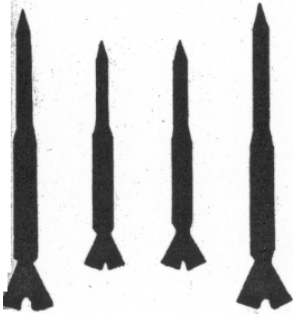
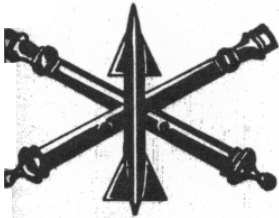


# ARTILLERY TRENDS



FEBRUARY

1959

U S ARMY ARTILLERY  
AND MISSILE SCHOOL

# ARTILLERY

## TRENDS

<u>CONTENTS</u>	<u>PAGE</u>
Field Artillery Weapons Range Chart -----	2
Field Artillery Missiles Present and Future -----	3
Organization and Tactics for Field Artillery Missile Units -----	11
A Quick Method of Computing Site Charge for the 4.2-inch Mortar -----	15
New Track Vehicles Under Test ---	17
Weapons of the Artillery--5 -----	22
Deflection Correction--Left 6 ---	23
The Radioteletype--A Coming Attraction -----	24
Reference Lines on the 4.2-inch Mortar -----	28
Experimental Platform Vehicle ---	31
Target Acquisition -vs- Combat Surveillance -----	34
Fire Direction Equipment Carrying Case -----	35
Redstone Materiel Courses Now Taught at Fort Sill -----	38
An Inspection Guide for Artillery Commanders -----	39
New Filmstrips for Observed Fire Instruction -----	40
Newsnotes for Artillerymen -----	42



**INSTRUCTIONAL AID NUMBER 8**

UNITED STATES ARMY  
ARTILLERY AND MISSILE SCHOOL  
Fort Sill, Oklahoma

2 February 1959

Beginning with this issue of ARTILLERY TRENDS, the words "Instructional Aid Number \_\_\_\_" will appear at the bottom of the table of contents page. Each issue will carry a progressively higher number to enable readers to check whether they have received all issues. TRENDS is printed when sufficient quality material becomes available and not on any fixed schedule.

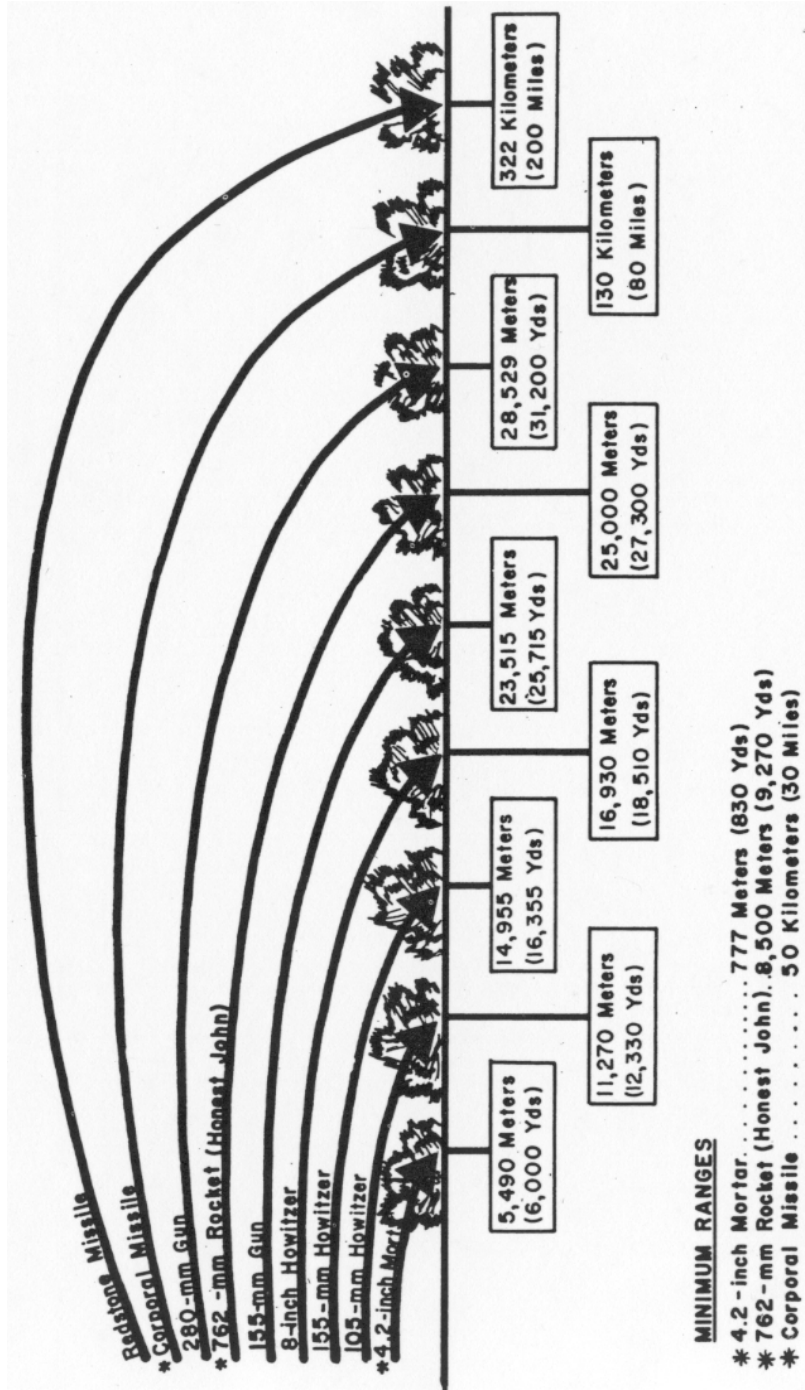
On address verification cards returned to the School many units have indicated the various ways that ARTILLERY TRENDS is used. One unit, for instance, hangs the current copy near the bulletin board where everyone may see it. Another organization says that extension course students read their TRENDS and then bring them to the battery so that additional copies are available. Many artillerymen use TRENDS articles in preparing lesson plans.

If someone in your unit has devised a better way of doing something than the device or technique currently used, have him send it to ARTILLERY TRENDS. TRENDS continually strives to present to artillerymen practical ideas that can be readily adopted. Master Sergeant Hunt's article on a "Fire Direction Equipment Carrying Case" offers an excellent solution to a current problem.

This issue of TRENDS contains a comprehensive presentation of field artillery missile data. The various articles discuss missile organization, tactics, and materiel. The chart on page 2 depicts graphically the ranges of all artillery weapons in both yards and meters. This chart is of general interest and particularly suitable for placement on a unit bulletin board.

A forthcoming issue of ARTILLERY TRENDS will deal exclusively with the new six-battalion infantry division artillery organization. Organization, tactics, gunnery procedures, communications, and other aspects of the new division artillery will be presented. This issue will be published in the near future.

# FIELD ARTILLERY WEAPONS RANGE CHART



## MINIMUM RANGES

- \* 4.2-inch Mortar . . . . . 777 Meters (830 Yds)
- \* 762-mm Rocket (Honest John). 8,500 Meters (9,270 Yds)
- \* Corporal Missile . . . . . 50 Kilometers (30 Miles)

This chart depicts the unclassified maximum ranges of field artillery weapons. Minimum ranges are listed where applicable.

## **FIELD ARTILLERY MISSILES-- PRESENT AND FUTURE**

Second Lieutenant Lawrence W. Zimmer  
Department of Publications and Nonresident Training

5--4--3--2--1--FIRE! The time: 2248 hours. The date: Friday, 31 January 1958. The place: Cape Canaveral, Florida. The Jupiter C left its launching pad carrying a 30-pound payload-- Explorer I. The satellite was in orbit at 2255 hours.

The United States had her first man-made satellite circling the globe, and it was a proud moment for the Army. The Army again demonstrated its ability in the missile business. The primary vehicle in the Jupiter C was the field artillery's Redstone, which was modified for its mission of putting Explorer I into space.

The success of that January night had added significance because the 2nd, 3rd, and 4th stages were driven by solid-propellant rockets. This was a clue that the second generation of Army missiles was on its way. At present, the solid-propellant Sergeant and Pershing missiles, members of that second generation, are being developed. However, the first generation missiles are tried and tested and will be with us for some time.

Here are descriptions of the field artillery's operational missiles and those planned for the future.

### Redstone

"Old Reliable," as Redstone (fig 1) has been dubbed, is the long-range missile which can be fired further than 200 miles. It is 69 feet long and 6 feet in diameter. The missile is checked out in a horizontal position and then is raised into its vertical firing position. When fired it rises slowly at first then accelerates to several times the speed of sound.

Alcohol is used as the fuel and liquid oxygen (LOX) as the oxidizer. Hydrogen peroxide generates the steam which drives internal equipment. The fuel tanks make up the center section of the missile, with the entire power plant comprising about 75 percent of the length.

The other sections are the warhead section and guidance sections. The Redstone's guidance system is entirely self-contained. The missile follows a preplanned ballistic trajectory to the target independent of outside influences. The preplanned trajectory makes it completely immune to known electronic countermeasures.

As the Redstone reenters the atmosphere, its power unit slows and falls short of the target. The remainder of the missile body continues on to the target. The first firing of the Redstone by troops was accomplished on 16 May 1958 at Cape Canaveral using test center facilities and equipment. More significant was the first troop tactical firing on 2 June 1958 at White Sands Proving Ground, New Mexico, using the unit's own field equipment.

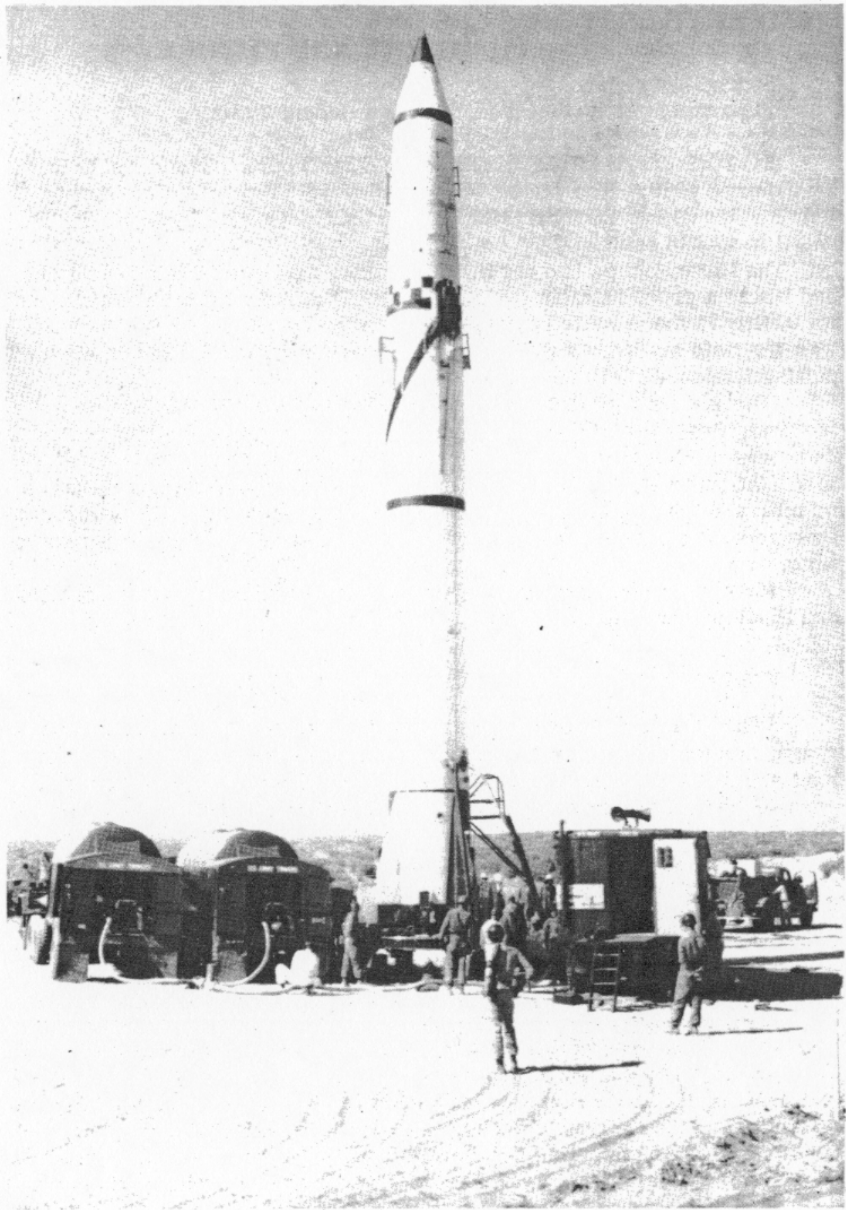


Figure 1. The Redstone missile.

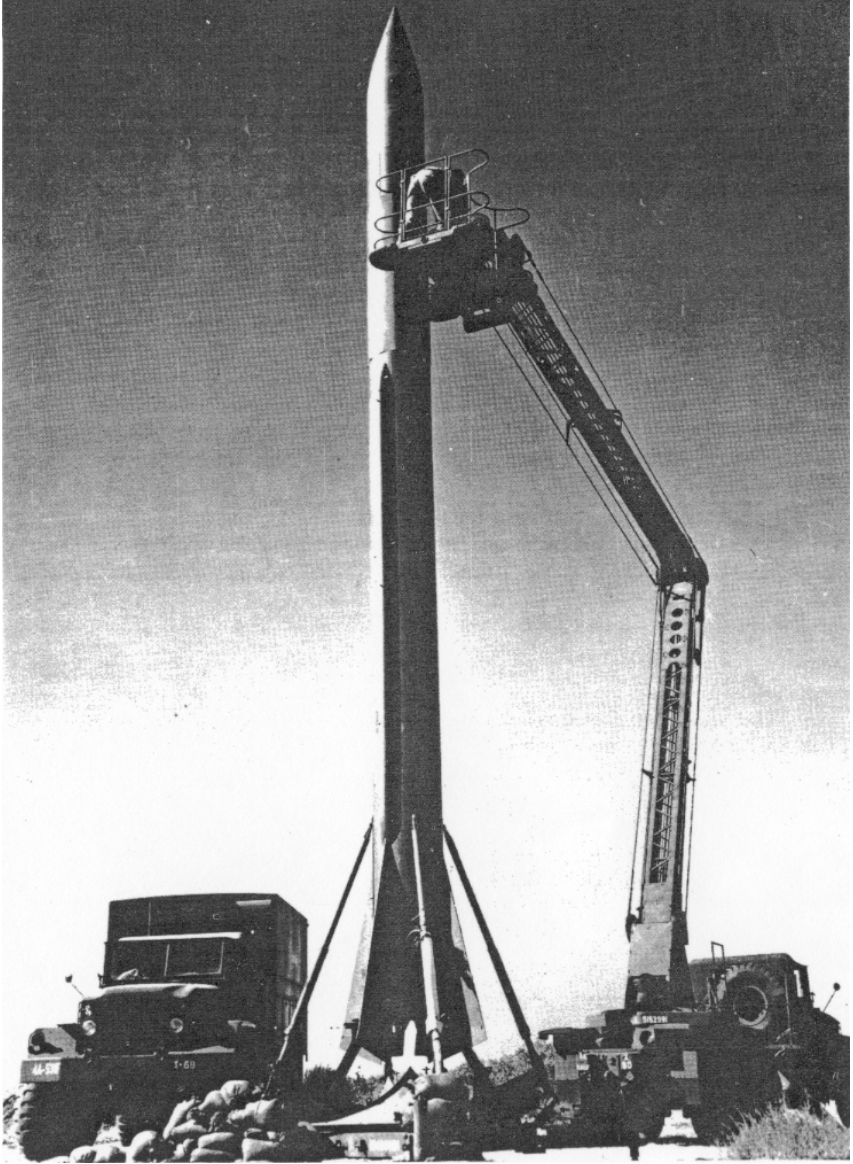


Figure 2. The Corporal on its launching pad.

## Corporal

The Corporal (fig 2) follows a modified ballistic trajectory to maximum range targets of 130 kilometers (80 miles). The slender (30 inches in diameter) missile's length is 45 feet, and it weighs 11,500 pounds.

The air-pressurized, liquid propellant system develops 20,000 pounds of thrust. The fuel and oxidizer are primarily aniline and red fuming nitric acid respectively.

After the missile is fueled and the warhead is mated, it is erected on the launcher and fired from a vertical position. The Corporal is guided to the target by a combination preset and command guidance system. The ground guidance station is composed of a radar, a doppler radio set, and a computer. A two-phase trajectory pattern is used to put the Corporal on its target. During the first phase, it leaves its vertical direction, is pitched over on its preset trajectory, and maneuvered into a radar beam. External guidance begins at this point. The missile is guided in elevation and azimuth until a predetermined velocity is reached, at which time the motor shuts off. This system gives a means of rough range control. A final fine range correction is determined by a second velocity reading. The reading is used by a memory device which makes the correction. Azimuth guidance is continued until shortly before impact.

The Corporal has been operational since 1953 and deployed overseas since 1955. Its first troop firing was at Fort Bliss, Texas on 18 March 1954.

## Honest John

The third operational missile of the field artillery arsenal is the 762-mm rocket, Honest John (fig 3). Units are deployed overseas and in this country. Honest John is a supersonic (Mach 2.5), solid propellant free rocket with a relatively simple system. It is 27 feet long and 23 inches in diameter. The weight is 5,900 pounds, of which 1,500 pounds is the warhead. The maximum range is 25,300 meters (27,000 yards).

The propellant, called ballistite, is composed of nitrocellulose and nitroglycerin. The rocket motor must be temperature conditioned so that the propellant remains within the storage temperature limits of 0° to 120° Fahrenheit. The propellant grains must be the same temperature throughout to insure uniform burning. Nonuniform burning results in considerable range errors. Temperature conditioning is accomplished with a heating blanket, which also serves as an insulator when the propellant temperature is correct.

The Honest John can be transported cross-country on its trailer or on its modified 5-ton truck launcher. Its on-carriage traversing and elevating capabilities correspond with those of medium cannon artillery.

The first troop firing of the Honest John was on 22 June 1954 at Fort Sill, Oklahoma.





Figure 3. The Honest John and its launcher mounted on a 5-ton truck.



Figure 4. The Little John shown here on its launcher is undergoing a prefire checkout.

## Little John

In the future the field artillery plans to add additional missiles to its arsenal. Still undergoing field tests are the Little John and Lacrosse. Little John (fig 4), like Honest John, is a free rocket. It is a smaller caliber weapon (318-mm) than the Honest John, and is only 12 feet long. It is completely air transportable. Other information about the Little John is classified.



Figure 5. The Lacrosse is launched from a 2½-ton truck.

## Lacrosse

The Lacrosse (fig 5) is a highly accurate, general support missile. This all-weather weapon is designed for use in close tactical support of ground troops. Its accuracy makes it especially effective against hard pinpoint targets such as pillboxes or bunkers.

The Lacrosse is 19 feet long and 20 inches in diameter. It has four swept-back wings mounted 90° apart and four fins offset 45° from the wings.

The Lacrosse has a solid-propellant rocket motor which drives it at supersonic speeds. The launcher is mounted on a standard 2½-ton truck. The missile is guided by a forward guidance station.

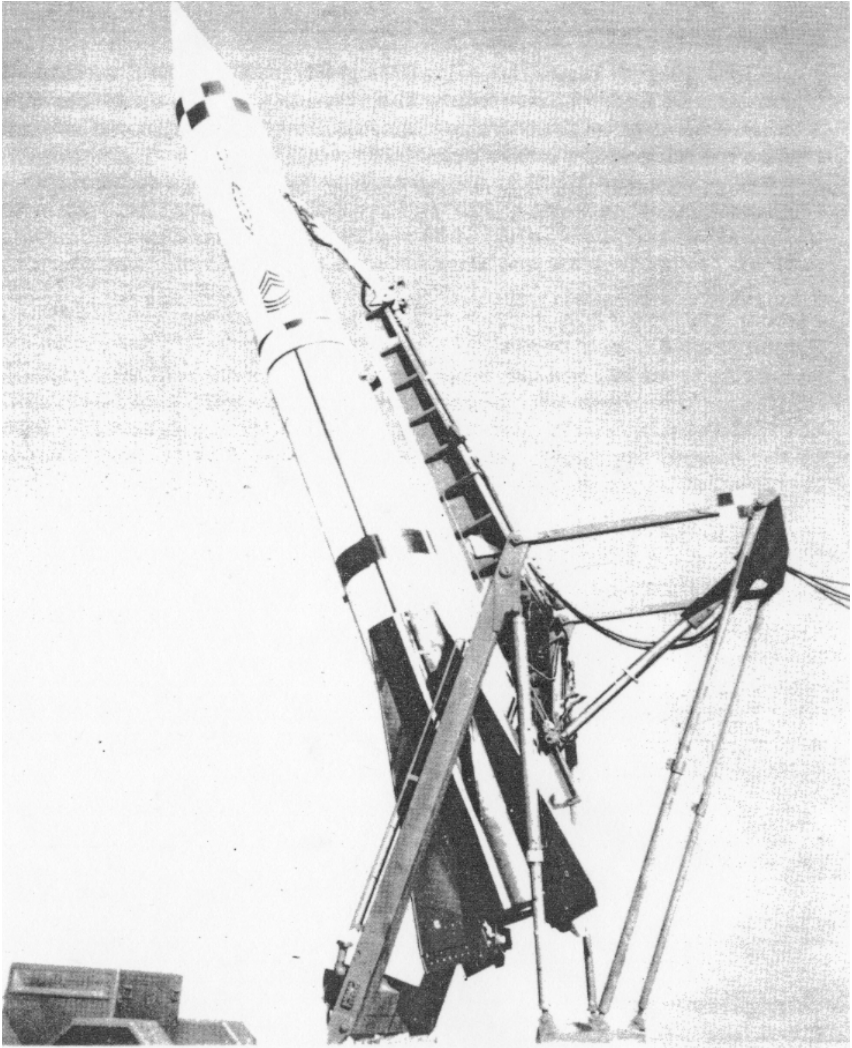


Figure 6. The Sergeant will eventually replace the Corporal.

## Sergeant and Pershing

Two longer range missiles designed to eventually replace the Corporal and Redstone are the solid propellant Sergeant and Pershing. Virtually all data on the Pershing is classified; however, some information on the Sergeant has been released.

The Sergeant (fig 6) is approximately 35 feet long and incorporates the latest guidance equipment. The system can deliver fire deep behind enemy lines and is not affected by any known electronic countermeasure system. Improvements are planned in the handling equipment which will give the Sergeant increased mobility and greater reliability. The entire system can be air-transported and can be rapidly emplaced and fired by a comparatively small crew.

The Army has reason to be proud of its present field artillery missiles, the second generation being tested, and the third generation on the drawing boards. It is hoped these missiles may continue to aid mankind by their use in exploring space, but when the countdown is used to put one in the lap of the enemy, the field artillery missiles stand ready.

## A GEM FOR THE BATTERY COMMANDER

The phrase "divide and conquer" can readily be applied to the problem of checking individual equipment prior to a command inspection. According to an announced schedule, have each man in the battery place one or two items on his bunk each day. While the battery is training, the first sergeant and supply people can quickly check the equipment for serviceability and proper marking. Deficiencies should be posted on the bulletin board. Unsatisfactory items would be displayed again on subsequent days.

--Submitted by Capt Charles M. Hunter  
Dept of P&NRT, USAAMS

## A GEM FOR USE WITH AIR MISSIONS

Air missions are simplified when SOPs for the battalion state that the initial rounds for the observer will be ranging rounds of 200---400---yards from the center platoon---thus, eliminating the request from the observer for ranging rounds and automatically giving the observer a yard stick on the ground plus his GT line.

--Submitted by Capt Thomas J. Patton  
Dept of P&NRT, USAAMS

# ORGANIZATION AND TACTICS FOR FIELD ARTILLERY MISSILE UNITS

Major John P. O'Connell, USMC  
Department of Tactics and Combined Arms

Since Hiroshima and Nagasaki, the world has been faced with a weapon that has a mass destruction capability previously unknown to mankind. When the first nuclear projectile was fired from an artillery cannon on 25 May 1953 at Frenchman's Flat, Nevada, nuclear weapons attained tactical application. This nuclear capability enables the commander to influence the outcome of a battle to a degree previously unattainable.

Nuclear weapons have made necessary greater dispersion of units and increased distances between them. Division fronts and depths are greater today than they were in World War II and the Korean conflict. Although field artillery missiles with their increased payload and extended range can provide artillery fire support to widely dispersed maneuvering forces, cannon artillery will still be a potent force on the nuclear battlefield. For example, the range of the 280-mm gun is greater than that of the 762-mm rocket.

The organization of missile units is similar to that of other artillery units. Each has a headquarters, service element, and firing elements. The main difference in the organizations is that missile organizations have fewer firing elements. With two exceptions, the Redstone group and the divisional Honest John battery, the battalion is the tactical and administrative unit as well as the fire unit.

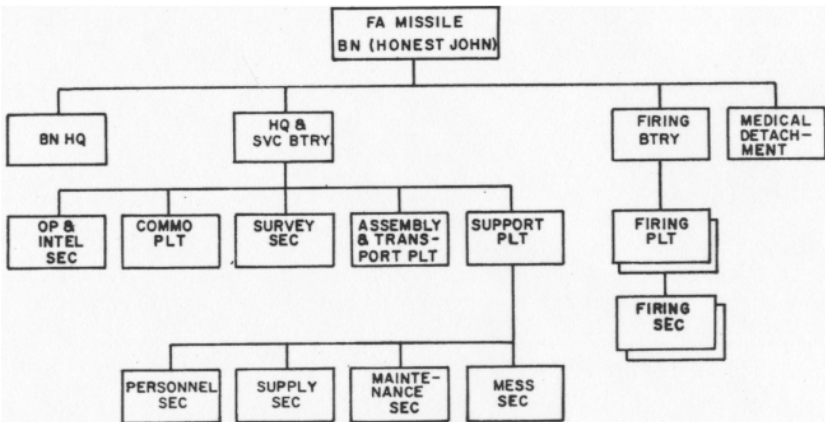


Figure 7. Organization of the field artillery missile battalion,  
Honest John.

The administrative and logistical support for the divisional Honest John battery comes from the composite battalion in the infantry and armored divisions and from division artillery headquarters in the airborne division.

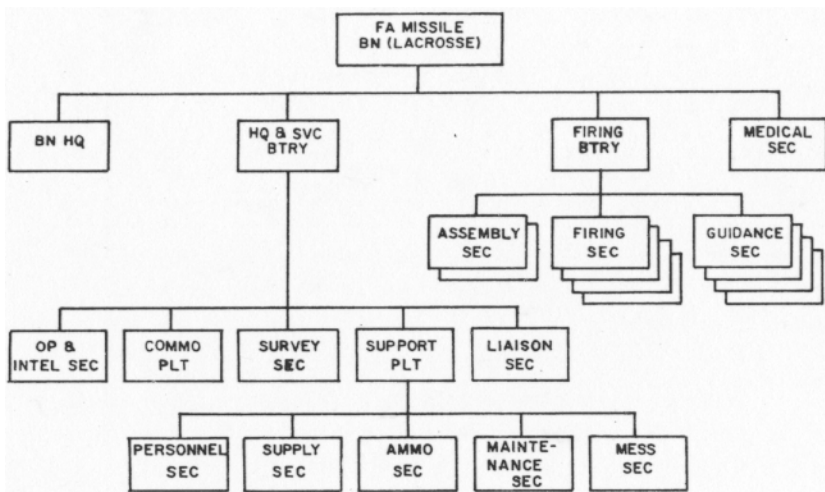


Figure 8. Organization of the field artillery missile battalion (Lacrosse)

The Honest John battalion (fig 7) is assigned to corps. Normally, there are three battalions per corps. Each battalion has 4 firing sections of 1 launcher.

The Lacrosse battalion (fig 8) also is a corps unit allotted on the basis of three battalions per corps.

The Corporal battalion (fig 9) is assigned to field army on the basis of three battalions per field army.

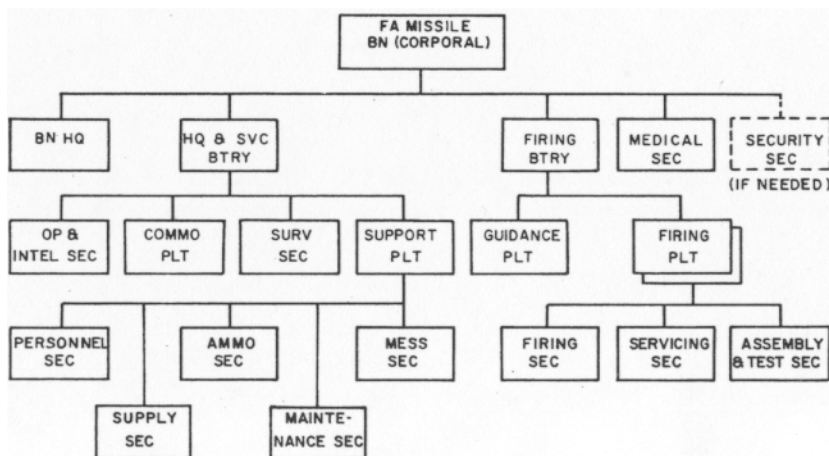


Figure 9. Organization of the field artillery missile battalion (Corporal).

The organization of these three battalions is similar and the staff of each is essentially the same. A typical staff consists of the battalion commander (lieutenant colonel), executive officer-S1 (major), S2-S3 (captain), S4-motor officer (captain), liaison officer (captain), and reconnaissance and survey officer (lieutenant).

The field artillery group (Redstone) (fig 10) is assigned to field army and is allocated as required, normally on the basis of one group per field army. The engineer company (Redstone) manufactures the liquid oxygen (LOX) and carbon dioxide (dry ice) necessary as oxidizer and coolant respectively. The ordnance company (Redstone) draws the missiles from the ammunition supply point and checks them out prior to issuing them to the batteries. The company also supplies missile fuel (alcohol) to the firing batteries. The Redstone group's two field artillery batteries are designated batteries "A" and "B." The Redstone batteries and companies

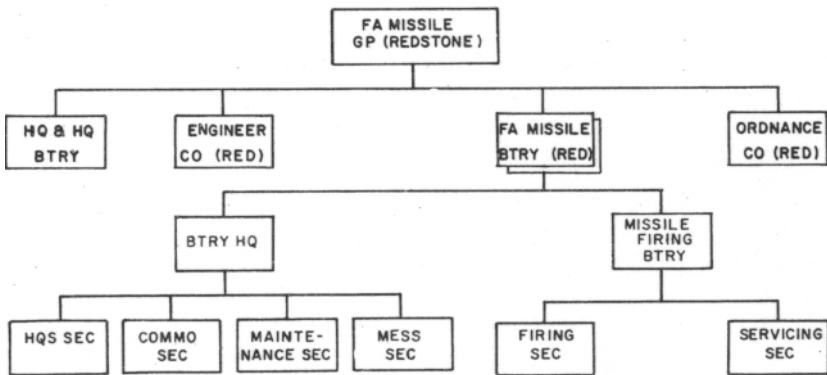


Figure 10. Organization of the field artillery missile group (Redstone).

perform their own administration. Each has a separate table of organization and equipment.

Mission the same

Missiles have not changed the mission of the field artillery--to support the ground-gaining arms by fire, to give depth to combat, and to isolate the battlefield.

Field artillery techniques continue to be used to employ missiles. Missile units will be assigned one of the standard, tactical artillery missions--general support, reinforcing, or general support-reinforcing. They are not equipped nor organized to fulfill the inherent requirements of direct support missions, but they can perform any of the the others. A discussion of the standard tactical missions is found in FM 6-20.

The Honest John battalion can be assigned 1 of 3 missions--

1. General support of the corps.
2. Reinforcing the fires of one of the division artilleries.
3. A combination of 1 and 2--general support of the corps, reinforcing the fires of one of the division artilleries.

The Lacrosse has the dual capability of delivering deep, unobserved fires and close, observed fires, both with a high degree of accuracy. These capabilities normally will prompt the mission of general support-reinforcing for the battalion.

As a result of the Lacrosse battalion's electronic target acquisition capability, this unit, or segments of it, is readily adaptable to support separate operations.

Generally, Corporal and Redstone units will be retained in a general support role because of their ranges, yields, and zones of coverage. However, they may be assigned a reinforcing or general support-reinforcing role.

Normally, missile units are displaced only on order of the next higher artillery commander. As with cannon artillery, missile unit commanders must maintain close liaison with the higher artillery headquarters in order to advise the headquarters of the unit's capabilities and to acquire timely information concerning displacements. Because of its single set of guidance equipment, the Corporal battalion is the only missile unit that cannot displace by echelon. Continuity of fire support by the Corporal is possible only when displacements are coordinated between adjoining corps.

Higher headquarters provides missile units with target intelligence. This includes target acquisition, target analysis, surveillance, and post strike analysis. Fire missions are assigned to missile units by higher headquarters, although a Lacrosse unit may acquire some of its own targets. Higher headquarters should give missile units as much advance warning of prospective fire missions as possible.

### Considerations in Deploying Missile Units

In deploying a field artillery missile unit, the commander must consider a variety of factors, including mission, availability of real estate, control, security, survey, cover, concealment, road networks, and communications. These are the same factors considered by the commander of a cannon organization in deploying his unit.

Missile units are deployed using the same four basic methods that are used to deploy cannon artillery. A full discussion of these methods is included in ARTILLERY TRENDS, October 1958. Briefly, the methods are--

1. All elements of the unit are within a common perimeter.
2. The unit's firing elements are separated from the headquarters and service elements.



3. An additional firing position is used by the firing elements to carry out their fire missions. When a mission is completed, the firing elements return to the main position area, which is the same as the one described in method 1.

4. A firing element(s) is stationed in a firing position(s) away from the headquarters and service area. When the fire mission is completed, the firing element(s) moves to another additional firing position.

Field artillery missile units have given a new power and dimension to the fire support available to the ground-gaining arms. In the field of tactical employment, they do not present new and mysterious problems. The equipment and organization of field artillery missile units introduce some new techniques in applying tactical principles, but the principles remain the same.

## **A QUICK METHOD OF COMPUTING SITE CHARGE FOR THE 4.2-INCH MORTAR**

First Lieutenant William W. Maurer

Department of Publications and Nonresident Training

The normal method of computing the site charge in mortar gunnery is time consuming and leaves possibilities for mathematical error. To reduce errors and speed up fire direction procedures, a simple shortcut may be used.

Site charges for vertical intervals of other than 100 yards are computed by multiplying the site charge read from the GFT fan by the vertical interval (in yards or meters) divided by 100. When the computed site charge is less than  $1/16$ , it is ignored. For example:

1. Elevation, 900 without extension; range, 3,230 yards; vertical interval, -40 yards.
2. Site charge read from GFT fan for 100-yard vertical interval,  $3/8$ .
3. Site charge for -40-yard vertical interval =  $1/8$  ( $3/8 \times (-40/100)$ ).

To speed up the computations, a simple ratio can be developed between the site charge (for a 100-yard interval) and the vertical interval, as indicated in the example below. This table can be written or pasted on a portion of the GFT fan for ready reference. When the vertical interval is announced, the chart operator simply refers to the table for the appropriate site charge.

If this solution solves your mortar gunnery problem--use it. It has been verified by the US Army Artillery and Missile School, although it is not taught there and probably will not appear in any field manuals. Here is an example of the use of the table (table 1).

$\frac{1}{8}$		$\frac{2}{8}$		$\frac{3}{8}$		$\frac{4}{8}$	
V.I.	Site Charge	V.I.	Site Charge	V.I.	Site Charge	V.I.	Site Charge
0 ↕ 49	0	0 ↕ 24	0	0 ↕ 16	0	0 ↕ 12	0
50 ↕ 100	$\frac{1}{8}$	25 ↕ 74	$\frac{1}{8}$	17 ↕ 49	$\frac{1}{8}$	13 ↕ 37	$\frac{1}{8}$
		75 ↕ 100	$\frac{2}{8}$	50 ↕ 83	$\frac{2}{8}$	38 ↕ 62	$\frac{2}{8}$
				84 ↕ 100	$\frac{3}{8}$	63 ↕ 87	$\frac{3}{8}$
						88 ↕ 100	$\frac{4}{8}$

Table 1. Table for rapid computation of the site charge.

1. Elevation, 900 without extension; range, 3,230 yards; vertical interval, -40 yards.
2. Site charge read from GFT fan for 100-yard vertical interval,  $\frac{3}{8}$ .
3. Site charge from the table corresponding to vertical interval of 40 yards,  $-\frac{1}{8}$ .

### A GEM FOR USE IN THE FIRE DIRECTION CENTER

How many times have pencils rolling around on the chart gotten in your way when you wanted to use the GFT fan? You can end this problem by placing a piece of masking tape on the end of the pencil and then sticking the tape to the right edge of the table (for right handers). A color scheme on the masking tape will help to identify the desired pencil. A gum eraser similarly attached to the table makes an excellent holder for plotting pins.

--Submitted by Maj Ralph M. Pope

Hq, 1st How Bn, 36th Arty, APO 751, N.Y.

## NEW TRACK VEHICLES UNDER TEST

Captain Joseph J. Addison  
US Army Artillery Board

The US Army Artillery Board presently is testing several track vehicles for possible use by the field artillery.

The new vehicles, designated the T236 family, presently include five models. They are the T235, T236, and T245 weapon carriages and the T119 and T120 wreckers. A self-propelled firing platform, originally designed for the 8-inch howitzer, was found to be adaptable to other weapons and wreckers (fig 11). Thus the T236 family was formed. The T235 mounts the 175-mm gun and the T245 mounts the 155-mm gun.

The family features light weight with a high load capacity, speed, and maneuverability. The different weapons and wrecker kits can be mounted interchangeably on the same chassis. Also, all five vehicles conform to the Phase III air-transportable requirements for size and weight.

The light weight chassis makes possible greater fuel economy and a longer cruising range than on present self-propelled carriages. All automotive parts are the same in the family, and therefore the number of different spare parts required has been reduced.

Two other vehicles are discussed in this article. They are not members of the T236 family, but possibly may be used by the artillery.

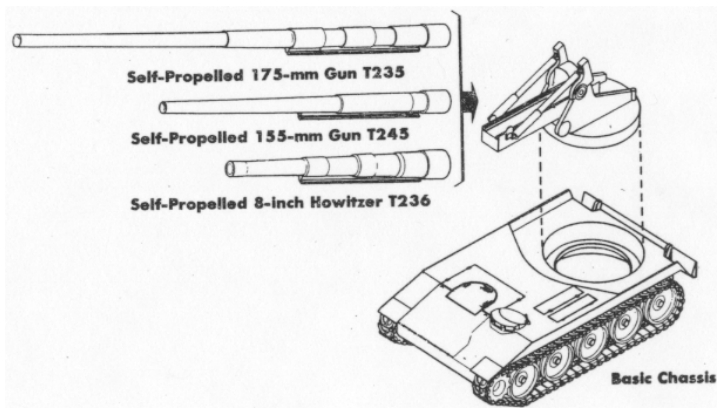


Figure 11. The basic chassis of the T236 family can mount any of the above kits.

### 8-inch Howitzer, Self-Propelled (T236)

The 8-inch howitzer, self-propelled (T236) (fig 12), if accepted, will replace the M55 in self-propelled 8-inch howitzer battalions. All components of the weapon including the ammunition handling devices are easily accessible.

Under ideal road conditions the T236 has a maximum cruising range of 526 miles. The fuel capacity is 450 gallons. The vehicle weighs 54,740 pounds with maximum fuel. Combat loaded, its weight is slightly more than half that of the M55.



Figure 12. The 8-inch howitzer, self-propelled (T236).

The weapon itself is the standard M28-inch howitzer. It may be elevated and traversed hydraulically as well as manually. Also, the ammunition is raised and rammed hydraulically. Stability is provided by the hydraulically operated rear spade and a mechanism which locks out the suspension system.

### T119 Wrecker

The same chassis is used for the T119 wrecker (fig 13). In place of the weapon, the turret bearing supporting structure mounts a 10-foot, 10-inch nonextending boom which revolves 360 degrees and has a lifting capacity of 30,000 pounds. The towing winch, mounted on the turret bearing supporting structure, develops a single line pull of 60,000 pounds. The wrecker carries a crew of three men; the driver, the boom operator, and the rigger.

Statistics on the T119 are similar to those of the T236. The maximum cruising range is 650 miles with a fuel capacity of 450 gallons.

The gross weight with a full fuel tank is 43,000 pounds.

The suspension system on the wrecker also is similar to that on the basic weapon chassis. The spring action is locked out when using the boom or the towing winch. Locking out the normal spring suspension permits the vehicle to operate as if it were fitted with solid axles and does away with screw jacks and outriggers. This feature also increases the usable lift height and enables the wrecker to lift greater loads.

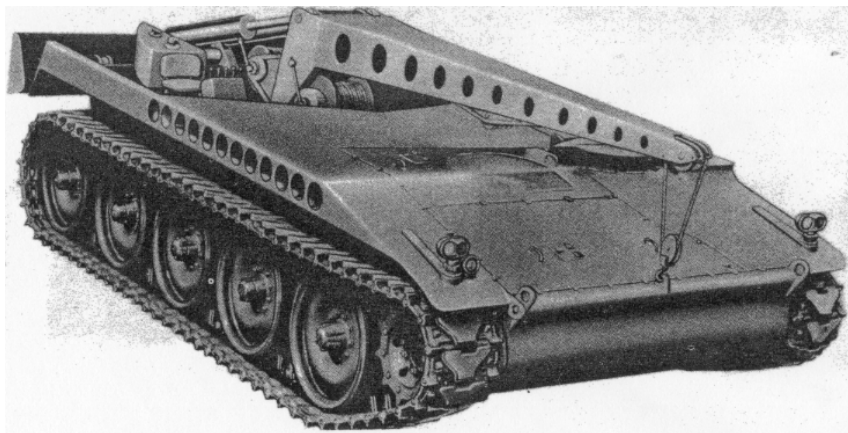


Figure 13. The T119 wrecker.

#### T117 Armored Personnel Carrier

Ordnance has developed a series of vehicles in an effort to provide a lighter weight armored personnel carrier for the combat arms. The latest models include the T117 (fig 14 and 15), which was service tested by the US Army Artillery Board. Other members of this series are the T113, the T113E1, and the T113E2. These carriers differ primarily in the amount and type of armor protection.

Much of the pertinent data on the T117 is still classified, but it is known that it can be air transported in Phase I. There is no indication that these vehicles will be issued to the artillery in the near future. However, the versatility of the vehicles has been demonstrated, and if this vehicle is adopted as a replacement for the M59, it should have no difficulty filling many roles.



**Figure 14. The T117 armored personnel carrier and a survey crew.**



**Figure 15. A second possible use for the T117 is as a prime mover for the 105-mm howitzer.**

## M85 Cargo Tractor

The M85 cargo tractor (fig 16) is a nonamphibious, full-tracked, unarmored, cab-over-engine prime mover for heavy artillery. It carries a payload of 12,000 pounds at a gross weight of 45,000 pounds. It can tow a 33,000 pound load.



Figure 16. The M85 cargo tractor.

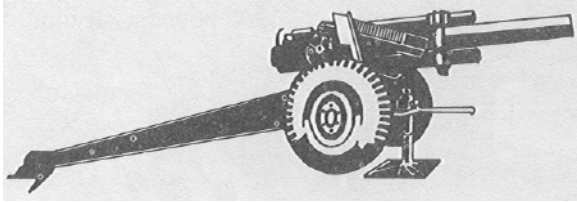
The engine is a 6-cylinder, air-cooled, horizontally opposed, AOI 895-5. It is rated at approximately 425 gross horsepower, and combines with a 3-forward-speed CD-500-3 transmission. The front-mounted winch has a 30,000 pound single line capacity. A tag line winch, with cable to the rear, is provided for limbering purposes. The front pintle is used for pushing only.

The M85 has a short turning radius and is quite maneuverable. During service tests it proved to be mechanically reliable and durable. All maintenance can be performed without removing any of the payload.

The tractor can ford 42 inches of water at 5 miles per hour without a fording kit. Its overall dimensions are: length--20 feet, width--10 feet, and height (including machine gun)--10½ feet.

All of these vehicles are still in the test stage; however, artillery units may expect to see some of them in the future.

## WEAPONS OF THE ARTILLERY-5



### **155-MM HOWITZER**

#### HOWITZER CHARACTERISTICS

Weight--12,700 pounds  
Length--12.5 feet  
Range--14,995 meters or  
16,335 yards  
Elevation--0 to 1,156 mils  
Traverse--448 mils right, 418  
mils left  
Muzzle velocity--1,850 ft  
per sec  
Rate of fire--3 rd per min rapid,  
1 rd per min prolonged  
Ammunition--HE, smoke,  
illuminating, gas, dummy  
Projectile weight--94.8 pounds  
Fire control  
equipment--panoramic  
telescope M12A7C and range  
quadrant M1  
Recoil mechanism--hydropneumatic,  
variable, independent, with  
floating piston using nitrogen gas  
under 1,500 psi at 70° F  
Length of recoil--41 inches at  
maximum elevation, 60 inches at  
minimum elevation  
Breechblock--stepped thread,  
interrupted screw  
Equilibrator--spring lifter  
Tube life--15,000 rd at maximum  
charge

#### TRAINING REFERENCES

FM 6-81, 155-mm How M1, Towed  
(Feb 53) w/change 1  
TM 9-331A, 155-mm How M1 and  
155-mm How Carriages M1A1  
and M1A2 (Jan 53) w/change 1  
Training film 9-1949, Recoil  
Mechanisms, Principles of  
Operation, Hydropneumatic  
Type--Part II: Independent  
System (16 min--1954)  
Film strip 6-76, Direct Laying with  
the 155-mm How M1A1 (1945)  
Firing table 155-Q-2 (Apr 44)  
w/changes 5, 6, 9, and 10  
Tables of Organization:  
6-135C, FA Bn, 155-mm  
How, Towed (Feb 56)  
6-137C, FA Btry, 155-mm How,  
Towed (Feb 56)  
6-235C, Abn FA Bn, 155-mm  
How, Towed (Nov 55)  
6-237C, Abn FA Btry, 155-mm  
How, Towed (Nov 55)  
Army Training Tests:  
6-1, FA How or Gun Btry  
w/change 1 (v) and  
change 2 (s)  
6-2, FA Bn Firing w/change 1  
6-5, Light and Medium FA Bn  
6-15, FA Bn, ROCID



## DEFLECTION CORRECTION-LEFT 6

Three officers of the 20th United States Army Corps (Reserve), Fort Hayes, Columbus, Ohio, have suggested a procedure for speeding up the application of the deflection correction during observed fires. Lieutenant Colonel M. B. Hardy, Major D. M. Kimbel, and Major P. A. Hewitt suggest a speeding up process consisting of two separate procedures.

In the first procedure the deflection correction scale is not used during "will adjust" missions. While this procedure results in a sacrifice of accuracy in initial data (normally about 2 mils) it speeds the operation. Instead of using the deflection correction scale, the computer makes a penciled note of the deflection correction at registration point range for each charge registered. Disregarding drift changes, the computer uses the same deflection correction (appropriate to the charge being fired) throughout transfer limits from the registration point. Thus, the chart operator does not announce deflection corrections, and the computer needs only one value for each charge.

The US Army Artillery and Missile School suggests that this procedure may be used during "will adjust" missions either by itself or with the second technique that further speeds up the fire direction center operations. However, this second technique is valid only when used with the first procedure.

### The Second Technique

The second technique is to construct a permanent deflection index for the primary charge being used. Each time a new corrected deflection for the charge is determined, the index is moved to the corrected deflection. Thus, the deflection correction at the registration point is always zero.

Here is a sample problem: The chart deflection is 2400 mils. After registration the index is moved to the adjusted deflection of 2386 mils. The concurrent meteorological (met) deflection correction is right 8. The first subsequent met deflection correction is right 10. Therefore, the weather change is right 2. To arrive at the new corrected deflection, the weather change (right 2) is applied to the adjusted deflection of 2386 mils and the index is moved to the new corrected deflection of 2384 mils. A later met deflection correction is left 2. Therefore, this met deflection correction of left 2 is applied to the first subsequent met deflection correction of right 10 and the weather change now amounts to left 12. Consequently this weather change (left 12) is applied to the new corrected deflection of 2384 mils, and the index is moved to the new corrected deflection of 2396 mils.

### Caution is Necessary

Some caution is necessary. Each new deflection index must be labeled (1400 registration, 1600 met, etc.). Registration data must be

tabulated for easy reference so that the weather change from the old to the new met deflection correction can be applied to the old deflection to produce the new corrected deflection (see paragraph 375d, FM 6-40, April 1957, for a registration data table).

If the new indexes become difficult to distinguish from the old ones because of erasures, cut a 2- to 4- inch square out of another grid sheet. With masking tape, fasten the square, blank side up, over the old indexes. Place the new indexes on the clean patch.

The School states that it is practical to move the deflection index during fast-moving situations such as airborne operations or pursuits when the same charge is continually being used. In a static situation, using the standard method is more desirable because of the number of different charges being fired.

These optional procedures are examples of several ideas submitted to the School. Reports of new techniques, short cuts, and recommendations for procedural improvements are always appreciated and closely evaluated.

## THE RADIOTELETYPE-A COMING ATTRACTION

Major John T. Beaver, Jr.  
Department of Communication and Electronics



How many of your radio operators are typists?

If your unit's table of organization and equipment authorizes either the radio set AN/GRC-46 or AN/VRC-29, radio operators with typing skill will be required to operate the teletype components of those sets. The radio sets will be issued to most field artillery battalions, and in some cases to batteries, during fiscal year 1959.

The AN/GRC-46 (fig 17) is basically the same as the AN/GRC-19 with the radioteletype components added. It can transmit and receive continuous wave (CW) (Morse code), voice (radiotelephone), or radioteletype.

Radioteletype communication has the advantage of increased speed and efficiency over voice or continuous wave emission. The following transmission speeds are now available to the artillery commander.

Radioteletype--60 words per minute--(100 words per minute maximum)

Continuous wave--15 words per minute--(25 words per minute maximum)

Radiotelephone--10 words per minute--(25 words per minute maximum)

Another advantage of the radio teletype is that it automatically delivers a printed page. Automatic printing is the secret of the greatly increased speed of radioteletype. The message writer is assured that a printed copy of his message is available at the receiving station.

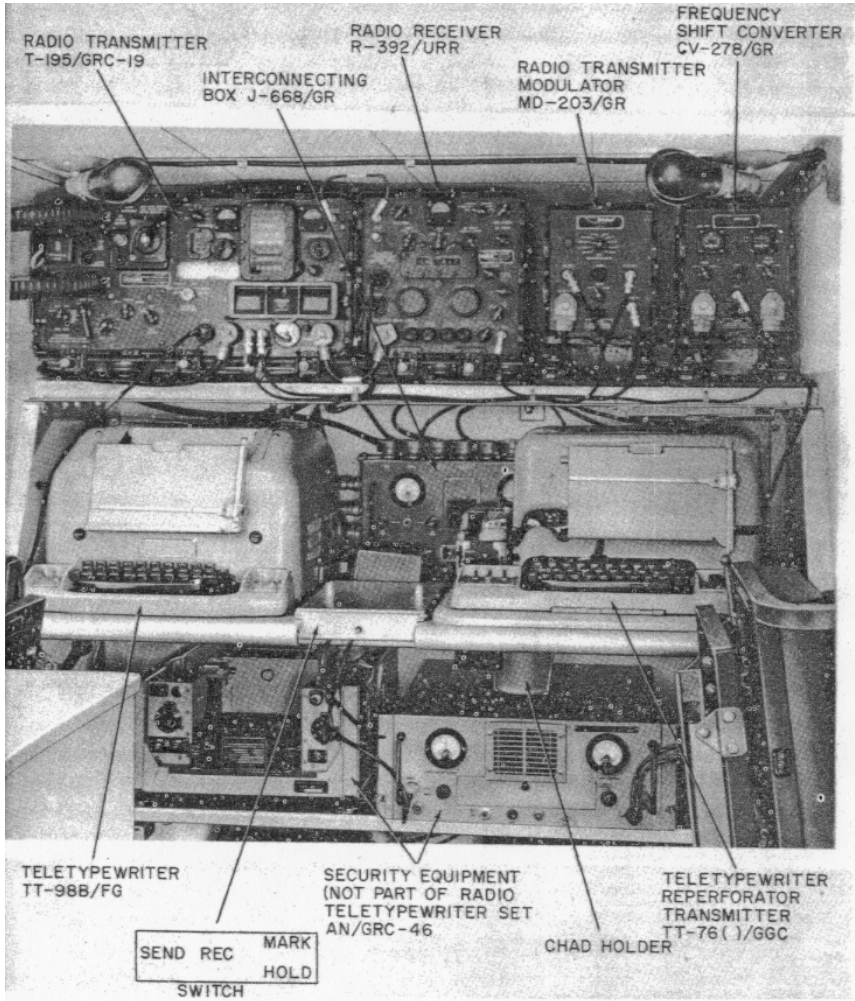


Figure 17. Radioteletypewriter AN/GRC-46 mounted inside a special shelter.

The following units will be issued radioteletype equipment.

<u>TOE Number</u>		<u>Quantity</u>	<u>Set</u>
6-101T	Hq and Hq Btry, Inf Div Arty	8	AN/GRC-46
6-126T	Hq and Hq Btry, FA Howitzer Bn, 105-mm, Towed	3	AN/GRC-46
6-146T	Hq and Hq Btry, Inf Div FA Comp Bn	3	AN/GRC-46
6-148T	FA Howitzer Btry, 8-inch, Towed	1	AN/GRC-46
6-150T	FA Missile Btry, 762-mm Rkt, SP, Inf Div FA Comp Bn	1	AN/GRC-46
6-201T	Hq and Hq Btry, Abn Div Arty	2	AN/GRC-46
6-301T	Hq and Hq Btry, Armd Div Arty	5	AN/GRC-46
		1	AN/VRC-29
6-316T	Hq and Hq Btry, FA Howitzer Bn, 105-mm, SP	2	AN/GRC-46
6-326T	Hq and Hq Btry, Armd Div FA Comp Bn	2	AN/GRC-46
6-328T	FA Howitzer Btry, 8-inch, SP	1	AN/VRC-29

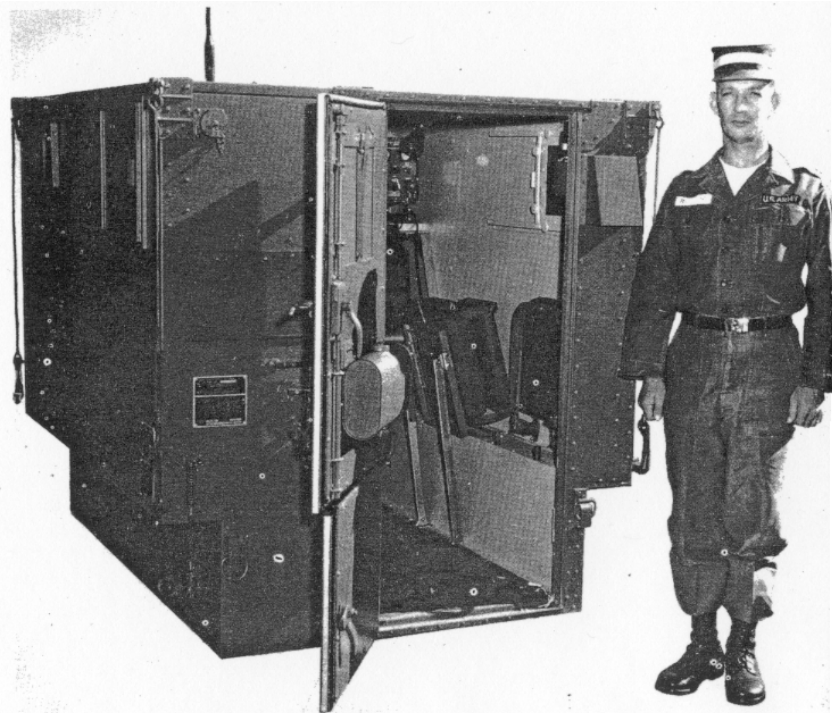


Figure 18. The lightweight electrical shelter for the radioteletypewriter AN/GRC-46 prior to being mounted on vehicle.



Figure 19. The shelter mounted on a 3/4-ton truck. Its power source is the vehicle's electrical system.

The AN/GRC-46 will be issued with a lightweight shelter (fig 18) to be mounted on a 3/4-ton truck (fig 19). The AN/VRC-29 is mounted in an armored personnel carrier or a shop van truck.

### Operators Not Issued

Unfortunately, operators are not issued with these sets; therefore, it becomes the unit's problem to provide and train them.

One solution is to send present radio operators to typing school. Most Army education centers conduct both on and off duty typing classes. The transition period from radio to radioteletype operation can be relatively simple if typist training is started now. The radio operator who is not a typist may find the task of becoming a radioteletype operator long and disagreeable. A unit commander might find himself in the position of a one-legged man on a bicycle--he has an excellent means available without the capability of utilization.

Battalion operations and communication officers should be conducting typing schools now to train radioteletypewriter operators. The battery commander may employ his battery clerk as an instructor. There will be a need for operators for the AN/GRC-46 and AN/VRC-29 before 1959 ends. Why not start now?

## REFERENCE LINES ON THE 4.2-INCH MORTAR

First Lieutenant John F. Stoneburner  
Mortar Battery, 2d Battle Group,  
30th Infantry, Fort Sill, Oklahoma

The 4.2-inch mortar, with its high angle of fire and high rate of fire, is a valuable weapon to have on the battlefield. Any technique which aids in emplacing the mortar or increases its accuracy is valuable. Three techniques are described in this article and are easily implemented with with some chalk, masking tape, and paint.

A deflection scale painted on the rotator of the 4.2-inch mortar will save time and help prevent 100-mil deflection errors. To paint the deflection scale on the rotator--

- (1) Mount the mortar on a level surface with the tube in the center of traverse.
- (2) Place a chalk or masking-tape index on the base plate (fig 20).
- (3) Paint a line on the rotator opposite the index (fig 20).
- (4) Change the deflection 100 mils by resetting the sight and shifting the bridge to lay back on the aiming point. Do not use the traversing handwheel.

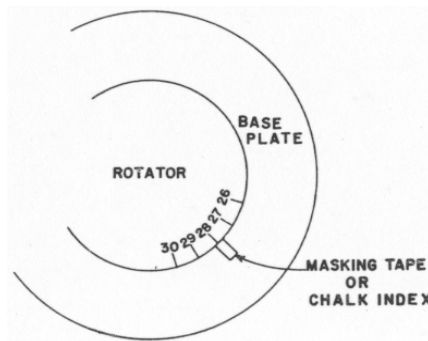


Figure 20. Deflection scale painted on 4.2-inch mortar rotator.

(5) Paint a line at the point on the rotator that is now opposite the index.

(6) Repeat this operation until lines are painted at 100-mil intervals on the rotator throughout the desired limits (fig 20).

### Use in Firing

When preparing to fire, after the piece is laid in center of traverse, place a chalk or masking-tape index on the base plate opposite the base deflection line on the rotator. The use of this scale is most convenient when the base deflection line (usually 2800 mils) is approximately at the 4 o'clock position on the rotator. Using the deflection scale and index, the section member shifting the bridge can accurately place the tube in one motion, saving time on each deflection shift. Furthermore, marking the deflection of each line in large numbers permits each man in the section to check against 100-mil errors.

When the deflection scale is used and the shift is greater than 50 mils, it should be standing operating procedure (SOP) to shift the bridge rather than to use the traversing handwheel. This practice standardizes tube positions within the platoon or battery and increases accuracy. For example, if one tube has been shifted 110 mils using the traversing handwheel and another has been shifted using the above method (shifting the bridge 100 mils, and then adding 10 mils using the handwheel), the two tubes have a different angular relationship between the line of sight and the axis of the tube. The different methods of changing deflection result in an appreciable difference between the points of impact of the rounds fired from the two tubes.

### Boresighting

By using another painted line, the tube can be boresighted while unmounted. This method is simple and rapid and allows the mortar to be boresighted under cover or at night. The line is painted from the center of the base cap to the top center of the muzzle (the top center of the muzzle can be marked by Ordnance support personnel). To boresight, place the mortar tube on the ground 15 to 20 meters from a leveled aiming circle. With the scale of the aiming circle set at 0, move the tube until the line on the tube is in line with the vertical hairline of the aiming circle. Sight on the panoramic telescope with the aiming circle and read the deflection. Turn the panoramic telescope to sight on the aiming circle and slip the scale to correspond with the deflection read on the aiming circle. The mortar is now boresighted.

### Eliminating Cant

Cant in the traversing rod is a source of error in the acutal deflection of mortar tubes and can cause the piece to fire out of the platoon

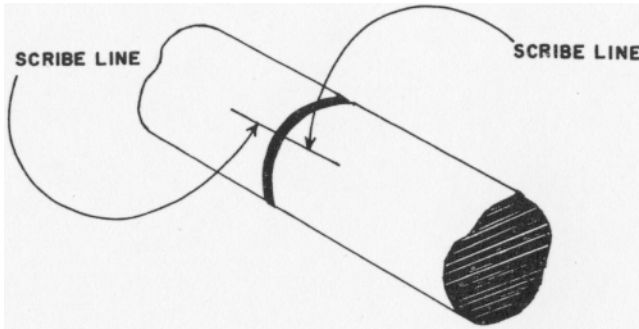


Figure 21. Scribe lines on the knuckle of the bridge.

sheaf. This error can be eliminated by keeping the bridge level during firing. A scribe line may be used as a guide to keep the bridge level while emplacing the mortar and during firing. First, mount the mortar as described for painting the deflection scale on the rotator. Then scribe a line across both portions of the knuckle of the bridge (fig 21). When the bridge is level, the two halves of the line will appear as one line. When the bridge is not level, the line will appear as a broken line.

The three techniques described have been tested by the US Army Artillery and Missile School and found to be workable. The School believes that they are acceptable for use as field expedients.

### A GEM FOR THE BATTERY EXECUTIVE

Artillery weapon laying time can be reduced if the reconnaissance party places a gun stake at each weapon position and reads a deflection to each stake. The recorded deflection on the stake may be used by the gunner as his first deflection reading. The weapons should be brought into position as close to the stake as possible to reduce the offset angle between the sight and gun stake. With practice, the gun crew will be able to lay their weapons much faster. Many times the weapon will be unlimbered within 20 mils of the direction of fire.

--Submitted by 1st Lt Robert A. Ray  
Dept of P&NRT, USAAMS

---

Please do not return lesson answer sheets and/or examinations for subcourses in the same packet with subcourse text. This delays processing of your final rating.

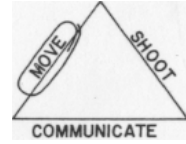
---



# EXPERIMENTA

## PLATFORM

## VEHICLE



While great strides have been made in aircraft and missile development, ground vehicles have remained basically of the same design since 1941. In an effort to improve the design and performance of ground vehicles, Willys Motors, Inc., has developed a completely new-type vehicle (fig 22) based on the platform principle. It is known as the XM443 E-1.



Figure 22. Side view of XM443 E-1 illustrates the vehicle's low silhouette and the ease with which passengers can mount and dismount.

A smaller version, the M-274 platform-type 1/2-ton "Mechanical Mule," is now in use with airborne units.

A prototype model of the proposed new vehicle was demonstrated at Fort Sill in September, 1958. The military version probably will be about 12 inches longer and have a more functional front than the vehicle pictured here. Figures 23 and 24 show possible field artillery use of the truck by a fully equipped forward observer section.

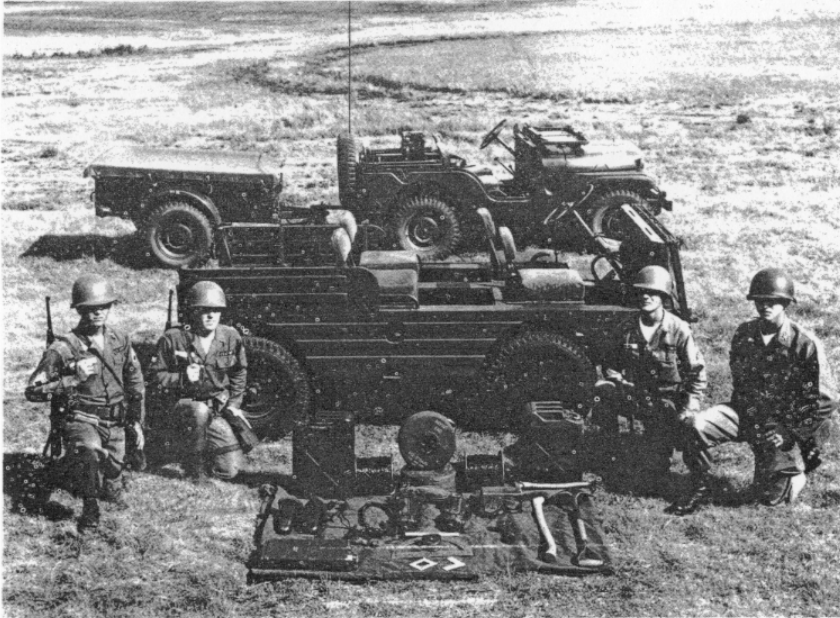


Figure 23. This experimental 3/4-ton truck could replace the forward observer's present 1/4-ton truck and trailer.

Willys Motors says that this vehicle has the ruggedness and versatility of the jeep, yet it carries a greater payload. The long-sought "one-to-one" ratio between vehicle weight and cargo capacity has been achieved in this vehicle. It weighs 1,500 pounds and can carry 1,500 pounds. The present jeep (1/4-ton truck, M38A1) is capable of carrying only 39 percent of its curb weight. It weighs 2,665 pounds and can carry 800 pounds.

The XM443 E-1 has constant 4-wheel drive and selective 2- or 4-wheel steering. It has a top speed of 65 miles per hour. It can be rapidly converted from a personnel carrier, comfortably seating six people, to a cargo carrier. All seats except the driver's seat fold into the floor, making a solid, flat cargo platform.

Additional space is gained by placing a pancake-type engine under the platform. This location presents no servicing problems. The horizontally opposed, 4-cylinder, air-cooled, aluminum engine can deliver up to 100 horsepower.

The cab can be enclosed by a canvas top, and the windshield is removable. The entire vehicle stands less than 30 inches high. Its short wheelbase and small shipping cube make it ideal for movement by air; it requires only 115 cubic feet of shipping space compared to 270 cubic feet needed for the M38A1 jeep.

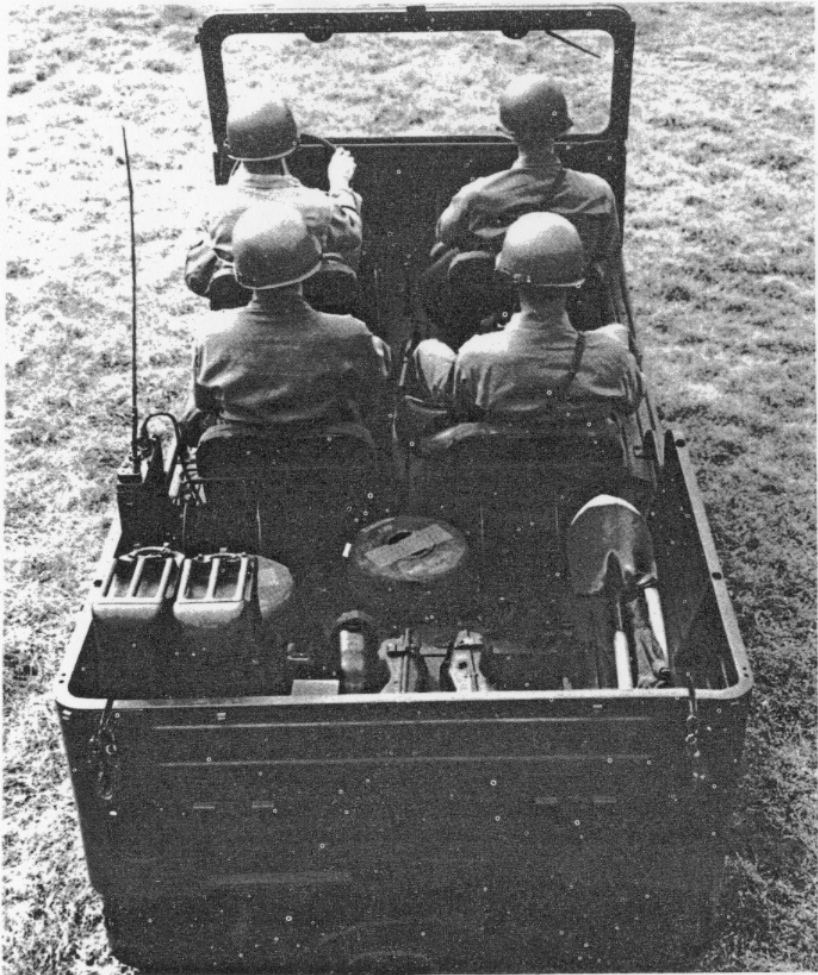


Figure 24. Rear view of XM443 E-1 showing a forward observer section and its equipment. There is ample room for individual gear such as sleeping bags, combat packs, and rations.

The manufacturer says the XM443 E-1 can be made of either lightweight materials, such as aluminum and magnesium, or of steel. With modifications, it can be made fordable.

---

Your knowledge is valuable to others--let us publish it in TRENDS.

---

# TARGET ACQUISITION -VS- COMBAT SURVEILLANCE

Major James F. Holcomb, Infantry  
Department of Target Acquisition

The increased range and yield of today's field artillery weapons have created a new problem. The problem is acquiring targets for these weapons. Present means of target acquisition are limited and need improvement to make full use of the nuclear capability and increased range of the weapons. Adjusting nuclear weapons fire is out of the question because of the great cost per round and the waste of critical nuclear materials. Organizations and equipment must be developed so that targets may be acquired under all weather conditions, 24 hours a day, and which are compatible to the range, accuracy, and lethality of the weapons.

An article in DA Pamphlet 20-1 (1958), "A Guide to Army Philosophy," lists the things that must be done to prepare the Army to fight future battles. Listed first is the increased ability to locate nuclear targets on the battlefield. Superiority in nuclear weapons has little meaning unless target acquisition is developed to a degree that continuous accuracy is assured. Long-range target acquisition is one of the most complex of the technological problems confronting the Army.

Department of the Army defines target acquisition as that part of combat intelligence which involves the detection, identification, and location of a target in sufficient detail to permit target analysis and the effective employment of weapons. To meet the need of the field artillery, target acquisition is defined as the detection, identification (including friend or foe), and three-dimensional location of a target in relation to a known control point or datum with sufficient accuracy and detail to permit the effective employment of appropriate weapons by the commander.

## Combat Surveillance

Combat surveillance is related to target acquisition. It is defined as a continuous (all weather, day and night), systematic watch over the battle area to provide timely information for tactical ground operations. Combat surveillance, as is target acquisition, is a part of the combat intelligence effort.

Until September 1958, target acquisition was considered a subordinate part of combat surveillance and did not receive its full measure of importance. Surveillance was emphasized, and the three-dimensional location of targets was not. Equipment developed for combat surveillance may be used, after modifications, in target acquisition systems. This equipment includes ground and airborne radar sets and infrared, photographic, and television devices.

The field artillery needs a target acquisition organization at each command level, so that the full potential of the weapons system at each level can be realized. Such an organization should emphasize the vital

need for the artillery to be capable of performing timely and complete target acquisition. Presently the US Army Artillery and Missile School is formulating concepts for such target acquisition organizations.

## **FIRE DIRECTION EQUIPMENT CARRYING CASE**

Master Sergeant Rayford W. Hunt  
Department of Gunnery

A fire direction center has many, small, easily misplaced items of equipment. These as well as the larger items are easily damaged if they are not properly protected. Damaged fire direction equipment is seldom accurate, yet in delivering artillery fire accuracy is all important. Nothing is issued with this equipment to carry or protect it. Foot lockers or canvas bags generally are used to store and carry fire direction equipment, but neither are entirely satisfactory.

One solution is to construct a simple plywood carrying case (fig 25) designed especially for carrying and storing fire direction equipment. The case can be made to fit the individual requirement. The case pictured in this article is 25 inches long, 20 inches wide and 5 inches deep. The depth consists of two rectangular sides, each 2½ inches deep (fig 26 and 27). The interior of each side is equipped with brackets, bolts, and wing nuts which hold each item in its place. Also, there is room for mapboards and firing charts (fig 26).

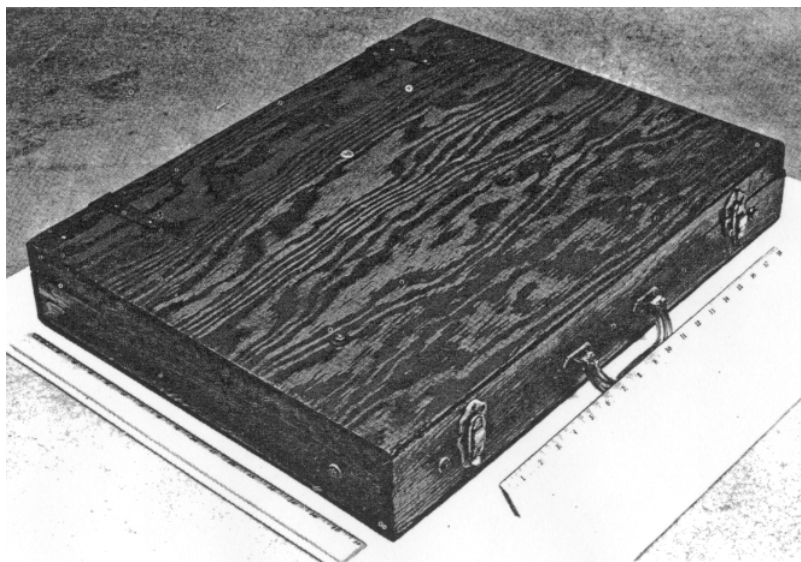


Figure 25. Outside view of the fire direction equipment carrying case. The size can be modified to individual requirements.

Some advantages of the carrying case are--

1. Protection.
  - a. Plastic equipment is protected from the sun, which helps prevent fading or warping.
  - b. Charts and papers are protected from rain and wind.
  - c. All equipment is protected from loss or breakage while in storage or transit to and from the field.
2. Security.
  - a. A special place is provided for each item.
  - b. A complete set of equipment, when not in use, is stored in the case.
  - c. A physical inventory, and notation of any equipment shortage, can be made in a few seconds.
3. Accessibility.
  - a. The case provides immediate access to a complete set of fire direction equipment without having to assemble it.

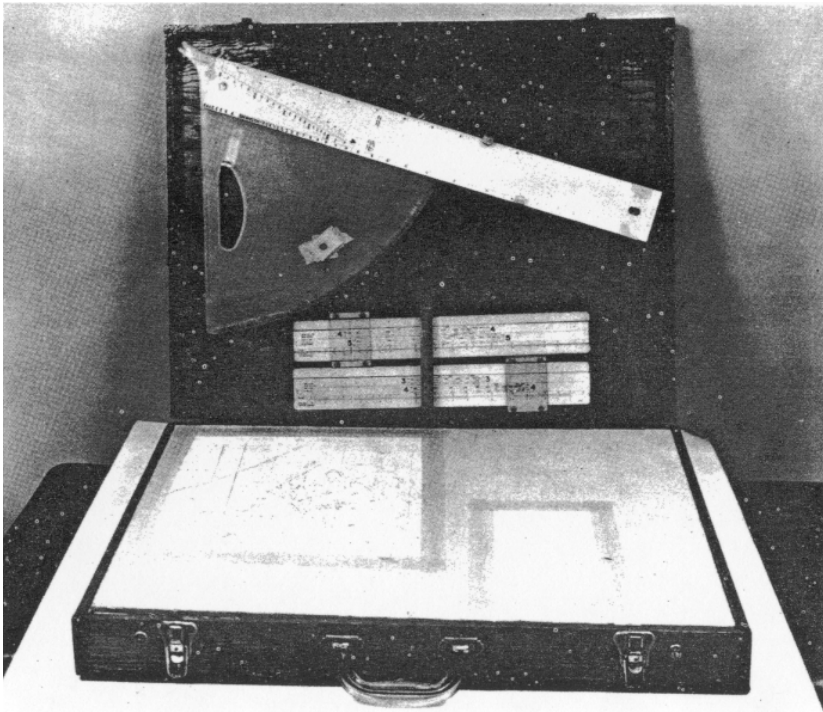


Figure 26. Fire direction equipment carrying case opened. Note the position of the mapboards.

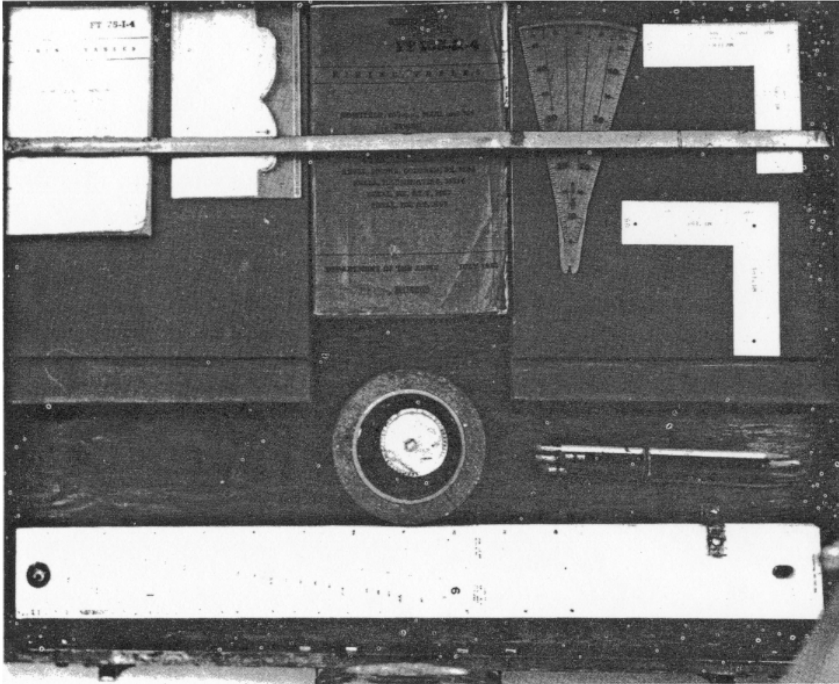


Figure 27. Bottom half of the carrying case with mapboards removed.

- b. Equipment is arranged so that it can be taken out in the sequence in which it should be set up for operation.
  4. The case is portable. A complete set of equipment can be easily and safely loaded, unloaded, and carried by one man.
  5. Convenience.
    - a. When the case is opened, any item of equipment can be located at a glance.
    - b. There is no grab-bag operation and no fumbling blindly in a canvas bag trying to locate the smaller items.

---

Please use your correct student number on all correspondence and on all lessons submitted to the Extension Courses Division.

---

## **REDSTONE MATERIEL COURSES NOW TAUGHT AT FORT SILL**

Chief Warrant Officer John C. McDuffey  
Department of Materiel

Redstone missile materiel courses are now being taught at the US Army Artillery and Missile School. The first classes started in January 1959. Redstone training is not new to the School curriculum. Resident officer classes have been taught Redstone gunnery and tactics for 2 years. The officer and enlisted materiel specialist courses are new to the School.

Formerly the Field Artillery Instructional Detachment of the Artillery and Missile School taught these materiel courses at Redstone Arsenal, Alabama. The detachment personnel were initially trained by the Ordnance Guided Missile School at Redstone Arsenal. On the job training with the Army Ballistic Missile Agency followed this formal schooling. Part of the detachment went to Cape Canaveral, Florida, to observe and assist in several Redstone firings.

In October 1958, the detachment was transferred to Fort Sill where it became the Redstone Division of the Department of Materiel.

While at Redstone Arsenal the detachment conducted several materiel maintenance courses. These included a course in Redstone operation and maintenance for US Air Force officers and airmen connected with the Jupiter program. This instruction was feasible because of the similarity of the Jupiter and Redstone systems.

### Three Courses Offered

At the present time three separate Redstone courses are being offered:

Redstone Officers' Course (MOS 1191) for selected commissioned officers. This course trains officers as to the characteristics, operating principles, capabilities, and limitations of the Redstone and its associated equipment. The course is 8 weeks long.

Redstone Electronic Materiel Maintenance Course (MOS 218 for enlisted men and 1192 for warrant officers). The course trains selected enlisted men and warrant officers to assemble, install, calibrate, adjust, and maintain on-missile electronic guidance control components associated electronic test equipment. This course is 9 weeks long.

Redstone Mechanical Materiel Maintenance Course (MOS 169). This course trains selected enlisted men to assemble, install, maintain, and adjust Redstone mechanical on-missile guidance and control systems and associated test equipment; to assemble missiles and perform required checks on propulsion, pneumatic, and mechanical systems and their associated test equipment; and to operate and supervise the maintenance of the ground handling equipment. This course is 8 weeks long.

These missile courses prepare graduates to successfully occupy key positions in Redstone units.



## AN INSPECTION GUIDE FOR ARTILLERY COMMANDERS

The weapon is a 155-mm howitzer; how far should the oil-index indicator rod protrude from the face of the recuperator-cylinder head if the correct amount of reserve oil is in the recoil mechanism? Stumped? Try a second question. You are inspecting a Corporal field artillery missile battalion. While inspecting the computer group, you observe that the "frequency meter" indicates 59.5 to 60.5 cycles per second (cps). Is this reading correct for normal operations?

You say that these questions are minute. After all, if you ever need this information, you can check a technical manual for the answer. Can you? TM's have a lot of information spread over many pages. You might need specific and detailed information on short notice. First you must determine which technical manual is applicable to the equipment, and then you must locate the specific data within the book. You can't say, "I can't find it" or "I don't know."

Here's a solution. The above questions were taken at random from Department of the Army Pamphlet 750-1, "Preventive Maintenance Guide for Commanders," more simply known as "The PM Guide." Oh yes, you remember that pamphlet. You glanced at it as it passed over your desk. Then you sent it to the motor pool. After all, aren't they the people who are concerned with maintenance?

### You Are Concerned With Maintenance

Preventive maintenance is a command responsibility. You, as the commander, are more concerned with maintenance than anyone else. You'd better retrieve that book! When you check it again, you will find that 119 pages deal specifically with field artillery weapons. There are detailed illustrations and explanations of what it takes to keep those weapons firing. You'll find information on fire control instruments, recoil mechanisms, missile bodies, weapons carriages, etc. An example of the detail is found in the section dealing with the Corporal missile system. It covers the missile, launcher, transporter, guidance section, radar, and computer. Everything is spelled out in detail, but in simple and easy-to-understand language.

In addition, many pages deal with equipment other than weapons organic to field artillery units.

For example, you will find nuts and bolts data on how to keep your vehicles rolling. You won't have to go through a stack of technical explanations to locate what you need, because the PM Guide is condensed and deals specifically with preventive maintenance. It tells you how to determine whether your unit is technically functioning properly. As for communications, you will find sections describing various artillery radio sets and switchboards. If you will follow the book, you will be able to communicate.

The PM Guide can be of great help to you in making inspections. Study this book before your next inspection, and you will surprise your subordinates with your detailed knowledge of the equipment.

Since the PM Guide is bound with clips through three punched holes, it's easy to remove pages and insert changes.

General Bruce C. Clarke, Commanding General of the Continental Army Command, has frequently said, "An organization does well only those things the boss checks." Have you checked lately?

## **NEW FILMSTRIPS FOR OBSERVED FIRE INSTRUCTION**

Major Wilber N. Herndon, USMC  
Department of Gunnery



Sensing: AIR, RANGE CORRECT, LINE.

Surveillance: END OF MISSION, ESTIMATE 15 CASUALTIES, INFANTRY DISPERSED.

The artillery range has been moved into the classroom. The above scene is the final frame of a complete fire mission presented on one

of the new 35-mm color filmstrips on "Observed Fire Procedure Training" developed recently by the US Army Artillery and Missile School. The filmstrips are an excellent supplement to terrain (puff) boards and Bishop trainers and improve on the Vu-Graph slide system of observed fire instruction.

The problem of gaining a three-dimensional effect has not been solved, but the new filmstrips are excellent for teaching observed fire procedures to inexperienced students. They also provide a valuable review for experienced observers. Commanders of active Army, Reserve, and National Guard units with limited range facilities or limited ammunition allowances will find the films valuable in training forward observers. The films will aid Military Assistance Advisory Group instructors who in teaching foreign students may have language difficulties to overcome.

Basically, successful adjustment of fire means mastering a set of established procedures. The filmstrips will teach these procedures effectively while saving ammunition.

#### Situations Designed for Student Response

Actual missions were photographed in sequence through a telephoto lens to provide views of what the observer sees through field glasses. The films are designed to get a student response on each, situation or

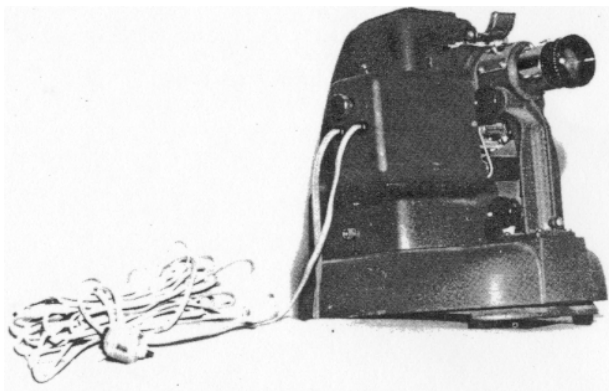


Figure 28. 35-mm projector with BPI remote control unit attached. The instructor operates the projector with the switch at the end of the long wire.

problem presented during the mission. A "school solution" frame follows the frame presenting the problem. The presenting of a solution makes the filmstrip an excellent self-teacher. Students attending resident courses are permitted to draw the filmstrips and a projector for home study.

Each frame that requires a solution was selected for a specific teaching point. The filmstrips may be used in conjunction with fire direction training and gun drill and as an aid in teaching map reading, communication procedures, and terrain appreciation and sensings.

### Three Filmstrips

The set contains three short filmstrips. Filmstrip 6-84 is 145 frames long and has 4 separate sections:

- Section I- Preparation of Initial Data
- Section II- Sensings and Subsequent Fire Requests
- Section III- Precision Registration, Fuze Quick
- Section IV- Precision Registration, Fuze Time

Filmstrip 6-85 is 98 frames long and shows 4 complete missions:

- Section I- Fuze Quick Mission
- Section II - Fuze Delay Mission
- Section III - Fuze Time Mission
- Section IV - Fuze Variable Time (VT) Mission

Filmstrip 6-86 is 94 frames long and shows 4 complete missions:

- Section I - Fuze Time Mission
- Section II - Destruction Mission
- Section III - Fuze VT Mission
- Section IV - Fuze Quick, Shell Mixed (high explosive and white phosphorus) in Fire for Effect Mission

The only equipment needed is a standard 35-mm filmstrip projector (fig 28) and a screen. By using the automatic filmstrip changer (control, remote switching, BP1), the instructor has more freedom in the classroom and does not need an assistant to operate the projector.

These "Observed Fire Procedure Training" filmstrips are an efficient and economical training device which soon can be borrowed along with a projector from all Army film libraries.

### A GEM FOR THE BATTERY EXECUTIVE

Armored field artillery units can occupy a position much faster if each cannoner acting as a gun marker is equipped with a large colored board (2 feet by 2 feet). Each gun section has its own color or distinctive design. The gun marker, who is standing over the assigned gun position, simply holds the board over his head as the battery occupies position, and the chief of section directs his weapon to the appropriate colored board. By looking at the board, the gun crew can tell as soon as they reach the position area where their weapon belongs.

--Submitted by Lt William W. Maurer  
Dept of P&NRT, USAAMS

# **NEWS** **NOTES FOR ARTILLERYMEN**

## CHANGES TO AIRBORNE ARTILLERY TOE

New tables of organization and equipment have been issued recently for airborne divisions. The division artillery fire support coordination center has been augmented with five enlisted men and communications equipment which includes radios, a switchboard, and a radioteletypewriter set.

The mortar and 105-mm howitzer battery commanders have been given an AN/PRC-9 radio in addition to their truck mounted AN/VRC-17 radio.

The rank of corporal has been restored to the assistant gunners in the 105-mm howitzer battery (MOS 141.67) and in the Honest John battery (MOS 147.67).

The new tables of organization and equipment make no provisions for vehicles for the mortar battery's five forward observers. As in the airborne rifle companies which they support, the forward observers will travel by parachute and by foot.

## NOTES FOR THE BATTERY EXECUTIVE--NEW EDITION

The third edition of Notes for the Battery Executive is available at the US Army Artillery and Missile School. The price is 35 cents a copy postpaid. Battery officers will find the book a handy pocket guide during field and combat operations.

Address order to: Book Department  
US Army Artillery and Missile School  
Fort Sill, Oklahoma

## ARTILLERY MOS PROFICIENCY TESTS BEGIN

Recently Congress established legislative authority for proficiency pay. To be eligible for the pay, enlisted men must demonstrate the knowledge or skill required by their military occupation specialty (MOS) on a competitive basis in order to merit the award of additional pay.

The new enlisted evaluation system provides an objective means of evaluating enlisted personnel in their assigned MOS. The system consists of two parts: (1) the Unit Commander's Evaluation Report (DA Form 2166) and (2) the proficiency tests. Each part is scored and computed into a single numerical rating. A cutoff score, established by the Department

of the Army, will then determine the personnel in a certain MOS who are eligible for proficiency pay. MOS testing began in January 1959.

The tests in the first series apply to the following artillery MOS: 153 (artillery surveyor), 211 (field artillery radar mechanic), 214 (field artillery missile electronics mechanic, Corporal), and 313 (artillery communication specialist).

A complete list of the MOS covered in this first series of tests is contained in DA Circular 611-22.

### LIST OF NEW MOS FOR ARTILLERYMEN

Listed below are examples of the new artillery military occupational specialty (MOS) structure which was implemented in December 1958. Both the new and the former MOS are shown. In some cases the titles as well as the MOS have been revised. For example, MOS 153, Artillery Surveyor, is the new title for the artillery survey specialist. Selected air defense artillery MOS are listed to illustrate their close numerical sequence to those of the field artillery. For instance, 169 Field Artillery Materiel Fire Control Crewman (Redstone) and 171 Air Defense Missile Crewman (Nike-Ajax).

A key to abbreviations follows the new and former MOS lists.

<u>New MOS</u>	<u>Former MOS</u>
103--Ballistic Met Crmn	210--Arty FC Crmn
	215--Weather Obsr
104--Field Illumination Crmn	144--Field Illumination Crmn
140--FA Basic	140--FA Basic
141--Lt and Med FA Crmn	141--FA Crmn
	142--Lt Rkt Crmn
	143--Pack Arty Crmn
142--Hv and VH FA Crmn	141--FA Crmn
146--FA Rkt Crmn (Little John)	147--Hv Rkt Crmn
147--FA Rkt Crmn (Honest John)	147--Hv Rkt Crmn
151--ADA Op and Intel Asst	163--AAA Op and Intel Sp
152--FA Op and Intel Asst	146--FA Op and Intel Sp
153--Arty Surveyor	145--Arty Survey Sp
154--Flash Ranging Crmn	101--Flash Ranging Crmn
155--Sound Ranging Crmn	102--Sound Ranging Crmn
156--FA Radar Crmn	210--Arty FC Crmn
	211--FA Radar Crmn
164--FA Msl Crmn (Corporal)	222--SSM Mechanical Asbl
	226--SSM Launching Crmn
165--FA Msl FC Crmn (Corporal)	228--SSM FC Crmn
166--FA Msl Crmn (Lacrosse)	222--SSM Mechanical Asbl
	226--SSM Launching Crmn
167--FA Msl Crmn (Lacrosse)	228--SSM FC Crmn

168--FA Msl Crmn (Redstone)	226--SSM Launching Crmn
169--FA Msl Mat Crmn (Redstone)	222--SSM Mechanical Asbl
171--AD Msl Crmn (Nike-Ajax)	225--SAM Launching Crmn
173--AD Msl FC Crmn (Nike-Ajax)	227--SAM FC Crmn
174--AD Msl Crmn (Hawk)	225--SAM Launching Crmn
211--FA Radar Mech	211--FA Radar Crmn
214--FA Msl Elct Mech (Corporal)	224--SSM Elct Asbl
215--FA Msl FC Mech (Corporal)	228--SSM FC Crmn
216--FA Msl Elct Mech (Lacrosse)	224--SSM Elct Asbl
217--FA Msl FC Mech (Lacrosse)	228--SSM FC Crmn
218--FA Msl Elct Mech (Redstone)	224--SSM Elct Asbl
221--AD Msl CW Radar Mech (Hawk)	227--SAM FC Crmn
223--AD Msl Elct Mech (Nike-Ajax)	227--SAM FC Crmn

Key to abbreviations.

AAA--antiaircraft artillery	It--light
AD--air defense	mat--materiel
ADA--air defense artillery	mech--mechanic
arty--artillery	med--medium
asbl--assembler	met--meteorological
asst--assistant	mssl--missile
crmn--crewman	obsr--observer
CW--continuous wave	op--operations
elct--electronics	rkt--rocket
FA--field artillery	SAM--surface-to-air missile
FC--fire control	SSM--surface-to-surface missile
Hv--heavy	sp--specialist
intel--intelligence	VH--very heavy

ASSUMED NUCLEAR WEAPONS AND FIRING SYSTEMS DATA

To add realism to resident and nonresident instruction, the US Army Artillery and Missile School has prepared an unclassified chart (table 2) of assumed nuclear weapons yields and assumed ranges, circular error probables (CEP), and height of burst probable errors (H<sub>b</sub>PE). The listed yields are representative of those shown in Reference Book 39-1-1 "Nuclear Weapons Employment," (Jul 58) from the US Army Command and General Staff College.

Three additional assumpitons are made:

- a. The cannon listed in table 2 have an air burst nuclear capability.
  - b. The free-flight and guided missiles have both an air and surface burst nuclear capability.
  - c. The Lacrosse guidance equipment has a range of 18,000 meters.
- This data is considered appropriate for use in field exercises, command post exercises (CPX's) and other related training.

<u>Weapon</u>	<u>Yield in KT</u>	<u>Minimum Rn</u>	<u>Maximum Rn</u>	<u>CEP</u>	<u>H<sub>b</sub>, PE</u>
8-inch How	1,2	3,000 M	15,000 M	Divide Rn by 200.	Divide Rn by 400.
280-mm Gun	2,10,20,50	5,000 M	30,000 M	Divide Rn by 200.	Divide Rn by 400.
Honest John	5,10,20,50	5,000 M	26,000 M	Divide Rn by 100.	Divide Rn by 200.
LaCrosse	2,5,10	10,000 M	28,000 M	100 M	20 M
Corporal	5,10,20,50	50 Km	130 Km	400 M	30 M
Redstone	500,2000	100 Km	330 Km	500 M	50 M

Table 2. Assumed nuclear weapons and firing systems data.

NEW HONEST JOHN FIRING TABLES

Recently new Honest John firing tables have been distributed. The new tables, FTR 762-A-2 and FTR 762-B-2 replace FTR 762-A-1 and 762-B-1.

These new tables have a revised simplified format that facilitates a more rapid solution of the gunnery problem. There is a separate page for each 100 meters in range, and all unit corrections for a given range appear on the same page. Page entry is determined by rounding off the computed range to the nearest 100 meters. For example, if the range is 19,665 meters, the table is entered at the page for 19,700 meters. On each page, unit corrections are listed for each 100 meters height of burst relative to the launcher. The correct entry needed for extracting unit corrections is determined by rounding off the height of burst to the nearest 100 meters. For instance, if the height is +260 meters, the line to use is opposite +300 meters. No interpolation is necessary.

With the exception of the earth rotation table, negative (minus) values are shown in red. A new term, "correction" component, has been introduced. The correction component table replaces the wind component table. These components are provided for both ballistic and low level 1-mile-per-hour cross and range winds. Unlike the old tables, the new tables require no sign change. The reason is that they are correction rather than effect tables.

Surface pressure unit corrections are based on millibars in the new tables whereas they were based on pounds in the old tables. This change allows the use of a direct reading from the barometer which is issued as a component of windsets AN/MMQ-1A, AN/MMQ-1B, and AN/PMQ-6, to obtain surface pressure. Provisions are made for computing surface pressure from the meteorological message when a barometer is not available.



## OPERATOR'S MANUAL--A TREND IN TRAINING LITERATURE

The problem of keeping training literature current and contained in a minimum number of manuals has become difficult. Rapid changes of tactical concepts coupled with the continuous introduction of improved and complex weapon systems are the cause of the problem.

The US Army Artillery and Missile School considers it feasible to prepare a publication combining field manuals and technical manuals for a specific unit into one "operator's manual." The user agency, for example the artillery, could prepare such a manual in conjunction with the technical services concerned.

Two advantages of such a text are as follows: First, one self-sustaining publication would be furnished to the operator prior to unit activation. Second, subsequent changes to such a manual would be facilitated

### STATUS OF TRAINING LITERATURE

1. The following training literature is under preparation or revision by the US Army Artillery and Missile School.

#### A. Field Manuals:

- 6-18 Mortar Battery, Airborne Division Battle Group
- 6-60 The FA Rocket, Honest John
- 6-61 FA Missile Battalion, Honest John Rocket
- 6-( ) Division Artillery (includes infantry, armored and airborne)
- 6-( ) US Army Missile Command (Air transportable)
- 6-( ) US Army Missile Command (Medium)
- 6-( ) US Army Missile Command (Heavy)
- 6-( ) FA Missile Lacrosse
- 6-( ) Warhead Section, W7, (Corporal) (U) 6x9 looseleaf
- 6-( ) Warhead Section, W7, (Honest John) (U) 6x9 looseleaf
- 6-( ) Warhead Section, W31, (Honest John) (U) 6x9 looseleaf
- 6-( ) Warhead Section, W39, (Redstone) (U) 6x9 looseleaf
- 6-( ) Warhead Section, W13 (Lacrosse) (U) 6x9 looseleaf
- 6-( ) Shell: Nuclear Explosive, T317E1;  
Training, T349E1, and Spotting, T347;  
8-inch Howitzer (U) 6x9 looseleaf
- 6-( ) Shell: Nuclear Explosive, M366  
(T315); and Training, T167;  
280-mm Gun (U) 6x9 looseleaf

#### B. Training Circulars (TC):

- TC 6-8(S) Change 1. Atomic Ammunition for Field Artillery Guns and Howitzers (U)
- TC 6-( ) Helicopter Transported Artillery

C. Army Training Programs (ATP):

ATP 6-545 FA Missile Battalion, Corporal  
ATP 6-630 FA Missile Group, Redstone

D. Army Training Tests (ATT):

ATT 6-5 FA Battalion, Light and Medium  
ATT 6-15 FA Battalion ROCID  
ATT 6-630 Change 1. FA Missile Group, Redstone  
ATT 6-( ) FA Missile Battalions and Batteries, 762-mm  
(New) combines ATT 6-7 and 6-11  
ATT 6-( ) FA Howitzer or Gun Battery, Heavy

2. Field Artillery training literature submitted to USCONARC:

FM 6-30 FA Missile Battalion, Corporal  
FM 6-31 Corporal Missile Firing Platoon  
FM 6-32 Guidance System FA Missile Corporal  
ATP 6-585 FA Missile Battalion, Lacrosse (New)  
ATP 6-( ) Reserve Forces Act (Artillery)  
ATT 6-585 FA Missile Battalion, Lacrosse

3. Field Artillery training literature at the Government Printing Office:

FM 6-20 FA Tactics and Techniques  
FM 6-40 Change 1 to Field Artillery Gunnery  
FM 6-45 FA Missile Battalion, Lacrosse  
FM 6-155 Warhead Assembly, HE 762-mm Rocket M6 (2043E1) and  
T2043

4. Field Artillery training literature printed since the October 1958 issue of ARTILLERY TRENDS:

FM 6-140 The FA Battery, dated 30 Sep 58  
ATP 6-100 Field Artillery Units, dated 5 Sep 58  
TM 6-300-59 Army Ephemeris, dated 24 Oct 58

---

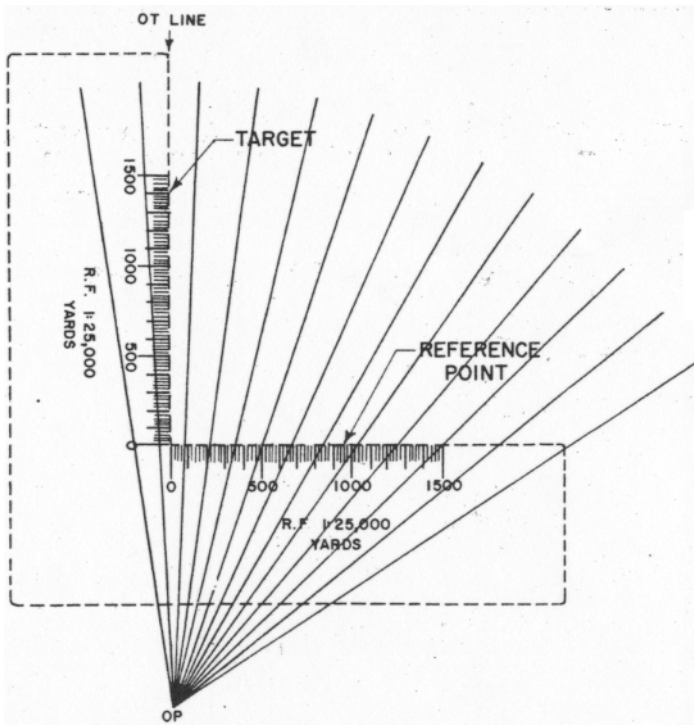
Do You Have A Gem?

Have you a practical idea on how to better accomplish an artillery task:

Send it to: ARTILLERY TRENDS  
Department of P&NRT, USAAMS  
Fort Sill, Oklahoma

## A GEM FOR THE FORWARD OBSERVER

Do you have trouble computing a shift from a known point? Do you have difficulty remembering rough sine factors? Have you been pressed for time in computing these shifts? Then this system is for you. All you need is a coordinate scale and your map. The known point(s) from which you want to shift and your observation post must be plotted on the map. Since a shift from a known point is reported to the fire direction center in yards, the yards side of the coordinate square is used. Locate the target on the map using a pencil or pin. Line up one side of the coordinate scale on the observer-target line and the other side on the known point from which you are shifting. The shift can now be read directly from the coordinate square. For example, in the illustration below, the shift



can be easily and quickly determined as: From registration point 1, left 950, add 1400. This system is much faster than using the sine factors and gives you approximately the same initial accuracy.

--Submitted by 1st Lt Norval R. Rose  
Dept of P&NRT, USAAMS