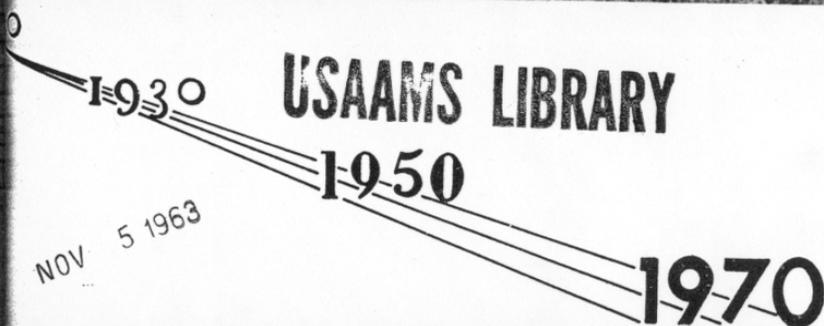
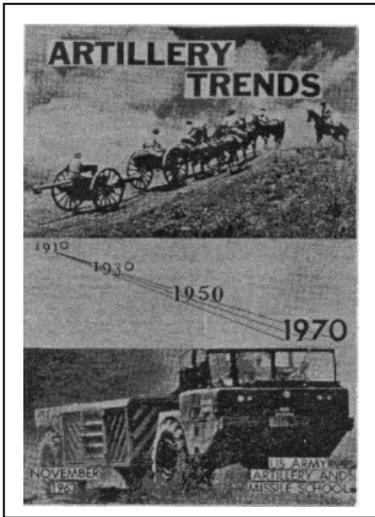


ARTILLERY TRENDS



EMBER

US ARMY
ARTILLERY AND



Instructional Aid Number 28

● COVER

From the days of the caisson to the foreseeable future, mobility has been and will remain an important requirement of the artillery. The article entitled "Unlimited Mobility" which begins on page 11 takes a look at some of the latest developments and planned developments which will provide the artillery with this mobility in the near future. The inside front cover shows the latest concept in "fast flying" artillery support—see page 5.

● ARTICLES

REDSTONE—A Decade of Firsts.....	2
Automotive Circuit Tester	3
Aerial artillery—A NEW HORIZON	5
Unlimited Mobility	11
New BC Scope	22
Artillery Antennas Revisited	25
M2 aiming circle—Magnetic Needle INACCURACIES	28
Simplified chart method—RAPID GRID CONVERGENCE	31
Artillery OCS—This Patch Needs A Sleeve.....	34
NATO method—Metro Minus Density	40
M17C range finder—OT Range Made SIMPLE.....	42
THE "MINUTEMAN" Fire Direction Device.....	45
The supported force—Development In Armor—AR/AAV	50

● NEWSNOTES

News of, for, about the Artillery World.....	53
--	----

● RESIDENT COURSE SCHEDULE

Resident Courses—U.S. Army Artillery and Missile School.....	57
--	----

● STATUS OF TRAINING LITERATURE AND FILM

TRAINING LITERATURE	61
TRAINING FILM.....	63

ARTILLERY TRENDS is a publication of the United States Army Artillery and Missile School appearing only when sufficient material of instructional nature can be gathered.

REDSTONE

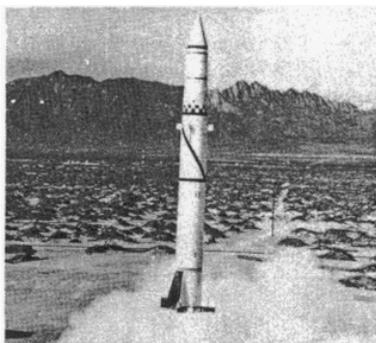
A Decade Of Firsts

At 9:30 on the morning of 20 August 1953 at Cape Canaveral, an olive-drab Redstone ballistic missile soared into its 10-year career as the Army artillery's biggest and mightiest missile (fig 1). Today, this veteran of 10 years' service is being phased out of the artillery and will soon be replaced by the Pershing missile system.

Since that historic morning, the Redstone has set so many "firsts" that its record has never been approached by any other missile. Its successes and reliability have earned the Redstone the nickname "Old Reliable." The missile provided a staggering amount of information which paved the way for many of the artillery's current missiles.

"Know how" provided by Redstone has made possible many advances in missile technology, such as the launching of Explorer I, America's first scientific satellite, on 31 January 1958 and the suborbital flight of Alan Shepard, the free world's first astronaut who made the suborbital flight 115 miles into space on 5 May 1961.

In addition, the Redstone was—



The Army's "Sunday punch."

development have been invaluable, as proved in the artillery's current ballistic missiles—Pershing, Sergeant, and Lance which is now under development.



Figure 1. First Redstone.

- the first United States ballistic missile to successfully employ an inertial guidance system, making it immune to known types of countermeasures.
- the first large ballistic missile to be fired by troops.
- the first US ballistic missile to be deployed overseas, joining the North Atlantic Treaty Organization (NATO) Shield Forces.

Although the Redstone is being phased out, the information and data it has provided ballistic missile research and

Automotive Circuit Tester

Mr. Dan C. Adkins
Artillery Transport Department

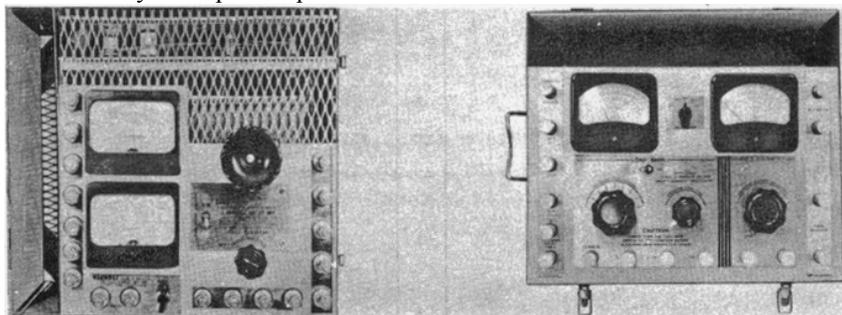


Figure 1. The meter equipment of the LVCT.

The number and complexity of electrically actuated accessories on modern army vehicles are ever-increasing. Any malfunctioning of electrical units will affect the overall efficiency and dependability of the vehicle. To minimize the deadlining of vehicles because of these electrical malfunctions, the low-voltage circuit tester (LVCT) (fig 1 and 2), currently provided for use by the organizational mechanic, should be properly used and not be neglected.

Experience indicates that organizational maintenance personnel use the LVCT very little, mostly because the mechanics and supervisors do not understand its purpose and use.

LVCT AND KIT

The low-voltage circuit tester and an adapter kit (fig 3) are component parts of the second-echelon number 2 common and number 1 supplemental tool sets. The LVCT, which is one of the most important pieces of automotive testing equipment, consists of a voltmeter, an ammeter, a load bank, and a field rheostat. The components are mounted in a metal case which also provides storage space for the leads and accessories.

PURPOSES AND USES

The LVCT with the adapter kit can be used to check out the waterproof electrical systems without removing covers, plates, or components of the system, which if removed, would break the waterproof seals. With the exception of the secondary ignition circuit, the LVCT checks the operation and the condition of automotive direct current (DC) electrical circuits and components, which include the cranking system, charging system, and primary portion of the battery ignition system.

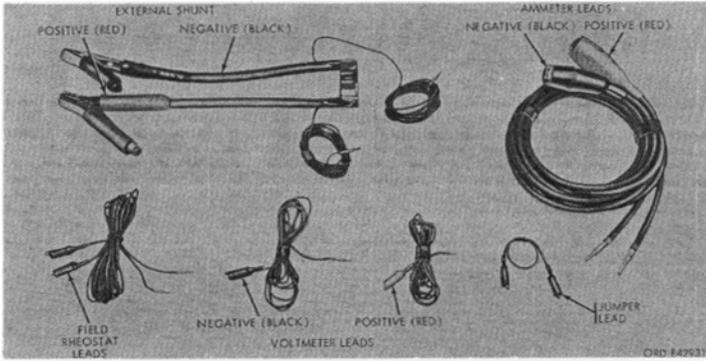


Figure 2. Meter leads and accessories.

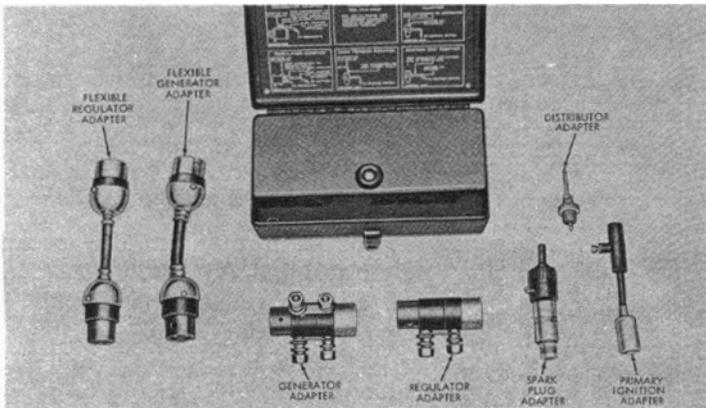


Figure 3. The adapter kit.

During troubleshooting the electrical system, the LVCT and adapters can also be used effectively to quickly diagnose, locate, and isolate electrical troubles, which helps to determine if a component is defective or the wiring is faulty.

For more complete information concerning the LVCT, an organizational mechanic or a unit may purchase manual, ATD 306, "Low Voltage Circuit Tester and Its Uses," offered by the Book Department, USAAMS. The manual can be used as a guide for training personnel and for performing maintenance and troubleshooting procedures on DC electrical systems. TM 9-2320-211-20 (March 1963) also contains some detailed information regarding the use of the LVCT with the 5-ton series of wheeled vehicles.

The LVCT is instrumental in minimizing the deadlining of vehicles, the loss of time used to replace parts which are not actually defective, and the overall maintenance costs. This item of automotive testing equipment should be used to perform the many checks of the DC electrical systems of vehicles.



AERIAL ARTILLERY----PAGE 5

aerial artillery . . .



A NEW HORIZON

Captain E. C. Riley
Gunnery Department

To maintain its highly effective supporting role, the field artillery's airmobility as well as its ground mobility must be equal to or greater than the mobility of the supported force. Aerial artillery is designed to provide "fast-flying" support fires to the long-range, fast-moving operations of airmobile units. This new artillery concept provides airmobile support with several types of weapons mounted on fixed-wing and rotary-wing aircraft (Air Assault Division, ARTILLERY TRENDS, April 1963).

CAPABILITIES AND LIMITATIONS

Aerial artillery is capable of closing on an objective at speeds comparable to those of the ground-gaining arms. This speed capability permits the field artillery to adequately support long-range operations. Although aerial artillery can accomplish any of the field artillery missions (direct support, general support, reinforcing, and general support-reinforcing), it is best suited for general support.

Perhaps the greatest limiting factor of aerial artillery is weather. Any restrictions to visibility, such as haze, dust, rain, smoke, low clouds, or snow, will hinder the usefulness of this new artillery concept, for the pilot and forward observer must maintain constant visual contact with the ground throughout the fire mission. Other limiting factors include the fuel and ammunition requirements of the aircraft and its vulnerability to automatic and air defense weapons.

CAATE COMMITTEE

In recognition of the need for intensive study and testing of aerial artillery, a Committee for Aerial Artillery Test and Evaluation (CAATE) has been established by the US Army Artillery and Missile Center. The Committee is comprised of representatives from each department of the US Army Artillery and Missile School, the US Army Artillery Board, and the US Army Combat Developments Command Artillery Agency. The objective of this committee is to determine the—

- Capability of aerial artillery to provide adequate, close, and continuous fire support.
- Adequacy of present command and control techniques in the employment of aerial artillery.
- Combat service requirements for aerial artillery.
- Adequacy of the organization of aerial artillery batteries and battalions.
- Combat effectiveness of aerial artillery in relation to existing artillery organizations.
- Adequacy of the fire support coordination procedures for aerial artillery.
- Tactics, techniques, and procedures for the employment of aerial artillery.

PROVISIONAL BATTERY

In order for CAATE to accomplish its objectives with realistic results, the 1st Aerial Artillery Battery (Provisional) (fig 1) was organized in April 1963. The provisional battery will test various types of aircraft and weapons systems to determine their effectiveness for aerial artillery.

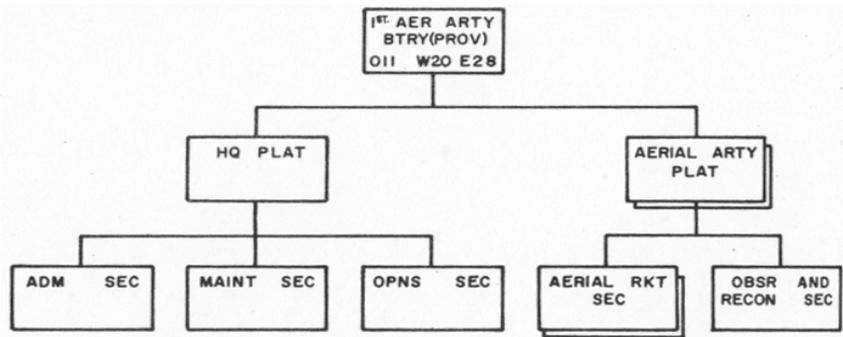


Figure 1. 1st Aerial Artillery Battery (Provisional).

The observation and reconnaissance section is equipped with two OH-13 light observation helicopters (fig 2), armed with light machineguns; and one OV-1 Mohawk (fig 3). The Mohawk will be tested in target acquisition, observation, and other missions as required; and the OH-13 will be evaluated in adjustment of cannon artillery fire, observation, damage assessment, and reconnaissance.



Figure 2. OH-13 Light observation helicopter.

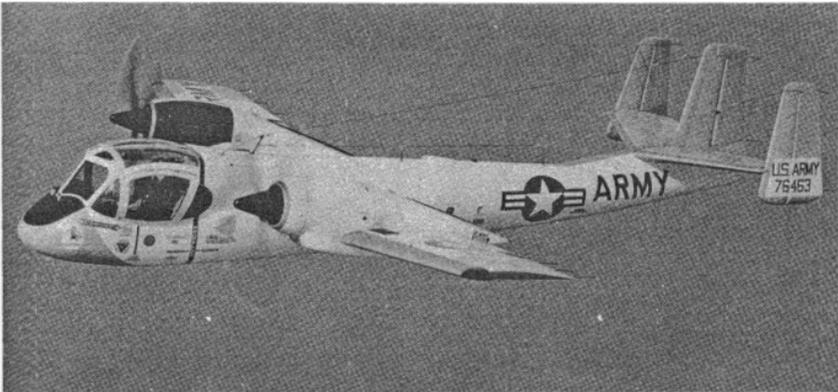


Figure 3. OV-1 Mohawk.

Each aerial rocket section consists of three CH-34/4.5-inch rocket weapons systems (fig 4). The CH-34/4.5-inch rocket system, an interim weapon substituting for the XM3 weapons system, provides an inexpensive and reliable means to fulfill test and evaluation requirements in the field of aerial fire support.

INITIAL TEST RESULTS

The committee's initial test schedule (PHASE I) includes several tests consisting of effects firing to determine the effectiveness and lethality of aerial artillery; a test to determine the artillery forward observer's



Figure 4. CH-34/4.5-inch rocket weapons system.

ability to control these armed Army aircraft; and tests to determine the tactical employment of aerial artillery in each standard artillery mission.

The results of Test 1, effects firing of the 4.5-inch rocket, demonstrate not only the reliability of the rocket (no misfires) but also the validity of the Firing Table 4.5-0-1 for the rocket system. In addition, the test has determined that automatic static firing of ripples up to five rockets can be accomplished safely and effectively. Ripples of rockets greater than five cause undue stress on the airframe of the helicopter and produce an undesirable dispersion pattern.

Test results show fire from hovering aircraft to be unacceptable, for dispersion is extremely wide and fire is inaccurate, since the aircraft does not provide a stable firing platform in the hovering attitude.

Test 2, forward observer control of Aerial Artillery, is complete, and the subject matter has been integrated into resident course POI's (OF 5A). The course, consisting of 2 hours of classroom instruction and a 1-hour demonstration (OF 5B), is designed to teach the artillery forward observer the procedures for, and consideration of, controlling the fires of armed Army aircraft.

Tests 3, 4, and 5, aerial artillery in the direct support role, in the reinforcing role, and in the general support role, have started, but Tests 4 and 5 will not be conducted until the completion of Test 3.

FUTURE CONCEPTS

As technology progresses, more suitable aerial weapons platforms and systems will be developed for study and evaluation. The Committee plans to test such developments as the UH-1B/XM3 weapons system (fig 5) and the UH-1B/SS11 antitank missile system (fig 6).

A new light observation helicopter model (fig 7) will be studied for replacement of the OH-13 in the aerial artillery battery; and the CV-2B Caribou will be tested in certain field roles (fig 8). In addition to the testing of these aircraft, contemporary aerial artillery weapons systems will be evaluated for an indirect fire capability.



Figure 5. UH-1B/XM3 weapons system.



Figure 6. UH-1B/SS11 antitank missile system.

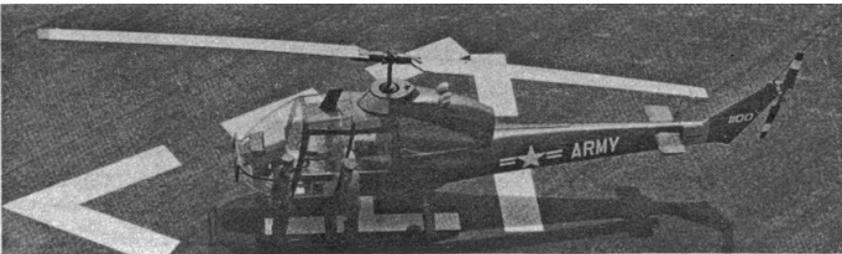


Figure 7. One of the entries in the Army's LOH competition.



Figure 8. CV-2B Caribou.

The aerial artillery concept is now an integral part of the artillery capability, and CAATE's continuing efforts to provide facts, doctrine, and techniques of aerial artillery will keep the field artillery abreast, if not somewhat ahead, of the rapid expansion in this new field of artillery fire support.

●

GEM FOR THE COMMANDER

A new "do-it-yourself" lighting device can eliminate delays caused by unmarked sights during night occupations of positions with M52 self-propelled howitzers. A red warning light from the driver's panel of a M113 personnel carrier can be taped to the top of the M100 sight and wired to a battery powered flashlight which the gunner can turn on and off as needed. Orienting flashlights, previously used for marking sights, was difficult because the left beam could not be reflected properly from the first prism to the last. Usually, the light beam was diffused on the walls of the panoramic telescope, and only a faint light was reflected from the last prism into the darkness.

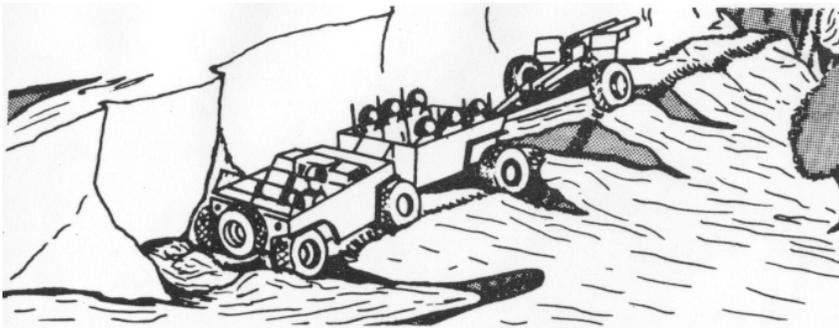
Previously, time was needed for the gunner to direct his sight toward the aiming circle before he could receive an initial deflection. With the new device, each piece is given an initial deflection as quickly as the howitzer stops and a deflection can be read on the aiming circle.

—Submitted by 1st Lt Harold E. Anderson

SFC Elmer M. West

* * * * *

NOTE: The XM53 Instrument Light Kit used with the M115 panoramic telescope mounted on the M107, 175-mm self-propelled gun and the M110, 8-inch self-propelled howitzer, operates and is used in essentially the same manner as the "do-it-yourself" system. The light kit is also used to project a narrow beam of light to the M1 and M2 aiming post reflectors. These reflectors were designed to replace the aiming post lights currently in use.



Unlimited Mobility

Part I -- XM 561

Captain John U. Thompson Artillery Transport Department

Versatile, economical, operates on almost any type fuel, has a high degree of mobility across rough terrain, "swims" rivers, and has a minimum 300-mile operating range—these phrases describe the proposed XM561, 1 1/4-ton truck (fig 1).

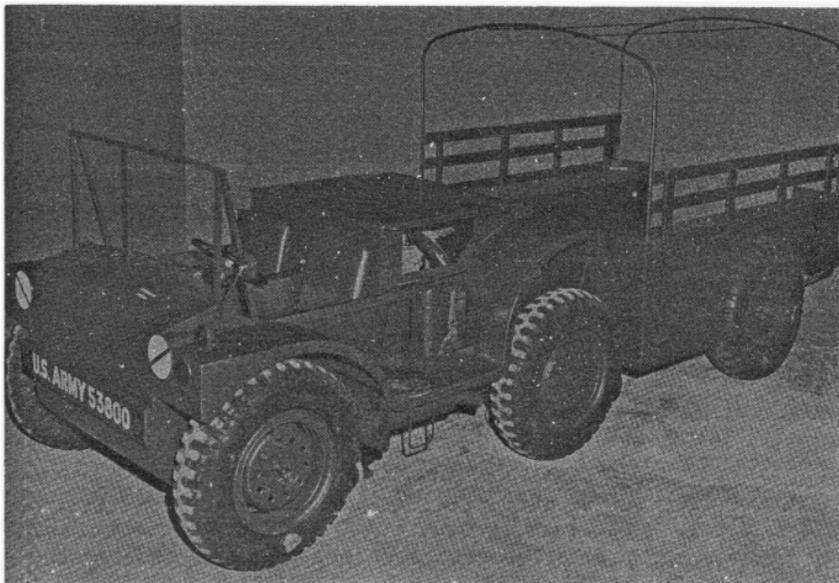


Figure 1. Engineering model of the XM561 cargo truck to be manufactured by Chance Vought Corporation.

DEVELOPMENT

The XM561 is a further development and highly improved version of Chance Vought Corporation's (division of Ling-Temco-Vought Inc.) articulated six-wheel Gama Goat (fig 2). The original 1 1/4-ton truck not only demonstrated its exceptional mobility over numerous rugged military test courses but also proved the soundness of the articulating dual body concept (fig 3).

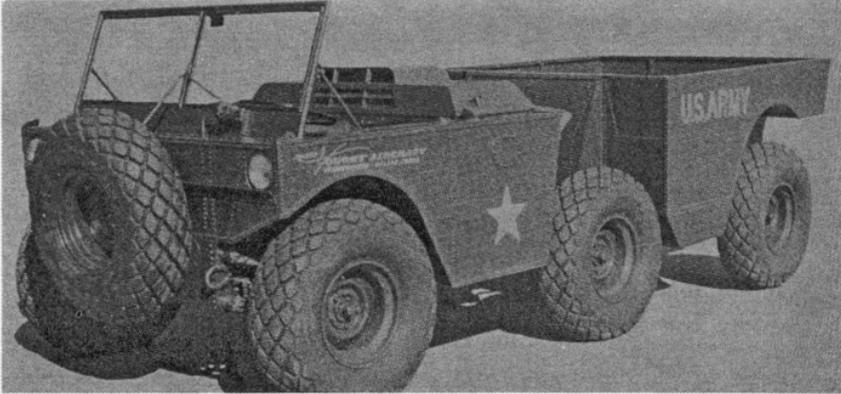


Figure 2. Original 1 1/4-ton Gama Goat.



Figure 3. The Goat successfully demonstrated its cross-country mobility.

CHARACTERISTICS

The XM561 is designed to replace the M170, 1/4-ton truck ambulance, the M43, 3/4-ton truck ambulance, and the M37, 3/4-ton cargo truck. In addition, this new vehicle will reduce the requirements for, and may replace, the M38, M38A1, M38A1C, and M151, 1/4-ton utility trucks, as well as general-purpose trailers towed by these vehicles (fig 4).

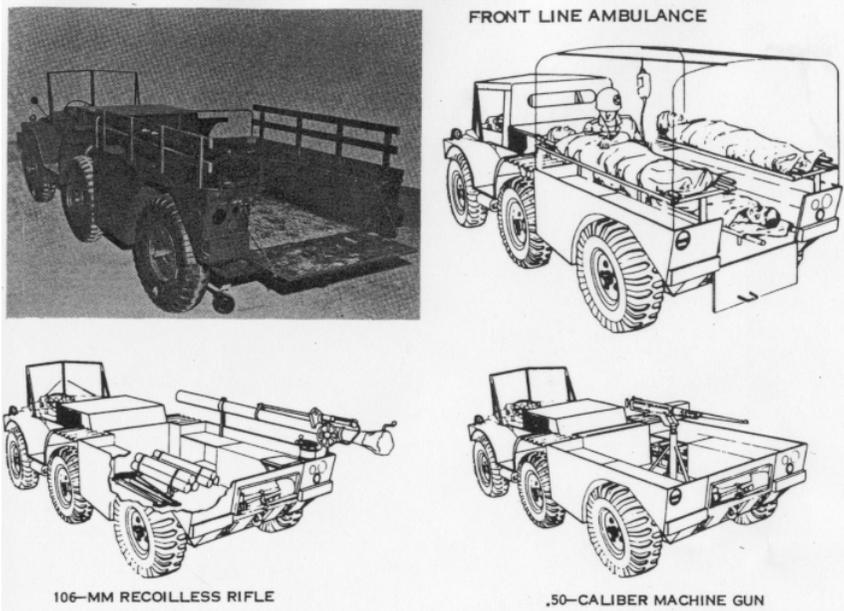


Figure 4. The carrier of the XM561 (top left) can be adapted to many uses. The carriers are connected to the tractor with an articulating assembly

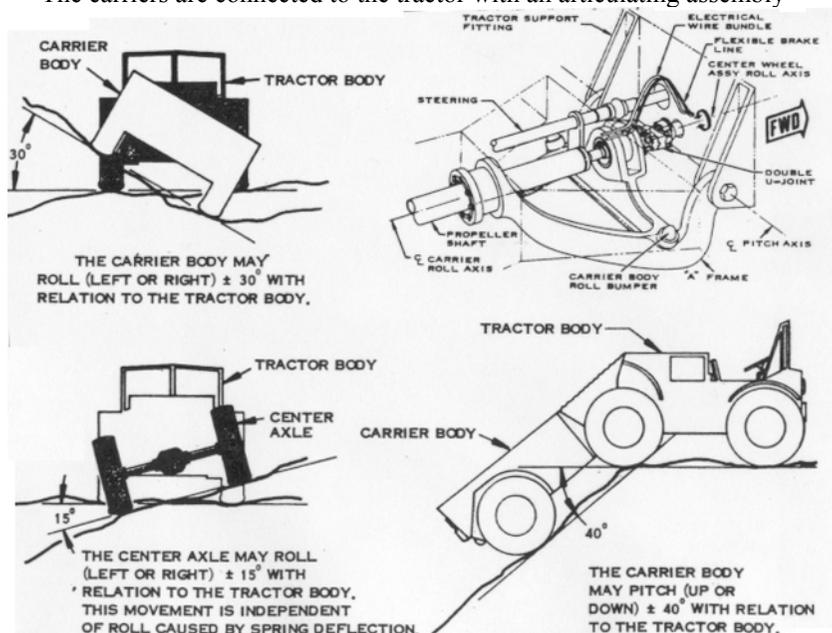


Figure 5. XM561 articulation assembly and performance.

which allows the two bodies to conform independently to most terrain (fig 5). The center wheels rotate about their own axis, independent of either body, to seek their own ground position. This permits all six oversized tires to contact the ground, and full wheel traction is obtained under adverse conditions.

Articulation has contributed to the fulfillment of several mandatory and desirable characteristics of the XM561 (fig 6).

Requirements	XM561 Mandatory and Desired Characteristics	Truck, Cargo, 3/4-ton, 4 × 4, M37B1 Characteristics	Chance Vought's Proposed XM561 Characteristics
Weight:			
Less payload	Improvement over present 3/4-ton	w/winch 5,950 pounds; w/o winch 5,700 pounds	w/winch 5,495 pounds; w/o winch 5,155 pounds
Payload	2,500 pounds	1,500 pounds	2,900 pounds
Gross Weight	————	w/winch 7,450 pounds; w/o winch 7,200 pounds	w/winch 8,395 pounds; w/o winch 8,055 pounds
Towed load allowable cross country	50% gross weight	4,000 pounds	4,200 to 4,800 pounds
Minimum ground clearance	————	10 3/4 inches	15 inches
Vehicle length	————	189 inches	220 inches
Vehicle width	————	72 3/4 inches	84 inches
Vehicle height w/tarp	————	89 1/2 inches	97 inches
Maximum well climb	————	————	20 inches
Approach angle	————	44 degrees	73 degrees
Departure angle	————	32 degrees	50 degrees
Water performance	Swimming capability	————	————
Fording depth	————	w/kit 84 inches w/o kit 42 inches	Vehicle floats and swims
Preparation	————	N/A	None
Freeboard	————	N/A	13 inches
Speed in water	————	N/A	2 miles per hour
Maximum entry grade	————	N/A	60%
Maximum exit grade	————	N/A	40%
Engine:	Multifuel or diesel desired		
Make	————	Dodge T245	General motors GM3-53 4 valve
T type	————	Liquid cooled, in line 6 cylinder, gas	Liquid cooled, vertical 3 cylinder, multifuel
Highway performance	Improvement over 3/4-ton	9 miles per gallon	14 miles per gallon
Cruising range	Minimum 300 miles	225 miles	520 miles
Maximum speed	50 miles per hour	55 miles per hour	56 miles per hour
Turning circle (diameter)	————	50 feet	54 feet
Cargo area	56 square feet desirable	34.6 square feet	54 square feet

Figure 6. XM561 characteristics.

Several outstanding characteristics, contributing to the cross-country mobility of the vehicle, include a high underbody ground clearance (15 inches), large entrance and exit angles (73° and 50°, respectively), short wheelbase (69 inches), and a watertight body (fig 7). In addition to these characteristics, the production vehicle with payload must be air transportable and capable of aerial delivery, including parachute delivery in Phase I airborne operations (fig 8).

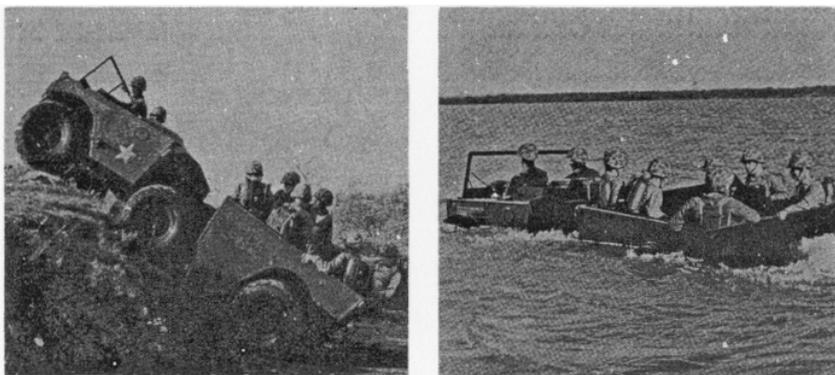


Figure 7. The XM561 can maneuver on land or water.

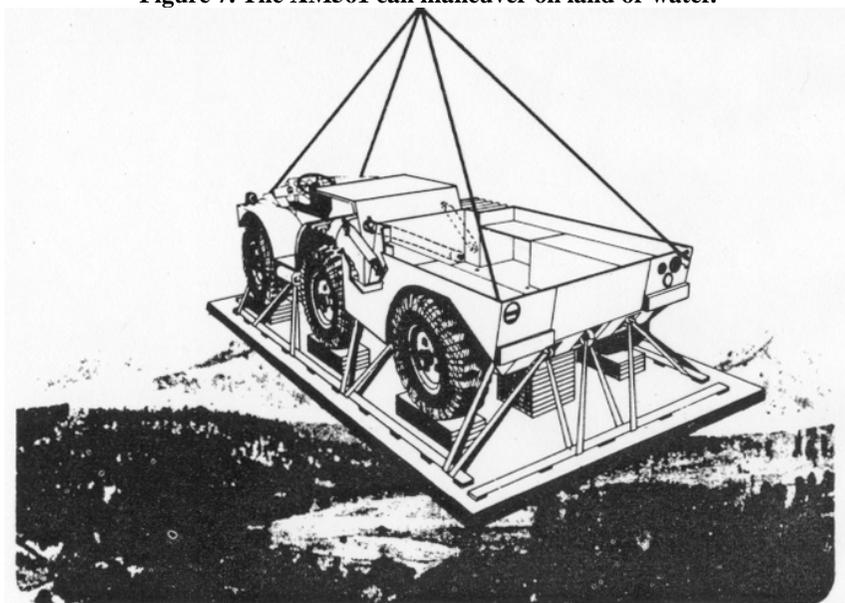


Figure 8. Air drop arrangement.

At present, the XM561 is in the mockup stage with limited activity in the fabrication of hardware. The target date for initial US Army Artillery Board tests is December 1964, with the first production vehicle due in March 1967.

Part II -- GOER

Captain Robert D. Beatty
Artillery Transport Department

The high mobility transport (GOER) vehicles (fig 1) are designed for improved mobility over a wide variety of ground conditions and through inland waters.

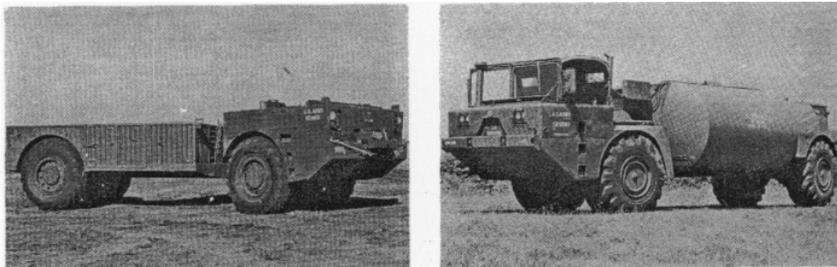


Figure 1. The GOER family includes 8-ton (left) and 16-ton (right) cargo, fuel, and wrecker trucks.

CHARACTERISTICS

The GOER design includes the same basic principles and components which have been proved in the field by high-speed earthmoving equipment. The vehicles, constructed of high tensile steel, not only can be transported in air phase III operations by C-133 aircraft but also can "swim," fully loaded, at speeds of 3 to 4 miles per hour (fig 2).

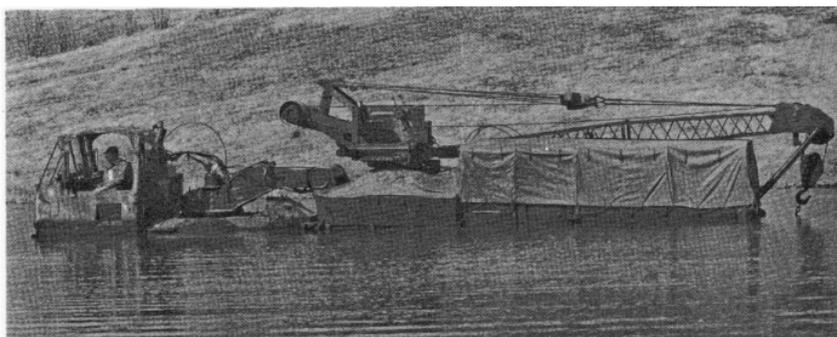


Figure 2. The amphibious capability requires no special kits or modifications.

Low-pressure-high-flotation tires, articulation, and wagon steering are the major features of the GOER concept. The vehicles, which consist of two units, a power unit and a carrying unit, attached by a swiveling joint (articulation), have a positive wagon steering system. This steering, accomplished by turning the entire front unit rather than just the front wheels, provides the GOER more vehicle maneuverability than the

automotive-type front wheel steering; for example, the turning radius of the 8-ton GOER is 300 inches compared to 493 inches for the 5-ton truck. Wagon steering also allows the front unit of the GOER to "duck-walk" or swing from side to side through muddy terrain.

Lateral articulation between front and rear units not only enables the GOER to cross obstacles that would strain solid-frame vehicles (articulation principles, PART I) but also permits four-wheel ground contact on most types of terrain (fig 3).

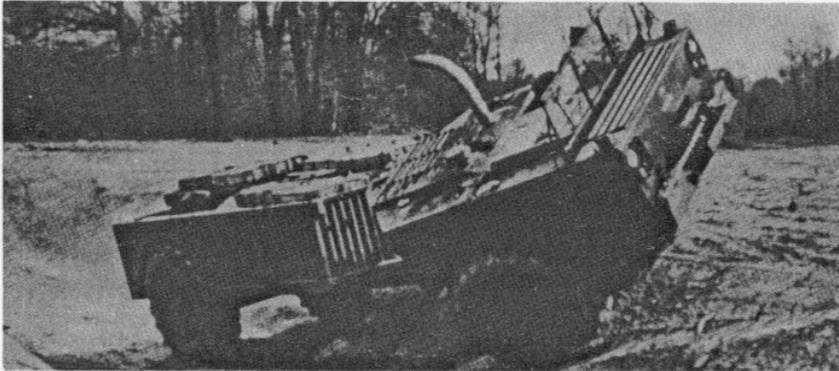


Figure 3. Maximum traction is maintained on varied terrain.

Utilizing the large diameter, low-pressure tires for suspension, the GOER has no springs or shock absorbers. This permits reduced maintenance requirements and parts stockage (fig 4). In addition, the "big wheel" suspension helps to provide high ground clearance and permits high axle loading. Wheel loads (road bumps) are transmitted directly to the frame through the axles.



Figure 4. Type suspension systems.

GOER front and rear units are interchangeable. The power unit can be used with the rear unit in cargo, wrecker, and tanker configurations.

Although the front units are not designed for interchangeability as tractor and semitrailer units, the GOER units can be interchanged with facilities available in most third-echelon shops and in supply depots.

8-TON GOERS

The 8-ton GOER vehicles have been designed and developed by the Caterpillar Tractor Company under the direction of the Army Tank Automotive Command. The company has contracted to deliver 23 troop test vehicles to consist of 13 cargo units, 8 tankers, and 2 wreckers.

All 8-ton vehicles are powered by the caterpillar liquid-cooled D333 compression ignition engine (CIE) which burns CIE fuel, number 1 and number 2 diesel fuel, number 2 furnace oil, and JP4 and JP5 jet fuels. Other characteristics of the 8-ton include wagon steering which is actuated hydraulically and a propeller shaft which transmits power to the rear wheels.

The 8-ton cargo truck, XM520E1 (fig 5), will accommodate 266 rounds of 105-mm ammunition or 127 rounds of 155-mm ammunition or 64 rounds of 8-inch ammunition. However, the heavy weight of the 155-mm or 8-inch ammunition does not allow the use of a large portion of the cargo space in the 8-ton truck. The floor of the cargo body also

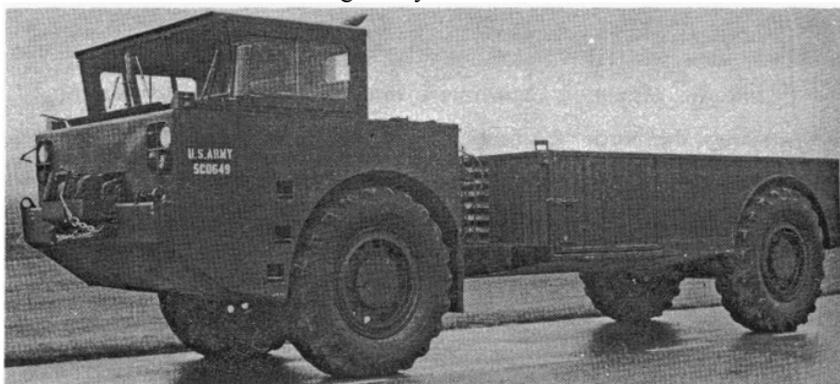


Figure 5. XM520E1, 8-ton cargo truck.

will hold six standard military pallets, or one conex container and two pallets, or twenty-five 55-gallon drums standing on end. The approximate 24,850-pound net weight of the 8-ton cargo unit provides one of the best known payload-to-curb weight ratios. Bows and a tarpaulin protect the cargo and crew from the elements, and, when not in use, the equipment is stored in a separate compartment.

The 8-ton, 2,500-gallon tanker, XM559 (fig 6), has three discharge hoses—one with a 100-gallon-per-minute (gpm) capacity and two hoses each with a 50-gpm capacity. Another outlet provides a maximum discharge rate of 300 gpm. With these rapid discharge rates and multiple outlets, the tanker can transfer fuels to vehicles or storage tanks in a minimum time. In addition, space is provided for two 55-gallon drums.

The 10-ton wrecker, XM553 (fig 7), also manufactured by Caterpillar,

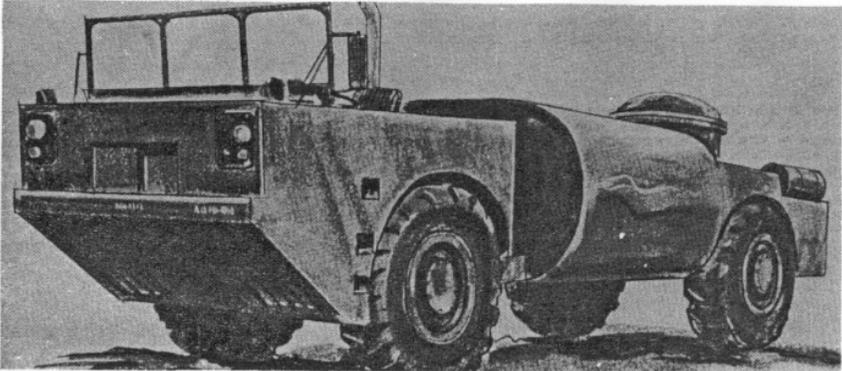


Figure 6. Artist's concept of the XM559, 8-ton, 2,500-gallon tanker.

can be used as a mobile tire servicing and general maintenance vehicle, or for emergency fieldwork and cargo handling. For recovery work the wrecker boom has a traverse of 360° with unobstructed operator

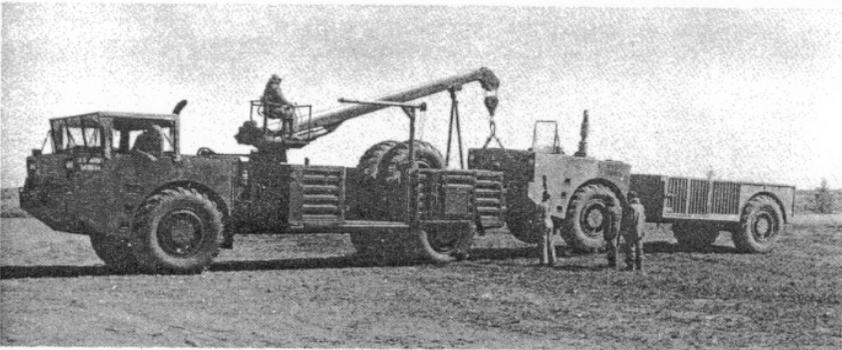


Figure 7. XM553, 10-ton wrecker recovering the XM520E1.

visibility. Extra stability for crane operation is provided by manually operated outriggers.

16-TON GOERS

The 16-ton GOER vehicles are being developed by the LeTourneau-Westinghouse Corporation. Compared to the 8-ton GOER, the engine in the 16-ton is a 8V-71 diesel engine, which is already being used in the new self-propelled artillery weapons (M107, M108, M109, and M110). Positive wagon steering on the 16-ton is accomplished by a three-phase, alternating current, electric motor which permits 90° horizontal steering either side of the centerline of the vehicles. In addition to these differences between the vehicles, a propeller shaft is not required for the 16-ton, for power is transmitted to the rear wheels through an electric cable.

The 16-ton cargo vehicle, XM437E1 (fig 8), has double the ammunition capacity of the 8-ton cargo truck.



Figure 8. XM437E1, 16-ton cargo truck.

The 16-ton, 5,000-gallon fuel tanker, XM438E2 (fig 9), has a net weight of approximately 35,000 pounds. This large-capacity refueling vehicle, capable of a 400-gpm discharge rate, dispenses fuel through five individual outlets at the rear of the vehicle.

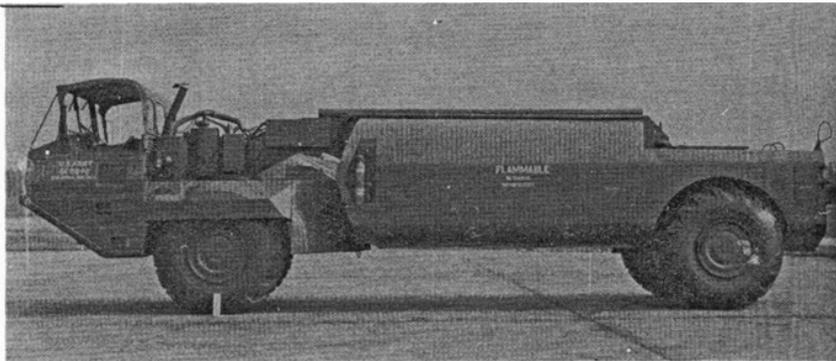


Figure 9. XM438E2, 16-ton, 5,000-gallon tanker.

The 20-ton wrecker, XM554 (fig 10), is based on the design of the XM437E1, modified for recovery work. The wrecker, also manufactured by Westinghouse, has a 20-ton capacity boom and a 30-ton capacity rear-mounted winch. Maximum vehicle stability is provided by two outriggers.

GOER vehicles are scheduled to replace, to varying degrees, conventional wheeled transport vehicles in the 2 1/2-ton, 5-ton, and 10-ton cargo classes. They may replace the 6-ton and 12-ton cargo and fuel semitrailers. Therefore, the use of these vehicles will result in an overall reduction in vehicle density. GOER vehicles have definitely trended toward increased maneuverability, mobility, and standardization. Because of the rapid changes taking place in the GOER program, the data presented may change as testing progresses. For more statistics concerning

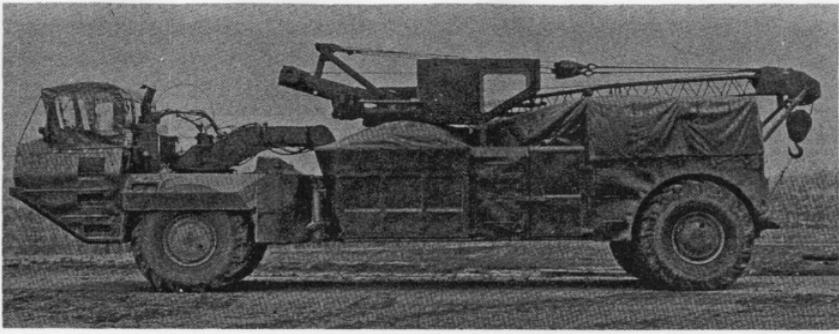


Figure 10. XM554, 20-ton wrecker.

GOER vehicles, see ARTILLERY TRENDS, July 1963, pages 27 and 28.

CLASSIFICATION OF VEHICLES

According to the Artillery Transport Department, USAAMS, the following vehicles have been classified as Standard A:

- The M577A1 command post vehicle mounted on a M113 chassis. This vehicle contains a diesel engine.
- The M54A2, 5-ton truck which incorporates a multifuel engine.
- The M543A2, M246A2, and M55A2, 5-ton wreckers which incorporate the multifuel engine.

GEM FOR THE BATTERY COMMANDER

Starting truck engines with radio switches in the "on" position often results in future radio troubles. Due to rear-mounted radios in the 3/4- and 2 1/2-ton trucks, it is difficult for the driver to determine whether or not the switches are on when the vehicle is started.

A Battery, 1st Battalion, 49th Artillery, has designed a switch and light arrangement so the driver can turn the radio "on" or "off" from the cab (fig 1). The light indicates when the equipment is on. Existing bolts or brackets on the dash board of the vehicle should be utilized for mounting the switch and light, since modification of the vehicle is not permitted under Ordnance regulations.

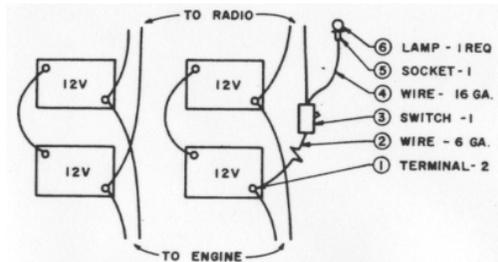
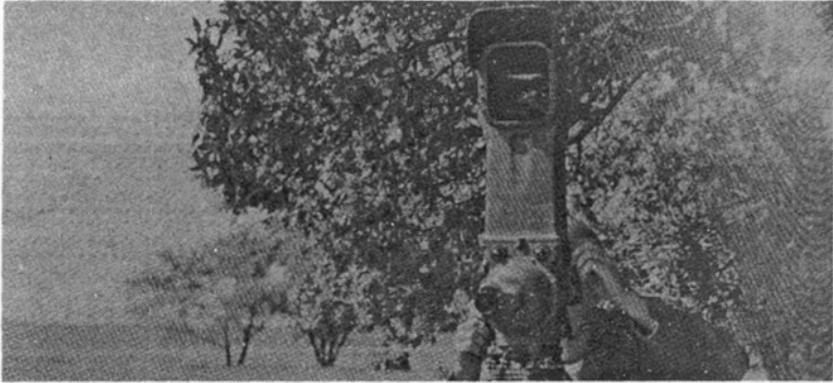


Figure 1. Radio switch.



New BC Scope

Maxwell R. Conerly
Target Acquisition Department

The United States Army field artillery always strives for greater speed and accuracy. Fire direction procedures, materiel, and artillery tactics have been tailored to provide speed consistent with accuracy. Now, a new observation instrument has been developed to improve this capability.

Officially designated the periscope, battery commander (BC), M43 (fig 1), the new instrument will eventually replace the M65 BC scope. The M43 is designed to do all the jobs accomplished by the current BC scope and to do these jobs with more accuracy. In addition, the M43 possesses several other advantages. The present BC scope utilizes a 10-power telescopic lens, and its azimuth scales enable the user to interpolate to 0.5 mil. The M43, however, has a selective magnification feature of 10 or 20 power, and its scales can be read to approximately 0.2 mil. Thus, the observer is provided with a better means of observing enemy action and sensing artillery bursts and he has the capability of reading horizontal angles with a greater degree of accuracy than with the old instrument (0.2 mil as compared to 0.5 mil).

The M43, developed by the U. S. Army Ordnance Corps, is basically a periscopic binocular theodolite. The horizontal field of view with the 10-power magnification is approximately 107 mils; the vertical field of view, approximately 74 mils (fig 2). When the 20-power magnification is used, the horizontal field of view is reduced to 54 mils; the vertical field of view, to 37 mils (fig 3).

The increased magnifying power of the M43 will give the observer a better capability of detecting targets. Two or more of the new instruments can be used in triangulation to obtain accurate and quick determination of enemy gun locations. This process will enable trained

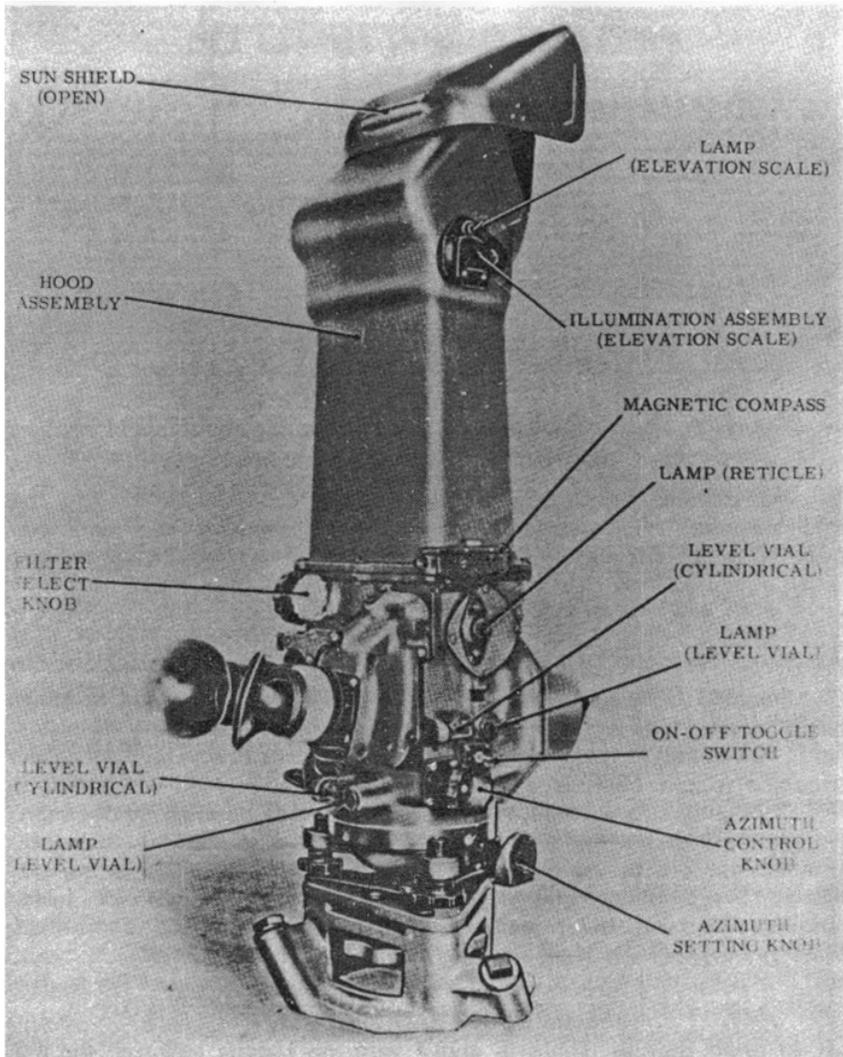


Figure 1. Periscope, battery commander, M43.

observers to locate hostile artillery and other targets at distances up to 15,000 meters, depending on visibility limits from individual observation posts. These techniques are accurate to within 50 meters. In addition, the new M43 BC scope provides the capability of observing a friendly nuclear burst.

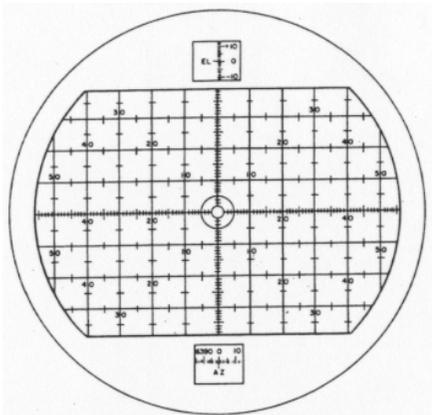


Figure 2. Reticle field at 10-power magnification.

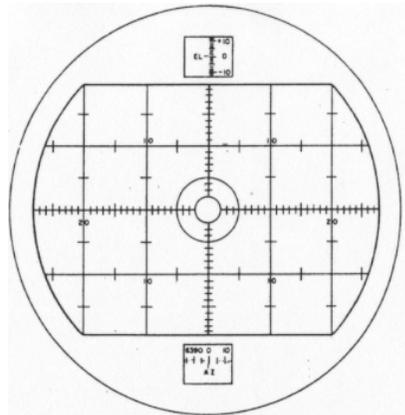


Figure 3. Reticle field at 20-power magnification.

The elevation and azimuth scales are optically projected into the light eyepiece; they are graduated in 1-mil increments and numbered every 10 mils. Because of the larger size scales, readings to 0.2 mil are easily estimated. Vertical angles can be measured from -500 to $+800$ mils. Built into the M43 is a variable filter mechanism with 12 different filter densities. The more dense filters will allow the observer to look directly into the fireball of a nuclear burst.

The M43 is leveled by a tribrach, which may be attached to either the universal tripod or to a ground-shelf mount provided with the instrument. Including its carrying case and all accessories, the periscopic theodolite weighs 62 1/2 pounds, as compared to the M65 which weighs 87 1/2 pounds. As a result, the M43 can be easily handled by one man.

The new instrument has been type classified standard A; however, current plans are to use the M65 BC scope until present stocks are depleted. By combining greater accuracy with lighter weight for faster handling, the new M43 promises to add to the capabilities of the field artillery.

155mm WHITE BAG PROPELLANT

In firing charges (Zones) 3 and 4 with the 155mm howitzer, the M3 green bag propelling charge is **preferred** over use of the M4A1 white bag propelling charge. When the M4A1 white bag propellant is used in charges 3 and 4 during training exercises, the surface danger areas indicated on page 9 of AR 385-63 (defined by dimensions A, B, and C) should be modified as follows:

- A area (width)—Unchanged
- B area (length)—Increase from 1,000 to 1,500 yards
- C area Low angle fire—Increase from 350 to 1,500 yards
 - High angle fire—Increase from 600 to 2,000 yards
 - Direct fire—Increase from 700 to 2,000 yards.

Artillery Antennas Revisited

Captain Robert E. L. Talley
1st Officer Student Battery

Many United States Army field artillerymen stationed in Europe have seen the new German-made mount (mast pole, telescopic, crank operated, 6KBM) for the RC-292 antenna. This antenna mount fits on the rear of a 1/4-ton truck, and the antenna can be quickly erected by turning a crank. Although this mount represents an excellent, solution to the problem of swift assembly and erection of the RC-292, it is currently in short supply and its high cost (approximately \$250) is a distinct disadvantage.

An alternate mount (fig 1) was fabricated and has been used successfully by one US Army unit for over a year. This mount is similar to the German-made mount, in that it uses several lengths of pipe in a nested arrangement. Although this mount was installed on an M151 1/4-ton truck, it can be easily adapted to larger vehicles. (See ARTILLERY TRENDS, January 1963, page 25, for an RC-292 mount for the M113 armored personnel carrier.) The fabricated mount has these outstanding features:

- The antenna can be erected quickly—about 45 seconds for two men and less than 2 minutes for one man. Disassembly and march order may be accomplished in shorter time periods.
- All parts of the mount, except the antenna, ground planes, and four cotter pins, are in place at all times (the antenna head and cable may remain attached).
- No guy wires are required because stress on the vehicle is negligible.
- The antenna can be raised to a height of approximately 24 feet, providing excellent communication.
- The materials for construction of this mount are easy to obtain, fabrication is simple, and the resulting mount is durable.

The materials needed for construction of this antenna mount are five 6-foot lengths of iron pipe, one length of pipe in each of 1-inch, 1 1/2-inch, 2-inch, 2 1/2-inch and 3-inch diameters; a steel plate to brace the body of the jeep; bolts to attach the steel plate to the body of the jeep; four large cotter pins or large nails; and a strip of angle iron to attach the 3-inch pipe to the steel plate.

Construction of the mount is relatively simple. The largest section of pipe (3-inch diameter) is cut to a length of 5 feet, and a piece of scrap metal is welded across the bottom of the pipe to provide a base for the pipe that will be nested inside it. (**Note:** Leave a hole in the base for drainage.) The 2 1/2-inch pipe is cut to a length of 5 feet 2

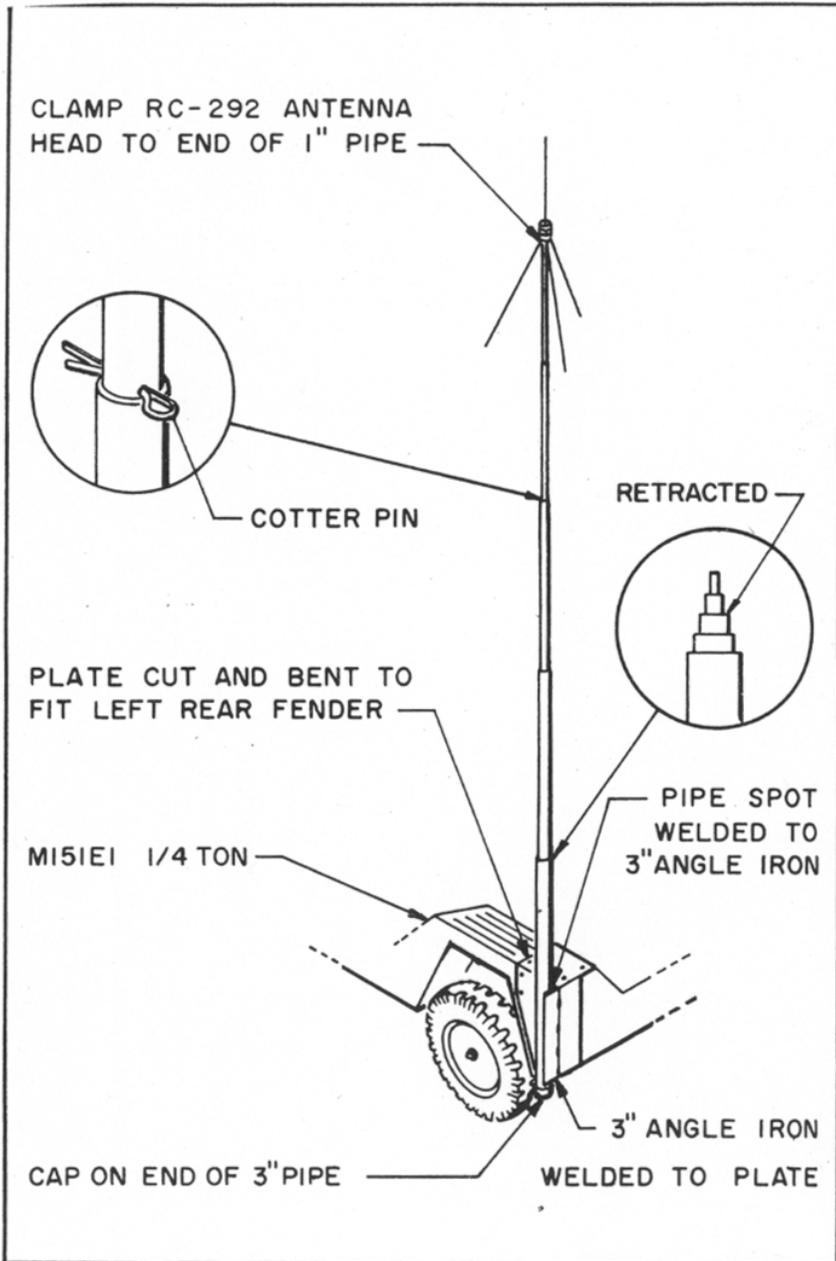


Figure 1. Construction details for fabricated antenna mount.

inches, and each successively smaller pipe is cut 2 inches longer, so that the smallest (1-inch) pipe is 5 feet 8 inches long. The varying lengths of pipe permit grasping each pipe, beginning with the smallest (which carries the antenna head), and raising it easily.

After the pipe has been prepared, the steel plate is cut to fit the left rear fender (fig 1). The steel plate should extend about 6 inches over the top of the fender and about 4 inches around the side of the body. Salvaged armor plate was used for the installation shown in figure 1, but other types of strong steel plate are satisfactory.

The next step in constructing the mount is to weld the 3-inch pipe to the angle iron. The base of the antenna, when attached to the steel plate, must have adequate ground clearance. The angle iron is welded to the steel plate so that the antenna will be vertical when mounted. The steel plate, with angle iron and 3-inch pipe attached, is bolted on the body of the 1/4-ton truck. Before the remaining lengths of pipe are inserted into the 3-inch diameter pipe, holes are drilled (for cotter pins or large nails) about 9 inches from the lower end of each pipe. The antenna head is attached to the top of the 1-inch pipe, and the antenna cable is connected.

The antenna and ground planes are attached before the antenna mount is raised. The smallest pipe is lifted until the cotter pin can be inserted above the rim of the next larger pipe. Each successive section is raised in this manner until the desired or maximum height is obtained. The antenna is lowered by reversing the erection procedures. The antenna and ground planes are removed when the telescoping mast is fully lowered.

This mount for the RC-292 antenna requires no bracing. If possible, the vehicle should be parked on reasonably level ground to facilitate erection and improve communication.

TRANSMISSION OF PERSHING FIRE MISSIONS

Accuracy and verification of Pershing fire mission data may be insured through a "repeat back" method of transmission developed by the US Army Artillery and Missile School (USAAMS). The "repeat back" method utilizes the tropospheric scatter radio AN/TRC-80 and its associated encryption device in conjunction with the teletypewriter reperforator transmitter TT-76/GGC, and the teletypewriter set TT-4/TG. When a fire mission is transmitted to a Pershing unit, the TT-4/TG at the unit prints a hard copy of the transmission and the TT-76/GGC cuts a tape. The hard copy is retained by the receiving unit, and the tape is used to retransmit the data to the originating station for verification. If the data is correct, the firing unit is so notified, but if the data is incorrect, the originating station makes the appropriate corrections using normal teletypewriter procedures. This "repeat back" method is presently being tested in the field.

M2 aiming circle experiments . . .

Magnetic Needle

INACCURACIES

Major William F. Gunkel
US Army Artillery Board

Two experiments conducted by the US Army Artillery Board, Fort Sill, Oklahoma, indicate that there may be considerable cause to doubt the accuracies of azimuths determined by means of the magnetic needles of declinated M2 aiming circles (fig 1).

FIRST EXPERIMENT

In the first experiment, 15 stations were established at intervals extending across the 18-mile southern boundary of Fort Sill's west range. Each of the points selected was, from all appearances, devoid of any local magnetic attractions or interference. By means of azimuth traverse, four grid azimuths, one for each quadrant of the compass, were established at each station. Four M2 aiming circles were then used to measure the azimuths of the established directions at each station, by magnetic needle, several times over a period of 20 days. The aiming circles were declinated twice daily, once before and once after each period of azimuth measurement, using the procedures prescribed in FM 6-2. Each instrument's declination constant remained the same (within one-half mil) throughout the experiment.



Figure 1. M2 aiming circle.

RESULTS OF FIRST EXPERIMENT

The results of the Artillery Board's first experiment were as follows:

- The grid azimuths measured by all four aiming circles at any one point on any given day agreed within the specified 2 mils on only 5 of 66 possible occasions.

- A maximum difference of 8 mils was experienced on two occasions between the grid azimuth measured by one aiming circle and that measured by another aiming circle at the same point on the same day.

- Maximum differences of 6 mils for one aiming circle and 4 mils for the other three aiming circles were experienced between the grid azimuths measured by individual aiming circles at particular points on separate days.

- The maximum errors in grid azimuths measured at any one point with the four aiming circles were 18 to 21 mils and were experienced at the point approximately 15.4 kilometers (9.6 miles) from the declination station.

- The maximum errors in grid azimuths experienced at the most distant point (approximately 28.1 kilometers (17.6 miles) from the declination station) on the same day were 4 to 10 mils.

- The maximum change, between points, in error of measured grid azimuth on a particular day was 13 mils and was experienced between two points approximately 2.5 kilometers (1.6 miles) apart. The minimum change in error between the same points was 2.3 mils. Neither point was the one at which the maximum errors occurred.

SECOND EXPERIMENT

In the second experiment, four points which formed a square of sides some 30 meters in length were established approximately 2 miles from the declination station. As in the first experiment, grid azimuths were established by traverse in all four quadrants at each point, and aiming circles, the proper declination of which had been verified, were used to measure the same azimuths by means of their magnetic needles.

RESULTS OF SECOND EXPERIMENT

The following results were obtained from the Artillery Board's second experiment:

- The grid azimuths measured by the four aiming circles at any one point on any single day agreed within 2 mils on only 10 of 24 possible occasions.

- A maximum difference of 9 mils was experienced between the grid azimuth measured by one aiming circle and that measured by another aiming circle at the same point on the same day.

- The largest error in measured grid azimuth encountered during the experiment was 5 mils.

- The maximum change, between points, in grid azimuth error on a particular day was 6 mils.

WHY?

The exact reasons for the wide discrepancies in readings encountered during the two experiments are not known by the Artillery Board. The variance of each instrument's measurements at differing points could be explained by the undetected presence locally of large quantities of metal

or electrical disturbances. The variance in measurements amongst instruments could be the result of differences in the attractability and mounting of magnetic needles. The variance of the performance of a particular instrument at a particular point from day to day is not so easily explained. The main conclusion to be drawn is that, within the areas of the two experiments, aiming circle inaccuracies were detected which were out of tolerance and which could not be anticipated, prevented, or corrected.

The results of similar experiments conducted at other posts and stations are needed in order to cross-check the Artillery Board's findings and determine whether such inaccuracies are confined solely to this area. Individuals and units are requested to conduct similar tests and to forward the resultant data to:

Commanding Officer
US Army Combat Developments Command,
Artillery Agency
ATTN: CAGAT-TA
Fort Sill, Oklahoma

More detailed information pertaining to the US Army Artillery Board experiments may be obtained by request to:

President
US Army Artillery Board
ATTN: STEBA-GD
Fort Sill, Oklahoma

●

GEM FOR THE FIRE DIRECTION CENTER

Do the computers in your fire direction center have difficulty using the tabular firing tables (TFT's) during an illumination mission? The many computations required for ideal height of burst above target, range spread, and deflection spread are time-consuming and error-prone. A common error in computing an illumination mission is applying the correction for change in elevation for a 50 meter increase in altitude (height of burst) to the fuze setting and vice versa. To decrease the possibility of this occurring in your unit, "color code" the illuminating shell section of your TFT's. One method of doing this is to lightly color the elevation column and its corresponding correction column with a red pencil; the fuze setting and correction column may be colored blue. Try this with your firing tables FT 105-H-6, C2, and FT 155-Q-3.

—submitted by Sp 5 Artenis A. Arbogast

●

SECURITY REQUIREMENTS FOR NUCLEAR WEAPONS TRAINING

The United States Continental Army Command (USCONARC) has directed that an appropriate final security clearance will be required for access to RESTRICTED DATA at CONARC schools. The provisions of this directive require that all personnel attending nuclear weapons instruction classified SECRET RESTRICTED DATA at the USAAMS have the appropriate final security clearance.

CONVERGENCE OF THE MERIDIANS
 UTM PROJECTION
 $C = q(XV)$ in mills

NORTHERN HEMISPHERE

Convergence $\left\{ \begin{array}{l} \text{Negative when } E > 500\text{km} \\ \text{Zero when } E = 500\text{km} \\ \text{Positive when } E < 500\text{km} \end{array} \right.$

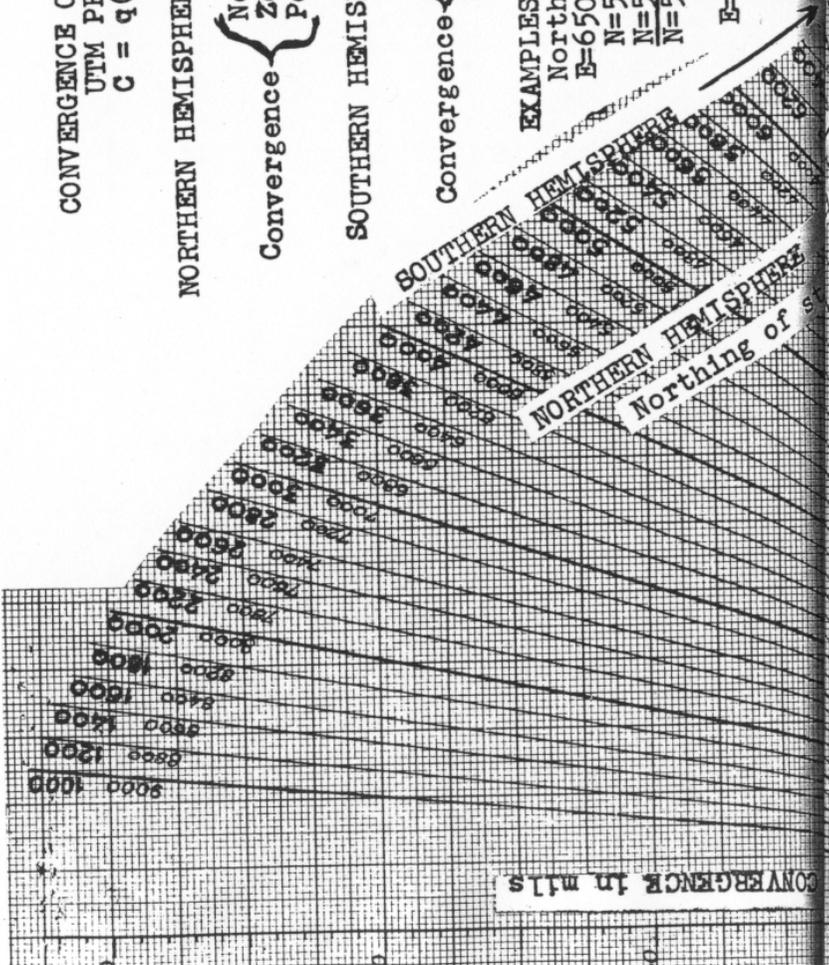
SOUTHERN HEMISPHERE

Convergence $\left\{ \begin{array}{l} \text{Negative when } E < 500\text{km} \\ \text{Zero when } E = 500\text{km} \\ \text{Positive when } E > 500\text{km} \end{array} \right.$

EXAMPLES:

Northern Hemisphere
 $E = 650\text{km}$ $N = 5440\text{km}$
 $N = 5400$, $C = -27.2\text{mills}$
 $N = 5440$, $C = -27.6\text{mills}$
 $N = 5600$, $C = -29.1\text{mills}$

Southern Hemisphere
 $E = 650\text{km}$ $N = 4560\text{km}$
 $N = 4600$, $C = +27.2\text{mills}$
 $N = 4560$, $C = +27.6\text{mills}$
 $N = 4400$, $C = +29.1\text{mills}$



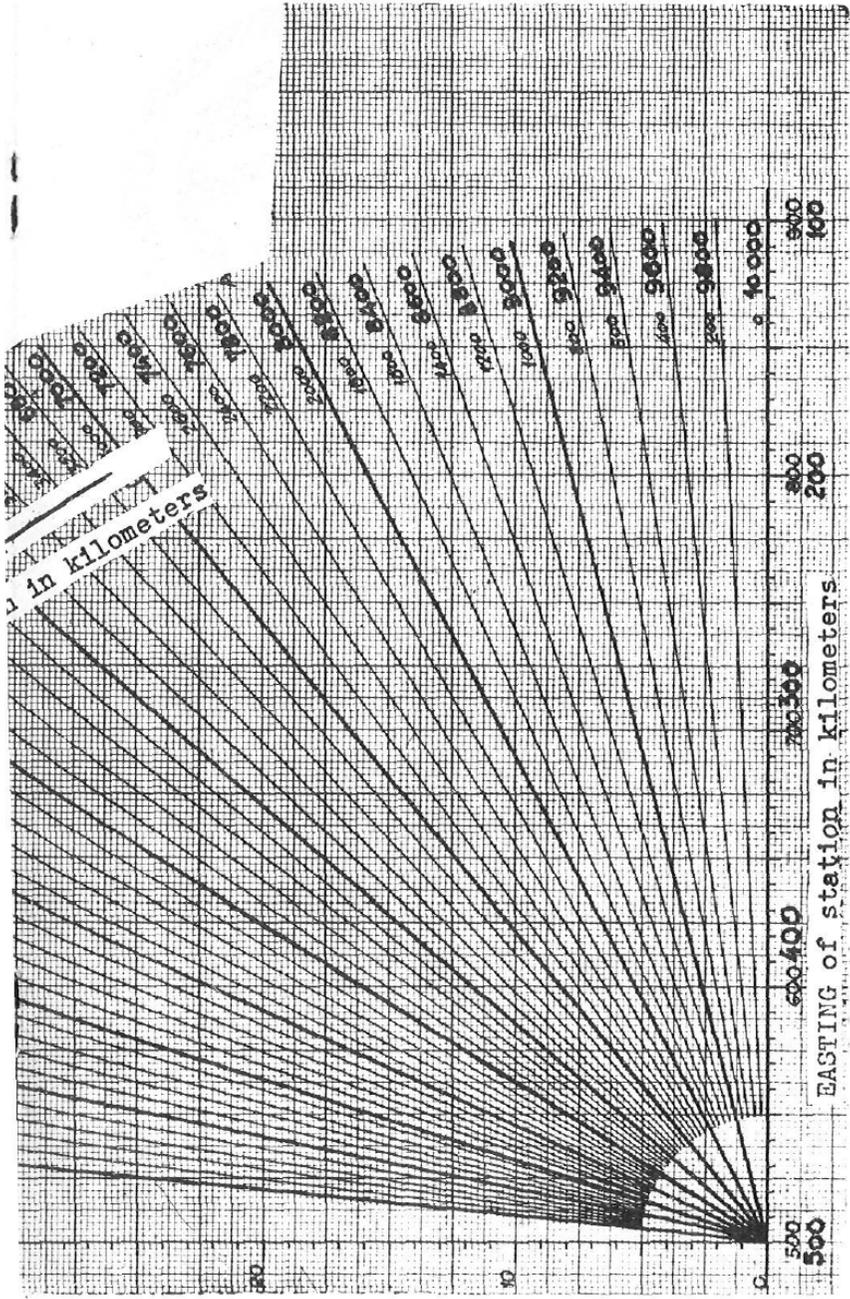


Figure 2. Grid convergence graph. This graph can be removed from this booklet for field use.

artillery OCS

This Patch Needs A Sleeve



Lieutenant James J. Dorsey
Officer Candidate School

The reorganization of the Army and new complex developments have created a demand for company grade officers in the artillery that is greater now than it has been since the Korean conflict. During times of national emergency, the Army has relied heavily on its officer candidate schools for its company grade officers. The Artillery OCS program alone produced 26,000 second lieutenants during World War II. During the years between World War II and the Korean conflict, the Artillery program, like all other branch candidate schools, was discontinued. However, as hostilities in Korea erupted in 1950, the need again arose for more company grade officers than were being commissioned at the time, and the Officer Candidate School was reactivated at Fort Sill. The Artillery Officer Candidate School, which produced 2,800 lieutenants during the Korean action, became a permanent part of the United States Army Artillery and Missile School and since the end of the Korean action, approximately 300 officers per year have been commissioned at Fort Sill.

SCHOOL EXPANSION

To meet the present demand for more lieutenants, the Artillery OCS program was recently expanded to triple the yearly output of officers. The facilities of the school have been almost doubled in size. The staff and faculty have been increased, and billeting and mess facilities have been expanded. The new program calls for a class of 105 students to begin every month, as compared with classes in the past which consisted of 50 to 70 students reporting every 2 months.

However, the increased capability of the School is of little value without a sufficient number of applicants to fill the classes. For example, the first of the expanded classes started in April 1963 with 95 students—10 short of capacity. Since then no class has been even that large (fig 1).

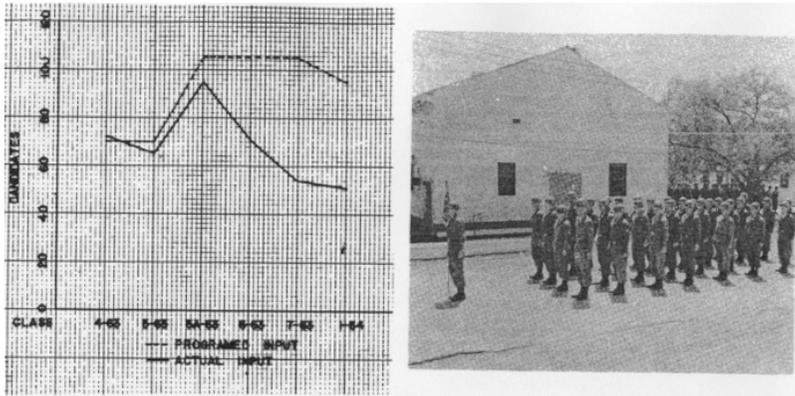


Figure 1. (left) Expected input as compared with actual input. (right) This class had room for 44 more qualified OCS candidates.

Although 200 of every 1,000 men entering the Army qualify for OCS, only 30 of those 200 apply for the program. Why the other 170 eligibles do not apply cannot be exactly determined. Probably the low percentage of applicants is due to lack of desire resulting from misunderstanding or misconceptions developed from erroneous information. Through interviews, the Artillery OCS faculty has found that many soldiers have little knowledge of the OCS program.

QUALIFICATIONS

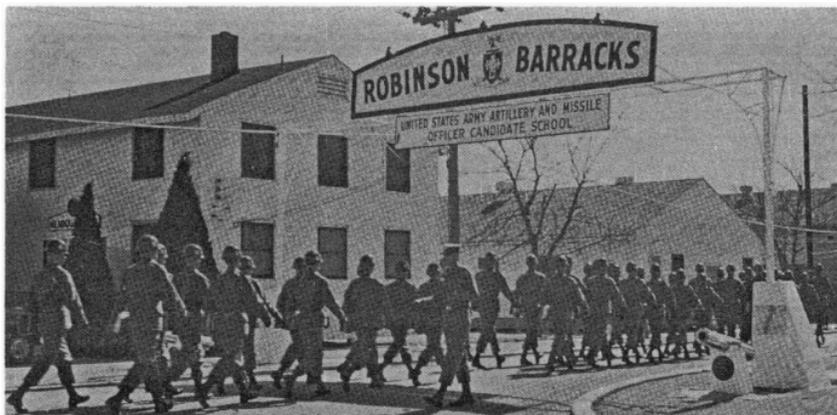
The requirements for OCS are outlined in AR 350-50. Briefly, they stipulate that the applicants must be between the ages of 18 1/2 and 28 and have a high school education or GED equivalent. The prospective candidate must have scored at least 110 on the General Test and 115 on the Officer Candidate Test, in addition to passing the physical examination and scoring 300 or better on the physical combat proficiency test. The applicant must be favorably evaluated by a selection board. In mathematics, he must have completed a course in trigonometry at the high school level. If he has not, he may satisfy this requirement by presenting proof of successful completion of either USAFI course B 188 or Field Artillery Subcourse 526, both of which are extension courses and the latter may be obtained by submitting DA FORM 145 to:

Commandant
 US Army Artillery and Missile School
 Nonresident Instruction Division
 ATTN: Extension Courses Division
 Fort Sill, Oklahoma

If conditions warrant, waivers may be granted for many of the requirements.

OCS PROGRAM

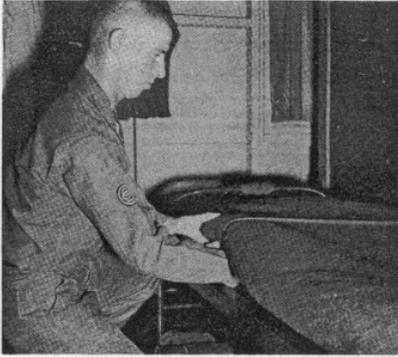
Desire, motivation, ability, determination, and acceptance of 23 weeks of study, double timing, and sweat constitute some of the essential qualities a candidate must possess to pass the artillery officer candidate school program.



The first week of a candidate's life, called "Processing and Orientation Week" or "P and O Week," is the first step in a gradual but tough conditioning process. During P and O Week, the candidate is processed, draws his texts and instruments, and learns what is expected of him.



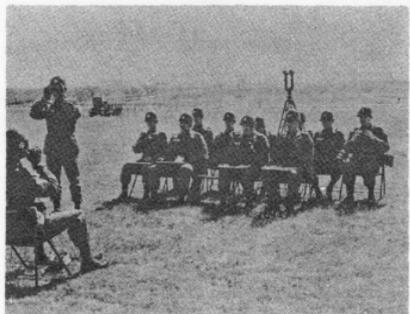
After P and O Week, the candidate becomes a lowerclassman, a private in the candidate battalion, who obeys rigorous and strict lowerclassman customs. The candidate begins the 23-week long academic and physical program. For the next six weeks, in addition to attending artillery classes, the lowerclassman buffs and polishes, mows and rakes, scrubs and paints . . . and does pushups when he does those things too slowly. In all, a candidate realizes that his training to be an artillery officer will be a 24-hour a day job.



Daily inspections are an important aspect of a candidate's life, and only through hard work and attention to specific details can he pass the rigid inspections. During the course there is only one acceptable speed—double timing. The reason? There is never enough time to take it easy.



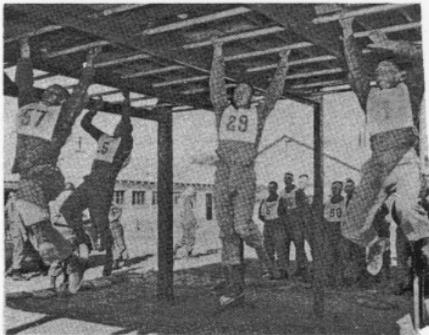
For the next eight weeks, the candidate is a middleclassman; thus, he begins to give orders and is observed and graded according to how well the lowerclassmen carry out their orders. If he has proven his leadership ability at the end of the eight weeks, he is promoted to an upperclassman and performs the duties of a candidate battalion officer.



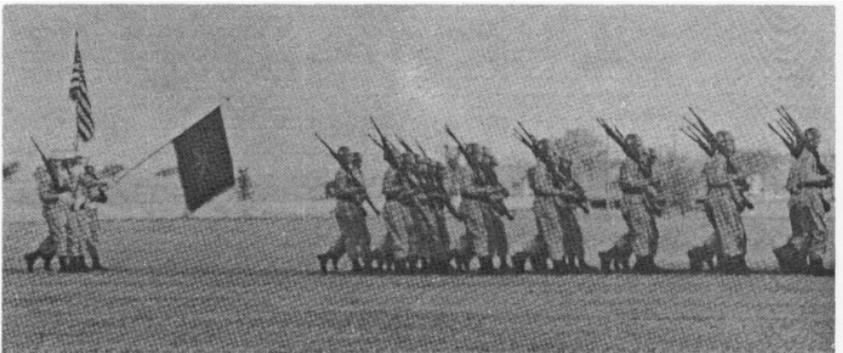
The pressure never lets up. Throughout the course, the candidate



must continually master the academic standards which include gunnery, survey, tactics, and communications. He learns not only current artillery, but also the new techniques and developments.



A candidate also must maintain a high degree of physical fitness to meet the physical standards of OCS. The school has various methods of developing a candidate's stamina. One such method is the Combat Proficiency Test.



At the end of 23 weeks, the former OCS candidate, now a commissioned second lieutenant in the artillery, realizes that the end, graduation, does justify the means by which he received his commission. He

knows why the course not only is tough but also demands the "all" in an individual.

Basically, it is found that the man to procure for the OCS program is one who wants a commission. It takes determination to complete the program, the kind of determination that only a man who wants a commission will display. Men who possess the qualifications should be made aware of the officer candidate program and the benefits which can be derived from it (TAKE COMMAND—DA PAM 20-18). Many more of the Army's qualified soldiers must become acquainted with the program and encouraged to apply if the Artillery OCS quotas and Army requirements are to be fulfilled.

GEM FOR THE FIRE DIRECTION CENTER

As an alternate graphical method for computing location in a high-burst or center-of-impact registration, try this:

Place a plotting needle through three target grids. The bottom grid represents (in a variable scale) a grid reference system oriented on the chart data center of impact. The middle target grid is oriented with 02's azimuth over the 0 of the bottom grid. The top grid is similarly oriented with 01's azimuth. The initial firing data and observer orienting data is computed through conventional means, i.e., the computer must then be provided the OT distances and azimuths from the conventional charts.

After the third usable round of the registration has been sensed, the computer should compute and plot (using the WORM formula and a graphical site table) the average lateral sensing (in meters) of each observer on his respective grid (using as a scale: 1 square = 20 meters). The sensings should be plotted as imaginary straight lines running parallel to each observer's azimuth.

The intersection of the two lines, transferred to the bottom grid by placing a plotting needle through it, locates approximately, on the bottom grid, the mean center of impact relative to the chart data. This allows the computer to adjust observer-target distances and to adjust the scale, if possible, to 1 square = 10 meters, or larger. From the averages of the six usable rounds, the process is repeated, using the WORM formula, but with the adjusted OT distances.

Accurate Easting and Northing deviations are projected onto the bottom grid. Site and the derived adjusted elevation for a high-burst registration can be computed concurrently by an assistant. The accuracy approaches $\pm 1\%$; total time required from the last sensed round to computation of the center-of-impact coordinates is about 40 seconds.

—submitted by Lt Selwyn D. Smith, III

NATO method . . .

METS39	MIFMIF
071014	049982
USL	
002618	009976
012618	009978
022720	008978
032924	004984

Metro Minus Density

For the past several years, a North Atlantic Treaty Organization (NATO) objective has been the standardization of equipment and techniques so as to permit the closest possible coordination and integration of NATO fighting forces. Of interest is the work being accomplished by the NATO Group of Experts on External Ballistics, which has made significant advances in its quest for uniformity. The exchanges of ideas and information have resulted in our present firing tables and meteorological (metro) message.

The United States artillery corrects for the nonstandard ballistic effect of atmospheric conditions by considering the air density and air temperature for the appropriate line number as extracted from the metro message. European NATO members do not use this system of density-temperature; instead, they use air pressure and air temperature to describe the atmosphere. The pressure at mean sea level is reported in the heading of the metro message and used for computations in the same manner as the United States now uses density.

The United States has recently approved a recommendation that the density-temperature method of computation be discarded in favor of the pressure-temperature method. This step has been taken for two reasons:

- It eliminates the need for reporting air densities for each line of the metro message, thereby saving time in transmission; and it eliminates a potential source of operator error.
- It provides a uniform system within NATO countries.

The accuracy of both systems is comparable. Our present system uses table D of the tabular firing table (TFT) to apply corrections to temperature (ΔT) and density (ΔD) to compensate for the difference between the altitude of the battery and the meteorological datum plane (MDP). This is slightly more accurate than the European method of accounting for the difference between the altitude of the battery and the altitude at mean sea level (MSL). Realizing this, the NATO Ballistics Group has agreed, in principle, to the US proposal that reporting of atmospheric pressure be at the meteorological datum plane rather than at mean sea level. With this modification, the pressure-temperature system has proved to be as accurate as the density-temperature system.

Some NATO countries will still use MSL pressure rather than MDP pressure until formal ratification of the agreement is accomplished within each country.

Upon receipt of appropriate implementing instructions, US Army artillery meteorological sections should furnish NATO metro messages in one of two ways:

- Meteorological messages transmitted to US artillery units and to NATO countries using the US system will report air pressure at the meteorological datum plane.

- Meteorological messages transmitted to artillery units of NATO countries requiring pressure at mean sea level will report pressure at mean sea level. These separate reporting procedures will remain in effect until all NATO countries ratify the above agreement.

The first new firing table to be published containing air pressure is the FT 155-AH-1 for the 155-mm self-propelled howitzer. The firing table will include a table D, labeled "Corrections to Temperature (ΔT) and Pressure (ΔP) in Percent to Compensate for the Difference in Meters Between the Height of Battery and the MDP," and a table F, containing unit corrections for each 1 percent in air pressure. The use, of both tables is identical with the use of tables D and F in FT 155-Q-3.

As soon as all firing tables have been converted from density-temperature to pressure-temperature, air density will be deleted from the NATO meteorological message.

●

GEM FOR THE BATTERY COMMANDER

As more and more electronic equipment comes into use, the electronic cable is becoming an increasing problem, according to the Target Acquisition Department of the Artillery and Missile School at Fort Sill, Oklahoma. The Sensory Equipment Division of the Department repairs over 300 such cables each year. The division suggests the following precautions be taken so maximum use may be obtained from the electronic cables:

- Don't drive over, stand on, or otherwise compress cables.
- Don't subject the cable to unusual twists or bends.
- Don't paint cables as paint causes deterioration. Cleaning should be done with mild detergent or warm water.
- Remember to consult appropriate TM's when in doubt.

—submitted by CWO-2 Robert C. Hill

Target Acquisition Department

●

According to reports received at the USAAMS, units in some areas are experiencing difficulty in procuring tabular firing tables and graphical firing scales for the 105-mm, 155-mm, and 8-inch howitzers. Currently authorized tabular firing tables are identified in Department of the Army Pamphlet Number 310-3 dated 9 April 1963 and Changes Number 1 dated 11 May 1963. Procurement of the Scale, Graphical Firing (GFT) and the Scale, Graphical Firing, Site (GST) will be greatly expedited by quoting federal stock numbers in requisitions as explained and tabulated in the January 1963 issue of ARTILLERY TRENDS.

OT Range Made **SIMPLE**

Lt Col John C. Burney, Jr.
4th Armored Division

As the tank company closed on its objective, the commander spotted dug-in enemy infantry on his exposed flank. The commander was little concerned until a well-concealed antitank gun suddenly knocked out one of his tanks. He could not stop now; so, to suppress the enemy infantry with their antitank guns, he asked his forward observer for artillery fire.

The forward observer had reported to the company only 2 days earlier and was unfamiliar with the M60 tank which each tank company provides its observer. The observer could not pinpoint the enemy position on the map, but he knew his location because of a road junction 50 meters behind the tank company. Although there were no identifiable features near the enemy, the observer hastily estimated the range and azimuth to the target, determined the target location by coordinates, and called for fire for effect on the target.

Only 4 minutes later the first rounds landed—300 meters beyond the enemy. The observer made the necessary adjustment, and the next volley landed on target.

The ineffectiveness of the first volley cost the tank company three tanks and their crews. This loss could have been avoided if the observer had been more familiar with his M60 tank, for 12 inches from his location in the tank was the M17C coincidence range finder, a device that in 3 seconds could have given him the precise range to the target and greatly increased the probability of a first round hit.

The M17C coincidence range finder (fig 1), an integral part of the M60 tank, not only is invaluable to artillery forward observers assigned to tank companies but also should be of interest to all forward observers in the Army. With the M17C, which is provided to increase a tank crew's probability of obtaining first round hits, the forward observer can measure ranges up to 4,400 meters; thus, the range finder can accurately pinpoint targets for the fire direction center. Furthermore, the simplicity of the device is almost unbelievable. The coincidence range finder is as easy to use as the range finder of a commercial camera, whereas the M17C's predecessor, a stereoscopic device, was difficult for most users to master.

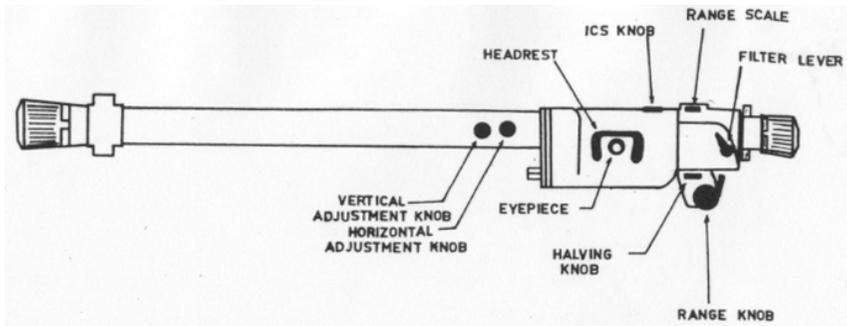


Figure 1. The M17C coincidence range finder.

CHARACTERISTICS

The two lenses of the range finder are 79 inches apart; through each of these lenses an image of a target is projected before the operator, who observes through a binocular-type eyepiece. With the range knob, the two images of the target are brought into coincidence, and the range to the target is read on the range scale. As the images are brought into coincidence, range data is fed into a ballistic computer, which automatically sets the 105-mm gun tube at the proper elevation. The M17C has 10-power magnification, and it is equipped with a diopter ring for adjusting the eyepieces for individual eyesight, a filter for use in bright sunlight, and lights for use at night.

CALIBRATION

Before the range finder is used, it must be calibrated so that it accurately measures ranges. In calibrating the device, it must be set so that the two images of a target are in coincidence when the range indicated on the range scale corresponds to the true range of the target. To calibrate the M17C, one selects a target at a known range (preferably about 1,200 meters) and, with the range knob, indexes 1,200 on the range scale. Then, by rotating the horizontal and vertical adjustment knobs, the two images of the selected target are brought together so that they appear as one image. The device is now calibrated.

However, temperature changes will alter calibration, so a reference is needed to which a forward observer can quickly adjust when no targets at known ranges are available. The reference, known as a coincidence reticle, consists of two right angles that are brought together to form a cross. Calibration is completed by bringing the two images together; but, if temperature changes throw the range finder out of calibration, the cross will separate and appear as—



The M17C can be recalibrated by forming a cross, using the horizontal and vertical adjustment knobs.

USING THE M17C

With a convenient handle (the override of the tank commander), the forward observer aims the 105-mm gun and range finder at the target. This can be accomplished swiftly, for the powered turret swings 360° in only 15 seconds. Then by looking through the range finder, the observer brings the two images of the target into coincidence. This procedure requires about 3 seconds. The range to the target will appear in the range scale window. As for accuracy, at a range of 1,200 meters, the variance will be only approximately 50 meters. For more details concerning the M17C range finder, see pages 30 and 69 to 73 of TM 9-2350-215-10, "Operator's Manual: Tank, Combat, Full Tracked, 105-mm Gun, M60."

TRAINING

A forward observer can learn the procedures for using the M17C in 15 minutes, but he should not be satisfied with only learning "how." Observers not only should train until they can swing onto a target and range in 3 or 4 seconds but also should develop the ability to range instinctively, so that when a need for the M17C arises suddenly, the observer will react without fluster or hesitation. Range finder training is discussed on pages 262 to 269 of FM 17-12, "Tank Gunnery."

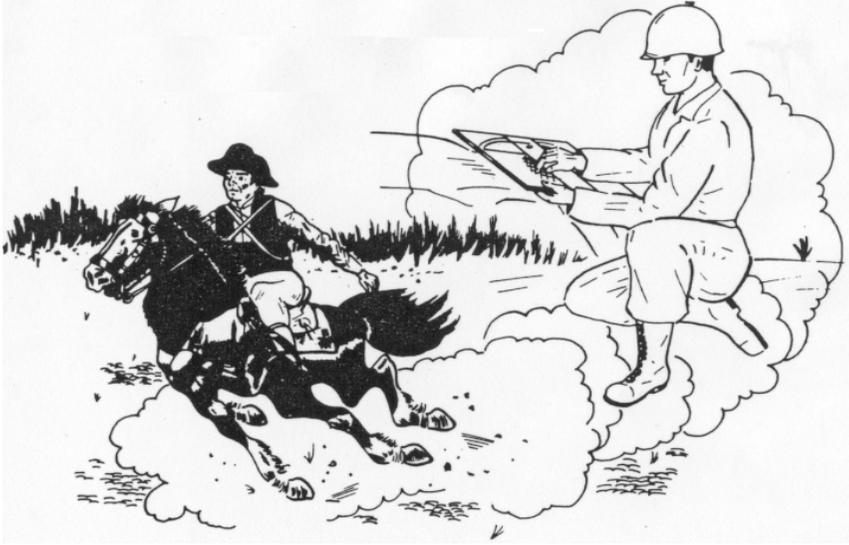
When the forward observer drops into the tank turret he becomes the tank commander; therefore, he should be able to operate the fire control instruments of the weapons of the tank—the 105-mm gun, the 7.62-mm machinegun, and the 50-caliber machinegun. Training with these weapons would be profitable.

Each forward observer with a tank company is provided a tank which carries the M17C, and he should learn to use the range finder quickly and accurately. But, this does not preclude other forward observers from using the device, because on today's fluid and mobile battlefield, any observer might find himself in a situation where the M17C could be of use.

ADDRESS CHANGES

With the recent reorganization of the Army Reserve and the implementation of the ROAD concept, many units have changed addresses the past few months. To insure prompt delivery of each issue of ARTILLERY TRENDS, units should notify TRENDS of any recent address changes.

THE "MINUTEMAN"



Fire Direction Device

Attention all fire direction officers and battery executives! The Minuteman emergency fire direction computer, described in the May 1960 issue of ARTILLERY TRENDS, has been redesigned so any unit may easily fabricate its own for use during an emergency fire mission.

The first article on the "Minuteman" explained how the device could be constructed, so interested units might build their own. The first Minuteman, however, contained several features, such as a plastic sliding deflection arc, which were difficult to produce by field units without considerable outside support. Therefore, because of renewed interest in this emergency fire direction computer, a new Minuteman has been developed which can easily be constructed by artillery units.

The Minuteman is simply a compact computer from which one man can determine initial and subsequent firing data in a matter of seconds. The device employs an abbreviated chart system, can be hand carried, and requires no computation other than normal site calculations. There is no need for deviation from standard plotting techniques after the initial orientation of the north index. Because of its compactness, the Minuteman requires less prepfire set time than any other emergency method. In addition, the device can be used as an observed or a surveyed firing chart.

CONSTRUCTION DETAILS

Figure 1 illustrates the four items needed to construct the new Minuteman. A is a plotting board with a deflection arc, B is a range-deflection arm, C is a target grid, and D is a ballistic plate with cursor. A GFT may be substituted for the ballistic plate if it is desired.

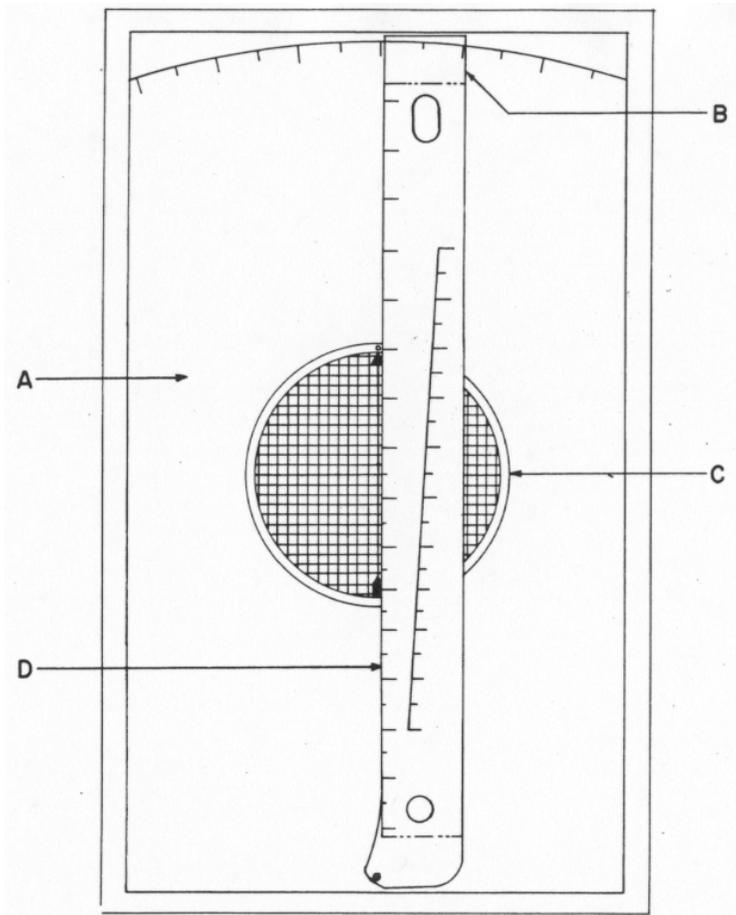


Figure 1. Components of the "Minuteman."

The plotting board may be made of any rigid material suitable for holding pins, such as Upsonboard. The range-deflection arm is made of clear plastic and contains studs for attaching the ballistic scales, which are similar to those on the base of the GFT fan. The range-deflection arm is attached to the plotting board with a flathead bolt and a wing-nut. Instead of a plastic sliding deflection arc, as the first Minuteman had, a deflection arc is drawn with reference to the fixed vertex at the top of the plotting board with a standard range-deflection protractor.

All of the elements of the new Minuteman should be easily obtainable, with the exception of the plastic range-deflection arm. This arm can be produced by a local training aids facility, using a silkscreen process. Since the ballistic scales for the GFT fan are in yards, the Gunnery Department, US Army Artillery and Missile School (USAAMS),

will provide upon request, the paper metric scales which can be pasted to the plastic ballistic scales.

PREFIRE PROCEDURE

Listed below are the steps of the prefire procedure to ready the Minuteman.

1. Determine from a battle map the initial azimuth and distance from the battery position to the target.
2. Slip the target grid under the range-deflection arm and place the center of the target grid at the plotted range of the target.
3. Place a map pin in the center of the target.
4. Orient the target grid with the arrow parallel to the range-deflection arm and pointing toward the top of the board.
5. Draw a north index opposite the proper azimuth graduation on the target grid (azimuth of target from battery position).
6. Rotate the target grid until the forward observer's azimuth, determined from the observer's fire request, appears under the north index.

SAMPLE PROBLEM

Following is a sample problem using the Minuteman during a hasty occupation of position:

The 105-mm howitzer battery is in march column advancing toward a new firing position. A fire request is received from the forward observer: BASEBALL 21, THIS IS BASEBALL 31, FIRE MISSION . . . COORDINATES 4468 5748 . . . AZIMUTH 1400 . . . INFANTRY IN THE OPEN, FUZE VT, WILL ADJUST.

Upon receiving the call from the observer, the battery executive selects a position, and the battery performs a hasty occupation. The battery executive plots his battery position and coordinates of the target on his battle map. He determines the range to the target to be 5,000 meters and the azimuth to be 600 mils.

The executive prepares the Minuteman for operation by performing the six steps of the basic prefire procedure. He instructs the chief of firing battery to lay the battery on azimuth 600 mils, deflection 2800. The target grid is slipped under the range-deflection arm and centered at the plotted target range with the arrow parallel to the range-deflection arm and pointing to the top of the board. Opposite 600 mils on the target grid, a north index is drawn (fig 2). The target grid is then rotated to place the observer's announced azimuth under the north index. The appropriate angle T is now established.

By comparing the range (5,000 meters) to the ballistic scales, the executive selects charge 5. He then places the cursor on the selected ballistic scale with the hairline over the measured range and determines that the elevation is 344 mils. Assuming the site is 0, quadrant elevation is announced as QUADRANT 344. Before the initial round is fired, the executive officer labels the deflection arc appropriately (fig 3). The executive officer is now ready to conduct the mission. He announces the fire command: BATTERY ADJUST, SHELL HE, CHARGE 5, FUZE QUICK,

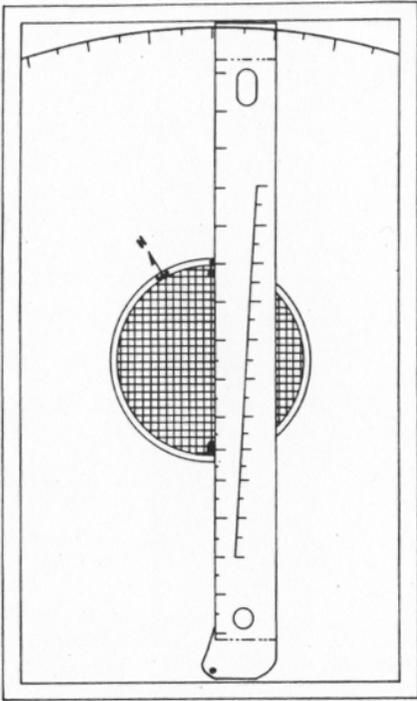


Figure 2. The north index is drawn opposite 600 mils.

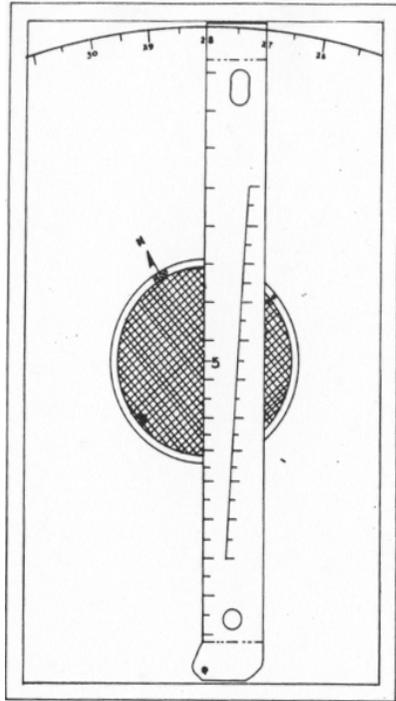


Figure 3. The deflection arc is labeled appropriately.

CENTER ONE ROUND, DEFLECTION 2800, QUADRANT 344. As soon as the center platoon is ready, the first volley is on the way.

SUBSEQUENT VOLLEYS

Continuing the sample problem, the observer announces LEFT 100, ADD 400 (fig 4). The executive officer plots these corrections on the target grid in the normal manner. After plotting the corrections, he reads the deflection by placing the left edge of the deflection arm against the map pin and announces DEFLECTION 2760. The deflection on the deflection arc increases from right to left as in the LARS rule (left, add: right, subtract). He reads the range to the target—5,370 meters—and announces the elevation from the ballistic scale: QUADRANT 380. Throughout the remainder of the mission, the executive officer continues to use the same procedure to determine the firing data.

The artillery continually seeks emergency fire direction techniques that can be used under all conditions with maximum speed and accuracy and a minimum number of trained personnel. The Minuteman fulfills these requirements and still uses the standard fire direction procedures. Units in the field interested in constructing this rapid fire direction device are encouraged to write to the Commandant, ATTN: AKPSIGU, US Army Artillery and Missile School, Fort Sill, Oklahoma, for further information and assistance.

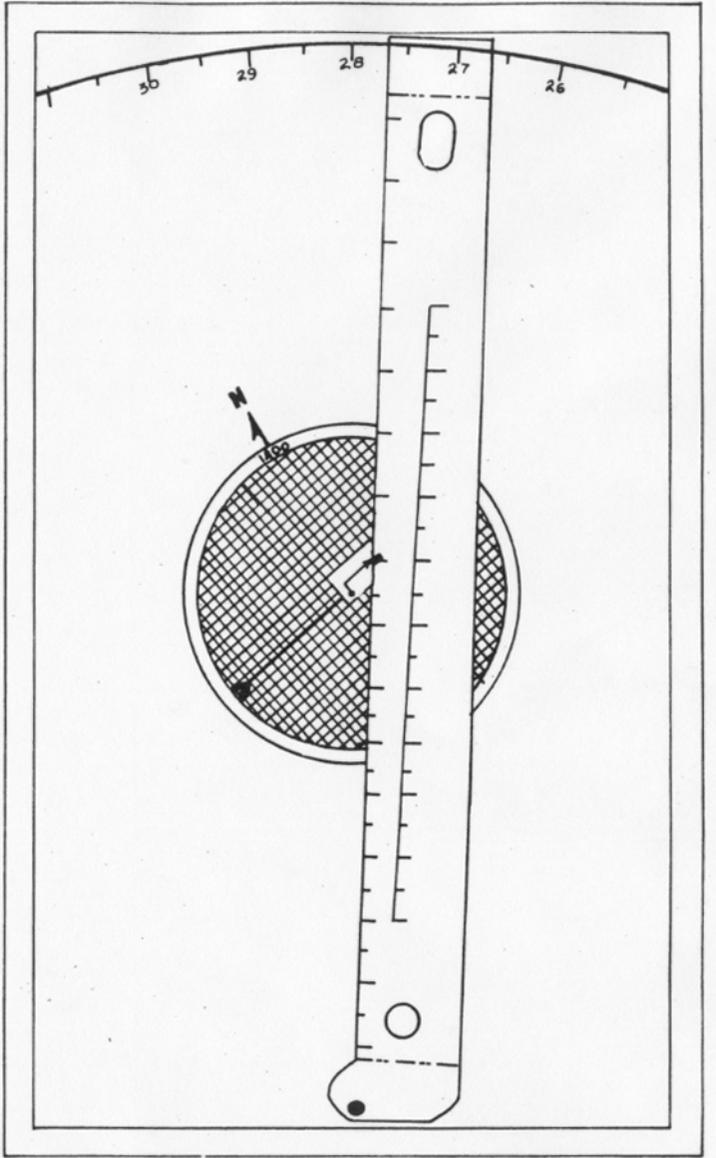
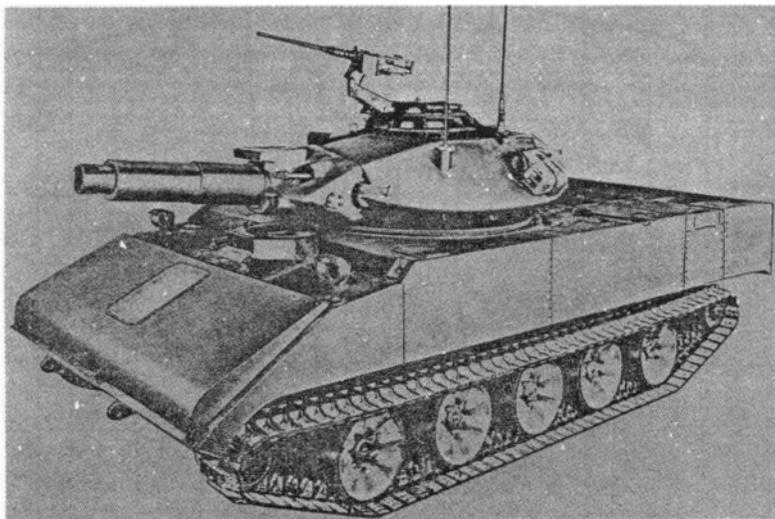


Figure 4. Observer's corrections are plotted.

The original "Minuteman" fire direction device, published in the May 1960 issue of ARTILLERY TRENDS, was developed by Lieutenant David Webster.

the supported force . . .



Development in Armor **AR/AAV**

Captain Robert D. Beatty
Artillery Transport Department

A proposed addition to the armor family, the XM551 armored reconnaissance/airborne assault vehicle (AR/AAV), still in the pilot model stage of development, is designed to replace the light tank M41 and the 90-mm antitank gun M56. The XM551, also known as the General Sheridan, carries a four-man crew, consisting of the commander, gunner, loader, and driver.

The vehicle turret, which rotates 360°, mounts the 152-mm gun-launcher M73, the M2 machineguns, and a 15-mm spotting rifle. The gun-launcher, capable of electrically firing conventional or missile ammunition, is a prototype weapon containing a separable type breech chamber (fig 1). The interior of the tube is not only rifled but is also intersected throughout its length at the 6 o'clock position by a rectangular keyway (fig 1).

The elevating and traversing systems of the vehicle

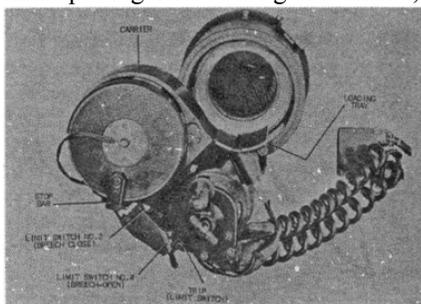


Figure 1. Breech chamber.

are designed to provide gyroscopic stabilized power control of the gun-launcher and turret. Accurate firing while on the move is made possible by isolating the gun and turret from the "bumps" (fig 2). With the line of sight stabilized in space, the gunner can aim and fire at both stationary

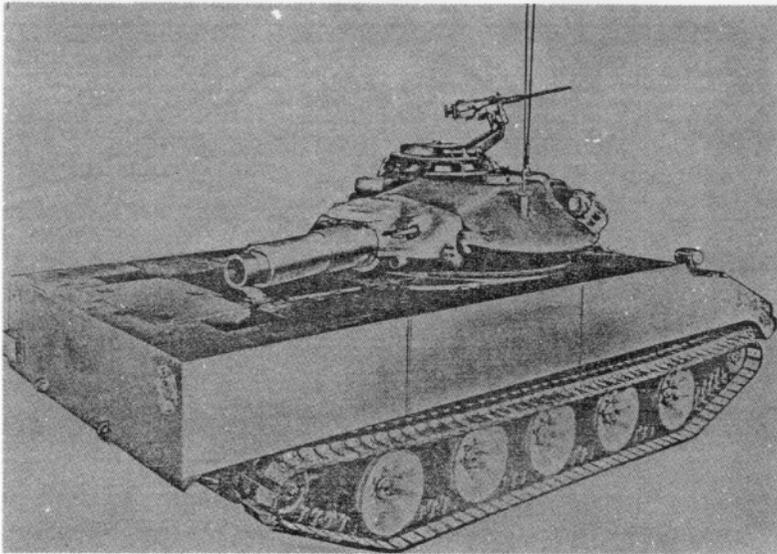


Figure 2. XM551 with turret in travel position.

and moving targets with a relatively high probability of first-round hits.

The AR/AAV, propelled in the water by a water propulsion unit mounted at the rear of the engine compartment, has achieved water speeds of 7 miles per hour. The water propulsion unit, consisting of two water turbines, operates on the hydrojet principle. In addition to the vehicle's amphibious capability, the XM551 can be air transported or air dropped.

The outstanding automotive components of the vehicle include an aluminum 6V-53 diesel engine and an Allison XTG-250 transmission which functions as a combination differential, steering, and braking unit. In addition, the transmission incorporates a pivot steering mechanism which allows the vehicle to turn around in its own length.

The technological improvements, such as the stabilized gun-launcher, incorporated into the AR/AAV program will make the XM551 a potent weapon.

The Army's revised Proficiency Pay Program, effective 1 October 1963, provides for two categories of proficiency pay—Proficiency Pay (Specialty) with pay incentives of \$100.00 to \$50.00 per month and Proficiency Pay (Superior Performance) with pay incentives of \$25.00 per month.

GEM FOR THE SURVEY SECTION

Does the battery cable's rubber molding on your unit's Gyro-Azimuth Survey Instrument-C2A ABLE split when subjected to acute bending near the battery clip (fig 1; (1))?

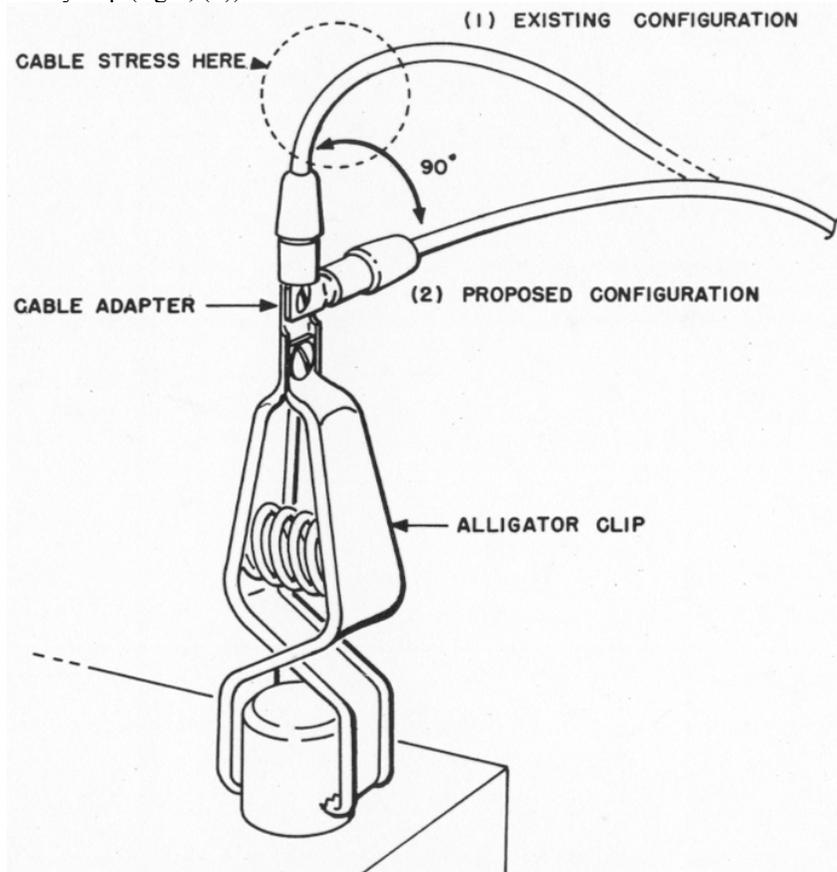
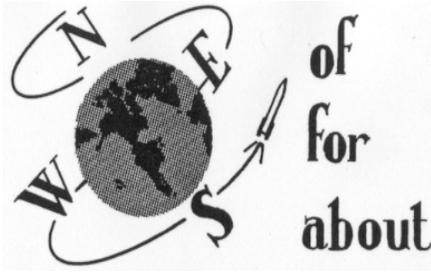


Figure 1. Battery Clip and Cable.

Repositioning of the cable adapter adjoining the alligator clip can prevent the split in the rubber molding. Turning the cable adapter 90 degrees eliminates the loop above the battery and any stresses occurring at or near the clip (fig 1; (2)).

Submitted by David L. Wickhart

Field manual 6-40 will appear in 1964 as a series of three manuals which will include all aspects of field artillery gunnery. FM 6-40-1 will cover rocket gunnery, and FM 6-40-2 will be concerned with missile gunnery. FM 6-40 will remain the cannon gunnery manual.



THE ARTILLERY WORLD

UNIVERSAL MINE DETECTOR

A mine detector (fig 1) capable of locating both metallic and nonmetallic mines has been developed by the US Army Engineer Research and Development Laboratories at Fort Belvoir, Virginia. Currently being prepared for service tests, the microwave detector locates mines by detecting the difference in response between the mine and the surrounding soil. The new mine detector is compact and uses transistors and etched circuitry in place of conventional electron tubes and wiring. Battlefield maintenance is simplified by the use of easily replaceable "plug-in" assemblies.



Figure 1. New universal mine detector.

UH-1D HELICOPTER

The first production model of the UH-1D Iroquois helicopter (fig 2) has been accepted by the Army. The UH-1D is a utility/tactical helicopter; as such, it is used as a cargo and personnel transport helicopter.



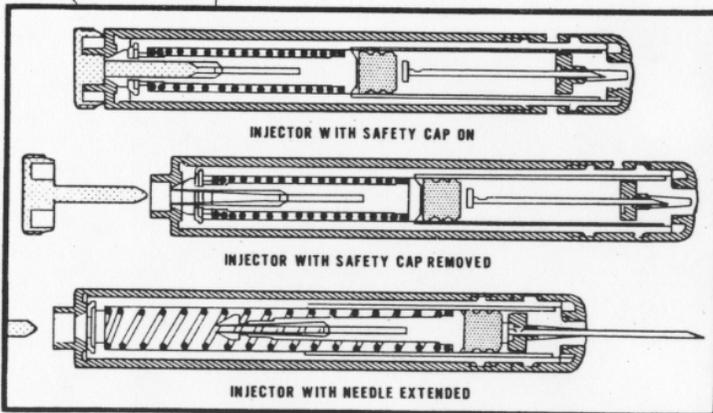
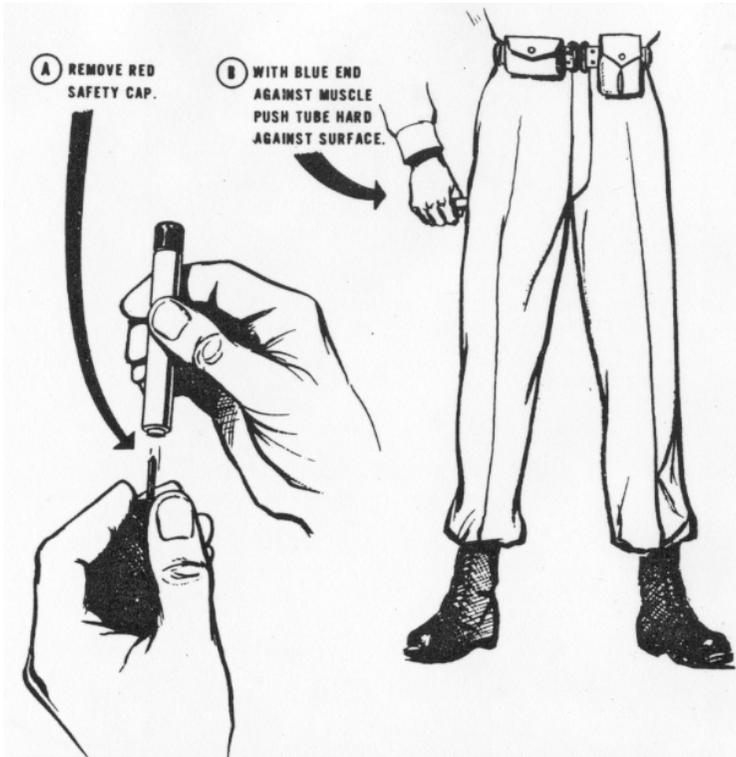
Figure 2. UH-1D Iroquois Helicopter.

The UH-1D retains the basic UH-1B dynamic system with a modified center fuselage section which provides increased cargo and troop carrying capacity. The UH-1D's cargo capacity is a 57 percent increase (140 to 220 cubic feet), and its troop capacity is a 50 percent increase (8 to 12 troops) from that of the UH-1B. For more comparisons see ARTILLERY TRENDS, July 1963, page 27.

ATROPINE AUTOMATIC INJECTOR

A new atropine automatic injector has been developed for counteracting nerve agent poison in the body's system. Nerve agents GA, GB, and VX are colorless, odorless, and tasteless; therefore, their presence is most difficult to detect. Aerosols of the agents may be absorbed into the body's system through breathing, and liquid agents may be absorbed through the eyes and skin. Symptoms of nerve agent poisoning include an unexplained runny nose; tightness in the chest; dimness of vision caused by pinpointed eye pupils; marked difficulty in breathing; and convulsions. At the first indication of the symptoms, the individual should mask, and then give himself an injection of atropine.

To employ the new atropine automatic injector, first remove the red safety cap, and then push the blue end of the injector hard against muscle (fig. 3).



A—Remove the red safety cap
 B—With blue end against muscle, push tube hard against surface
 Diagram of atropine automatic injector

Figure 3. Use of atropine automatic injector (reproduced from Figure 22.1 of Changes 2, dated 16 April 1963, to FM 21-11, July 1959).

NEW AUTOMATIC VG-AGENT ALARM

The E41R3 Automatic Field Alarm (fig 4) for V and G nerve agents is a portable, electrically powered device that will detect and give instant advanced warning of the presence of the vapors or aerosols of V and G nerve agents.



Figure 4. Components of the automatic VG-agent alarm.

The VG-agent alarm continuously samples the surrounding air and operates off a direct current power source, storage battery BB-462/U. It warns personnel in its vicinity of the presence of nerve agents by means of a red light, horn, or clicking in the alarm headset. The alarm is capable of continuous 24-hour a day operation except for short periods of required servicing every 12 hours. The alarm, intended for use by echelons of command down to and including platoon size units, is currently being supplied to combat units in the field on a priority basis.

Additional information on the VG-agent alarm can be found in TM 3-6665-210-12 and TC 3-13.

ARTILLERY TRENDS' MAILING ADDRESS

The correct mailing address for ARTILLERY TRENDS is:

Commandant
ATTN: AKPSIPL-ARTILLERY TRENDS
US Army Artillery and Missile School
Fort Sill, Oklahoma 73504

Course	CI No.	Report	Start	Close	Input
Field Artillery Officer Basic (6-A-C20)	10-64	8 Jan 64	13 Jan 64	12 Mar 64	100
	11-64	22 Jan 64	27 Jan 64	26 Mar 64	100
	12-64	5 Feb 64	10 Feb 64	9 Apr 64	100
	13-64	18 Feb 64	24 Feb 64	23 Apr 64	99
	14-64	4 Mar 64	9 Mar 64	7 May 64	99
	15-64	18 Mar 64	23 Mar 64	21 May 64	99
	16-64	1 Apr 64	6 Apr 64	4 Jun 64	99
	17-64	30 Apr 64	5 May 64	2 Jul 64	99
	18-64	9 Jun 64	12 Jun 64	13 Aug 64	99
	Artillery Officer Career (6-A-C22)	3-64	28 Jan 64	31 Jan 64	15 Sep 64
4-64		3 May 64	8 May 64	18 Dec 64	165
Associate Field Artillery Officer Career (6-A-C23)	3-64	27 Jan 64	29 Jan 64	4 Jun 64	118
	4-64	4 May 64	6 May 64	11 Sep 64	118
Field Artillery Field Grade Officer Refresher (Res Comp) (6-A-C11)	3-64	12 Apr 64	13 Apr 64	24 Apr 64	40
Senior Field Artillery Officer (6-A-F6)	2-64	26 Apr 64	27 Apr 64	8 May 64	22
Nuclear Weapons Employment (Res Comp) (6-A-F20)	2-64	19 Jan 64	20 Jan 64	31 Jan 64	26
	3-64	26 Apr 64	27 Apr 64	8 May 64	26
	4-64	14 Jun 64	15 Jun 64	26 Jun 64	25
Nuclear Weapons Employment (6-A-F26)	3-64	8 Mar 64	9 Mar 64	11 Apr 64	40
Field Artillery Radar Officer (6-A-0140)	2-64	2 Apr 64	6 Apr 64	25 May 64	14
Artillery Target Acquisition Officer (6-A-1154)	2-64	9 Jan 64	13 Jan 64	27 Mar 64	11
	3-64	20 May 64	25 May 64	7 Aug 64	11
Artillery Survey Officer (6-A-1183)	3-64	12 Feb 64	17 Feb 64	9 Apr 64	28
Sergeant Officer (6-A-1190D)	3-64	2 Mar 64	4 Mar 64	10 Apr 64	25
	4-64	27 Apr 64	29 Apr 64	8 Jun 64	25
Pershing Officer (6-A-1190E)	1-64	29 Mar 64	30 Mar 64	22 May 64	28
	2-64	26 May 64	27 May 64	24 Jul 64	28
Pershing Officer (Non-US)	2-64	22 Jan 64	24 Jan 64	20 Mar 64	13
Artillery Communications Officer (6-A-0200)	3-64	9 Mar 64	10 Mar 64	1 Jun 64	26
Artillery Motor Transport (6-B-0600/6-B-631A)	3-64	27 Mar 64	30 Mar 64	28 May 64	15
Field Artillery Officer Candidate (6-N-F1)	6-64	1 Dec 63	9 Dec 63	26 May 64	95
	7-64	12 Jan 64	20 Jan 64	23 Jun 64	95
	8-64	9 Feb 64	17 Feb 64	21 Jul 64	95
	9-64	8 Mar 64	16 Mar 64	18 Aug 64	95
	10-64	5 Apr 64	13 Apr 64	15 Sep 64	95
	11-64	3 May 64	11 May 64	13 Oct 64	95
	12-64	31 May 64	8 Jun 64	10 Nov 64	95
	13-64	28 Jun 64	6 Jul 64	8 Dec 64	95
Field Artillery Officer Candidate (Res Comp) (6-N-F2)	1-64	12 Jun 64	17 Jun 64	29 Aug 64	140
Nuclear Projectile Assembly (6-D-142.1)	6-64	19 Jan 64	20 Jan 64	24 Jan 64	30
	7-64	23 Feb 64	24 Feb 64	28 Feb 64	30
	8-64	15 Mar 64	16 Mar 64	20 Mar 64	30
	9-64	19 Apr 64	20 Apr 64	24 Apr 64	30
	10-64	17 May 64	18 May 64	22 May 64	18
Rocket Nuclear Warhead Assembly (6-D-147.2)	6-64	7 Jan 64	8 Jan 64	15 Jan 64	20
	7-64	4 Feb 64	5 Feb 64	12 Feb 64	20
	8-64	3 Mar 64	4 Mar 64	11 Mar 64	20
	9-64	7 Apr 64	8 Apr 64	15 Apr 64	20
	10-64	5 May 64	6 May 64	13 May 64	18
Artillery Ballistic Meteorology (6-H-103.1)	5-64	26 Jan 64	27 Jan 64	3 Apr 64	37
	6-64	16 Mar 64	17 Mar 64	22 May 64	37
	7-64	4 May 64	5 May 64	14 Jul 64	36
Weather Equipment Maintenance (6-N-201A/6-N-205.1)	3-64	10 Jan 64	13 Jan 64	17 Apr 64	9
	4-64	3 Apr 64	6 Apr 64	10 Jul 64	10
	5-64	29 May 64	1 Jun 64	4 Sep 64	10

Course	CI No.	Report	Start	Close	Input
Field Artillery Radar Maintenance (6-N-211A/211.3)	3-64	5 Feb 64	10 Feb 64	24 Sep 64	14
	4-64	29 Apr 64	4 May 64	18 Dec 64	14
AN/TRC-80 Transition Pershing (6-D-F21)	2-64	11 Jun 64	12 Jun 64	19 Jun 64	8
Field Artillery Operations and Intelligence Non-commissioned Officer (6-R-152.6)	3-64	6 Jan 64	7 Jan 64	25 Mar 64	50
	4-64	30 Mar 64	31 Mar 64	17 Jun 64	50
Artillery Survey Advanced (6-R-153.1)	5-64	9 Jan 64	14 Jan 64	5 Mar 64	64
	6-64	23 Jan 64	28 Jan 64	19 Mar 64	64
	7-64	19 Mar 64	24 Mar 64	14 May 64	64
	8-64	2 Apr 64	7 Apr 64	28 May 64	63
Artillery Flash Ranging (Advanced) (6-R-154.1)	9-64	27 May 64	2 Jun 64	24 Jul 64	63
	2-64	7 Jan 64	9 Jan 64	18 Feb 64	23
	3-64	5 May 64	7 May 64	17 Jun 64	23
Artillery Sound Ranging (Advanced) (6-R-155.2)	3-64	27 Feb 64	2 Mar 64	23 Apr 64	12
Field Artillery Radar Operation (6-R-156.1)	5-64	6 Jan 64	7 Jan 64	16 Mar 64	30
	6-64	14 Feb 64	18 Feb 64	27 Apr 64	30
	7-64	20 Mar 64	24 Mar 64	1 Jun 64	30
	8-64	24 Apr 64	28 Apr 64	7 Jul 64	30
	9-64	26 Jun 64	30 Jun 64	8 Sep 64	30
Sergeant Missile Battery (6-N-161.2)	2-64	8 Dec 63	10 Dec 63	4 Feb 64	32
	3-64	16 Feb 64	18 Feb 64	1 Apr 64	32
	4-64	12 Apr 64	14 Apr 64	26 May 64	32
Pershing Specialist (6-N-163.2/214E)	1-64	27 Feb 64	2 Mar 64	26 Jun 64	33
	2-64	29 Apr 64	1 May 64	28 Aug 64	33
Pershing Missile Battery (6-R-163.6)	1-64	23 Mar 64	25 Mar 64	22 May 64	33
	2-64	21 May 64	25 May 64	24 Jul 64	33
	2-64	30 Jan 64	3 Feb 64	1 May 64	22
Pershing Specialist (Non-US)	2-64	16 Jan 64	20 Jan 64	20 Mar 64	16
AN/TRC-80 Operations (Pershing) (6-R-F24)	3-64	3 Apr 64	6 Apr 64	8 Jun 64	15
	4-64	24 Apr 64	27 Apr 64	29 Jun 64	15
	5-64	5 Jun 64	8 Jun 64	10 Aug 64	15
	6-64	26 Jun 64	29 Jun 64	31 Aug 64	15
Artillery Radio Maintenance (6-R-313.1)	12-64	6 Dec 63	9 Dec 63	30 Mar 64	41
	13-64	10 Jan 64	13 Jan 64	20 Apr 64	41
	14-64	24 Jan 64	27 Jan 64	4 May 64	41
	15-64	7 Feb 64	10 Feb 64	18 May 64	41
	16-64	21 Feb 64	24 Feb 64	1 Jun 64	41
	17-64	6 Mar 64	9 Mar 64	15 Jun 64	41
	18-64	20 Mar 64	23 Mar 64	29 Jun 64	41
	19-64	3 Apr 64	6 Apr 64	14 Jul 64	41
	20-64	17 Apr 64	20 Apr 64	28 Jul 64	41
	21-64	1 May 64	4 May 64	11 Aug 64	41
	22-64	15 May 64	18 May 64	25 Aug 64	41
	23-64	29 May 64	1 Jun 64	8 Sep 64	41
	2-64	6 Jan 64	7 Jan 64	7 Apr 64	29
	Artillery Communication Supervisors (6-R-313.6)	2-64	24 Jan 64	27 Jan 64	27 Mar 64
Artillery Vehicle Maintenance Supervisors (6-R-631.7/632.7)	3-64	29 May 64	1 Jun 64	31 Jul 64	16
	9-64	3 Jan 64	7 Jan 64	27 Mar 64	63
Artillery Track Vehicle Maintenance (6-R-632.1)	10-64	24 Jan 64	28 Jan 64	17 Apr 64	63
	11-64	13 Feb 64	18 Feb 64	7 May 64	63
	12-64	6 Mar 64	10 Mar 64	28 May 64	64
	13-64	27 Mar 64	31 Mar 64	19 Jun 64	64
	14-64	17 Apr 64	21 Apr 64	10 Jul 64	64
	15-64	8 May 64	12 May 64	31 Jul 64	64
	16-64	29 May 64	2 Jun 64	21 Aug 64	64
	17-64	19 Jun 64	23 Jun 64	11 Sep 64	64

Course	CI No.	Report	Start	Close	Input
Refresher Training in the Tactical Employment of Nuclear Weapons	4-64	19 Jan 64	20 Jan 64	24 Jan 64	34
	5-64	9 Feb 64	10 Feb 64	14 Feb 64	34
	6-64	8 Mar 64	9 Mar 64	13 Mar 64	34
	7-64	12 Apr 64	13 Apr 64	17 Apr 64	34
	8-64	10 May 64	11 May 64	15 May 64	34
	9-64	31 May 64	1 Jun 64	5 Jun 64	34

COURSES DROPPED PERMANENTLY

Course No.	Course Title	Length
6-A-1190B	Redstone Officer	5 weeks, 3 days
6-A-C21	Field Artillery Officer Familiarization	8 weeks

GEM FOR THE SURVEY SECTION

Does the instrument operator in your survey section have trouble making sightings on range poles over 800 meters distant? One unit has solved this problem by fabricating panels of 1/4-inch plywood in the shape of an equilateral triangle with 16 inch sides (fig 1). One side of the panel is painted white and the other is covered with red or orange

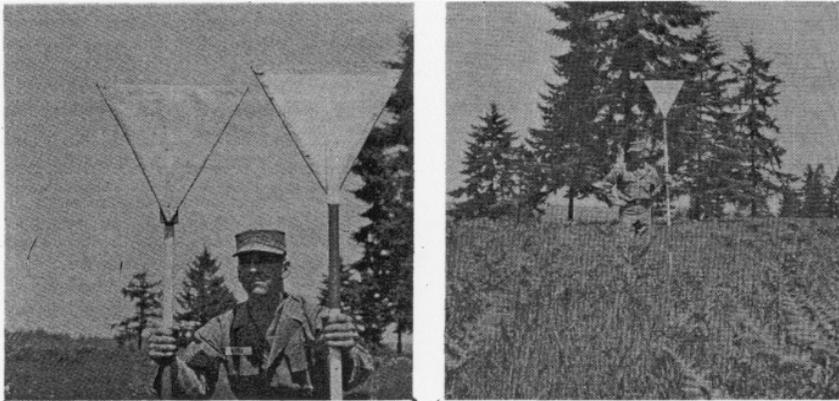


Figure 1. Left—front and back of panel. Right—visibility of panel against background of trees.

material from an airplane marking panel. A bracket mounted on one point of the triangle facilitates attachment to the range pole. The point of the triangle then marks the exact center of the range pole.

The red (orange) side of the panel is used when surveying in snow or when the range pole is silhouetted against the sky line. The white side is used when the terrain background is green or brown. In addition to helping the instrument operator, the tapemen also have an easier time seeing the forward station to which they are taping.

—submitted by SFC Joseph J. Giorno

STATUS OF TRAINING LITERATURE AND FILMS

TRAINING LITERATURE

1. The following training literature is under preparation or revision by the US Army Artillery and Missile School or the US Army Combat Developments Command, Artillery Agency:

A. FIELD MANUALS (FM):

- FM 6-3-2 Operations of Gun Direction Computer M18 (FADAC), Cannon Application.
- FM 6-20-2 Field Artillery Techniques.
(Changes 1)
- FM 6-37 Field Artillery Battalion, Sergeant.
- FM 6-38 Field Artillery Battery, Sergeant.
- FM 6-40-2 Field Artillery Missile Gunnery.
- FM 6-54 Area Toxic Rocket.
- FM 6-70 105-mm Howitzer M102.
- FM 105-6-1 (C) U. S. Nuclear Play Calculator.
- FM 105-6-2 U. S. Nuclear Play Calculator.
- FM 105-6-3 Aggressor Nuclear Play Calculator.

B. ARMY TRAINING PROGRAMS (ATP):

- ATP 6-100 Field Artillery Units.
- ATP 6-302 Field Artillery Missile Units, Honest John and Little John.
- ATP 6-555 Field Artillery Battalion, Sergeant.
- ATP 6-575 Field Artillery Acquisition Battalion.
- ATP 6-615 Field Artillery Missile Battalion, Pershing.
- ATP 6-700 Air Assault Field Artillery Units.

C. ARMY TRAINING TESTS (ATT):

- ATT 6-705 Air Assault Field Artillery Howitzer Battalion, 105-mm.
- ATT 6-707 Air Assault Field Artillery Howitzer Battery, 105-mm.
- ATT 6-715 Air Assault Field Artillery Missile Battalion, Little John.
- ATT 6-717 Air Assault Field Artillery Missile Battery, Little John.
- ATT 6-725 Field Artillery Battalion, Aerial Rocket.
- ATT 6-727 Field Artillery Battery, Aerial Rocket.

D. ARMY SUBJECT SCHEDULES (ASUBJSCD):

- ASubjScd 6-5 Communications Training for Sections and Platoons.
- ASubjScd 6-6 Communication Exercises for Artillery Units.
- ASubjScd 6-12 Field Exercises.
- ASubjScd 6-14 Fire Support Coordination.
- ASubjScd 6-16 Field Artillery Instruments and Duties of Instrument Operators.
- ASubjScd 6-29 Artillery Survey.

- | | |
|------------------|--|
| ASubjScd 6-32 | Field Artillery Command Post Exercises. |
| ASubjScd 6-42 | Difficult Traction and Field Expedients. |
| ASubjScd 6-141 | Light and Medium Field Artillery Crewman, MOS 141.1. |
| ASubjScd 6-142 | Heavy and Very Heavy FA Crewman, MOS 142.1, .2. |
| ASubjScd 6-147 | Field Artillery Rocket Crewman, MOS 147.1. |
| ASubjScd 6-152 | FA Operations and Intelligence Assistant, MOS 152.1. |
| ASubjScd 6-153 | Artillery Surveyor, MOS 153.0. |
| ASubjScd 6-153-1 | Artillery Surveyor, MOS 153.1. |
| ASubjScd 6-154 | Flash Ranging Crewman, MOS 154.0. |
| ASubjScd 6-154-1 | Flash Ranging Crewman, MOS 154.1. |
| ASubjScd 6-155 | Sound Ranging Crewman, MOS 155.0. |
| ASubjScd 6-155-1 | Sound Ranging Crewman, MOS 155.1. |
| ASubjScd 6-161 | FA Missile Crewman (Sergeant). |
| ASubjScd 6-162 | FA Missile Operations and Intelligence Assistant. |
| ASubjScd 6-163 | FA Missile Crewman (Pershing). |
- 2. Training Literature submitted for publication:**
- | | |
|----------------|---|
| FM 6-56 | Field Artillery Battalion (Battery), |
| (Changes 1) | Little John Rocket. |
| FM 6-59 | Field Artillery Rocket Honest John with Launcher M386. |
| FM 6-61 | Field Artillery Battalion Honest John Rocket, SP. |
| (Changes 3) | |
| FM 6-99 | Employment of Selected Ammunition. |
| ASubjScd 6-13 | Operation of Fire Direction Center. |
| ASubjScd 6-41 | Organization, Mission, and Employment of Infantry, Mechanized, Armored and Airborne Division. |
| ASubjScd 6-140 | Field Artillery Basic, MOS 140.0. |
- 3. Training Literature recently printed:**
- | | |
|-------------|---|
| FM 6-3 | Operation and Field Application of Gun Direction Computer, M18. |
| FM 6-75 | 105-mm Howitzer, M2 Series, Towed (Revision). |
| FM 6-79 | 105-mm Howitzer, M108, Self-Propelled. |
| FM 6-88 | 155-mm Howitzer, M109, Self-Propelled. |
| FM 6-125 | Qualification Tests for Specialists, Field Artillery. |
| FM 6-300-63 | The Army Ephemeris. |
| (Changes 1) | |
| FM 6-300-64 | The Army Ephemeris. |
| ATT 6-115 | Field Artillery Battalion, 105/155, Towed, Self-Propelled, Infantry Division. |
| ATT 6-137 | Field Artillery Gun or Howitzer Battery, Heavy, Towed or Self-Propelled (Revision). |

ATT 6-155	Light Field Artillery Battalion, Towed or Self-Propelled.
ATT 6-175	Field Artillery Missile Battalion and Battery, Honest John and Little John.
ATT 6-325	Field Artillery Rocket 1 Howitzer Battalion, Armored Division.
ATT 6-415	Field Artillery Battalion, Heavy.
ATT 6-576	Headquarters and Headquarters Battery, Field Artillery Target Acquisition Battalion.
ATT 6-577	Lettered Batteries, Field Artillery Target Acquisition Battalion.
ATT 6-615	Field Artillery Battalion, Pershing (Revision).

TRAINING FILMS

1. The following training films are currently under production and scheduled for release during calendar year 1964:

Artillery Forward Observer—Part I. In the Defense—Part II. In the Attack
 Fire Direction Procedures—Part I. Precision Fire—Part II. Area Fire—Part III.
 Observed Fire
 Maneuver of the Honest John Battalion—Part I. Fire Mission—Part II. RSOP

2. Training films scheduled for production during calendar year 1963 and for release during calendar year 1964:

Electronic Distance Determination with the Tellurometer
 Operation of Surveying Instrument Azimuth Gyro Artillery

3. Training films scheduled for production and release during calendar year 1964:

Field Artillery Target Acquisition Battalion
 Fire Support Coordination, Infantry Division
 Defense of the Field Artillery Battery
 The Pershing Missile System Modes of Operation
 Pershing Missile Laying Procedures
 Helicopter Artillery RSOP
 The Sergeant Artillery Guided Missile System

4. Training films recently released:

TF 6-3248. The 318mm Little John Rocket—Part I. Introduction to the System (23 min.)
 TF 6-3249. The 318mm Little John Rocket—Part II. Description of Equipment (28 min.)
 TF 6-3250. The 318mm Little John Rocket—Part III. Assembling, Transporting, and Firing (31 min.)
 TF 6-3251. The AN/TPS-25 Ground Surveillance Radar (30 min.)
 TF 6-3261. Laying the Field Artillery Battery (15 min.)
 TF 6-3298. The 762mm Rocket M50—Part I. Introduction to the System (21 min.)
 TF 6-3299. The 762mm Rocket M50—Part II. Mechanical Assembly and Checkout (30 min.)

TF 6-3300. The 762mm Rocket M50—Part III. Loading, Preparation for Action, Firing, and March Order (37 min.)

TF 6-3306. RSOP, Reconnaissance, Selection, and Occupation of Position—Part I. (22 min.)

TF 6-3307. RSOP, Reconnaissance, Selection, and Occupation of Position—Part II. Limited Reconnaissance (14 min.)

ARTILLERY INFORMATION LETTERS.

The following artillery information letters containing items of a technical nature have been recently published by the US Army Artillery and Missile School. Distribution is made only to the units and their controlling headquarters which are authorized the equipment discussed in these letters:

Artillery Instructors Information Letter Number 22 (6 June 63)

Artillery Instructors Information Letter Number 23 (12 Sep 63)

Honest John—Little John Information Letter Number 3 (9 Apr 63)

175-mm Gun Information Letter Number 1 (5 July 63)

Metro Information Letter Number 10 (31 May 63)

Pershing Information Letter Number 1 (25 July 63)

115-mm Rocket System Information Letter (8 Aug 63)

8-inch Howitzer Information Letter (20 Sep 63)

NOTICE TO EXTENSION COURSE STUDENTS

Artillery Subcourse 474, "Nuclear Weapons Refresher," is ready for administration to the field. This subcourse is designed to provide refresher training in the tactical employment of nuclear weapons for all officers who now hold an MOS prefix digit 5. The successful completion of the examination to this subcourse will demonstrate the officers proficiency for the retention of his prefix digit 5, and meet the requirements for periodic (each two years) nuclear weapons refresher training established by letter, AGAM-P(M), 210.63, (7 Jan 63), DSOPS, TAG, DA, dated 16 January 1963.

To enroll for this subcourse the individual officer should submit his request on DA Form 145, Army Extension Course Enrollment Application, to the Commandant, US Army Artillery and Missile School, ATTN: NRID, Fort Sill, Oklahoma. To avoid any possibility of confusion with other nuclear weapons subcourses, the applicant should request the refresher subcourse by number and title, i.e.; Subcourse 474, "Nuclear Weapons Refresher." For further information concerning nuclear weapons refresher training, see page 18 of the 1963-64 Extension Courses Catalog.

L 1136 ARMY-FT. SILL, OKLA.