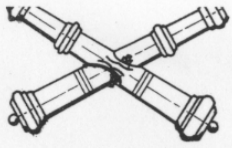
ARTILLERY

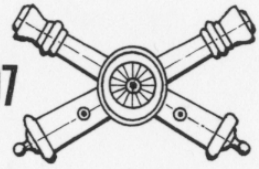
1968

1836



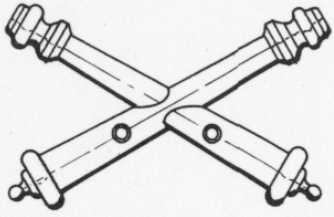
US ARMY
ARTILLERY AND
MISSILE SCHOOL

1902 - 1907

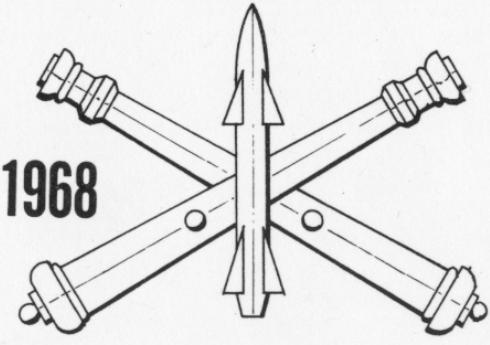


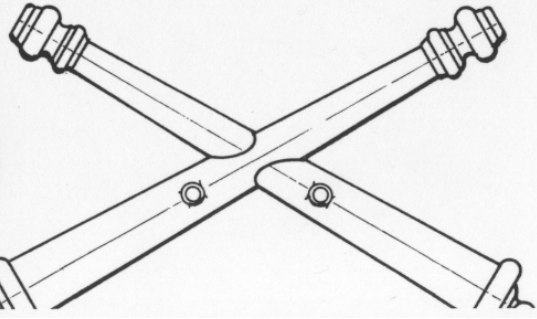
DECEMBER
1968

1907 - 1957



1957 - 1968





# TRENDS

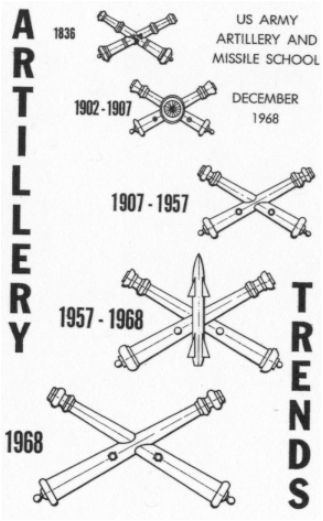
# INSIDE THIS ISSUE

**INSTRUCTIONAL AID NUMBER 42**




ARTILLERY TRENDS is an instructional aid of the United States Army Artillery and Missile School published only when sufficient material of an instructional nature can be gathered.

# Introduction




## COVER

Effective 1 December 1968, the Field Artillery returns to the wearing of the crossed cannons. The Artillery originally adopted the crossed cannons as its insignia in 1836. Subsequent changes include the addition of a wheel from 1902 to 1907, and the addition of a missile in 1957. The army authorized the elimination of the missile and the return to crossed cannon for the Field Artillery as a result of the separation of the Artillery into branches.

Artillery officers below the grade of colonel will be managed as either air defense artillery or field artillery officers by their respective career branches. Field artillery will remain in the present artillery branch and a separate office will be established for the career management of air defense artillery officers. Artillery colonels will continue to be managed by the Colonels Division, Office of Personnel Operations, because of the more generalized career requirement for officers of this grade and length of service.

The doctrines, missions, equipment, and techniques of air defense artillery and field artillery have created two widely separated fields, each requiring a greater concentration of different skills and efforts. Two career branches will provide a tailored response to the dual missions assigned and to the anticipated professional requirements for the employment of future weapons systems.

Other articles included in this issue should prove interesting to readers. These articles are in addition to regular features which are "Instructional Department Notes," "Notes from the US Army Artillery Board," "USAAMS Resident Courses," and "Southeast Asia Lessons Learned."

A special picture feature, "On to 'Graf'," follows an artillery unit through preparation for its annual Army Training Test at Gratenwoehr, Germany, and then picks up another battalion during the testing stage.

# Artillery Trends

As an instructional aid of the United States Army Artillery and Missile School, **ARTILLERY TRENDS** is published only when sufficient material of an instructional nature can be accumulated. It is designed to keep field artillerymen informed of the latest tactical and technical developments in artillery.

In accordance with AR 310-1, distribution of **TRENDS** will not be made outside the command jurisdicton of the School except for distribution on a gratuitous basis to Army National Guard and USAR schools, Reserve Component staff training and ROTC programs, and as requested by other service schools, ZI armies, U. S. Army Air Defense Command, active army units, major oversea commands, and military assistance advisory groups and missions.

Subscription to **TRENDS** on a personal basis may be obtained by qualified individuals by writing to: The Book Store, U. S. Army Artillery and Missile School, Fort Sill, Oklahoma 73503.

Primarily, articles are prepared by individuals assigned to departments of the School or to artillery units and agencies outside the School. All articles, no matter what the source, are coordinated by appropriate departments in the School and with the U. S. Combat Developments Command Artillery Agency and the U. S. Army Artillery Board collocated with the School at Fort Sill, Oklahoma. This coordination is effected in an effort to arrive at an "Artillery Community" position before publishing the information. The Artillery Community is Fort Sill's term for the center team concept of Continental Army Command, Army Materiel Command, and the Combat Developments Command.

Gunnery Department . . . . . Colonel A. C. Anderson
Nonresident Instruction Department . . . . . Colonel Jesse B. Hollis
Tactics/Combined Arms Department . . . . . Colonel T. F. Perpich
Target Acquisition Department . . . . . Colonel Harry R. Jackson
USAAMS Brigade . . . . . Colonel Salvador F. Taranto
Officer Candidate Brigade . . . . . Colonel T. E. Watson

**U. S. Army Artillery and Missile Center**

Commanding General . . . . . Major General Charles P. Brown
Chief of Staff . . . . . Colonel William C. George

### III Corps Artillery

Commanding Officer . . . . . Colonel William H. Hamilton

### U. S. Army Training Center, Field Artillery

Commanding Officer . . . . . Colonel Frank Hawthorne

### U. S. Army Artillery Aviation Command

Commanding Officer . . . . . Colonel F. C. Goodwin

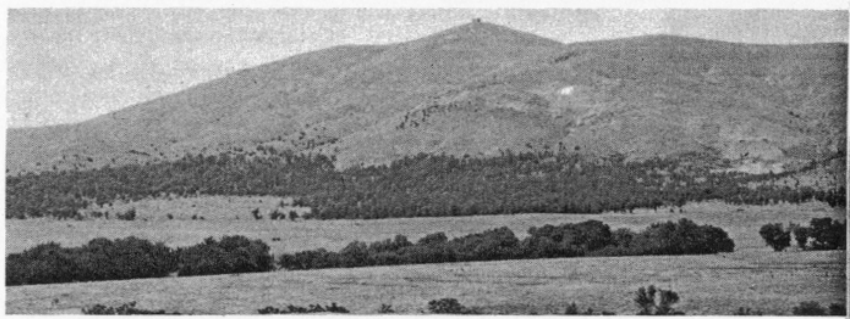
**U. S. Army Artillery Board**

President . . . . . Colonel Paul S. Cullen

**U. S. Army Combat Developments Command Artillery Agency**

Commanding Officer . . . . . Colonel A. F. Rollins

# Instructional Department Notes



## Artillery Transport Department

### GAMA GOAT CONTRACTED

The Army has awarded a contract to Consolidated Diesel Electric Company, a division of the CONDEC Corporation, Old Greenwich, Connecticut, for production of M561 Gama Goat 1¼-ton cargo trucks. This is the first increment of a purchase to be made over a 3-year period.

Simultaneously, a contract was awarded to General Motors Corporation, Detroit Diesel Engine Division, Detroit, Michigan, for procurement of diesel engines for the M561 Gama Goat. This contract also represents the first increment of a purchase to be made over a 3-year period.

The first vehicle is expected off the production line in August 1969.

The six-wheeled, two-unit Gama Goat represents a significant departure from traditional Army truck design and has demonstrated a considerable improvement in off-road mobility compared to present Army vehicles.

The two units are connected by an articulated joint which permits the units to pitch and roll and still maintain ground contact and traction with all six powered wheels. In addition, the Gama Goat can swim inland waters, can be airlifted by a helicopter, and can be parachuted into remote areas.

## Director of Instruction

### USAAMS INSTRUCTIONAL TELEVISION

Instructional television (ITV) is rapidly taking its place as a supplement to live instruction in the programs of instruction of the United States Army Artillery and Missile School.

Having realized the advantages of instructional television (such as illustrating or demonstrating concepts not readily available in regular classrooms, savings in both time and money, and enrichment of training), the School is making a concentrated effort to gain the full value of this

instructional medium. For example, officer candidate and officer basic students are shown the ITV program "Adjustment of Fire," before they actually adjust fire from an observation post (OP). In many cases, the students' responses on the OP have been much faster.

During 1966-67, the USAAMS television facility produced a number of ITV programs that were considered to be of value not only to USAAMS but to artillerymen at other installations in the continental United States and overseas.

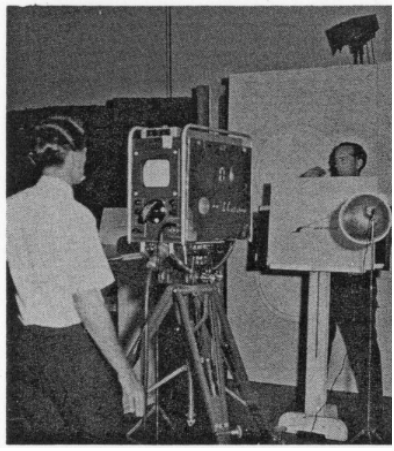


**Figure 1. Preparing ITV program for FDC classes.**

Programs deserving special mention are described below:

"Adjustment of Fire"—a controlled practical exercise which requires the student to conduct two area missions and one impact and time registration.

"The Call for Fire"—a demonstration of new proceures and techniques for the initial fire request and subsequent corrections and a detailed explanation of the new format which have been effective since September 1966.

"Aerial Adjustment of Artillery" — a controlled practical exercise which requires the student to participate in the adjustment of artillery from the air.

"Removal and Installation of the 175-mm Gun Tube" — the detailed procedures for the removal and installation of the 175-mm gun tube.

"Service Upon Receipt Inspection of the Pershing Missile" — an explanation in detail of the service upon receipt inspection for each of the missile sections and their containers.

"Call for Fire" and "Receipt and Inspection of the Pershing Missile" — both programs were converted to the 16-mm kinescope film and placed in worldwide distribution.

The USAAMS Television Division is experiencing growing pains as a result of USCONARC's plan to provide all training facilities with an ITV capability. In March 1966, the Television Division became operational with 15 personnel, 1 mobile TV production van, 2 video tape playback machines, 40 TV receivers, and a two-channel closed circuit distribution system to four academic buildings. Today it is authorized a total of 35 personnel and has 2 mobile TV production units, 1 semimobile TV production unit, 6 video tape playback machines, a film chain, 7 playback channels, 205 TV receivers in 50 USAAMS classrooms and 250 receivers in 46 classrooms at the US Army Training Center, Fort Sill, Oklahoma.

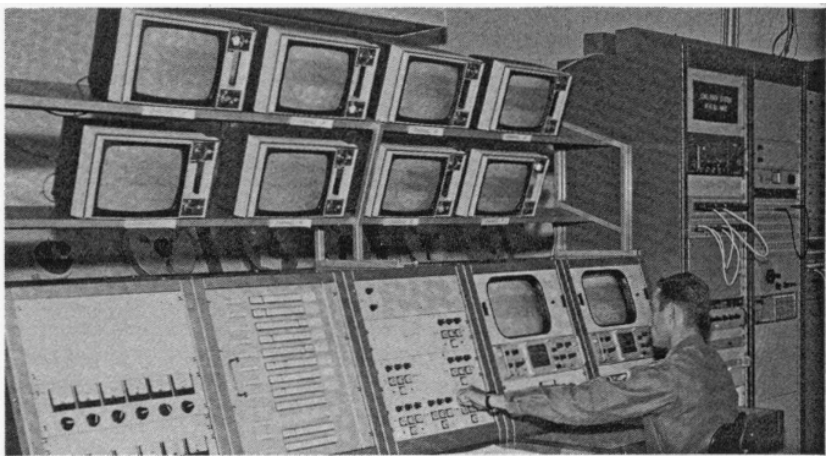


**Figure 2. Playback Operation Center monitoring transmission of programs to USAAMS classes.**

USAAMS also supports ITV programs at Fort Polk, Louisiana; USATC, Fort Sam Houston, Texas; USAPHS, Fort Wolters, Texas; and the USAC&GSC, Fort Leavenworth, Kansas.

The School's approach to instructional television is that it must teach and that, except in an occasional unique situation, it must complement rather than replace the live instructor in the classroom.

# Guided Missile Department

### MISSILE COURSE CHANGE

The Field Artillery Ballistic Missile Officer Course (FABMOC) has been established at the US Army Artillery and Missile School to replace the Pershing and Sergeant officer courses. The development of this course is based on a comprehensive analysis of the performance required for an officer whose potential assignment is to either a Pershing or a Sergeant missile unit. The common and related features of the two systems allow the course to maximize the number of hours of practical instruction in each functional area. Since an officer is primarily a supervisor, the value gained from combining practical instruction on both maintenance and firing procedures allows the student greater flexibility in assignment. Other key advantages accruing from the FABMOC are a more constant student load and more effective utilization of instructors and facilities. The course length is 8 weeks and 3 days and includes 115 hours of practical instruction.

The FABMOC started in May 1968. This course provides officers with the training required to supervise the tactical employment, system maintenance, and operation of the Pershing and Sergeant missile systems. Graduates will be awarded MOS 1190 (Ballistic Missile Unit Commander).

### 6,400-MIL CAPABILITY FOR M107 AND M110

The carriage of the 175-mm gun M107 and the 8-inch howitzer M110 must be power shifted to deflections out of traversing ranges to obtain the desired 6,400-mil capability. This shifting causes enough displacement to warrant re-laying the pieces.

The fire direction center (FDC) converts the announced deflection into an azimuth.

Orient the aiming circle on the computed azimuth.

Shift the weapon to the approximate direction of fire and lay it reciprocally on the desired azimuth, using the upper scale of the M115 panoramic telescope.

Close the upper scale door, handcrank the lower scale of the panoramic telescope to the announced deflection, and then realine the collimator or aiming posts.

**Caution:** Do not reset the lower scale of the sight to 3200.

The above procedure is applicable when the primary aiming point can be seen. When the announced deflection falls between 4100 and 6200 (bottom scale), the tube and recoil mechanism of the M107 and M110 mask the primary aiming point. In this case, the alternate aiming point must be used.

The procedures for re-laying by using the alternate aiming point are as follows:

The first three steps are the same as those mentioned above.

After the weapon has been relaid, set the true deflection to the alternate aiming point (5,600 mils for the M107 and M110) on the upper scale.

Reset the lower scale to 3200.

Close the upper scale door. Handcrank the lower scale to the announced deflection.

With the announced deflection on the lower scale, look through the sight and realine the aiming posts or collimator.

**Caution:** Do not traverse the tube after the weapon is laid until the collimator ar aiming posts have been realined.

**Note:** When shifting requires that the alternate aiming point be used, it may be more desirable to move the collimator to that position rather than to realine the aiming posts.

When returning to the primary aiming point after using the alternate aiming point, observe the following steps:

The weapon must be accurately laid.

The true deflection must be set to the primary aiming point on the upper scale, normally 2400.

The counter reset knob must be turned until the bottom scale reads 3200.

The upper scale door must be closed. The announced deflection is set on the bottom scale and the collimator or aiming posts are realined.

Several methods are now being used in Vietnam to shift the M107 and M110 throughout 6,400 mils. Generally, these methods require setting out the aiming point at referred deflection 3200 each time the weapon is laid. The FDC must then put new deflection indexes on the chart. When the weapons are laid on different azimuths, a color code for each weapon or some other means of distinguishing the indexes is used.

In the procedures outlined above, the original deflection indexes on the 6,400-mil chart are used for all azimuths of fire. If weapons of the same battery are laid on different azimuths, the above method eliminates the possibility of two weapons being pointed in different directions with the same referred deflection.

## ARTILLERY MECHANICS COURSE

To meet the need for trained artillery mechanics at the battery level in Vietnam, a new course of instruction has been inaugurated for enlisted men at the U.S. Army Artillery and Missile School. The Light and Medium Towed Field Artillery Mechanics Course is designed to produce mechanics capable of repairing or replacing any parts or mechanisms authorized at battery level on the towed 105-mm howitzers M101A1 and M102 and the towed 155-mm howitzer M114A1.

The course lasts 4 weeks and 1 day and is offered eight times a year. Each class has a scheduled input of 20 students.

All students must have an MOS 13A10 (Artillery Basic), a minimum general maintenance (GM) aptitude score of 95, and a minimum of 9 months remaining in service upon graduation. Upon successful completion of the course, students receive MOS 45F20 (Artillery Mechanic). Up to 50 percent of the graduates can be promoted to specialist fourth class, and the remainder can be promoted to private first class. Promotions are based on academic achievements during the course and recommendations by the instructors.

The program of instruction is 156 hours in length and is presented by the Gunnery Department and the Artillery Transport Department.

The subjects covered in the instruction by the Artillery Transport Department include the Army maintenance system, maintenance publications, materiel readiness, and Army equipment record procedures.

The instruction by the Gunnery Department includes all aspects of functioning, malfunctions, maintenance, troubleshooting, and parts replacement on the three towed howitzers. The subjects included in the curriculum are the role of the artillery mechanic, the care and use of tools, and the care and maintenance of pneumatic tires. The instruction on each weapon covers the carriage, recoil mechanism, barrel and breech, cannon replacement, sight tests and adjustments, and lubrication and inspections.

# Nonresident Instruction Department

## COURSE CHANGES

Many changes have been made in the Field Artillery Correspondence Course Program for 1968-69. The new program offers enlisted career development correspondence courses for all military occupational specialties (MOS) in Career Group 13, Cannon and Rocket Artillery.

To meet the enlisted career development requirement, a number of new subcourses are directed toward a particular MOS area. These correspondence courses are designed to provide unit commanders with an additional means of augmenting the MOS proficiency of their personnel. Enlisted career development courses may be taken by group study as well as by individual enrollment.

A number of new common subject subcourses for officers have been introduced into the basic correspondence course. These new subcourses cover subjects pertinent to small unit (company/battery) requirements and include mess management, personnel management, officer indoctrination, records, and supply. The introduction of new subcourses into the program has increased the subject coverage by 114 credit hours.

The new catalog has been distributed to the field. It contains a number of options for the completion of basic and advanced branch training as well as branch qualification and instruction preparatory to attendance at a resident course. For further information write to the Commandant, US Army Artillery and Missile School, ATTN: NRID, Fort Sill, Oklahoma 73503.

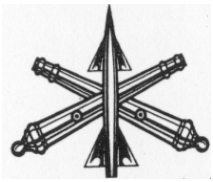
## NEW CORRESPONDENCE COURSE

The U.S. Army War College has initiated a correspondence course that is open to senior officers of the Army, as well as to senior officers of other services. Of 2-year duration, the nonresident course consists of three primary areas — strategic appraisal, strategy, and military planning. The course provides qualitative augmentation to the resident program and fills a void in military education for the Army Reserve officers.

The course is offered to lieutenant colonels or higher ranking officers who are in active status in the Regular Army, who are on extended active duty in the Army Reserve, or who are in an Active Reserve status but not on active duty. To be eligible, one must have completed 15 but less than 25 years of service and must have successfully completed the U.S. Army Command and General Staff College resident or nonresident courses or the equivalent.

Further selection criteria and application procedures are given in DA Circular 350-63, 20 March 1968.

# Notes from the U.S. Army Artillery Board



## Guardian of the Soldiers Warranty

The US Army Artillery Board, originally organized at Fort Riley, Kansas, in 1902, is the oldest user test agency in the US Army. It continued to function at Fort Riley, Kansas, until it moved to Fort Sill, the home of the Artillery School of Fire. In 1922 the Artillery Board moved to Fort Bragg, North Carolina where it remained until 1954. It then returned to its present location at Fort Sill, Oklahoma. The purpose of the move was to facilitate coordination and interchange of ideas and information between the Artillery Board and the US Army Artillery School. Since the reorganization of the Department of the Army in 1962, the Artillery Board has been a service test agency of US Army Test and Evaluation Command, a major subordinate command of the US Army Materiel Command.

### INTRODUCTION

Simply stated, the function of the Artillery Board is to insure that new developments in weapons and equipment for the Artillery can be effectively employed in combat by representative artillerymen. The purpose of the notes from the Artillery Board is to keep the artilleryman abreast of such developmental materiel being tested and of tested improvements for materiel already in the field. Readers are cautioned that an Artillery Board note on an item is not in any way indicative of the item's availability.

### TACFIRE

The Tactical Fire Direction System (TACFIRE)* of the Automatic Data Systems within the Army in the Field will be designed to provide data processing hardware, software, and associated data entry, display, and control devices necessary to automate selected field artillery operational functions. The system will be capable of performing 24 missions which can be consolidated into 3 categories—fire missions, support missions, and planning missions.

The contract for the TACFIRE system was awarded on 8 December 1967. During the 22-month development phase, three systems will be developed — the Program Support System, the Training Support System, and the Engineer/Service Test System.

The integrated Engineer Test and Service Test is scheduled to begin in March 1970 and has a scheduled completion date of February 1971. The Artillery Board has been designated as the executive agency for the Service Test.

The Artillery Board has furnished one officer, an experienced artilleryman trained in Automatic Data Processing, as a member of the in-plant team. This officer will observe the development of both the TACFIRE hardware and software, and will monitor all contractor conducted tests.

* An article on TACFIRE appeared in the May 1968 issue of **Artillery Trends.**

## PERSHING AZIMUTH-LAYING TRAINING DEVICE

The service test on the Pershing azimuth-laying training device was completed in early 1968.

The training device permits the azimuth-laying team of the Pershing firing battery to train independently of other personnel and equipment and provides the realism necessary for effective training. It is designed to operate in conjunction with the existing azimuth-laying set and to use either power sources existing within the firing battery or commercial power. The device consists primarily of two Porro prisms, optically identical to the prisms in the missile's stabilized platform, and a means for positioning both prisms. The prisms are slaved together electrically so that the angular positioning of one will result in the angular positioning of the other an equal amount.

## FADAC PROGRAM FOR PROCESSING METEOROLOGICAL DATA

Currently being service tested is a meteorological data reduction program for the M18 field artillery digital automatic computer. This program has been developed by Frankford Arsenal for use with the present rawin set AN/GMD-1( ) and the radiosonde recorder AN/TMQ-5( ).

The program requires input data from four areas. First, the identification line data consisting of message type, station location, date, valid time, etc., are entered. Secondly, the surface wind data for the offset angle and the offset distance are entered. Upon completion of these entries, thermodynamic data consisting of significant level pressure, temperature, and relative humidity are entered. Thirdly, when sufficient thermodynamic data have been entered for the required met message type and line number, the FADAC is asked to compute time at standard altitude. In a short time, the computer outputs the standard altitudes and the times they were reached via a 100-word-per-minute teletypewriter that is used as an output device. Finally, with these times, the angular data are obtained from the control recorder and entered into the computer. When the angular data have been entered, the computer will, upon request, compute NATO type 2 and 3 met messages, FADAC messages, sound ranging messages, Air Weather Service messages, fallout messages, and other messages as desired. All these met messages can be produced from one radiosonde flight more easily and with less probability of error than with the present manual system of plotting and computing and within a fraction of the time previously required. The FADAC program for processing meteorological data shows great promise.

## MORE GROUND STABILITY FOR THE M102

A larger firing platform to increase the stability of the lightweight, towed 105-mm howitzer M102 in soft soils has recently been tested by the U.S. Army Artillery Board.

The platform is made of welded aluminum and is designed so that the standard weapon platform fits inside of it and is retained by four safety latches. The larger platform uses eight 38-inch stakes to hold it in position in soft soil. The weight of the new platform is 157 pounds.

## RADIOACTIVE ILLUMINATION OF FIRE CONTROL EQUIPMENT

The Artillery Board has recently tested radioactively illuminated fire control equipment for the M102 howitzer. All scales, reticles and level bubbles are radioactively illuminated, as well as aiming post lights and gunner's quadrant. Shielded in capsules, the radiocative sources are harmless, since only amounts sufficient to cause phosphorus materials to glow are being used. In fire control, this illumination eliminates the requirement for an external power source, connecting wires and light bulbs.

## BREECH-MOUNTED RAMMER FOR M109

A breech-mounted projectile rammer for the M109 howitzer has been tested. The rammer cylinder and tray are mounted on a steel tube, which is attached to the bottom of the breech. The rammer and tray move with the howitzer in azimuth deflection. Ramming is automatic when the cylinder is swiveled to a position behind the projectile loaded on the tray. Ramming can be accomplished at all elevations, as the rammer moves with the gun tube.

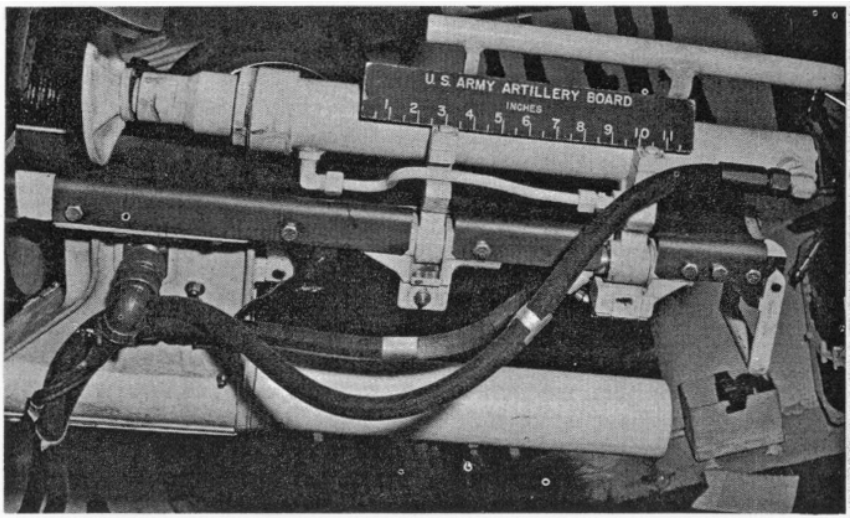
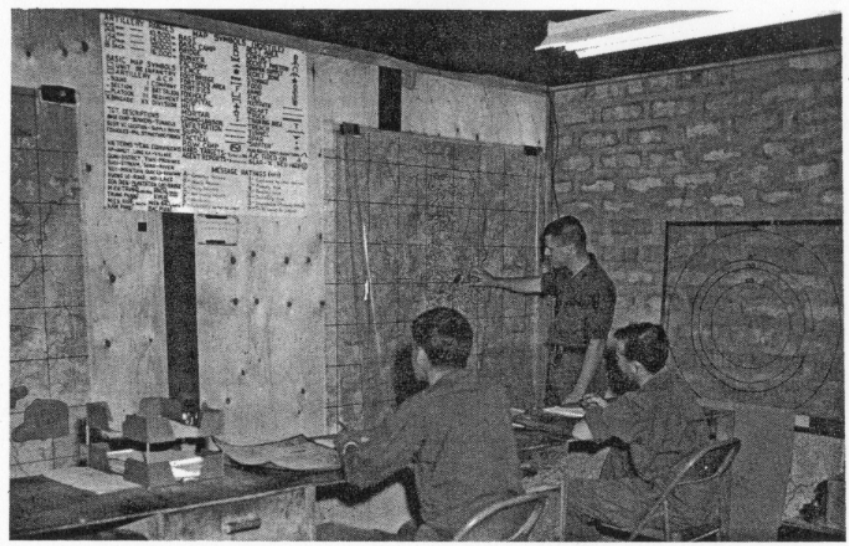



**Figure 1. The rammer cylinder and tray for the M109 howitzer are shown mounted on a steel tube which is attached to the bottom of the breech.**

## ARTILLERY TARGET PLANNING—



# *A New Approach by the Big Red One*

*Major Raymond E. Burrell, S2*
*1st Infantry Division Artillery*

### INTRODUCTION

The internal defense environment in Southeast Asia has added new dimensions to artillery target planning. The area that artillery influences, as compared with conventional operations, has expanded severalfold. The enemy is no longer confined to that portion of the battlefield forward of the FEBA; he may be and usually is deployed throughout the artillery's zone of action. For target planning, the problem is to determine where the enemy is at any given time so that artillery can be brought to bear upon him.

**NOTE:** The above photograph shows the inside of the target center within the 1st Infantry Division Artillery tactical operations center. The chief target analyst and two target analysts plan the day's intelligence targets to be fired.

The key to locating the enemy is accurate and timely intelligence. But intelligence is not a target — it is information. A target is the product of intelligence after skillful analysis, evaluation, and collation with all other data available.

Because of the nature of the enemy's tactics, artillery ammunition expenditure has been extremely high compared to the results achieved. In order to increase the effectiveness of artillery fire with reduced expenditures, the 1st Infantry Division Artillery has taken a unique approach to artillery target planning by establishing a target center. The target center gathers all the intelligence available in the division tactical area of responsibility and the tactical area of interest (TAOR/TAOI) and develops intelligence targets for the artillery units to engage. A TAOR is an area approved by the ARVN Division Tactical Area/ Capital Military District Commander for which a U. S. or Free World Military Assistance Force (US/FWMAF) commander has assumed primary tactical responsibility for an indefinite period of time and may conduct operations on a continuing basis. TAOI is an area in which a US/FWMAF unit has the following continuing responsibilities to be coordinated as necessary with the local Government of Vietnam (GVN) authorities, both civil and military:

* Participation in defense of key installations.

* Conduct of operations including such reaction operations as necessary to secure the area against organized military force.

* Support of GVN revolutionary development (pacification) activities as required.

Those aspects of the target center's organization and methods of operation that may be of interest to other units are discussed in some detail in the following paragraphs.

## TARGET CENTER ORGANIZATION

The target center is under the supervision of the division artillery S2 and depends on the S2 section for clerical and other administrative support. Personnel within the center include a lieutenant, who performs the duties of chief target analyst, and five enlisted target analysts in grades E-4 and E-5. The analysts are specially selected from division artillery units specifically based on their education, interest, and aptitude for intelligence work. Each enlisted analyst is assigned a specific area of the division TAOR/TAOI as his primary area of specialization. He is required to become thoroughly familiar with the terrain, friendly forces, and enemy forces that normally operate in his area. The analyst must also have a good understanding of the enemy's tactics, habits, and methods of terrain utilization. The mission of the target analyst is to produce intelligence targets for all the United States artillery units in his area. The chief target analyst supervises the activities of the enlisted analysts.

## THE TARGET FOLDER

The principal tool for target planning is the target folder. A target folder has been prepared for each 10,000-meter grid square in the division TAOR/TAOI. Each target analyst maintains the target folders that cover his area of specialization. All the intelligence developed in the 10,000-meter square is recorded in the target folder. The target folder consists of—

- A 1:25,000 pictorial map covered with clear acetate.
- A journal log sheet for each of the following:
  a. Side-looking airborne radar (SLAR) readouts. SLAR is an aerial surveillance detection device capable of detecting moving objects, such as vehicles, sampans, ox carts, and motorbikes.
  b. Red haze readouts. Red haze is an aerial surveillance detection device with an infrared receiver. It is capable of picking up heat emitting sources, such as cooking fires, hot engines (truck or sampan), generators, brush fires, charcoal kilns, and warm tin roofs.
  c. Chemical bloodhound (people sniffer) readouts. An airborne personnel detector (APD), commonly called people sniffer, is an aerial surveillance detection device which chemically and electronically detects (smells) human beings through a filtering process of odors given off by the human body.
  d. Antiaircraft incidents.
  e. Agent reports.
  f. Contacts with enemy ground forces.
  g. Mines, booby traps, roadblocks.
  h. Visual reconnaissance sightings.
  i. Airstrikes.
  j. Miscellaneous.
- The automatic data processing machine printout of reported hard installations. Hard installations include fortified areas, supply depots, storage sites, base camps, etc. (A booklet prepared by the 1st Infantry Division G2 lists all reported hard installations in a 10,000-meter grid square. This list is updated quarterly.)
- Aerial photograph coverage.

The analyst first records current information on the appropriate journal sheet. Then, the information is portrayed graphically on the pictorial map with a symbol to indicate the information and a color to denote the date. Information is maintained on the map for 7 days. All hard installations reported active during the past 90 days are shown on the map by an appropriate symbol in red. Journal sheets are kept in the folder until the sheet is filled and the most recent entry on the sheet is 30 days old, at which time the sheet is destroyed. Hard installations that have been destroyed by ground, air, or artillery action are removed from the hard installation list and the pictorial map.

## SOURCES OF INTELLIGENCE

The target center depends on the division G2 for the vast majority of its intelligence for target planning. A "hot line" between the target center and G2 operations is used to pass information of immediate value. G2 journal notes are received by radioteletype every 6 hours and the division intelligence summary (INTSUM) is received at the end of each day. Other sources of intelligence that are exploited include—

- INTSUM from subordinate, adjacent, and higher units (i.e., brigades, II FFV, 23d Arty Gp, etc.).
- The Army of the Republic of Vietnam (ARVN) unit INTSUM to include sectors and subsectors.
- Special forces INTSUM.
- Interrogation prisoner of war (IPW) and Chieu Hoi interrogation reports. Chieu Hoi is the "Open Arms" program. The purpose of the program is to encourage and accept Viet Cong defectors to the cause of the Republic of South Vietnam.

Some intelligence is also generated by division artillery personnel such as aerial observers, forward observers, and liaison officers.

## TARGET PRODUCTION

Intelligence information is recorded in the target folder as soon as it is received at the target center. The target analyst then evaluates the information and, if appropriate, recommends a target or targets to the chief target analyst. The analyst also recommends a priority for each target. Priorities are established as follows:

- Priority 1—Based on information that indicates the **probable** location of an enemy unit or installation.
- Priority 2—Based on information that indicates the **possible** location of an enemy unit or installation.
- Priority 3—Based on information that indicates a **likely** location for an enemy unit or installation. These targets are based on the analyst's knowledge of the terrain and the enemy's tactics and habits and are primarily planned in areas where the enemy is thought to be located but specific "hard" intelligence is lacking.

The chief target analyst then plots the recommended target on a friendly situation map which contains friendly unit locations, artillery range capabilities, and no-fire areas. (This map also contains the same enemy activity as that portrayed on the pictorial map in the target folder, thus allowing the chief target analyst to make a hasty check of the accuracy and completeness of the recommended targets.) He checks each target to determine—

- That friendly units will not be endangered by fire on the target.
- That the target priority is justified. This is extremely important because the priority will determine when and how the target will be engaged.

- That it is within range of an artillery unit.
- That it does not violate any other special guidance.

Targets that are accepted by the chief target analyst are compiled on a target list. A separate list is prepared for each artillery battalion in the division TAOR/TAOI that controls artillery fire. A daily target list is transmitted by radioteletype before 0600 hours each day to be effective from 0600 hours on the day of receipt until 0600 hours the following day. Targets on the daily list are based on intelligence received during the previous day. Special target lists are transmitted for targets that require immediate engagement. These targets are passed to the firing unit by telephone or radio as soon as they are approved by the chief target analyst.

Target lists contain only the following information:

- Target number—assigned by division artillery from a block of numbers allocated to each unit.
- Coordinates.
- Priority.
- Target description.

In addition to producing intelligence targets, the target center also provides information needed by the units to design special artillery programs, such as countermortar/rocket programs, special destruction programs, and target lists for artillery raids. Basically, an artillery raid entails displacing a reduced, four-gun battery into the rear areas of the enemy to fire on preselected targets. The area for the raid is selected outside the zone of current tactical operations at some location in which the enemy feels he is in a haven free from artillery fire. Missions are conducted as quickly as possible and then the reduced battery is immediately returned to its original battery position.

The special programs do not preclude the immediate engagement of targets of opportunity. Such targets are engaged as soon as possible after their detection, and the initial fires are followed by exploitation fires planned by the target center.

## UNIT ACTION

Unit actions on intelligence targets are specified by division artillery policy. The actions include—

- Time to fire. Units attempt to fire priority 1 targets during the day, utilizing an aerial observer to evaluate damage assessment and to adjust additional fire on the target if exploitation is warranted. Priority 2 and 3 targets may be engaged during the day and an aerial observer may be utilized if time and ammunition are available and clearance can be obtained. All targets not engaged during the day are included in the unit's nightly program of fires. When warranted by analysis, a precise time to fire will be specified by the target center.

- Number of rounds.
    a. Priority 1 targets are engaged by a time-on-target (TOT) one round from each tube available.
    b. The number of tubes is not specified for priority 2 and 3 targets, but these targets are engaged with at least one platoon (TOT), one round. The total number of tubes is determined by the firing unit based on a consideration of the ammunition available, the tactical situation, and the target description.
    c. Followup harassment and interdiction (H&I) fires are placed on intelligence targets in order to maintain neutralization. H&I fires are designed to restrict enemy movement throughout the TAOR/TAOI, and to be used as "followup" fires on intelligence targets. H&I fires are primarily unobserved.
- Target clearance. Appropriate ARVN and US ground clearance for all targets is a battalion responsibility. Division artillery screening of targets against friendly locations does not constitute ground clearance to fire.
- Damage assessment. Units make every attempt to obtain damage assessment on intelligence targets. Targets fired during the day by an aerial observer are assessed immediately. Targets fired during the night are assessed by an aerial observer (if one is available) the following morning.
- Reports. Units submit daily the following data on each target listed:
    a. Whether the target was engaged by observed or unobserved fire.
    b. The number of rounds fired, by caliber, on each target.
    c. Damage assessment (if any).
    d. If the target was not engaged, the reason why (e.g., clearance denied).

## RESULTS

The target center became operational in September 1967. The following expenditure figures for July 1967 through December 1967 show the dramatic decrease in artillery ammunition expended.

| Month | Rounds |
|---|---|
| July | 260,000 |
| August | 220,000 |
| September | 100,000 |
| October | 140,000 |
| November | 120,000 |
| December | 110,000 |

**NOTE:** These figures are not the exact figures because of security classification. They approximate the actual figures and reflect the proper ratios between the months.

This decrease has been accomplished without any corresponding decrease in the effectiveness provided by the "Big Red One" Division Artillery.

## FOLLOWUP ACTION

Every means is exploited to gather the data necessary to evaluate and increase the effectiveness of the target center. Specific intelligence requirements have been submitted to the division IPW section and to agent handlers. Information is sought that indicates the effectiveness of artillery missions as well as data on enemy tactics and practices that are useful for target planning.

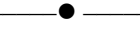
## SUMMARY

There is no mystery to artillery target planning. It is mainly a task of organization, hard work, and diligent application. The target center concept established by the 1st Infantry Division is a step in the right direction to meet the challenge of increasing the effectiveness of artillery fire on the Viet Cong with less ammunition expenditure.

# CHRONOGRAPH CALIBRATION

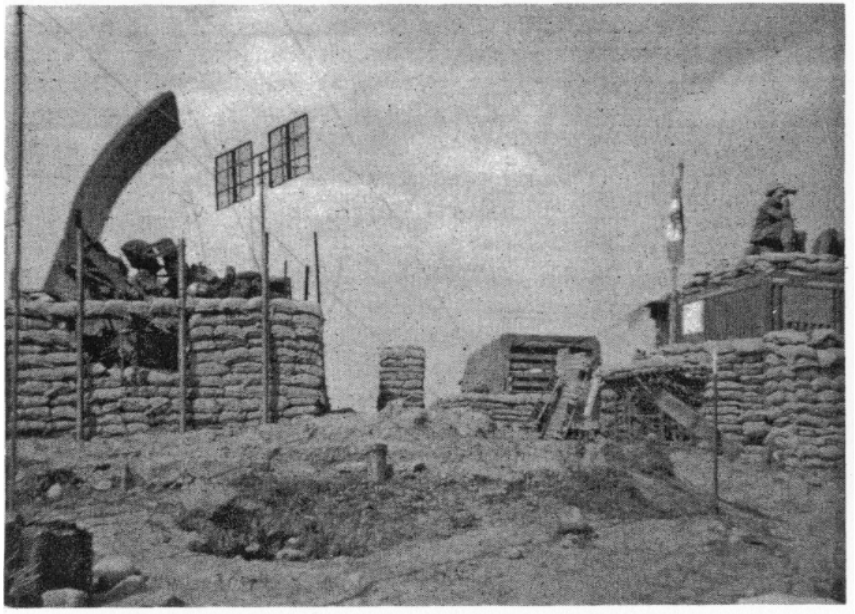
Three ordnance units are now available in CONUS to assist artillery commanders in determining the muzzle velocities of their weapons. Artillery calibration by the skyscreen chronograph method not only insures maximum accuracy in fire support, but also meets the requirement in FM 6-40, para 22-3 for annual calibration. Actual time for the calibration of a battalion is generally four to six daylight hours, and will require ten rounds of ammunition per tube.

The 151st Ordnance Detachment, Fort Sill, Oklahoma, has area responsibility for CONUS units west of the Mississippi River, with requests for their services monitored by Headquarters, Fourth US Army, ATTN: AKADD-DK. Units in the second and third Army areas may request calibration services from the 180th Ordnance Detachment, Fort Bragg, with request monitored by Headquarters, Third US Army, ATTN: AJAGL-D-M-C. Other CONUS units may submit their request to the 135th Ordnance Detachment, Aberdeen Proving Grounds, with request monitored by Headquarters, First US Army, ATTN: G-3. These calibration detachments will provide their services to Marine, Reserve and National Guard units as well as Active Army units, as requested.



# SENTINEL CONTRACT SIGNED

The initial production contract of $85,480,628 for the Sentinel AntiBallistic Missile System has been signed in March 1968 by the Department of the Army and Western Electric, the prime contractor for the system. This contract provides for the build-up of a manufacturing capability of some components for use in the development of the system.



# *Counterfire*

*Brigadier General John J. Kenney*
*Office of the Joint Chiefs of Staff*
*Formerly Assistant Commandant*
*USAAMS*
*Fort Sill, Oklahoma*

Among the greatest challenges faced by the Army, and the Artillery, in Vietnam is that of countering the threat presented by the enemy's intensive use of indirect fire weapon systems. This threat varies from light mortar attacks by elusive guerrilla bands, through rocketing of cities by terrorists, to comparatively conventional types of attacks in the North along the DMZ.

Countering this threat obviously is the responsibility of the force commander; but the commander, in many cases, turns to his artilleryman as his staff advisor and expert in counterfire.

Recent articles in **ARTILLERY TRENDS** have included discussions of equipment and techniques available to support the counterfire effort.

However, a hard look at the problem reveals that current equipment, though impressive, is not perfect and is not likely to be improved in the immediate future. The key to successful counterfire, as in all military activities, is **control.**

Whether we examine a semifixed base camp in the Republic of Vietnam or a temporary fire base, the senior combat arms commander normally will have available to him indirect and general support artillery; ground surveillance radars; countermortar radars (AN/MPQ-4A); flash, and sometimes sound, observers; searchlights; automatic weapons; gunflare ships; and various maneuver units. His success in the counterfire effort depends on how he organizes his defense to provide detection and location of hostile direct and indirect fire and on how he organizes his counterweapon response to counter enemy mortar, rocket, and artillery attacks. Many factors are involved in organizing and conducting counterfire operations. The key factors, in the opinion of the author, are the four listed below.

**Figure 1. Preparing for the possibility of an enemy mortar or rocket attack, a member of the 2d Battalion, 77th Artillery, 25th Infantry Division, plots coordinates of suspected enemy locations.**

Counterfire, including counterbattery, countermortar, and counterrocket activities, **is an art;** it is not yet a **science.** There is no push-button system, no fixed rule. The corollary of this is that the individual, or individuals, charged with counterfire coordination must be dedicated, interested, and imaginative. He must not be "just another staff officer."

The second factor is that **every individual** within a command is part of the counterfire team. Consequently, the techniques, the SOP's, and the channels of communications for counterfire must be known to the cook, to the mechanic, to the outpost personnel, to the communications personnel—in other words, to everyone within the base camp, as well as to all others capable of providing supporting fires, whether by gunship or artillery.

The third factor, although probably first in order of priority, is **speed.** The intelligence-gathering part of the counterbattery team must also be responsible for delivering counterfire. Information must be processed

instantaneously, and counterfire must be delivered immediately. For example, any operation or processing interposed between a forward observer, or a Q-4 radar operator and the direct support artillery will lead to delay and inefficiency.

The fourth factor is the **selection of weapons** for counterfire. Selection of the appropriate weapon(s) is of critical importance and should be prearranged to insure speedy reaction. Efforts to simultaneously use 105's, 175's, and gunships will prove futile because of mutual interference and confusion as to responsibilities. The weapon(s) selected will depend on the availability of weapons, the weather, the time of employment (day or night), and other considerations. Weapons can and should be preselected and tied to the information-gathering agency to maximize responsiveness, to minimize the requirement for decision making, and to avoid mutual interference.

The art of counterfire has been studied in considerable detail since World War I. Certain guidelines involving detailed analysis, forms, charts, records, and maps are essential to the commander and can be effectively employed at any level to form the framework within which decisions are made. At the risk of becoming involved in too much detail, a large portion of this article is devoted to these tested and flexible guidelines.

During World War I, after the first battle of the Marne, the battle-lines became stable; fighting was violent and resistance stubborn. The character of the war shifted from mobile to static, becoming a war of the 7-foot trench. The effectiveness of the direct fire infantry weapons was greatly reduced, and artillery, the most effective weapon against the trench, came into its own as the greatest killer on the battlefield.

With the artillery's achieving such importance, armies expended increasing efforts in countering artillery fire with artillery. The appropriate term for "the subduing of enemy artillery" is counterbattery, and the success or failure has been of vital concern to every soldier on the battlefield since 1914. Counterbattery is divided into **two** distinct and separate aspects—intelligence aspect, with the objective of locating hostile weapons, and operations, with the objective of destroying them. These two aspects are interdependent and must not be separated.

Within our force structure, as reflected by our TOE's, the primary responsibility for the coordination and supervision of counterbattery rests at the division artillery and corps artillery levels; however, these headquarters obviously cannot exclusively conduct either the operational or intelligence aspects of all counterbattery activities. In RVN, for example, every subordinate unit which acquires targets must attack them, provided they have the capability to deliver the required fires.

The corps is the only level where a full-time counterbattery intelligence officer (CBIO) is authorized by TOE. Since counterbattery activities — by definition — include both intelligence and operations, staff responsibility rests with both the corps artillery S2 and S3. The number of personnel at division level differs from that at corps; however, within the realm of staff responsibility, the division artillery S2 and S3 combine their efforts to provide a counterbattery team. Artillery units below division level normally do not possess the means to conduct formal counterbattery activities; however, those activities within the capabilities of a separate battery or battalion must be conducted by using the same techniques and principles employed by the higher echelons. The one requirement normally imposed by higher headquarters is that the close support battalion must forward all counterbattery intelligence to the division artillery by the most expeditious means possible.

Counterbattery at all levels of command is discharged in accordance with guidance established by the commander. This guidance is referred to as counterbattery tactics and is the artillery commander's policy for the attack of hostile weapons. This guidance may include the types of counterbattery programs to be executed — the standard methods of attack of specific targets — and guidance to be used to define suspect and confirmed weapon locations.

**Figure 2. A senior radarman with the 2d Battalion, 77th Artillery, keeps eyes intent on AN/MPQ-4A radar screen.**

That part of the artillery commander's guidance pertaining to the attack of hostile weapons is referred to as the counterbattery status. This status may be defined as active, semiactive, or silent. When an active status is in effect, counterbattery fires **must** be delivered against all hostile weapons as soon as their locations are confirmed, and suspect targets **may** be fired on depending on the commander's desire. The opposite is a silent status — the withholding of counterbattery fires. One reason for adopting a silent status may be to provide time for the collection of counterbattery information by all available means so that a more effective counterbattery program can be prepared. A semiactive status represents a compromise between the active status and the silent status. As examples, a unit in a semiactive status may be silent except for the delivery of counterbattery fires on hostile weapons whose fires are causing damage to friendly elements, or a unit might allow a certain period of time to elapse before responding with counterbattery fires in order to obtain direction with the countermortar radar or to permit gunships and gunflare ships an opportunity to seek and destroy the hostile weapons.

The intelligence aspect of counterbattery tactics, called criteria, simply provides the artillery commander's guidance on what constitutes a confirmed weapon location and what constitutes a suspect weapon location. A hostile weapon location which is verified by sufficient evidence is considered a confirmed location; a suspect location is a location which is doubtful and which has not been verified. Normally, the S2 will recommend the criteria to the artillery commander. The recommendation of the S2 will be based on the major factors of the available acquisition means and a knowledge of the enemy's current tactics and employment of deceptive means. Obviously, our counterbattery tactics must be continually scrutinized and revised, as necessary, in accordance with the changing situation.

The specific techniques used to develop counterbattery target intelligence have evolved into a standardized system. This system is considered valid under the most complex counterbattery situation and can be adapted to any type of situation encountered. An understanding of this system requires an understanding of the forms, records, and charts necessary for a logical analysis of the acquired information.

The **artillery counterfire information form (ACIF)** is designed to assist in the rapid transmission of counterbattery information and to insure completeness of information. The form is divided into three sections.

Section I is used to transmit information concerning a crater analysis or information from a single observer, such as a flash or sound observed from a single observation post. This section provides only an azimuth to the hostile battery; it does not provide the grid coordinates of the location.

Section II is used by those agencies which have the capability of providing the exact location of a hostile weapon; for example, a sound

ARTILLERY COUNTERFIRE INFORMATION FORM
(FM 6-121)

RECD BY_____ FROM _____TIME_____ NO_____

SECTION I – SHKLREP MORTREP -BOMREP (DESIGNATE WHICH)

| A | B | C | D | E | F | G | H | I | J | K |
|---|---|---|---|---|---|---|---|---|---|---|
| FROM | PSN OF OBSR | MAG OR GRID AZIMUTH OF SOUND, FLASH, FURROW, OR FLT PATH ORIGIN | TIME FROM | TIME TO | AREA SHELLED | NO., CALIBER (OR SIZE) AND TYPE OF WEAPON | NATURE OF FIRE | NR & TYPE SHELLS, BOMBS, ETC. | TIME OF FLASH TO BANG | DAMAGE (REMARKS) |
| | | | | | | | | | | |

SECTION II - LOCATION OF HOSTILE WEAPONS

| L | M | N | O | P | Q |
|---|---|---|---|---|---|
| FROM & TIME | GRID REFERENCE & ACCURACY | MEANS OF LOCATING | TIME ACTIVE. | NO., CALIBER (OR SIZE) AND TYPE OF WEAPON | REMARKS |
| | | | | | |

SECTION III -COUNTERFIRE ACTION

| TIME C/FIRE | FIRED BY | NO. OF RD FUZE AND PROJECTILE | REMARKS (EFFECT) |
|---|---|---|---|
| | | | |

DA Form 2185-R, 1 NOV 58

**Figure 3. Artillery Counterfire Information Form.**

or flash base, a radar section of a close support battalion, and a ground or air observation from which the map coordinates of the hostile weapon location can be determined.

Section III is used by agencies which have the organic weapons available to deliver counterfire on known hostile locations. When this section is completed by the reporting agency, section II is also completed to provide the counterbattery intelligence personnel with information concerning the hostile weapon location. For example, a close support battalion would use sections II and III to report to division artillery that it has located and delivered fire on a hostile weapon. Information on this form is transmitted by the most expeditious means available.

Reports should be as accurate and in as much detail as possible commensurate with the need for rapid counterfire. However, a report should not be delayed because of a lack of complete information, since fragmentary or incomplete information is often of value in supplementing or confirming existing information. All reports are relayed through artillery S2 channels to the next higher artillery headquarters.

The **hostile weapons chart** is another important aid used in the development of counterbattery target intelligence. The chart may be prepared on an ordinary grid sheet or on a topographic map. A map is preferable, since it permits determination of the altitude of a hostile battery location by map inspection. The hostile weapons chart provides the user with a pictorial representation of all hostile weapon locations and is the basic working chart for processing the locations. Information of friendly units, such as boundaries and dispositions, is shown on the chart.

The locations of artillery battalion observation posts and countermortar radar sites may also be included. Only confirmed weapon locations are plotted on the chart, and a standard method of plotting is used. The target number assigned to the hostile location is shown in the first quadrant of the plot so that the target may be readily identified and will not be confused with other locations.

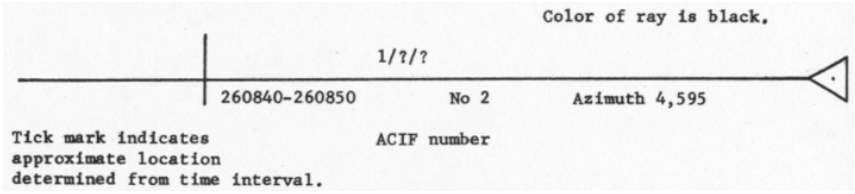



**Figure 4. Plot of Crater.**

All sources reporting the location are identified by an appropriate abbreviation in the second quadrant. The third quadrant indicates the best available information on the number, caliber, and type of hostile weapons in the location. The fourth quadrant indicates the most recent time that the location was active or the time of the last report. The tick marks are color coded to indicate the accuracy of the plot.

Attached to one side of the hostile weapons chart is the **suspect location overlay** on which all suspect weapon locations are plotted. Suspect locations are plotted in the same manner as confirmed locations. The **SHELREP overlay** is attached to the other side of the hostile weapons chart. This overlay contains information from crater analysis reports and from flash or sound reports from a single observer. The location of a crater plotted from a crater analysis report is represented by a dot inside a circle. A ray is drawn from the location of the crater along the reported direction of hostile shelling. Above the ray, the best information available on the number, the caliber, and the type of weapons firing is entered by using the standard abbreviations. Below the ray, the ACIF reference number and the time the firing occurred are posted. The length of the ray is determined by the range capability of the weapon(s) firing. A flash report from a single observer is plotted in a similar manner. If the flash-bang distance has been determined, it is indicated by a short line bisecting the ray. The distance from the observer's plotted location

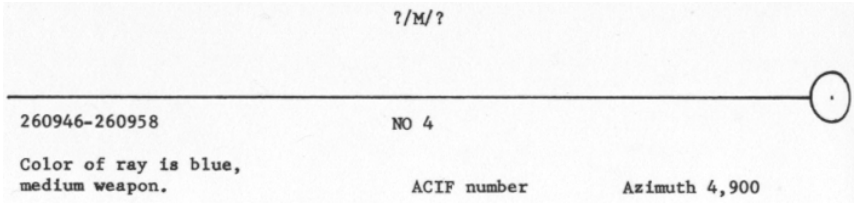



**Figure 5. Plot of Flash.**

| ( )HB ( )HM ( ) HR<br>LISTED ON LIST NUMBER | EVALUATED ACCURACY | SQUARE | ( )HB ( )HM ( )HR<br>LETTER DESIGNATION |
|---|---|---|---|

| HOSTILE BATTERY LOCATION (MORTAR) | | | | | | | OUT COUNTERBATTERY FIRE (COUNTERMORTAR) | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| REF | COORDINATES* | ALT | TARGET DESIGNATION | ACCURACY | SOURCE | DATE | DATE/ HOUR | OBSVD BY** | FIRED BY | CONC NO | NO RDS | EFFECT |
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| *Adjusted coordinates may be augmented by coordinates from photo inspection<br>**Give unit and type of observation and if fired from photo. HB - Hostile Battery HM - Hostile Mortar HR - Hostile Rocket | HOSTILE BATTERY FILE (MORTAR) (FM 6-121) |
|---|---|

DA Form 2186-R, 1 Jul 62 Previous edition is obsolete.

**Figure 6. Hostile Battery File Card.**

to the bisector is computed by multiplying the flash-bang time interval in number of seconds by 340 meters per second, the approximate speed of sound. A suitable color code may be used on the SHELREP overlay to indicate the caliber of the hostile weapon. This will prevent confusion between rays from two or more different hostile weapon locations.

A **hostile battery file card** is initiated for every suspect and every confirmed hostile weapon location and serves as a record of that location.

All information received on a particular location is recorded on the card, to include the times when counterbattery fire was delivered and the effect of the fire, if known. These cards are normally maintained in a hostile battery file with one section for suspect locations and another for confirmed locations. A third section may be used for inactive locations or for known enemy units with mobile capabilities.

A **hostile battery list** is prepared from the hostile battery file cards and includes all confirmed and suspect locations, along with the information needed by a counterfire agency to initiate a fire request. This list is always kept current since it is extremely valuable for use in fire planning. The list is distributed to higher, lower, and adjacent artillery commands.

Tab____(Target List) to Appendix____(Arty Fire Spt) to Annex_____(Fire Spt) to OPORD

TARGET LIST NO_____

REFERENCES:

Sheet___of___

| La No | Target Number (a) | Description (b) | Location (c) | Altitude (Meters) (d) | Size (e) | | Attitude (f) | Source a/o/Accuracy (g) | Remarks (h) | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
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**Figure 7. Hostile Battery List.**

The **counterbattery intelligence map** is a topographic map, usually to the scale of 1:50,000, on which are shown all suspect and confirmed hostile weapon locations and boundaries and dispositions of friendly units. Like the hostile weapons chart, the counterbattery intelligence map provides a pictorial representation of all hostile battery locations. This map is used to perform target prediction, to eliminate impossible or improbable locations, to study the tactics and techniques of enemy artillery employment, to determine enemy fire support capabilities, and to determine the altitude of hostile weapon locations. It may also serve as a reference map for the S2 and S3 and may be used to brief the commander regarding the counterbattery situation. Use of the counterbattery intelligence map for these purposes prevents interference with the recording and processing of counterbattery information on the hostile weapons chart and its attached overlays.

**Target prediction** is one of the primary methods of developing counterbattery targets. Target prediction consists of a tactical evaluation or analysis of the information contained in the records just discussed, balanced against a knowledge of the terrain, the enemy order of battle, and the enemy's current tactics and techniques in employing his forces. With all this information, it is possible to predict the general areas in which the enemy will probably position his weapons. Based on this prediction, suitable acquisition means are selected to search out and provide confirmation of his weapon positions.

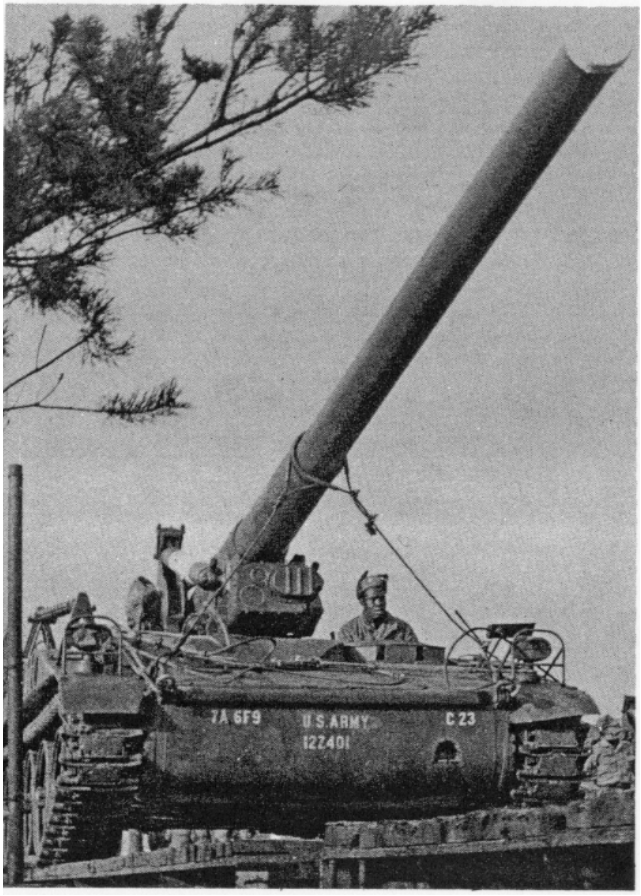
One important area of concern involves the concept of employing neutralization fires versus destruction fires against counterbattery targets. Surprise fire, designed to neutralize the target, is the principal method outlined in current doctrine; however, this does not preclude the use of destruction fire when warranted. If the time and the situation permit, the use of destruction fire has merit, if the targets can be accurately located and if the ammunition expenditure is worth the results expected. Following the stabilization of the battleline in the Korean conflict, destruction fire was used extensively against counterbattery targets. According to an Eighth Army study of the employment and effectiveness of their artillery, a systematic program of neutralization and destruction was carried out against known enemy gun emplacements. The destruction missions were fired daily across the front and resulted in curtailing the enemy's daytime firing. However, the enemy artillery usually resumed firing at night. The enemy's recovery indicates that even when emplacements were known to contain a weapon, there was never any assurance that destruction of the emplacement would cause major damage to the weapon. The conclusion drawn from this report was that the combination of neutralization and destruction fires was effective and that the results justified the ammunition expenditures. A similar type of program might be effectively employed in Southeast Asia today.

The current threat posed by the enemy's use of mortars, rockets, and cannon artillery must be recognized and effectively countered by the Army artillerymen. Proven procedures and techniques have been developed over the years and continue to be valid for use in Southeast Asia. A thorough understanding and a professional application of these procedures are demanded of every artilleryman if this threat is to be effectively neutralized. Although the details of the functions of the counterbattery team appear cumbersome, the administrative tasks just described need not hold up operations once the decision is made to fire. A sense of teamwork and the application of fundamentals will provide the commander the best possible chance of defeating the enemy threat. Every individual in the command is involved in the intelligence-gathering effort. The control system devised by the commander must be keyed to speed in gathering and processing this intelligence to expedite counterfire on the target.

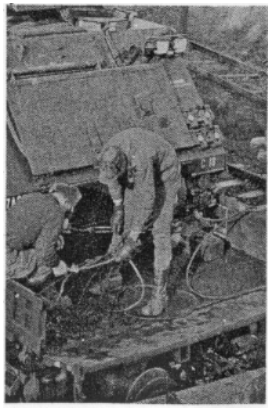
# *On to 'GRAF'*

*For those who have been assigned to artillery units in Germany, the trip to Grafenwoehr is a familiar one. In an effort to recapture some of the highlights of a typical Army Training Test (if an ATT has any highlights), a pictorial glance is presented here. Photographs and information were supplied by Specialists Fourth Class John Abramson, Ronald Frazier and Richard Wallace, all assigned to the Information Section, V Corps, APO New York.*


*Local drivers steer clear of rumbling 175-mm guns of the 6th Battalion, 9th Artillery. The unit's move through the streets of Giessen on their way to the railhead marks the initial phase of its trip to Grafenwoehr.*



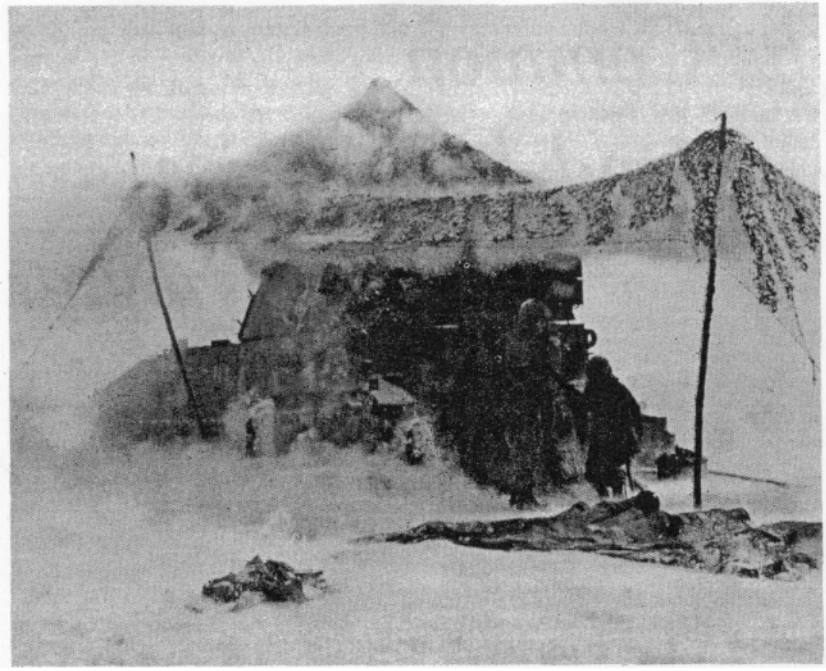

*Parking is no ordinary task especially when the tracks of each weapon overlap by several inches the width of the flatcar. One weapon and one armored personnel carrier (APC) are loaded onto each car.*



*Once a weapon or vehicle has been loaded, its tracks must be blocked and the weapon or vehicle tied down.*

*A last-minute check is made of the secured equipment prior to the approximately 15-hour move by rail to Grafenwoehr. Tracked vehicles and their crews move by rail while the unit's remaining personnel travel by truck and jeep convoy.*

*Snow — and lots of it — greets members of the 4th Battalion, 18th Artillery, 155-mm (self-propelled Howitzer,) as they arrive in Grafenwoehr for their annual ATT.*



*A cascade of snow descends upon crewmen during a firing mission. The ATT continues despite the sudden heavy snowstorm.*

*A "slight chill" is in the air as unit personnel await movement orders which would spell the end of a long, cold day.*

# *The Common and Progressive Electives Program*

*LTC Charles E. Patch, Jr.*
*Tactics/Combined Arms Department*
*USAAMS*

The US Army Artillery and Missile School now offers students attending the Field Artillery Officers Advance Course (FAOAC) six common and progressive elective subjects which total 576 new hours of instruction. The terms "common electives" and "progressive electives" probably need some clarification for complete understanding.

The term "elective" applies to subjects in the program of instruction from which the student will select the number of hours necessary to complete the total hours required for graduation. Applied to the FAOAC, the term "common electives" means an elective subject common to more than one of the Army's branch schools' officer advanced courses. A progressive elective is a subject that is taught in a branch school and followed by an additional elective course, in the same subject area, at the Command and General Staff College and at the senior Army colleges. Progressive electives offered to the FAOAC students are Management and Automatic Data Processing Systems (ADPS) combined with Operations Research/Systems Analysis (OR/SA).

The common electives are Communicative Arts (Comm Arts), Psychological Operations (PSYOP), and Stability Operations (STABOP). Military History is also taught at the USAAMS and at other branch schools as an elective. The Tactics/Combined Arms Department (T/CAD) is responsible for teaching all these classes except the Automatic Data Processing System, which is presented by the Communications and Electronics Department.

## HISTORY OF THE PROGRAM

The elective courses now being offered in depth for the first time to the FAOAC students are the direct result of a complete review of the Army's officer education system. LTG Ralph Edward Haines, Jr., presided over the Department of the Army Board to review the Army officer schools. The report of this board, normally referred to as the Haines Board, was submitted to the Department of the Army in February 1966.

A study of the recommendations and conclusions of the board resulted in advance information of the study being forwarded to Headquarters, USCONARC, in June and July 1966. On 16 November 1966, USCONARC advised the US Army Artillery and Missile School that the Department of the Army had directed that certain specific recommendations and conclusions pertaining to the officer advanced course be implemented effective with classes beginning after the start of fiscal year 1968. Implementation of these recommendations and conclusions required the development of local, branch-oriented elective subjects in addition to the common and progressive electives. Meteorology and Field Artillery Target Acquisition and Survey are currently being offered to the FAOAC as local electives.

One of the conclusions of the Haines Board was: "Greater intellectual challenge in officer career schooling and more and earlier opportunities for graduate civilian schooling would increase the professionalism and competence of the officer corps and result in improved career satisfaction and retention." (Conclusion 1-52.) Incorporation of the ideas expressed in this conclusion had two significant effects on the program. First, to provide a greater intellectual challenge, all the common and progressive subjects were developed at the academic level of the lower graduate school courses or at the upper undergraduate level. The second action taken is related directly to the graduate level schooling. USAAMS currently is offering one graduate level subject to each advanced course. The classes are presented during duty hours by professors from the University of Oklahoma. The 3-semester-hour course is presented at no cost to the student except for such incidentals as required texts. Students successfully completing a graduate course elective are awarded appropriate graduate or undergraduate credit by the University. This 3-semester-hour course may be taken in place of one of the other elective subjects. The subjects presented to date have been 20th Century China (FAOAC 1-68); Ethnology of Asia (FAOAC 2-68); and Geography of the Far East (FAOAC 3-68). These subjects have been enthusiastically received by the student officers.

## THE PROGRAM TODAY

The common and progressive electives are taught in two different terms. All students are briefed on the subjects and required to indicate their first, second, and third choices on a selection form. The form also requires them to indicate their degree of interest in the subject selected and their evaluation of the importance of the subject to their career. This information forms the basis for shifting students into their second choice, but this is done only if the number of students choosing a specific subject exceeds the instructor or equipment capabilities. These 96-hour subjects are all presented from the platform by USAAMS instructors.

Term A subjects include Management, Communicative Arts, and Psychological Operations and are presented during the 14th through the 19th weeks of the advanced course. These subjects are the only electives

presented during this period. Approximately half of the students' time is devoted to electives and the rest to the hard core curriculum. Term B subjects, presented from the 32d through the 39th week include Stability Operations, Military History, Automatic Data Processing Systems, Operations Research/Systems Analysis, and the two local electives. The electives and the graduate course occupy about half of the scheduled time, except for the 36th and 37th weeks. During these 2 weeks no electives are scheduled; the students devote their time to a corps command post exercise and a comprehensive examination.

The electives program has been divided into two terms for several reasons. The interjection of the electives provides a change of pace from the hard core instruction. The study indepth, during a concentrated period, of branch immaterial subjects establishes a different intellectual challenge. This diversity helps to create an entirely different academic atmosphere. This difference is further enhanced by the wide variety of instructional methods and educational techniques employed in the presentation of the elective subjects.

## CONCEPT AND SCOPE OF THE PROGRAM

The concept of presentation of all the common and progressive electives places paramount emphasis on individual work. Individual work provides enough latitude for the student to make maximum use of his own background, education, experience, and intellectual capacity. This also frequently gives him the opportunity to concentrate his studies in specific areas of personal interest.

The scope of each subject intentionally is broad to satisfy the academic interest of as many students as possible. Latitude in study is permitted to the maximum degree possible to include work on practical exercises (PE) and individual research for seminars. Thus, during the discussion of a practical exercise, the different students who have studied the problem from different viewpoints or on different command levels will have divergent opinions. This results in increased student response, and improves the discussion.

The practical exercise is the keystone in the implementation of this concept, with the maximum amount of time being devoted to this method of instruction as shown in figure 1. Most of the hours presented by other methods of instruction are directly related to the practical work. The practical exercises are not "canned" problems with "pat" solutions, except in those cases in which the objective of the exercise is to teach a certain principle, fact, technique, or procedure. In most practical exercises, the primary intent is to lead the student into a challenging situation that will provide him with meaningful experiences in problem solving. One of the most startling, and, at times, frustrating, realizations made by a student in the PE is that his greatest challenge is to accurately identify the problem. Therein lies one of the most critical and beneficial parts of the practical exercise. Thorough study of the situation is required in

order to identify and define, in precise terms, the problem and its ramifications. In reaction to this challenge, the student finds himself directly and personally involved in solving the exercise.

| | MANAGEMENT | PSYOP | COMM ARTS | STABOP | MIL HISTORY | OR/SA | TOTAL HOURS |
|---|---|---|---|---|---|---|---|
| Conferences | 24 | 23 | 24½ | 25 | 14 | 21 | 131½ |
| Seminars | 7 | 0 | 0 | 7 | 32 | 2 | 48 |
| Practical exercises | 30 | 61 | 43 | 43 | 47 | 17 | 241 |
| Demonstrations | 2 | 0 | 2½ | 0 | 0 | 0 | 4½ |
| Guest speakers | 5 | 5 | 5 | 5 | 0 | 0 | 11 |
| Guest instructors | 5 | 9 | 0 | 6 | 2 | 3 | 24 |
| Programmed instruction | 1 | 0 | 12 | 0 | 0 | 0 | 13 |
| Case studies | 7 | 0 | 0 | 6 | 0 | 3 | 16 |
| Television | 6 | 0 | 1 | 5 | 1 | 0 | 13 |
| TV recording and playback | 0 | 0 | 6 | 0 | 0 | 0 | 6 |
| War games | 7 | 0 | 0 | 0 | 0 | 0 | 7 |
| Examinations | 2 | 2 | 5 | 2 | 0 | 2 | 13 |
| Total hours | 96 | 96 | 96 | 96 | 96 | 48 | 528 |

**Figure 1. Methods of instruction.**

Seminars and case studies are used extensively in those subject areas that are adaptable to supervised group research or group deliberation. These methods of instruction have been exceptionally well received by the officer students. The give-and-take atmosphere during the case studies occasionally becomes quite intense, but there is no doubt that the students involved become so emotionally absorbed in the situation that they learn from their experiences. The seminars are utilized for the presentation of both progress reports and final reports on individual research projects germane to the seminar topic. The seminars provide the students with the opportunity for critically analyzing the work of others, for comparing and evaluating any conflicting material presented, for evaluating the progress made by others since their previous reports, for expressing their own opinions and recommendations, and, most significantly, for participating in the decision-making process.

The preferred method for presenting the subjects in the elective program of instruction is to teach small, working conference groups of not more than 12 students each. The availability of qualified instructors, the number of students selecting an elective, and the subject material influence the size of a conference class. Regardless of the size of a conference group, all conferences include planned student participation and continuously provide the opportunity for self-expression by the student. Reaction to this academic freedom is sometimes a little slow in developing but, when the students realize that their questions, comments, and opinions are wanted, the response is excellent. Mature, expert instructors are required to lead a conference in this give-and-take atmosphere, but the increase in student motivation and interest justifies the difficulties that occasionally occur.

Figure 1 shows the wide variety of instructional methods employed. Probably the most unusual method is the guest instruction program. The US Army Artillery and Missile School has entered into a contractual agreement with the University of Oklahoma (OU) for instruction by professors in each of the electives. The university provides its most eminent, fully qualified professor for the presentation of each specific subject. A total of 26 guest instructor hours are allotted to 12 different topic areas. This provides a level of expertise not otherwise available within the school and a depth of knowledge that can only be gained by extensive study and experience in a specific field. The presentation of the most up-to-date information on new techniques and practices influences the students' motivation in a most positive manner. The unique classroom atmosphere created by the opportunity to openly question and discuss the issues and problems with a distinguished civilian scholar has proved to stimulate creative thinking and has provided a refreshing change of pace for the students. Significantly, the inclusion of these professors in the program has added to the prestige of the subjects and has emphasized their importance to the Army.

The decision-making game, a method of instruction employed increasingly by industry to train their executives, is used in the Management elective. The game is entitled "WITS" (Weapons and Intelligence in a Time Sequence). In it the students relate financial expenditure, intelligence, and value received for money spent. Student officers make up two teams, Team X and Team Y. Acting as the planning staffs of national defense agencies, Team X and Team Y separately budget expenditures for weapon systems procurement, operations, research and development, and intelligence variables. A valuable management lesson is that the organization of the student group is important to the success of its planning effort. The desired result is a dynamic group effort which also demonstrates a sensitivity to the opinions of student members. All decisions are played against the clock as well as against the scoring results of the other groups. The 7-hour exercise may cover a maximum

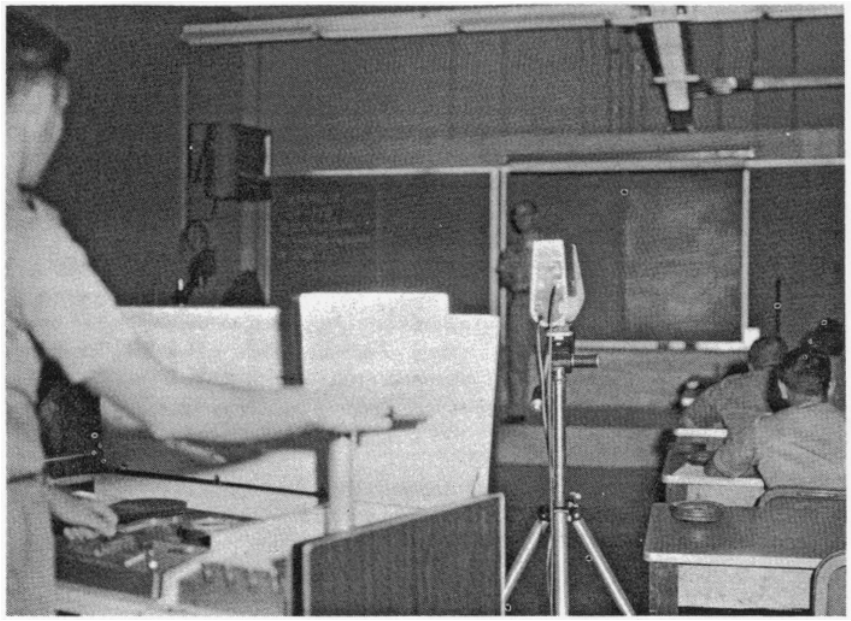


**Figure 2. A student rehearses his presentation before the visual trainer as classmates observe.**

of seven fiscal periods, depending on group effectiveness, and the pressure is continuous for maximum output throughout the entire game.

The instructional technique about which Communicative Arts students are most apprehensive and most appreciative of later is the television trainer. This device is used to tape one of each student's speeches early in the course and another just before the end. The immediate playback of the TV tape enables the student to see, hear, evaluate, and critique his own speech. "Are my gestures actually that bad?" "My posture is terrible!" "I was scared to death but it doesn't show." "That's the first time I've ever seen and heard myself speak." "There is room for improvement." These are only a few of the typical reactions to the TV tape playback. The second time on camera usually shows a marked improvement in poise and confidence. Better gestures, smoother transitions, improved voice qualities, and overall, a more professional job are the products of the television trainer—certainly a valuable instructional tool.

Variety may not be the spice of life for a course of instruction, but it does add interest and often sparks enthusiasm that would otherwise be lacking. Student response has proved the value of the use of different instructional techniques in the presentation of a course of instruction.

## CONCLUSIONS

The common and progressive elective subjects presented by the Tactics/Combined Arms Department have accomplished their objectives. The students have continuously been challenged intellectually by the level of instruction and their response has been enthusiastic. The presentation of these subjects from the platform by USAAMS officer instructors has been expensive in terms of the man-hours required to research, develop, and write the 528 new hours of instruction. Approximately 9,000 pages of instructional material have been developed and printed. If these subjects were presented consecutively, one after the other at the rate of 32 hours of instruction each week, a 16½-week course of electives could be taught. Stated another way, this is roughly equal to eleven 3-semester-hour college courses. Approximately 20 man-years of work has been invested in preparing for the first presentation of the five subjects now being taught. Operations Research/Systems Analysis, which were taught the first time in August and September, 1968, will require about 2½-man years of effort to develop. During the first 2 years, $15,000 for library costs, $5,300 for special equipment, and $24,000 for OU support have been expended or are programmed. Both costs and returns have been high. During fiscal year 69, an estimated 12,507 platform man-hours of instruction will be presented in these subjects under the current concept. FAOAC students who choose one of the Tactics/Combined Arms Department's electives in both terms will spend almost 15 percent of their academic time on these subjects. The addition of the electives to the curriculum has significantly broadened the academic areas of study available to the student. This has contributed to the accomplishment of the training mission of the US Army Artillery and Missile School.

## SENLOG LOCATED IN ALABAMA

The recently established US Army Sentinel Logistics Command (SENLOG) will be located in Huntsville, Alabama.

SENLOG, organized April 15, 1968, at a temporary location in Washington, D. C., is a major subordinate command of the US Army Materiel Command (USAMC). Its mission is to provide logistical support to the Sentinel System, the Communist Chinese-oriented antiballistic missile system approved for deployment last September. SENLOG's responsibilities include all aspects of inventory management and maintenance engineering functions required to support the Sentinel System.

## SPARTAN TESTED

The SPARTAN, long-range interceptor missile for the SENTINEL system, was successfully test fired by the Army at Kwajalein Test Site in the Marshall Islands in March 1968.

The 55-foot long SPARTAN is designed to intercept intercontinental ballistic missiles and will be deployed at Sentinel sites throughout the nation.

*A Real Breakthrough*

# In Learning Motivation

*Colonel Salvo Rizza*
*Former Director, Gunnery Department*
*USAAMS*

## PREFACE

"In all things, success depends upon previous preparation, and without such preparation there is sure to be failure"—Confucius.

"Practice is the best of all instructors"—Publilius.

"Skill to do comes of doing"—Emerson.

How often have we heard the statement that students realize only a small fraction of their learning potential?

With all our technological know-how and development, do we really motivate the student any more now than we did a thousand years ago, or is the motivation less?

Granted our modern day presentations or instruction through books, pictures, film, models, methods, etc., are vastly superior and readily available to the student. The student today ends up knowing much more than students of the past, but has the stimulation or exercising of his mind increased? From a purely analytical viewpoint, this question is debatable.

The methods of teaching are bounded by two philosophical extremes — one believing in applying maximum pressure on the student and forcing him to dig for his understanding; the other allowing the student alone to progress at his own individual pace and in his own individual way. Educators continue to debate the merits of these two divergent concepts.

If we draw a parallel in the field of physical or athletic achievements, where we can measure relative progress much easier because our standards of comparison are uniform, we find that "pressuring" an athlete to his physical limits has produced results which were believed impossible twenty years ago. In fact, "absolutely impossible" achievements in swimming, track and field events have been commonplace during the past 20 to 25 years. "How is it possible?" is a question old-timers ask today, particularly the old competitors themselves.

Assuming that the brain is a much more complex organ than the muscular elements in our body, applying pressure to the limit of one's mental capacity may be disastrous for many students. Nevertheless, since the average student has a long way to go to reach even a major fraction of his mental potential, it is evident that something must be done in learning motivation or stimulation.

There are many methods or rewards used to motivate the student's learning, some new, some old — including examinations, tests, future prestige and wealth, greater challenges, etc. Systems employing computers, film, slides and student multiple-choice responders have been devised to present the instruction and test the student. For example, the binaural language trainer is a device which improves the presentation and stimulates the student to learn at his own pace. The new concept of opening doors to the brighter students and letting them move at a faster pace is one of the biggest improvements in our school system during the past few decades.

Our affluent society with all its distractions, easy life, TV, leisure — and its reduction in the requirement to struggle for survival or gain has compounded the motivation problem, therefore emphasizing even more the need to motivate, stimulate or provide for new catalysts for learning.

Dr. Lowell, former President of Harvard University, says this about exercising the mind—

"There is only one thing which will really train the human mind, and that is the voluntary use of the mind by the man himself. You may

aid him, you may guide him, you may suggest to him, and above all you may inspire him, but the only thing that is worth having is that which he gets by his own exertions, and what he gets is proportionate to the effort he puts into it. It is the voluntary exercise of his own mind, and I care very little about what he exercises it upon."

An answer for this problem is the system, as described below, which has been developed to motivate the student in his preparation before class, in participation and practice during class, and in analysis of self as well as other student participants. It is applicable to a large as well as a small class.

Perhaps the most consequential result of this system over the present system is the increase of motivation and learning which can be achieved. Additionally, in comparison with other systems, another great advantage is its simplicity and inexpensiveness.

The elements of the system consist of one or more tape recorders with separate or built-in speakers, one microphone for each student and instructor, and a console or switching central. The switching central connects the tape recorder to selected students, or it allows the instructor to play back a recording or to "listen in" on a student. In addition to the simplicity of the hardware, the operation is also extremely simple. Here is how it is used.

The instructor, in sequence (1) develops a problem, (2) asks a question, (3) uses the console to place one, two, three, or four students into a recording mode (the students do not know which of them are being recorded), and (4) plays back one of the student recordings so that the entire class, including that student, can hear and critique or comment on the expressed answer. A television or film can be used by the instructor for steps (1) and (2) above if desired. All the recorded students can be played back and commented upon in turn or some of the recordings can be analyzed by the instructor after the class. Saving some of the recordings for playback after the class will preclude any students' playing the odds against being recorded the second time after they have once been selected for playback.

The element of the unknown — who is being recorded — and the subsequent playback before an audience — makes up the psychological force which motivates every student to prepare for every possible question before coming to class. It also motivates students to participate with a maximum effort in every problem or demand posed by the instructor in the classroom. In other words, every student in the class, to save himself embarrassment, to improve his grade, or to project his best image, must participate in every class problem to his maximum capability. In addition to these learning benefits, the selected student also gains from listening to his own presentation and the instructor's comments which follow. Except when the instructor desires, there is little time for mental relaxation and the learning rate is multiplied many times over that achieved in the normal classroom.

The concept described above can be used at all levels of education. Although the gains at the lower school grades are significant, the greatest dividends are at the higher levels of learning where the problem development or solution requires an analysis of many interrelated factors. The oral response at these levels will require an orderly, articulated presentation in the proper voice and with the necessary justification, reasoning, and organization of words and thoughts.

Even at higher educational levels, in far too many instances, motivation occurs only at periodic or infrequent examination times. In spite of available educational devices, the relative motivation index has improved little over the ages and, in many cases, has decreased as a result of improved economic conditions, less economic pressure, distractions of modern times, and lack of necessity for a maximum effort.

The separate parts of this system are not novel in themselves; however, the element of the unknown with the added stimulant of possibly a student's going "on stage" before an entire class is novel and not a part of any other system. It is this concept or system that produces the revolutionary breakthrough in class motivation.

Although this phenomenal breakthrough in the learning process motivates toward maximum or "total" learning, the student may not like it since he is under continual pressure — required to prepare himself and recite for every possible question. But the object of education is to learn as much as possible and to make the student as resourceful as possible. He must achieve this by his own exertions. When the course is completed, the student will be grateful for development that produced far greater results than believed possible before the introduction of this device. His time in school would be well spent and a far greater percentage of his training potential realized.

As Aristotle once said, "The roots of education are bitter but the fruit is sweet."

To prove the above concept for improved learning, a modification of the above device has been constructed and used at the Artillery and Missile School at Fort Sill in an attempt to provide additional motivation for students participating in observed fire shoots. It is called a Group Trainer. The following article tells about it.

## INTRODUCTION

For many decades one of the field artillery's most difficult problems has been that of adequately training the forward observer without using large amounts of ammunition and troop support. At the normal service practice, only one student truly fires each mission. The learning achieved by the other students during this mission leaves much to be desired.

In an attempt to solve this problem, subcaliber weapons of various sizes, a variety of puff boards ranging from small simple ones to large elaborate ones, the Bishop trainer, the Vu-Graph with an assortment of transparencies, the 14.5-mm trainer, and other devices, such as the most recent projector-computer arrangement costing almost $200,000, have been used. But, none of these have proved popular or sufficiently worthwhile.

Various procedures have been used in service practice instruction to keep all students alert and stimulated. These procedures include changing observers in the middle of a problem and collecting observed fire forms from all students for random problems.

Today, very few of these devices are used. While instructional procedures contribute to a limited degree, "total" participation falls far short of the desired goal. Therefore, the basic problem remains: Only one student fires the problem. The other students are required to follow the problem closely, but there is a large gap between the stimulation of the firer and the nonfirers.

## GROUP TRAINER

Now, forward observers can be trained without using additional time or ammunition and without resorting to substitutes. A simple and inexpensive device, called a group trainer, has recently been developed and tested. With it, almost 100 percent stimulation can be achieved in the nonfiring students. Fundamentally, the group trainer places every student in the same psychological medium as the firer. Each student is equipped with a microphone which is tied into a recorder through a console. The instructor, through the console, selects two nonfiring students whose transmissions will be recorded. None of the students know which two have been selected. All students must give their initial call for fire and subsequent corrections at the same time as the student who is the firer. Since the students are separated and since they do not hear the call for fire or the corrections by the firing student until the fire direction center transmits the readback over the speakers, there is no chance for them to parrot the firer or each other. As a further precaution, the tape recorder is stopped before the readback. Thus, each student is motivated to fire to the same degree as the firer, and in the process, whether or not his call for fire and corrections are recorded, he gains invaluable training.

The tape recorder provides the unknown element which psychologically forces each student to fire with the same sense of urgency as the firer. In fact, greater pressure may be placed on some of the nonfiring students in that they must, in cases of difference, adjust their bases for corrections according to the situation which results from the firing student's data and the response thereto. At the end of the firing, the instructor corrects and grades the recordings against his written record and provides each student with a written critique of his problems.

As a result, the instructional value of each problem fired has been increased many-fold, without the addition of time, ammunition, supporting troops, or other simulator-type devices. Instead of just one student reaching the 100-percent stimulation level, it is now possible to achieve almost 100-percent stimulation in all the students. For example, with

25 students at the observation post, 25 students "fire" each and every problem — perhaps as many as 15 to 20 problems in a day. With the previous system, the student was fortunate to be able to "fire" one problem.

## COMPONENTS

The console is housed in a small aluminum box. It consists of a tape recorder, a switching array, and external connections for cables. Later models will have the capability to use either a built-in dry-cell power source or an external source of power.

A dual-track recorder or two, small, single-track tape recorders may be used. The recording tracks are connected to two microphones selected by pushing their switches to channel A or B (fig 1).

The array has 30 numbered toggle switches (single-pole, double-throw) to permit the selection of channel A or B on each. Each switch number corresponds to a microphone number which, in turn, identifies a student.

There are four speaker, or public address, switches as follows:

- The instructor's switch which permits him to speak with the fire direction center or over the speaker system.
- The conference switch which, in the ON position, connects all microphones to the speaker system. This switch permits the students to use the speakers instead of assembling for the critique phase of the problem.
- The two playback switches, one for each channel, are used if a critique of the recorded mission is desired.

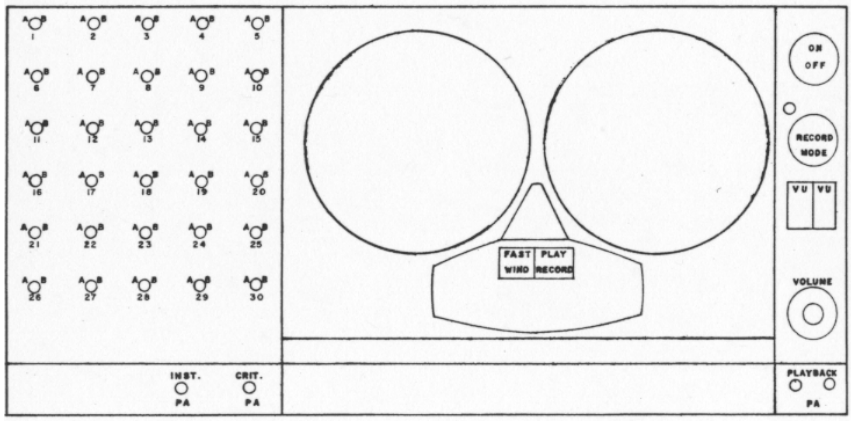



**Figure 1. An illustration of the tape recording set.**

**Figure 2. Vehicle with public address system.**

The external connections consist of —

- Three 10-conductor cables, each connected to a terminal strip.
- Two single conductor lines; one for the instructor, the other for the radiotelephone operator.
- Two cables to the vehicle public address system. One cable provides power for the tape recorder and speaker system, and the other connects the console to the speaker system (fig 2). In later models, these cables will connect the speakers to the recorder, with power to be supplied either internally or from an outside source.

Other equipment and characteristics associated with the trainer are as follows:

- Three 25-foot, 10-conductor cables, each connecting the console to a terminal strip with 10 quick-connect receptacles.
- Thirty pushbutton microphones, each with a 25-foot cable.
- One microphone headset with WD-1 wire for the instructor's connection to the console.
- Two TA-312/PT telephones, one for the radiotelephone operator (RTO) and one for the instructor's headset.
- Two single conductor cables for power to the tape recorder speakers or for connecting the console to the speaker system.
- Two lengths of WD-1 wire, one to connect the radiotelephone operator and the instructor to the console and one to connect the fire direction center (FDC) to the console. These connections permit the FDC to talk to the OP without switching.

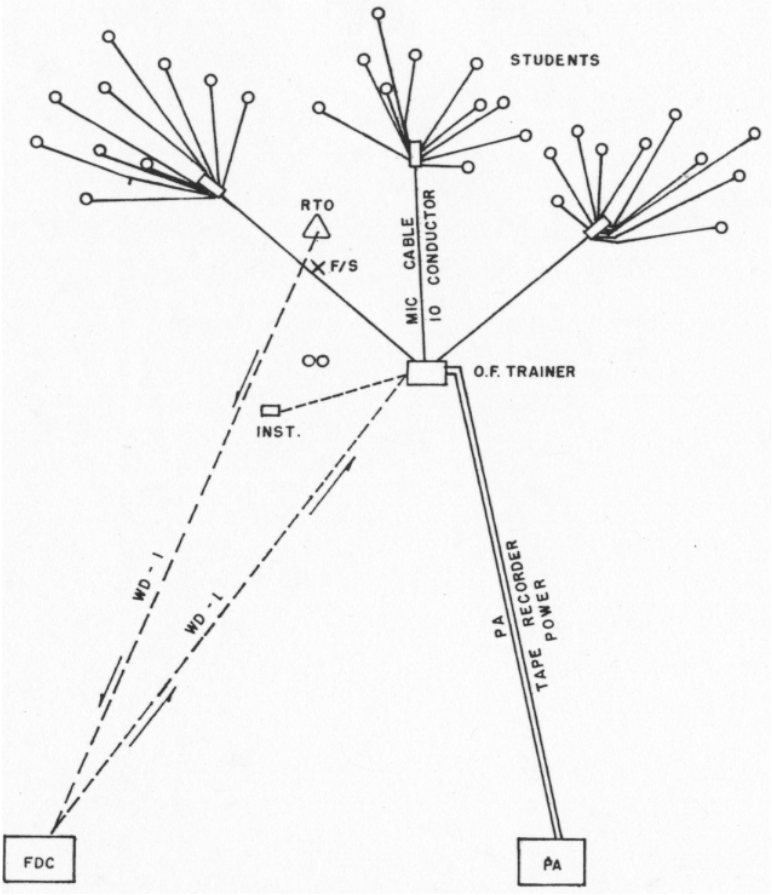



**Figure 3. Diagram of observation post.**

- All terminals are of the quick-connect type except those for the binding posts for the WD-1 wire.
- Equipment is carried in three parts: the control console, a box with microphones, and a box with reels for the microphone and power cables, telephones, headsets, etc.
- The control console weighs about 40 pounds, and its approximate dimensions are 26 by 15 by 12 inches.
- All material is waterproofed for operations under adverse weather conditions.

## ORGANIZATION OF THE OP

Figure 3 depicts the observation post layout. Note that the students, each with a microphone, are seated about 10 feet apart to preclude interference.

Each student should have an unobstructed view of the firing range. The trainer is placed to the rear center of the student group so that its operator will also have an unobstructed view of the range. The instructor stands to the side of the trainer, with the radiotelephone operator in front. The student firing the mission stands and faces the radiotelephone operator. The cable layout and speakers are shown in figure 3.

## OBSERVED FIRE INSTRUCTION

There are no changes in present instructor or student procedures. The initial target location is given in the usual manner, but the instructor uses the speaker system. The student firer's procedure and action with the radiotelephone operator are identical with those in present practice, but the readback from the fire direction center is transmitted over the speaker system. Before the instructor calls on a student to fire, he has the trainer operator switch (record) two numbers, corresponding to selected students, on A and B channels. None of the students know whose call for fire and corrections will be recorded, so they must fire almost simultaneously with the firer. The entire action places a sense of urgency on the nonfirers and causes them to send their corrections within 5 to 10 seconds after the round lands. The separation of the students, the timing of the repeat back, and the stopping of the recorder prevent the students from parroting or copying transmissions. The firer's repeat back, transmitted over the speaker system, permits all students to know what to expect, so they can follow the mission to its conclusion.

During the critique, the students use the microphone and speaker system and there is no need for them to assemble. At the end of the day's firing, the instructor correlates the tape playback with his written record and grades each student. The grade sheets and critique points are given to each student the next day or soon thereafter. Approximately 3 hours are required for grading the day's firing.

The group trainer is so simple and reliable that no problems have been encountered during its use. The set up time and the communication check take about 45 minutes, and the training of an operator requires 1 to 2 hours. A later model with built-in speakers and power supply will be much simpler to operate and set up. Comments from students and instructors indicate a great improvement in observed fire training.

## OTHER USES

The concept of the group trainer is not restricted to field artillery observer training at the United States Army Artillery and Missile School. It will also provide the same training advantages for mortar observers and for observers in tactical units and throughout the Army's school system. In fact, the group trainer is simple and inexpensive enough for issue to all group, brigade, and division artillery size units.

# *Radar Orientation By Sound Ranging*

*Mr. W. R. Bursell and Mr. E. L. Lacy*
*Target Acquisition Department*
*USAAMS*

Receiving an artillery or mortar attack from any direction is a constant threat to units operating in an internal defense environment. One of the most significant problems encountered by the radar section is being able to rapidly point the radar antenna in the proper direction when an attack begins.

In November of 1967 the Sound and Flash Instructional Branch of the Sensory Equipment Division, Target Acquisition Department, United States Army Artillery and Missile School, conducted limited tests to determine the feasibility of using the sound ranging set GR-8 to provide a "looking azimuth" from the AN/MPQ-4A and AN/MPQ-10A radars to enemy cannons, mortars, or rockets.

In order to provide a "looking azimuth" for a radar, a square array of four sound ranging microphones was installed as shown in figure 1. Microphone 1 was placed on the ground at an azimuth of 6,400 mils; microphone 2, at 3,200 mils; microphone 3, at 1,600 mils; and microphone 4, at 4,800 mils. Microphones 1 and 2 were considered a pair, and microphones 3 and 4 were considered a pair. In this array, one pair of microphones face in the general direction of the target regardless of the direction of the target from the array.

Initially, the two microphones of each pair were installed 600 meters apart. As testing continued, this distance was reduced to 200 meters and then to 100 meters. Of the three arrays tested, the 600-meter distance proved the most accurate. However, the error experienced at the 100-meter distance proved irrelevant; and it was easier to interpret records when using the shorter distance.

The radar was emplaced at the centerpoint of the array, because all azimuths to hostile weapons were determined from this point. The sound ranging set GR-8 was placed near the center of the array, and a wire was laid between the GR-8 and each microphone.

The GR-8 does not operate continuously; therefore, observers are normally required to activate the sound array before the sound of the hostile firing reaches any microphone. If observers are not employed, the GR-8 operator can activate the array when he hears a hostile round fired and then range on subsequent rounds. During the tests, "shots" were announced by the project officer to alert the sound ranging personnel to turn on the recorder.

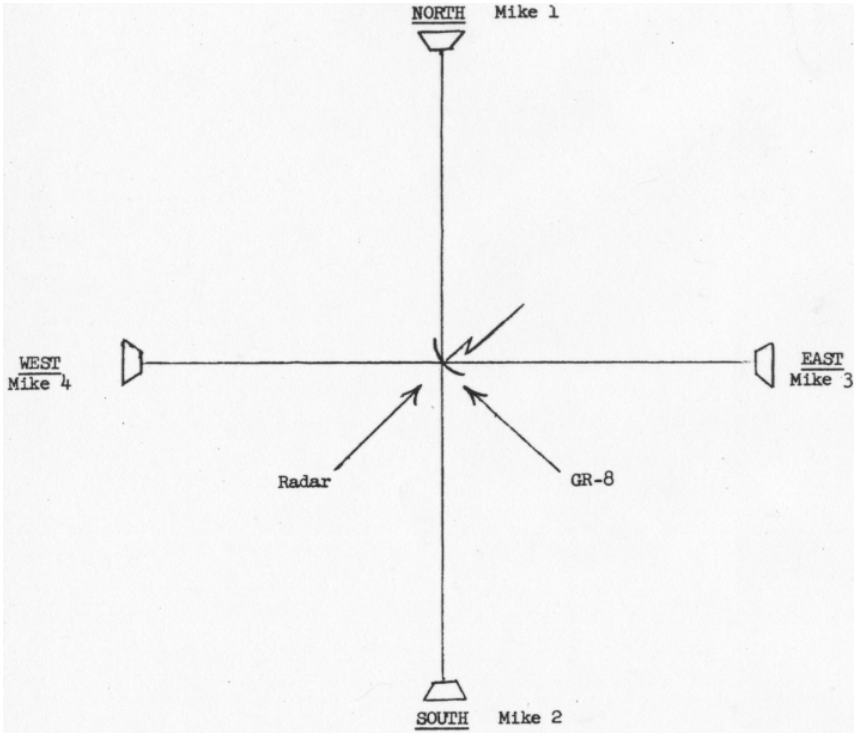



**Figure 1. Array of sound ranging equipment with radar.**

## DETERMINING THE TIME INTERVAL

The time difference between a pair of microphones must be determined in order to obtain an azimuth to a sound source.

The time difference can be determined from the sound record in the normal manner, or it can be read directly from the record by using an improvised record reader (fig 2).

The sound record is read as follows:

- If microphone 1 or microphone 2 receives the sound **first,** the time interval is determined from microphone 3 and microphone 4.
- If microphone 3 or microphone 4 receives the sound **first,** the time interval is determined from microphone 1 and microphone 2.

Once the time difference is obtained, it is converted into an azimuth by use of an azimuth board.

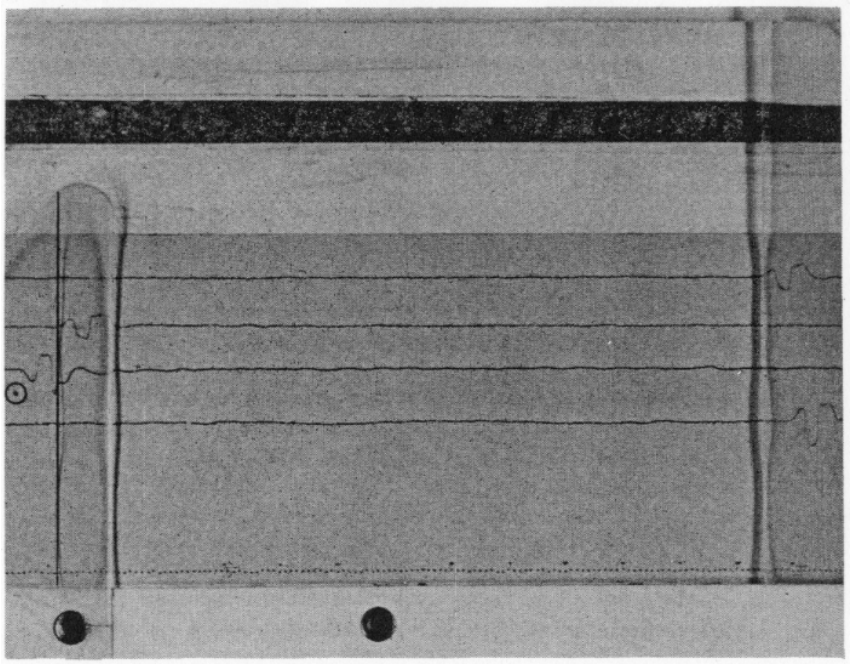


**Figure 2. Improvised record reader.**

## CONSTRUCTION OF AZIMUTH BOARD

The azimuth board consists of a target grid mounted on some suitable material (or a modified M10 plotting board) which has a time difference scale placed on it for the sound base being used. The center of the azimuth board represents the radar location and the centerpoint of the microphone array. It is marked as shown in figure 3.

Data for the time scale are determined using the formula sine $O = \frac{t}{s}$ where s is the base length and t is the time interval (converted to distance). The theta angles are then laid off both left and right of the azimuth index, using the center of the board as the vertex. These lines are labeled corresponding to the time interval. The azimuth index is an arbitrary point which becomes the center (zero) of the completed scale.

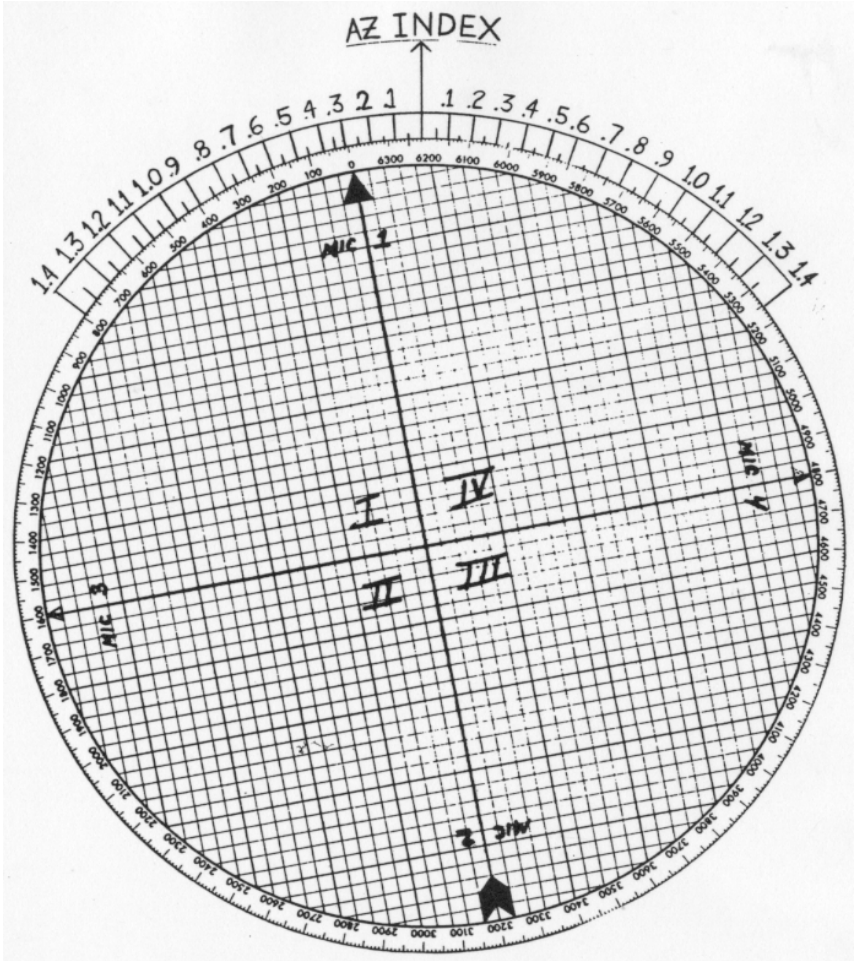



**Figure 3. The azimuth board showing radar location and the centerpoint of the microphone array with a 600-meter base.**

## DETERMINING THE AZIMUTH

The azimuth is determined as follows:

- The plotter obtains from the record reader the number of the microphone the sound reached **first** and the number of the microphone the sound reached **second.**

- The azimuth scale is oriented so that the quadrant in which the sound source lies appears under the azimuth index.
- The arrow representing the microphone that the sound reached first is then positioned at the time interval announced by the record reader.
- The azimuth to the sound source is read at the azimuth index.

## CONCLUSIONS

Although a radar "looking azimuth" can be quickly determined from a single firing, numerous sounds entering an array from different directions at the same time make it very difficult, if not impossible, to interpret the sound record.

During the November tests, the "looking azimuth" was determined to a 105-mm howitzer, to an 81-mm mortar, and to a 4.5-inch rocket. Fourteen firing positions were used, with the range to the sound array varying from 2,000 to 8,000 meters.

The time required to determine an azimuth, after the sound wave reached the microphones, averaged 20 seconds. The average accuracy of the azimuth was within 25 mils of the true azimuth, and in no case did it exceed 39 mils.

## QUADRIPARTITE AGREEMENTS

(Correction to July 1968 **Artillery Trends**)

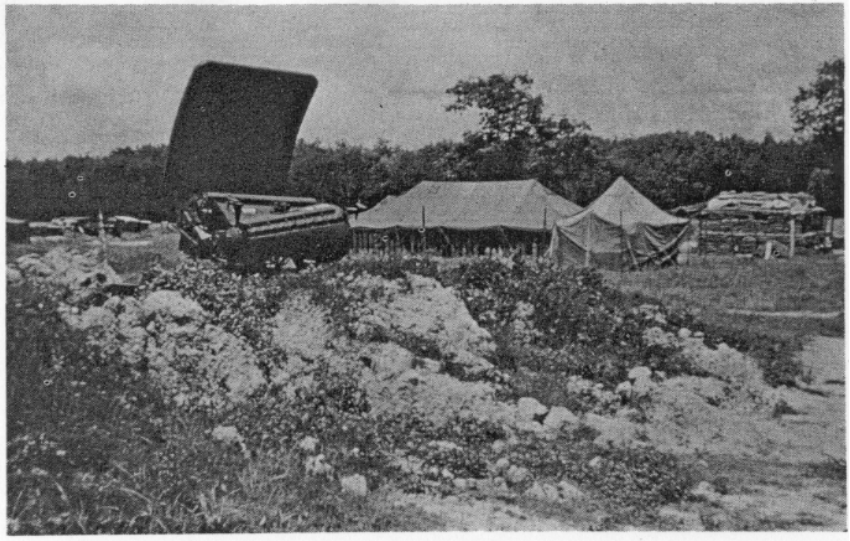
Under the discussion of field artillery tactical missions in the July 1968 issue of **Artillery Trends,** the following statement was made:

"Certain changes in the area of artillery tactical missions were mostly of significance to the other three nations, since they elected to adopt our concept of four standard tactical missions."

Although proposed for ratification by the Ad Hoc Working Group on Artillery Fire Direction (final report July 1966), the US concept of standard tactical missions was never adopted as stated above. In fact, no agreement has been adopted. Furthermore, the Fifth Quadripartite Artillery Conference recommended that agreement on tactical missions was not essential to standardization. Results of this conference, however, were not available for publication in the July issue of **Trends.** Excerpts from the conference's final report are reprinted as follows:

"That Armies agree that standardization of Tactical Missions, although desirable, is not practicable.

"That Armies agree to circulate and exchange the BCA (British, Canadian and Australian) and the US definitions of Tactical Missions to achieve an acceptable degree of interoperability."



# *Adjustment of Fire and Special Application of Countermortar Radar AN/MPQ-4A*

*Ruffin Redwine*
*Target Acquisition Department*
*USAAMS*

## BACKGROUND

When the S3 of a field artillery firing unit decides to fire on a target, he must determine whether predicted fire or adjustment techniques will be required. If the target is accurately located with respect to the guns and if corrections for the effects of nonstandard conditions are current, predicted fire will be delivered; otherwise, an observer or some other means must be used to adjust the artillery onto the target.

There are many considerations which influence the decision to use field artillery radar in the adjustment of fire. Normally, radar will be used only when no artillery observer is available (or during the night or other periods of limited visibility) and when the target has been located by radar and a common grid does not exist between the firing unit and the radar.

## FIRE ADJUSTMENT

Since an adjustment warns the enemy that artillery fire is on the way and gives him time to take cover or leave the area, speed is essential.

When radar is used in the adjustment process the time required is decreased because the radar crewmembers need not know the location of the firing unit, nor is it necessary for the FDC personnel to know the location of the radar. In addition, no special call for fire is required.

The elements of the message transmitted by the radar section are the same as those in the call for fire from an observer with one minor exception, the term ONE GUN is always included in the radar message.

Adjustment begins by firing one round onto a point represented by the coordinates of the target, at the center of sector, or at an auxiliary target. The fire direction center places the target grid over the coordinates at which the first round is to be fired and orients the target grid on grid north.

When the battery fires, SHOT is transmitted to the radar section. When the location of the burst of the adjusting round in relation to the radar has been determined, the coordinates of the burst as read from the radar computer are compared to the coordinates of the target. The resulting lateral shift is the difference in easting (dE), and the range shift is the difference in northing (dN).

**Example:**

| | | |
|---|---|---|
| COORDINATES OF TARGET | 62800 | 51600 |
| COORDINATES OF BURST | 62600 | 51200 |
| DIFFERENCS E AND N | —200 | —400 |

The radar section can also adjust the fire by using a target grid or by computing the shifts using the mil relation. The adjustment is continued until a round bursts within 100 meters of the target. At this time the radar section transmits final corrections and requests fire for effect.

The procedure of adjusting fire by using the dE and dN for lateral and range shifts has certain advantages over the target grid method and the computation method. These advantages are as follows:

- The radar-target azimuth cannot be determined by the enemy.
- Time is saved and possible plotting errors are eliminated, since the radar does not need a target grid in order to shift the burst onto the target.

## ORIENTING AN AIR OBSERVER

There are times when a target can be seen by an air observer but cannot be fired upon without an excessive expenditure of ammunition. This may be the result of poor maps or faulty survey control. In any case, the countermortar radar section can rectify this dilemma quite simply.

First the direction from the radar to the aircraft must be determined. After communication has been established with the aircraft, the radar section keys the radio mike for 5 to 10 seconds. This will enable the aircraft pilot to give the radar section the direction (in degrees) from the aircraft to the radar. After the back azimuth has been determined, the radar antenna can be pointed at the aircraft. The aircraft then is flown over the target, and a metal container, about the size of a beer can, is dropped from the aircraft so that it will fall on or near the target. Echo returns from the falling object will be picked up and displayed on the radar B-scope. By marking and strobing the radar returns, the radar section can determine the grid coordinates of the point at which the can struck the ground.

The air observer can then use these coordinates to initiate a fire mission. This mission may be a fire-for-effect mission or an adjust-fire mission depending on how far the dropped object landed from the target.

Both of these processes — adjusting of fire and orienting an air observer by radar — are easily understood and just as easily employed. These are just two of the many applications for which a radar can be employed.

## TO DESIGN RADAR SITES

The US Army Corps of Engineers have engaged the architect-engineer firm of Ammann and Whitney, of New York, to design the first two Perimeter Acquisition Radar sites for the nation's new Sentinel ballistic missile defense system.

The Perimeter Acquisition Radar (PAR) is a radar set designed to detect an enemy intercontinental ballistic missile as it rises above the horizon. For the Sentinental system the PAR installations will be along the northern borders of the United States. The first to be constructed in the Boston area.

## RECORD NUMBER

Approximately 23,486 students at colleges and universities throughout the United States have received commissions as officers in the Armed Forces through ROTC programs during the 1968 academic year. This figure includes a record number of nearly 18,000 Army students.

## With AN/MPQ-4A—

# *Strobing Technique*

*CPT Joseph Stanley*
*Target Acquisition Department*
*USAAMS*

The countermortar radar AN/MPQ-4A has been highly successful in detecting and locating hostile weapons which fire projectiles at high-angle trajectories. In order to enhance the Q-4's capability to provide more comprehensive detection of hostile artillery, a program has been initiated at the U. S. Army Artillery and Missile School to devise a means of detecting and locating weapons which fire low-angle, high-velocity projectiles.

Although the AN/MPQ-4A was designed to locate high-trajectory weapons, it can, in its normal configuration, detect and locate low-trajectory artillery and rocket weapons. However, because of computer limitations, there are times when both echoes cannot be strobed.

During August and September 1967, a test was conducted at Fort Sill by the Target Acquisition Department to develop techniques for using the AN/MPQ-4A radar set to locate the firing positions of the 105-mm and 8-inch howitzers and the 4.5-inch rockets.

A technique which was successful in overcoming some of the effect of the computer limitations is outlined below. In the example, which uses incoming artillery rounds, the RANGE SHIFT switch is off; however, the technique can be used with either mode of operation (RANGE SHIFT switch on or off).

After the initial detection has been made on the 10,000-meter scale, the RANGE SELECTION switch can be placed on the 2,500-meter scale and additional locations can be made and averaged for greater accuracy.

The antenna should be positioned at the lowest possible elevation to further enhance the accuracy of artillery locations.

When the upper and lower beam echoes from a projectile are detected and the upper beam echo cannot be strobed because of the azimuth and range limits of the computer, the following procedure can be used to overcome some of the effect of these limitations:

- Prepare a recording form as shown in figure 1.

| | Easting grid | Northing grid |
|---|---|---|
| a. Lower beam | | |
| b. One-half distance | | |
| c. Difference between a and b | | |
| d. Sum of b ± c = approximate weapon location | | |

**Figure 1. Recording form.**

- Detect and strobe in the same mode of operation (RANGE SHIFT switch ON or OFF). Use the normal method of strobing and perform the following steps:

(1) Mark the upper and lower beam echoes (fig 2).

(2) Strobe the lower beam echo (fig 3) and record the easting and northing grids on line a, figure 1.

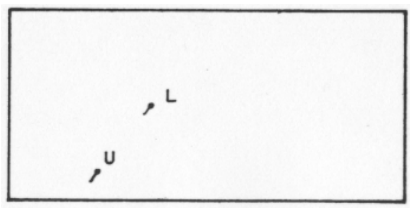



**Figure 2. Upper and lower beam echoes marked.**

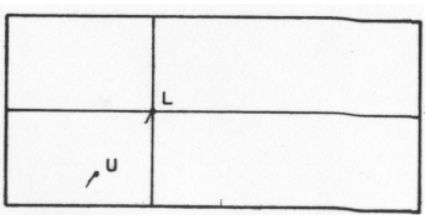



**Figure 3. Lower beam echo strobed.**

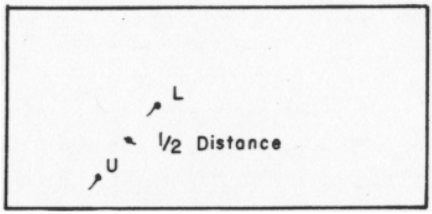



**Figure 4. Halfway point marked.**

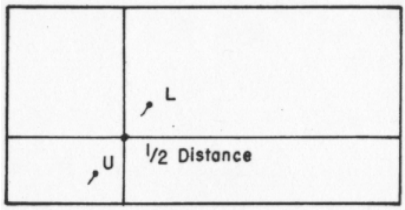



**Figure 5.**

(3) Determine and mark a point halfway along a straight line distance between the first and second echoes (fig 4).

(4) Strobe the point with the upper beam (delta) handwheels (fig 5). Record the easting and northing grids on line b, figure 1.

(5) Compare the lower beam and the one-half distance grids which have been recorded and determine the difference between the two.

- If the grid **increased** on the one-half distance reading, **add** the difference to the one-half distance grid (line c, fig 1).

- If the grid **increased** on the one-half distance reading, subtract the difference from the one-half distance grid (line c, fig 1).

**Note:** There may be an **increase in one grid** and a **decrease in the other grid.** Apply the difference as appropriate.

(6) Complete line d, figure 1. The result will be the approximate location of the weapon which fired.

## MARKSMANSHIP SUPPORT LIMITED

The Secretary of the Army, who is charged by law with conducting a civilian marksmanship program, has approved a revised program limiting support of civilian marksmanship.

Under the revised program, support for marksmanship clubs will be limited to those clubs most of whose members still have their service obligation ahead of them and whose marksmanship training would be of greatest value to the military services. These are the junior clubs, the junior divisions of senior clubs, and undergraduate college clubs.

**In Vietnam—**

# Artillery Warning Control Centers

*LTC Gordon A. Noffsinger and MAJ Joseph F. Puett, Jr.*
*Headquarters, II Field Force Artillery Vietnam*
*APO San Francisco 96266*

"PHU LOI ARTILLERY, THIS IS RED WING 708 EN ROUTE FROM DI AN TO LAI KHE. REQUEST ARTILLERY ADVISORY."

"RED WING 708, THIS IS PHU LOI ARTILLERY: ARTILLERY FIRING FROM PHU LOI INTO GRID XT795235, MAXIMUM ORDINATE 1,000 FEET:

KEEP EAST OF THE RAILROAD UNTIL BONG TRANG: APPROACH LAI KHE FROM SOUTHEAST."

This is a typical transmission from one of the artillery warning control centers within the III Corps Tactical Zone, Republic of Vietnam.

The artillery warning control center (AWCC) is an agency established to provide information to friendly aircraft pertaining to artillery fires within a specified geographic area. Such warning control centers have been established in 16 segments of the III Corps Tactical Zone. Recognizing the requirements for safeguarding aircraft and for placing minimum firing restrictions on artillery, the II Field Force Vietnam Artillery fire support coordination element initiated the present artillery warning advisory system in early 1967. The 16 artillery warning control centers are heterogeneous, since they are manned by US MACV advisors, personnel of the U. S. Army, U. S. Air Force, U. S. Navy, and First Australian Task Force.

Phu Loi AWCC may have received the artillery firing information reported to Red Wing 708 from either US or ARVN artillery units over FM radio or telephone. The firing point, impact grid, maximum ordinate, and times of firing were plotted on a 1:50,000 scale operations map.

This firing information was transmitted some 5 minutes before the mission began to preclude compromise. If the maximum ordinate of this reported artillery firing had been over 7,000 feet, the data would have been passed to Paris Control. Within the limits of the III Corps Tactical Zone, en route flight corridors are not used, thus some type of in-flight control is necessary. Paris Control is a U. S. Air Force control reporting center at Tan Son Nhut Air Base, whose function is to vector aircraft at operational altitudes above 7,000 feet.

The AWCC provides all requesting aircraft with information concerning artillery firing into or from the control center's area to include the point of origin, point of impact, maximum ordinate, and azimuth of firing in degrees. In the event a number of artillery units are firing along the intended flightpath, the AWCC will provide a safe routing to the aviator rather than overwhelm him with specific firing information. This service is available through the forward air controllers (FAC) to United States and Free Military Assistance Forces and Republic of Vietnam Air Force (RVNAF) aircraft, to include helicopters, light fixed-wing aircraft jets, and transport aircraft (e.g., C-7A, C-123, C-130).

At the present time the AWCC's are staffed and equipped from existing resources, as there are no TOE or TD spaces or equipment available for this function. The Phu Loi Artillery operator is very likely a PFC or SP4 operations specialist (MOS 13E20) trained by the responsible unit to man the AWCC. The AWCC operator personnel must be well grounded in radiotelephone procedures and map reading and plotting techniques. During the initial phases of on-the-job training, the operator is taught the basic techniques of aircraft vectoring and gains some knowledge of the prominent landmarks and terrain features in the area. Density of aircraft and Artillery operations dictates the number of personnel required to man these centers. Some centers, such as Song Be Artillery, are operated by as few as three persons whereas busier centers, such as Bien Hoa Artillery, require up to nine operators.

To simplify the system within the III Corps Tactical Zone, all aviators are issued maps on which the AWCC's unclassified call signs, frequencies, and physical boundaries have been superimposed. Presently, each AWCC is operating with two frequency modulated (FM) radios. As equipment becomes available, the centers will be issued ultrahigh-frequency (UHF) equipment to provide greater flexibility.

The AWCC's are normally collocated with the fire support coordination centers at major base camps. Artillery warning control subcenters may be established as required to support specific tactical operations when a high density of artillery fires and aircraft operations would overload existing AWCC facilities. Information pertaining to the establishment of such subcenters will be furnished to aviators by "Notices to Airmen (NOTAM)."

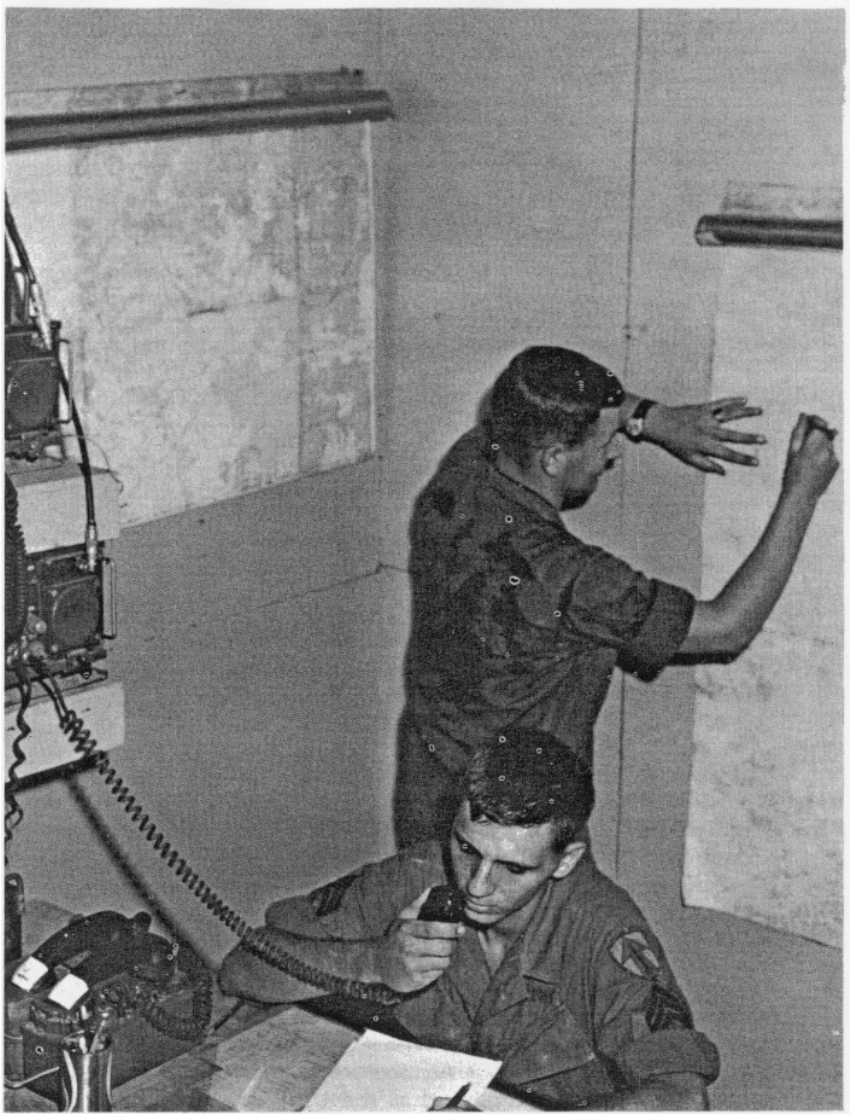
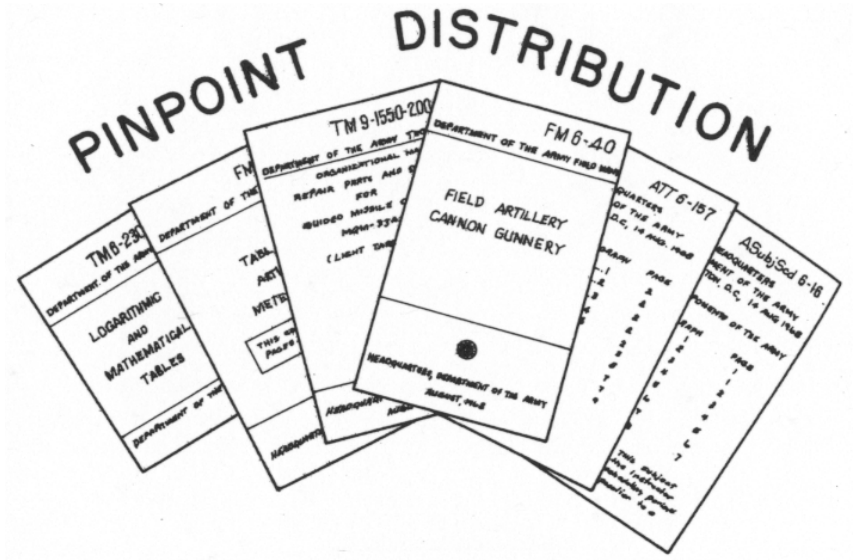


**Figure 1. AWCC operator personnel are well grounded in radiotelephone procedures and map reading and plotting techniques.**

By the establishment of the AWCC's in the III Corps Tactical Zone, the commander has provided aircraft with an atmosphere safe from artillery fires without restricting his supporting artillery.




# SYSTEM

*Major Vernon L. Clark*
*Tactics/Combined Arms Department*
*USAAMS*

Does your unit receive Army publications through the "pinpoint" system of distribution? Department of the Army Circular 310-51, dated 15 November 1967, entitled "Military Publications Resupply (Requisitioning) Procedures," announces new and modified resupply procedures in the Army Adjutant General publications supply system. Due to the brevity of this circular, the following pertinent information is provided for use by unit commanders in obtaining publications and changes through the pinpoint system.

The pinpoint system for distributing Department of the Army publications permits each unit down to company, battery, and detachment levels to establish a pinpoint account. An account for administrative and training publications may be established at the U. S. Army Adjutant General Publications Center in Baltimore, Maryland; and an account for supply and technical publications may be established at the St. Louis AG Publications Center. In establishing a pinpoint account, the unit subscribes for the types and the exact quantity of publications desired. Thereafter, as the types of publications ordered by the unit are changed or revised or as new publications in the same functional area are printed, the publications centers automatically make distribution in the quantity indicated as

a requirement by each unit. This initial distribution (ID) is part of the subscription service and is made without requisition action by the unit.

In view of the expected life of the commodity involved, resupply actions should be reduced significantly if the unit's initial requirements are carefully calculated when its pinpoint accounts are established. This apparently has not been the case, however, as evidenced by the constantly increasing resupply workload at the publications centers.

To provide the best possible service consistent with the publications centers' available resources, the following modifications in resupply procedures were established effective 1 January 1968:

- A unit having an established pinpoint account will not submit a resupply requisition (DA Form 17) for a publication received by automatic initial distribution until 120 days after the date of the publication. To be certain that an adequate supply of publications is received through ID, units will review their current subscription forms (DA Form 12-series) and promptly advise the centers of any changes in the types of publications and the number of copies desired. In instances in which the 120-day time limit does not apply, specific exemption notices will be published in the weekly bulletin of each publications center. Bulletins from both centers are distributed each week to each pinpoint account.

- At the end of the 120-day period, company-level units will submit DA publications resupply requirements to their next higher headquarters, which will prepare and submit a consolidated requisition (DA Form 17) to the appropriate publications center. Separate company-level units not organic or attached to a battalion or comparable unit are excluded from this requirement. Battalion or higher level elements may continue to submit resupply requisitions for needed publications and blank forms directly to the appropriate publications center under the following schedule:

  (1) Units with a San Francisco or Seattle APO/FPO address—submit requisitions between the 1st and 10th of the month.

  (2) Units with a New York APO/FPO address—submit requisitions between the 11th and 20th of the month.

  (3) ALL CONUS units—submit requisitions between the 21st and last day of the month.

- Elements of the U. S. Army, Vietnam, are exempt from the preceding modifications in resupply procedure.

Requisitions for emergency requirements will be honored. Emergency requisitions will be submitted on DA Form 17 marked "special" in block number 3. Company-level units, not separate units, will submit special requisitions through their next higher headquarters.

# *Improved Cannon Programs For FADAC*

*Lieutenant Colonel Merlyn H. Smith (Retired)*
*Gunnery Department*
*USAAMS*

Improved cannon program tapes for the M18 gun direction computer, FADAC, have been produced through the joint efforts of Frankford Arsenal, US Army Combat Developments Command Artillery Agency, and the US Army Artillery and Missile School and have been tested by the US Army Artillery Board, an agency of the US Army Test and Evaluation Command. The tapes were scheduled to be issued to units during the summer of 1968, with units in Vietnam receiving tapes beginning in June. Six improved tapes were produced to replace the 16 tapes now in the field. Each new tape will contain the ballistic program for two different calibers and/or models of weapons. The combination of calibers and models will provide both ballistic and tactical grouping considerations. These tapes, which will be known as Issue 2, Phase III, FADAC Cannon Program Tapes, are as follows:

- 105-mm (M101A1)/105-mm (M108, M102)
- 105-mm (M101A.)/155-mm (M109)
- 105-mm (M108, M102)/155-mm (M114)
- 105-mm (M108, M102)/155-mm (M109)
- 8-in (M110)/155-mm (M109)
- 8-in (M110)/175-mm (M107)

The new programs use a different matrix design (fig 1): however, the basic ballistic solutions remain unchanged for the most part. The most significant improvements incorporated in the new tapes are:

- The ability to compute ballistic data for high-explosive (HE) shells M444, M449 MODS, M404, M454, and M426, using applicable fuzes.

- The proper deflection display for either 3,200- or 6,400-mil fire control equipment.

- The flexibility gained by met input procedures allowing selective input, recall, or correction of individual lines of met data. In addition to these improvements, ballistic fuze data may now be computed for the M564 fuze, as well as for the M520 and M501. A provision has

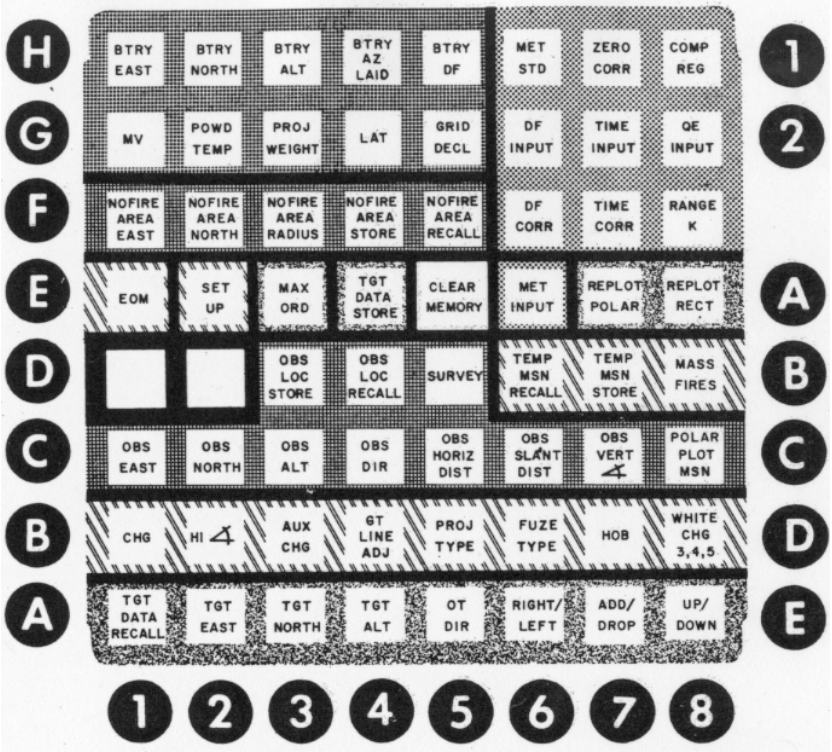


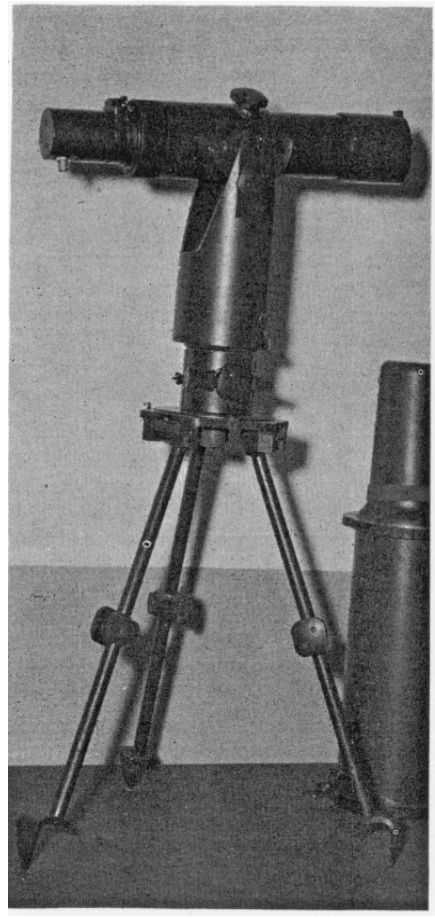

**Figure 1. Matrix design for Issue 2, Phase III tapes.**

been added to allow the operator to determine the maximum ordinate (altitude) of the intended trajectory. This altitude is displayed by the computer as meters above mean sea level to facilitate the issue of safety warnings for aircraft. Registration corrections will now be applied for a specific charge and trajectory, high or low angle. A program controlled test to sequentially test the filaments of all the Nixie display tubes and a no-fire area preclusion subroutine have been included in the program tape. The ballistic coefficient factor (BCF) input capability has been deleted from the program; however, separately developed muzzle velocity data may now be entered for green bag and white bag propellants.

Pending the publication of the revised Field Manual 6-3-1, Operation of the Gun Direction Computer, M18, Cannon Application, which will reflect these improved procedures, the complete draft manual accompanied the first issue of tapes as **Fire Control and Information Letter . . . 7** published at Fort Sill.

The USAAMS began teaching the new operator procedures in May before the new tapes are issued. These improved tapes will significantly enhance the value of the M18 computer in cannon application.

# The *Collimator Training Aid*



*Captain Robert W. Mathewson*
*S3, 2d Training Battalion, 1st Brigade*
*U. S. Army Training Center, Field Artillery*
*Fort Sill, Oklahoma*

The adage that one picture is worth a thousand words is true as it applies to training gunners to use the Infinity Aiming Reference Collimator M1, (normally referred to as the Collimator). In order for one instructor to teach several potential gunners the proper sight-picture when using the collimator, a training aid that displays the collimator sight-picture has been developed for use at the U. S. Army Training Center, Field Artillery.

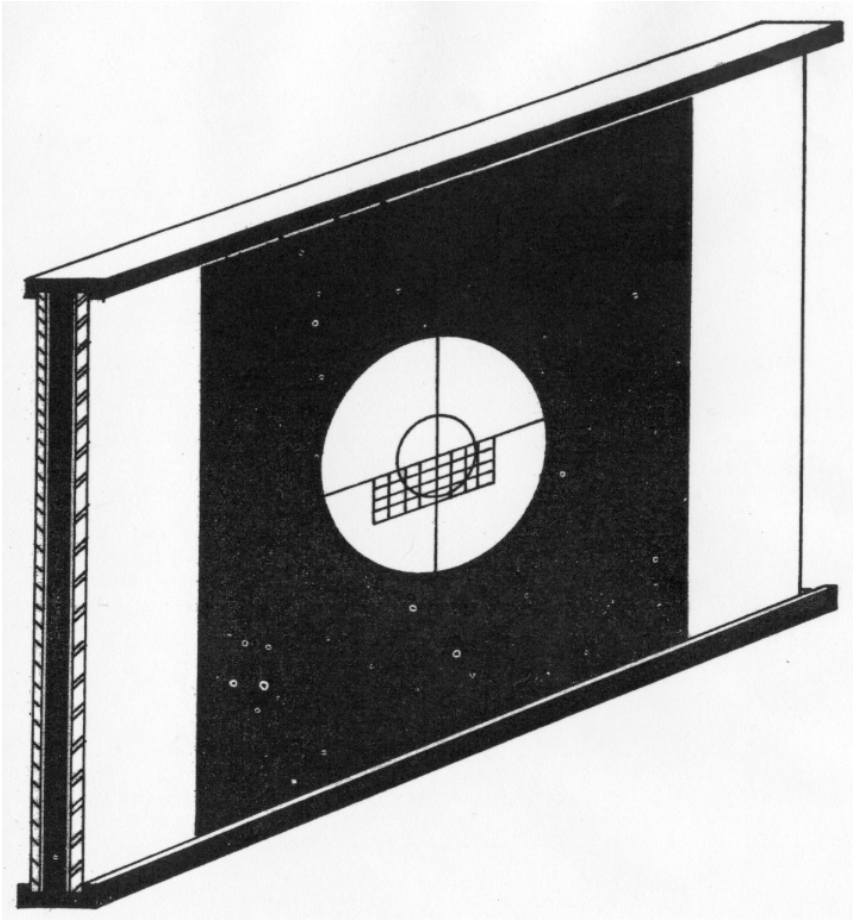


**Figure 1. Collimator training aid.**

Weighing approximately 100 pounds, the collimator training aid (fig 1) consists of three main parts—a center support and two movable panels. The center support (fig 2) is a 4-by-6-foot sheet of ¾-inch plywood with a 6¾-inch-diameter hole in the center. This circular hole depicts the lensatic end of the collimator. One of the movable panels is a 4-by-4-foot sheet of ¼-inch plastic upon which is inscribed the reticle pattern (fig 3) of the panoramic telescope sight M12A7D. This panel moves in a slotted track in front of the center support. The other panel (fig 4) is a 4-by-6-foot sheet of masonite on which is printed the center portion of the numbering pattern as seen through the lens of the

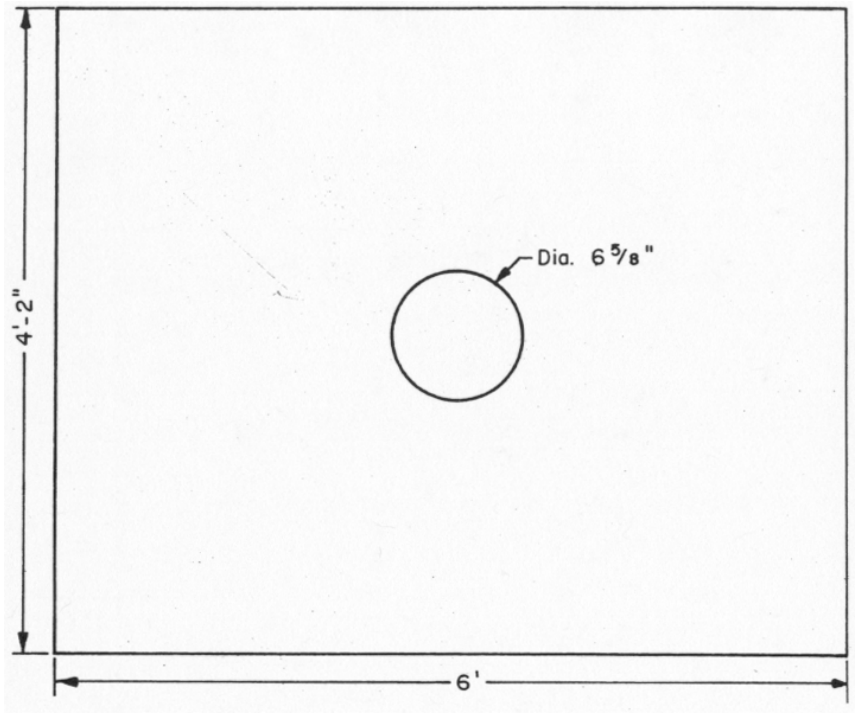



**Figure 2. Center support.**

collimator. This panel moves in the slotted track behind the center support.

By using this training aid, an instructor can illustrate, to many students at the same time, the initial sight picture plus the sight-pictures that correct for piece displacement. The initial sight-picture will show the 0 line of the collimator reticle and the 0 line of the panoramic sight reticle alined in the center of the hole of the center support. This sight picture (fig 5) indicates the correct alinement of the collimator during the initial lay.

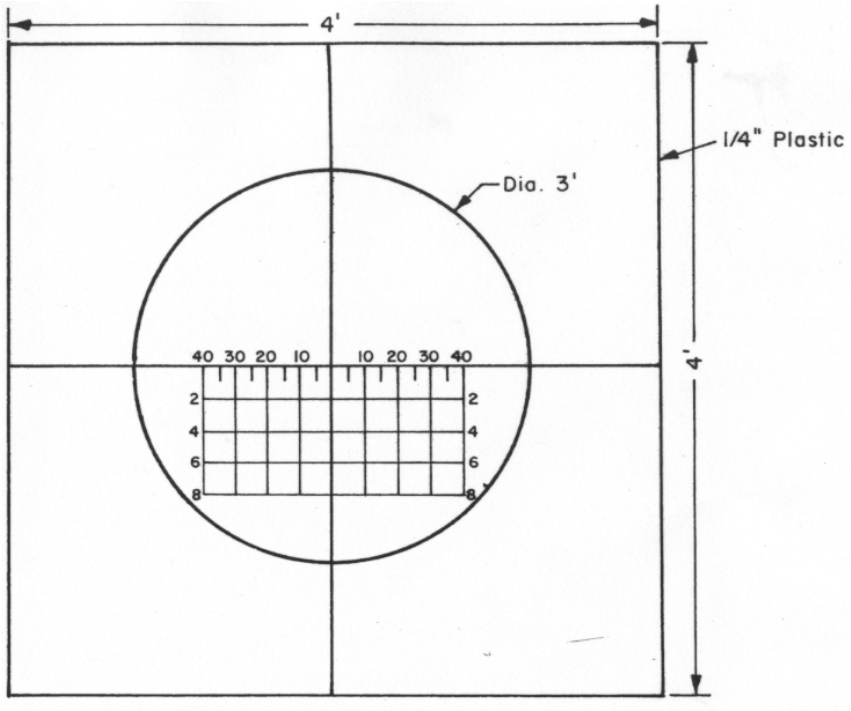



**Figure 3. Reticle pattern.**

The proper sight-picture for displacement can be demonstrated by sliding the movable panels so that the collimator reticle and the panoramic sight reticle coincide (fig 6).

Presently, each training battalion within the 1st Advanced Individual Training (AIT) Brigade, U. S. Army Training Center, Field Artillery, is equipped with one or more collimator training aids. The possibility of each artillery unit's constructing the training aid is excellent because of its low cost. This training aid helps to eliminate the problem of training personnel to correct for piece displacement when the infinity reference collimator is used as an aiming reference point.

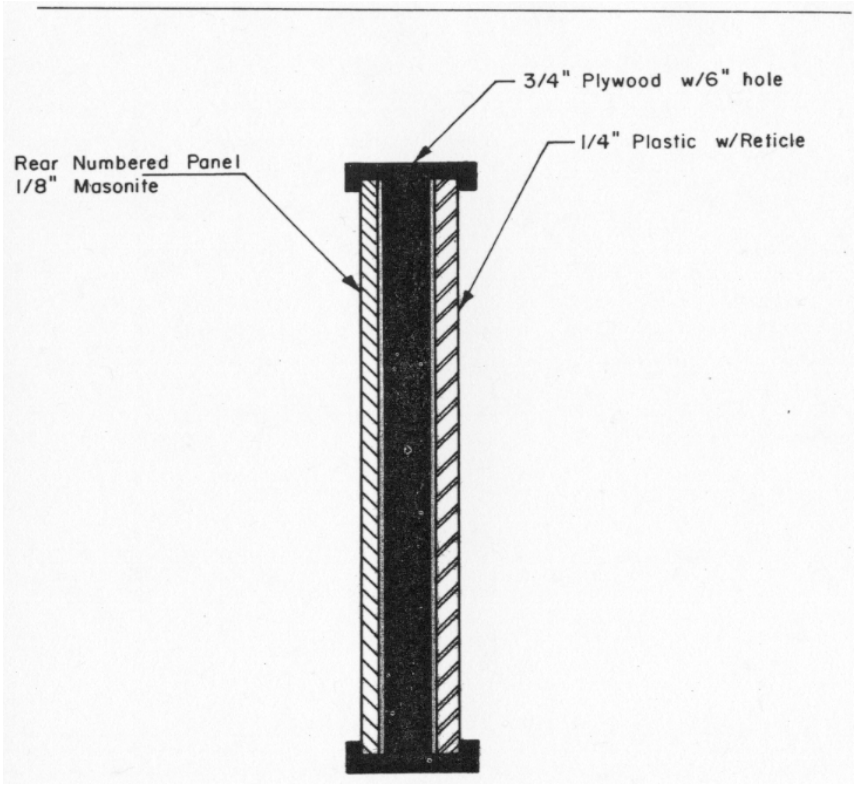



**Figure 4. End view.**

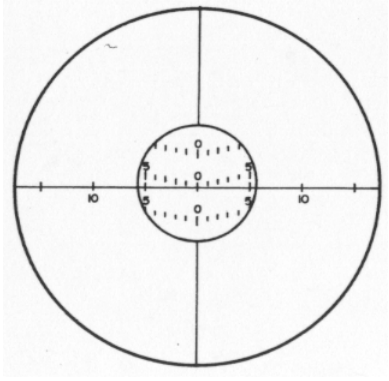


**Figure 5. Initial alinement.**

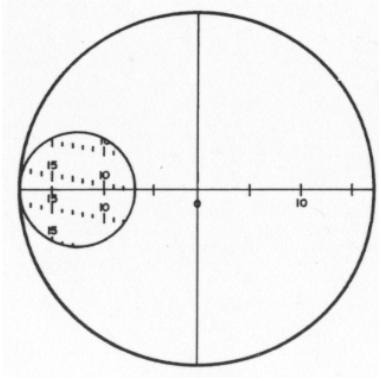


**Figure 6. Right displacement.**

# Fire Support Coordination

*LTC Charles W. Montgomery, (Retired)*
*Tactics/Combined Arms Department*
*USAAMS*

Editor's Note: This is the second in a series of "Dear John" letters on field artillery operations.

* * * * * * * * * *

APO .....
San Francisco, California
..... March 19 .....

Dear John:

Things have "warmed up" a bit over here since my last letter. Our well-used tactic of "search and destroy" has been made somewhat easier by the enemy who has been presenting himself a bit more readily than before. In my last letter I described for you the fire support at a division level and pointed out **that** fire support which is normally available to the combat echelons of the division. That discussion covered both weapons and ammunition. I promised that I would describe how this fire support was coordinated in my next letter. This, then, is my attempt to fulfill that promise. Being a field artilleryman, I will devote most of my words to the artillery's role in this endeavor. You must remember that this is in no way intended to degrade the roles of the other combat arms and services.

You will recall I stated that when a division is employed in a linear-type configuration, it really operates in four "layers" (front to rear). Closest to the enemy is the **company.** Companies are controlled and directed in their operations by **battalions.** In the third layer is the **brigade** which controls the operations of the battalions. The **division** headquarters serves as the fourth layer. Over here, we often have operations in which brigades or battalions may be operating independently of their control headquarters. Such operations are exceptions to the "four layer" concept.

The supported company commander coordinates fire support for companies. Representatives of the fire support means may be present with the company to assist the commander in determining the most effective use of the fire support available. Forward observers from the mortar platoon and supporting field artillery battalion habitually accompany the frontline companies. Marine spotters and Air Force forward air controllers (FAC) may also accompany the company in order to provide advice, request supporting fires, and direct fires/airstrikes against enemy targets. If air observers are needed for the adjustment of fires and surveillance of enemy-held areas, they are available through several sources. (One of the principal sources is the field artillery.)

At the maneuver battalion headquarters, an informal fire support coordination center is usually established by grouping operations and intelligence (S3 and S2) personnel with the representatives from the Air Force and Navy and from the mortar, field artillery, and Army aviation elements. Such grouping insures the immediate responsiveness of all fire support to the needs of the supported battalion. The chief representative from each fire support means present has the necessary communication with which to call for fires as needed. Unity of fire support effort is achieved by having the field artillery liaison officer (a captain from the artillery battalion in direct support) serve as the fire support coordinator (FSCOORD) for the supported maneuver battalion. Thus, when fires are needed or advice concerning fire support is sought, the supported battalion commander can deal with only one individual instead of several.

At the brigade headquarters, the organization for fire support is identical to that at the maneuver battalion headquarters except for the FSCOORD. The commander (a lieutenant colonel) of the field artillery battalion in direct support of the brigade has the responsibility for coordinating all fire support. Because the commander cannot spend all his time at the brigade headquarters in this capacity, the field artillery table of organization and equipment (TOE) authorizes a liaison officer (a captain) to work at the brigade headquarters in a full-time capacity as assistant fire support coordinator. This arrangement insures a fulltime advisor on fire support. The artillerymen at brigade must be constantly aware of the status of all available fire support means. They must also be continuously aware of the importance of targets for attack and how these targets affect the overall combat plans of the brigade. On numerous occasions, the brigade cannot effectively attack a target with the fire support immediately available. When this occurs, higher echelons (division, etc.) must be called on to provide the necessary fire support for the attack of these targets.

At the division headquarters, a tactical operations center (TOC) is established under the general staff supervision of the G3. The TOC is a formal grouping of staff personnel and fire support representatives from all supporting arms and services. The primary function of the TOC is to focus attention on current combat operations. Current combat operations are formulated, altered, and directed from within this facility. Fires are planned in concert with maneuver operations. The division commander provides the TOC with guidance on the mission of the division and with his concepts of how the division's resources should be used. Members of the TOC recommend the best use of such resources (both personnel and materiel). Usually the division commander will delegate authority to some members of the TOC to commit forces and expend ammunition during the course of combat. To do so insures short reaction time for the TOC.

At the division echelon, the division artillery commander normally serves as the division FSCOORD and as the principal adviser on the use of fire support. He assembles a group of fire support coordination personnel with some of the necessary communication facilities and equipment within the TOC. This facility is known as the fire support element (FSE), and personnel of the FSE are trained to peform the fire support coordination function for the division. They assemble and analyze target information, and when targets have been approved for firing, the FSE assigns them to the appropriate fire support agencies. In addition, the FSE reviews for adequacy of fire support planned at the lower echelons of the division and augments such support when necessary. Representatives of all fire support immediately available to the division are collocated with the fire support coordination element. This group is kept abreast of the current status of division operations. Fire support representatives relay this information to their respective commands. I work with the field artillery element of the TOC as a target analyst. My job is to analyze targets and prepare recommendations for the use of weapons and ammunition in the attack of such targets. To do so, I am required to be fully aware of the situation at all times, the capabilities and limitations of available fire support, safety requirements in effect, and the importance of the targets to the overall combat operation. It is a most interesting position and one in which everyday brings forth new experiences and knowledge. In most operations here, we operate from vans, tents, and buildings; however, on some occasions during short-duration operations, we operate from airborne aircraft. When this occurs, our group is considerably reduced in size and equipment.

Although I have addressed this discussion to the typical (field manual) fire support organization for a division, you must recognize that over here the "norm" is to use forces (layers) smaller than division for many operations. However, this practice does not alter the normal organization for fire support. Augmentations of personnel and equipment may be needed if the operation is to be of long duration. Coordination techniques may need minor modification but the overall procedures remain basically the same. Each committed layer has its own fire support coordination capability with control centralized at the highest echelon. When fire support is needed, it is accomplished by the lowest layer which has the capability.

As you no doubt have noticed at this point, the commander charged with the responsibility for the success of combat operations has available to him several means of attacking surface targets with either organic and/or nonorganic means. Only at the company echelon do we find the commander serving as his own fire support coordinator. At higher echelons, each commander is provided with a single fire support adviser—the fire support coordinator. Each supported commander must use his principal combat power (fires and maneuver) in harmony to succeed

in combat operations. I hope that this letter has provided you with the required insight to the mechanics of fire support coordination at the several "layers" of the division. For the sake of brevity, I have purposely avoided the "nuts and bolts" of fire support coordination procedures. Also, I have intentionally omitted any reference to the coordination needed between US operations and those by forces of other nations. The need does exist, but to describe it would take too much time and space. I would also remind you that at echelons higher than division similar coordination is accomplished, and these echelons can be requested to augment the fire support available to the division.

Respectfully yours,
REDD LEGG
Captain, Arty

## ADVANCED SCHOOLING AVAILABLE

Advanced civil schooling at the University of Texas at El Paso is now available for selected graduates of the Guided Missile Systems Officer Course (4F-1181).

The artillery branch, under the provisions of AR 350-200, considers graduates of the 30-week course conducted at Fort Bliss, Texas for an additional year of collegiate study which would lead to a University of Texas graduate degree in the engineering or physical science fields.

All selections for this civil schooling, as well as for the 4F-1181 course, will be made on a best qualified basis considering each student officer's demonstrated duty performance and potential (as indicated by his overall efficiency file) and his academic qualifications.

Both the Field Artillery and Air Defense Artillery Branches will participate in this program after Artillery officers are transferred into the Air Defense Artillery Branch.

The Army Air Defense School conducts the Guided Missile Systems Officer course twice annually to provide commissioned officers with advanced and comprehensive instruction in the physical sciences related to the guided missile field.

Each class normally consists of 15 to 20 officers (all volunteers) and graduates are awarded MOS 1181. Course completion dates of September and January are compatible with starting dates at the University of Texas at El Paso.

Chance to attend graduate school in conjunction with the 4F-1181 course is designed to provide additional incentive to high potential officers.

Prerequisites for the 4F-1181 course are contained in DA Pamphlet 350-10. Applications should be submitted through channels on DA Form 2496.

# Applying
# The Deflection Correction Scale

*Captain James B. Parham*
*Gunnery Department*
*USAAMS*

The fire direction center (FDC) computer usually constructs the deflection correction scale directly in the DEFL CORR/DRIFT blocks on the graphical firing table. If the FDC is receiving regular met messages, at least 12 deflection correction scales will be constructed on the GFT in one 24-hour period. Such pencilings and subsequent erasures wear thin the paper on the GFT. High humidity, as in Southeast Asia, causes the paper to deteriorate and wear through rapidly.

An alternate solution to the construction of the deflection correction scale on the GFT is the use of a 3-by-5-inch card. However, the use of a card is somewhat cumbersome and time-consuming and requires a knowledge of the elevations at which the drift changes.

Another solution incorporates the advantages of the first two methods and eliminates their disadvantages. Writing a single figure on the cursor of the GFT instead of writing several figures directly on the GFT eliminates the wear on the GFT and the necessity of constructing additional scales. This figure is the value which, when applied to the values already marked on the GFT in the DEFL CORR/DRIFT blocks, will yield the appropriate deflection correction for a specific elevation.

Figure 1 illustrates a GFT setting for an initial registration with the deflection correction (R6) applied to the cursor. Since this is an initial registration, the deflection index will be displaced on the chart, and the deflection correction at the adjusted elevation will effectively become zero. This can be reflected graphically on the GFT in the following manner:

The GFT setting is placed on the GFT in the normal manner. Assume that all printed values in the DEFL CORR/DRIFT blocks are left (e.g., L1, L2, L3, etc.) and that the elevation gageline corresponding to the adjusted elevation falls over the block having a value of left 6 (L6). Since the deflection index was displaced, the actual deflection correction at the adjusted elevation is 0. In order to reflect the true value of the deflection correction, the computer places R6 (right 6) on the cursor, between the manufacturer's hairline and the elevation gageline. Combining the two values (R6 + L6) yields a correction of 0.

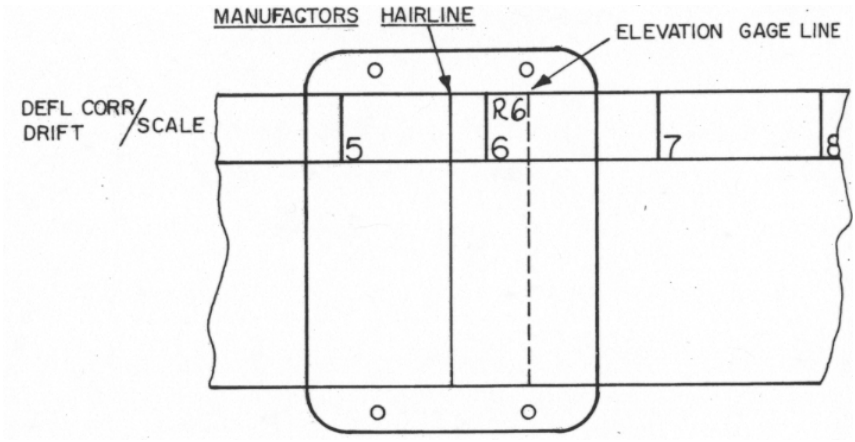



**Figure 1. GFT setting for an initial registration with the deflection correction (R6).**

In effect, then, a value of right 6 has been assigned to the elevation gageline. When the elevation gageline falls in any given DRIFT block on the GFT, the computer simply combines the value of the elevation gageline with the value in the DRIFT block. For example, at a range of 5,660 meters, the elevation gageline falls in the DRIFT block having a value of left 7. Since the value of the gageline is right 6, combining these two values results in a deflection correction of left 1 (L7 + 6R = L1).

Transfer limits can be portrayed by a straight line through the DRIFT block at the elevations corresponding to the upper and lower transfer limits.

Subsequent registrations would be handled in a similar manner. The elevation gageline would, of course, be reconstructed for the new adjusted elevation and then be assigned a value which, when combined with the value in the DRIFT block, will yield the deflection correction.

Assuming and adjusted elevation of 320 (range 4,800 meters) and a deflection correction of left 2, the computer constructs the elevation gage-line in the normal manner. Since the correction is left 2, he assigns the elevation gageline a value of right 4 (fig 2). Combining the value of right 4 with the value of the drift block (left 6) yields a deflection correction of left 2 (L6 + R4 = L2). Then, it is a simple matter to change the transfer limits.

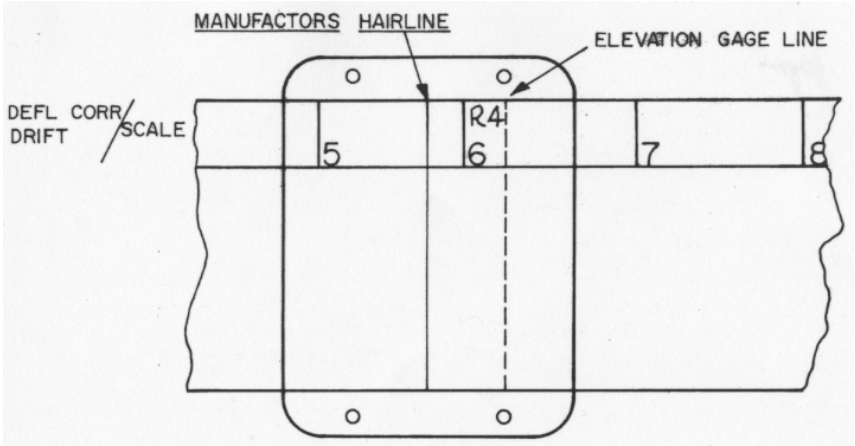



**Figure 2.**

This method of constructing the deflection correction scale is adaptable to the new slant scale GFT now being produced. It improves the speed and efficiency of fire direction center operations, it cuts down the cost and inconvenience of replacing GFT's which have been worn through continued use under the present system, and it eliminates the requirement for the 3-by-5-inch card used in the first alternate method.

# Employment of Nuclear, Biological, and Chemical Weapons

## General

The general facts presented in this discussion have been extracted from field manuals and are considered useful to commanders, staff officers and firing units involved in the employment of nuclear, biological, and chemical (NBC) weapons. No attempt has been made to cover in detail the subject of target analysis, since the personnel directly concerned with that function have already received essential information by school and refresher training and must rely on the complete treatises contained in appropriate reference manuals in order to perform their duties properly.

Since May 1967, artillery officers qualifying as nuclear weapons employment officers (NWEO) have been trained in the employment of chemical and biological weapons. This action was taken to provide each tactical operations center (TOC) at all levels of command with a 24-hour NBC employment capability and because of the similarity between nuclear, chemical, and biological target analysis techniques.

## Command Guidance for Nuclear Weapons

Because of the magnitude and nature of nuclear weapons effects, their employment may very well be the decisive element of an attack or defense. The basic concepts of employment for nuclear weapons are as follows:

- The US Army is organized, equipped, and trained to fight in nuclear warfare, nonnuclear warfare, or under the threat of nuclear warfare.

- Nuclear weapons may be employed within the area of operations when the theater commander announces that their use has been authorized.

- Once nuclear warfare has commenced, the authority to employ nuclear weapons is decentralized.

- United States nuclear weapons may be employed in support of Allied forces, using either United States or Allied delivery means. The nuclear warhead sections (to include artillery projectiles) remain under the control of United States military personnel until the time of launching or firing.

- A commander who plans to employ a nuclear weapon coordinates with any adjacent unit commander into whose sector militarily significant weapons effects are expected to extend. Lacking concurrence, the commander requests authority to fire from the next higher commander who controls both sectors.

- Nuclear firepower is a form of combat power. Nuclear weapons may, on occasion, be used alone to accomplish tasks which might otherwise require the maneuver of close combat units; however, most tasks require a combination of fire and maneuver. Plans for the employment of nuclear firepower, nonnuclear firepower, and maneuver forces are integrated to provide decisive results.

- Nuclear weapons are employed to destroy or degrade enemy combat capabilities. Consistent with the requirements imposed by the tactical mission, casualties among civilian personnel are held to a minimum. Destruction of man-made structures or natural terrain features and creation of high intensity residual contamination areas may cause adverse political effects as well as create undesired obstacles to movement. Consistent with military objectives, destruction and contamination should be held to a minimum.

- Commanders normally employ the smallest and most readily available weapon with a sufficiently high probability of providing the coverage that insures the desired results.

- Commanders may employ surface bursts in lieu of airbursts when results are improved and the limiting effects are acceptable or the residual effects are desired.

- Commanders conduct poststrike analysis as required.

### Command Guidance for Chemical and Biological Weapons

Chemical and biological (CB) weapons are selective in their action. They can be employed to produce a wide variety of effects ranging from mild incapacitation to sudden lethality without significant damage to material and structures.

Chemical and biological agents can be effectively used to penetrate fortifications and cause casualties among dug-in personnel who are relatively well protected from high explosive (HE) and nuclear weapons.

The six basic concepts for the employment of chemical and biological weapons are as follows:

- The United States Armed Forces are trained, equipped, and supplied for CB defense and operations in a toxic CB environment.

- The decision to use toxic chemical and biological weapons rests with the President. Commanders receive directives relating to the employment of CB munitions through command channels. The pattern and objectives for the use of CB agents will depend on such variables as US foreign policy, requirements of the military situation, Allied participation, nature of the enemy, and related factors.

- Commanders are authorized to use certain nontoxic chemical agents, such as flame, incendiaries, smoke, riot control agents, and defoliants.

- Once the decision has been made to conduct toxic CB operations, authority to use CB weapons is normally delegated to the lowest echelon responsible for the area within which the effects of the agents will extend.

- Control of the use of toxic chemicals is retained at division but may be delegated to the brigade level, depending on the scale of employment and the brigade mission. Because biological weapons effects may extend over very large areas, control of their use is expected to be delegated no lower than corps level.

- Commanders who plan to employ CB weapons must coordinate with any adjacent commander over whose sector toxic clouds may be expected to pass or whose operations may be affected by the contamination of terrain. He must also consider the sequence of CB fires and their relationship to conventional and nuclear weapons.

### NBC Weapons Employment Reference Material

The following manuals will be revised in 1968 and 1969:

- FM 101-31-1 provides specific doctrine concerning the facts of tactical operations which are applicable to active nuclear warfare. It contains the US Army concepts for nuclear weapons employment and the command and staff actions required to carry out these concepts. Appendices to this field manual present detailed technical procedures concerning target analysis. This manual is unclassifed.

- FM 101-31-2 provides the necessary data for actual target analysis. This manual is classified SECRET, RESTRICTED DATA.

- FM 101-31-3 provides data concerning a family of hypothetical nuclear weapons and data necessary for target analysis. This unclassified manual is designed specifically for use in training the staff officer, particularly the nuclear weapons employment officer. It is not intended for field exercises or command post exercises by US forces, but can be so used by non-US forces.

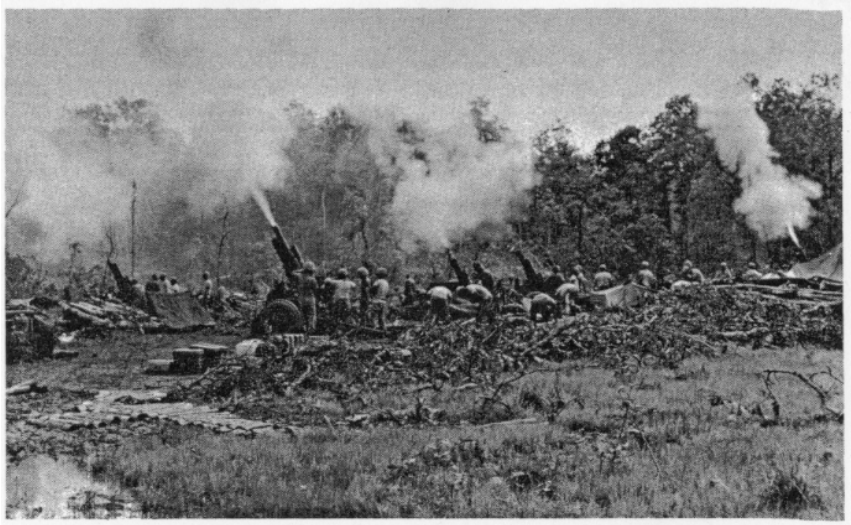
- TM 23-200 presents the phenomena and effects of a nuclear detonation. It provides the source material and reference needed for the preparation of operational and employment manuals by the military services. This manual is classified CONFIDENTIAL.

- FM 3-10 provides doctrinal guidance for the employment of antipersonnel chemical and biological agents as well as guidance for target analysis. This manual is unclassified.

- FM 3-10A provides data on biological agents and on the capabilities and effects of biological munitions. This manual is classified SECRET.

- FM 3-10B provides data on chemical agents and on the capabilities and effects of chemical munitions. This manual is classified CONFIDENTIAL.

# Southeast Asia Lessons Learned



The following material finds its origin in information extracted by the U. S. Army Artillery and Missile School from correspondence which has passed between U. S. artillery units and USAAMS, efforts by departments of the School to solve problems experienced by units in counterinsurgency operations, and after action reports distributed by the Department of the Army.

## DRIVER TRAINING

It is imperative that units in CONUS preparing for deployment to RVN conduct a driver training program, to include international road signs, because little or no time is available for such a program once the unit has arrived in country.

Drivers must avoid driving over potholes, road shoulders, boxes, cans, grass matting, loose boards, or other foreign items on a road which may conceal mines. Also, drivers must know the weight classification of their vehicles and avoid bridges of lower classification.

Units likely to haul cargo extensively would be well advised to train drivers thoroughly on all types of secondary and pioneer roads. Driving on narrow and heavily crowded roads in RVN is a new experience for all drivers. Defensive driving techniques are stressed. In addition, the assistant driver is an absolute must since he assists the driver in observing hazards along the road.

## RECOVERY

Units must insure that proper recovery techniques are used at all times. Extracting a wheeled vehicle by the front bumper is an improper technique and will result in damage to the bumper.

When tracked vehicles become mired while operating in soft rice paddy areas, one method of recovery used is to chain logs to the tracks, thus increasing traction for recovery. When an armored personnel carrier becomes mired, recovery vehicles often cannot approach close enough to recover it due to the soft terrain. Consequently, other APC's can be used in tandem to extract the vehicle.

## PREVENTIVE MAINTENANCE

In many cases, the normal interval stated in technical manuals is too infrequent for periodic preventive maintenance services. Therefore, intervals must be reduced by one-half or even one-third, depending on the local operating conditions.

During operations under extremely muddy conditions, vehicle brake systems must be cleaned at least once a week. Even with periodic cleaning, brake shoes and brake drums will wear out much more rapidly than during the dry season.

Because of the extremely high temperatures, seals, gaskets, flex hoses, and other fluid-carrying hoses crack and wear out more quickly than normal. Measures should be taken to review the prescribed load list to insure that enough demands have been placed on an item for possible justification of incorporating the item in the PLL.

Most self-propelled heavy artillery pieces remain in position for long periods of time and move only to have their tubes changed or to displace when ordered. It is found that fewer chassis maintenance problems develop after a weapon has been driven several miles. The practice of driving each weapon at least two miles bi-monthly should be adopted by each self-propelled artillery battalion, thus producing a noticeable reduction in the number of chassis maintenance problems.

## GENERATORS

When preparing positions for generators, allow for a two-foot clearance on all sides for ventilation and servicing. For most units in RVN, the primary source of electrical power is the generator. Units must be prepared to maintain their generators to prevent breakdowns and resultant loss of electricity.

## GENERAL

During hot weather, avoid stopping vehicles in shaded areas or near a stream for these are typical spots for enemy mines.

Destroy or crush empty containers, including "C" ration cans, beer and soda cans, and ammunition or fuze boxes which are used extensively for improvised mines. Also destroy all discarded batteries of any size or type, for batteries are used as initiators in improvised mines.

If installed and maintained properly, any vehicle battery will give at least 24 months of trouble-free, highly efficient service. The battery should be wiped free of dust daily and the water filled to the proper level weekly. Bi-weekly, terminal clamps should be removed and corrosion scraped from both the clamps and posts. The battery should not be discharged for more than 30 continuous seconds while starting the engine and should not provide radio power without the use of the engine generator. Monthly, the battery should be removed and thoroughly cleaned.

We invite readers to submit for publication their ideas which have proved workable in advancing artillery effectiveness. Dissemination of such information would be in keeping with the latest trends in the Artillery. The material contained in this issue represents the best information available at time of publication. All readers and users of this handbook are encouraged to forward information concerning changes or suggestions for improvement of content and format to:

Commandant
US Army Artillery and Missile School
ATTN: AKPSIAS-PL-FM
Fort Sill, Oklahoma 73503

# RESIDENT COURSES

## U. S. Army Artillery and Missile School

Listed are resident courses scheduled by the United States Army Artillery and Missile School for both officer and enlisted personnel. Courses listed are those scheduled to begin during fiscal year 1969.

### OFFICER COURSES

| COURSE | CLASS NO | REPORT | START | CLOSE | INPUT |
|---|---|---|---|---|---|
| **2-6-C1** | 1-69 | 23 Mar 69 | 24 Mar 69 | 18 Apr 69 | 43 |
| **FA Officer Mobilization Basic** | 2-69 | 20 Apr 69 | 21 Apr 69 | 16 May 69 | 42 |
| **(4 Weeks) (Max Cap: 45)** | | | | | 85 |
| **2-6-C8** | 1-69 | 11 Aug 68 | 12 Aug 68 | 23 Aug 68 | 56 |
| **FA Field Grade** | 2-69 | 29 Sep 68 | 30 Sep 68 | 11 Oct 68 | 56 |
| **Officer Refresher** | 3-69 | 19 Jan 69 | 20 Jan 69 | 31 Jan 69 | 48 |
| **(2 Weeks)** | 4-69 | 8 Jun 69 | 9 Jun 69 | 20 Jun 69 | 48 |
| **(Max Cap: 62)** | | | | | 208 |
| **2-6-C20** | 1-69 | 9 Jul 68 | 15 Jul 68 | 4 Oct 68 | 140 |
| **FA Officer Basic** | 2-69 | 23 Jul 68 | 29 Jul 68 | 18 Oct 68 | 138 |
| **(12 Weeks) (Max Cap: 120)** | 3-69 | 6 Aug 68 | 12 Aug 68 | 1 Nov 68 | 103 |
| | 4-69 | 20 Aug 68 | 26 Aug 68 | 15 Nov 68 | 148 |
| | 5-69 | 3 Sep 68 | 9 Sep 68 | 29 Nov 68 | 103 |
| | 6-69 | 17 Sep 68 | 23 Sep 68 | 13 Dec 68 | 138 |
| | 7-69 | 1 Oct 68 | 7 Oct 68 | 17 Jan 69 | 103 |
| | 8-69 | 29 Oct 68 | 4 Nov 68 | 7 Feb 69 | 132 |
| | 9-69 | 26 Nov 68 | 2 Dec 68 | 7 Mar 69 | 146 |
| | 10-69 | 7 Jan 69 | 13 Jan 69 | 4 Apr 69 | 151 |
| | 11-69 | 4 Feb 69 | 10 Feb 69 | 2 May 69 | 149 |
| | 12-69 | 4 Mar 69 | 10 Mar 69 | 29 May 69 | 141 |
| | 13-69 | 1 Apr 69 | 7 Apr 69 | 27 Jun 69 | 148 |
| | 14-69 | 29 Apr 69 | 5 May 69 | 25 Jul 69 | 138 |
| | 15-69 | 20 May 69 | 26 May 69 | 15 Aug 69 | 120 |
| | 16-69 | 10 Jun 69 | 16 Jun 69 | 5 Sep 69 | 120 |
| | 17-69 | 24 Jun 69 | 30 Jun 69 | 19 Sep 69 | 120 |
| | | | | | 2238 |
| **2-6-C20-RA** | 1-69 | 2 Jul 68 | 8 Jul 68 | 6 Sep 68 | 93 |
| **RA FA Officer Basic** | *2-69 | 13 Aug 68 | 19 Aug 68 | 18 Oct 68 | 132 |
| **(9 Weeks) (Max Cap: 120)** | 3-69 | 7 Jan 69 | 13 Jan 69 | 14 Mar 69 | 89 |
| | 4-69 | 1 Apr 69 | 8 Apr 69 | 6 Jun 69 | 90 |
| | | | | | 404 |
| | *USMA Class | | | | |
| **2-6-C22** | 1-69 | 1 Jul 68 | 5 Jul 68 | 25 Apr 69 | 138 |
| **FA Officer Advanced** | 2-69 | 9 Sep 68 | 12 Sep 68 | 3 Jul 69 | 138 |
| **(39 Wks, 3 Days)** | 3-69 | 12 Nov 68 | 15 Nov 68 | 5 Sep 69 | 134 |
| **(Max Cap: 145)** | 4-69 | 27 Jan 69 | 30 Jan 69 | 7 Nov 69 | 134 |
| | 5-69 | 7 Apr 69 | 10 Apr 69 | 30 Jan 70 | 135 |
| | | | | | 679 |

Approximately 17 non-US students will attend each of the above C22 classes.

| COURSE | CLASS NO | REPORT | START | CLOSE | INPUT |
|---|---|---|---|---|---|
| | | **PHASE II** | | | |
| **2-6-C23** | 1-69 | 2 Mar 69 | 3 Mar 69 | 28 Mar 69 | 45 |
| **FA Officer Mobilization Advanced** | 2-69 | 27 Apr 69 | 28 Apr 69 | 23 May 69 | 45 |
| | | | | | 90 |
| | | **PHASE III** | | | |
| **(Ph II: 4 Wks)** **(Ph III. 4 Wks)** **(Max Cap: 120)** | 1-69 | 30 Mar 69 | 31 Mar 69 | 25 Apr 69 | 45 |
| | | | | | 45 |
| **2E-F4** | 1-69 | 14 Jul 68 | 15 Jul 68 | 26 Jul 68 | 31 |
| **Senior FA Officer** | 2-69 | 12 Jan 69 | 13 Jan 69 | 24 Jan 69 | 31 |
| **(1 Wk, 5 Days)** **(Max Cap: 50)** | 3-69 | 20 Apr 69 | 21 Apr 69 | 2 May 69 | 32 |
| | | | | | 94 |
| **2E-F13** | 1-69 | 7 Jul 68 | 8 Jul 68 | 9 Aug 68 | 8 |
| **NBC Weapons Employment** | 2-69 | 15 Sep 68 | 16 Sep 68 | 18 Oct 68 | 8 |
| **(5 Weeks) (Max Cap: 10)** | 3-69 | 17 Nov 68 | 18 Nov 68 | 20 Dec 68 | 8 |
| | 4-69 | 2 Feb 69 | 3 Feb 69 | 7 Mar 69 | 8 |
| | 5-69 | 13 Apr 69 | 14 Apr 69 | 16 May 69 | 7 |
| | | | | | 39 |
| (NOTE: Dates correspond to Prefix 5 portion of Course 2-6-C22) | | | | | |
| **2E-F14** | 1-69 | 27 Oct 68 | 28 Oct 68 | 9 Nov 68 | 24 |
| **NBC Weapons Employment** | 2-69 | 19 Jan 69 | 20 Jan 69 | 1 Feb 69 | 24 |
| **(Res Comp) (2 Weeks)** **(Max Cap: 35)** | 3-69 | 8 Jun 69 | 9 Jun 69 | 21 Jun 69 | 23 |
| | | | | | 71 |
| **2E-F25** | 1-69 | 27 Oct 68 | 28 Oct 68 | 2 Nov 68 | 68 |
| **Artillery Staff Officer** | 2-69 | 5 Jan 69 | 6 Jan 69 | 11 Jan 69 | 68 |
| **Corps Arty, Div Arty, FA Group (1 Week)** **(Max Cap: 70)** | 3-69 | 2 Mar 69 | 3 Mar 69 | 8 Mar 69 | 67 |
| | | | | | 203 |
| **2E-F30** | 1-69 | 21 Jul 68 | 22 Jul 68 | 23 Aug 68 | 50 |
| **FA Officer Vietnam** | 2-69 | 20 Aug 68 | 21 Aug 68 | 26 Sep 68 | 50 |
| **(5 Weeks) (Max Cap: 50)** | 3-69 | 15 Sep 68 | 16 Sep 68 | 18 Oct 68 | 50 |
| | 4-69 | 13 Oct 68 | 14 Oct 68 | 15 Nov 68 | 50 |
| | 5-69 | 12 Nov 68 | 13 Nov 68 | 20 Dec 68 | 50 |
| | 6-69 | 5 Jan 69 | 6 Jan 69 | 7 Feb 69 | 50 |
| | 7-69 | 31 Jan 69 | 1 Feb 69 | 10 Mar 69 | 50 |
| | 8-69 | 5 Mar 69 | 6 Mar 69 | 9 Apr 69 | 50 |
| | 9-69 | 2 Apr 69 | 3 Apr 69 | 7 May 69 | 50 |
| | 10-69 | 1 May 69 | 2 May 69 | 6 Jun 69 | 50 |
| | 11-69 | 12 Jun 69 | 13 Jun 69 | 18 Jul 69 | 50 |
| | | | | | 550 |
| **2E-1154** | 1-69 | 3 Jul 68 | 5 Jul 68 | 16 Sep 68 | 19 |
| **Artillery Target** | 2-69 | 11 Sep 68 | 12 Sep 68 | 22 Nov 68 | 19 |
| **Acquisition Officer** | 3-69 | 13 Nov 68 | 14 Nov 68 | 6 Feb 69 | 18 |
| **(10 Wks, 1 Day)** | 4-69 | 26 Feb 69 | 27 Feb 69 | 8 May 69 | 18 |
| **(Max Cap: 20)** | 5-69 | 28 May 69 | 29 May 69 | 11 Aug 69 | 18 |
| | | | | | 92 |

| COURSE | CLASS NO | REPORT | START | CLOSE | INPUT |
|---|---|---|---|---|---|
| **2E-1190** | 1-69 | 7 Jul 68 | 8 Jul 68 | 5 Sep 68 | 33 |
| **FA Ballistic Missile Officer** | 2-69 | 8 Sep 68 | 9 Sep 68 | 6 Nov 68 | 33 |
| **(8 Wks, 3 Days)** | 3-69 | 13 Oct 68 | 14 Oct 68 | 13 Dec 68 | 27 |
| **(Max Cap: 32)** | 4-69 | 12 Nov 68 | 13 Nov 68 | 24 Jan 69 | 27 |
| | 5-69 | 5 Jan 69 | 6 Jan 69 | 6 Mar 69 | 26 |
| | 6-69 | 9 Mar 69 | 10 Mar 69 | 7 May 69 | 27 |
| | 7-69 | 4 May 69 | 5 May 69 | 3 Jul 69 | 27 |
| | | | | | 200 |
| **2G-1183** | 1-69 | 3 Sep 68 | 4 Sep 68 | 23 Oct 68 | 48 |
| **Artillery Survey Officer** | 2-69 | 29 Oct 68 | 30 Oct 68 | 20 Dec 68 | 46 |
| **(7 Wks, 1 Day) (Max Cap: 48)** | 3-69 | 2 Jun 69 | 3 Jun 69 | 23 Jul 69 | 46 |
| | | | | | 140 |
| **4C-0200** | 1-69 | 3 Jul 68 | 5 Jul 68 | 20 Sep 68 | 43 |
| **Communications Officer** | 2-69 | 18 Jul 68 | 19 Jul 68 | 4 Oct 68 | 42 |
| **(10 Wks, 5 Days)** | 3-69 | 22 Aug 68 | 23 Aug 68 | 8 Nov 68 | 43 |
| **(Max Cap: 40)** | 4-69 | 5 Sep 68 | 6 Sep 68 | 22 Nov 68 | 42 |
| | 5-69 | 24 Oct 68 | 25 Oct 68 | 25 Jan 69 | 42 |
| | 6-69 | 21 Nov 68 | 22 Nov 68 | 20 Feb 69 | 41 |
| | 7-69 | 5 Dec 68 | 6 Dec 68 | 7 Mar 69 | 42 |
| | 8-69 | 5 Jan 69 | 6 Jan 69 | 22 Mar 69 | 41 |
| | 9-69 | 6 Feb 69 | 7 Feb 69 | 25 Apr 69 | 42 |
| | 10-69 | 19 Feb 69 | 20 Feb 69 | 8 May 69 | 41 |
| | 11-69 | 6 Mar 69 | 7 Mar 69 | 22 May 69 | 42 |
| | 12-69 | 24 Apr 69 | 25 Apr 69 | 12 Jul 69 | 41 |
| | 13-69 | 22 May 69 | 23 May 69 | 9 Aug 69 | 41 |
| | 14-69 | 5 Jun 69 | 6 Jun 69 | 22 Aug 69 | 41 |
| | | | | | 584 |
| **WO-F1** | 1-69 | 7 Jul 68 | 8 Jul 68 | 26 Jul 68 | 135 |
| **Warrant Officer Orientation** | 2-69 | 11 Aug 68 | 12 Aug 68 | 30 Aug 68 | 135 |
| **(3 Weeks) (Max Cap: 202)** | 3-69 | 15 Sep 68 | 16 Sep 68 | 4 Oct 68 | 135 |
| | 4-69 | 20 Oct 68 | 21 Oct 68 | 8 Nov 68 | 135 |
| | 5-69 | 12 Jan 69 | 13 Jan 69 | 31 Jan 69 | 135 |
| | 6-69 | 23 Feb 69 | 24 Feb 69 | 14 Mar 69 | 135 |
| | 7-69 | 30 Mar 69 | 31 Mar 69 | 18 Apr 69 | 134 |
| | 8-69 | 4 May 69 | 5 May 69 | 23 May 69 | 134 |
| | 9-69 | 8 Jun 69 | 9 Jun 69 | 27 Jun 69 | 134 |
| | | | | | 1212 |
| *** REFRESHER** | 1-69 | 11 Aug 68 | 12 Aug 68 | 17 Aug 68 | 30 |
| **Training in the Tactical** | 2-69 | 25 Aug 68 | 26 Aug 68 | 31 Aug 68 | 30 |
| **Employment of Nuclear** | 3-69 | 20 Oct 68 | 21 Oct 68 | 26 Oct 68 | 30 |
| **Weapons** | 4-69 | 3 Nov 68 | 4 Nov 68 | 9 Nov 68 | 30 |
| **(1 Week) (Max Cap: 30)** | 5-69 | 12 Jan 69 | 13 Jan 69 | 18 Jan 69 | 30 |
| | 6-69 | 6 Apr 69 | 7 Apr 69 | 12 Apr 69 | 30 |
| | 7-69 | 18 May 69 | 19 May 69 | 24 May 69 | 30 |
| | 8-69 | 22 Jun 69 | 23 Jun 69 | 28 Jun 69 | 30 |
| | | | | | 240 |

*For local input and instructor personnel from other installations.

| COURSE | CLASS NO | REPORT | START | CLOSE | INPUT |
|---|---|---|---|---|---|
| | **OFFICER/ENLISTED COURSE** | | | | |
| **2E-F19/030-F2** | 1-69 | 16 Sep 68 | 17 Sep 68 | 20 Sep 68 | 13 |
| **FA Searchlight** | 2-69 | 9 Dec 68 | 10 Dec 68 | 13 Dec 68 | 13 |
| **(5 Days) (Max Cap: 30)** | 3-69 | 3 Mar 69 | 4 Mar 69 | 7 Mar 69 | 12 |
| | | | | | 38 |
| **2F-F1/121-F1** | 1-69 | 7 Jul 68 | 8 Jul 68 | 12 Jul 68 | 30 |
| **FADAC Operators** | 2-69 | 11 Aug 68 | 12 Aug 68 | 16 Aug 68 | 30 |
| **(1 Week) (Max Cap: 20)** | 3-69 | 15 Sep 68 | 16 Sep 68 | 20 Sep 68 | 30 |
| | 4-69 | 6 Oct 68 | 7 Oct 68 | 11 Oct 68 | 30 |
| | 501-69 | 27 Oct 68 | 28 Oct 68 | 1 Nov 68 | 30 |
| | 5-69 | 3 Nov 68 | 4 Nov 68 | 8 Nov 68 | 30 |
| | 502-69 | 17 Nov 68 | 18 Nov 68 | 22 Nov 68 | 30 |
| | 503-69 | 24 Nov 68 | 25 Nov 68 | 29 Nov 68 | 30 |
| | 6-69 | 1 Dec 68 | 2 Dec 68 | 6 Dec 68 | 30 |
| | 7-69 | 19 Jan 69 | 20 Jan 69 | 24 Jan 69 | 30 |
| | 504-69 | 26 Jan 69 | 27 Jan 69 | 31 Jan 69 | 30 |
| | 505-69 | 2 Feb 69 | 3 Feb 69 | 7 Feb 69 | 30 |
| | 8-69 | 9 Feb 69 | 10 Feb 69 | 14 Feb 69 | 30 |
| | 9-69 | 2 Mar 69 | 3 Mar 69 | 7 Mar 69 | 30 |
| | 506-69 | 23 Mar 69 | 24 Mar 69 | 28 Mar 69 | 30 |
| | 10-69 | 30 Mar 69 | 31 Mar 69 | 4 Apr 69 | 30 |
| | 11-69 | 20 Apr 69 | 21 Apr 69 | 25 Apr 69 | 30 |
| | 12-69 | 11 May 69 | 12 May 69 | 16 May 69 | 30 |
| | 13-69 | 1 Jun 69 | 2 Jun 69 | 6 Jun 69 | 30 |
| | 14-69 | 22 Jun 69 | 23 Jun 69 | 27 Jun 69 | 30 |
| | | | | | 600 |
| **4F-F5/041-13A1N** | 3-69 | 2 Aug 68 | 5 Aug 68 | 9 Aug 68 | 15 |
| **8-Inch Nuclear Projectile** | 4-69 | 9 Aug 68 | 12 Aug 68 | 16 Aug 68 | 15 |
| **Assembly** | 5-69 | 23 Aug 68 | 26 Aug 68 | 30 Aug 68 | 15 |
| **(1 Week) (Max Cap: 30)** | 6-69 | 6 Sep 68 | 9 Sep 68 | 13 Sep 68 | 15 |
| | 7-69 | 13 Sep 68 | 16 Sep 68 | 20 Sep 68 | 15 |
| | 501-69 | 20 Sep 68 | 23 Sep 68 | 27 Sep 68 | 15 |
| | 8-69 | 4 Oct 68 | 7 Oct 68 | 11 Oct 68 | 10 |
| | 9-69 | 11 Oct 68 | 14 Oct 68 | 18 Oct 68 | 8 |
| | 10-69 | 18 Oct 68 | 21 Oct 68 | 25 Oct 68 | 8 |
| | 11-69 | 25 Oct 68 | 28 Oct 68 | 1 Nov 68 | 8 |
| | 12-69 | 1 Nov 68 | 4 Nov 68 | 8 Nov 68 | 8 |
| | 13-69 | 15 Nov 68 | 18 Nov 68 | 22 Nov 68 | 8 |
| | 14-69 | 29 Nov 68 | 2 Dec 68 | 6 Dec 68 | 8 |
| | 15-69 | 6 Dec 68 | 9 Dec 68 | 13 Dec 68 | 8 |
| | 16-69 | 10 Jan 69 | 13 Jan 69 | 17 Jan 69 | 8 |
| | 17-69 | 17 Jan 69 | 20 Jan 69 | 24 Jan 69 | 8 |
| | 18-69 | 31 Jan 69 | 3 Feb 69 | 7 Feb 69 | 8 |
| | 19-69 | 7 Feb 69 | 10 Feb 69 | 14 Feb 69 | 8 |
| | 20-69 | 21 Feb 69 | 24 Feb 69 | 28 Feb 69 | 8 |
| | 21-69 | 28 Feb 69 | 3 Mar 69 | 7 Mar 69 | 8 |
| | 22-69 | 7 Mar 69 | 10 Mar 69 | 14 Mar 69 | 8 |
| | 23-69 | 14 Mar 69 | 17 Mar 69 | 21 Mar 69 | 8 |
| | 24-69 | 21 Mar 69 | 24 Mar 69 | 28 Mar 69 | 8 |
| | 25-69 | 28 Mar 69 | 31 Mar 69 | 4 Apr 69 | 8 |
| | 26-69 | 4 Apr 69 | 7 Apr 69 | 11 Apr 69 | 8 |
| | 27-69 | 11 Apr 69 | 14 Apr 69 | 18 Apr 69 | 8 |
| | 28-69 | 18 Apr 69 | 21 Apr 69 | 25 Apr 69 | 8 |
| | 29-69 | 25 Apr 69 | 28 Apr 69 | 2 May 69 | 7 |
| | 30-69 | 2 May 69 | 5 May 69 | 9 May 69 | 7 |
| | 31-69 | 9 May 69 | 12 May 69 | 16 May 69 | 7 |
| | 32-69 | 16 May 69 | 19 May 69 | 23 May 69 | 7 |
| | 33-69 | 30 May 69 | 2 Jun 69 | 6 Jun 69 | 7 |

| COURSE | CLASS NO | REPORT | START | CLOSE | INPUT |
|---|---|---|---|---|---|
| | 34-69 | 6 Jun 69 | 9 Jun 69 | 13 Jun 69 | 7 |
| | 35-69 | 13 Jun 69 | 16 Jun 69 | 20 Jun 69 | 7 |
| | 36-69 | 20 Jun 69 | 23 Jun 69 | 27 Jun 69 | 7 |
| | | | | | 316 |
| **4F-214F/121-15B30** | 1-69 | 22 Jul 68 | 23 Jul 68 | 26 Aug 68 | 21 |
| **Sergeant Missile Battery** | 3-69 | 3 Feb 69 | 4 Feb 69 | 11 Mar 69 | 9 |
| **(5 Weeks) (Max Cap: 32)** | 4-69 | 7 Apr 69 | 8 Apr 69 | 12 May 69 | 9 |
| | 5-69 | 2 Jun 69 | 3 Jun 69 | 8 Jul 69 | 9 |
| | | | | | 48 |
| **4F-214E/121-21G20** | 1-69 | 5 Jul 68 | 8 Jul 68 | 25 Nov 68 | 9 |
| **Pershing System Maintenance** | 2-69 | 6 Sep 68 | 9 Sep 68 | 7 Feb 69 | 9 |
| **(19 Wks, 4 Days)** | 3-69 | 4 Oct 68 | 7 Oct 68 | 10 Mar 69 | 22 |
| **(Max Cap: 21)** | 4-69 | 1 Nov 68 | 4 Nov 68 | 7 Apr 69 | 22 |
| | 5-69 | 6 Dec 68 | 9 Dec 68 | 8 May 69 | 21 |
| | 6-69 | 3 Jan 69 | 6 Jan 69 | 23 May 69 | 21 |
| | 7-69 | 14 Feb 69 | 17 Feb 69 | 8 Jul 69 | 21 |
| | | | | | 125 |
| **1-4F-214E/121-21G20-P1A** | 1-69 | 10 Jan 69 | 13 Jan 69 | 2 Jun 69 | 21 |
| **Pershing System Maintenance,** | 2-69 | 7 Feb 69 | 10 Feb 69 | 30 Jun 69 | 21 |
| **P1A (19 Wks, 4 Days)** | 3-69 | 28 Mar 69 | 31 Mar 69 | 18 Aug 69 | 21 |
| | 4-69 | 11 Apr 69 | 14 Apr 69 | 2 Sep 69 | 20 |
| | 5-69 | 9 May 69 | 12 May 69 | 30 Sep 69 | 20 |
| | 6-69 | 30 May 69 | 2 Jun 69 | 20 Oct 69 | 20 |
| | 7-69 | 27 Jun 69 | 30 Jun 69 | 18 Nov 69 | 20 |
| | | | | | 143 |
| **(UNNUMBERED)** | 1-69 | 6 Jan 69 | 7 Jan 69 | 18 Mar 69 | 20 |
| **Pershing System Maintenance** | 2-69 | 3 Feb 69 | 4 Feb 69 | 15 Apr 69 | 20 |
| **Transition, P1A (10 Weeks)** | 3-69 | 10 Feb 69 | 11 Feb 69 | 22 Apr 69 | 20 |
| | 4-69 | 28 Apr 69 | 29 Apr 69 | 9 Jul 69 | 20 |
| | | | | | 80 |
| **4B-F1/101-31B30** | 501-69 | 12 Jul 68 | 15 Jul 68 | 26 Jul 68 | 24 |
| **FADAC Maintenance** | 502-69 | 26 Jul 68 | 29 Jul 68 | 9 Aug 68 | 24 |
| **(1 Wk, 5 Days)** | 503-69 | 16 Aug 68 | 19 Aug 68 | 30 Aug 68 | 24 |
| **(Max Cap: 24)** | 504-69 | 30 Aug 68 | 3 Sep 68 | 16 Sep 68 | 24 |
| | 505-69 | 20 Sep 68 | 23 Sep 68 | 4 Oct 68 | 24 |
| | 2-69 | 11 Oct 68 | 14 Oct 68 | 25 Oct 68 | 24 |
| | 3-69 | 1 Nov 68 | 4 Nov 68 | 18 Nov 68 | 24 |
| | 4-69 | 6 Dec 68 | 9 Dec 68 | 20 Dec 68 | 11 |
| | 5-69 | 5 Jan 69 | 6 Jan 69 | 17 Jan 69 | 11 |
| | 6-69 | 14 Feb 69 | 17 Feb 69 | 3 Mar 69 | 11 |
| | 7-69 | 7 Mar 69 | 10 Mar 69 | 21 Mar 69 | 11 |
| | 8-69 | 4 Apr 69 | 7 Apr 69 | 18 Apr 69 | 11 |
| | 9-69 | 25 Apr 69 | 28 Apr 69 | 9 May 69 | 11 |
| | 10-69 | 16 May 69 | 19 May 69 | 2 Jun 69 | 10 |
| | 11-69 | 6 Jun 69 | 9 Jun 69 | 20 Jun 69 | 10 |
| | | | | | 254 |
| **5B-F1/420-93F20** | 1-69 | 15 Jul 68 | 16 Jul 68 | 23 Sep 68 | 30 |
| **Artillery Ballistic Meteorology** | 2-69 | 5 Aug 68 | 6 Aug 68 | 14 Oct 68 | 30 |
| **(9 Wks, 4 Days)** | 3-69 | 26 Aug 68 | 27 Aug 68 | 4 Nov 68 | 30 |
| **(Max Cap: 40)** | 4-69 | 16 Sep 68 | 17 Sep 68 | 25 Nov 68 | 30 |
| | 5-69 | 7 Oct 68 | 8 Oct 68 | 17 Dec 68 | 42 |
| | 6-69 | 28 Oct 68 | 29 Oct 68 | 20 Jan 69 | 42 |
| | 7-69 | 18 Nov 68 | 19 Nov 68 | 7 Feb 69 | 42 |

| COURSE | CLASS NO | REPORT | START | CLOSE | INPUT |
|---|---|---|---|---|---|
| | 8-69 | 9 Dec 68 | 10 Dec 68 | 28 Feb 69 | 42 |
| | 9-69 | 13 Jan 69 | 14 Jan 69 | 24 Mar 69 | 42 |
| | 10-69 | 3 Feb 69 | 4 Feb 69 | 14 Apr 69 | 42 |
| | 11-69 | 24 Feb 69 | 25 Feb 69 | 2 May 69 | 42 |
| | 12-69 | 17 Mar 69 | 18 Mar 69 | 23 May 69 | 42 |
| | 13-69 | 7 Apr 69 | 8 Apr 69 | 16 Jun 69 | 42 |
| | 14-69 | 28 Apr 69 | 29 Apr 69 | 8 Jul 69 | 42 |
| | 15-69 | 19 May 69 | 20 May 69 | 29 Jul 69 | 41 |
| | 16-69 | 9 Jun 69 | 10 Jun 69 | 18 Aug 69 | 41 |
| | | | | | 622 |
| | | **PH I REPT** | **PH II REPT** | | |
| **4C-211A/104-26B20** | 1-69 | 9 Aug 68 | 31 Oct 68 | 3 Mar 69 | 24 |
| **Weapons Support Radar** | 2-69 | 20 Sep 68 | 13 Dec 68 | 17 Apr 69 | 24 |
| **Maintenance (26 Wks, 3 Days)** | 3-69 | 1 Nov 68 | 6 Feb 69 | 23 May 69 | 24 |
| **(PH I: 11 Wks, 4 Days)** | 4-69 | 10 Jan 69 | 3 Apr 69 | 21 Jul 69 | 24 |
| **(PH II: 14 Wks, 4 Days)** | 5-69 | 7 Feb 69 | 1 May 69 | 18 Aug 69 | 24 |
| **(Max Cap: 24)** | 6-69 | 4 Apr 69 | 26 Jun 69 | 13 Oct 69 | 24 |
| | 7-69 | 2 May 69 | 25 Jul 69 | 10 Nov 69 | 24 |
| | 8-69 | 27 Jun 69 | 19 Sep 69 | 20 Jan 70 | 24 |
| | | | | | 192 |
| | | **ENLISTED** | | | |
| **1-2-6-F1** | 1-69 | 14 Jul 68 | 22 Jul 68 | 20 Dec 68 | 126 |
| **FA Officer Candidate** | 2-69 | 4 Aug 68 | 12 Aug 68 | 28 Jan 69 | 126 |
| **(23 Weeks) (Max Cap: 126)** | 3-69 | 25 Aug 68 | 3 Sep 68 | 18 Feb 69 | 126 |
| | 4-69 | 8 Sep 68 | 16 Sep 68 | 4 Mar 69 | 126 |
| | 5-69 | 15 Sep 68 | 23 Sep 68 | 11 Mar 69 | 126 |
| | 6-69 | 6 Oct 68 | 14 Oct 68 | 1 Apr 69 | 126 |
| | 7-69 | 20 Oct 68 | 28 Oct 68 | 15 Apr 69 | 126 |
| | 8-69 | 3 Nov 68 | 12 Nov 68 | 29 Apr 69 | 126 |
| | 9-69 | 17 Nov 68 | 25 Nov 68 | 13 May 69 | 126 |
| | 10-69 | 1 Dec 68 | 9 Dec 68 | 27 May 69 | 126 |
| | 11-69 | 8 Dec 68 | 16 Dec 68 | 3 Jun 69 | 126 |
| | 12-69 | 5 Jan 69 | 13 Jan 69 | 17 Jun 69 | 126 |
| | 13-69 | 19 Jan 69 | 28 Jan 69 | 1 Jul 69 | 126 |
| | 14-69 | 2 Feb 69 | 10 Feb 69 | 15 Jul 69 | 126 |
| | 15-69 | 16 Feb 69 | 24 Feb 69 | 29 Jul 69 | 126 |
| | 16-69 | 2 Mar 69 | 10 Mar 69 | 12 Aug 69 | 126 |
| | 17-69 | 16 Mar 69 | 24 Mar 69 | 26 Aug 69 | 126 |
| | 18-69 | 30 Mar 69 | 7 Apr 69 | 9 Sep 69 | 126 |
| | 19-69 | 13 Apr 69 | 21 Apr 69 | 23 Sep 69 | 126 |
| | 20-69 | 27 Apr 69 | 5 May 69 | 7 Oct 69 | 126 |
| | 21-69 | 11 May 69 | 19 May 69 | 21 Oct 69 | 126 |
| | 22-69 | 25 May 69 | 2 Jun 69 | 4 Nov 69 | 126 |
| | 23-69 | 8 Jun 69 | 16 Jun 69 | 18 Nov 69 | 126 |
| | 24-69 | 22 Jun 69 | 30 Jun 69 | 2 Dec 69 | 126 |
| | | | | | 3024 |
| **2-6-F2** | 1-69 | 7 Mar 69 | 10 Mar 69 | 24 May 69 | 104 |
| **FA Officer Candidate** | 2-69 | 13 Jun 69 | 16 Jun 69 | 30 Aug 69 | 105 |
| **(Res Comp) (11 Weeks)** | | | | | |
| **(Max Cap: 120)** | | | | | 209 |
| **41-F1** | 1-69 | 7 Jul 68 | 8 Jul 68 | 20 Jul 68 | 20 |
| **Self-Propelled Artillery** | 2-69 | 4 Aug 68 | 5 Aug 68 | 17 Aug 68 | 20 |
| **Cannon, Chief of Section** | 3-69 | 8 Sep 68 | 9 Sep 68 | 21 Sep 68 | 20 |
| **(2 Weeks) (Max Cap: 20)** | 4-69 | 29 Sep 68 | 30 Sep 68 | 12 Oct 68 | 20 |
| | 5-69 | 20 Oct 68 | 21 Oct 68 | 2 Nov 68 | 20 |
| | 6-69 | 17 Nov 68 | 18 Nov 68 | 30 Nov 68 | 20 |

| COURSE | CLASS NO | REPORT | START | CLOSE | INPUT |
|---|---|---|---|---|---|
| | 8-69 | 5 Jan 69 | 6 Jan 69 | 18 Jan 69 | 20 |
| | 10-69 | 2 Feb 69 | 3 Feb 69 | 15 Feb 69 | 20 |
| | 12-69 | 9 Mar 69 | 10 Mar 69 | 22 Mar 69 | 20 |
| | 14-69 | 13 Apr 69 | 14 Apr 69 | 26 Apr 69 | 20 |
| | 16-69 | 11 May 69 | 12 May 69 | 24 May 69 | 20 |
| | 18-69 | 15 Jun 69 | 16 Jun 69 | 28 Jun 69 | 20 |
| | | | | | 240 |
| **101-F4** | 1-69 | 3 Oct 68 | 4 Oct 68 | 18 Dec 68 | 45 |
| **Communications Chief** | 2-69 | 3 Apr 69 | 4 Apr 69 | 17 Jun 69 | 44 |
| **(10 Wks, 3 Days)** | | | | | |
| **(Max Cap: 40)** | | | | | 89 |
| **250-F1** | 1-69 | 7 Jul 68 | 8 Jul 68 | 24 Sep 68 | 33 |
| **FA Operations and** | 2-69 | 29 Sep 68 | 30 Sep 68 | 18 Dec 68 | 33 |
| **Intelligence Assistant** | 3-69 | 12 Jan 69 | 13 Jan 69 | 25 Mar 69 | 33 |
| **(11 Wks, 1 Day)** | 4-69 | 6 Apr 69 | 7 Apr 69 | 24 Jun 69 | 32 |
| **(Max Cap: 65)** | | | | | 131 |
| **121-15E20** | 1-69 | 1 Jul 68 | 2 Jul 68 | 19 Aug 68 | 17 |
| **Pershing Missile Battery** | 2-69 | 3 Sep 68 | 4 Sep 68 | 21 Oct 68 | 17 |
| **(6 Wks, 4 Days)** | 3-69 | 16 Sep 68 | 17 Sep 68 | 1 Nov 68 | 17 |
| **(Max Cap: 35)** | 4-69 | 23 Sep 68 | 24 Sep 68 | 8 Nov 68 | 17 |
| | 5-69 | 4 Nov 68 | 5 Nov 68 | 20 Dec 68 | 35 |
| | 6-69 | 6 Jan 69 | 7 Jan 69 | 24 Feb 69 | 35 |
| | 7-69 | 20 Jan 69 | 21 Jan 69 | 10 Mar 69 | 35 |
| | 8-69 | 10 Mar 69 | 11 Mar 69 | 25 Apr 69 | 35 |
| | 9-69 | 17 Mar 69 | 18 Mar 69 | 2 May 69 | 35 |
| | 10-69 | 24 Mar 69 | 25 Mar 69 | 9 May 69 | 35 |
| | 11-69 | 14 Apr 69 | 15 Apr 69 | 2 Jun 69 | 35 |
| | 12-69 | 5 May 69 | 6 May 69 | 23 Jun 69 | 36 |
| | 13-69 | 12 May 69 | 13 May 69 | 30 Jun 69 | 36 |
| | | | | | 385 |
| **412-F1** | 1-69 | 26 Jul 68 | 29 Jul 68 | 23 Aug 68 | 28 |
| **Artillery Survey NCO** | 2-69 | 7 Mar 69 | 10 Mar 69 | 4 Apr 69 | 28 |
| **(4 Weeks) (Max Cap: 80)** | 3-69 | 25 Apr 69 | 28 Apr 69 | 23 May 69 | 29 |
| | | | | | 85 |
| **610/611-F1** | 1-69 | 7 Jul 68 | 9 Jul 68 | 6 Sep 68 | 22 |
| **Master Mechanic** | 2-69 | 18 Aug 68 | 20 Aug 68 | 18 Oct 68 | 22 |
| **(9 Weeks) (Max Cap: 40)** | 3-69 | 29 Sep 68 | 1 Oct 68 | 29 Nov 68 | 22 |
| | 4-69 | 10 Nov 68 | 13 Nov 68 | 24 Jan 69 | 22 |
| | 5-69 | 5 Jan 69 | 7 Jan 69 | 7 Mar 69 | 22 |
| | 6-69 | 23 Feb 69 | 25 Feb 69 | 25 Apr 69 | 22 |
| | 7-69 | 6 Apr 69 | 8 Apr 69 | 6 Jun 69 | 23 |
| | 8-69 | 18 May 69 | 20 May 69 | 18 Jul 69 | 23 |
| | | | | | 178 |
| **221-17B20** | 1-69 | 5 Aug 68 | 6 Aug 68 | 1 Oct 68 | 70 |
| **FA Radar Operation** | 2-69 | 9 Sep 68 | 10 Sep 68 | 4 Nov 68 | 70 |
| **(8 Wks, 2 Days)** | 3-69 | 30 Sep 68 | 1 Oct 68 | 26 Nov 68 | 70 |
| **(Max Cap: 35)** | 4-69 | 4 Nov 68 | 5 Nov 68 | 14 Jan 69 | 60 |
| | 5-69 | 25 Nov 68 | 26 Nov 68 | 5 Feb 69 | 60 |
| | 6-69 | 13 Jan 69 | 14 Jan 69 | 13 Mar 69 | 60 |
| | 7-69 | 10 Feb 69 | 11 Feb 69 | 10 Apr 69 | 60 |
| | 8-69 | 10 Mar 69 | 11 Mar 69 | 7 May 69 | 60 |
| | 9-69 | 14 Apr 69 | 15 Apr 69 | 12 Jun 69 | 60 |
| | 10-69 | 5 May 69 | 6 May 69 | 3 Jul 69 | 60 |
| | 11-69 | 9 Jun 69 | 10 Jun 69 | 7 Aug 69 | 54 |
| | | | | | 684 |

| COURSE | CLASS NO | REPORT | START | CLOSE | INPUT |
|---|---|---|---|---|---|
| **412-17C20** | 1-69 | 22 Jul 68 | 23 Jul 68 | 12 Sep 68 | 22 |
| **Artillery Sound Ranging** | 2-69 | 30 Sep 68 | 1 Oct 68 | 21 Nov 68 | 22 |
| **(7 Wks, 2 Days)** | 3-69 | 2 Dec 68 | 3 Dec 68 | 4 Feb 69 | 24 |
| **(Max Cap: 28)** | 4-69 | 17 Feb 69 | 18 Feb 69 | 10 Apr 69 | 23 |
| | 5-69 | 21 Apr 69 | 22 Apr 69 | 12 Jun 69 | 23 |
| | 6-69 | 23 Jun 69 | 24 Jun 69 | 14 Aug 69 | 23 |
| | | | | | 137 |
| **ASubScd 11-31B20** | 1-69 | 1 Jul 68 | 2 Jul 68 | 4 Sep 68 | 40 |
| **Field Radio Mechanic** | 2-69 | 8 Jul 68 | 9 Jul 68 | 10 Sep 68 | 40 |
| **(9 Weeks) (Max Cap: 40)** | 3-69 | 15 Jul 68 | 16 Jul 68 | 17 Sep 68 | 40 |
| | 4-69 | 22 Jul 68 | 23 Jul 68 | 24 Sep 68 | 40 |
| | 5-69 | 29 Jul 68 | 30 Jul 68 | 1 Oct 68 | 40 |
| | 6-69 | 5 Aug 68 | 6 Aug 68 | 8 Oct 68 | 40 |
| | 7-69 | 12 Aug 68 | 13 Aug 68 | 15 Oct 68 | 40 |
| | 8-69 | 19 Aug 68 | 20 Aug 68 | 22 Oct 68 | 40 |
| | 9-69 | 26 Aug 68 | 27 Aug 68 | 29 Oct 68 | 40 |
| | 10-69 | 2 Sep 68 | 3 Sep 68 | 4 Nov 68 | 40 |
| | 11-69 | 9 Sep 68 | 10 Sep 68 | 12 Nov 68 | 40 |
| | 12-69 | 16 Sep 68 | 17 Sep 68 | 19 Nov 68 | 40 |
| | 13-69 | 23 Sep 68 | 24 Sep 68 | 26 Nov 68 | 40 |
| | 14-69 | 7 Oct 68 | 8 Oct 68 | 11 Dec 68 | 40 |
| | 15-69 | 14 Oct 68 | 15 Oct 68 | 18 Dec 68 | 40 |
| | 16-69 | 21 Oct 68 | 22 Oct 68 | 8 Jan 69 | 40 |
| | 17-69 | 28 Oct 68 | 29 Oct 68 | 15 Jan 69 | 40 |
| | 18-69 | 4 Nov 68 | 5 Nov 68 | 22 Jan 69 | 40 |
| | 19-69 | 11 Nov 68 | 12 Nov 68 | 28 Jan 69 | 40 |
| | 20-69 | 18 Nov 68 | 19 Nov 68 | 4 Feb 69 | 40 |
| | 21-69 | 25 Nov 68 | 26 Nov 68 | 11 Feb 69 | 40 |
| | 22-69 | 2 Dec 68 | 3 Dec 68 | 17 Feb 69 | 40 |
| | 23-69 | 9 Dec 68 | 10 Dec 68 | 25 Feb 69 | 40 |
| | 24-69 | 16 Dec 68 | 17 Dec 68 | 4 Mar 69 | 40 |
| | 25-69 | 6 Jan 69 | 7 Jan 69 | 11 Mar 69 | 40 |
| | 26-69 | 13 Jan 69 | 14 Jan 69 | 18 Mar 69 | 40 |
| | 27-69 | 20 Jan 69 | 21 Jan 69 | 25 Mar 69 | 40 |
| | 28-69 | 3 Feb 69 | 4 Feb 69 | 8 Apr 69 | 40 |
| | 29-69 | 10 Feb 69 | 11 Feb 69 | 15 Apr 69 | 40 |
| | 30-69 | 17 Feb 69 | 18 Feb 69 | 22 Apr 69 | 40 |
| | 31-69 | 24 Feb 69 | 25 Feb 69 | 28 Apr 69 | 40 |
| | 32-69 | 3 Mar 69 | 4 Mar 69 | 5 May 69 | 40 |
| | 33-69 | 10 Mar 69 | 11 Mar 69 | 12 May 69 | 40 |
| | 34-69 | 17 Mar 69 | 18 Mar 69 | 19 May 69 | 40 |
| | 35-69 | 24 Mar 69 | 25 Mar 69 | 26 May 69 | 40 |
| | 36-69 | 31 Mar 69 | 1 Apr 69 | 3 Jun 69 | 40 |
| | 37-69 | 14 Apr 69 | 15 Apr 69 | 17 Jun 69 | 40 |
| | 38-69 | 21 Apr 69 | 22 Apr 69 | 24 Jun 69 | 40 |
| | 39-69 | 28 Apr 69 | 29 Apr 69 | 1 Jul 69 | 40 |
| | 40-69 | 5 May 69 | 6 May 69 | 9 Jul 69 | 40 |
| | 41-69 | 12 May 69 | 13 May 69 | 16 Jul 69 | 40 |
| | 42-69 | 19 May 69 | 20 May 69 | 23 Jul 69 | 40 |
| | 43-69 | 26 May 69 | 27 May 69 | 30 Jul 69 | 40 |
| | 44-69 | 2 Jun 69 | 3 Jun 69 | 5 Aug 69 | 40 |
| | 45-69 | 9 Jun 69 | 10 Jun 69 | 12 Aug 69 | 40 |
| | 46-69 | 23 Jun 69 | 24 Jun 69 | 26 Aug 69 | 40 |
| | 47-69 | 30 Jun 69 | 1 Jul 69 | 3 Sep 69 | 40 |
| | | | | | 1880 |
| **101-31D20** | 1-69 | 5 Aug 68 | 6 Aug 68 | 2 Oct 68 | 18 |
| **Pershing Communications** | 2-69 | 21 Oct 68 | 22 Oct 68 | 19 Dec 68 | 18 |
| **Specialist (8 Wks, 1 Day)** | 3-69 | 6 Jan 69 | 7 Jan 69 | 5 Mar 69 | 18 |
| **(Max Cap: 18)** | 4-69 | 17 Mar 69 | 18 Mar 69 | 13 May 69 | 18 |
| | 5-69 | 26 May 69 | 27 May 69 | 24 Jul 69 | 18 |
| | | | | | 90 |

| COURSE | CLASS NO | REPORT | START | CLOSE | INPUT |
|---|---|---|---|---|---|
| **98-35D20** | 1-69 | 27 Sep 68 | 30 Sep 68 | 20 Jan 69 | 10 |
| **Meteorological Equipment** | 2-69 | 24 Jan 69 | 27 Jan 69 | 5 May 69 | 20 |
| **Mechanic (14 Weeks)** | 3-69 | 4 Apr 69 | 7 Apr 69 | 15 Jul 69 | 19 |
| **(Max Cap: 14)** | 4-69 | 13 Jun 69 | 16 Jun 69 | 23 Sep 69 | 19 |
| | | | | | 68 |
| **198-35D30** | 1-69 | 27 Sep 68 | 30 Sep 68 | 3 Mar 69 | 22 |
| **Meteorological Equipment** | 2-69 | 24 Jan 69 | 27 Jan 69 | 16 Jun 69 | 22 |
| **Repairman** | 3-69 | 13 Jun 69 | 16 Jun 69 | 3 Nov 69 | 21 |
| **(19 Wks, 4 Days)** | | | | | |
| **(Max Cap: 18)** | | | | | 65 |
| **642-45F20-B** | 1-69 | 7 Jul 68 | 8 Jul 68 | 5 Aug 68 | 24 |
| **Light and Medium Towed** | 2-69 | 4 Aug 68 | 5 Aug 68 | 3 Sep 68 | 24 |
| **FA Mechanic (4 Wks, 1 Day)** | 3-69 | 8 Sep 68 | 9 Sep 68 | 7 Oct 68 | 24 |
| **(Max Cap: 25)** | 4-69 | 6 Oct 68 | 7 Oct 68 | 4 Nov 68 | 24 |
| | 5-69 | 17 Nov 68 | 18 Nov 68 | 17 Dec 68 | 24 |
| | 6-69 | 5 Jan 69 | 6 Jan 69 | 3 Feb 69 | 24 |
| | 7-69 | 2 Feb 69 | 3 Feb 69 | 4 Mar 69 | 24 |
| | 8-69 | 2 Mar 69 | 3 Mar 69 | 31 Mar 69 | 24 |
| | 9-69 | 30 Mar 69 | 31 Mar 69 | 28 Apr 69 | 24 |
| | 10-69 | 27 Apr 69 | 28 Apr 69 | 26 May 69 | 24 |
| | 11-69 | 1 Jun 69 | 2 Jun 69 | 30 Jun 69 | 24 |
| | | | | | 264 |
| **611-63C20** | 1-69 | 7 Jul 68 | 9 Jul 68 | 23 Aug 68 | 43 |
| **Tracked Vehicle Mechanic** | 2-69 | 14 Jul 68 | 16 Jul 68 | 30 Aug 68 | 43 |
| **(7 Weeks) (Max Cap: 45)** | 3-69 | 21 Jul 68 | 23 Jul 68 | 7 Sep 68 | 43 |
| | 4-69 | 28 Jul 68 | 30 Jul 68 | 13 Sep 68 | 43 |
| | 5-69 | 4 Aug 68 | 6 Aug 68 | 20 Sep 68 | 43 |
| | 6-69 | 11 Aug 68 | 13 Aug 68 | 27 Sep 68 | 43 |
| | 7-69 | 18 Aug 68 | 20 Aug 68 | 4 Oct 68 | 43 |
| | 8-69 | 25 Aug 68 | 27 Aug 68 | 11 Oct 68 | 43 |
| | 9-69 | 1 Sep 68 | 4 Sep 68 | 18 Oct 68 | 43 |
| | 10-69 | 8 Sep 68 | 10 Sep 68 | 25 Oct 68 | 43 |
| | 11-69 | 15 Sep 68 | 17 Sep 68 | 1 Nov 68 | 43 |
| | 12-69 | 22 Sep 68 | 24 Sep 68 | 8 Nov 68 | 43 |
| | 13-69 | 29 Sep 68 | 1 Oct 68 | 16 Nov 68 | 43 |
| | 14-69 | 6 Oct 68 | 8 Oct 68 | 22 Nov 68 | 43 |
| | 15-69 | 13 Oct 68 | 15 Oct 68 | 30 Nov 68 | 43 |
| | 16-69 | 20 Oct 68 | 22 Oct 68 | 6 Dec 68 | 43 |
| | 17-69 | 27 Oct 68 | 29 Oct 68 | 13 Dec 68 | 43 |
| | 18-69 | 3 Nov 68 | 5 Nov 68 | 20 Dec 68 | 43 |
| | 19-69 | 17 Nov 68 | 19 Nov 68 | 17 Jan 69 | 43 |
| | 20-69 | 24 Nov 68 | 26 Nov 68 | 24 Jan 69 | 43 |
| | 21-69 | 1 Dec 68 | 3 Dec 68 | 31 Jan 69 | 43 |
| | 22-69 | 8 Dec 68 | 10 Dec 68 | 7 Feb 69 | 43 |
| | 23-69 | 5 Jan 69 | 7 Jan 69 | 20 Feb 69 | 43 |
| | 24-69 | 12 Jan 69 | 14 Jan 69 | 28 Feb 69 | 43 |
| | 25-69 | 19 Jan 69 | 21 Jan 69 | 7 Mar 69 | 43 |
| | 26-69 | 26 Jan 69 | 28 Jan 69 | 14 Mar 69 | 43 |
| | 27-69 | 2 Feb 69 | 4 Feb 69 | 21 Mar 69 | 43 |
| | 28-69 | 9 Feb 69 | 11 Feb 69 | 28 Mar 69 | 43 |
| | 29-69 | 23 Feb 69 | 25 Feb 69 | 11 Apr 69 | 43 |
| | 30-69 | 2 Mar 69 | 4 Mar 69 | 18 Apr 69 | 43 |
| | 31-69 | 9 Mar 69 | 11 Mar 69 | 25 Apr 69 | 43 |
| | 32-69 | 16 Mar 69 | 18 Mar 69 | 2 May 69 | 43 |
| | 33-69 | 23 Mar 69 | 25 Mar 69 | 9 May 69 | 43 |
| | 34-69 | 30 Mar 69 | 1 Apr 69 | 16 May 69 | 43 |
| | 35-69 | 6 Apr 69 | 8 Apr 69 | 23 May 69 | 43 |
| | 36-69 | 13 Apr 69 | 15 Apr 69 | 31 May 69 | 43 |
| | 37-69 | 20 Apr 69 | 22 Apr 69 | 6 Jun 69 | 43 |

| COURSE | CLASS NO | REPORT | START | CLOSE | INPUT |
|---|---|---|---|---|---|
| | 38-69 | 27 Apr 69 | 29 Apr 69 | 13 Jun 69 | 43 |
| | 39-69 | 4 May 69 | 6 May 69 | 20 Jun 69 | 43 |
| | 40-69 | 11 May 69 | 13 May 69 | 27 Jun 69 | 42 |
| | 41-69 | 18 May 69 | 20 May 69 | 5 Jul 69 | 42 |
| | 42-69 | 25 May 69 | 27 May 69 | 11 Jul 69 | 42 |
| | 43-69 | 1 Jun 69 | 3 Jun 69 | 18 Jul 69 | 42 |
| | 44-69 | 8 Jun 69 | 10 Jun 69 | 25 Jul 69 | 42 |
| | 45-69 | 15 Jun 69 | 17 Jun 69 | 1 Aug 69 | 42 |
| | | | | | 1929 |
| **412-82C20** | 1-69 | 1 Jul 68 | 2 Jul 68 | 29 Aug 68 | 100 |
| **Artillery Survey Specialist** | 2-69 | 8 Jul 68 | 9 Jul 68 | 5 Sep 68 | 100 |
| **(8 Wks, 2 Days)** | 3-69 | 15 Jul 68 | 16 Jul 68 | 12 Sep 68 | 100 |
| **(Max Cap: 90)** | 4-69 | 22 Jul 68 | 23 Jul 68 | 19 Sep 68 | 100 |
| | 5-69 | 19 Aug 68 | 20 Aug 68 | 17 Oct 68 | 100 |
| | 6-69 | 26 Aug 68 | 27 Aug 68 | 24 Oct 68 | 100 |
| | 7-69 | 9 Sep 68 | 10 Sep 68 | 6 Nov 68 | 100 |
| | 8-69 | 16 Sep 68 | 17 Sep 68 | 14 Nov 68 | 100 |
| | 9-69 | 14 Oct 68 | 15 Oct 68 | 13 Dec 68 | 101 |
| | 10-69 | 21 Oct 68 | 22 Oct 68 | 20 Dec 68 | 101 |
| | 11-69 | 6 Jan 69 | 7 Jan 69 | 6 Mar 69 | 101 |
| | 12-69 | 13 Jan 69 | 14 Jan 69 | 13 Mar 69 | 101 |
| | 13-69 | 20 Jan 69 | 21 Jan 69 | 20 Mar 69 | 101 |
| | 14-69 | 27 Jan 69 | 28 Jan 69 | 27 Mar 69 | 101 |
| | 15-69 | 3 Feb 69 | 4 Feb 69 | 3 Apr 69 | 101 |
| | 16-69 | 3 Mar 69 | 4 Mar 69 | 30 Apr 69 | 101 |
| | 17-69 | 10 Mar 69 | 11 Mar 69 | 7 May 69 | 101 |
| | 18-69 | 17 Mar 69 | 18 Mar 69 | 14 May 69 | 101 |
| | 19-69 | 24 Mar 69 | 25 Mar 69 | 21 May 69 | 101 |
| | 20-69 | 7 Apr 69 | 8 Apr 69 | 5 Jun 69 | 101 |
| | 21-69 | 5 May 69 | 6 May 69 | 3 Jul 69 | 101 |
| | 22-69 | 12 May 69 | 13 May 69 | 11 Jul 69 | 101 |
| | 23-69 | 19 May 69 | 20 May 69 | 18 Jul 69 | 101 |
| | 24-69 | 2 Jun 69 | 3 Jun 69 | 31 Jul 69 | 101 |
| | 25-69 | 30 Jun 69 | 1 Jul 69 | 28 Aug 69 | 101 |
| | | | | | 2517 |

**NOTE:** The following courses are for active Army only. Primary purpose of courses is to support operations in Vietnam.

| | | | | | |
|---|---|---|---|---|---|
| **250-13E40-I** | 1-69 | 12 Jul 68 | 15 Jul 68 | 12 Oct 68 | 38 |
| **FA Operations &** | 2-69 | 8 Nov 68 | 12 Nov 68 | 28 Feb 69 | 38 |
| **Intelligence Assistant** | 3-69 | 22 Mar 69 | 24 Mar 69 | 21 Jun 69 | 38 |
| **Skill Development** | | | | | |
| **Base (SDB) (13 Weeks)** | | | | | 114 |
| **221-17B40-I** | 1-69 | 28 Jul 68 | 29 Jul 68 | 21 Oct 68 | 6 |
| **FA Radar Crewman** | 2-69 | 6 Oct 68 | 7 Oct 68 | 13 Jan 69 | 6 |
| **Skill Development** | 3-69 | 10 Nov 68 | 12 Nov 68 | 17 Feb 69 | 5 |
| **Base (SDB) (12 Weeks)** | 4-69 | 1 Dec 68 | 2 Dec 68 | 7 Mar 69 | 5 |
| **(Max Cap: 6)** | 5-69 | 19 Jan 69 | 20 Jan 69 | 14 Apr 69 | 5 |
| | 6-69 | 16 Feb 69 | 17 Feb 69 | 12 May 69 | 5 |
| | 7-69 | 16 Mar 69 | 17 Mar 69 | 16 Jun 69 | 5 |
| | 8-69 | 13 Apr 69 | 14 Apr 69 | 8 Jul 69 | 5 |
| | 9-69 | 11 May 69 | 12 May 69 | 5 Aug 69 | 5 |
| | 10-69 | 15 Jun 69 | 16 Jun 69 | 9 Sep 69 | 5 |
| | | | | | 52 |

| COURSE | CLASS NO | REPORT | START | CLOSE | INPUT |
|---|---|---|---|---|---|
| **030-17E40-I** | 1-69 | 27 Jul 68 | 29 Jul 68 | 31 Aug 68 | 15 |
| **Field Illumination Crewman** | 2-69 | 28 Sep 68 | 30 Sep 68 | 2 Nov 68 | 15 |
| **Skill Development** | 3-69 | 11 Jan 69 | 13 Jan 69 | 15 Feb 69 | 15 |
| **Base (SDB) (5 Weeks)** | 4-69 | 22 Mar 69 | 24 Mar 69 | 26 Apr 69 | 15 |
| **(Max Cap: 18)** | 5-69 | 17 May 69 | 19 May 69 | 21 Jun 69 | 15 |
| | | | | | 75 |
| **101-31G40-I** | 1-69 | 15 Jul 68 | 19 Jul 68 | 11 Oct 68 | 41 |
| **Tactical Communications Chief** | 2-69 | 3 Sep 68 | 6 Sep 68 | 2 Dec 68 | 41 |
| **Skill Development** | 3-69 | 21 Oct 68 | 25 Oct 68 | 3 Feb 69 | 41 |
| **Base (SDB) (12 Weeks)** | 4-69 | 6 Jan 69 | 10 Jan 69 | 4 Apr 69 | 41 |
| **(Max Cap: 40)** | 5-69 | 3 Mar 69 | 7 Mar 69 | 29 May 69 | 41 |
| | 6-69 | 21 Apr 69 | 25 Apr 69 | 21 Jul 69 | 41 |
| | 7-69 | 2 Jun 69 | 6 Jun 69 | 29 Aug 69 | 40 |
| | | | | | 286 |
| **420-93F20-I** | 1-69 | 11 Aug 68 | 12 Aug 68 | 14 Oct 68 | 13 |
| **Ballistics Meteorology Crewman** | 2-69 | 21 Sep 68 | 23 Sep 68 | 25 Nov 68 | 12 |
| **Skill Development** | 3-69 | 5 Jan 69 | 6 Jan 69 | 10 Mar 69 | 12 |
| **Base (SDB) (9 Weeks)** | 4-69 | 4 Apr 69 | 5 Apr 69 | 9 Jun 69 | 12 |
| **(Max Cap: 13)** | | | | | |
| | | | | | 49 |
| **041-13B40-I** | 1-69 | 1 Jul 68 | 8 Jul 68 | 19 Oct 68 | 48 |
| **FA Noncommissioned Officer** | 2-69 | 15 Jul 68 | 22 Jul 68 | 2 Nov 68 | 48 |
| **Candidate (15 Weeks)** | 3-69 | 29 Jul 68 | 5 Aug 68 | 16 Nov 68 | 48 |
| **(Max Cap: 48)** | 4-69 | 12 Aug 68 | 19 Aug 68 | 30 Nov 68 | 48 |
| | 5-69 | 26 Aug 68 | 3 Sep 68 | 14 Dec 68 | 48 |
| | 6-69 | 9 Sep 68 | 16 Sep 68 | 20 Dec 68 | 48 |
| | 7-69 | 23 Sep 68 | 30 Sep 68 | 25 Jan 69 | 48 |
| | 8-69 | 7 Oct 68 | 14 Oct 68 | 8 Feb 69 | 48 |
| | 9-69 | 21 Oct 68 | 28 Oct 68 | 20 Feb 69 | 48 |
| | 10-69 | 4 Nov 68 | 12 Nov 68 | 8 Mar 69 | 48 |
| | 11-69 | 18 Nov 68 | 25 Nov 68 | 22 Mar 69 | 48 |
| | 12-69 | 2 Dec 68 | 9 Dec 68 | 5 Apr 69 | 48 |
| | 13-69 | 13 Jan 69 | 20 Jan 69 | 3 May 69 | 48 |
| | 14-69 | 27 Jan 69 | 3 Feb 69 | 17 May 69 | 48 |
| | 15-69 | 10 Feb 69 | 17 Feb 69 | 31 May 69 | 48 |
| | 16-69 | 24 Feb 69 | 3 Mar 69 | 14 Jun 69 | 47 |
| | 17-69 | 10 Mar 69 | 17 Mar 69 | 28 Jun 69 | 47 |
| | 18-69 | 24 Mar 69 | 31 Mar 69 | 12 Jul 69 | 47 |
| | 19-69 | 7 Apr 69 | 14 Apr 69 | 26 Jul 69 | 47 |
| | 20-69 | 21 Apr 69 | 28 Apr 69 | 9 Aug 69 | 47 |
| | 21-69 | 5 May 69 | 12 May 69 | 23 Aug 69 | 47 |
| | 22-69 | 19 May 69 | 26 May 69 | 6 Sep 69 | 47 |
| | 23-69 | 2 Jun 69 | 9 Jun 69 | 20 Sep 69 | 47 |
| | | | | | 1096 |

(CLOSE DATES FOR CRS 13B40-I SUBJECT TO CONARC APPROVAL)

*L1136 Army–Ft. Sill, Okla.*