ammonia and formaldehyde can be added to the steam which is generated. The two chambers can each hold 20 winter or 30 summer uniforms, and the equipment can treat 48 uniforms per hour in winter or 80 per hour in summer. When used for personnel decontamination, the DDA-53 is combined with three interconnected tents — one for undressing, one for showering and one for dressing. It can provide 70 showers per hour in winter or 100 in summer. The DDA-66 is a smaller vehicle on a GAZ-66 chassis with only one steam chamber. These are also to be found in medical units, to prepare casualties for treatment and a return to duty.

The foregoing has dealt only with major VKhV divisional equipment. It is only a small proportion of equipment available in abundance to maintain the viability of Soviet units and formations.

carry a higher payload (about 10 percent) than shells and, thanks to their lower velocity, less agent is lost since the round does not bury on impact. Moreover, their high rate of fire makes mortars attractive for engaging enemy forward positions, though their range limitation reduces their general utility.

The ideal artillery delivery system, at least for area targets, is the multi-barrelled rocket launcher. Agent payload accounts for at least 15 percent of warhead weight, the percentage rising with calibre, and large numbers of rounds can be delivered in a matter of seconds. For longer-range tasks, free-flight rockets, such as *Frog-7*, and surface-to-surface missiles like *Scud-B* are eminently suitable for engaging area targets. Their huge warheads compensate for lack of pinpoint accuracy (though it may be noted in this context that the *Frog* and *Scud* replacements, the SS-21 and SS-23, are believed to combine even longer ranges with even higher payloads, and much greater accuracy).

Most versatile of all delivery systems are, of course, aircraft. Modern ground attack aircraft such as the MiG-27 *Flogger-D* and Su-24 *Fencer* can attack targets throughout NATO's operational depths. While, unlike missiles, they can be shot down, they can achieve a higher degree of accuracy. They can also tailor their attack profile and weapons load to suit the mission. Sprays can be used to achieve surprise through launching attacks either off-target or from above low cloud, or to contaminate long swathes of ground. Massive bombs (e.g., 500-kg bombs, 60 percent of which could be agent fill) are ideal for creating very high concentrations of ephemeral agents such as hydrogen cyanide, while cluster-bombs are excellent for delivering persistent agents, since they ensure a more uniform spread of agent than a single warhead.



A T-62 undergoing decontamination. A column of vehicles drives slowly down a lane (marked by the striped poles) while two TMS-65 jets spray them with decontamination solution. Although this method is quick (each vehicle takes only two to three minutes) it is not 100 percent effective.

The Soviets thus have plenty of suitable delivery means. However, it is not known what proportion of their munitions is chemical-filled. Open press estimates vary from 5 to over 30 percent. The higher figure must surely be nearer the mark, given the Soviets' belief in the effectiveness of CW and their insistence that only *mass* use of any weapon can be decisive. This is not to say that all potential delivery systems will have the same proportion of chemical ammunition, or even that all will be used for CW purposes. With its ability to attack both forward and depth targets accurately, with large payloads, and given its relatively rapid response time, the frontal aviation may well have a lot of chemical munitions in its inventory.

At least until an operation becomes nuclear, the CW role of the operational tactical missile troops could loom large, considering the advantages accruing from the range and invulnerability to interception of their weapons. In the artillery, large stocks of chemical warheads would make sense for the multi-barrelled rocket-launcher units, the optimum CW delivery means.

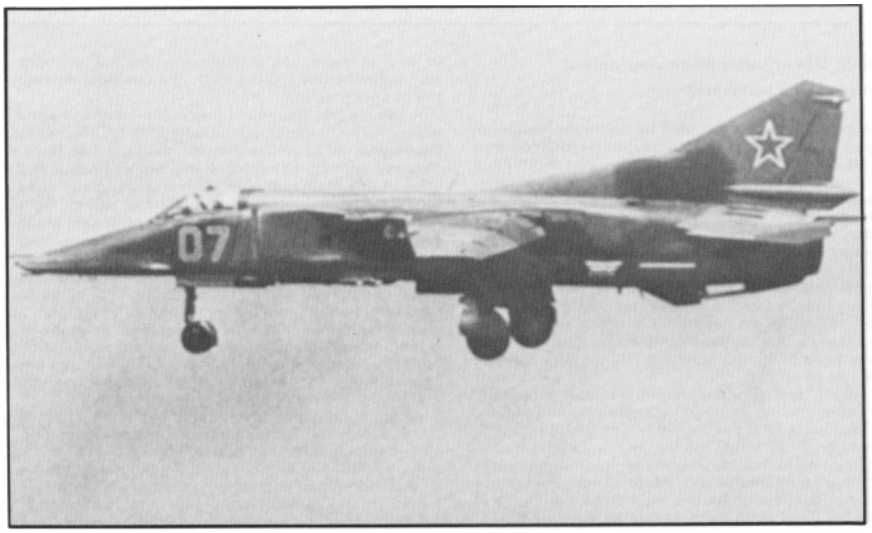
On the other hand, the limitations of guns, howitzers, and mortars could lead to their carrying little or, in the case of the smaller calibres, no

chemical ammunition. After all, they have to deliver most of the vast quantities of HE necessary to enable the motor rifle and tank troops to advance. Can they afford to carry large stocks of CW rounds in case they might have to stand in for a more efficient CW delivery system? As it is, resupply in a fluid battle is going to be a big problem, even without introducing any complicating factors — though this argument does not, it may be noted, apply to air units, ample chemical munitions being pre-stocked at or near their airfields.

Employment

How will the Soviets employ their impressive CW capability to support an offensive operation in the Central Region? Soviet military literature and training practices give at least a framework on which to hang speculation, assuming that the tasks tackled by their chemical-defense forces are a mirror image of the problems with which they intend to confront NATO. Again and again, Soviet writings stress the overwhelming importance of surprise and numbers. As the first chemical strike of the war is undoubtedly going to be the most effective, it is reasonable to assume that, as with the initial nuclear blow, it will consist of a theatre-wide, in-depth, mass attack. The aim will be to inflict a significant level of casualties on and at least a temporary paralysis of crucial NATO activities. If the strike were effective enough, the ground forces' exploitation of it could be eased decisively. In other words, theatre command will only delegate chemical independence to army or divisional commanders after a carefully planned, coordinated attack conducted simultaneously by resources from front down to division. Thereafter, control of the use of persistent agents is likely to remain at army level, with divisional commanders empowered to use non-persistent agents to ease their forward progress.

The main value of non-persistent agents lies in preparing the way for an attack on the enemy's forward positions. His trenches afford him no protection against a chemical attack. If chemical surprise and the appropriate agent concentration are achieved, casualties in the area of 10-30 percent could be inflicted even on well equipped troops, though staffs are not likely to count on more than 15 percent casualties (about a quarter of them being fatalities). The weakened defense, further attrited and demoralized by the following artillery bombardment, will be easily overrun by the assaulting tank and motor rifle troops. Even dismounted, the latter will need no more protection than that offered by their respirators and, if hydrogen cyanide or, in favorable weather conditions, *Sarin* is the agent used, even these may be dispensed with. As shown previously, a combination of hydrogen cyanide with another agent could be particularly effective.



If, on an overcast day with a gentle breeze, aircraft such as this MiG-27 *Flogger* D sprayed 4,000 kg of *Sarin* over a 6-km frontage, 5-km upwind of a target unit in relatively open terrain, it could cause extensive casualties. It has been estimated that unwarned but well trained troops donning their respirators on feeling the first symptoms would suffer 20 to 30 percent severe or fatal casualties and 70 to 80 percent light casualties (i.e., miosis and slight breathing difficulty). Poorly trained troops might have 80 percent severe or fatal casualties and 20 percent light casualties through inefficient countermeasures. (Photo courtesy of *Flug Revue*).

Non-persistent agents may also be used for harassing effect in rear areas. For instance, delayed action fuzes could be fitted to chemical munitions delivered off target. They would go off at night, when surprise is most likely to be achieved and meteorological conditions are usually favorable (table 3). Of course, such attacks depend on accurate intelligence and weather forecasting.

A side benefit will accrue to the Soviets from far-downwind hazards. The enemy's civilian population will be panicked into fleeing its homes. Roads will become clogged with refugees, no matter what efforts are made to control them. The deployment and resupply efforts of NATO formations could be significantly hampered by this development. If the end of World War II is any guide, the Soviet advance will not be similarly slowed by concern for the fate of German refugees.

Persistent agents have a wide variety of operational applications, all aimed at sapping the strength, efficiency, and morale of NATO units, and, above all, at delaying them, thus winning crucial time for the Soviets. The deployment into Europe of US and British units will be impeded by aircraft-delivered or missile-delivered contamination of reinforcement ports and airfields, and of dumps of pre-stocked equipment and vehicles.

The battlefield can be interdicted by hitting choke points, such as key road junctions, defiles, and bridges over major rivers. If supply columns or units (whether advancing or withdrawing) do not stop to decontaminate, they will not only remain a hazard to themselves, but carry contamination into previously "clean" areas.

Ground contaminants can also be used to hinder logistic units or troops trying to prepare new defensive positions in the path of the Soviet advance, and to hit reserves. It is worth noting in this context that, because chemical agents are area weapons, the attacker need not know the precise locations of target units.

Persistent agents also have an important role to play in the counterair campaign. Conventional attacks on airfields can be accompanied by CW strikes. The contamination will hinder and delay repairs to essential installations and pose the problem of operating aircraft from "dirty" fields. Even the threat of a CW attack against an airfield obliges aircrew to fly wearing NBC suits, if they intend to recover to that airfield. One way or another, the enemy's sortie rates

Table 5: Chemical Delivery Means

Division

Weapon					Numbers		
Designation	Calibre, Type	Max range (m)	Max rate of fire	HE projectile weight (kg)	MR Regt/Tk Regt	Div arty Regt	MR Div/Tk Div
M-43	120 mm Mor	5,700	12–15rds/min	15.4	18/0 (a)		54/18 (a)
D-30/M-74	127 mm How	15,200	6–8rds/min	22	18/0 (a)	36	90/54 (a)
M-73	152 mm How	17,200	7–8 rds/min	44		18	18/18
BM-21	122 mm	20,500	40 rds in 20 secs (b)	19		18	18/18
Frog-7	600 mm FFR	65,000	–	450		4	4/4

Notes: (a) It is reported that tank regiments in GSFG are receiving a motor rifle battalion and a D-30 battalion (*IDR* 6/1980, p. 802). This would give each tank regiment 6 × 120 mm mortars and 18 × 122 mm howitzers, and each tank division 36 × 120 mm mortars and 180 × 122 mm howitzers. The motor rifle division would be stronger by another 6 mortars and 18 × 122 mm howitzers. (b) Reload time, 20 minutes.

Army

Weapon					Numbers		
Designation	Calibre, Type	Max range (m)	Max rate of fire	HE projectile weight (kg)	Army and Arty troops	Front assets (a)	Army total
D-20/M-73	152 mm How	17,200	4/7–8 rds/min	44	18	36	54
M-46	130 mm Gun	27,000	5–6 rds/min	33	36	36	72
BM-21	122 mm MRL	20,500	40 rds in 20 s	19		18	18
M-77 (b)	240 mm MRL?	over 30,000?	?			18	18
Scud	850 mm SSM	280,000	–	850	12	12	24

Notes: (a) The Front assets listed represent a typical augmentation of a main axis army from a Front level artillery division (e.g. GSFG's 34 Guards Artillery Division). (b) Details of this new multi-barrelled rocket launcher are still classified.

Frontal Aviation

The MiG-27 *Flogger D*, the Su-17 *Fitter C*, and the Su-24 *Fencer* are the most modern aircraft in Frontal Aviation's inventory. They are all capable of delivering CW munitions, having maximum payloads ranging between at least 2-5 t (MiG-27) and 6 t or more (Su-24).
With a hi-lo-hi mission profile, they could all make chemical attacks on targets in the west of mainland Europe. The Su-24 has sufficient radius of action to reach all major operational airbases in the UK.

would be lowered, perhaps considerably, for a modest outlay of chemical ammunition.

Persistent agents have their tactical uses, too. High-value targets, such as nuclear delivery systems, headquarters, communications centres, POL or ammunition points, or immediate reserves, may be located only approximately, for example, by radio direction finding. Attacks with conventional explosives may thus be impractical, but a harassing chemical strike may be possible, and it has the added advantage that its effects are less transient.

It also makes sense to mix some chemical rounds in with HE when conducting counterbombardment missions. This is especially effective against towed artillery, of course, but it will also delay SP batteries in restoring their combat effectiveness. Persistent agents can also help the Soviets to deal with the problems of open flanks and built-up areas. Their advance will inevitably develop unevenly, facing successful units and formations with the possibility of counterattacks into their flanks. However, the task of counterattacking can be complicated for the enemy by contaminating approach routes, especially choke points, and suitable forming-up places for the attack. Similarly, built-up areas being bypassed can be rendered all but uninhabitable by CW attacks. As well as reducing the risk of counterattacks developing from these areas, the use of chemical agents will hinder or prevent enemy attempts to sabotage valuable industrial plants that the Soviets wish to capture.

References

1. Table 4 is adapted from FM-21-40 NBC Defense (HQ Department of the Army. Washington DC, 1977). The other tables are adapted from "CB Weapons Today" (SIPRI, 1973). The author wishes to thank Dr J. P. Perry Robinson for some amendments.
2. Source "CB Weapons Today" (SIPRI, 1973), p. 139.
3. "Soviet Military Strategy," V.D. Sokolovsky (translated by Harriet Post Scott, McDonald and Jane, 1978) p. 68-69.
4. Source "CB Weapons Today" (SIPRI, 1973), p. 140.

The prospect of Soviet use of CW

It has been shown that the Soviets have invested a great amount of money, ingenuity and manpower in preparing for CW (see Box 1). Chemical troops and weapons are an integral part of all units and formations. This would suggest that, "weapon of mass destruction" or not, chemical agents have become part of the Soviets' inventory for "conventional" war. Not to use them would be to ignore Marshall V. D. Sokolovsky's authoritative dictum: "A war must be conducted decisively, using the necessary forces and means to achieve political and military goals. The need for success is incompatible with the requirement for limiting the scale of combat operations." For the Soviets, it would be to forfeit the benefits of a marked superiority in training and, in most respects, equipment which would tell, perhaps decisively, in favor of using chemical weapons. Self-sacrificing restraint is hardly likely in the event of war with NATO, a war the result of which will, the Soviets believe, be decisive.

The only consideration likely to restrain the Soviets from chemical use is the belief that they will get as good, or better, than they can give. A US threat to respond to CW with nuclear escalation is of doubtful credibility. The only rational policy for NATO is, therefore, to provide its forces with a comprehensive and efficient chemical defense and, arguably, a significant retaliatory capacity.

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Charles J. Dick of Edinburgh, Scotland, is a teacher of history, a keen student of Soviet military affairs, and a Captain in the Intelligence and Security Group (Volunteers).

Right by Piece

NOTES FROM UNITS

Correction

Reference "COHORT battery" on page 34 of the January-February 1982 *Journal*: The opening sentence should have read "Charlie Battery, 6th Battalion, *80th* Field Artillery . . . ." instead of "*90th* Field Artillery."

New battery for MLRS training

FORT SILL, OK—On 19 February, collective training on the Multiple Launch Rocket System took a step forward with the activation of Battery D, Training Command Battalion.

The battery, with a current membership of 32, consists of "instructors/evaluators" or "trainers" for the MLRS. These trainers will be responsible for teaching units how to use the weapon.

MAJ Lonnie B. Adams, battery commander, said that already-trained soldiers will come to his battery for training in the MLRS as a unit and then be deployed overseas together. He explained that the soldier will go to Basic and Advanced Individual Training and then join his or her unit for MLRS collective training.

"Battery D has two types of units to train," said MAJ Michael L. Waldron, Training Command Battalion's S3. "They will train batteries here at Fort Sill for overseas and they will also have a training element for the continental United States. This group, for example, will go to Fort Hood to train as MLRS unit for the 1st Cavalry Division."

Battery D is expected to consist of 60 members in October, including the 14-member mobile training unit. Adams said the number of personnel will continue to increase through the years.

Waldron used the terms "instructors/evaluators" and "trainers" because the members will be training sections, platoons, and batteries and will immediately evaluate their students.

The normal program of instruction for MLRS training consists of 10 weeks (one week of in-processing, eight weeks of field training, and one week of out-processing). The eight weeks of field training are broken down as follows:

- 1st week: briefing, classroom work, driver's training and section-level training.
- 2d week: section-level training.
- 3d week: section-level training and evaluation and platoon-level training.
- 4th week: platoon-level training.
- 5th week: platoon-level training and evaluation.
- 6th week: battery-level training.
- 7th week: battery-level training.
- 8th week: battery-level training and evaluation.

Besides the training, the first cycle will also be used to validate the concept.

The privates for the first cycle are in the basic training stage now and are scheduled to begin MLRS training in June. The first group will spend the summer at Fort Sill and will then proceed to Fort Bliss, TX, for additional training and firing.

Adams said that a practice round is being developed in hopes that the MLRS can be fired at Sill. Until then, he said, hands-on training will only go as far as maneuvering.

The actual MLRS crew will consist of a driver with a Military Occupational Specialty (MOS) of 13M10, a gunner with MOS 13M20, and a section chief with MOS 15D30 (Lance missile crewman). There will be three MLRSs to a platoon and three platoons to a battery.

During the first MLRS training cycle at Fort Sill, the Field Artillery Board's Weapons Testing Division will be evaluating the system. They will gather data on the adequacy of several aspects to include organization, doctrine involved, tactics, logistics, and, of course, training. This testing will decide the future organization of the MLRS. (PFC Douglas Mallary)

FORT SILL, OK—General (Ret) Walter T. Kerwin Jr., President of the US Field Artillery Association, presents the Association's first chapter charter to COL Louis J. Del Rosso, Commander of the 75th Field Artillery Brigade. Since January of this year, the "Diamond Brigade" Chapter has added more than 700 members to Association rolls.

Redlegs in Egypt

CAIRO WEST, EGYPT—At the jump command of "ONE MINUTE," the troopers of Battery B, 2d Battalion (Airborne), 321st Field Artillery, 82d Airborne Division, finally realized that this was not going to be just a training jump. Prior to departure, they dressed in the new desert camouflage uniforms and after intense press coverage, boarded the aircraft. From the air they saw endless miles of Egyptian desert below.

At the command "GO" the paratroopers spilled from the aircraft. Quickly the deafening noise inside the aircraft was replaced by silence as they floated to earth. The pleasure of the moment was fleeting as more important matters raced through the jumpers' minds—avoiding other jumpers, lowering equipment, avoiding pieces of heavy equipment on the ground, and searching for the elusive soft landing on a hard drop zone.

Once on the ground, the cannoneers of B Battery scrambled to ready their howitzers and prime movers for action. Within minutes the battery was laid and ready to fire in support of the 2d Battalion (Airborne), 504th Infantry, as they assaulted their assigned objectives.

With this mass tactical airborne assault, Operation Bright Star 82 (a rapid Deployment Joint Readiness exercise) began for the men of Battery B. After the airborne assault, the troopers moved by convoy to their cantonment area at Cairo West, an Egyptian Air Force base located approximately 16 miles West of Cairo.

Cross-training with Egyptian soldiers began the next day as Americans and Egyptians set up static displays of their respective equipment. Then, SGT Sonny Clemons, 23, from North Myrtle Beach, SC, led this section through crew drill to demonstrate the M102 howitzer. Later, B Battery trained with the Egyptians on the Soviet AK-47 and other small arms. The enthusiasm of both the Egyptians and Americans made the training not only enjoyable but highly educational.

The climax of Operation Bright Star 82 was a 3½-day live fire exercise approximately 50 kilometers south of Cairo West. Leaving garrison in convoy with the mortars of the 2d Battalion (Airborne), 504th Infantry, the battery headed east into Cairo, then turned south at the foot of the great pyramids at Giza, and arrived at the training area at dusk.

The next day, B Battery fired in a Combined Arms Live Fire Exercise (CALFEX) with an armor heavy battalion task force from the 24th Infantry Division and the Egyptian Army. The organic mortars of B Battery as well as those of the 2d Bn, 504th Inf, and an M109A1 battery of the 24th Inf Div fired in support of the mechanized units. Observed by senior members of both the American and Egyptian Armies, B Battery fired 170 rounds during the highly successful exercise.

Field training continued for the Redlegs as they experienced, first hand, the difficulty of conducting artillery operations in the desert.

"You have to be there to fully appreciate the difficulty of trying to navigate from one firing position to another," said 1LT Paul L. Merritt, executive officer of B Battery. "The lack of any recognizable terrain features either on the map or on the ground requires that you rely on your compass and vehicle odometer more than usual."

SSG Norris Hand (center) is supervising his section in direct fire during Operation Bright Star 82. All live fire operations took place near Dashur, Egypt, approximately 50 kilometers south of Cairo.

The live firing exercise ended with direct fire at targets constructed by the battery in the training area. Here the wide open Egyptian terrain made range estimation by the section chiefs more challenging than ever.

"The first round was the toughest," noted section chief SGT Drew Waller, "However, once we were able to get that first round out there, it was just a matter of one or two rounds before we could get a target hit."

Bright Star 82 was a demanding exercise from conception to completion. As a result of the joint efforts of the Egyptians and fellow Redlegs of the 24th Infantry Division, the men of B Battery returned from Egypt with a new appreciation and respect for artillery operation in a truly demanding environment—the desert.

NG unit celebrates 247th birthday

KEYSER, WV—On 17 February 1982, the 1st Battalion, 201st Artillery, West Virginia Army National Guard, celebrated 247 years of almost continuous service. Originating on 17 February 1735 near present-day Martinsburg, WV, as Captain Morgan's Company of Volunteer Militia, Orange County, VA, the unit was redesignated as Morgan's Company, Frederick County Militia, in November of 1738 when the county lines were redrawn. On 24 February 1742, the company was expanded to become Morgan's Battalion.

The years 1744 to 1763 were marked by skirmishes along the Appalachian frontier between the British colonists and the French and Indians over rights to the inland fur trade. Early in 1758, CPT Robert Rutherford's Company of Rangers was raised from volunteers of Morgan's Battalion. They

served through 1759 and participated in the struggle with other Virginia mountain men (mostly of English and German descent) against the French who were seeking to expand their territorial rights east of the Ohio Valley.

Over the years, the 201st (under numerous designations) participated in the following campaigns:

- Revolutionary War — Boston and New York 1776.
- War of 1812 — Indiana Territory (1812-1813).
- Civil War — 1861, 1862, and 1863.
- World War I — Without inscription.
- World War II — Aleutian Islands.
- Korean Conflict — Europe (1951-1952).

On 14 June 1775, CPT Hugh Stephenson's Company was created from the volunteers of what had become Hampshire County, VA, in 1753. The unit was later expanded to four companies and consolidated with two Maryland rifle companies under CPT Moses Rawlings to form the Maryland and Virginia Rifle Regiment with Stephenson, by then a colonel, in command. However, on 16 November 1776, at Fort Washington, the unit was captured in part and the regimental organization was broken up. However, in 1789, the Virginia General Assembly passed an act describing the formation of the state militia which provided for a regimental organization in each county of the state. In December of 1792, volunteer companies of the 10th and 16th Brigades, 3d Division, Virginia Militia, were formed, encompassing the counties of what is now the northern and eastern part of West Virginia, with the 18th and 20th Brigades being added later.

In the years since Korea, the 201st has served the state by aiding residents during floods, providing personnel and vehicles to distribute commodities to needy families (1960-61), and standing by during gas price wars, the last such duty occurring in 1979 in Morgantown.

During that time two further reorganizations and redesignations took place, one on 1 March 1959, as the 201st Artillery, a parent regiment under the Combat Arms Regimental System, to consist of the 1st Howitzer Battalion (155-mm) (SP), and the other on 1 March 1968, to 1st Battalion, 201st Artillery (SRF 11).

Today's 201st under LTC William G. Hartman consists of three firing units (Battery A at Elkins, Battery B at Morgantown, and Battery C at Keyser), Service Company at Kingwood, and Headquarters at Fairmont. Each firing unit is authorized 100 men and six pieces of self-propelled artillery equipment.

Training for the 201st includes monthly weekend drill and training sessions, most of which take place at Camp Dawson near Kingwood, the only National Guard Camp in West Virginia. The unit did, however, go to Fort Irwin, CA, for a weekend in March this year. In addition, a 15-day annual training is held at Fort Knox, KY, or Fort Pickett, VA, each summer.

When SGT Lionel Friend of Battery C was asked how he viewed the role of the Guard today, he replied simply, "Why, what our job has always been — to train to be ready to protect our country and the lives of its citizens." (Mona Ridder)

French 75s on display

FORT LEWIS, WA—The 9th Infantry Division has acquired two more weapons for its inventory, but these are not for testing. They were battle tested in World War I.

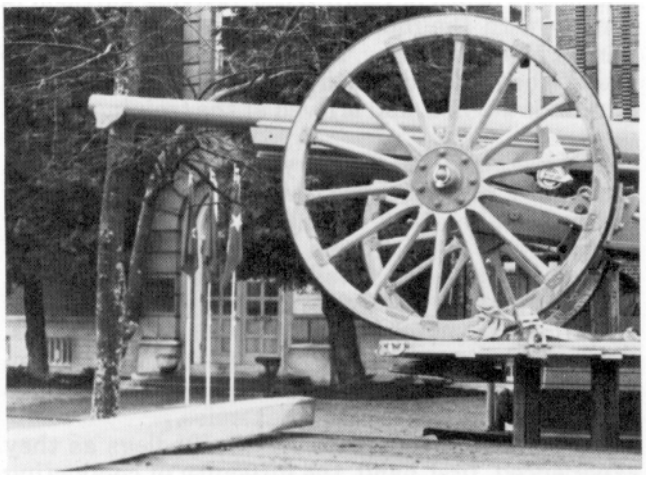
Two French 75-mm guns (Model 1897), previously owned by the Fort Lewis Musuem, now sit in front of the division headquarters building. It took more than six months to get them in shape for display.

The French 75 was perfected in France by Captains Sainte-Claire Deville and Emile Rimailho. As the first rapid fire gun with mobility and accuracy, it revolutionized combat arms. It also forced the entire world to adopt, against its will and at an expense of hundreds of millions of dollars, its own rapid fire program.

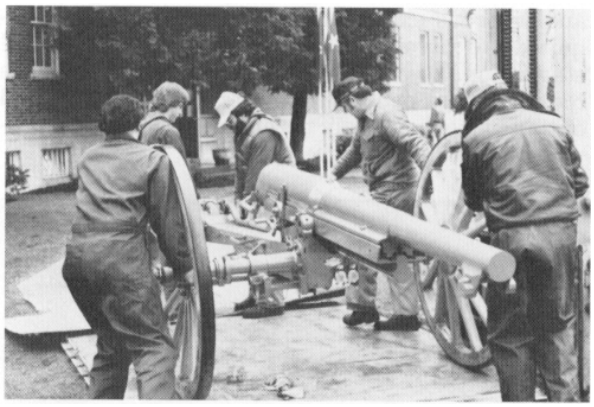
A single French 75 can fire 15 to 20 rounds per minute under normal conditions. It has tested up to 40 rounds per minute, almost melting the gun barrel.

The gun's length is 34.5 calibers and it weighs 1,015 pounds. Its range is 13,500 yards using either a 16.1-pound shrapnel shell or a 12.3-pound high explosive shell.

Called the "finest fieldpiece of its time," the French 75 is fitted with a pneumatic or Puteaux recuperator which enables it to fire repeatedly without being reseated after each firing. The recuperator is made up of two cylinders—one filled with oil and fitted with a piston and the other filled with oil and nitrogen and fitted with a piston to separate the two contents. The two cylinders are connected so that the flow or throttling of oil from one to the other spends the force of a recoil and softens any counterrecoil.



A restored French 75 of World I Vintage gets a forklift ride to the division headquarters.



Fort Lewis maintenance workers guide a French 75 onto its pad at the entrance of the 9th Infantry Division Headquarters. (Photos by Barry Dowell)

French 75s were widely used by Allied forces in World War I. Approximately 60 percent of the US forces used the weapon while the French were even more dependent on it, nearly causing their defeat.

France was obsessed with the merits of the gun. The 75 was expected to do everything; thus, France failed to balance its artillery with howitzers and heavy guns. The 75, though superior on open ground, could not search out the nooks and slopes where machinegunners lurked. Only the high angle plunging fire of the howitzer could accomplish that task.

Still, the French 75 was a giant step in field artillery and was depended on around the world for decades. In fact, as late as the spring of 1940, 40 percent of the US Army's field artillery was made up of 75-mm guns of World War I vintage—most of them French. (Sandi Pellicano)

IRR Counterpart Training Program

FORT BRAGG, NC—Army Reservists assigned to local Reserve units have an opportunity to train year round by attending assemblies and participating in two-week tours of Annual Training. However, many Reservists assigned to the Individual Ready Reserve (IRR) found, until recently, that their ability to participate in meaningful training was quite limited. Tours for IRR soldiers were constrained to attendance at service schools and augmentation duty with organized Reserve units.

The IRR Counterpart Training Program, a relatively new scheme, responds to this shortcoming by allowing Reserve Component officers and enlisted soldiers from the IRR to train with Active Component units. One unit in which this program has proved particularly successful is the 18th Field Artillery Brigade at Fort Bragg, NC.

A major subordinate unit of the Rapid Deployment Force-Army and the XVIII Airborne Corps, the 18th Field Artillery Brigade provides a substantial portion of the counterpart training for those Reserve Component artillerymen living along the eastern seaboard. In fact, more than 115 Reserve Component artillerymen trained with the brigade during 1981. These officers and enlisted men served as numbered cannoneers, unit surveyors, battery executive officers, and assistant S3s, to mention only a few.

Personnel management officers (PMOs) at the Reserve Component Personnel and Administration Center (RCPAC) arrange such training tours with the objective of preparing individual Reservists to perform effectively in the event of mobilization. For example, 28 company grade officers with limited branch experience received assignments directly to the brigade's firing batteries and performed those duties normally assigned to junior officers; 49 other company grade and 28 field grade officers, who had substantial experience at the battery and battalion levels, were posted as assistant S3s in the brigade tactical operations center (TOC). Here they not only acquainted themselves with the Army's new training and operational doctrine but also tackled demanding staff actions such as producing training guidance on resource management, coordinating SQT accomplishment, and planning battalion-level Emergency Deployment Readiness Exercises (EDREs).

Each Reservist serving in the TOC worked for LTC Oren E. Oeschger, brigade S3, who had nothing but praise for these officers and the entire Counterpart Training Program. According to Lieutenant Colonel Oeschger, everybody benefits from such training—the individual Reservist refreshes his technical and tactical skills, while the unit receives a hard working officer or soldier who can augment the brigade's staff.

COL William K. Seago, the Brigade Commander, is quick to point out just how much his unit benefits by having so many qualified "extra hands" to assist in planning and executing long-and short-range projects. In fact, Reservists become full-fledged members of the brigade; i.e., they take physical readiness training, join in social activities, and act as brigade-level action officers as well as serve as evaluators on EDREs and ARTEPs.

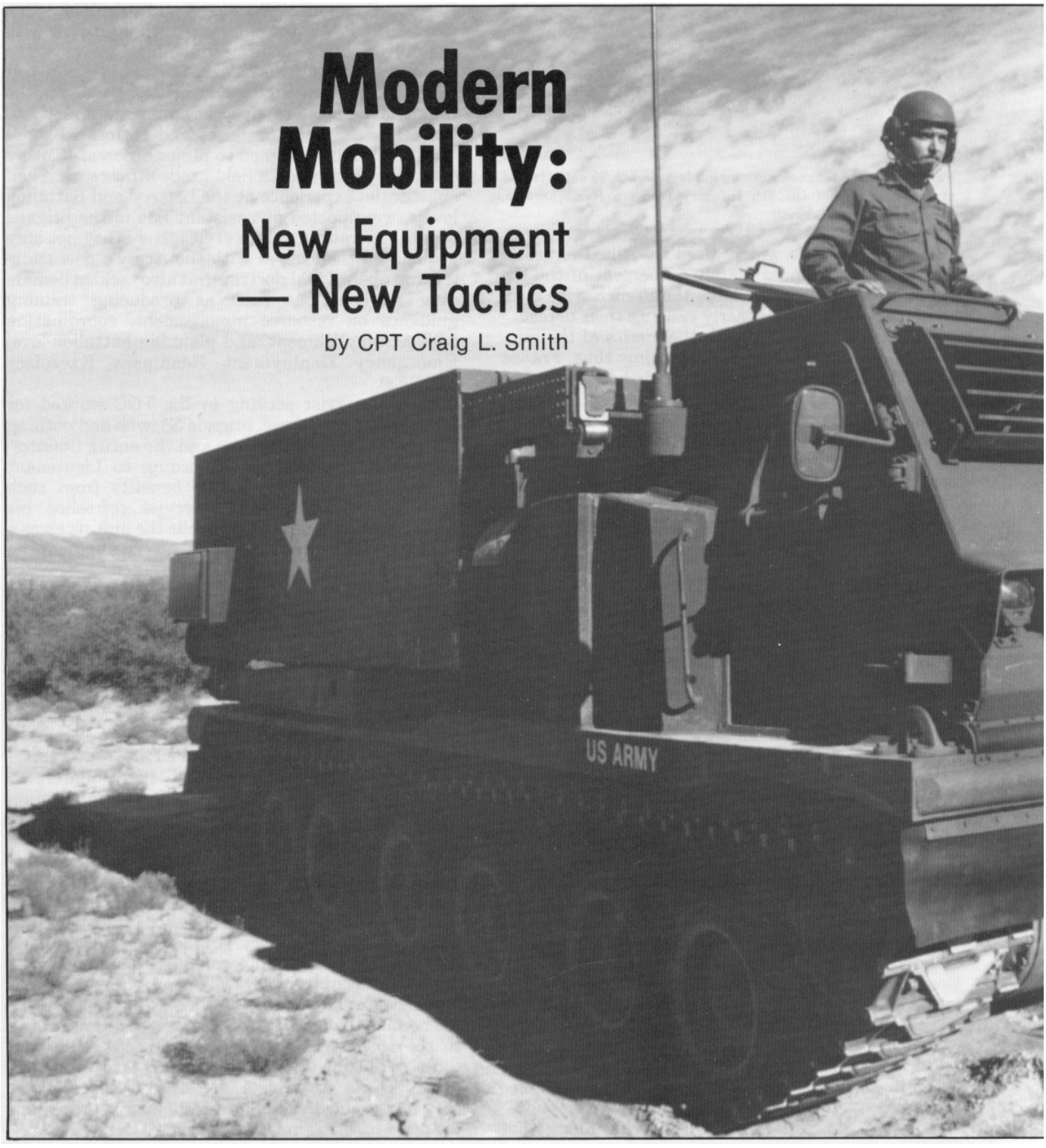
Before RCPAC implemented the Counterpart Training Program, most Active Duty for Training (ADT) tours were limited to the summer months. By placing an individual Reservist in an active unit, PMOs can arrange ADT tours anytime during the year. This enables a Reservist to train at a time convenient to him, and it permits units to program Reservists to fill slots when the need is most critical. The 18th Field Artillery Brigade, for example, requests extra officers to accomplish such manpower intensive events as ARTEPs and support ROTC Advance Camp.

The fact that individual Reservists are returning to the 18th Field Artillery Brigade for additional tours of duty is evidence of the success of this program. These Reservists are acknowledging that they have gained valuable experience and are asking for more of the same. (MAJ Paul Kelly, USAR)

Modern Mobility: New Equipment — New Tactics

by CPT Craig L. Smith

Mobility has been one of the most decisive factors in the outcome of battle ever since the military started using animals and even more so with the invention of the wheel. Gaining a decisive mobility advantage over a threat force that is equally mobile on the battlefield is certainly difficult. Too often, the existence of such an advantage is assumed, while no real effort is made to secure it. Deliberate planning and vigorous execution on a repetitive basis is required to avoid complacency and operational stagnation. To put it plainly, a mobility advantage requires more deliberate efforts than the potential enemy makes; certainly nothing less will yield an advantage over those forces.



Many items of new equipment, such as the M1 tank, the M2 and M3 fighting vehicles, the Division Air Defense (DIVAD) gun, the Multiple Launch Rocket System (MLRS), and TACFIRE to name a few, are joining the force. All of these will be of prime importance in making the mobilization of our force easier and more effective, but new tactics and leadership techniques must accompany this weaponry modernization. And, more importantly, every commander, leader, and soldier must realize the value of mobility and must visualize ways to gain a mobility advantage over an essentially equivalent adversary. Simply stated, a quantum jump in the quality or effectiveness of new equipment and the inherent increase in the potential it represents require a corresponding change in the tactics and techniques used in standard battle drills or operations (employment) in order to most advantageously commit the new equipment.

The modernization of the operation essence of mobility must be based on the characteristics of the new weapons, or the potentials those characteristics offer, and tempered with modern realities — not with preconceived, outmoded techniques.

Mobility used to be the difference between the 3-mile-an-hour rate of a foot soldier and the 15-mile-an-hour trot of a horse. Today, it is the difference, not just in speed, but in operational potential as well, between the foot soldier and the 20- to 40-mile-an-hour rate of a fighting vehicle or tank; or more startling, the 80- to 100-mile-an-hour rate of a helicopter and the almost instantaneous effect of the MLRS, DIVAD, and TACFIRE. If these differences are not understood and exploited, the mobility advantage offered by the new equipment will be sacrificed and the battle, the first battle, may well be lost.

Napoleon described force as mass times velocity (F=MxV). Mobility is represented by velocity in this equation. The truth of this equation is verified by any soldier who understands mobility as a force multiplier or geometric consideration in the development of total force. He knows by experience that by moving fast and relentlessly (but of course not irresponsibly) that he doesn't just add to his force, he multiplies it.

Lately, however, mobility has been described as a statistical characteristic; i.e., the ability to move a weapon platform around the battlefield. Labels such as "leg" infantry, airmobile infantry, self-propelled artillery, etc., have unfortunately been accepted as a complete definition of a unit's mobility potential. This is wrong — dangerously wrong — when even the slightest advantage is being sought. These are descriptive terms of transportability but not of mobility. Real mobility is much more; it is a force multiplier. Weapon transportability or vehicle readiness rates alone do not yield operational flexibility. Simply stated, mobility is the ability to concentrate force in any operation; this concept must be deliberately inbred into a unit through purposeful training — not by merely enacting a canned scenario as an actor simply rehearses a scene.

One very important consideration in ascribing to modern mobility is the heightened importance of enemy positions on the modern battlefield. In the past, enemy positions were primarily the objective or aim of the planning; they did little to really affect the planning or execution of operations (the means) unless the force occupying the position was considerable

in size. The historical assumption was that, if a small force occupied relatively unimportant terrain or its seizure unnecessarily detracted from the main thrust, it was to be operationally ignored. In modern conflicts, however, even small units have great effectiveness. The effectiveness of modern weapons (range and lethality) even at the squad and platoon level, as well as the very considerable support available to such units through improved communications, has made enemy positions a very important consideration to planners and commanders alike. The enemy disposition (position and strength) has become as important a consideration as the terrain in the battle area. This is a startling yet deceptive development. Modern mobility is the singular advantage that will allow us to erode enemy strengths and yet attack weaknesses while economizing forces in some areas and massing forces in others. Therefore, one very important modern consideration is that the operational mobility must be effective enough to enable a unit to react to enemy dispositions and developments (the "friction" of war as Clausuitz called it).

The how-to-fight manuals (FMs 100-5, 71-1, 71-2, 6-20, 19-95, etc.) tell us we must concentrate forces where needed to win and economize our forces in other areas; however, there is a void in explaining that mobility, both in planning (contingency plans) and in execution (operations with inherent flexibility), is absolutely essential to apply these tactics. Further, the manuals do not discuss the very real difficulties a commander will encounter when attempting to shift forces while being attacked on a broad front (a fundamental principle of warfare for our most threatening adversary). Therefore, most likely, these shifts will entail movement at high speeds and over great distances. This, then, is another very real and important consideration of modern warfare in restructuring a modern and functional mobility advantage and surprise action over long distances.

Many times, even in recent history, warfare has been fundamentally changed by the development and introduction of technically new and advanced equipment. Each time new equipment has offered increased effectiveness and a corresponding change in tactics and techniques. The forces that understood these changes and adapted old principles to modern realities won; those that dismissed the need for change or failed to fully effect the change lost.

History is rich with examples. Body armor, the English long bow, the Swiss pike, the stirrup, gun powder, the arquebus, the breech loading gun, the internal combustion engine, the iron navy, tanks, rockets, and nuclear power all were only fully accepted in military history after an upset or unexpected victory — victories which are all too understandable now. Yet these victories were clearly doubted and sometimes even rebuked by leaders who opposed the protagonists for years, until they could more plainly see the evidence and were forced to accept the verdict of a battlefield.

Before World War II, a few men advocated the revitalization of the concept of mobility as it was checked by the machinegun and the methodical structuring of defensive positions on a continuous line, as from the World War I trenches. These were men like General Hanz Guderian of Germany, General Chassin and General d'Armee Andre Beaufre of France, General Fuller, Mr. Basil Liddell Hart of England, and General Douglas McArthur, the US Army Chief of Staff.

In General McArthur's annual report of 1935, as the Army Chief of Staff, he said:

> "*Much deliberation is spent on the distinction between more motorization and true mechanization with armored vehicles [by "true mechanization" he means 'the state of the art' in mobility]. The principles which must guide the American Army in its future development must be along the line of producing a modern mobile arm which, because of its combined fighting power and great road speed [F=MxV] will concentrate within itself a tremendous capacity for distant surprise action. A modern Army is a highly organized and in some respects a delicately adjusted mechanism [methodically trained, not just maintained]*."

General Guderian (the general who trained the German Army for the Blitzkrieg and is said to be the best practitioner of that concept of mobile warfare) said that theorist Liddell Hart was the creator of the theory of the conduct of mechanized warfare. Generals Chassin, Beaufre, McArthur, and Patton, to name just a few, also saw the potential of mechanization as a means to create and exploit an advantage in mobility at about the same time, but their Armies reacted slowly in developing it. Mr. Liddell Hart, a well publicized and an almost universally accepted theorist on the conduct of warfare, stated:

> "*Infantry, even the best light infantry, cannot replace the need for a modernized cavalry, because they cannot strike quick enough or follow through soon enough for decisiveness in battle. The only condition on which they could do so is if they took the form of a mounted infantry, mounted wholly in small armored vehicles. Such a corps might be like tank men when mounted and light infantry when dismounted*."

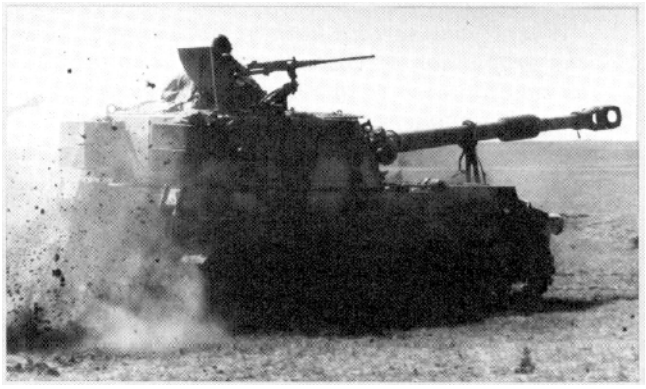
So, a modern mobile unit must use tactics and techniques which exploit every capability offered by modern equipment to strike quickly and follow through to be decisive. Mr. Liddell Hart went on to say that mobility is a "perfect combination of fire and shock tactics [a highly organized and delicately adjusted mechanism]." Combined fighting power requires real mobility; there is no substitute in this requirement.

Combined arms operations is the state of the art today, but it must be just as assuredly understood that a much more purposeful effort is required for tanks, infantry, and artillery to work together in optimum efficiency than it was to commit an infantry battalion or regiment as a battlefield entity and orchestrate its actions in a concert. Very deliberate measures are called for in developing such a model of mobility, especially if winning the first battle is expected to be a reality. As a very logical first step, a combined arms force must be organized and allowed to perform as such on a daily basis. Task forces and teams, not pure companies and battalions, are needed in garrison as well as in the field. Infrequent, short, and needlessly haphazard task organizations, while participating in excursions in scenerio based field training, are ineffective and should not continue. First, and most importantly, mobility requires training, competence, and initiative at the *doer* level. Flexibility and responsiveness demands bold, experienced leadership. Platoon and squad leaders do not report for duty with these attributes; they must be trained, extensively, until they are fully competent and able to act with enlightened initiative.

With these modern realities in mind, what about mobility itself? The principles involved in restructuring a mobility concept for a modern force are the same principles which great leaders long ago illuminated for us and victory has repeatedly validated. First, it is important to stress that the use and exploitation of mobility is equally important in both offensive and defensive operations. An army should never stop or slow its advance. For, in the defense, the prime objective is to regain the initiative (or the offense) and end the battle in victory. A battle is not concluded in victory from a defensive posture any longer. Only mobility, properly planned for and executed, can give the commander a viable potential to conduct offensive action, even while defending and during the retrograde. In all operations, there must be both a plan and the raw ability to sieze an unforeseen opportunity, to concentrate superior force at the critical time and decisive point in order to win the day, and to follow through to exploit every opportunity realized.

• First, mobility demands ease in internal operations, flexibility in execution, and speed in movement. Speed, responsiveness, the ability to mass, the ability to gain or regain the initiative, integrated movement on the field, flexibility, and simplicity are all at the very heart of mobility.

• Second, leaness is necessary for every unit striving to maximize mobility (gain an advantage over another unit). Leaness entails stripping materials which are not absolutely necessary for mission accomplishment. Much of the excess fat in mechanized units is the result of trying to provide for every contingency. Possibilities too easily become regarded as probabilities, and luxuries as necessities. Mr. Liddell Hart called this "fatty degeneration." This growth requires constant pruning by leaders at every level of supervision. It is one of the very few areas where leaders can materially increase a unit's mobility.



A battle is not concluded in victory from a defensive posture.

• Third, the ability to mass and execute operations as a massed unit is one of the most important indicators of a mobile unit. The Russian, Marshal Tukhackevski, states:

> "*Western military thinkers, like Fuller and Liddell Hart, are afraid of using the masses and . . . supplementing manpower with technical equipment is a rationalization of the bourgeois fear of masses*."

This may not have been wholly accurate in 1936 when it was stated; however, our present understanding of economy of force appears to have led us to forget that the only purpose for economizing in one area is to mass in another and that massing is *essential* to victory. A force must be mobile enough to focus that mass at the decisive time and place to be effective.

• Fourth, there are many ways to operationally increase the margin of effectiveness in mobility. This is especially important when opposing forces are roughly equivalent in equipment. For example, contingency plans, meaningful and well drilled standard operating procedures (which are viable and effective), accurate and timely reporting of information, vigorous and confident execution of operations will yield mobility advantages to units that repetitively practice them. Recent developments in our tactics and techniques include the dedicated battery, extensive fire planning for immediate smoke and suppression on likely enemy positions (extensively referencing the battle area with predesignated "kill zones" and "firing positions" to facilitate integrated movement of units on the battlefield), massed firepower, and speed of movement. There are several more, but these are good examples of modernizing old techniques and tactics to fit modern realities and thereby establishing modern mobility.

Mobility is costly, and sometimes efficiency and effectiveness are conflicting considerations in light of this expense. The proper balance is often hard to find when tailoring or reorganizing a unit. Gustavus Adolphus, one of Mr. Liddell Hart's "Great Captains," suggests:

> "*Where your service lieth in campaignia, the proportion of your Army ought to be as two footmen to one horseman, besides your Dragooners. But where the service of your Army shall be most in sieges, there you ought to have three footmen to one horseman . . . and to every 800 horses, you ought to have 150 Dragooners*."

Gustavus is remembered by history as being one of the very best in organizing and equipping an Army. During his period, mobility was proportioned according to the mission. This is still true today; however, commanders must also now consider the enemy disposition as well.

Moreover, the efficient and effective use of such an organized force also requires an astute and enlightened analysis by all commanders. For example, in the experimental tank brigade developed by Liddell Hart, he found that the brigade's 600 men with their mobile equipment and the execution of new tactical techniques could generate more firepower than the usual 20,000 men of a whole infantry division. Firepower in Hart's mind was thought of as multiplying the strength and speed of the brigade. Further, this 600-man force would not occupy as much space and, therefore, could mass its fire on a much smaller area. The key to this multiplication of force was that the unit had to be massed.

Establishing the objective for which the force was concentrated and correctly estimating the concentrated capabilities is critical and that subject requires detailed analysis. For example, consider the German forces at Dunkirk.

> "*If he [Hitler] had prevented the British forces [from] escaping through this one remaining bolt-hole [Dunkirk], Britain, herself, would have been so defenseless that he might have conquered her even by hastily improvised invasion . . . . But having missed his supreme chance of trapping the British Army at Dunkirk, he could not hope to subdue her without a well-organized invasion in strength, and for that he had made neither plans nor preparations*."

Evidently, the force level of the German Army and its mobility had been underestimated.

Napoleon saw mobility, in a day of nonmechanization, as a means of gaining surprise and insuring security. Gengis Khan felt that it enabled him to keep out of unfavorable conflict and put his Army at the right place, at the right time, when conditions were favorable. Liddell Hart places much importance on maneuver; instead of risking frontal attack, he would use mobility to concentrate superior firepower in a weak spot, break through, and neutralize the enemy by destroying his command and control, communications, and supply. Hart believes penetrations followed closely by a coordinated assault give the attacker initiative and forces the enemy to play catch-up which makes the enemy's position much more difficult, if not impossible. Mobility, in its broad concept, is the focal point of all these views.

The application of Liddell Hart's "Blitzkrieg" principle by the Germans in World War II typify the use of mobility.

> The art of lightning war: ". . . *lies partly in combination of tanks and aircraft, partly in the unexpectedness of the stroke in direction and time, but above all, in the follow-through — the exploitation of a breakthrough (the tactical penetration of a front) into deep strategic penetration carried out by armored forces racing ahead of the main Army and operating independently . . . . It is the persistent pace, coupled with the variability of the thrust point that paralyzes the opponent . . . . It is a high speed indirect approach to the enemy's rear areas where his vital and vulnerable organs of control and supply are located*."

In a more contemporary view, mobility in the defense can be thought of as the equalizer facing the inherent strength of a larger attacking enemy force. The concept of mobility, if applied in planning and operations, enables a unit to react to the attack, concentrate its power, and defeat the enemy. Nothing else can produce this effect today. As more modern technology negates the power recently given the offense (by its use of armored vehicles) mobility can further increase the comparative effectiveness of the defending force by replacing stagnation with flexibility (dispersion of the defense and concentration in the offense).

To be victorious — not just effective — mobility must be an integral part of all planning, training, and operational activity. FMs 71-1, 71-2, 6-20, 17-95, and 100-5 outline "how to fight" but fall short of advising commanders and leaders how to finish the fight with victory. A unit must use mobility to end the battle and win.

Liddell Hart used the history of mobility's decisiveness in past wars to substantiate his advocacy of mechanization. This has also been accepted as the modern approach to war. However, the continued realization of better equipment and the increased ability to project force cannot by themselves fulfill the goal of obtaining a mobile force capable of destroying the enemy. Instead, the enlightened use of modern mobility represents the presence or absence of all these tactical considerations followed through to their logical and very true end. New equipment requires new tactics and techniques to materialize potential advantages, and it is the duty of every soldier to follow through on that task now!

CPT Craig L. Smith (Infantry) is attending the US Army Institute for Military Assistance at Fort Bragg, NC.

View from the Blockhouse

FROM THE SCHOOL

E7 Promotion Selection Board

The School's Assistant Commandant, BG Donald E. Eckelbarger, recently served as panel chief for the FY82 E7 promotion selection board. His experience on that board led to the following comments concerning Career Management Field (CMF) 13 which appropriately should be shared with *Journal* readers.—Ed.

E6 competence (strengths and weaknesses)

Physical fitness: A tabulated eight percent of CMF 13 did not meet the standards of AR 600-9 concerning appearance, weight control, and physical conditioning. MOSs 93F and 15D recorded a 16 percent failure rate.

Training and education:

• Attendance at an advanced noncommissioned course (ANCOC) was not a major factor used for determining promotion qualification. Numerous soldiers have not had the opportunity to attend ANCOC due to limited quota availability and other reasons. However, a considerable number of personnel who possess poor records and have limited promotion potential had attended ANCOC.

• MOS 82C (FA surveyor) gained numerous soldiers through reclassification action in 1967; however, this career field appears to be highly skilled and well-trained. There were very few individuals who had worked outside 82C duty positions.

Utilization and assignments:

• Unlike MOS 82C, soldiers in MOS 17C (FA target acquisition specialist) have been performing an unusually high number of duties outside their career field. Common assignments include customs inspectors, community activities, range control, and staff duty NCO. This MOS has received sizable numbers of soldiers through reclassification and, as a specialty, expertise and technical competence are not up to usual standards.

• Although 15E (Pershing missile crewmember) is a space imbalance MOS (SIMOS) with more positions overseas than in CONUS (three battalions in USAREUR; one battalion and the FA School at Fort Sill), too many E6s continue to perform instructor-type duties in both locations. These soldiers have not performed in leadership positions with troops.

Performance and potential of MOS 93F (FA meteorological crewmember): This small group had the poorest quality files of any in CMF 13. It was unclear whether this condition was related to leadership (SFC and WO1 supervisors in many cases), type of duty (small, unique section with no other peer groups to compete with), limited or no field duty (which tends to lessen teamwork and competence), or other factors. Derogatory comments generally concerned leadership and initiative — not necessarily technical ability.

Overall career management of MOS 13F (fire support specialist): Although the current overall strength of this MOS is 99.6 percent, the strength at grade E7 is just over 50 percent. Therefore, in an effort to begin to correct this shortage condition, both primary and secondary zone promotion rates were high. Most 13Fs have had superb training as FIST and FSO personnel. Generally speaking, 95 percent of this MOS are doing quite well. They are performing 13F duties and receiving good reports. There is not doubt that 13F is a demanding career field, but it was encouraging to see the excellent quality that exists in it.

MOS 17B (FA radar crewmember): This is a fairly good looking career field; most are well trained, but a few soldiers are not working in their MOS.

CMF structure and career progression

Suitability of grade and structure standards: CMF 13 appears to be well structured at this point. Although there are some imbalances which restrict promotion flow, the proponent is taking action to correct this situation through TOE restructuring.

Assignment and promotion opportunity: At the E7 level, all CMF 13 MOSs are either in a balanced or shortage condition: none are overstrength. Therefore, promotion opportunity in all Field Artillery MOSs is excellent at this time. Except for space imbalanced MOSs (Lance and Pershing) where fewer positions exist in CONUS than in USAREUR, assignment opportunities in the proper MOS are available worldwide and are commensurate with appropriate promotion progression. Even Lance and Pershing soldiers are performing meaningful duties in their secondary MOS in Army training centers, schools, nonmissile units, headquarters, and other Army organizations in CONUS.

Overall status of CMF:

• Generally speaking, CMF 13 is viable and healthy; however, continued special attention should be given to improving Lance and Pershing force structure in order to increase the length of the CONUS tour. Currently, CONUS turnaround time back to USAREUR is under two years.

• MOS 15D was the recipient of reclassified soldiers, which has resulted in a less technically qualified grade structure than desired, since these newcomers are not as highly trained as they would be had they progressed up through the ranks in Lance missile units.

Other MOSs: Although the board was given authority to offer limited reclassification to fully qualified soldiers for promotion and assignment into shortage MOSs (15E, 15J, 13C, and 93F), a review of over 250 records revealed only a very few soldiers possessed the requisite qualifications for reclassification.

Recommendations

Physical fitness and weight control should continue to receive emphasis by all commanders.

A review of the Noncommissioned Officer Education System (NCOES) should be conducted to improve selection procedures for attendance at advanced NCO schools to insure that only the best E6s (those who are potential E7s, E8s, and E9s) attend this important course of instruction.

MOS 17C training and education programs should be studied and procedures implemented to increase job knowledge and competence. Steps taken should include provisions to improve assignment procedures so that soldiers perform MOS duties.

Soldiers with 15E MOS should be alerted to the importance of serving in leadership positions with troops. It is their responsibility to seek these jobs for continued successful career development.

All aspects of the 93F career field, to include equipment, organization, training, and other factors, should be reviewed and steps taken to strengthen the structure of this MOS and improve the quality of soldiers.

In an effort to improve the quality of the 15D MOS, it is recommended that the proponent review entrance qualifications, AIT instruction, BNCOC, ANCOC, assignment patterns, and other considerations to determine whether proper training, duty assignments, and promotion opportunities are being afforded soldiers in this career field.

MQS II Program for Lieutenants ready for on-site evaluation

The Military Qualification Standards (MQS) II Program for Lieutenants will be evaluated by the US Army Training and Doctrine Command (TRADOC) beginning 1 August 1982 and ending 1 September 1983.

Currently, the MQS II program is in a pilot phase involving the Field Artillery School, Infantry School, Missile and Munitions School, and Military Police School. During this pilot phase, the one-year evaluation will be conducted to determine the effectiveness of the MQS II training concept and the usability and validity of the accompanying MQS II manuals. Units participating in the evaluation have been selected from USAREUR and FORSCOM. Teams of evaluators from each proponent school will visit the selected units to explain evaluation procedures and collect evaluation data.

The MQS II program, developed as a result of the Review of Education and Training for Officers (RETO) study ordered by the Chief of Staff, was designed to help the lieutenant learn what he must do on his job and to assist him in his continued professional development. Chaired by BG Benjamin L. Harrison in 1977, the study group recommended the establishment of military qualification standards for all officer training from precommissioning through the tenth year of service.

The MQS program provides a method to qualify officers to perform the duties required of their specialty and their grade. It also provides a framework which will effectively integrate the training and evaluation efforts of the officer, his commander, and the Army School System.

Components for standardization in the MQS II program consist of common tasks, military specialty tasks, a professional reading program, and professional education. Specialty tasks are listed in Specialty MQS Manuals and are those tasks that are required by an officer to be combat-ready. An MQS II Manual has been developed at US Army Field Artillery School for each of the three Field Artillery career management specialties for lieutenants: Light Missile (Lance), Cannon, and Target Acquisition. These manuals will serve as the main tool of the program. An MQS II (test) Common Task/Skill Manual, developed by TRADOC, will also be evaluated during this period.

In addition to specialty tasks, the MQS II Manual contains a list of reading requirements which introduces the lieutenant to some of the fundamental books relating to critical issues facing his profession and the nation. The third component of the program outlines requirements for attainment of a professional education that includes studies in history, communication, human behavior, national security policy, and management. The MQS program is divided into three levels:

• *MQS I—Precommissioning*. The purpose of MQS I is to provide the prospective officer with the common military skills and languages required to enter the Officer Basic Course.

• *MQS II—Specialty qualification*. MQS II will continue the officer's development of those skills that are essential for professional growth. This phase begins in the Officer Basic Course and is completed on the job when the lieutenant becomes proficient in the specialty and core tasks listed in the MQS II Manual and the common tasks listed in the MQS II (Test) Common Task/Skill Manual. He must also complete a required reading program from four specified categories. It is envisioned that the MQS II program will be completed before an officer attends the Officer Advanced Course or is promoted to captain.

• *MQS III—Command and staff training.* MQS III will build and expand upon the basic specialty foundation developed during MQS II and produce an officer who is qualified in command and/or increasingly responsible staff positions in his primary

specialty. Preparation for the MQS III program begins when the officer is certified in the MQS II program and continues during the Officer Advanced Course and on the job.

One of the more important and potentially controversial aspects to be evaluated during this one-year period is the certification of completion procedure. Two proposals for certification will be evaluated: command certification and self certification. Command certification requires the battery commander/rater to certify that the lieutenant has completed all MQS II requirements, and self certification requires the lieutenant to certify himself as he completes the program.

Command certification procedures may be difficult to administer unless the battery commanders/raters become directly involved in the supervision of training for battery lieutenants. During the evaluation, the USAFAS team will be asking for suggestions and opinions from commanders to help decide on the best procedure for certification.

Help is needed from participating unit commanders and lieutenants to evaluate the proposed MQS program so that it can be refined to produce a viable and useful system for training our future Field Artillery officers. (LTC(P) Walter J. Bryde Jr.)

Exercise Kangaroo 1981

It's beginning to happen! Validation of the implementation of Standardization Agreements (STANAGs) and Quadripartite Standardization Agreements (QSTAGs) has gotten off the ground. At its 22d meeting, TEAL (Vice Chief of Staff Level) of the American, British, Canadian, and Australian (ABCA) working parties directed that selected QSTAGs be validated on multinational exercises.

During Exercise Kangaroo 1981 (K81), Australia agreed to include validation of certain QSTAGs. Those of special interest to the Field Artillery were:

- QSTAG 217—Tactical Tasks and Responsibilities for Control of Artillery.
- QSTAG 221—Target Numbering System (Nonnuclear).
- QSTAG 246—Radio Telephone Procedures for the Conduct of Artillery Fire.
- QSTAG 503—Bombing, Shelling, Mortaring, and Location Reports.
- QSTAG 505—Target Grid Procedures.
- QSTAG 514—Methods for Describing Ground, Locations, Areas, and Boundaries.

US Army participation primarily consisted of an infantry battalion, a brigade headquarters, and a Special Forces "A" Team.

A glaring omission from the validation list was QSTAG 225, "Call For Fire Procedures," which is particularly important because of the requirement of all field artillerymen of participating nations to be absolutely familiar with the two systems of "requesting fire." This is especially true when US forces participate in NATO exercises where STANAG 2144, "Call For Fire Procedures," is used.

Included on pages 13 and 14 of the March-April 1982 *Journal* was a listing of the US ratified STANAGs/QSTAGs and their locations within the implementing documents (normally field manuals).

The 11th meeting of the Quadripartite Working Group, Surface-to-Surface Artillery, will be held at Headquarters, Directorate Royal Artillery, Woolwich (UK), 17-21 May 1982. (Mr. B. M. Berkowick, USAFAS International Standardization Coordinator (NATO/ABCA), AUTOVON 639-2900)

COUNTERFIRE SYSTEMS REVIEW

Meteorology

The following changes, noted in a recent Met Information Letter, have been sent directly to Ballistic Meteorological Technicians and may be of interest to unit supply and calibration personnel:

•The OL-192/GMD-1 Meteorological Processing Data Group is now a component of the rawin set and will be incorporated into the next change to TM 11-6660-206-12 and TM 11-6660-206-35.

•Calibration of frequency standard TS-65/FMQ-1 and test set TS-538 are no longer required and will be noted in the next change to the calibration technical bulletin.

Rawin set AN/GMD-1 and radiosonde recorder AN/TMQ-5

Department of the Army (DA) Form 2028 was recently submitted requesting that the AN/GMD-1 and AN/TMQ-5 be added to TM 38-750. When approved, these items will be added to DA Form 2406 to allow increased command emphasis on availability of these equipments.

In December 1981, the Meteorological Data Processing Group OL-192/GMD-1, now a component of the rawin set, was approved for addition to TM 11-6660-206-12.

Firefinder system configuration changes

Experience has shown that the M116A1 (¾-ton) trailer is inadequate to carry the weight of the AN/TPQ-36 Firefinder radar transceiver group. Thus, the M103 (1¼-ton) trailer has been selected as a replacement along with a larger primemover—the M35A3 2½-ton cargo truck which replaces the Gama Goat.

The S-250 Common Shelter will be mounted on the 2½-ton M35A3 vehicle, thus allowing additional space for the system's camouflage nets as well as additional improvements such as NBC and air conditioning equipment. The NBC and air conditioning systems will require an additional generator which can also be accommodated in the increased storage space.

M90 chronograph mounting brackets

The Counterfire Department continues to receive questions on how to requisition the mounting bracket assemblies for the M90 chronograph. The differences in howitzer tubes require that these requisitions contain exception data listing the model number (i.e., type of howitzer) and the quantity of mounting brackets required. (Each howitzer will be authorized a bracket as part of its basic issue item.)

Initial issue of the brackets will be PEMA funded, while replacements will be stock funded. For those units issued an M90 chorongraph without mounting brackets, requisition should be forwarded through normal supply channels using the appropriate national stock number from the list below:

Howitzer	Bracket NSN
M101	1290-01-088-2380
M102	1290-01-089-7453
M109 (all models)	1290-01-089-0377
M107 and M110	1290-01-091-1758
M114A1	1290-01-091-1918
M198	1290-01-088-2379

M90 radar chronograph

Approximately 800 M90 radar chronographs will be issued to Active US Army, Reserve, National Guard, and Marine Corps units to replace the old M36. About half that number have already gone to the field. Basis of Issue Plan (BOIP) is one per six-gun battery or two per eight-gun battery. Mounting brackets for the M90 will be issued for each gun.

Direct support (DS) and general support (GS) maintenance will remain under contract to Lear-Siegler Corporation through FY82. Organizational maintenance is taught by the Counterfire Department (CFD) to Firefinder radar repairers (MOS 26B20 K1) and, when the DS/GS maintenance technical manuals are available, CFD will also teach this type of maintenance to MOS 26B20 K1 personnel. Operator training for the M90 is being conducted by Weapons Department, USAFAS.

The US Army Armament Materiel Readiness Command (ARRCOM) is responsible for the new equipment training team (NETT) and video tapes to teach operation and operator maintenance on the M90. Point of contact (POC) at ARRCOM is Mr. Csendes, DRSAR-MAF-NW, Rock Island, IL 61201 (AUTOVON 793-3187/4382). For specific information, other POCs are:

	AUTOVON
Mr. Jim Montgomery—ILS Manager	793-6663
Mr. John Jones—System Support (Fielding)	793-3471
CW3 Tom Barrett—Maintenance Training (USAFAS)	639-5014

Replacement magnetrons available for AN/MPQ-4A radar

The improved magnetron for the radar set AN/MPQ-4A is now available for issue. Test models of the device have demonstrated a life span of more than four times that of the older model.

The national stock number (NSN) to order the new magnetron is 5960-01-082-4284; the approximate cost is $1,667.00.

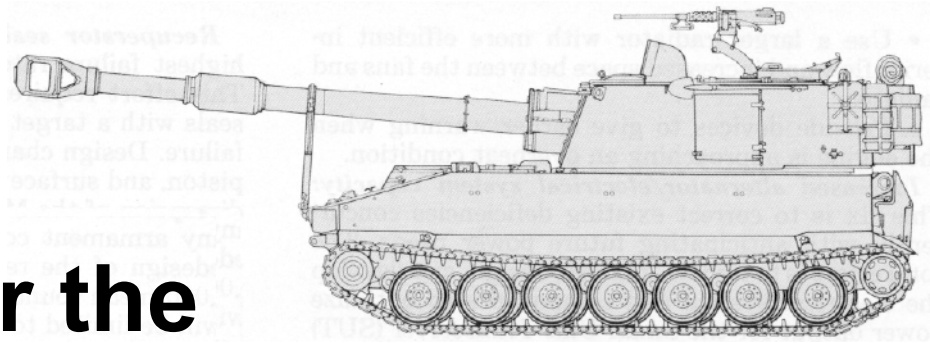
Commanders Update

COL Howard C. Eggleston
1st Infantry Division Artillery

LTC David B. Smith
3d Battalion, 13th Field Artillery

LTC Milivoj Tratensek
1st Battalion, 38th Field Artillery

LTC John M. Harnisch
1st Battalion, 80th Field Artillery



HELP for the M109 Self-Propelled Howitzer

by LTC (Ret) Browder A. Willis

HELP as defined by Webster is "a source of aid, a remedy, relief." Although this definition is applicable to an on-going effort to enhance the M109 fleet, HELP actually is an acronym for Howitzer Extended Life Product improvement.

This program, designed to make significant improvements to the weapon's reliability, availability, maintainability (RAM), and survivability (figure 1), was conceived in early 1980 when experiences with the M109A2 and A3 pointed out continuing deficiencies. A team of combat and materiel developers, US Army Field Artillery School instructors, and M109 unit personnel was assembled to evaluate comments from the field, equipment improvement reports (EIRs), and sample data collection reports. The purpose of the team was to identify hardware deficiencies that could be corrected with near term product improvement action. Additionally, School combat developers undertook a concurrent effort to determine whether a land navigation system could be adapted to the howitzer. If that could be accomplished, the howitzer would be freed from the traditional land survey grid, making it possible to fire from any point on the battlefield immediately and without any loss of accuracy.

After three months of diligent effort, the team consolidated a list of 25 candidate product improvement actions that offered potentially high RAM and survivability payoffs. That list, including a concept for an automatic gun positioning system (AGPS), was forwarded through US Army Training and Doctrine Command (TRADOC) to the US Army Materiel Development and Readiness Command (DARCOM) with a recommendation that a formal Product Improvement Program (PIP) be formulated and approved. The recommendation was approved by TRADOC and DARCOM in November 1980 and PIP management responsibility was assigned to US Army Armament Materiel Readiness Command (ARRCOM). TRADOC designated USAFAS as the user proponent for combat development and evaluation. Additionally, a separate previously approved PIP action to add nuclear, biological, and chemical (NBC) collective protection was consolidated into HELP for concurrent application. The specifics of the 26 HELP product improvements are presented in the following paragraphs. For this discussion, the actions are grouped according to functional improvement areas.

- **IMPROVE RELIABILITY BY UPGRADING OR REPLACING HIGH FAILURE RATE COMPONENTS.**
- **IMPROVE AVAILABILITY BY INCREASING MEAN MILES AND MEAN ROUNDS BETWEEN FAILURES.**
- **IMPROVE MAINTAINABILITY BY SIMPLIFYING DIAGNOSTIC AND MAINTENANCE PROCEDURES.**
- **IMPROVE SURVIVABILITY BY REDUCING OR ELIMINATING CREW EXTERNAL OPERATIONS AND BY ADDING NBC COLLECTIVE PROTECTION.**

Figure 1. Help objectives.

Reliability and availability

Radiator cross-over tube protection: Damage to the radiator cross-over tube as a result of stepping or standing on the tube when engine deck covers are opened is a major cause of cooling system malfunctions. The fix for this problem is to add stiffeners and step plates over those segments of the tube most susceptible to damage.

Desert cooling: Currently, the cooling system does not meet the desert cooling requirement of 230 degrees Fahrenheit maximum coolant temperature at 115 degrees Fahrenheit ambient temperature with a full radiator. Additional cooling system maintenance problems are caused by operating the engine with excessively low coolant levels. The solution to this problem will include one or more of the following alternatives.

- Modify frontal armor to provide more space in the engine compartment for more efficient heat dissipation.
- Reverse flow of cooling air through radiator and fans.
- Modify cooling fans for greater air flow.
- Use an oil-to-air heat exchanger for transmission oil and possibly engine oil.
- Use a de-areator in the cooling system.

• Use a larger radiator with more efficient interior flow and increased space between the fans and radiator.

• Provide devices to give earlier warning when the engine is approaching an overheat condition.

Increased alternator/electrical system capacity: This fix is to correct existing deficiencies concurrently with anticipating future power needs. The total effort is to review, analyze, design, and develop the electrical system and components to optimize power output for the Small Unit Transceiver (SUT) radio, Battery Computer System (BCS) components, NBC equipment, and the automatic gun positioning system. One objective is to provide adequate power output at minimum engine revolutions per minute (RPM).

External power receptacle: This improvement will permit the howitzer electrical system to draw power from the Auxiliary Power Unit (APU) being developed for the XM992 FAASV. The APU will be capable of charging the howitzers' batteries, thereby reducing the time the howitzer engine is required to operate.

Slave start capability: This action will modify the vehicle slave start system to eliminate electrical system damage or component failure during slave starts. The use of NATO cables and plugs will continue.

Air cleaner blower motor: The air cleaner (AC) blower motor is susceptible to water damage that causes shorting of the motor and motor switch relays. The PIP will waterproof these components. Additionally, the in-tank fuel pumps will be removed from the master switch to air cleaner blower motor circuit.

Alternator/rectifier/voltage regulator/reliability: This is primarily an evaluation, rather than a hard core design change, to analyze failures in these components to determine whether they are primary or secondary failures which will not be eliminated by other system changes. If they are primary failures, then system components will be designed to eliminate these failures.

Engine starter: The present primary cause of starter failure is burnout due to excessive engine cranking. To reduce failures, the maximum safe cranking time must be determined. The fix will be to install a device or devices that will interrupt and prevent further cranking until the burnout hazard subsides. Provisions for an emergency override feature will also be included.

Sensors and connectors protective covers: Sending units located in the engine compartment are often damaged during routine maintenance operation. This fix will provide protective covers to prevent damage by personnel or tools when maintenance is being done.

Cab power relay box: This component is often damaged by high pressure water during cleaning inside the turret due to inadequate waterproofing. The fix is to provide better waterproofing to prevent damage to the relays caused by corrosion and electrical shorting.

Recuperator seals: Recuperator seals have the highest failure rate of any armament component. This effort requires a redesign of the recuperator seals with a target of 15,000 mean rounds between failure. Design changes will be limited to the seals, piston, and surface finishes to avoid changes to any dimension of the M178 gun mount.

Traversing mechanism: Field reports indicate that the electric clutch in the traversing mechanism has been failing at a higher than expected rate. This is a design as well as a water seepage problem. The configuration of the clutch and housing also restricts stowage of ammunition in the hull because of the arc swept by the mechanism during traverse. The clutch and its housing will be redesigned to eliminate these problems. An attempt will also be made to increase rotational forces for better upslope traversing capability.

Engine/transmission mechanical disconnect: A primary cause of battery failure during cold-weather starting is the resistance imposed by internal transmission drag. This PIP action will permit the transmission main drive shaft to be disengaged from the engine during starting. After engine start and full warm-up, the engine will be shut down, the transmission engaged, and the engine restarted. A positive lock-out/lock-in feature will be incorporated to prevent disengaging or engaging the transmission while the engine is turning.

Suspension: This is a contingency action. If total vehicle weight is increased by more than 800 pounds, the suspension system components will require uprating to accommodate the added weight. The extent of "tweeking" required will be determined by the US Army Tank-Automotive Materiel Readiness Command (TARCOM) based on total vehicle weight.

Maintainability

Power pack removal aids: Damage is often caused to engine components during removal or reinstallation of the engine for maintenance operations. This PIP action will result in quickly installed devices that will permit removal and reinstalling the engine along a predetermined track, thereby eliminating incidental damage. Continued use of a crane type hoist will be required.

Crew compartment and subfloor drain: Fluids which collect in the space between the bottom of the hull and the turret floor can create safety hazards and cause maintenance problems with suspension components. Currently, fluids are disposed of by removing the crew floor sections and dipping or pumping the fluids. The PIP fix for this problem is to drill and tap the hull bottom with quick drain plugs.

Starter access: Work on the starter can only be accomplished when the engine is removed which is time-consuming and costly and causes much incidental damage. The PIP will correct this problem by providing access to the starter through the hull floor and possibly a redesign of the starter mount.

Design goals are to permit removal and replacement of the starter in less than one hour using common organizational maintenance tools.

Simplified test equipment/internal combustion engines: This PIP action adds the transducers and couplings necessary to permit rapid and accurate engine fault diagnosis and fault isolation.

Survivability

Halon fire suppression: An automatic Halon 1301 fixed fire extinguisher system shall be installed in the engine and crew compartment. Through a series of sensors, the system will provide 0.1-second response time to a fire source and 20-minute crew safety.

Driver's night vision: Improved night vision for the driver will be provided with the addition of an AN/VVS-2 image intensifier which will be demountable for daytime stowage. It will also be modified for mounting in the driver's hatch to preclude interference with tube traverse when the tube is at maximum depression.

Loader-rammer actuator: This device will be further improved to provide a consistent ramming cycle under any loading conditions. The actuators, which will utilize hydraulic power and require no additional operator tasks, will operate such that the ramming stroke is not less than four seconds or more than six seconds.

Although the following five actions are survivability oriented, they are specifically directed toward operating successfully in an NBC environment. The objective of these actions is to keep crew exposure outside the howitzer to a minimum.

Remote powered travel lock: This action will permit the tube to be taken out of and returned to the travel lock without a crewman leaving the howitzer. This device will be remotely operated from either the driver's compartment or the turret.

Remote powered spades: This feature will permit the spades to be lowered to the firing position and raised to the travel position by controls located inside the turret. A safety interlock will prevent the spades from being raised until the weight of the howitzer is removed to prevent damage to the mechanism.

External stowage baskets: Large external baskets for stowage of section equipment and personal gear will be added to the forward turret. The baskets will be removable for rail, air, and sea surface transportation.

NBC ventilated face piece system (VFPS): Two M8 pump and filter units will provide filtered forced air to a maximum of seven stations in the howitzer. One station will be located in the driver's compartment and six in the turret. The VFPS is designed for use with the M25A1 protective mask and mission-oriented protection posture (MOPP) clothing. Provisions are also being made to stow six complete sets of MOPP clothing for immediate accessibility by the crew.

Automatic gun positioning system (AGPS): This system is the most exciting advancement to self-propelled howitzer technology in the past 30 years. It features an inertial navigation system that will, after initialization, continuously display the weapon's location in grid coordinates. The direction the tube is pointing will be determined by an azimuth finder located on the right trunnion and also displayed on the date display module. The AGPS will also measure and display tube elevation. All data required by the BCS, including the altitude of the weapon, necessary to compute fire commands will be determined automatically by the equipment located on the howitzer. Fire commands generated by BCS will be digitally transmitted to the howitzer and displayed for the section chief, gunner, and assistant gunner. Tube elevation and bearing (deflection) will be electronically measured and established by the AGPS. Outside reference to a collimator or other reference points will be eliminated while efforts continue to include servo gun drive mechanisms as a part of the AGPS. This feature will automatically set aiming data sent to the guns by BCS. A more detailed discussion of the AGPS will be the subject of a subsequent article. General design performance data is shown in figure 2.

GUN TUBE AZIMUTH (6400)	± 1 MIL 1 SIGMA
GUN TUBE ELEVATION (-60+1300)	± 0.5 MIL 1 SIGMA
AZ DRIFT	< 1 MIL/HOUR
INITIAL ALIGNMENT TIME	≤ 15 MIN
HASTY ALIGNMENT	≤ 5 MIN
REALIGNMENT (UPDATE)	≤ 2 MIN
AZ/POS LOC	IMMEDIATE
SLOPE CAPABILITY	10 DEGREES
LATITUDE	65° N TO 65° S
LOC ACCURACY (RADIAL)	0.25% DISTANCE
VERTICAL	± 5 METERS
COORDINATES	UTM
AZIMUTH	GRID

Figure 2. Performance parameters.

Conclusion

The ultimate goal of the M109A2/A3 HELP program is a qualitative improvement that will permit the howitzer to operate effectively and survive in future battlefield environments.

When fielded, the "HELPed" M109 will give the field artillery the capability of providing maneuver forces the most timely and responsive cannon fire support available to any combat force. It is expected that experiences gained and lessons learned from the HELP program will significantly enhance the development of the follow-on Direct Support Weapons System (DSWS) for the 21st century.

LTC (Ret) Browder A. Willis is the M109 Project Officer, Materiel Division, Directorate of Combat Developments, USAFAS.

FA Test and Development

DESIGN • DEVELOPMENT • TESTING • EVALUATION

The new Norwegian artillery fuze PPD 440

First strike hit capability has always been one of the major tasks in development of tactics as well as materiel for the Norwegian Army. Norway is a small country with limited resources, both in manpower and procurement funds. The potential enemy is just as advanced, both in numbers and training; therefore, it is even more necessary to develop a "winning factor" as a first hit capability.

To achieve first hit capability, some major principles have guided development technology; e.g., first of all, simplicity, then reliability (even in the most severe conditions), and finally a high degree of protection against hostile influences. For the most part, the present Norwegian field artillery meets these requirements. The digital computerized fire control system, ODIN, as well as the ammunition and tactics applied to the artillery, represents visible proof of the importance given to these factors.

Even though Norway has limited resources to put into armament development, it has successfully developed several types of materiel which are vital to the defense of the country. These items are termed "vital" since the typical Norwegian terrain and climatic conditions require features which are not needed in equipment operating under "normal" conditions. Thus, in two major fields of armament development, Norway has taken a leading position; e.g., ship-to-ship missiles and mortar and artillery proximity fuzes. The Norwegian Defence Research Establishment started development work on the proximity fuzes in the early fifties. After considerable effort, using a wind-driven generator power supply, a fuze was successfully fired in 1956.

Norwegian artillery fuze PPD 440.

Later modifications and industrial adaptations made it possible for the Norwegian Army to produce its first proximity fuze for mortar bombs in 1965. These fuzes, which were named "NVT," were later adapted to different caliber of mortars as well as artillery.

In the mid-seventies, based on experience with the existing NVT fuzes and new technology, the Norwegian Army decided to start development work on more sophisticated fuzes. As such, two contracts were signed with the Norwegian Army Material Command in 1976—one for an improved mortar proximity fuze for calibers 81-mm to 120-mm, and the other for a new artillery fuze. The artillery fuze, designated "PPD 440," had the following main concept objectives:

- Minimum external settings.
- Detonation in optimum height over target.
- Minimum height dispersion.
- Protection against enemy electronic countermeasures (ECM).
- High functional reliability and safety.
- Price giving best cost effectiveness ratio.

The development work on the PPD 440 is now in its final stages; a large number of these fuzes were fired under different conditions with excellent results. For example, 180 fuzes were fired in the company qualification program, of which 20 were fired in an intelligent ECM environment of high strength. All the fuzes were 100 percent effective. The major features of the PPD 440 fuze are:

- Frequency modulated continuous wave radar system.
- Proximity function unaffected by enemy electronic countermeasures.
- Burst height independent of target reflection.
- Selectable impact function.
- Applicable on all standardized field artillery shells.
- High electronic and mechanical reliability and safety.
- Safety and arming mechanism meet Military Standard 1316A.

Of particular importance is the ECM resistance feature. Due to the rather advanced type of frequency modulation, combined with a unique signal processing with an extremely high radiated power (due to the special power source), the PPD 440 fuze may be the only fuze in the world which has sufficient ECM resistance to survive the most likely jamming equipment on today's battlefield.

Company qualification of the PPD 440 fuze was concluded in March, with Army qualification set for this summer. The Army qualification will be conducted by the Norwegian Army in collaboration with the French Army who has taken a strong interest in the fuze. Production is scheduled to begin in 1983.

As part of the "two-way-street" efforts initiated by the US Government in the late seventies, the PPD 440 fuze was selected for further evaluation. As a result, two Memorandums of Understanding were signed with the US Government—one with US Air Force in 1977 and the other with the US Army in 1979. A contract for data and hardware delivery was then signed with the US Air Force to cover the delivery of test quantities, etc. The scope of these Memorandums of Understanding is to evaluate the PPD 440 for possible use by the US Army and Air Force. (MAJ Christopher Kloed, A/S Kongsberg Vapenfabrikk Company in Norway)

Revised M198 hearing protection requirements

The requirement to have double hearing protection when firing the M203 (8s) propellant charge has been rescinded based on guidance from the Surgeon General. The US Army Armament Materiel Readiness Command has published the following information which prescribes the use of foam earplugs only, negating the requirement to wear the DH178 helmet to obtain double ear protection:

• Properly worn foam earplugs (Plug, Ear, Hearing Protection, Universal Size, Yellow/White, 400S, NSN 6515-00-137-6345) provides adequate protection for crews of the M198, 155-mm towed howitzer at all quadrant elevations and all existing propellant charges, including M203, for all normal crew operating positions when not exceeding 12 rounds per 24-hour period.

• If conditions dictate firing more than 12 rounds per day with the M203 propellant charge, the crew should use the 25-foot lanyard in addition to the foam ear plugs. (The use of the DH178 helmet for extra ear protection is not required.)

• Training in the proper use of foam earplugs must be insured for all personnel using the M198. Improper fitting of the earplug will invalidate the adequacy of protection.

• Foam earplugs are mandatory for wear by all personnel who must be within 25 feet of the M198 during firing using the M203 charge. Other approved hearing protection devices are permitted during firings using other charges; however, the foam earplug is suitable for use with all charges.

• Foam earplugs must be clean and dry prior to insertion into the ear canal. In cold weather, the foam plug must be stored in an inside pocket when not in use. Sufficient time must be allowed (approximately six minutes) to warm up and form the plug prior to insertion. Upon insertion, additional time must be allowed for the foam plug to expand and seal the ear canal.

• Further guidance on the number of allowable rounds per day with single hearing protection for propellant charges M3A1, M4A2, and M119 will be issued when available. Also, TM 9-1025-211-20 (Operator's Manual, M198) will be changed to include the latest guidance on hearing protection.

TACFIRE tape released

TACFIRE Tape Version III was released to the field during March and April this year. A Mobile Training Team from the TACFIRE Training Division of the Tactics, Combined Arms, and Doctrine Department of the US Army Field Artillery School trained units in CONUS. In USAREUR, transition to version III was accomplished by the TACFIRE school at the 7th Army Combined Arms Training Center at Grafenwoehr, Germany.

Successful 12-rocket firing of MLRS

In February this year, the Vought Corporation, an aerospace subsidiary of the LTV Corporation, fired a full load of 12 rockets for the first time from the Multiple Launch Rocket System.

Launched in less than a minute, the 12 MLRS rockets hurled thousands of live submunitions onto a target area 16 kilometers (9.6 miles) away. The firing was conducted as part of the extensive developmental testing of the new weapon system, which is set to begin service with the US Army in 1983 and by the British, French, and West German armies shortly thereafter.

The firing of the 12-round ripple, with intervals of a few seconds between each shot, demonstrated the system's designed capability to deliver a massive volume of defensive firepower. Armed with the MLRS standard XM77 warhead, for use against enemy troops and material, the rockets destroyed or disabled trucks, guns, and equipment set up in the target area.

In addition to continued maturation phase testing of the system and the beginning of low-rate production, program activities include development of the AT2 mine layer warhead by West Germany and also plans for development of a terminally-guided warhead.

A rocket is fired from Vought's new Multiple Launch Rocket System to begin the first launch of a full load of 12 rockets during recent testing at White Sands Missile Range in New Mexico.

Meteorological Data System

Preliminary tests on the Army's new Meteorological Data System (AN-TMQ-31) were recently conducted at Wallops Island, VA. During its early development, this system was known as the Field Artillery Meteorological Acquisition System (FAMAS).

The constant air turbulence on Wallops Island makes it an ideal site for upper atmosphere tests. The purpose of the tests were twofold:

- To verify the wind-tracking accuracy of the Meteorological Data System.
- To validate the step-by-step setup instructions in the operator's manual.

Bendix Corporation developed the system to the specifications of the Combat Surveillance and Target Acquisition Laboratory, one of seven laboratories in the US Army Electronics Research and Development Command.

Although the Army uses weather data for a variety of reasons, wind and density data in particular are crucial to the correction of artillery fire and target acquisition weapon locating systems. For the first time, the Wallops Island tests gave Army artillery experts an opportunity to see the Meteorological Data System in action.

The Army needs the new system badly since the ground station it now uses—an AN-GMD-1 rawin system—has been in the field for more than 30 years. As such, repair parts are hard to find, and the system cannot keep pace with today's mobility requirements.

The new system, which is highly mobile and passive, is housed in an S-280 shelter and rides on a standard 2½- or 5-ton truck.

The current AN/GMD-1 ground station receives raw data that requires processing by several soldiers before transmission to artillery batteries. Now, with a single soldier at the controls, the new ground station automatically converts acquired data into meteorological messages and transmits them to the fire direction center.

During the series of 40 flight tests at Wallops Island, Bendix successfully compared the new system's accuracy against the accuracy of the precision radar that NASA uses to track its rockets on the island. Even though a few software flaws had to be corrected early in the tests, the system met all main test objectives.

The Meteorological Data System will be tested at Fort Huachuca, AZ, and Fort Sill, OK, this fall.

BCS follow-on evaluation completed

The follow-on evaluation of the Battery Computer System (BCS) was conducted this year during February and March by the Army's Operational Test and Evaluation Agency at Fort Hood, TX. The preliminary results appear favorable; however, the decision to continue with BCS procurement will not be made until later this year.

PADS tested in Australia

The US Army's Position and Azimuth Determining System (PADS) was tested recently in the Southern Hemisphere by the Australian Army's 131st Division Location Battery.

Under strict Australian field-trial monitoring, PADS was sent on a rough 50-kilometer course, a six-hour cross-country trek, and underwent a seven-kilometer sound-ranging, base test course over undeveloped terrain. Ten-minute zero velocity updates (ZUPTS) were used in the 50-kilometer and six-hour test courses. The three-minute ZUPTS used during the sound-ranging base test considerably increased the accuracy of the system.

The 50-kilometer survey mission lasted approximately two and one-half hours with position accuracies of four meters, elevation accuracies of seven meters, and azimuth accuracies of two-tenths mil. All azimuths were determined optically using a theodolite. The six-hour mission data revealed position and elevation accuracies of better than 10 meters.

PADS is designed for mounting in most Army vehicles such as the Australian landrover shown here. It can also be installed in light observation helicopters.

PII guidance system to be tested

The Pershing Reference Scene System (PRESS) was delivered to the Defense Mapping Agency (DMA) in November 1980 and has been tested extensively there by both DMA and US Army Engineer Topographic Laboratories (ETL) personnel. Goodyear Aerospace Corporation delivered the laboratory prototype of the field Reference Scene Generation Facility (RSGF-L) to ETL in January 1981. The RSGF-L and PRESS are now generating simulated radar reference scenes of the test areas which will be used for captive flight testing of the terminal guidance system aboard fixed-wing aircraft. Currently, the van-mounted rugged military version of the RSGF has been assembled and is being tested at Goodyear's Akron, OH, facility.

Developing reference scenes for the terminal guidance system, like the missile itself, has the highest presidential priority designation as a vital national defense project—DX status. ETL's Special Projects Division, headed by John Pattie, is responsible for delivering the goods and meeting the milestones in this "crash" program.

In keeping with the Army's goal of fielding the first operationally complete missiles as soon as possible, ETL engineers expect 1982 to be a year of frequent, accelerated, and intensive tests of the current second generation of prototype hardware and software.

Captive flight testing of the PII terminal guidance systems is scheduled to begin this year. There are 14 targets in four test areas in the United States, according to PII Design and Software Group Chief Donald J. Skala. The terminal guidance systems will be installed in a Saberliner twin engine jet.

The planes will fly at level altitudes above the test areas, rather than diving on the targets as in past tests. Flight safety considerations bar the planes from diving, except in perfectly clear weather, so the test planners have decided to have the planes pass over the target zones at several altitudes. Like the PII missile itself, these tests can be flown under almost any weather conditions.

Sometime around mid-year, the first actual overland launches of PII missiles with dummy warheads are scheduled to begin at White Sands Missile Range. The on-board terminal guidance systems in the rocket-launched missiles will also contain reference scenes from both the PRESS and the RSGF.

Planning the impact areas is a challenging task, involving the selection of extended range flight paths from the points of launching to radar correlatable targets while trying to avoid flights over inhabited areas. ETL's Clyde Berndsen has selected radar correlatable targets with safe missile flight corridors. Berndsen is also responsible for coordination with the White Sands Missile Range flight safety personnel who approve flight paths, prepare environmental impact statements, and authorize any measures necessary to protect isolated civilian communities.

Another task to be completed this year is delivery of ruggedized and militarized reference scene tape cartridges. Reference scenes are now recorded on magnetic tape cassettes identical to the ones used in home audio systems and minicomputers. Radar reference scenes will be recorded on Raymond tape cartridges which are sealed against moisture and dirt. One military cartridge will contain several reference scenes and will not be vulnerable to electronic emissions that might cause the recording to be erased or distorted.

One problem solved during the past year was, in the words of PII Equipment Development and Test Group Chief Jack Bondurant, "fitting 180 cubic feet of equipment and data bases into 150 cubic feet of space." In other words, the contents of the RSGF van had to be reduced in size to make room for the operators. One part of the solution was production of a PII Operational Data Base (PII ODB) on magnetic discs for convenience in shipping and storage. The PII ODB discs contain all the necessary radar digital elevation and feature data from the Defense Mapping Agency's Digital Land Mass Simulation data base, but compacted to 1/12 of the memory storage capacity by the techniques of differential compacting and run length encoding. When converted to a radar reference scene, all the original radar significant data are recovered as needed to guide the missile unerringly to its target center in the last seconds of flight.

While hardware and software testing and development go on, there will be collateral training and doctrinal and logistical actions to be completed. Personnel, supply lines, spare parts, manuals, and training aids have to be developed and tested since they must be in the field the same time as the missile.

Four scheduled training courses for PII technical specialists have already been conducted by Martin Marietta Orlando Aerospace, prime contractor for Pershing missiles. The Army has already established Military Occupational Specialties for Pershing operators (MOS 21G) and Pershing maintenance personnel (MOS 21L). Martin Marietta will also conduct a Physical Teardown Evaluation and Review (PTEAR) and a logistical maintenance demonstration.

DMA and ETL represent two of the many organizations that support the Pershing Project Manager's Office in the US Army Missile Command, a subordinate command of the US Army Materiel Development and Readiness Command (DARCOM). Many government agencies and private corporations are contributing to the technology that will put the PII over the target.

New stock number for DPM pens

Pens for TACFIRE Digital Plotter Maps (DPM) can now be ordered in kits of 24. The recorder pen (NSN 7010-01-076-2971) is no longer issued to the field as a single item; therefore, the DPM kit (NSN 7010-01-112-0127) should be ordered when pens are needed. (This new national stock number was initially announced in the Army Master Data File, July 1981.)

TACFIRE user's workshop

The US Army Field Artillery School will host the next TACFIRE User's Workshop at Fort Sill this year on the 10th and 11th of August. The workshop is primarily for S3s, fire direction officers, and TACFIRE computer operators.

A message will be sent out to all units in the near future with additional instructions. The last User's Conference, which was sponsored by the 212th FA Brigade at Fort Sill, was a very worthwhile experience.

The DS Battalion
TOC and TACFIRE

by CPT Forrest G. Clark

Current fire support doctrine designates the direct support field artillery battalion commander as the fire support coordinator (FSCOORD) for the maneuver brigade. A fire support officer (FSO) is then assigned as assistant FSCOORD and serves as the representative of the artillery commander. Doctrine thus envisions that the field artillery commander will coordinate all fire support for the brigade, assisted by the FSO.

In practice, however, the artillery commander does little fire support coordination. Controlling his own battalion is a full-time job, leaving little time to personally coordinate fire support. This results in the brigade FSO becoming the *de facto* FSCOORD. The artillery commander has little personal contact with the brigade commander or his staff, while the FSO has little contact with the artillery commander and staff other than by radio.

A new dimension is added to this problem when TACFIRE is introduced into the unit since TACFIRE significantly enhances fire support for the maneuver commander. However, current allocations of remote terminals to provide access to the central computer present some dilemmas in tactical employment of the system. One potential problem is where to locate the brigade FSO's Variable Format Message Entry Device (VFMED) used to provide access the battalion and division artillery computers. If located at the brigade main command post (CP) where future operations are planned, it can provide valuable information from the artillery target intelligence (ATI) files at division artillery as well as fire planning support. However, this means the tactical (TAC) or "jump" CP has no means of accessing TACFIRE in support of the current operations controlled from that location. Conversely, locating the VFMED at the TAC CP deprives the main CP of the use of TACFIRE.

A related problem is that of locating the FSO himself. With the artillery battalion commander at his own battalion tactical operations center (TOC), the FSO should stay with the brigade commander to provide advice on fire support, but this will often separate him from the VFMED and access to TACFIRE. The FSO must provide fire support expertise to two command posts plus the brigade commander himself, despite being equipped with only one VFMED. And let's not forget the need to coordinate with the distant artillery battalion

commander who is the nominal FSCOORD.

This employment dilemma has been recognized. The Field Artillery School's "Organizational and Operational Concept for an Improved Fire Support C^3 System," dated 8 August 1980, envisions a system which eliminates the existing problems. Each brigade and battalion FSO would be provided with his own computer which interfaces with the computers at division artillery, the field artillery battalion, and the other FSOs. A remote terminal is provided for the other maneuver CP (TAC or main) and also a device for the FSO which can provide continuous access to the system as he moves.

Such a system will greatly enhance the FSO's ability to coordinate and control fire support from the maneuver CP since everyone has ready access to the system at all times. Unfortunately, this concept is a proposal for a follow-on system to TACFIRE for the 1990s. As such, for the next 10 to 20 years artillerymen will have to operate with what we have now: TACFIRE.

One measure to improve the situation would be to field more devices. Providing an additional VFMED to the brigade FSO would allow access by both the TAC and main command posts. However, at approximately $75,000 for each VFMED, plus the cost of an additional M577A1 in which to mount it, this solution appears infeasible within current budget constraints. It also fails to solve the problem of communicating with the commander as he moves around the battlefield, as well as the problem of the artillery commander having two full-time jobs.

To overcome the above problems *with the equipment currently available*, I propose that:

•The DS battalion TOC/FDC be located within one kilometer of the brigade TAC CP.

•The brigade FSO, with his VFMED, be located at the main CP.

•The battalion FSOs, with VFMEDs, continue to be located at the maneuver battalion TOC.

•The fire support teams (FISTs) and forward observers (FOs) with digital message devices (DMDs) continue to be located with the maneuver company and platoons, respectively.

SECTION	PERSONNEL	EQUIPMENT
Fire direction center	2 fire direction officers 2 computer operators 2 TACFIRE equipment specialist	2 5-ton trucks 2 15-KW generators
Command group	1 Battalion commander 1 Command sergeant major 1 Driver	1 ¼-ton vehicle
Operations and intelligence	1 S3 1 S2 1 Operations NCO 1 Intelligence NCO 3 Operations specialists	2 M577 1 ¼-ton vehicle
Wire team	1 Wire team chief 2 Wiremen	1 1¼-ton vehicle
Totals	19 Personnel	7 Vehicles

Figure 1. TACFIRE TOC (DS battalion).

The artillery battalion TOC would consist of the fire direction center (central computer), operations an intelligence section (VFMED), and one wire team (figure 1). This small (7 vehicles, 19 personnel) group would be more mobile, easier to disperse and hide, and easier to support logistically than the larger headquarters and headquarters battery organization. Security would be that normally provided the brigade TAC CP. Mess, maintenance, and POL would either be provided by the brigade or by the battalion trains in the rear.

Collocating TOCs will significantly reduce the separation of the artillery commander from the brigade commander. The artillery commander can wear both hats (battalion commander and FSCOORD) from one location. He is present where current operations are being controlled and where his experience and decision-making are most needed. He no longer must choose between two full-time jobs in two separate locations. His S3, now able to work closely with the maneuver S3, can thus serve as an assistant FSCOORD for current operations.

The brigade FSO will now be able to devote all of his efforts to working with the assistant S3 Air, chemical officer, and S3 in planning for future operations at the main CP. He no longer must choose between the main and TAC command posts or divide his

Figure 2. Location of TACFIRE devices and fire support personnel.

MANEUVER ELEMENT	TACFIRE DEVICE	FIRE SUPPORT PERSONNEL
Brigade main CP	VFMED	Brigade fire support officer
Brigade TAC CP	COMPUTER	FA battalion commander
	VFMED	FA battalion S3
Battalion CP	VFMED	Battalion fire support officer
Company	DMD	FIST chief
Platoon	DMD	Forward observer

efforts between future and current operations. The result is better fire support coordination.

Communications will also benefit from this arrangement. Wire, which can be installed in minutes rather than the hours needed for current communication, can now be used to connect the artillery battalion TOC with the brigade TAC CP. This will free an additional radio for other uses and will reduce the electronic signature of both CPs and lessen their vulnerability in an electronic warfare (EW) environment. Communication security is also enhanced by the reduced usage of radio. Distance should not be a problem, since the brigade TAC CP will normally be close enough to the forward elements to permit forward observers to communicate with the battalion FDC. Firing batteries will be even closer, as will the brigade and battalion FSOs. Division artillery and mutual support battalions (reinforcing or general support reinforcing) should also be within range of FM radio. Careful siting of antennas is still required; thus the proposed radius of one kilometer from the TAC CP.

All of these considerations take on greater importance when TACFIRE is present, since TACFIRE will only enhance fire support to the extent that fire support personnel and maneuver commanders have access to the system. Its capabilities must be available to as many personnel as possible. Thus, the TOCs must be located within one kilometer of each other, and each maneuver CP, artillery TOC, and fire support agency must have a TACFIRE device capable of providing access to the computer. Also, an artillery advisor should be present at each location so that fire support advice backed by TACFIRE will be available everywhere on the battlefield. The configuration in figure 2 will make TACFIRE's artillery target intelligence files and fire planning function available to every commander, S3, S2, and FSO in the division because secure digital communications will connect every fire support agency and maneuver CP.

TACFIRE is not only an artillery system but is also a combined arms command and control system. The ability to have access to TACFIRE from every CP will allow each commander to roam his zone of action, visit his subordinate elements, and have access to TACFIRE and fire support advice at each location. If the artillery commander accompanies the maneuver commander, the artillery commander will be able to retain control of his units and receive updates on their status, using the VFMED at each CP visited. Should the FSO accompany the maneuver commander, he can continue to provide fire support advice by using the VFMED in a similar manner. Total, integrated, automated fire support will give commanders greater flexibility and more and better information. Maneuver commanders and staffs are more likely to use these assets since any "out of sight, out of mind" syndrome is eliminated. Making TACFIRE available to the maneuver commander and any visiting commander will allow the FSO to do a better job.

Collocating TOCs does present some limiting considerations, since the artillery target intelligence function is only available *if* the battalion computer is within FM radio range of its mutual support FA battalion and the FISTs. However, most brigade TAC CP locations will meet these requirements, and careful antenna siting and the use of retransmission capabilities should minimize any other problem. Frequent displacements by the brigade TAC CP will affect artillery operations when another computer must assume control of the unit's elements. The size of the TAC CP may also pose a problem. The addition of seven vehicles may cause crowding and complicate concealment, but the one-kilometer radius should preclude most problems and assist in dispersion and concealment. Should this distance be increased, the difficulty in establishing wire communications with the TAC CP must be considered, although this will still be an improvement over current practices. The one problem which is not solved by this configuration is that of providing the commander or FSO access to TACFIRE while traveling between command posts. This situation will continue to exist until new hardware is developed and fielded.

Current doctrine requires the artillery commander to do two jobs at two places simultaneously. The brigade FSO must choose between the main CP and TAC CP, leaving one without a fire support advisor. Because of the limited number of VFMEDs, only one maneuver CP can have access to the computer. Collocating the direct support artillery battalion TOC with the brigade TAC CP eliminates these problems by making TACFIRE devices and fire support advisors available at all maneuver echelons and fire support agencies. Everyone on the battlefield can have access to TACFIRE and thus benefit from enchanced fire support. The artillery commander can again become the FSCOORD, with the S3 and brigade FSO concentrating on current and future operations, respectively. The result is closer cooperation and coordination between maneuver personnel and fire support personnel.

Every new tactical system requires careful consideration of how it can best be tactically employed. Where shortcomings exist, employment techniques must be found to solve the problems using the equipment currently available while new and improved systems are being developed. Collocating the DS artillery battalion TOC and the maneuver brigade TAC CP is one way of accomplishing this.

CPT Forrest G. Clark is assigned to the Communication and Electronics Command New Equipment Training Team (TACFIRE), Europe, as an instructor.

Redleg Newsletter

ITEMS OF GENERAL INTEREST

Correction

The single page layout of the Field Artillery Branch Team, page 49 of the March-April *Journal*, shows AUTOVON 221-0117 as an alternate branch phone number. This is incorrect. The listing should have read *AUTOVON 221-0118*. Other numbers are 221-0116/0187/7817.

USMA preparatory school

The United States Military Academy Preparatory School (USMAPS) at Fort Monmouth, NJ, is now accepting applications for the Class of 1982-83 which begins in August this year. The application deadline for this class is 1 May.

The school assists selected enlisted members to prepare and qualify academically, physically, and militarily for admission to the United States Military Academy at West Point. The 10-month academic year emphasizes English and mathematics. All graduating students automatically receive a nomination to the Military Academy.

Applicants are urged to apply early because admission to USMAPS is highly competitive. Last year, more than 1,000 Regular Army soldiers applied for the 170 USMAPS vacancies. Competing with them were 33 Reserve Component soldiers, of whom 13 were accepted and are now students.

Reserve Component soldiers who are accepted are ordered to active duty in their current pay grade specifically for the purpose of attending USMAPS. While students at USMAPS, they are eligible for promotion under active duty criteria and regulations.

To be eligible, an applicant must be:

- A citizen of the United States or able to become a citizen prior to entering the Military Academy.
- At least 17 and not 21 years of age on 1 July of the year he or she enters the Preparatory School.
- Unmarried and have no legal obligation to support a child or children.
- In good health, have no disqualifying physical defects and have vision correctable to 20/20.
- A high school graduate, or the equivalent, with a solid academic background.

Ideally, applicants should have four years of English and three years of college preparatory mathematics. An individual with obvious leadership potential but a weaker academic background may still apply since many factors are considered.

Applicants should be highly recommended by their commanders. A Commander's Counseling Guide is included as the appendix to AR 351-12. All recommendations from the chain-of-command are closely reviewed to determine the applicant's maturity, motivation, and desire.

Inclosures to the basic application are described in paragraph 9 of AR 351-12, dated 1 October 1980. In addition to a photograph, the commander's evaluation, and several official forms, applicants must include a handwritten essay entitled "Why I Want to Attend the Preparatory School and My Goals in Life."

More information may be obtained by calling MAJ Charles Henning, the USMAPS Admissions Officer, at AUTOVON 992-1807/1808 or commercial (201) 523-1807/1808 or by writing to the Commandant, US Military Academy Preparatory School, ATTN: Admissions, Fort Monmouth, NJ 07703.

Reenlistment changes

For many years it was believed that soldiers with more than 18 years' service could automatically reenlist or extend their enlistment to remain on active duty until they reach their 20-year retirement mark. A clarification of policy outlined in Interim Change 16 to AR 601-280 now states that major field commanders may deny this opportunity to soldiers who have DA imposed or DA approved bars to reenlistment, refuse to take required action to comply with DA assignment instructions, or do not meet height and weight standards of AR 600-9.

Changes which went into effect on 1 January 1982 are as follows:

- Reenlistment can be denied to soldiers who do not make corporal or specialist four during their first three years of service.
- Privates first class on oversea orders can be extended long enough to complete a tour.
- Soldiers who need additional time to satisfy a Department of the Army imposed service remaining obligation can be extended.

Change in retired pay computation

The FY82 DoD Appropriations Act, signed by the President on 29 December 1981, changed the method used to calculate retired pay and directs that service credit be computed to the nearest whole month actually *completed* for any portion of a year in excess of six months. In the past, any portion of a year over six months was rounded up to the next year.

Any portion of a year under six months will continue to be rounded down to the last whole year of completed service. This change is effective for those retiring on or after 1 January 1982 except for those who applied for retirement prior to 1 January 1982 or were being processed for disability retirement or were on the Temporary Disability Retired List and thereafter retired.

SOCAD expands to USAREUR

Soldiers stationed in Europe may now take advantage of the Servicemembers' Opportunity Associate Degree (SOCAD) Program.

Those enrolled in SOCAD receive college credit for their military training and experience while they work toward an Associate's Degree.

Under the SOCAD program, soldiers agree to follow a set curriculum with a "home" college or university. Upon reassignment to another post, they may continue their studies at another SOCAD institution offering the same curriculum network. However, credits earned are sent to the "home" college or university from which the soldier will ultimately receive his or her college degree upon certified completion of the program.

Five institutions will offer 11 SOCAD curriculum networks for more than 25 European posts. These curriculum networks are:

- Automotive maintenance.
- Aviation maintenance.
- Communications and electronics.
- Data processing.
- Diesel maintenance.
- Food service management.
- Law enforcement.
- Management science.
- Office management.
- Transportation technology.
- A flexible curriculum for soldiers pursuing a general studies/liberal arts option.

Soldiers in Europe may choose to enroll in curriculum networks from one of the following institutions:

- Big Bend Community College (Moses Lake, WA).
- Central Texas College (Killeen, TX).
- City Colleges of Chicago, IL.
- Embry-Riddle Aeronautical University (Daytona, FL).
- University of Maryland (College Park, MD).

Currently, about 44 institutions offer 16 SOCAD curriculum networks to soldiers stationed in the continental United States (CONUS). In addition to the networks now being offered in Europe, the stateside curricula include civil engineering, communications media, computer maintenance, digital electronics, and medical records.

Soldiers interested in the program should contact their local education center for more information.

CSM personnel photographs

All command sergeants major (CSM) serving on active duty should have had a full-length photograph taken by 31 March this year. This onetime requirement is part of a recent policy change to AR 640-30. In addition to the above, soldiers appointed to CSM from CSM (Designee) status are now required to have a photo taken within 60 days of appointment. Future photos for these two grades will be taken in accordance with the new provisions outlined in AR 640-30. One copy of the photograph must be sent to Commander, US Army Enlisted Records and Evaluation Center, ATTN: PCRC-F, Fort Benjamin Harrison, IN 46249 and one copy to the Commander, US Army Military Personnel Center, ATTN: DAPC-EPZ-E, 2461 Eisenhower Avenue, Alexandria, VA 22331. This policy does not affect current policy for official photographs for other service members.

CANS pay

The Combat Arms NCO Shortage (CANS) pay planned for implementation in Fiscal year 1981 has now been officially canceled.

The pay was designed to improve the retention of key leaders in combat arms TOE units by providing a monthly pay to squad leaders, platoon sergeants, and first sergeants. The decision to scratch the pay from the 1982 budget was made after the Army's field commanders requested reconsideration for a program that would include more than just combat arms skills.

The recently concluded relook determined that other incentives, such as selective reenlistment bonuses and promotions, provided better retention of needed soldiers than the planned CANS pay.

Check-to-bank option available to Army Reservists

Army Reservists are encouraged to have their inactive duty paychecks sent directly to their bank or financial institution according to officials at the US Army Finance and Accounting Center (USAFAC), Indianapolis, IN.

This service is offered Reservists who receive their drill pay under JUMPS-RC (Joint Uniform Military Pay System — Reserve Component). The check-to-bank option can be started by completing DA Form 3685, JUMPS — Army Pay Elections.

Finance officials point out that the direct deposit option is the only pay alternative available to Reservists who are not on active duty. Allotments and mid-month paychecks are not permitted under JUMPS-RC.

The financial institution will normally receive the Reservists's pay by the fifth of the month (USAR payday). A composite check is sent to the institution along with a list of payees, account numbers, and amount of pay.

This is not, however, a guaranteed pay program. Army Reserve inactive duty pay is not guaranteed because a Reservist is not paid if he or she misses a weekend drill.

Annual Training pay and Active Duty for Training pay (man days) are not in the check-to-bank option because these pays are normally prepared manually.

Compassionate assignment policy localized

Under a new policy, commanders of installations or those having general court-martial authority may approve requests for deletion/deferment from reassignment submitted by soldiers with severe but temporary compassionate problems. This change took effect in mid-September 1981 and is in revisions to AR 614-101 for commissioned and warrant officers and AR 614-200 for enlisted personnel.

In the past, such requests had to be submitted to the US Army Military Personnel Center for approval; now, the installation commander or the officer in the soldier's chain of command with general court-martial authority can approve many such requests. This change gives commanders one-time authority to approve a soldier's deferment from reassignment for up to 90 days. Additionally, a one-year, one-time authority to approve deletions is also effective with this change.

The maximum periods of deletion or deferment remain the same. That is, when a soldier is deleted from a reassignment, he/she is stabilized in his/her present assignment; when he/she is deferred from reassignment, his/her reassignment is rescheduled.

Local commanders now have the authority to delete a soldier's reassignment under the following circumstances:

- If a family member is afflicted by a terminal illness and death is anticipated within one year.
- The soldier's spouse or child died recently.
- A family member is hospitalized for more than 90 days and the soldier's presence is essential to resolve associated problems.
- There is a documented case of a rape of a spouse or child, or a documented case of child abuse, where the soldier's presence is essential to resolve the problem.

Criteria for command-approved deferments include hospitalization of a family member for less than 90 days; a recent death in the family (other than spouse or child); receiving custody of one or more children because of divorce, legal separation, or desertion; firm court dates for legal matters that require the soldier's presence; and domestic hardships involving a soldier's family where, permanent relief cannot otherwise be achieved.

Off-duty employment

Military personnel wishing to hold a second job in their off-duty hours should insure that the employment does not interfere with the performance of their military duties. In addition, individuals should be cautious in finding employment that does not bring discredit upon the government or the Department of the Army. The employment should not create a conflict of interest or the appearance of a conflict of interest.

Department of the Army policy on off-duty employment is contained in AR 600-50.

Army Strategist Program

The purpose of the Army Strategist Program is to develop qualified field grade officers for assignment to strategic planning and operations positions on the Army staff, Joint and Combined staffs, and staffs of other agencies. The program, managed jointly by the Office of the Deputy Chief of Staff for Operations and Plans (ODCSOPS) and MILPERCEN's Officer Personnel Management Directorate (OPMD), identifies officers whose performance, education, and experience indicate an ability to serve in these positions. Additional Skill Identifier (ASI) 6Z is used to designate both officer strategists and validated strategists positions.

ODCSOPS, in coordination with MILPERCEN, is conducting an annual review of strategist positions which will be completed by April this year.

Officers identified as strategists are managed within the framework of their designated OPMS specialties. Because the Strategist Program does not involve the establishment of a separate OPMS specialty, patterns of development for officers identified within the program will be those of the initial and additional specialties in which the officers regularly participate.

Desirable qualifications for officers interested in the Army Strategist Program include, but are not restricted to, the following:

- Attendance at a senior service college, or as a minimum Command and General Staff College or an equivalent.
- Demonstrated potential, through manner of performance, to serve in a strategist position on a high-level staff (Department of the Army, Office of the Joint Chiefs of Staff, Office of the Secretary of Defense, etc.).
- Graduate schooling in a strategy-related discipline.
  1) International relations.
  2) Foreign affairs.
  3) Master of military arts and science with concentration in strategy of political/military affairs.
- Successful completion of 12 months in an ODCSOPS-validated strategist position may waive the requirement for the master's degree or CGSC-level schooling.

AFEES name change

Effective 1 January this year, the 67 Armed Forces Examining and Entrance Stations (AFEES) were renamed "Military Entrance Processing Stations" (MEPS). These stations located throughout the United States, have the mission of qualifying applicants for the armed forces through aptitude testing, medical examinations, and administrative processing.

The name change allows closer identity with their parent headquarters, United States Military Enlistment Processing Command (USMEPCOM), and avoids confusion with the Army and Air Force Exchange Service (AAFES).

Interoperability Training:
Collocation of FDCs

by CPT Mark L. Uhart and 1LT Scott E. Lacagnin

It had been a sleepless night in the fire direction center (FDC) and tactical operations center (TOC) complexes with targeting information arriving at an unbelievable rate. In the distance, near the town of Springe, the echos of tank fire and the rumble of rocket attacks could be heard. The opposing forces were systematically reducing each village to rubble with rocket and cannon fire in an attempt to eliminate the counterfire threat.

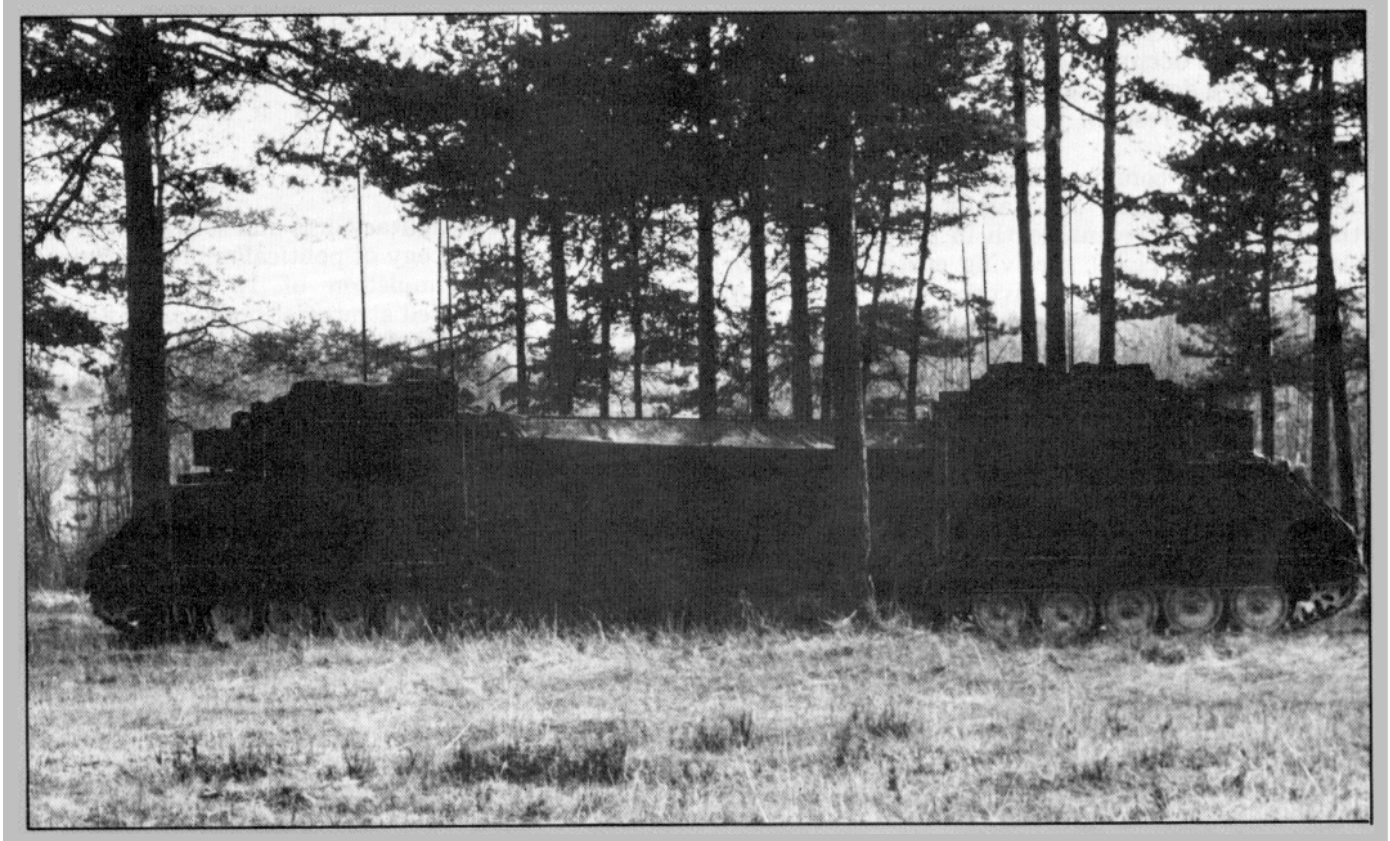
A rocket attack forced Battery B to conduct a hasty displacement to its alternate position, leaving tons of dug-in ammunition. Immediately upon occupation and establishment of communications, the chief computer of 1st Battalion, 3d Field Artillery, contacted the British 45th Field Artillery Regiment FDC (the reinforced unit) with the following message: "Battery B moved northeast to square CK218 as a result of rocket fire. Notify all affected units as soon as possible."

In less than two hours, a passage of lines began the British (BR) 1st Corps counterattack. An on-order 30-minute conventional preparation against 172 targets was planned as a result of close coordination between British and American FDCs. The effectiveness of that preparation was achieved by collocation of the FDCs.

Exercise Spearpoint

In early September 1980, the 2d Armored Division deployed from Fort Hood, TX, to Europe for *Reforger '80*, drew equipment, and moved north to link up with the 3d Brigade and its support elements to participate in "Exercise Spearpoint," a NORTHAG maneuver designed to test interoperability between American, British, and German Forces. The four-phase operation required rapid dissemination of targeting information and intelligence, complete control of all movements, and coordinated continuous fire support.

Liaison between American and British Forces actually started 60 days before the Reforger exercise when elements of the 2d Armored Division traveled to Germany to participate in "Exercise Javelin." At that time, operational differences were discussed in detail. Key considerations of these discussions were:



• Differences in FM communications equipment.

• Differences in the method of controlling movement of artillery units.

• Lack of US target acquisition assets because of only partial deployment of 2d Armored Division Artillery to Europe.

• Unfamiliarity of counterparts with standard operating procedures (SOPs) at the battalion/regimental level.

In order to minimize the impact of these problems, the decision was made to collocate the FDCs to support the passage of lines and counterattack. This seemed the most straight-forward approach to fire coordination.

Shortly after the US 2d Armored Division received the warning order for commitment into the BR 1st Corps zone, it moved to a tactical assembly area where the BR 1st Corps Artillery provided required fire planning information to division fire support elements. The BR 1st Armored Division sent a liaison team to the US 2d Armored Division Artillery and the artillery commanders of US 2d and BR 2d Armored Divisions exchanged liaison teams. The US 1-3d FA and 1-78th FA dispatched liaison teams to the British artillery units with whom they would be operating to make initial coordination for the collocation of FDCs and to coordinate movement into the BR 1st Corps area. As our battalions approached their position areas, they were met by British reconnaissance squads which had previously cleared the area. The scheme of maneuver for the counterattack called for a British task force to attack in the north under US 2d Armored Division control with 2d Brigade to follow and support. In the south, the 1st Brigade would pass through the BR 2d Armored Division and conduct the main attack with 3d Brigade to follow. All available British artillery would support the attack.

In the north, the 1-3d FA FDC collocated with the BR 45th FA Regiment FDC. Because of FM radio incompatibility, British forward observers could only transmit calls for fire to the 45th Regiment FDC. To reduce the impact of this problem, 1-3d FA dispatched three fire support teams (FISTs) to link up with the British task force fire support officer who attached the FISTs to three maneuver battalions.

After initial contact was made with our FDC, all fire nets maintained radio silence until initial enemy contact was made. As the British fire direction nets became loaded with fire missions, the three US nets were used to transmit hasty fire plans developed by the collocated British observers. These fire plans were then hand-carried to the 45th Regiment FDC less than 100 meters away. Spot reports sent on these nets were also valuable in developing the intelligence situation.

In the south, the 1-78th FA, on the other hand, did not maintain collocation with its supporting FDC. Since British maneuver forces in that sector were not directly involved in the counterattack after the passage of lines, the British FDC remained with its supported maneuver forces. Instead, a British liaison team was provided to 1-78th FA to facilitate rapid fire.

"Exercise Spearpoint" allowed the 2d Armored Division to participate in the test of the collocation concept under conditions where missions changed from reinforcing British artillery units to direct support with British artillery units reinforcing US units. A subset of the collocation concept tested the best location for the artillery FDCs.

The greatest problem in this interoperability training was that forces were unfamiliar with their counterpart's standing operating procedures and organization. Opening of communications and establishing a flow of battlefield intelligence was slow. Other problem areas encountered included communications incompatibility, movement control, and target acquisition. British FM radios are designed to receive and transmit across a wider frequency range and to the nearest 0.1 kilohertz. This means that four of the five frequency settings on a British FM radio will not match those in its US counterpart. Movement control also differs greatly. Instead of deploying artillery batteries in position areas that must fit the terrain, each battery is normally given a one-kilometer grid square in which to position itself. Grid squares are numbered for identification, and a battalion may occupy three adjacent squares or they may be randomly selected based on the density of maneuver elements. The primary point here is that the gun position officer (BR) or battery commander (US) has no latitude in positioning a battery. A reinforcing battalion will most often be positioned within squares that afford little or no natural cover and concealment. Routes of march for reinforcing units are selected by the direct support artillery FDC and position area guides are positioned at all release points. This almost eliminates the need for a commander's reconnaissance, and advance parties are seldom given more than 20 minutes to prepare the position for occupation. Ammunition convoys are equally controlled and normally escorted by security forces during the hours of darkness.

Several problem areas were encountered in target acquisition. The US 1st and 2d Brigades deployed in sector without attached acquisition assets. The British 45th FA Regiment employed the Cymbeline mortar locating radar; however, the radar command post was not collocated with the FDC. Thus, intelligence on enemy movements and troop concentrations were received on a separate radio net in the regimental FDC. Generally, only counterfire information and enemy concentrations planned for targeting were forwarded to the FDC. The British locating battery (consisting of the drone, sound ranging, and meteorological troops) provided the best target information and current weather information. An exchange of battalion/regimental SOPs and the collocation of FDCs were instrumental in solving these problems. Close coordination was particularly vital during the passage of lines and passing of responsibility for fire support. Collocating also allowed the exchange of target lists and battlefield intelligence in a most expeditious manner. Ammunition expenditures were reported to the direct support artillery unit hourly without jeopardizing unit locations with lengthy radio messages. As counterfire target lists were compiled in the British FDC, they were hand-carried to the US FDC. Each target on the target list required a certain number of volleys to be fired in effect. Collocating was absolutely essential in this aspect. Ranging capabilities of allied artillery (such as the 105-mm SP Abbot, 5.5-inch, and the newer 155-mm FH70) required careful consideration in planning continuous support. The added range of the US 155-mm howitzer, firing rocket assisted projectiles, allowed British artillery to move forward without lessening the support available to the maneuver units. Additionally, the increased effectiveness of US ammunition, such as the dual purpose improved conventional munitions and field artillery scatterable mines (FASCAM), reduced the number of volleys required for a specific target and added a new dimension to the maneuverability of the task force. In several cases, hasty minefields were laid using FASCAM to protect the flanks of the advancing force. With the introduction of newer ammunition, including Copperhead, collocation will be even more essential to insure effective use of this system when US artillery operates in the reinforcing mission. Collocation of FDCs may not be the complete answer for operating with allied artillery but it certainly appeared to be the right step in the right direction during "Exercise Spearpoint." Diversity of design in the military equipment of NATO and organizational/operations and doctrinal differences could make mutual support extremely difficult without both liaison and collocation, especially in cases where English is not the common language.

CPT Mark L. Uhart is the commander of G Battery 29th Field Artillery, 2d Armored Division, and 1LT Scott E. Lacagnin is the executive officer of A Battery, 1st Battalion, 78th Field Artillery, 2d Armored Division.

With Our Comrades in Arms

NEWS OF OTHER BRANCHES AND SERVICES

Tank fire control systems tested

Researchers at the US Army Human Engineering Laboratory (HEL) are conducting a test program that uses live rounds in a .50-caliber spotting rifle, mounted on the gun tube of a battle tank. Objectives of the test are to determine the effectiveness of current battle tank fire control systems and what can be done to improve them.

According to HEL researchers, one of the main problems with the current fire control systems is that they are designed to perform well under training conditions, rather than battlefield conditions. For example, when soldiers go to the range to fire a battle tank, they shoot at targets that are relatively predictable; i.e., the targets are a specified distance away. Also, the tanks travel at a constant rate of speed in a specified direction, and there are few variables which challenge the fire control system.

The HEL study has changed that. Targets will appear at shorter ranges, intermittently, with short target exposures. The gunner will not have any idea from which direction the target is coming, where it is going, or in which direction he will have to fire next.

HEL elected to use .50-caliber rounds fired from a spotting rifle at a manned target. The target, originally an M114 reconnaissance vehicle, was scaled down to a six-tenths version of a main battle tank. The "scaled tactical target" vehicle, or minitank, will be equipped with the most stringent safety features to include everything from outside armor plating that can withstand the impact of the .50-caliber round at point blank range to nylon ballistic blankets on the inside compartments.

The M60 normally fires a 105-mm cannon but, by modifying the fire control computer to the ballistics of the .50-caliber round, the gunner must still do everything he would have to do to fire the 105.

The HEL researchers don't expect the same results from the .50-caliber round, but they do expect the same relative performance in the fire control systems. For training, this will bridge the gap between range firing and combat and will give the soldier a better idea of what battlefield conditions are like. Even though no one is shooting back at him, the soldier has to shoot at an evasive target.

Near-combat realism is not the only beneficial factor in using the minitank for training. The cost of ammunition for the 105-mm cannon ranges from $300 to $800 per round, whereas .50-caliber rounds cost about $3 a piece.

Not only is the cost of ammunition getting very prohibitive, but there are few places left in the country where modern tank gun ammunition can be fired. The .50-caliber gun will eliminate this problem.

The test crew is planning to extend the testing to include a three-day field maneuver, during which the M60 crew will not know when it is to be attacked, day or night. Battlefield and artillery simulators as well as smoke and dust grenades will be used, and the minitank will perform countermeasures to go undetected.

The test crew will also check to see whether the crew makes more mistakes with one fire control system than another. The minitank target, unlike the panel on the range, won't be there all the time, and the gunner will be in a hurry to fire.

Congress funds Roland

Congress has provided sufficient funds in FY82 for the continued production of the Roland weapon system.

Current plans call for Hughes Aircraft and its associate contractor on the Roland project, Boeing Aerospace Company, to deliver 27 fire units and 595 missiles. This requirement, together with production of spare parts, will keep the Roland production lines rolling through the middle of 1983.

These quantities represent a reduction from the original production plans which called for 38 fire units and 885 missiles.

Deliveries of fire units will continue at the rate of approximately one a month into mid-1982, and then they will accelerate to two a month until the program is completed.

Second Viper buy

The US Army Missile Command (MICOM) has awarded approximately $89.3 million to General Dynamics Corporation for the second production buy of the Army's Viper antitank system to include 60,000 tactical rounds, training hardware, and additional production facilities.

The Viper hardware will be delivered to the Army beginning early next year.

Weighing approximately nine pounds, Viper is a small, unguided, antitank rocket that will be issued to soldiers as rounds of ammunition. The shoulder-fired Viper will be more powerful and accurate than the M72 LAW it replaces and will have a much longer effective range.

From propellant formulation to a complete weapon prototype, the new tank killer was developed by MICOM's Army Missile Laboratory. General Dynamics won the competitive contract in February 1976 to begin engineering development of Viper.

The first production contract of $14.4 million was awarded to General Dynamics in December 1981.

Hind-D target tested

The US Army Air Defense Board recently tested a pop-up, scale model, helicopter threat target designed to train air defense forward observers and gunners in target acquisition and engagement.

The Hind-D, 1/5-scale, Helicopter Threat Target (HELTT) is a styrofoam and fiberglass reproduction of the well-known Soviet attack helicopter. The fuselage is 10 feet long, 1.3 feet wide, and 2 feet high. The HELTT is mounted on a remotely controlled lifting device and has operational rotor blades.

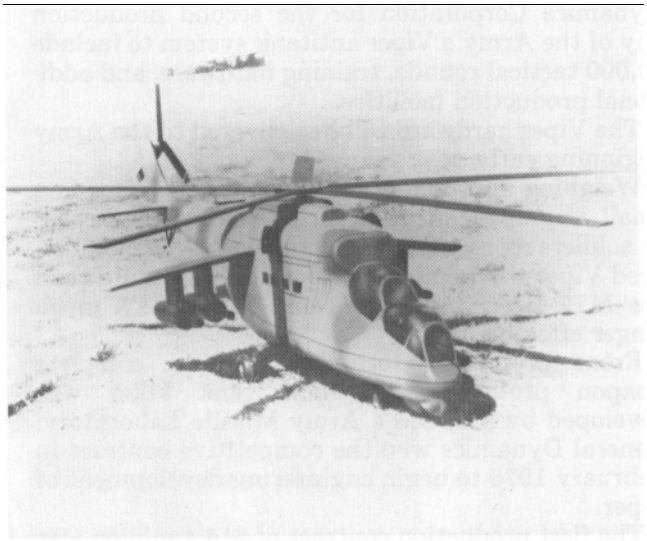
The HELTT is designed to realistically present the actions of a helicopter rising from defilade to conduct an attack. This is accomplished by positioning the HELTT behind existing terrain, out of view of forward observers or air defense systems. On command, the HELTT is raised into view and held in an attack position for a designated period of time, which correlates with enemy attack profiles, and is then lowered. Because the HELTT is not a full-scale model, reduced ranges are required to achieve realistic presentations.

The HELTT rotor blades are covered with a metal foil to provide a radar signature. Infrared sources can be mounted on the HELTT to enable infrared weapon systems to acquire and lock onto the target.

HELTT realism and durability were tested against Redeye, Vulcan, FAAR, and nonair defense organic weapons including M16 rifles, M60 machineguns, and .50-caliber machineguns operated by ground troops.

The target was unmasked at ranges of 200, 400, and 600 meters. The test team included the following in the major findings:

• The FAAR acquired HELTT and presented video at all ranges at the correct azimuth; however, the range was always presented at approximately 1,000 meters.



The Hind-D helicopter threat target.

• The Vulcan system successfully acquired the HELTT, obtained a ready-to-fire light, and simulated engagements.

• The Redeye was successful in obtaining a missile tone at 200 and 400 meters, but had difficulty at 600 meters.

• The M16 riflemen, M60 machinegunners, and the .50-caliber machinegun crew successfully acquired and engaged the HELTT.

• The 5.56- and 7.62-mm ammunition damage to the HELTT was easily repaired in the field, and the appearance and operation of the target remained good.

• The .50-caliber and 20-mm ammunition damage to the HELTT was quite extensive. At the end of each firing series, the target was damaged and did not operate as required.

The test report was forwarded to the US Army Air Defense School, Directorate of Training Develoments, Fort Bliss, TX, for analysis and evaluation.

DIVAD being tested

A developmental model of the Army's new Division Air Defense Gun System (DIVAD) has recently arrived at Aberdeen Proving Ground (APG) for extensive testing.

The vehicle, an advanced computer-controlled frontline weapon, was designed to be effective against helicopters and high-performance fixed-wing aircraft, as well as ground targets.

The system has completed exhaustive performance testing phases at the Army's Air Defense Center ranges at Fort Bliss, TX. At APG, it will be subjected to strenuous automotive, endurance, firing, and reliability testing.

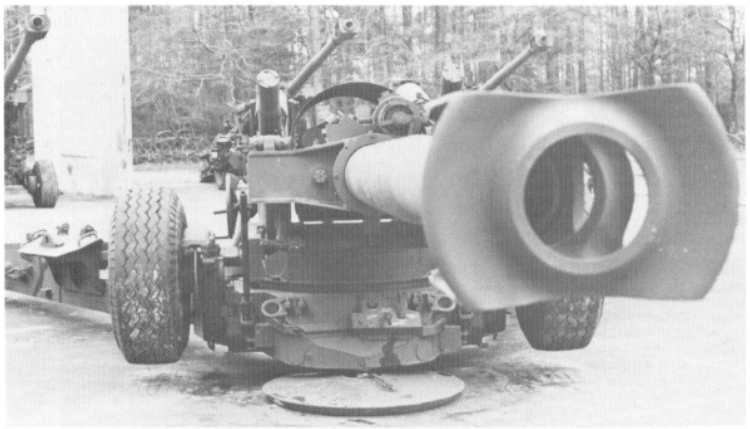
The DIVAD vehicle uses a modified M48A5 tank chassis, M60 tank drive train, and a specially-designed advanced firing unit and fire control system mounted in a hardened turret.

Armament includes two Bofors 40-mm linkless guns, coupled to a sophisticated radar system and a laser range-finding device. Gunners may use either a day-night optical system, a computerized fire control aiming system, or a combination of the two, according to Ford Aerospace and Communications Corporation, producer of the weapon.

The recently-completed tests at Fort Bliss studied gun and fire control performance against aerial targets, using soldiers as crewmen-operators.

While at APG, the system will be subjected to approximately 4,000 miles of automotive tests on various types of terrain and road surfaces and extensive reliability, availability, maintainability, and durability (RAM-D) tests. Crew-level maintenance procedures will also be evaluated.

Other aspects of the test program include environmental conditioning tests, during which the vehicle will be exposed to extreme temperatures and excessive humidity.



The M198 155-mm howitzer is the newest in long range weaponry to be added to the Tenth Marines inventory at Camp Lejeune. (Official USMC photo by MSgt Frank Segreto)

New weapon at Camp Lejeune

The 2d Battalion, 10th Marines, recently received six M198 155-mm towed howitzers, making them the first Marine unit to receive this weapon. The M198 has the capability of firing an improved family of ammunition at greater ranges than the towed or self-propelled predecessors which makes it a much more satisfactory weapon for direct and general support artillery missions on the modern battlefield.

Selected crews from Lima Battery, 2d Battalion, will be firing and training on the new weapon. What is particularly pleasing to the weapon crew is the ease of handling and low incidence of repair and maintenance it requires. It is, according to the commanding officer of Lima Battery, Captain Louis Stough, "designed with the cannoneer in mind."

Although the M198 is heavier than its predecessors, it is not considered overly bulky or unwiedly by the cannoners. A technological advance called the "speed shift" allows two men to pivot the howitzer 360 degrees in a matter of seconds.

Other features which have impressed local gunners include a tube that requires less frequent replacement, an illuminated digital firing control panel, and a warning device that tells the crew when the gun is overheating.

Immediate plans for the howitzers include field work at Fort Bragg and in the Caribbean area.

The more local crews study the new weapon, the more they learn. As Staff Sergeant Doug Wiles indicates, "We are like a bunch of kids with a new toy on Christmas morning." (Corporal Stephen Whit-field)

Mobile water chiller

A small mobile water chiller designed to military specifications as part of the water supply system for the Rapid Deployment Joint Task Force has passed operational tests.

The chiller, developed by the US Army Mobility Equipment Research and Development Command (MERADCOM), was tested for performance, feasibility, and transportability at Fort Bragg, NC. Also, it was environmentally tested at MERADCOM and road tested with the 400 gallon water trailer at Aberdeen Proving Ground, MD.

The water chiller is designed to be used with the 400-gallon water trailer and the 250- and 500-gallon collapsible water drums. It can cool 40 gallons of water per hour or 800 gallons of water per day from 120 to 60 degrees Fahrenheit. The chiller can be used in a recirculation or single pass mode to cool water. The entire system is mobile, efficient, and capable of supporting company-sized units by providing four gallons of water per man per day which is the daily consumption in desert environments.

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Collocation of FDCs

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