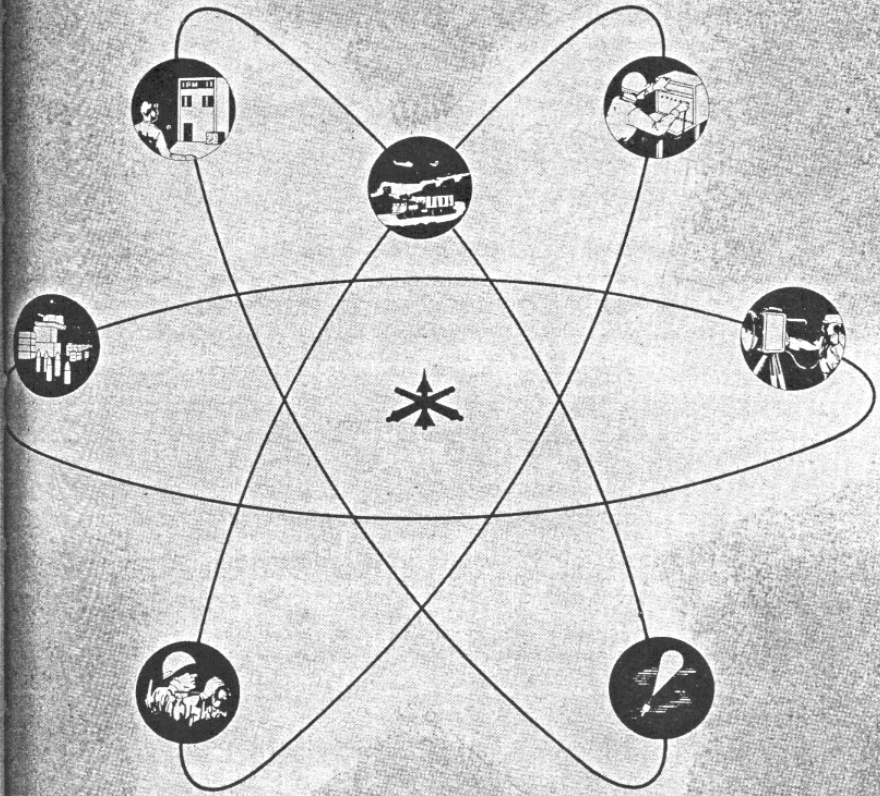
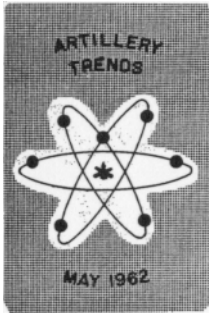


ARTILLERY TRENDS



MAY 1962

US ARMY ARTILLERY and MISSILE SCHOOL



Instructional Aid Number 22

● COVER

The weapon—represented by the Artillery crossed cannons and missile—is the central element of the nuclear-capable weapons system; this is the subject of ARTILLERY TRENDS' cover and feature article on page 4—Weapons System: 1970.

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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.

9/27/62 - 11/26/62
1-10-63 - 11-27-63
3-11-63 - 11-27-63

Extension Courses for Field Artillery

1962 • 1963

U.S. MAIL



NEW FIELD ARTILLERY EXTENSION COURSES CATALOG

A completely revised Field Artillery Extension Course Program is described in the 1962-63 Field Artillery Extension Course Catalog. The new program, which has approximately 15 June 1962. The new program, which has been approved by the Chief of Staff of the Army, the Adjutant General's Division, staff of the Military and Civilian Affairs Division, and the Field Artillery School, reflects the latest information on Field Artillery Extension Courses. A book of seven new summary subcourses, complete with syllabi, is included in the new program. The new program is directed to the specific needs of the Field Artillery and is designed to provide the necessary training and information subcourses and many of the subcourses have been revised prior to printing.

The Field Artillery Extension Course Program offers a variety of courses: **FAMILIARIZATION** for officers transferring from other branches; **CAREER**, including **PREPARATORY** courses; **SPE** (Specialized Professional Education); and **Advanced** courses. The program is designed for members of the Army National Guard and the US Army Reserve. Enrollment procedures and details in the program are contained in the new catalog.



COMMANDANT
US ARMY ARTILLERY AND MISSILE SCHOOL
NONRESIDENT INSTRUCTION DEPARTMENT
ATTN: EXTENSION COURSE DIVISION
FORT SILL, OKLAHOMA

ERRATA

To accompany MAY 1962 issue of ARTILLERY TRENDS. Instructional Aid Number 22.

- Page 18—Paragraph reading "The new radio . . . 1840 different channels" should read: "There are two types of squelch possible with the AN/VRC-12 series of FM radios. The two types are carrier (noise) operated squelch, as is used on the old series of FM radios, and tone operated squelch. It is optional whether or not squelch is used; however, the call signal for radio/wire integration will not operate unless the squelch switch is placed on the ON position."
- Page 27—Line 5, paragraph continued from previous page should read: ". . . successive 2,000-meter layers of the atmosphere."
- Page 32—Sentence beginning on Line 35 should read: "The circuitry of the computer is on a series of circuit boards which are easily replaced if a component becomes defective."
- Page 33—Figure line, figure 24 should read: "Battery Display Unit."
- Page 62—Under A. FIELD MANUALS (FM): Fifth entry should read: "6-() Operation and Field Artillery application of Gun Direction Computer, M18."

WEAPONS SYSTEM: 1970

As every artilleryman well knows, the artillery weapons system is more than just a cannon or missile. It is a combination of thousands of men handling millions of dollars' worth of equipment for the single purpose of raising a protective umbrella over the heads of our vulnerable maneuver forces. The artilleryman must know his weapons system—its capabilities and limitations—in order to employ it to the highest degree of its capabilities.

In the decade that lies ahead, the artillery weapons system will follow a realistic but forward-looking development program which promises to give it even more of a "Buck Rogers" look than it has today. Despite its "science fiction" look however, the artillery of 1970 will be down to earth and more capable of maintaining the fast pace of the modern nuclear Army.

The general outline of how the weapons systems components will look over the next ten years is known. That is the purpose of this article—to inform artillerymen everywhere, in words and pictures, of some of the now unbelievable equipment that will be in everyday use in just a few short years.

THE WEAPON

Though only a part of the entire weapons system, the weapon itself is, nevertheless, the reason for the existence of the weapons system. "In the next ten years, the capability of the field artillery will be greatly improved by the introduction of a complete new family of weapons in the army structure. These weapons will be characterized by increased mobility and range, greater firepower, improved lethality of ammunition, and a reduction in the overall weight of each weapon in comparison with its World War II counterpart.

This article is based on selected material prepared for presentation by the US Army Artillery and Missile School for the World Wide Combat Arms Conference, to be held at Fort Leavenworth, Kansas, in June 1962.

The 105-mm caliber cannon will be revolutionized by the introduction of two new lightweight weapons. The XM102 will be a lightweight, towed weapon. Its prime characteristics will include: Weight—3,000 lb; length—17'6"; width—68"; height—traveling position 46", firing position 30". A traversing track under the rear of the trail will permit 6,400-mil on-carriage traverse. The weapon will feature a new tube (XM103), which is 30" longer than current howitzer tubes. It will fire standard and extended range ammunition, will be equipped with a semiautomatic, vertical breech block, and will have a hydropneumatic, variable recoil mechanism. It is anticipated that the XM561 1 1/4-ton utility truck (see transportation section, following) will be the prime mover for the XM102 howitzer.

The second new 105-mm weapon under development is a lightweight, self-propelled, unarmored 105-mm howitzer, XM104. Combat loaded with a crew of four, ten rounds of ammunition, and fuel for 300 miles, it weighs only 8,500 lb. This can be reduced to 7,200 lb for airdrop or helicopter transport. The XM104 employs the same tube as the towed XM102 (without a muzzle brake), has a top speed of 35 mph, uses a standard jeep engine, and is amphibious. It is about 12'6" long, 69" wide, and 64" high.

In the 155-mm caliber family, there is an improvement for the towed 155-mm howitzer. It consists of a power pack (a 35 hp gasoline engine with hydraulic drives to the howitzer wheels) which can be installed or removed by the crew in about 10 minutes. This auxiliary propulsion allows the howitzer to operate for short distances in rugged terrain without a prime mover. It is also capable of towing a 3,000 lb trailer load of ammunition. Speed of the howitzer with one engine is about 6 mph. A second concept, using two engines, has a top speed of 9 mph. Steering is accomplished by regulating the power applied (separately) to the howitzer wheels. The weight of the single engine power pack is about 1,100 lb, that of the two engine about 2,200 lb. The howitzer can be emplaced and fired with the power pack installed. This, together with the new tube (T258E1, see News Notes) and the extended range ammunition, will result in a tremendous improvement for the towed 155-mm howitzer.

Leaving the flyweights, and moving up a notch to the bantamweights, we come to two new armored, self-propelled howitzers which also boast of weight reductions over older models. Both will enhance the mobility, flexibility, and firepower of the armored and mechanized divisions. The M108 (T195E1) is a diesel powered, aluminum armored, 105-mm weapon with the new XM103 tube (firing standard and extended range ammunition). It has a cruising range of 300 miles on integral fuel tanks. Five crew members, including the driver, and 85 rounds of M1 ammunition can be transported in the carriage. When combat loaded it weighs 48,000 lb and is amphibious when equipped with a fording kit.

The medium artillery of the armored and mechanized divisions will soon be the new armored 155-mm howitzer, M109 (T196E1), which will replace the current M44. The basic characteristics (turret, motor, chassis, sights) of the carriage are identical to the carriage of the 105-mm howitzer,

M108 (T195E1). The weapon consists of a new tube, a semiautomatic-opening breech block, the M35 firing mechanism, and a bore evacuator with muzzle brake. It fires both current and extended range ammunition. The M109 is amphibious when equipped with a fording kit. When combat loaded (crew of 6, 26 rounds of ammunition, and fuel for 300 miles) it weighs about 53,000 lb.

Heavy artillery has two new diesel powered, full-track, unarmored weapons with a standard carriage. The 175-mm gun, M107, and the 8-inch howitzer, M110, use the same engine employed in the 105-mm howitzer, M108, and 155-mm howitzer, M109. The top carriage, recoil mechanism, and equilibrators of the towed 8-inch howitzer are used. Except for the tubes (which can be changed in 30 minutes without modification), the components of these two weapons are identical. Power for traverse, elevation, loading, ramming, and seating the spade is hydraulic. Combat loaded, the 8-inch howitzer weighs about 58,000 lb, the 175-mm gun about 62,000 lb. Cruising range on integral fuel tanks is 500 miles.

New in the area of rockets is the Little John. Officially designated the 318-mm rocket, it is a solid-propellant, fin stabilized, free-flight rocket fired from a straight-rail launcher. Just over 14 feet in length, 12 inches in diameter, and weighing 780 pounds, Little John can deliver a 260-pound high explosive, chemical, or nuclear warhead to distances ranging from 3,000 meters to 20,400 meters.

The Little John launcher is a lightweight, helicopter-transportable, towed, field artillery weapon. Constructed primarily of aluminum alloy, it is simple of design, rugged, and highly mobile, either cross-country or by air.

The Little John system has a unique feature in its Spin-on-Straight-Rail (SOSR) technique. The rocket is actually pre-spun on the launcher prior to firing. Two collars, in which the rocket is spun, are secured to the launcher rail by the front and the rear shoes. The spinning mechanism, a component of the launcher, supplies the necessary force to prespin the rocket in the collars. When the rocket spin reaches 3 revolutions per second it is automatically fired. As it clears the launcher, the rear collar with the fins attached locks with the spinning rocket and spin is maintained throughout the ballistic flight by the four fins.

The reliable Honest John rocket will continue to make its presence felt in artillery as the decade wears on, as will the Lacrosse, Corporal, and Redstone missiles.

Pershing is a solid-propellant guided missile which has broken all reliability and accuracy records of former test missiles. It not only surpasses the range and effectiveness of Redstone, but also offers the added advantages of lighter weight, smaller dimensions, greater mobility, and a more rapid firing capability. Pershing stands 34 feet tall with its unique two-stage rocket motor and double set of fins. A valuable innovation within the Pershing system is the EL—erector, launcher—which both moves the missile to the firing site and acts as the launching pad.

At the intermediate missile range of 75 miles, our artillery will sport the new solid-fuel Sergeant. Sergeant is smaller but more powerful than

Corporal, is lighter but capable of greater lethality, has fewer crew members but emplaces and fires in less time. Sergeant is over 34 feet long and is 31 inches in diameter, and has an inertial-guidance system which, like all of Sergeant's components, can be pre-tested "in the package" for immediate determination of operability. Furthermore, Sergeant can be emplaced, checked, and fired in all conditions of weather and terrain.

TRANSPORTATION

To move these new weapons through all parts of the world, the artillery needs, and is getting, a bigger, tougher, GOER family of vehicles. The concept of military operations for the 1962-1970 period envisions an increased requirement for artillery units to be capable of moving rapidly over great distances and, in many cases, over extremely difficult terrain. These units may be employed in the Continental United States, arctic, subarctic, tropics, jungle, desert, mountain, or savanna areas. The anticipated increased dispersion of units, the greater distances between unit centers of mass, and the tactics of both offensive and defensive action will require that artillery units at all echelons be capable of moving 200 to 300 kilometers without resupply. This fact will require significant improvements in tactical and strategic mobility, including air mobility. General purpose vehicles must be fully utilized and special purpose vehicles must be rugged and simple. Improved air vehicles are necessary for target acquisition, resupply, command, and control.

Transportation is a vital link in the movement of our weapons system over the battlefield to assure commanders at all levels of continuous and responsive artillery fire.



Figure 1. XM561 1 1/4-ton cargo truck.

The 1 1/4-ton utility truck, XM561, may be used as a prime mover for the new 105-mm howitzer (XM102) carriage. It may also be used as a personnel and equipment carrier. The development of this vehicle is in the design stage and no prototypes have been fabricated.



Figure 2. XM520E1 GOER 4x4, 8-ton.

The GOER 8-ton 4x4, XM520E1, has cross-country mobility greater than that of other wheeled vehicles. It has a high payload-to-curb-weight ratio, inherent swimming capability, low maintenance requirements, and increased cruising range. It may be used as a battery ammunition vehicle or in the battalion train for ammunition resupply. Eight-ton GOER's may also be used as prime movers for towed artillery and could be used as general resupply vehicles, particularly for high-density loads.

Employing the same power package and basic chassis, an 8-ton GOER truck, XM559, may be used for refueling and transport of liquid fuel. It will have the same favorable characteristics as the 8-ton cargo version. This vehicle may be used as an organic liquid fuel transporter in the artillery battalion service battery. It is currently undergoing fabrication.

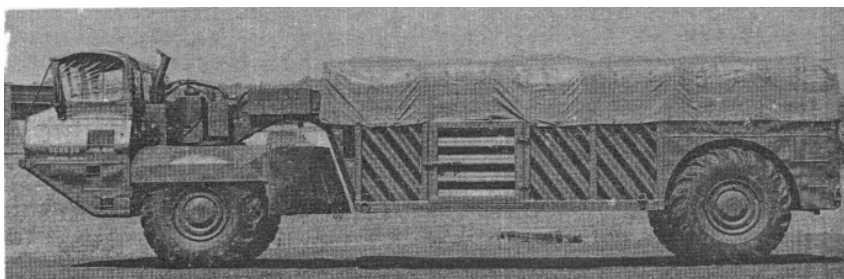


Figure 3. GOER 4x4, 16-ton.

The 16-ton 4x4 GOER, XM437E1, has an increased cross-country mobility over that of other wheeled vehicles. Its high payload-to-curb-weight ratio, inherent swimming capability, and low maintenance requirements make this vehicle suitable for use as a battery and battalion ammunition resupply vehicle. It may also be used as a prime mover for towed heavy artillery.

The cargo and ammunition carrier, XM104, will make maximum use of the power package, suspension systems, and basic chassis of the lightweight, 105-mm howitzer, XM104. The ammunition carrier and/or accompanying vehicle can carry two men plus 60 rounds of 105-mm ammunition. Like the XM104, it is Phase I air transportable. A qualitative materiel requirement has been stated for this vehicle. Other tracked ammunition carriers have been recommended by the Artillery and Missile School for use with the T195E1 (M108), T196E1 (M109), M107, and the M110.

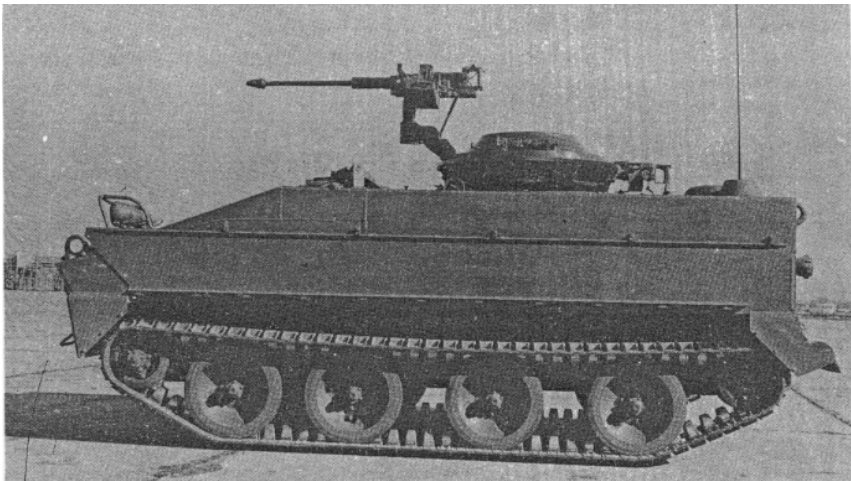


Figure 4. M114 carrier, reconnaissance, full-track, armored.

The M114 armored, full-track reconnaissance carrier may replace many 1/4-ton utility trucks in armored artillery units in the 1962-1970 time frame. The M114 has been type classified limited production and a contract has been let to build 1,215 of these vehicles, with production beginning in August of 1962. A Chevrolet V-8, 283 cubic inch, water-cooled engine is employed in conjunction with a GMC automatic transmission. The suspension system is torsion-bar type with a band-type track.

Employing the same power package and similar suspension system as the M114, the M116 1 1/2-ton amphibious cargo carrier may replace the 3/4-ton cargo truck on a one-for-one basis in the armored, mechanized, infantry, and airborne division artillery TOE's of the reorganized divisions, especially in arctic and special operations WABTOC/CONARC. The primary asset of this vehicle is its low ground pressure which enhances its mobility. Production on the M116 will begin in July 1962.

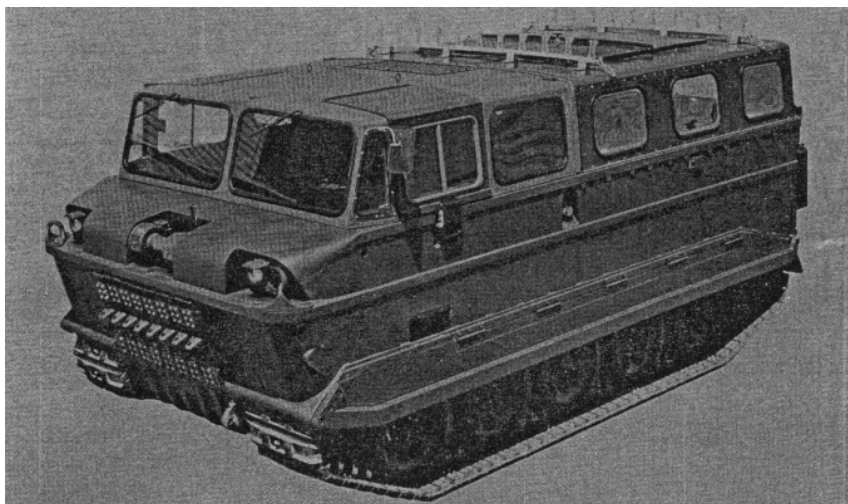


Figure 5. M116 carrier, cargo, amphibious, 1 1/2-ton.

The XM577 command post carrier is a modification of the M113 armored, personnel carrier and will replace the M113 on a one-for-one basis in the administrative section, operations and fire direction sections, and firing battery headquarters of armored artillery units. This vehicle may also be used as a communications and/or medical vehicle.

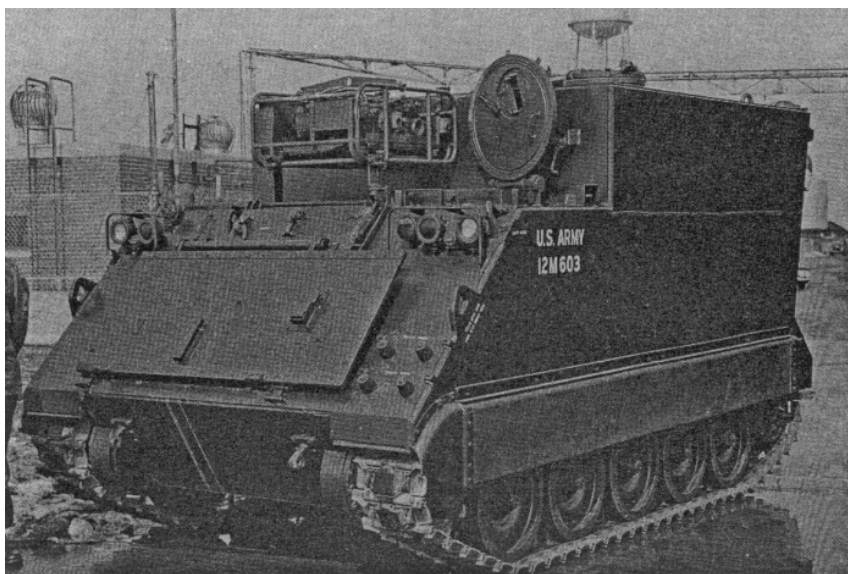


Figure 6. XM577 carrier, command post.

Pictured below is one of the entries in the Army's light observation helicopter (LOH) competition. The LOH is being designed as simply as possible to reduce maintenance requirements, which, when accomplished, will permit assignment of this aircraft at small unit level—perhaps down to battery or company. However, to accomplish this, only basic instruments which provide for daytime visual flight will be installed. It may be used in the transportation of supplies and equipment. The LOH is designed for a pilot and an observer. Without the observer, it is possible to transport small arms, ammunition, C-rations, clothing, and other items of equipment which are not bulky or overweight. Presently, the LOH is in the design stage. This vehicle will be able to travel for three hours on integral fuel tanks and will have a maximum speed of 100 miles per hour. It is scheduled to replace the L-19, H-13, and H-23.



Figure 7. Light observation helicopter.

The HU-1 Iroquois utility/tactical transport helicopter, already in production, is scheduled to replace the current L-20 fixed wing Beaver, H-19 utility helicopter, H-21 light helicopter, and the H-34 light transport helicopter. The HU-1B can carry five troops plus the pilot and copilot, whereas the HU-1D can carry 12 troops plus the pilot and copilot. The HU-1D may also be used as a mobile fire direction center.



Figure 8. HU-1 Iroquois utility/tactical transport helicopter.

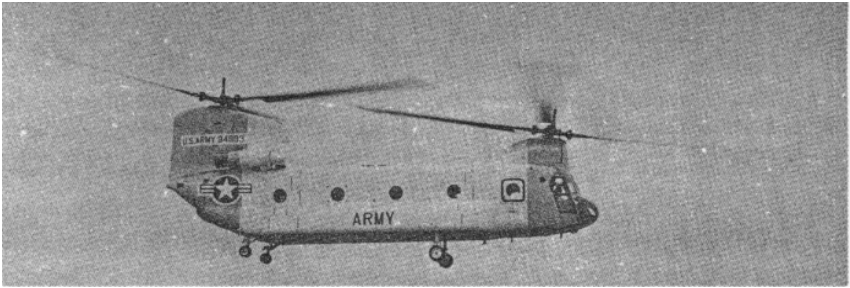


Figure 9. HC-1B Chinook helicopter.



Figure 10. AO-1 Mohawk.

The HC-1B Chinook helicopter, planned replacement for the H-37A Mojave medium transport helicopter, is now being tested at the Vertol Division of Boeing Airplane Company. Chinook was built specifically to carry the Pershing. Its lifting capability is three tons and it will transport a crew of three plus 33 fully-equipped troops, or 24 litters. The Chinook is powered by two turbine engines, making the helicopter capable of a speed of 130 knots. Deliveries under the present contract will begin in December 1962.

The AO-1 Mohawk combat surveillance aircraft is scheduled to replace the RL-23 and RL-26 aircraft. The AO-1A version has a visual and photo capability, the AO-1B version employs the side-looking airborne radar (SLAR), and the AO-1C employs an infrared surveillance system. The Mohawk will be available down to division level.



Figure 11. AC-1 Caribou.

The AC-1 Caribou transport airplane is planned to replace the U-1A Otter. Powered by two Pratt and Whitney engines, the Caribou has a

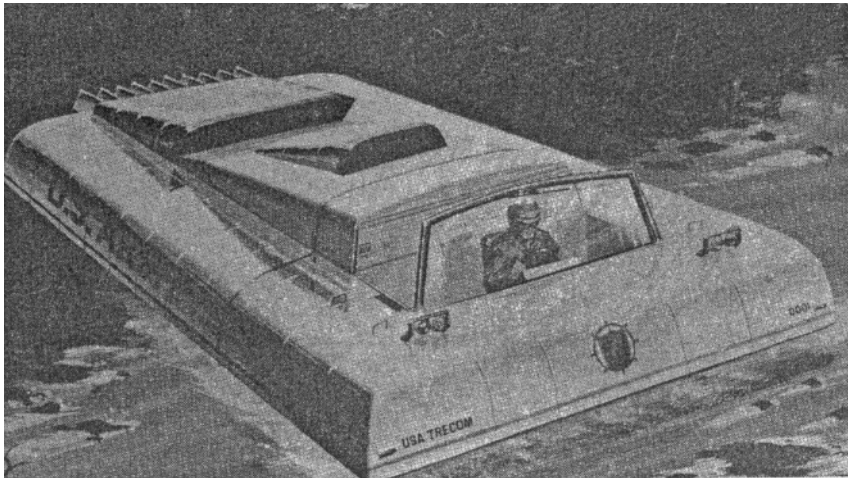


Figure 12. Artist's concept of a ground effects machine (GEM).

3-ton cargo capacity or can carry 32 combat-equipped troops. The Caribou can travel at a speed of 180 miles per hour.

A qualitative materiel requirement for a 15-ton amphibious air cushion (ground effects machine, or GEM) vehicle has been stated. This vehicle should be capable of transporting a 15-ton payload operating at sustained speeds of 25 to 40 miles per hour and providing a relatively unrestricted mode of transportation over water and compatible land surfaces. The vehicle will provide a new logistical over-the-shore capability and will be able to traverse inland waterways and land surfaces commensurate with future concepts of dispersed operations. This vehicle should be available for troop use in the 1965-1970 time frame.

COMMUNICATIONS

So far, we've talked about shooting and moving. The third element of the famous artillery axiom still remains—communicate. The field artillery presently maintains short and medium range tactical communication by means of FM radio and field wire. Since great dispersion and mobility are required on the nuclear battlefield, time will not be available for the installation of an adequate wire system. This means that the FM radio nets must be used to handle most of the tactical communication traffic. Unfortunately however, an increase in the use of FM radio nets will cause an increase in the time required to *gain access* to these nets.

As an alternative to the use of some FM radio and field wire, the Motorola Corporation has designed and manufactured the Communication System AN/USC-3(V), which has many of the advantages of both wire and FM radio. This system is being user-tested by the Airborne, Electronic, and Special Warfare Board.

The Communication System AN/USC-3(V) is a synchronous, multiplexed, single sideband radio system capable of transmitting and receiving voice, facsimile, and teletypewriter signals on twelve separate radio channels at ranges of greater than 10 miles. Each communication system operates on a frequency bandwidth of 90 kc in the frequency range of 132 to 165 mc.

A typical USC system may consist of one central, AN/USC-37, twelve or more radio subscriber sets, AN/URC-40, and as many as 16 land line subscribers. The central contains two switchboards, SB-22, to provide complete duplex switching between any of the subscribers. The system can be further extended by the use of a standard field telephone and one mile of wire to remote control a stationary subscriber. The flexibility of the system can be further increased by connecting a stationary subscriber to a standard field switchboard for access to the field wire system in the vicinity of the subscriber.

The central station is designed to be mounted in a shelter on a standard 3/4-ton truck. The primary power for the central is supplied by a trailer mounted generator PU-294/G. The central is equipped with vehicular mounted whip antennas for use when the central is being displaced and an omnidirectional antenna with a thirty foot mast for stationary

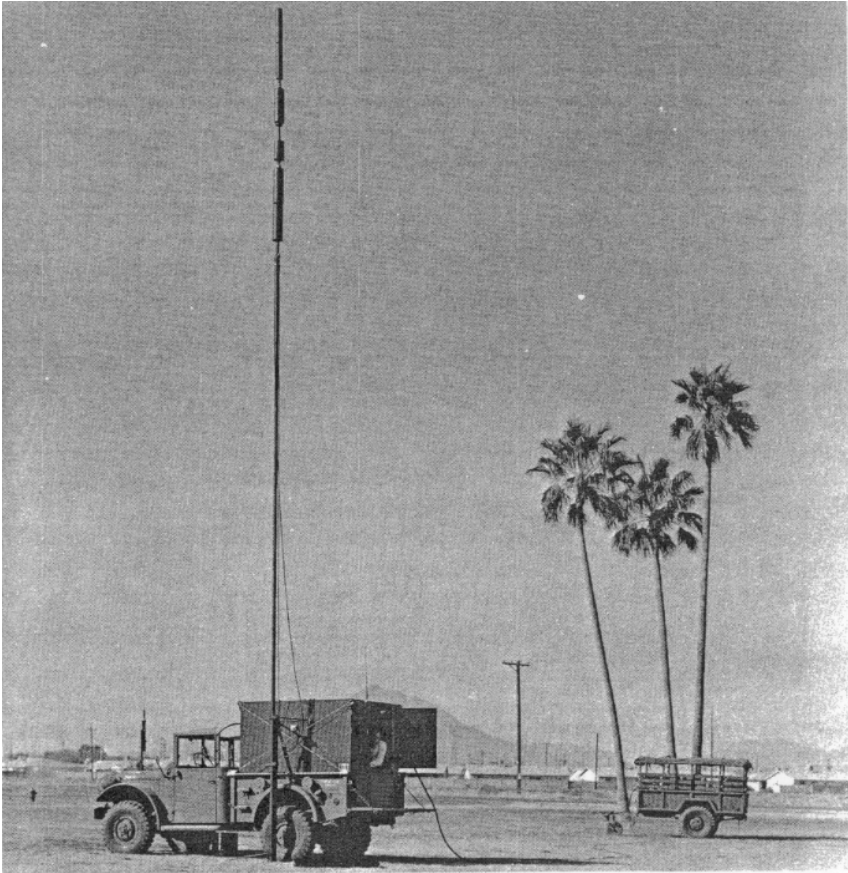


Figure 13. Communications central AN/MS-37 in stationary operation.

use. The shelter at the central station contains a receiver, a transmitter, multiplexing equipment, test equipment, and two SB-22 switchboards. The exterior of the shelter contains facilities for connecting wire lines to the system and connections for use in installing the switchboards at a remote position.

The radio subscriber set contains two receivers, a transmitter, and a control unit. The set can be mounted in any military vehicle and obtains primary power from the 24 volt vehicular electrical system. In addition to the vehicular mounted antennas, the subscriber may be provided with a directional antenna for use on a thirty foot mast to increase the range of the radio when the subscriber is operating in a stationary position.

The Communication System AN/USC-3 will provide the field artillery with a flexible, mobile, reliable, rapidly-installed, short and medium range communication means which can be used at battalion, artillery group, and

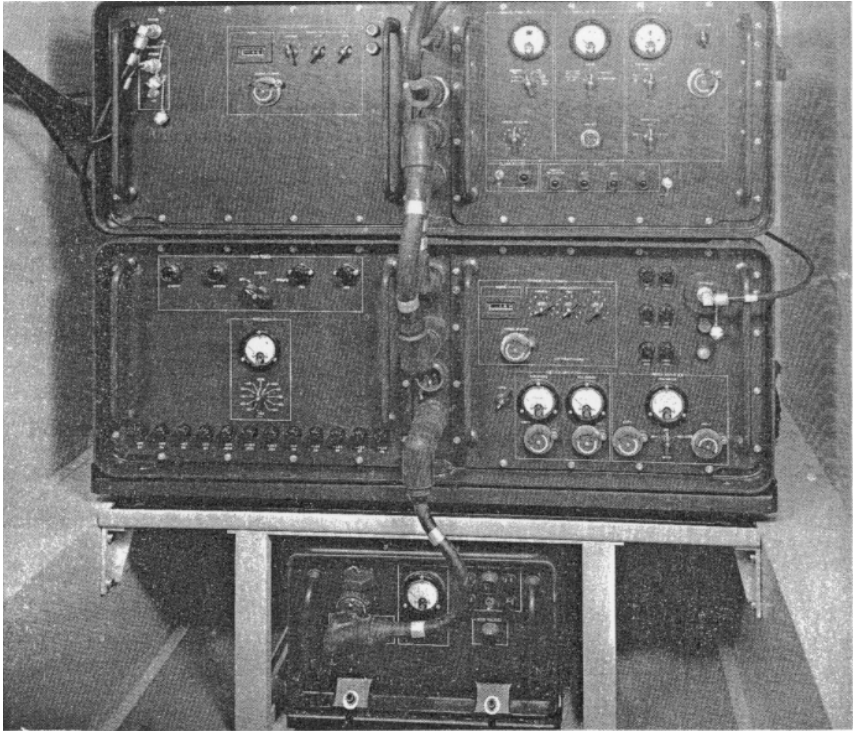


Figure 14. Communication central AN/MSC-37. Interior looking forward.

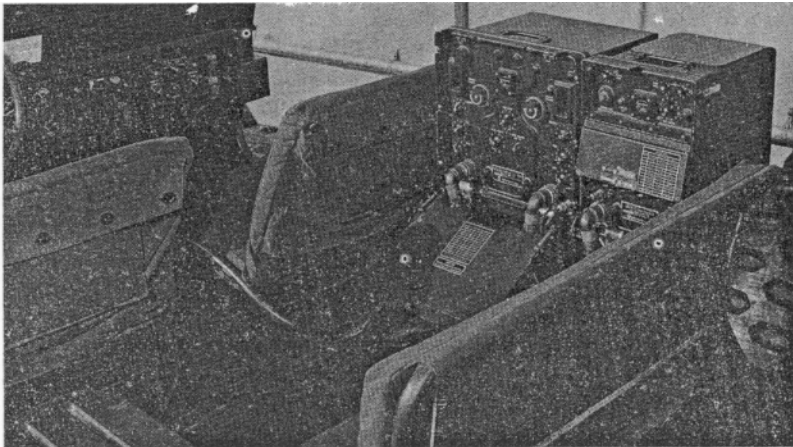


Figure 15. Subscriber set AN/URC-40. Installation in a 1/4-ton 4x4 truck.

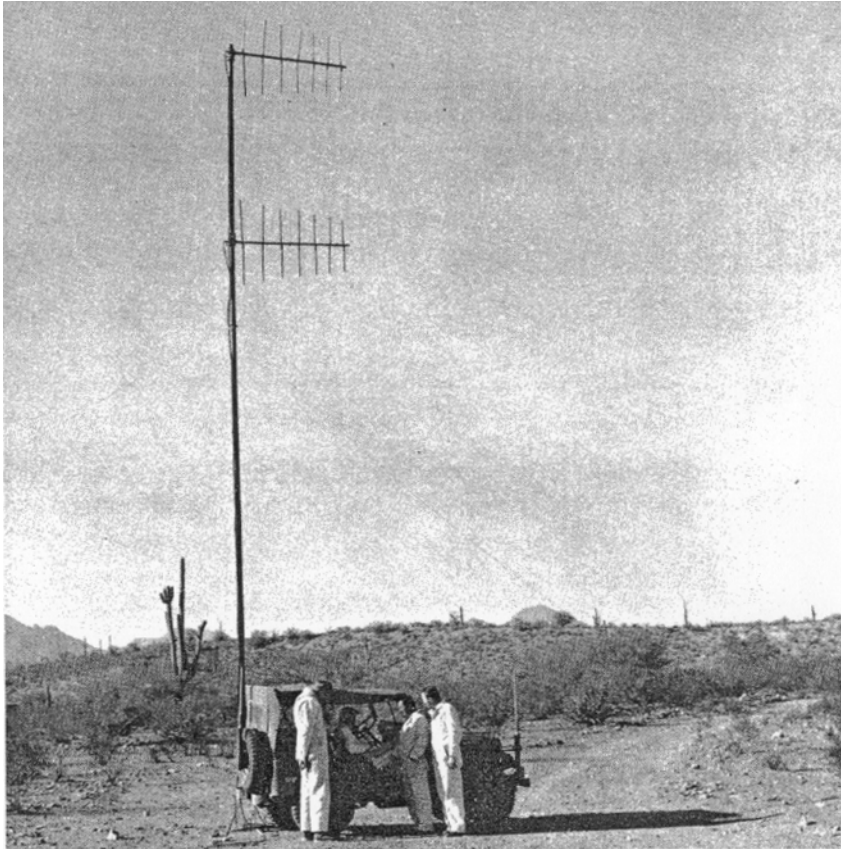


Figure 16. Subscriber set AN/URC-40, directional 30 foot auxiliary antenna for use with subscriber set.

division artillery echelons to tie the various elements of the field artillery into an integrated artillery weapons system.

Another development is a new family of radios, currently in production, to replace the present AN/GRC-3 through -8 series of medium powered FM radios. The new radio, known as the AN/VRC-12 series, provides a single series of radios, each with 920 operating channels spaced 50 kilocycles apart. Eight system configurations of the new series will replace 21 configurations of the current series.

The basic set of the AN/VRC-12 family, the AN/VRC-47, consisting of a receiver-transmitter with self-contained power supply and an auxiliary receiver, is approximately one-half the size of its counterpart, the AN/VRC-17. The new sets are smaller for two reasons—they are almost totally transistorized and they feature modular type circuit construction. The sets plug directly into their mounts, thus eliminating all power and control cables.

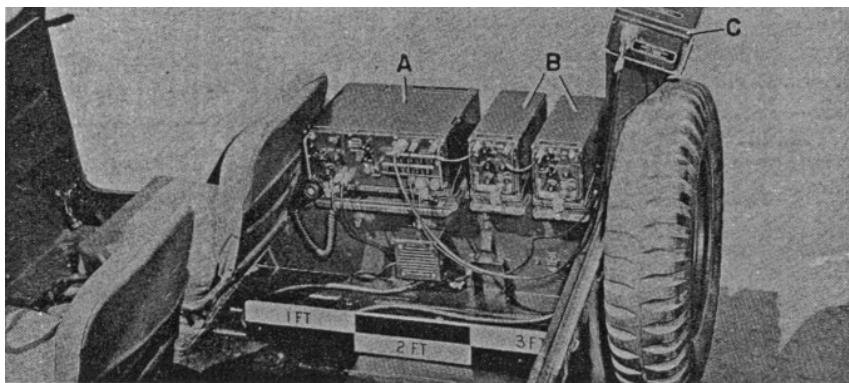


Figure 17. The new AN/VRC-12 series of radios.

- A. Receiver-transmitter RT-246(XC-2)/VRC-12 (automatic).
- B. Receiver radio R-442 (XC-1)/VRC-12.
- C. Antenna matching unit.

The new radio has an automatic squelch system. When the squelch control is turned on, the squelch is automatically adjusted to the proper level. The squelch circuit has another feature—selective squelch. With selective squelch, a signal can be sent out that will only be received by a receiver using the same kind of selective squelch. In other words, two radios operating on the same frequency will not interfere with each other if one is using selective squelch and the other is not. Therefore, in actuality, we have the capability of doubling our operating channels or having access to 1840 different channels.

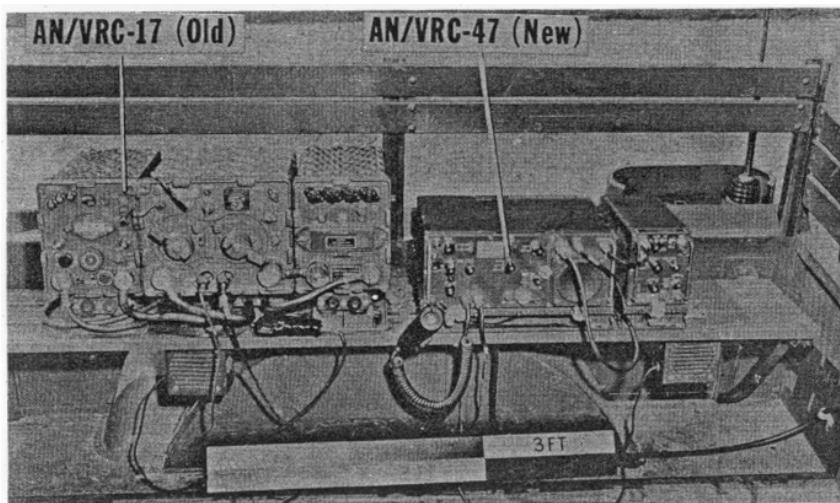


Figure 18. AN/VRC-17 (old)—AN/VRC-47 (new).

In addition to the improvements mentioned above, the new radio gives us greater range (15 to 20 miles), automatic calibration to include the auxiliary receivers, and a new "center fed" antenna system which eliminates the necessity of proper orientation of the vehicle. With a "center fed" antenna system, radiation is equal in all directions.

Another member of this new family of radios is the AN/PRC-25 (ARTILLERY TRENDS, Feb 1962). This radio will replace the present AN/PRC-8, -9, and -10. It has all of the features of the AN/VRC-12 including automatic calibration.

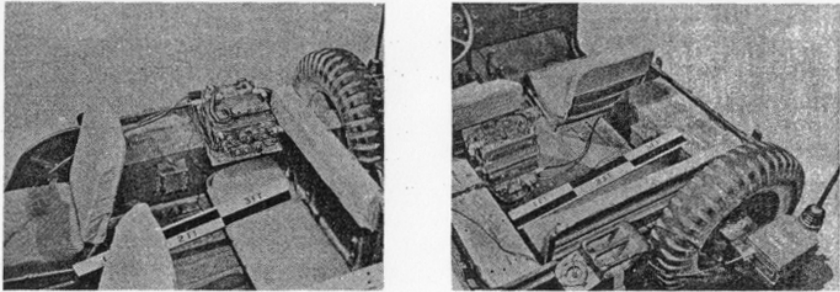


Figure 19. Two views of radio set AN/PRC-25 (XC-3) mounted in 1/4-ton trucks.

The radio set AN/TRC-80 (ARTILLERY TRENDS, Feb 1962, p 4) was designed by the Collins Radio Company as part of the Pershing missile system. It is a completely self-contained, portable, tropospheric scatter, radio communication terminal. It provides one duplex voice channel and one half-duplex teletypewriter channel for point to point communication with an operational reliability of 99.9 percent to distances of 100 miles. The AN/TRC-80 is equipped with a highly directional, air-inflatable, parabolic antenna and operates in the 4.4 to 5 kilomegacycle band with 333 operating frequencies.

A gasoline engine-generator on slide-out rails is housed in the shelter with the radio. Since there is no requirement for separate loading of the primary power source, the entire terminal can be moved as one 4,600-pound load.

The AN/TRC-80 can be transported by helicopter; however, the primary means of transportation is the same XM474 tracked vehicle which is used to transport the other elements of the Pershing missile system.

The radio set AN/TRC-80 meets the reliability, transportability, and range requirements of the Pershing missile system. It is the first item of communication equipment designed as a part of a field artillery weapons system, and as such, fulfills the requirements of the system more completely than any other communication equipment currently in the signal inventory.

A high frequency, single sideband series of radio sets is being developed by the US Army Signal Research and Development Laboratories

for use by the US Army which will provide reliable voice and continuous wave communications and FSK (teletypewriter) or composite transmissions when equipped with appropriate auxiliary devices. Some single sideband radio sets are presently scheduled to be available for troop issue in fiscal year 1966-67. These are the Radio Set AN/GRC-106, a 50 mile set; the Radio Set AN/GRC-107, a 100 mile set; and the Radio Teletypewriter Set AN/GRC-108, a 100 mile set. A major improvement will be achieved in equipment standardization in that one basic transceiver will be common to the 50 and 100 mile configurations.

The Radio Set AN/GRC-106 is a vehicular mounted radio set weighing approximately 70 pounds. It will be capable of operating from a 24 volt DC, 25 ampere, vehicular generating system. The primary usage will be in forward area tactical command, fire control, warning, and administrative nets.

The Radio Set AN/GRC-107 is the same basic radio set as the AN/GRC-106 except for power supplies, power amplifiers, and other ancillary equipment which makes it capable of operation over a 100 mile range.

The Radio Teletypewriter Set AN/GRC-108 utilizes the Radio Set AN/GRC-107. The radio teletypewriter set weighs approximately 1,500 pounds and is mounted in a 3/4-ton truck shelter. It is a tactical radio teletypewriter set for use with other high frequency, single sideband sets in the division, corps, and army communication systems and for use in equivalent field artillery communication systems.

Single sideband (SSB) radios will provide more economical use of the radio frequency spectrum. They will be smaller and lighter than the sets they replace, and will provide greater capabilities in both frequency coverage and transmission range. Modular construction will reduce maintenance requirements. They will provide greater reliability, reduce the number of major components in the high frequency family of radios, and will provide for component standardization throughout the high frequency family. The change from conventional AM to SSB is necessitated because the tactical concepts of a nuclear battlefield require greater range and reliability than is available from present tactical AM radio sets.

Pictures shown here are of the single sideband Communication Central AN/TSC-15 and Radio Set AN/MRC-83, which have been tested at the US Army Electronic Proving Ground and have basically similar features to the future Army series of single sideband radios.

Single sideband radios have been used with success by the Marine Corps, US Air Force, and in Navy shipboard communication systems. Tests substantiate the belief that the artillery will have the same success, and that single sideband radios will be the backbone of future longer range field artillery communication systems.

In the post-1967 years of the decade, the artillery communication system may include an entirely new concept of radio communication known as the Random Access System. This method of radio transmission is currently in the very early stages of development. Some experimental hardware

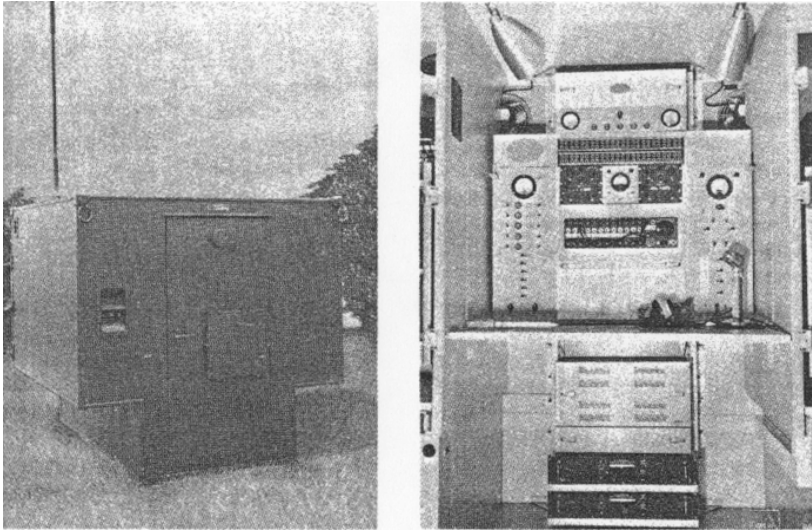


Figure 20. Single sideband Communication Central AN/TSC-15.

has been assembled and the results obtained from this equipment are encouraging. Random Access is a radio system which permits a number of simultaneous conversations over a single wide band channel. To achieve this capability, each transmitter sends short coded address pulses which are recognized and accepted only by the addressed receiver. If both the address pulses and the voice modulation pulses from different transmitters were transmitted simultaneously on one frequency they would interfere with each other. To reduce this interference, addressing is accomplished by redundant transmissions. The address pulses are transmitted on several carrier frequencies in the wide band channel or in different time divisions on the carrier frequency, or by a combination of these methods. A particular receiver is able to recognize only one time division and/or frequency division combination of radio frequency pulses and, therefore, accepts only those messages addressed to it. Each receiver will normally have only one address; however, the transmitters will have a variable code so that they can address many different receivers. In those cases where it is required, a number of receivers can be made to accept a second address which will permit the group addressed to operate as a conference call on a conventional wire system.

The bandwidth required by this system will vary from 1 megacycle to 10 or more megacycles, depending on the number of simultaneous transmissions that must be accommodated in the system. A great number of stations can operate in the system if it is assumed that the average station is transmitting only during a relatively short period of time (for example 10% of the time). This means that a system which can accommodate 20 simultaneous transmissions can have 40 stations engaged in

conversation at the same time; if all stations in the system talk only 10% of the time, the Random Access System could be composed of 400 stations in a given geographical area. The size of the area covered by the system is determined by the maximum transmission range of the type radio set used in the system.

The advantages of the Random Access System of radio communication are:

- It provides instantaneous communication; there is no need for net control stations or radio central operators.
- It provides single fixed channel operation; there is no need for individual frequency assignment.
- The system is simpler to operate than the present radio system using current radio sets.
- It is difficult to detect and jam.
- The address system is flexible.
- Messages can be retransmitted on the same frequency on which they were received in order to provide a time relay capability.
- Improved system overload characteristics. As additional stations begin transmitting in the system, there is no sudden break down.



Figure 21. Radio Set AN/TRC-83.

Instead, the background noise increases until some distant stations are unable to communicate full range.

These advantages of the Random Access Radio System are causing the field artillery to consider this system as a means of artillery communication for use in the post-1967 time frame.

The Signal Corps is developing a four wire communication system to replace the present two wire system. By using the four wire concept, it will be possible to use automatic switchboards throughout the system. The use of automatic switchboards will reduce the need for operators and the time required for a subscriber to contact other subscribers, thus allowing more traffic to be passed over the system.

The automatic electronic switching central AN/TTC-14 is currently being tested and will provide local switching service. This switchboard provides, in multiples of 20 lines, switching service for up to 60 subscribers.

A new telephone, TA-341, is being developed in conjunction with the four wire system and the automatic switchboards. It features push-button signaling, which will reduce the time required for dialing and has provisions for a handset-headset. It is powered by six "C" type flashlight batteries. The pushbutton telephones and the automatic switchboards will probably not be issued below division artillery level; however, the SB-1191, a manually operated, 4-wire electronic switchboard for use at battery level, is currently being tested. Present radio terminal equipment is designed for both two wire and four wire operation. The quality of the circuit is greatly improved when four wire operation is used.

Wire currently being tested for utilization with the four wire system consists of a pair of two conductor wires twisted together to form a single four conductor cable. Each conductor is composed of seven copper alloy strands. One pair has a tracer ridge as an aid in determining correct polarity. The new wire will weigh approximately 62 pounds per mile, compared with the current 48 pounds per mile for two conductor field wire.

SURVEY

The effectiveness of artillery is reliant upon the ability to place fire upon a target at a designated time in the amount required. With survey, the artillery is more capable of placing fire on the designated target and, coupled with target acquisition and metro, can expect to achieve first round fire-for-effect.

The purpose of artillery survey is to provide a distance, direction, and height relationship between weapons, target locating devices, and targets of a sufficient accuracy to insure first round hits. The establishment of this relationship is the establishment of the common grid. When all the various levels of unit surveys have been connected and completed, this relationship has been established between the weapons in the corps area and the targets. The common grid gives artillery units the capability to mass their fires, to deliver surprise fires, to deliver unobserved fires, and to transmit usable target data from unit to unit.

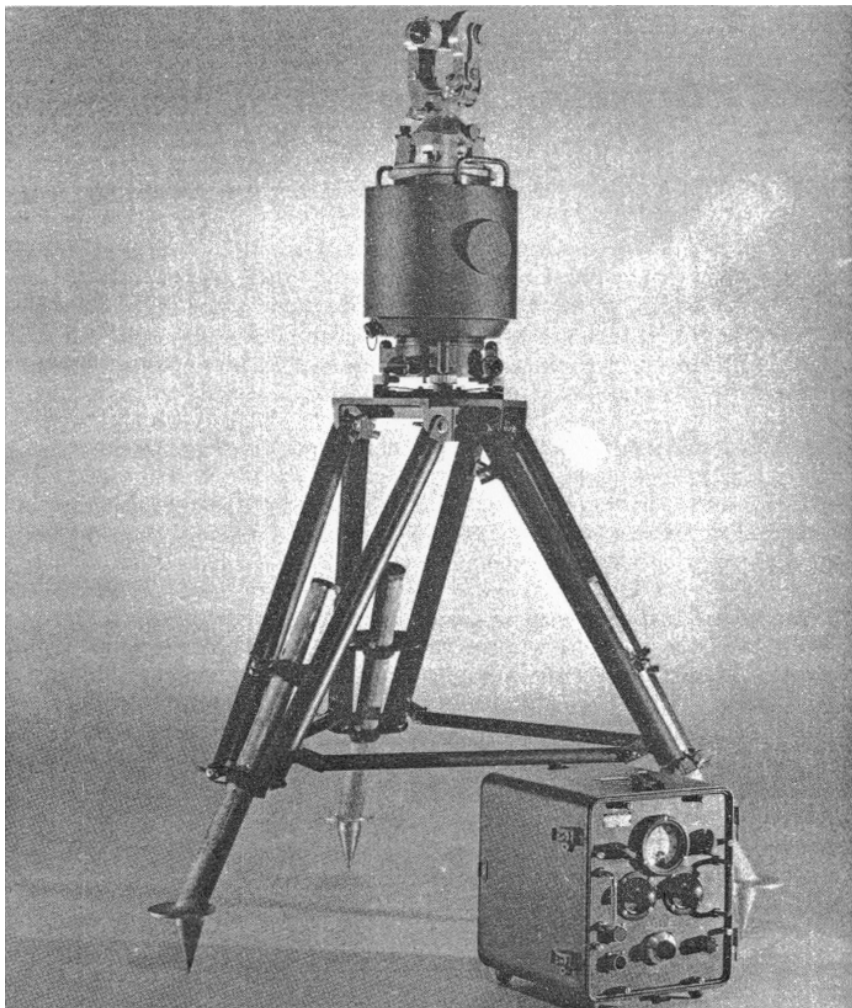


Figure 22. "Able" orientor.

To aid in the establishment and extension of common survey control, the artillery unit with the corps are now equipped with improved survey equipment. The tellurometer, an electronic distance measuring device, provides the capability of measuring distances from 150 meters to 64 kilometers accurately and rapidly. A North-seeking gyro device, the Able orientor, now being issued to troop units, will permit rapid determination of accurate direction, which is so important during the initiation of common survey control and is vital to the orientation of our long range missiles. Inertial survey equipment is being developed to provide the capability of determining locations of weapons positions and target



Figure 23. Altimeter.

locating devices. This vehicular-mounted system is equipped with a gyro platform, which will provide direction through an integrally mounted theodolite. The long range survey system now under development will provide a means to extend control over great distances through the use of oriented base positioning equipment, an airborne relay, and forward area equipment.

Through the use of this new equipment and techniques, artillery surveyors will be able to provide survey control points throughout an area

approximately 60 kilometers square in less than one hour. In addition, the capability to extend survey control deep into the area of interest of the field army will be realized.

METEOROLOGY

The wide dispersion of army forces on the modern battlefield and the sophistication of current weapons systems has increased the Army's requirements for information about current atmospheric conditions. This information can be separated into two general areas: Information concerning weather and climate, and artillery meteorological data. Information concerning weather and climate encompasses weather forecasts, weather summaries, and climatological reports required for military tactical and strategic operations. This information is furnished by the Air Weather Service, US Air Force. Artillery meteorological messages, sound ranging messages, wind information for fallout prediction, upper air data for the Air Weather Service detachments with the field army, pressure data for missiles, and low level wind data for rockets is the area of artillery meteorology. Current meteorology data is vital for the effective use of FADAC.

The measurement of atmospheric variables and the determination of variations from firing table standards are accomplished by artillery metro sections. Each section is composed of a warrant officer and from 14 to 17 enlisted men (depending upon the unit's mission), and is equipped with the Rawinsonde sounding system. These sections are mobile and are capable of 24-hour operation in all but the most severe weather. They are assigned on the basis of two in each corps artillery target acquisition battalion (FATAB) and one in each division artillery headquarters. Thus, in a typical corps there are six metro sections available. One metro section is normally assigned to each free rocket battalion in a missile command and recommendations have been made to include one in the artillery section of army headquarters.

In order to compute firing table data, ordnance ballisticians assume certain conditions as standard. The International Civil Aviation Organization (ICAO) atmosphere has been agreed upon as the standard structure for artillery meteorological messages by the NATO nations. This atmosphere is divided into three basic altitude structures to provide data for the FADAC computer messages, the NATO metro message, and fallout prediction messages.

When computers are used, fire direction center personnel insert unweighted, true value metro data into the computer and the computer then solves the metro problem as it computes the basic trajectory. The NATO metro message for artillery ballistics was standardized by agreement in November 1960 to become effective in July 1962. This is a coded message which contains information about current atmospheric conditions of wind, density, and temperature. Each set of data is placed on a separate line of the message and contains the ballistic values of wind, density, and temperature, which represent the layer of air extending from the earth's surface up to the altitude corresponding to that particular line. Firing

units use this message by extracting the particular set of variables which applies to the trajectory of their weapons. In order to provide special weather data for fallout prediction, artillery metro sections sound the atmosphere to a maximum altitude of 30 kilometers on a routine basis and provide a message of current wind data for successive 200-meter layers of the atmosphere.

The validity of the metro message is extremely important because meteorological factors vary in space and time. As a guide in determining space and time validity, a metro message may be considered valid out to a horizontal distance of approximately 30 kilometers from the preparing station and for a time period of approximately 2 hours.

In order for accurate survey data and target locations to be useful, artillery meteorological sections must provide range and direction corrections for non-standard weather conditions existing in the immediate general area of the weapons and in the atmosphere through which the projectile will pass. This data must be collected frequently for immediate and accurate fires. Current equipment must be improved to shorten the time required to measure weather conditions. A meteorological rocketsonde system now under development should assist in satisfying this requirement.

TARGET ACQUISITION

In order for the weapons system to deliver effective firepower, adequate and responsive target acquisition devices and agencies must be integrated into the overall system. These target acquisition means provide the timely detection, identification, and accurate three-dimensional location of targets in sufficient detail to permit effective attack by the weapons component. To accomplish this, the device must have the capability to provide target location at ranges to meet the commander's requirements to influence the battle. Also, these devices must have an accuracy capability commensurate with that of the supported weapons.

The target acquisition component of the weapons system will vary with the echelon of command. In the division, the forward observer remains as one of the prime target locating means, although he is still limited by having no means to determine range to a target accurately. Because of this, costly time and ammunition expenditures are necessary in adjustment, resulting in loss of surprise, with attendant reduction in firepower effectiveness. The forward observer urgently requires a very lightweight rangefinder that will permit him to determine range to targets accurately within his zone of observation. So equipped, he will be able to provide first round fire-for-effect target location data. The forward observers will be supplemented at direct support battalion level by counter mortar radars. At division artillery the ground surveillance radar and visual airborne target locator sections (VATLS) will assist the commander in accomplishing his mission. The VATLS is an aided visual airborne device which will permit three-dimensional target locations independently of maps. In addition, division artillery agencies are furnished with suspect target data by components of the division aviation battalion.

This data is provided by the target acquisition and surveillance platoon equipped with the surveillance drone system and medium observation aircraft of the Mohawk type. These means provide photographic, infrared, and side-looking airborne radar capabilities to indicate enemy activity patterns. Division artillery also requires a small, inexpensive drone system which is immediately responsive to the artillery commander.

At corps level, we must extend the depth to which targets can be located. In addition to improved sound and flash ranging and counterbattery radar for locating relatively close-in targets, the organic artillery target acquisition means must be augmented by organic manned observation and drone aircraft carrying target acquisition sensors and by high performance drone aircraft from other corps or army agencies for deeper range penetration. This longer range target acquisition is necessary to provide target locations throughout the depth of the corps area of influence.

Time is critical in the detection and attack of enemy cannon, rockets, and missiles. It must be expected that the enemy is capable of occupying positions, launching missiles, and displacing rapidly to other positions. The target acquisition components of the system must function continuously and effectively under all conditions of weather and visibility to provide immediate responsiveness to the commander. When this is accomplished, the commander can quickly attack enemy weapons locations with the most appropriate means at his disposal.

The artillery, as an important member of the combined arms team, materially contributes to the overall force intelligence effort by fully exploiting and continually improving its target acquisition capability.

ADMINISTRATIVE AND LOGISTICAL SUPPORT

The components of the weapons systems which "supports the supporting arm" is that of administrative and logistical support. In several areas of logistical support, the artillery is self-sufficient. One of the more important is the ability of the artillery to sustain itself in ammunition resupply using organic transportation to draw both conventional and special ammunition direct from the Ammunition Supply Point.

Some of the missile systems are self-sufficient through third echelon, such as: The Redstone battalion which has organic to it an Ordnance company and an Engineer company. The Ordnance company provides direct maintenance and supply support for ordnance materiel including vehicles and missile peculiar items. The Engineer company, in addition to providing liquid oxygen and liquid nitrogen as necessary to support the operations of the Redstone battalion also provides field maintenance and repair parts support for the mechanical engineer equipment of the battalion. Similar support will be provided the Pershing battalion by an organic Ordnance platoon, Engineer section and Signal section. It is anticipated that the new Sergeant missile battalion TO&E will include an Ordnance platoon.

Other combat and technical support is provided the field artillery by the various support elements of the field army. The new division reorganization

concept provides for a relatively fixed administrative support structure which is still flexible enough to support the field artillery in all four types of the new divisions.

Administrative support will be provided to combat and combat support units of the divisions by the *division support command* (DSC). It is a major subordinate unit at the same command level as the brigades and division artillery.

The division support command consists of a headquarters and headquarters company and band, an administration company, a medical battalion, a supply and transport battalion, a maintenance battalion, and in the airborne division, an air equipment support company. The organization is basically the same in all four type divisions, but will vary in size and capability depending on the type and mission of the parent division.

The division support command commander (DSCC) is a commander in every sense of the word. He is the logistical commander for the division and is responsible to the division commander for the logistical support of tactical operations. As a commander, he is responsible for area damage control and rear area security for that portion of the division rear area necessary for the efficient operations of administrative support units, including security of higher echelon administrative support units operating in the division rear area.

The DSCC may designate commanders of subordinate units to represent him in advising the division commander in technical areas. When acting in this role, the designated representative assumes the responsibility of a special staff officer. For example, the commanding officer of the supply and transport battalion would have special staff responsibility for transportation and supply of chemical, engineer, ordnance, quartermaster, signal, and transportation materiel.

In the infantry, mechanized, and armored divisions, the division ammunition officer (DAO) is on the support command staff. In the airborne division he is a member of the supply and transport battalion. His job is to control the class V supply within the division.

The administration company consists of those staff sections which normally remain with the division rear echelon. The company provides division level personnel and administrative service support to the division. It operates under the support command commander for unit administration, tactical training, and tactical operations.

The Adjutant General (AG) will normally be the OIC of the division rear echelon because of the magnitude of the AG function. The AG platoon is subdivided into the AG office, special services section, postal section, replacement section, administrative services section, and the personnel services section. The replacement section is organized to process and support 300 replacements at any one time. The administrative services section accomplishes nonpersonnel administrative service. The personnel services section provides personnel administration—maintenance of 201 files, pay records, and publication of orders to implement personnel actions for the *entire* division. All other units within the division have only a personnel NCO whose duty is liaison between the personnel services section and his parent unit.

The headquarters and support company furnishes medical support to all divisional units not operating with the brigades and to nondivisional units operating in the division rear area. It furnishes medical supply and second echelon medical equipment maintenance for the division. Each medical company is normally placed in support of a brigade. It can operate a single clearing station on a 24-hour basis, and has the capability of operating two clearing stations for a limited period, giving it the capability of displacing by echelons. An ambulance platoon of the medical company evacuates patients from the aid stations of the supported units.

In addition to his duties as battalion commander, the commanding officer of the supply and transport battalion is also the division supply officer.

The division supply office itself is headed by an assistant division supply officer. As assistants he has engineer, signal, ordnance, and quartermaster supply officers. These officers are responsible for activities incident to their respective supply fields.

The transportation motor transport company is organized with three light truck platoons, a medium truck platoon, and a maintenance section. The mission of the company is to provide transportation for distribution of all classes of supplies except class V. It must also transport the division reserve of supplies. The capability of the company varies with the type of division to which it is assigned.

The supply and service company consists of a company headquarters, three forward supply sections, a main supply platoon, a bath section, and a graves registration platoon when augmented. The mission of the company is to supply class I, class II, class III, and class IV supplies (except for repair parts, medical supplies, and aircraft parts and supplies) and maps.

Each forward supply section is normally placed in support of a brigade and operates forward distributing points in the brigade trains area. The main supply platoon has the personnel and equipment to receive, store, and issue supplies, except class V, at the division main supply points.

The supply and transport battalion of the *airborne division* is tailored to meet the requirements peculiar to airborne operations but it performs the same mission in essentially the same manner.

The maintenance battalion provides functionalized field maintenance, repair parts, maintenance float items, and salvage service for all division material except medical, cryptographic items, and electrical accounting equipment.

The supply platoon is responsible for all repair parts for the division, except as already noted. It serves as the source of supply for the forward support companies and provides organizational spare parts to units located in the support command area.

The service and evacuation platoon provides such services as welding, metal working, canvas, and leather repair for units in the support command area and serves as back-up support for the forward support companies. It provides recovery and evacuation for all units of the division.

The mechanical maintenance platoon provides third echelon maintenance for engineer and ordnance (less armament) equipment to units in the division support area and supplements the capabilities of the forward support companies. It provides third echelon maintenance for all quartermaster items within the division.

The armament platoon provides third echelon maintenance for towed and self-propelled artillery, tank main armament, small arms, antitank missiles, instruments, and chemical corps equipment. It also supplements the capabilities of the forward support companies.

The aircraft maintenance company provides third echelon aircraft maintenance to include the airframes and engines of drones. It requisitions, receives, and stores transportation air items to meet the requirements of the units supported.

The air equipment support company is organic to the support command of the airborne division. The mission of the company is to supply air-delivery equipment and related items to support airborne operations. The packing platoon inspects and packs personnel and cargo chutes. The aerial delivery platoon performs heavy cargo rigging and preparation of aerial delivery containers.

If an administration support operations center (ADSOC) is established, it is a staff facility of the support command post. Its purpose is to act upon other than routine requirements. Its composition is determined by the support commander.

The ADSOC control section is provided by the support command headquarters, and supervises and coordinates ADSOC elements. The ADSOC OIC is designated by the support command commander. He should be given maximum authority possible to act in matters referred to ADSOC. When time permits, problems that are not within the delegated authority of the OIC are referred to the support command commander for resolution.

The division ammunition office may operate in ADSOC if the location is suitable. It should be located far enough to the rear so that units do not have to go forward to contact it and then backtrack to the ammunition supply point (ASP). A good location for the DAO is at or near the ASP.

The foregoing discussion shows that the field artillery is self-reliant in the function of ammunition resupply and has organic technical support immediately responsive to certain of its missile systems. Furthermore, the division support command promises to offer the rest of the weapons system more than adequate administrative and logistical support in the decade ahead with its matching system of tailoring to fit the situation.

AUTOMATIC DATA PROCESSING

A new member of the weapons system, and possibly the fastest-growing, is ADP—automatic data processing. Through ADP, the artillery will eliminate the encumbrances of time consuming, error prone human computation. This is already true at FDC and firing battery level, where the FO's data can be computed and fed to the guns to result in first round fire-for-effect. But the ADP story does not end with the swift and

accurate delivery of fire upon enemy targets. After firing, for instance, the processing equipment at the fire direction center electronically *communicates* its newly acquired target information to higher echelons, where a storehouse of target intelligence is constantly processed, incremented, and updated on the basis of target information received from other elements within the system. Major contributors to this intelligence process are the *target acquisition* agencies, employing advanced and conventional techniques which speed their target information through computer language to the central intelligence processing point via interconnecting wire and radio networks. And the roads to the intelligence echelons are not one way, either. The continuously updated core of intelligence serves as an invaluable source of information for subsequent fire control. Thus, the intelligence process will later be called upon to furnish compiled and refined target data to the firing unit fire direction centers. Portions of this timely intelligence will be disseminated for use in the parallel but distinct functions of nonnuclear fire planning and fire support coordination. Further, the system as a whole provides for such a comprehensive collection and exchange of information, in readily usable computer form, that even the more involved and critical functions of nuclear fire planning and nuclear target analysis can be automated. As a result, the commander has at his disposal a current description of the fast-changing battlefield situation.

ADP, then, promises to be not only a highly efficient but also highly integrated and intercontributing fire support complex. Manual computation and voice communication are reduced to a minimum, and the command decision, always prime and still "human," is implemented by processing equipment possessing a high order of speed and accuracy.

Artillerymen have long dreamed of placing immediate surprise fire on the enemy without adjustments or registrations. This dream will soon be realized through the use of the field artillery digital automatic computer (FADAC). FADAC is a lightweight, versatile fire direction tool which can give precise firing data. FADAC is a compact digital computer weighting 211 lb. It is designed to operate under field conditions from temperatures of 125 degrees Fahrenheit (F.) to as low as —40 degrees F. The circuitry of the computer is on a series of circuit boards which are interchangeable and easily replaced if a component becomes defective. The computer automatically checks for the loss of information within itself through a system of parity checking. In addition, it will check its program or set of instructions during lulls in firing to insure against intermittent errors. Trouble lights on the operator's panel indicate errors as they are detected.

Operation of the computer is quite simple. Terms familiar to the field artilleryman are used, thus reducing operator training time. Numerical data is entered through a keyboard, and neon tube displays show the operator what he has entered, the results of computations, and error indications. If the operator makes an error in entering data it is a simple matter for him to make necessary corrections and cause the computer to recompute the mission. Artillerymen familiar with the manual method of solution can learn to operate the FADAC in a few minutes.

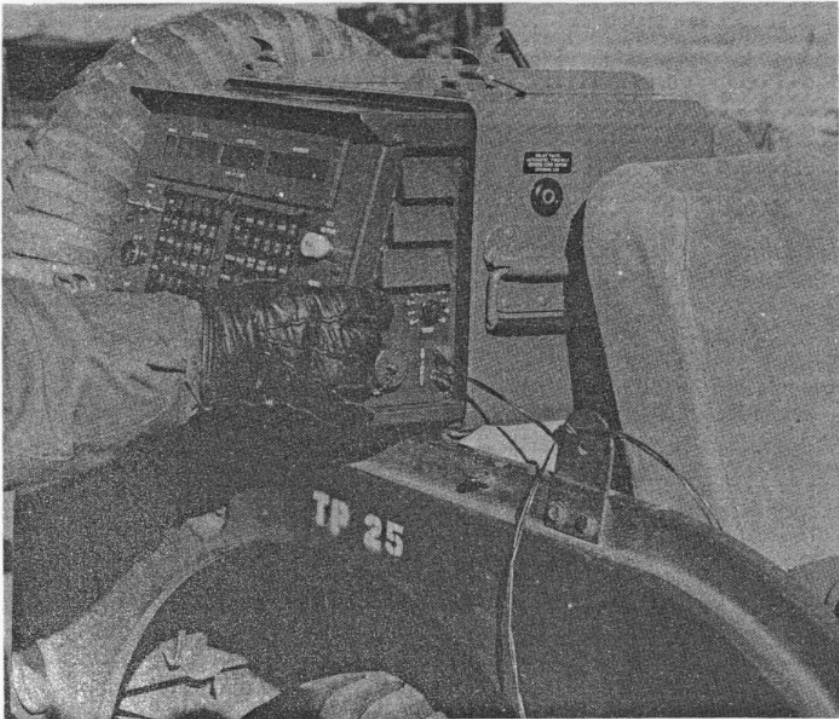


Figure 24. FADAC.

FADAC's greatest advantage—speed—is best shown when applied to the complicated missile/rocket gunnery problem. The problem is solved at electronic speed with precise and timely answers. Greater accuracy, too, is obtained by using a more detailed solution of the gunnery problem. FADAC applies corrections for *all* conditions operating on the projectile approximately *each second* during flight, and ceases only when it has computed a trajectory to within 10 meters of the target. But remember, this entire procedure is accomplished in a *matter of seconds*. The final solution includes latest powder temperatures, exact weights of projectiles, muzzle velocities, and earth rotation among other factors. The accuracy of firing data provided (deflection, time, quadrant, charge) is limited only by the accuracy of the data input.

FADAC will be the hub of an automated fire control system known as the FADAC *system*. This system has already undergone user tests and will be ready for issue in the near future. The system consists of the FADAC computer, the gunnery officer's console (GOC), the electrical tactical map (ETM), and the battery display unit (BDU) (see ARTILLERY TRENDS, Sep 60, Feb 62). Use of this system greatly decreases the time necessary to process a mission.

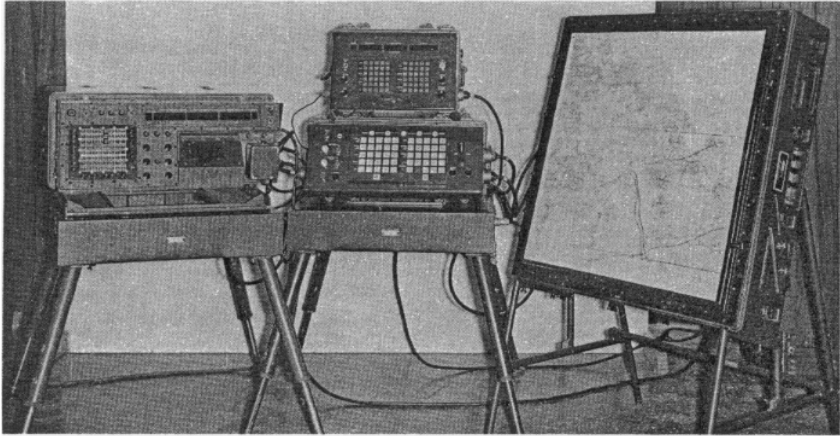


Figure 25. The complete FADAC system.

FADAC, by a more accurate solution of the gunnery problem and as the center of an automated fire control system, will allow us to fire on the target more rapidly and accurately than ever before.

Target acquisition means several things to the artilleryman—adequate target identification, accurate target location, and rapid reporting of this information to a fire direction center. But because of the stringent location requirements, target acquisition is often considered as merely the extension of survey control to a target. Several interesting pieces of equipment are currently under development which will erase this notion of the target acquisition limitations:

- Counterbattery radar AN/MPQ-32
- Visual airborne target location system AN/UVS-1
- Very lightweight rangefinder
- Long range survey system

These developments are representative of the recognition of the importance of more accurate and longer range capabilities in target acquisition. The majority of this equipment is automated to a high degree. Single-purpose computers are incorporated to produce target locations rapidly and accurately with more reliability. Additionally, use of message entry devices and other devices of the artillery fire support ADP system will permit direct access into computers located at fire direction centers for processing and immediate response.

Experience gained by industry in the accurate, three-dimensional location of space satellites is being utilized in the development of the long range survey system. The base equipment and computer will be housed in a small shelter mounted on a 3/4-ton weapons carrier. A small beacon normally carried on board the missile will be placed over any point, the coordinates of which are desired. In missile tracking, no line of sight problem exists for many miles, but in a field army environment

with the base on the ground and the beacon on the ground, it becomes necessary to introduce a relay. This unattended relay will be airborne in a manned aircraft when the system is operational. Those who recall the heavy equipment and large antenna masts of the hyperbolic systems need not be alarmed, and no long computational forms are required. Within seconds after the aircraft has made its run, the computer will begin printing out the locations of the points in UTM coordinates. Service tests of the long range survey system are scheduled for the fall of 1962.

The artillery target intelligence program is a computer program which will be found on the computers located in the artillery fire direction centers of groups, divisions, and corps. The objective of this program is to generate targets worthy of artillery fire—targets for immediate fire as well as lists of suspect and confirmed targets to be used in fire planning. As can be imagined, the program will be integrated with the tactical fire direction program, the nonnuclear fire planning program, and the ammunition accounting program. Furthermore, direct data links to target acquisition agencies and firing units throughout the zone of responsibility will be essential in realizing the potential of this program.

The program will receive, store, and analyze target information. Some of the analysis will be done entirely by the computer. In other cases the computer will make the operator aware of a situation which needs human evaluation and analysis. The flexibility of the program will insure its usefulness in all situations.

Artillery nonnuclear fire planning is the process of planning the fires of a number of firing batteries on a far greater number of targets within a given period of time. The purpose of this plan is to place fire on all known and suspect enemy targets in support of an operation.

The number of variables to be considered is great. For each firing unit, its location, mission, type, and the amount of ammunition on hand, as well as its capabilities, must be known. For each target, the location, complete description, and time of activity must be known, and finally, for each situation, the tactical significance of each target must be made known to the computer. The automated fire planning program will consider each piece of information and produce a schedule of fires of the desired duration.

Depending on the number of targets to be processed, three or four officers usually spend six to eight hours producing a fire plan. There is no guarantee that this manually produced plan will include the latest changes in the friendly or enemy situation. The automated process will produce a fire plan including all the latest changes in a maximum of 15 minutes. If the commander is not satisfied with the plan he may produce a new and different plan by altering a few of the criteria. Thus the commander is not bound to the computer and its program. He will use the program as an aid, and its product will reflect his tactical experience. Thus, for example, when a ground-gaining force commander orders the firing of a preparation, he will be assured of a schedule which reflects up-to-the-minute field conditions.

The nuclear target analysis program will be run on the computer found in the fire support element (FSE) of the TOC at division, corps, and army. The program will be capable of analyzing a single target or multiple targets for determination of a suitable yield and delivery system consistent with the allocation of nuclear weapons. The program will also make a recommended allocation of nuclear weapons after analyzing potential targets for a future phase of operations.

The program will recommend a yield, height of burst, delivery means, and coordinates of the desired ground zero of each target. In arriving at the recommendations, the program will consider the commander's criteria for damage, troop safety, and any limiting requirements for preclusion of damage. The program will have complete flexibility in that rated yields, system delivery errors, and effects parameters can be easily changed by the computer operator.

The nuclear fire planning program will also run on the computer found in the FSE of the TOC at division, corps, and army. For inputs, this program can use the recommendations made by the nuclear target analysis program, changes to those recommendations made by the FSC, G3, or CG, or new selections made by manual analysis. It will compute a schedule of fires after considering the separation distances and waiting times in order to preclude preinitiation of any other nuclear weapon. In addition, it will compute a radius of integration and a complete description of weapon effects and troop warning distances for each target. This information will be sent to the nonnuclear fire planning program at division artillery or corps artillery FDC for integration into the complete artillery fire plan.

This function will be performed on the computer at the FSEs of division, corps, and army. It will be integrated with the displays in the AN/MSQ-19, "ARTOC," at army level. The program consists of a number of subroutines which are grouped together with the objective of assisting the commander in the coordination of all available artillery fires in support of the plan of maneuver.

The preliminary analysis of each target will determine the best means of attack, i.e., nuclear, chemical, biological, or special munitions. It will then perform a rapid detailed analysis of the type munition to determine the most suitable fire support unit to fire the mission and the quantity and type of fire.

The program will be capable of making a rapid artillery capabilities analysis and displaying this information on an electrical tactical map. It will also be able to analyze the vulnerability of artillery units to assumed enemy weapons. Both of these subroutines will assist the coordinator in selecting position areas for optimum location of weapons.

The field artillery fire support system will require on-line data communication between computers at various echelons and between computers and certain ancillary equipment. These data transmissions will be sent over standard communication equipment employed by the field artillery at the time the ADP system is implemented, and will utilize the artillery communication systems, both wire and radio, then in existence.

The requirement for existing communication nets to be used to transmit data will necessitate the design and procurement of auxiliary devices to allow the transmission of voice and data on the same communication net without loss of overall operational control. These devices will enable the computer output equipment to determine whether the communication channel is in use for either voice or data transmission before outputting data. The system will also provide for warning to the voice operator when the channel is in use for data transmission.

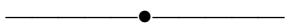
The transmission of data will be entirely automatic after the operator has decided where the data should be sent. The transmission equipment will provide for addressing a data transmission to a single or multiple destination in the radio net or wire system. When the data is properly addressed it will be received only by the device or devices to which it is addressed.

The communication elements of the field artillery fire support system will be designed to operate within a communication system composed entirely of wire circuits, entirely of radio nets, or any combination of wire and radio. This capability will enable the system to function in a moving or static situation and to operate during the various phases of the installation of the communication system.

This system is designed to handle both classified and unclassified information; therefore, on-line security means will be included to provide cryptographic security for data transmissions. The system will also provide a means to prevent the transmission of classified data to unauthorized stations within the communication system and to prevent the retrieval of data stored in the system by unauthorized stations.

* * * * *

That is tomorrow's weapons system—or rather, the skeleton of it. The muscles to tie it all together into one complete system will develop as the days pass. The mere "parts" of the whole, as separately discussed here, will be fused into the same unity that has made the weapons system the artillery, and the artillery the most modern, the most potent, the most influential force on the battlefield.



YOU CAN BE A TANK DESIGNER

ARMOR MAGAZINE is currently conducting a "Design-a-Tank" contest. It is actually soliciting drawings and/or ideas for the future design of main battle tanks.

Artillerymen who are assigned to armored units, or have been assigned to them in the past, may very well have some practicable suggestions to make. Entries must be received by ARMOR no later than midnight 31 August 1962, and must be submitted on an official entry blank. Entry blanks can be obtained from:

Secretary
United States Armor Association
1757 K Street, N. W.
Washington 6, D. C.





Mr. H. A. Howell
Artillery Transport Department

There is to be a new look in the Army's equipment record system—a new look called Operation TAPER, short for The Army's Plan for Equipment Records Revision. A recent study made by a government agency outside the Army pointed out certain areas of record keeping in which the Army system required improvement. Department of the Army recognized the validity of the study and directed that the current equipment records system be revised.

The United States Army Maintenance Board was assigned the task of accomplishing and coordinating the revision. Their guidelines were clearcut. The revision was to provide a simple, effective, standard procedure which would produce essential maintenance management intelligence and provide necessary controls for each successive level of command and supporting echelon, starting with the equipment operator and his unit.

TAPER TEST PACKAGE

An Operation TAPER "test package," phase I, involving tank automotive equipment only, was prepared for three continental United States (CONUS) installations and one overseas organization. Testing began 1 July 1961 and terminated 31 December 1961.

Early in January 1962, a conference was convened to evaluate reports from the four testing agencies. The conference was also responsible for formulating plans for the implementation of the program and for training commanders, supervisors, and other affected personnel in the preparation and use of the revised equipment records.

Department of the Army directives specify that implementation of TAPER will begin in the CONUS on 1 July 1962 for all categories of equipment and that worldwide phase-in of the new system will be completed by 31 December 1962. It should be noted that the revised equipment record system will be used in managing the maintenance of all equipment, not merely tank automotive equipment as was the case in the test package. Standardization in the preparation and use of equipment maintenance records in all categories of maintenance and throughout the Army is the goal of TAPER.

INSTRUCTION IN TAPER

To insure standardization, a group of instructors at Fort Knox, Kentucky, will prepare necessary instructional material. The group is made up of representatives from all the combat arms and technical services to insure that the instructional material developed is compatible with the requirements of all users from organizational through depot levels.

Upon completion of the preparation of instructional material, the instructional group will be broken down into teams which will conduct instructor courses for major CONUS and overseas command representatives. Instruction will be presented in accordance with schedules which have now been developed by the United States Army Maintenance Board. The schedule includes locations of instructor training courses and allocation of student quotas. Personnel receiving instructor training will return to their commands to organize local training programs.

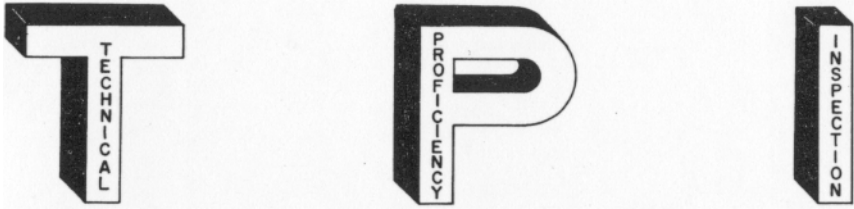
TAPER has many advantages over past equipment record systems. Its main feature is standardization in records maintenance for all categories of equipment. It will also produce timely data of the cost of operation and maintenance of Army equipment. Furthermore, TAPER will make it possible to assess the reliability and combat readiness of materiel by the feedback of pertinent maintenance information, the status of equipment modifications, and the accurate reporting of deadlined equipment. Mandatory equipment improvement requirements are another feature of TAPER. Recommendations for the improvement of equipment are an integral part of the new record system. These recommendations will also be the basis for developing new designs and new equipment, as well as adding certain modifications to existing items. Certain of the historical record entries of the Revised Equipment Records System are designed to provide for prompt analysis of the cause of product failures, mortality rates of components, and repair parts supply support requirements at the national and intermediate command levels.

TAPER will certainly be a giant step in providing the commander and supervisor with better maintenance management tools. These tools will ultimately result in the reduction of personnel, time, and materiel required to operate the Army in all its complexity and at the same time will result in a better equipment product with which to accomplish the Army's assigned mission.

When specific details on Operation TAPER become available, ARTILLERY TRENDS will publish them in full.

CORRECTION

There is an error in figure 37, page 52, of the February 1962 issue of ARTILLERY TRENDS. The radio net diagram shows one vehicle with one radio each for the commanding officer and executive officer, when in actuality each officer has one vehicle with *two* VRC-9 radios.



Captain Donald W. Moore
TPI Division, FA Missile Systems Evaluation Group

What is a TPI? Artillerymen of 8-inch, missile, and rocket units are best qualified to answer this question. TPI means technical proficiency inspection, an inspection conducted to evaluate the capability of artillery nuclear weapons units. It is not unlikely that a 105-mm or 155-mm artilleryman may suddenly find himself in a nuclear weapons unit. Therefore, in an effort to orient him and to further the professional knowledge of many other people who otherwise would not be aware of this subject, a general description of the TPI is given in this article.

A TPI is a deliberate test and is conducted annually by a team from the Department of the Army, Defense Atomic Support Agency, or USCONARC. In addition, each major army headquarters conducts at least one TPI per unit during each fiscal year. The number of TPI's the unit receives in preparation for the final yearly TPI is usually from 6 to 10, varying with the type of unit and the army headquarters to which it is assigned. The time, effort, and money invested in preparation and the magnitude of the missions of the units make their performance a matter of most serious concern to commanders at all echelons. The test includes emergency situations which a unit may hope will never be encountered in a tactical situation. To be sure of the unit's competence, each step in each procedure must be observed closely. Although this close observation tends to prolong the operation, it is essential to the proper evaluation of a unit's competence. Commanders must have positive assurance that special weapons units can perform all the necessary routine and emergency operations required by their specific systems in a safe, timely, and correct manner.

GENERAL REQUIREMENTS

The basic document for the TPI is TBIG-5, a publication from the Department of the Army Inspector General. This document establishes the general objectives of a TPI—to insure achievement of high standards in the performance of technical operations utilizing nuclear weapons and to keep the appropriate authorities informed of the technical proficiency of Army nuclear weapons units—whether the unit has storage, support, or delivery capability. It is stated in this document that an unsatisfactory rating will be given if one or more technical deficiencies are present which might result in an unreliable nuclear weapon, if a number of technical deficiencies indicate unfamiliarity with or a disregard for prescribed

procedures, if shortages of personnel and equipment prevent satisfactory accomplishment of technical operations, or if the unit fails to provide a safe and secure environment for nuclear weapons.

GENERAL SEQUENCE OF EVENTS

The inspected unit will receive notification of a scheduled TPI through command channels. The inspection will be preceded by two briefings—one by the inspection team chief for the unit, the other by the unit commander for the inspection team members. The actual inspection consists of the administrative phase and the technical phase. The *administrative* phase includes the check of unit SOP's, publications, records, and general performance of staff actions related to nuclear weapons operations. The *technical* phase evaluates the unit's ability to perform the following:

- Receipt, handling, transportation, and storage; storage inspection and monitoring; unpackaging and repackaging procedures; and issue of nuclear weapons.
- Assembly, test, and shop procedures; maintenance of nuclear weapons; emplacement procedures; prefire procedures; and procedures for delayed or canceled fire missions.
- Emergency disarmament and destruction procedures, accident/incident control and reporting, troubleshooting procedures, preparation and maintenance of nuclear weapons records and reports, and safety and security procedures.

An inspection of all tools and test and handling equipment is the next phase of the TPI. These items are checked for adequacy, maintenance, and marking and load test or calibration date, where applicable. Specific areas of inspection are records and reports, maintenance of equipment, proficiency of personnel, and the environmental conditions under which these weapons are secured and stored.

The administrative phase of the TPI is conducted either separately or concurrently with the technical phases. Administrative items are factors affecting technical operations and may include—

- Inquiry into activities, such as the statement of the mission and the guidance given the unit from higher headquarters.
- Adequacy and qualification of personnel and adequacy of standing operating procedures, training, supply, facilities, and area.
- Emergency destruction and evacuation plans, security, and safety.

The inspection is followed by a critique at which time the unit is informed of the rating received and is given a copy of the notes to be used in preparation of the inspection report.

The formal report is usually forwarded directly to the inspected unit and requires a reply through channels. Two definitions pertinent to the formal report are as follows:

1. A *deficiency*—An observed discrepancy which violates established procedures contained in pertinent field or technical manuals or other publications.

2. A *comment*—An observation which may be a fact for which a reference cannot be found in an appropriate publication or which may be a matter of interpretation. The actual mistakes, errors, and shortcomings reported as deficiencies or comments on the inspection report do not necessarily include the full extent of the unit's malpractices. Inspectors may not detect all errors. In some cases, the extra care exercised by a unit during an inspection may prevent the occurrence of malpractices that occurred previously or that will be noted in future inspections. For this reason, it is generally unwise for a unit to depend too much on lists of deficiencies reported on previous TPI's of that unit or similar units.

FACTORS CAUSING DEFICIENCIES

Practically every deficiency noted on the TPI can be traced to the unit's lack of attention to one or more of these four factors:

- *Attitude*—Every man in an artillery nuclear weapons unit must be imbued with a determination to pass the TPI and demonstrate a superior order of professional competence. There must be a sense of urgency. The TPI and all of its provisions are based on authentic directives. Inspectors cannot negotiate, arbitrate, or debate the applicability of the directives. Any tendency of personnel to be argumentative may result in comments referring to lack of familiarity or disregard for prescribed procedures.
- *Management*—Proper management of time, personnel, material assets, and the exploitation of every available resource is essential in preparing for this mission. A unit may show by its records and by aggressive command or staff action some justification for an unsatisfactory condition. A few specific management points that can improve unit performance in nuclear weapons operations or on a TPI include—
 - All staff sections' work in the implementation of administrative requirements. This is an administrative job and should not be imposed on nuclear weapons teams.
 - Assignment of the best of the unit's common assets (vehicles, radios, crew-served weapons, fire extinguishers, etc.) to the sections performing the nuclear weapons operations.
 - Layout of the documents, lesson plans, property books, and other items that will be covered during the administrative phase in one convenient location.
 - Preparation of the TPI brochure far enough in advance to afford the next higher commander an opportunity to approve it or comment on it.
- *Team drill*—Team drill is essential for personnel performing nuclear weapons operations. There is no substitute for rigorously supervised deliberate practice. The supervisor must be in control and must aggressively direct operations and make corrections. Each member must know his particular job thoroughly

and have skill and precision in manipulative operations. Training and coordination among team members are necessary. Most of the TPI deficiencies noted in the technical procedures area are the result of a lack of either adequate effective team drill or proper supervision. However, the supervisor and team members must be able to recognize situations that are beyond the limit of their responsibility.

AR 15-12	U. S. Army Nuclear Weapon Coordination Group
AR 350-216	Training in the Geneva Conventions of 12 August 1949
AR 370-5	Qualifications and Familiarization
AR 385-63	Safety: Regulations for Firing Ammunition for Training, Target Practice, and Combat
AR 600-10	Military Discipline
AR 600-20	Command
DA PAM 750-1	Preventive Maintenance Guide for Commanders
FM 6-20-1	Field Artillery Tactics
FM 6-20-2	Field Artillery Techniques
FM 11-16	Signal Orders, Records and Reports
FM 21-5	Military Training
FM 21-6	Techniques of Military Instruction
FM 22-100	Military Leadership
FM 25-10	Motor Transportation, Operations
FM 101-5	Staff Officers' Field Manual
FM 101-10	Staff Officers' Field Manual, Parts I, II, and III
TM 9-2810	Preventive Maintenance, Supply, Inspection, and Training Procedures: Tactical Motor Vehicle
TBIG-1	Inspector General Guidance Material
TBIG-5	Inspector General Technical Proficiency Inspection

Figure 26. TPI reference publication list (general).

- *Equipment and personnel*—The required equipment and personnel must be present; the established TOE authorizations for nuclear weapons units provide little leeway for underequipped or understrength units. Essential personnel must be either qualified or highly trained. The absence of such personnel or items of equipment may cause the unit to fail the TPI.

PREPARATION FOR TPI

Preparation for this inspection is inherent in the normal training and operations of a nuclear weapons unit. The commander's estimate of the training situation, his evaluation of the unit's nontraining commitments, and the time available for training will serve as a basis for organizing and managing the efforts of the unit. To assist in the implementation of this program, a list of some of the most pertinent unclassified general references related to nuclear weapons operation is shown in figure 26. Publications considered essential to the operation and training of special

weapons units, and which the unit must have in its possession, are shown in figure 27.

Some of these publications are necessary for reference only; others should be read periodically by special weapons personnel. The designation of publications to be included in a periodic reading program is, of course, a command function. A suggested reading list is indicated by an asterisk (*) in figure 27.

TM 39-0-1 (SRD)	*AR 385-63 (U) Sec V
TM 39-5-7 (U)	AR 700-65 (U)
TM 39-5-8 (CRD)	AR 735-35 (U)
¹ *TM 39-20-1 (SRD;U)	*AR 746-2300-1 (U) Par 34
² *TM 39-20-3 (SRD)	OC DOC 71 (SRD)
*TM 39-20-12 (SRD;U)	TBIG-1 (U)
TM 39-35-51 (U;U)	*TBIG-5 (U)
³ TM 39-40-3 (U;U)	TA 23-103-1 (CRD)
TM 39-40-54 (U;U)	*FM 5-25 (U)
*TM 9-1903 (U)	FM 9-5 (U)
CHG 2, Sec V, CHG 3	*TB 385-2 (U)
*TM 9-1946	*Unit SOP
*AR 55-203; (C), Sec II, III & IV	*Peacetime Safety Rules
*AR 190-60 (C)	TM 39-4-1 (SRD)
AR 380-5 (U)	*AR 380-150 (U)

**Suggested list of publications for Periodic Reading Program*

Figure 27. TPI reference list (essential).

- 1—Except Honest John, Little John, and Redstone
- 2—Except Honest John, Little John, Lacrosse, and Redstone
- 3—Except 8-inch Howitzer

The special weapons publication index TM 39-0-1 (SRD) (fig 27) is published monthly and includes changes, additions, and deletions to the 39 series. Units revise their publications by this directive. Other publications are indexed in the DA Pamphlet 310 series.

Documents not on hand must be on a valid requisition. Another important area related to publications is the implementation of changes to nuclear weapons manuals. After a unit has established an account with the US Army AG Publications Center in St. Louis, Missouri, all of the changes and revised nuclear weapons publications that pertain to the system will be sent to the unit.

A STANDING OPERATING PROCEDURE (SOP)

The administrative phase of a TPI includes the inspection of the unit's SOP. The SOP as a document serves as the framework for all actions in relation to nuclear weapons. The SOP is a document that will indicate to the inspector how your unit operates, who does what, and what actions your personnel can be expected to take in any normal or

(CLASSIFICATION)

Copy No _____
Unit _____
Location _____
Date/Time _____

ANNEX (Nuclear Weapons) to Tactical SOP

1. PURPOSE: This SOP prescribes the procedures to be followed by personnel of this unit in storing, testing, handling, transporting, assembling, and firing of nuclear weapons.

2. GENERAL:

a. All Special Weapons, Command and Staff personnel of this unit will read this SOP. Further familiarization will be provided through classroom presentation and practical exercise.

b. In the event of conflict between this SOP and the orders or directives of higher headquarters, the orders and/or directives of higher headquarters will prevail.

c. Supervisors will insure that all personnel involved understand the provisions of this annex where applicable, prior to commencing any operation involving nuclear weapons.

d. A copy of this annex will be available throughout all operations.

3. DEFINITIONS:

a. Warhead section also applies to projectile.

b. Load carrying vehicle is the vehicle transporting round.

4. Separate distribution authorized for appendixes.

Acknowledge

BLACK

Lt Col

- Appendixes:
- 1—Special Weapons Publications
 - 2—Security
 - 3—Resupply, maintenance, and storage procedures
 - 4—Emergency Disposal
 - 5—Nuclear accident/incident control procedures (NAICP)
 - 6—Emergency Disarm Procedures
 - 7—Safety
 - 8—Operational Check Sheets (SRD)

DISTRIBUTION:

OFFICIAL:

/s/ White

Adjutant

(CLASSIFICATION)

Figure 28. A sample nuclear weapons unit SOP.

special situation. It is a directive by the unit commander and should be recognized as such. Personnel must understand and strictly adhere to the unit SOP. A *sample* guide for a nuclear weapons unit SOP is shown

in figure 28. It is not intended as a unit tactical SOP. It will serve only as a nuclear weapons *annex* to a tactical SOP.

As mentioned previously, the contents of the SOP are noted during the administrative phase of the TPI. The application and implementation are noted during the technical phase. To be valid, the document must be authenticated by or for the commander. Violations of provisions of the SOP during the technical operation will appear as deficiencies or comments on the inspection report.

The unit nuclear weapons SOP is emphasized to assure that the unit has a satisfactory and standardized procedure for accomplishing its nuclear weapons operation.

The following considerations should be included in the nuclear weapons SOP as a *minimum*: safety, to include electrical, nuclear, tritium, explosive, mechanical, and transportation; security; transportation; emergency disposal and destruction of nuclear weapons; nuclear accident/incident control; emergency disarmament procedures; action and reporting in case of emergencies; Department of Defense safety rules; resupply of ammunition; and firefighting.

PERSONNEL RECORDS AND CONSIDERATIONS

There are only a few items of personnel records that are likely to be checked on a TPI. These include, but are not necessarily limited to, personnel strength—the unit should be up to the highest possible percentage of its authorized strength, each member of the unit should be POR qualified, and each member should be qualified in his individual weapon.

Personnel considerations include but are not limited to the following:

1. Personnel serving in duty MOS's that require school training in nuclear weapons should have received the appropriate training.
2. Personnel must have a valid security clearance high enough to cover the highest classification of the material or operations on which they work. Only one security clearance should be in force at any one time on any individual. Interim clearances should be withdrawn when final clearance is recorded. Clearances reported on personnel records (Forms 20 or 66) should correspond to the individual DA Form 873.
3. Aliens generally will not be assigned to nuclear weapons duties.
4. Personnel having physical or medical limitations or any other condition likely to interfere with the performance of the individual under stress should not be assigned to nuclear weapons duties. Some limitations include a history of or susceptibility to asthma, heart disease, emotional disturbance, color blindness, and vision difficulties. If such personnel are assigned, the commander should promptly initiate action to have appropriate medical evaluation completed to assure that the continued use of these personnel does not jeopardize the unit.
5. Personnel on whom 208 or 209 board action or court-martial proceedings are in process should not generally be assigned to nuclear weapons duties.

TRAINING RECORDS

A nuclear weapons unit must maintain sufficient records to indicate that the minimum recurring training in nuclear weapons subjects is programmed, organized, and aggressively carried out. Some of these records include—

1. A periodic training program with suitable nuclear weapons annex.
2. A complete file of training schedules and up-to-date lesson plans.
3. Careful accounting for attendance (by roster or otherwise) and posting of training records cards to show what specific training has been accomplished.
4. A nuclear weapons reading program.
5. Active supervision of publications, programs, directives, lesson plans, and reading lists to include prompt revision and periodic review. Dates of latest review or revision should be indicated.
6. Integration of training in nuclear weapons subjects into field exercises; i.e., exercises involving ammunition train, practicing emergency situations, and preparing nuclear weapons at night.

FORMS AND REPORTS

The following are the essential forms and reports used in connection with TPI's. The local situation may require additions.

1. DA Form 581—Ammunition transportation order.
2. DA Form 2028—Form used to recommend changes to publications. Unit maintains file.
3. DA Form 468—An unsatisfactory equipment report (UER). File copies are maintained in unit.
4. DD Form 110, DD Form 317, DD Form 518, DD Form 626, SF Form 46 and SF Form 91—Forms used with motor vehicle operation and inspection.
5. DA Form 873—Statement of security clearance.
6. FC-DASA Form 41—An equipment maintenance record (EMR).
7. DA Forms 12-6 and -17—Forms used to requisition publications.
8. Packing lists and weapons log book. These items are usually not encountered until the technical exercise is in progress, but they account for deficiencies so often that they justify mention here as an essential form.
9. DD Form 626—Inspection of vehicles carrying explosives.
10. DD Form 836—Special instruction to drivers of explosive transport vehicles.
11. A Training Record Card.

SUMMARY

The preceding is a general description of a TPI. There are, of course, many details of a classified nature that require training, knowledge, and practice. A classified special information letter to be published by the

USAAMS, appropriate for the various nuclear weapons systems, is under preparation at this time. Release of this document will be made in the summer of 1962.

A TPI is designed to evaluate the unit's potential nuclear weapons delivery capability. This is done by observation of routine and emergency procedures, by questioning personnel, and by examination of documents. TPIs recur periodically, and the locale tends to become stale. The same old motor pool, same routes, and same position areas are used so often that TPIs can lose much of their training advantage. A real test of a unit's capability such as would occur in a tactical situation would, of course, impose greater stress on every aspect of unit performance. Distances would be longer, routes would be unfamiliar, and the time allotted for completion of the operation would be less definite. All elements of the unit would be exercised more strenuously, and the training materials would be replaced by crisp, new war reserve items. A TPI must always be considered as a poor artificial substitute, always less rigorous and less exacting than a real tactical situation. Recognizing this, the commander's challenge is to seek ways and means to enhance the training value of the exercise. The intent of all directives, rules, and requirements related to TPIs is to assure the safest and most effective tactical delivery of special weapons. TPIs are not an end in themselves but are an indication of the artillery unit's ability to accomplish its nuclear weapons mission in a successful manner.

WHITE SANDS FIRINGS

Firing of the 15,000th missile from White Sands Missile Range, New Mexico, was one of the highlights of operations during 1961. By coincidence, 1,961 missiles were fired during the calendar year 1961. The missiles most frequently fired were Honest John, with 114 missions, and Little John, with 75 firings. Although these two missiles have long been past the research and development stage, testing at White Sands continues to insure production line quality and improvements of the individual systems. Four Redstone firings were conducted during the summer and fall by NATO troops from Europe, who in each case handled the weapon under conditions almost identical to those of a tactical situation. A fifth firing was conducted by Redstone troops from Fort Sill, Oklahoma.

STAFF ORGANIZATION AND PROCEDURES, SUBCOURSE 457

Artillery Subcourse 457, Staff Organization and Procedures, Part I, has been added to the Extension Course program of the US Army Artillery and Missile School (USAAMS). This subcourse has been written to replace portions of two US Army Ordnance School subcourses carried in the USAAMS Extension Course program. Artillery Subcourse 457 replaces parts of Artillery Subcourse 75, Command and Staff Procedures I, and parts of Artillery Subcourse 78, Command and Staff Procedures II.

RESIDENT COURSES

Many changes and additions have been scheduled among the 48 resident courses scheduled for fiscal year (FY) 63 at the US Army Artillery and Missile School (USAAMS). Complete details of these courses, including prerequisites, are listed in DA Pamphlet 20-21, "The Army School Catalog," and Changes 1 through 23. In keeping with ARTILLERY TRENDS' efforts to present the latest instructional information available, resident course changes and additions are listed below:

CHANGES

Artillery Officer Career Course (AOCC) (6-A-(22)).—This course will be reduced from 38 weeks to 32 weeks effective with class number 4-62 and continuing through FY 63. Twenty-four weeks of field artillery instruction will be presented at Fort Sill and eight weeks air defense instruction will be presented at Fort Bliss. It is contemplated that selected officers will attend certain specialist courses upon graduation (these officers will be selected by the Department of the Army). The Prefix Digit 5 will continue to be awarded to officers successfully completing that portion of the course.

Associate Field Artillery Officer Career Course (AFAOCC) (6-A-C23).—Unlike previous years, this course, effective FY 63, will *not* award the Prefix Digit 5. However, a 40-hour orientation on nuclear weapons will be presented. Officers desiring a Prefix 5 may participate in the Resident/Nonresident Nuclear Weapons Course (6-A-F20). Length of the AFAOCC will be 18 weeks.

NEW COURSES

- Pershing Officer Course (6-A-1190E) (8 weeks).
- Sergeant Officer—Non US—(6-A-F-1190X) (7 weeks).
- AN/TRC-80 Operations (6-R———.1) (9 weeks).
- AN/TRC-80 Transition (6-R-F———) (1 week, 1 day).
- Pershing Specialist (6-N-163.1) (17 weeks).
- Pershing Missile Battery (6-R-163.6) (8 weeks, 4 days).

COURSES DROPPED

- Artillery Officer Basic Course (AOBC) (6-A-C1C/44-A-C1C).

- Corporal Fire Control System Maintenance (CFCSMC)
(6-N-1186/215.1).
- Corporal Electronic Materiel Maintenance (CEMMC)
(6-N-1192A/214.1).
- Lacrosse Fire Control System Maintenance (LFCSMC)
(6-N-217.1).
- Corporal Mechanical Materiel Maintenance (CMMMC)
(6-R-164.3).

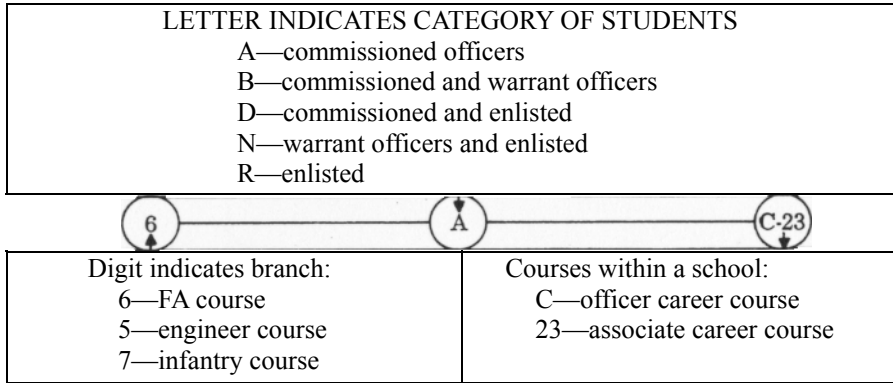


Figure 29. Explanation of the digits and letters comprising a typical course number. The example shown is the Associate Field Artillery Officer Career Course.

The USAAMS has recommended that an 11 week "Field Artillery Operations and Intelligence Assistant Course" (6-R-152.6) be established effective 1 July 1962. If this recommendation is approved, the School is prepared to conduct four classes a year, with a projected input of 30 per class. This course would cover artillery transport subjects; communications equipment systems, procedures, and security; the Lacrosse, Corporal, Redstone, Pershing, and Sergeant missile systems; observed fire procedures; fire direction; Honest John and Little John gunnery; cannon/rocket materiel; automatic computers; tactical subjects; artillery survey; target acquisition; and demonstrations, as appropriate. Recommended prerequisites for this course are: grade E-5 or above, demonstrated strong leadership potential, high school graduate or general education development (GED) equivalent, normal color perception, at least 13 months' service remaining after completion of the course, standard score of 100 or higher in Aptitude Area GT, and security clearance to include SECRET (interim).

SCHEDULE OF CLASSES

The United States Continental Army Command has published a schedule entitled "Detailed Schedule of Classes, Army Service Schools." This schedule of classes contains the course title, class number, reporting

dates, close dates, and the class capacity, and is distributed throughout the Army.

Career active duty artillery officers are selected to attend the officer career courses by the Artillery Section, Officers Assignment Division, DCSPERS, Department of the Army. Applications for admission to resident courses should not be sent to the School. Officers of the Active Army who desire to attend specialist (MOS) resident courses at the USAAMS may apply through channels. Army Reserve officers not on active duty may make application for attendance for any course (providing they meet all prerequisites) in accordance with the provisions of AR 140-220. Only active status members of the Army Reserve are eligible for selection. National Guard officers not on active duty should make application on National Guard Bureau Form 64 for admission to USAAMS resident courses to the Chief, Army National Guard Bureau, ATTN: Schools Division, Washington 25, D. C. Warrant officers and enlisted personnel of the National Guard and the Army Reserve, not on active duty, will submit application for attendance at Army service schools in the same manner as commissioned officers of their respective components who are not on active duty.

Listed below are the officer and enlisted resident courses scheduled to be taught at the USAAMS during FY 1963. All courses listed below which exceed 20 weeks are attended in a permanent change of station (PCS) status and those 20 weeks or less in length are attended in temporary duty (TDY) status. A brief summary of all courses, except the five (5) allied courses and the one (1) nuclear weapons employment refresher course, is given.

OFFICER CAREER COURSES

1. FA OFFICER ORIENTATION (FAOOC) (6-A-C20) (9 Weeks). To provide basic branch orientation and training in field artillery for newly commissioned artillery officers. Class capacity: 113; FY 63 classes: 20.

2. ARTILLERY OFFICER CAREER (AOCC) (6-A-C22) (32 Weeks). To train regular army and career reserve officers (with 3 to 8 years commissioned service) in Field Artillery and Air Defense Artillery command and staff duties and responsibilities of artillery officers. Course conducted jointly by US Army Artillery and Missile School and US Army Air Defense School. Officers are selected for attendance at DA. Prefix digit 5 awarded upon successful completion of nuclear weapons employment phase of course. Class capacity: 160; FY 63 courses: 4.

3. ASSOCIATE FA OFFICER CAREER (AFAOCC) (6-A-C23) (18 Weeks). To provide branch training in the duties and responsibilities of active duty and reserve component artillery officers. Active duty officers are selected for attendance at DA. Reserve officers not on active duty may make application for the course. Prefix digit 5 awarded upon successful completion of nuclear weapons employment phase of the course during mobilization only. Class capacity: 120; FY 63 classes: 4.

4. FA OFFICER FAMILIARIZATION (FAOFC) (6-A-C21) (6 Weeks, 5 Days). To provide familiarization with field artillery tactics and techniques for officers transferred from other branches to field artillery or assigned to field artillery duties without prior formal field artillery training. Class capacity: 75; FY 63 classes: 4.

5. FA FIELD GRADE OFFICER REFRESHER (Res Comp) (FAFGORC) (6-A-C11) (2 Weeks). To provide refresher training in tactics, techniques and materiel appropriate to field artillery field grade reserve component officers not on active duty. Class capacity: 60; FY 63 classes: 3.

OFFICER FUNCTIONAL COURSES

6. DIVISION ARTILLERY STAFF OFFICER REFRESHER (DASORC) (6-A-F5) (1 Week). To provide refresher training as a team (minimum of 6 officers) to National Guard and USAR division artillery or artillery group commanders and principal staff officers. Class capacity: 60; FY 63 classes: 3.

7. SENIOR FIELD ARTILLERY OFFICER (SFAOC) (6-A-F6) (2 Weeks). To provide refresher training for senior artillery officers on field artillery tactics, techniques, organization, and equipment in current employment and to provide orientation on trends proposed for the future. Class capacity: 50; FY 63 classes: 3.

OFFICER MOS COURSES

8. FA RADAR OFFICER (FAROC) (6-A-0140) (7 Weeks, 2 Days). To train captains and lieutenants of the active army and reserve components to supervise field artillery radar operation, maintenance, and employment, including target acquisition, fire direction, position fixing and vectoring of light army aircraft. Class capacity: 25; FY 63 classes: 2.

9. ARTILLERY TARGET ACQUISITION OFFICER (ATAOC) (11 Weeks). To train active army and reserve component officers in counterbattery and countermortar, drone target acquisition, sound and flash ranging techniques, and to provide them with a general knowledge of corps and division target acquisition functions, field artillery radar operations, production and dissemination of ballistic meteorology data and airborne target location techniques. Class capacity: 30; FY 63 classes: 3.

10. ARTILLERY SURVEY OFFICER (ASOC) (6-A-1183) (8 Weeks). To train active army and reserve component captains and lieutenants in reconnaissance and survey procedures. Class capacity: 35; FY 63 classes: 3.

11. CORPORAL OFFICER (COC) (6-A-1190A) (9 Weeks, 3 Days). To train active army officers in the characteristics, operating principles, capabilities and limitations of the Corporal missile and associated equipment.

12. REDSTONE OFFICER (ROC) (6-A-1190B) (5 Weeks, 3 Days). To train active army officers in the characteristics, operating principles, capabilities and limitations of the Redstone missile and associated equipment. Class capacity: 20; FY 63 classes: 1.

13. SERGEANT OFFICER (SOC) (6-A-1190D) (5 Weeks, 4 Days). To train active army officers in the characteristics, tactical employment, system maintenance and general operating procedures of the Sergeant missile system. Class capacity: 25; FY 63 classes: 4.

14. PERSHING OFFICER (POC) (6-A-1190E) (8 Weeks). To train active army officers in the characteristics, tactical employment, system maintenance and general operating procedures of the Pershing missile system. Class capacity: 30; FY 63 classes: 4.

15. CORPORAL MAINTENANCE OFFICER (CMOC) (6-A-1191) (33 Weeks). To train commissioned officers below the rank of major (with a minimum of 1 and a maximum of 8 years of commissioned service) in the function, technical operation, characteristics, maintenance, and inspection of Corporal fire control systems, launching and handling equipment and on-missile materiel. Class capacity: 15; FY 63 classes: 1.

16. LACROSSE OFFICER (LOC) (6-A-1187) (5 Weeks). To train active army officers in the characteristics, operating principles, fire direction procedures, tactical employment, and capabilities of the Lacrosse missile system. Class capacity: 20; FY 63 classes: 2.

17. ARTILLERY COMMUNICATIONS OFFICER (ACOC) (6-A-0200) (13 Weeks, 3 Days). To train active army and reserve component officers in the grade of major or below in the supervision and coordination of the installation, operation and maintenance of artillery communication equipment and systems. Class capacity: 40; FY 63 classes: 3.

18. ARTILLERY MOTOR TRANSPORT (AMTC) (6-B-066/0606) (9 Weeks). To train active army and reserve component company grade officers in the supervision of organizational maintenance, to include artillery turret maintenance, and operation and recovery of automotive equipment in artillery units. Class capacity: 40; FY 63 classes: 2.

OFFICER/ENLISTED COURSES

19. FA OFFICER CANDIDATE (FAOCC) (6-N-F1) (23 Weeks). To train selected warrant officers and enlisted men to be reserve second lieutenants. Class capacity: 65; FY 63 classes: 6.

20. FA OFFICER CANDIDATE (RES COMP) (FAOCC) (RC) (6-N-F2) (11 Weeks). To train National Guard and USAR personnel to be second lieutenants. ARNG personnel are selected by the State Adjutant General for attendance. USAR personnel must meet requirements of AR 140-50. Class capacity: 112; FY 63 classes: 2.

21. NUCLEAR PROJECTILE ASSEMBLY (NPAC) (6-D-142.1) (1 Week). To train active army officers and enlisted men in the mechanical assembly, disassembly, and prefiring preparation of nuclear projectiles. EM receive MOS 142.1. Class capacity: 30; FY 63 classes: 3.

22. ROCKET NUCLEAR WARHEAD ASSEMBLY (RNWAC) (6-D-147.2) (1 Week, 1 Day). To train active army officers and enlisted personnel in prefiring procedures, storage and logistical considerations of nuclear warheads for the 762mm and 318mm rockets. EM receive MOS 147.2. Class capacity: 20; FY 63 classes: 10.

23. ARTILLERY BALLISTIC METEOROLOGY (ABMC) (6-N-103.1) (11 Weeks). To train warrant officers and enlisted personnel in the installation and operation of an artillery meteorological station. Enlisted personnel receive MOS of 103.1. Class capacity: 38; FY 63 classes: 7.

24. WEATHER EQUIPMENT MAINTENANCE (WEMC) (6-N-8219/205.1) (13 Weeks, 4 Days). To train warrant officers and enlisted personnel in the organizational maintenance of electrical and electronic meteorological equipment used in artillery ballistic meteorology sections. Warrant officers receive MOS 8219; enlisted personnel receive MOS 205.1. Class capacity: 15; FY 63 classes: 15.

25. FA RADAR MAINTENANCE (FARMC) (6-N-1121/211.3) (32 Weeks). To train warrant officers and enlisted personnel in the operation, adjustment and organizational maintenance of field artillery radar equipment. Warrant officers receive MOS of 1121; enlisted personnel receive MOS of 211.3. Class capacity: 25; FY 63 classes: 4.

26. REDSTONE ELECTRONIC MATERIEL MAINTENANCE (REMMC) (6-N-1192B/218.1) (20 Weeks). To train warrant officers and enlisted personnel of the active army to assemble, install, calibrate, adjust and maintain on-missile electronic guidance control components and systems and associated electronic test equipment for the Redstone missile. Warrant officers receive MOS 1192; enlisted personnel receive MOS 218.1. Class capacity: 13; FY 63 classes: 2.

OFFICER/ENLISTED FUNCTIONAL COURSES

27. CORPORAL NUCLEAR WARHEAD ASSEMBLY (CNWAC) (6-D-F13) (1 Week, 3 Days). To train active army commissioned officers and enlisted personnel in prefiring procedures involving assembly and nuclear and mechanical tests of the nuclear warhead for the Corporal missile. Class capacity: 15; FY 63 classes: 2.

28. CORPORAL HANDLING EQUIPMENT MAINT (CHEMC) (6-H-F8) (4 Weeks). To train selected officers, warrant officers, and enlisted personnel presently assigned to a Corporal unit in the operation and maintenance of Corporal handling equipment. Class capacity: 15; FY 63 classes: 1.

29. AN/TRC-80 TRANSITION (6-D-F?) (1 Week, 1 Day). To provide communication officers (in the grade of major or below) and communication chiefs (grade E-6 or above) with a working knowledge of the operation, maintenance and employment of the Radio Terminal Set AN/TRC-80 and associated equipment. Class capacity: 9; FY 63 classes: 3.

ENLISTED MOS COURSES

30. ARTILLERY SURVEY ADVANCED (ASAC) (6-R-153.1) (8 Weeks). To train enlisted personnel to supervise, coordinate, and participate in operations of an artillery survey party, battery detail, or survey information center; to assist in establishment of observation. Receives MOS 153.1. Class capacity: 70; FY 63 classes: 9.

31. ARTILLERY FLASH RANGING ADVANCED (AFRAC) (6-R-154.1) (6 Weeks). To train enlisted personnel in the installation, operation and organizational maintenance of a field artillery flash ranging unit. Receives MOS 154.1. Class capacity: 30; FY 63 classes: 2.
32. ARTILLERY SOUND RANGING ADVANCED (ASRAC) (6-R-155.2) (8 Weeks). To train enlisted personnel in the installation, operation and organizational maintenance of a field artillery sound ranging unit. Receives MOS 155.2. Class capacity: 30; FY 63 classes: 2.
33. FA RADAR OPERATION (FAROC) (6-R-156.1) (10 Weeks). To train enlisted personnel in the operation, tactical employment and utilization of field artillery radar. Receives MOS 156.1. Class capacity: 35; FY 63 classes: 9.
34. SERGEANT MISSILE BATTERY (SMBC) (6-N-161.2) (6 Weeks, 2 Days). To train warrant officers and enlisted personnel, grade E4 or above, of the active army, in the assembly, checkout, maintenance and operation of the Sergeant missile and associated ground handling equipment. Warrant officer receives MOS to be announced. Enlisted personnel receive MOS 161.2. Class capacity: 30; FY 63 classes: 3.
35. PERSHING SPECIALIST (PSC) (6-N-163.2) (17 Weeks). To train warrant officers and enlisted specialist personnel, grade E4 or above, of the active army, in the detailed assembly, checkout, maintenance, and operation of the Pershing missile and associated ground support equipment. Warrant officer receives MOS of FA Msl System Technician, Pershing (21X), enlisted personnel receive MOS 163.2, or other skill level digits as appropriate. Class capacity: 30; FY 63 classes: 3.
36. PERSHING MISSILE BATTERY (PMBC) (6-R-163.6) (8 Weeks, 4 Days). To train noncommissioned officers, E4 or above, of the active army, in the assembly, checkout, maintenance, and operation of the Pershing missile and associated ground support equipment. Receives MOS of 163.6 or other skill level digits as appropriate. Class capacity: 35; FY 63 classes: 6.
37. AN/TRC-80 OPERATIONS (6-R—1) (9 Weeks). To qualify enlisted personnel, grade E5 or below, of the active army, in the operation and operator maintenance of the Radio Terminal Set AN/TRC-80 and associated equipment. MOS for which trained to be determined. Class capacity: 18; FY 63 classes: 5.
38. REDSTONE MECHANICAL MATERIEL MAINTENANCE (RMMMC) (6-R-169.1) (7 Weeks, 3 Days). To train enlisted men of grade E6 or below in organizational maintenance procedures to assemble, install, maintain and adjust Redstone mechanical on-missile guidance and control systems and associated test equipment, to assemble missiles and perform required checks on Redstone propulsion, pneumatic and mechanical systems and their associated test equipment and to operate and supervise the organizational maintenance of the Redstone servicing equipment. Receives MOS of 169.1. Class capacity: 15; FY 63 classes: 1.
39. ARTILLERY RADIO MAINTENANCE (ARMC) (6-R-313.1) (14 Weeks). To train enlisted personnel of grade E5 or below to install, operate and perform organizational maintenance on communications equipment

used in artillery communication systems or units employing similar equipment. Receives MOS of 313.1. Class capacity: 45; FY 63 classes: 24.

40. ARTILLERY COMMUNICATION SUPERVISORS (ACSC) (6-R-313.6) (15 Weeks). To train enlisted personnel of grade E4 or above to supervise, coordinate, and participate in the operation of a communication section of an artillery unit. Receives MOS of 313.6. Class capacity: 40; FY 63 classes: 3.

41. ARTILLERY VEHICLE MAINTENANCE SUPERVISORS (AVMSC) (6-R-631.7/632.7) (9 Weeks). To train enlisted personnel of grade E5 or above to supervise artillery turret maintenance, organizational maintenance and recovery of vehicles used in the artillery. Receives MOS of 631.7 or 632.7. Class capacity: 25; FY 63 classes: 2.

42. ARTILLERY TRACK VEHICLE MAINTENANCE (ATVMC) (6-R-632.1) (12 Weeks, 4 Days). To train enlisted personnel of the active army or a reserve component to perform organizational maintenance on artillery track vehicles, self-propelled mounts, associated accessories and equipment, to include turret maintenance. Receives MOS 632.1. Class capacity: 60; FY 63 classes: 20.

CURRENT RESIDENT COURSE SCHEDULE

Listed below are the courses to be given at the US Army Artillery and Missile School during the period 1 Jul 62 through 30 Sep 62.

Course	CI Nr	Report	Start	Close	Input
Field Artillery Officer Orientation (6-A-C20)	1-63	11 Jul 62	16 Jul 62	14 Sep 62	98
	2-63	25 Jul 62	30 Jul 62	28 Sep 62	98
	*3-63	13 Aug 62	20 Aug 62	19 Oct 62	113
	4-63	5 Sep 62	10 Sep 62	9 Nov 62	98
	5-63	19 Sep 62	24 Sep 62	23 Nov 62	99
* Reserved for USMA Graduates					
Field Artillery Officer Familiarization (6-A-C21)	1-63	8 Aug 62	9 Aug 62	27 Sep 62	62
Artillery Officer Career (6-A-C22)	1-63	2 Jul 62	6 Jul 62	1 Mar 63	153
Associate Field Arty Officer Career (6-A-C23)	1-63	1 Jul 62	3 Jul 62	6 Nov 62	114
	2-63	23 Sep 62	25 Sep 62	12 Feb 63	115
FA Field Grade Officer Refresher (Res Comp) (6-A-C11)	1-63	23 Sep 62	24 Sep 62	5 Oct 62	58
Nuclear Weapons Employment (6-A-F1)	1-63	26 Aug 62	27 Aug 62	28 Sep 62	100
Senior Field Arty Officer (6-A-F6)	1-63	8 Jul 62	9 Jul 62	20 Jul 62	25
	2-63	9 Sep 62	10 Sep 62	21 Sep 62	25
FA Radar Officer (6-A-0140)	1-63	9 Aug 62	10 Aug 62	2 Oct 62	15
Artillery Target Acquisition Officer (6-A-1154)	1-63	13 Sep 62	17 Sep 62	3 Dec 62	15
Arty Survey Officer (6-A-1183)	1-63	5 Jul 62	10 Jul 62	30 Aug 62	35
Corporal Officer (6-A-1190A)	1-63	2 Aug 62	6 Aug 62	10 Oct 62	16
	2-63	10 Sep 62	12 Sep 62	16 Nov 62	15

Course	CI Nr	Report			Start			Close			Input
Redstone Officer (6-A-1190B)	1-63	5	Jul	62	9	Jul	62	14	Aug	62	20
Sergeant Officer (6-A-1190D)	1-63	4	Jul	62	6	Jul	62	14	Aug	62	22
	2-63	28	Aug	62	30	Aug	62	9	Oct	62	20
Pershing Officer (6-A-1190E)	1-63	20	Jul	62	23	Jul	62	17	Sep	62	11
Lacrosse Officer (6-A-1187)	1-63	16	Sep	62	17	Sep	62	20	Oct	62	19
Artillery Communications Officer (6-A-0200)	1-63	27	Aug	62	28	Aug	62	4	Dec	62	33
Artillery Motor Transport (6-B-0600/0606)	1-63	1	Jul	62	2	Jul	62	31	Aug	62	40
Field Artillery Officer Candidate (6-N-F1)	1-63	29	Jul	62	6	Aug	62	22	Jan	63	55
	2-63	23	Sep	62	1	Oct	62	19	Mar	63	55
Nuclear Projectile Assembly (6-D-142.1)	1-63	16	Sep	62	17	Sep	62	21	Sep	62	22
Rocket Nuclear Warhead Assembly (6-D-147.2)	1-63	8	Jul	62	9	Jul	62	16	Jul	62	20
	2-63	5	Aug	62	6	Aug	62	13	Aug	62	20
	3-63	9	Sep	62	10	Sep	62	17	Sep	62	20
Artillery Ballistic Meteorology (6-N-103.1)	1-63	22	Jul	62	23	Jul	62	5	Oct	62	37
	2-63	16	Sep	62	17	Sep	62	30	Nov	62	37
Weather Equipment Maintenance (6-N-8219/205.1)	1-63	5	Jul	62	6	Jul	62	11	Oct	62	9
	2-63	28	Aug	62	29	Aug	62	6	Dec	62	9
FA Radar Maintenance (6-N-1121/211.3)	1-63	12	Sep	62	17	Sep	62	14	May	63	25
Redstone Electronic Materiel Maintenance (6-N-1192B/218.1)	1-63	26	Jul	62	30	Jul	62	18	Dec	62	15
Corporal Nuclear Warhead Assembly (6-D-F13)	1-63	23	Jul	62	24	Jul	62	2	Aug	62	15
Artillery Survey Advanced (6-R-153.1)	1-63	18	Jul	62	23	Jul	62	13	Sep	62	70
	2-63	1	Aug	62	6	Aug	62	27	Sep	62	70
Artillery Flash Ranging Advanced (6-R-154.1)	1-63	23	Aug	62	24	Aug	62	5	Oct	62	25
Artillery Sound Ranging Advanced (6-R-155.2)	1-63	1	Jul	62	2	Jul	62	24	Aug	62	20
Field Artillery Radar Operation (6-R-156.1)	1-63	26	Jul	62	30	Jul	62	5	Oct	62	35
	2-63	30	Aug	62	4	Sep	62	9	Nov	62	35
Sergeant Missile Battery (6-N-161.2)	1-63	13	Aug	62	15	Aug	62	27	Sep	62	30
Pershing Missile Battery (6-R-163.6)	1-63	13	Jul	62	16	Jul	62	14	Sep	62	12
	2-63	23	Sep	62	24	Sep	62	26	Nov	62	20
AN/TRC-80 Operations (6-R-———.1)	1-63	16	Aug	62	17	Aug	62	19	Oct	62	9
Artillery Radio Maintenance (6-R-313.1)	1-63	5	Jul	62	6	Jul	62	12	Oct	62	45
	2-63	19	Jul	62	20	Jul	62	26	Oct	62	45
	3-63	2	Aug	62	3	Aug	62	9	Nov	62	45
	4-63	14	Aug	62	15	Aug	62	23	Nov	62	45
	5-63	28	Aug	62	29	Aug	62	7	Dec	62	45
	6-63	12	Sep	62	13	Sep	62	21	Dec	62	45
	7-63	26	Sep	62	27	Sep	62	18	Jan	63	45
Artillery Vehicle Maintenance Supervisors (6-R-631.7/632.7)	1-63	15	Jul	62	16	Jul	62	14	Sep	62	21
Artillery Track Vehicle Maintenance (6-R-632.1)	1-63	30	Jul	62	1	Aug	62	26	Oct	62	60
	2-63	13	Aug	62	15	Aug	62	9	Nov	62	60
	3-63	27	Aug	62	29	Aug	62	23	Nov	62	60
	4-63	10	Sep	62	12	Sep	62	7	Dec	62	60
	5-63	24	Sep	62	26	Sep	62	21	Dec	62	60
Corporal Handling Equipment Maintenance (6-H-F8)	1-63	5	Aug	62	6	Aug	62	31	Aug	62	10



THE ARTILLERY WORLD

M113 APC PRODUCTION

The M113 armored personnel carrier, which was successfully tested by the US Army Artillery Board (ARTILLERY TRENDS, Nov. 61, p. 58) received its production "OK" with a contract in excess of \$64 million. The contract calls for 2,832 of the vehicles to be manufactured by the Food Machinery Corporation (FMC) in two locations. FMC was the low bidder in an eight-firm competition for the job.

The M113 is a lightweight, low silhouette vehicle designed to transport personnel and cargo. It can operate as an amphibious vehicle on inland lakes and streams, is capable of extended cross-country travel over rough terrain, and of relatively high speed operation on improved roads and highways. The low net weight of this aluminum vehicle enables it to be transported by cargo aircraft and parachute-dropped to using forces. It carries 13 personnel, including the commander and the driver.

"SMALL-ARMS" RADAR

The US Army Signal Research and Development Laboratory, Fort Monmouth, New Jersey, is developing a new hand-held, miniature radar set which can detect and distinguish moving targets as far as a mile away. Resembling a flashlight and aimed like a submachine gun, the radar equipment, as yet undesignated, emits a sound which changes in pitch to match different target configurations which it "sees." An experienced operator can differentiate between a tank, a jeep, or a walking man after a minimal amount of familiarity with these characteristic sound changes.

The radar is operable in fog, darkness, and light foliage areas. When a target is spotted, range can be read directly from a dial. The operator has an option of attaching an auxiliary unit to the set for visual display, which gives more detailed information on the distance and character of a suspect target.



Figure 30. The "small-arms" radar.

The system is powered by a lightweight belt battery which lasts through 12 hours of continuous operation. It is transistorized, utilizing only two tubes, and weighs 10 pounds. The flashlight radar is the only one-man radar system available today.

155-MM HOWITZER, M1A2E3

The US Army Artillery Board has been testing a new tube (T258) and other modifications for the towed 155-mm howitzer, M1A2. The modifications permit the howitzer to be fired at elevations up to +70 degrees as opposed to 65 degrees with the old howitzer. The objectives of the improvements are to give increased maximum range, decreased minimum high-angle range, and greater lethality. The modifications add approximately 3 feet to the original length and approximately 425 pounds to the original weight of the howitzer, but do not significantly impair flexibility or ease and speed of handling. The new weapon is designated 155-mm howitzer, M1A2E3.

The new T258 tube is designed to fire both the standard 155-mm ammunition and the developmental extended-range round. The tube has a

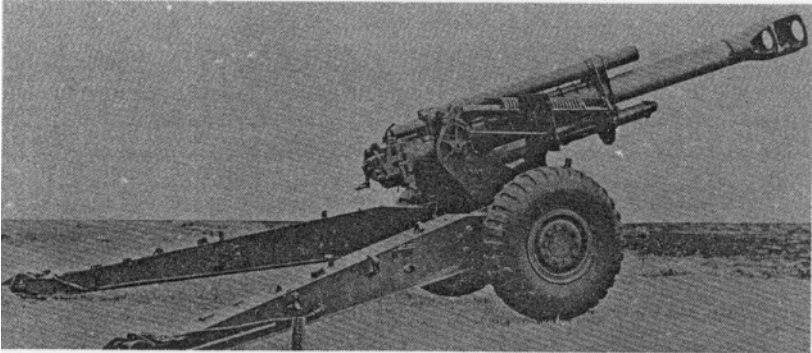


Figure 31. 155-mm howitzer, M1A2E3, with new tube, T258.

rifling twist of one turn in 20 calibers, compared to one turn in 25 in the old tube, and is equipped with a double-baffle muzzle brake to absorb the added impulse of the developmental round. An undesirable result of the muzzle brake is the back-blast and pressure created in the cannoneers' working area. Protective measures such as increased shielding for the howitzer, redesign of the muzzle brake, or protective clothing and headgear for the cannoneers are being studied to alleviate this problem.

RECENT CONTRACTS

The US Army has awarded contracts totaling over a hundred million dollars for the following items: 53 AC-1 "Caribou" transport aircraft; rocket motors and ammunition propellants; engineering services on the Sergeant missile system; 48 AO-1B "Mohawk" combat surveillance aircraft; production of the M116 amphibious cargo carrier and related items; air and ground equipment for the USD-1 drone; continued development of the Shillelagh surface-to-surface guided missile system; 361,000 projectiles and 160,000 cartridge cases for 105-mm shells; 105-mm and 155-mm self-propelled howitzers; proximity fuzes; and improved Honest John components.

MAP TACK PROCUREMENT

The plotting needles indicated in FM 6-40 (1960), paragraph 257d, are not stock numbered items and cannot be requisitioned through regular supply channels or purchased at the self-service supply center. The long map tack (1 1/8"), FM 6-40 (1960), paragraph 257c, provides a suitable substitute for plotting with no appreciable decrease in plotting accuracy. The use of these tacks for plotting is being taught at Fort Sill with both satisfactory results and a savings to the government.

The stock number for map tacks is 7510-274-5450, the nomenclature is "Map tack, colored glass, metal or plastic, 100 to box, black," and the unit of issue is the box. Stock numbers for different colors of tacks are: Blue, 7510-274-5451; green, 7510-274-5452; and red, 7510-274-5453.

A GEM FOR THE 105-MM/155-MM BATTALION

In a unit equipped with M52 105-mm SP howitzers and M1A1 155-mm towed howitzers, some method is needed to simplify the horizontal control chart in battalion FDC. The 105-mm howitzers are normally laid on a common deflection of 3200 mils and the 155-mm howitzers are laid on 2600 mils. When supplementary deflection indices are used, this means that six rows of numbers will have to be placed on the range deflection protractor of the HCO. This leads to confusion concerning selection of the proper deflection for each battery. Using a separate range deflection protractor for each battery provides a partial solution, but is time consuming and can lead to using the wrong protractor for a particular battery.

To solve these problems, the following procedure has been developed. The 105-mm howitzers are laid according to the procedure outlined in FM 6-77. Because of equipment peculiarities, no satisfactory variation from this procedure has been found. The 155-mm howitzers are laid according to the method outlined in FM 6-81, except that the aiming posts are put out at 2600, using the nonslipping azimuth scale. The slipping azimuth scale is then set at 3200 mils and all subsequent deflection readings are taken from the slipping azimuth scale. All deflections (corrected if necessary) for the 105-mm battery are transmitted as announced by the HCO directly to the firing battery. If deflection for the 155-mm battery as announced by the HCO is less than 3200 mils, the computer transmits it directly to the battery; if greater than 3200 mils, the computer subtracts 3200 and transmits the difference to the battery. This procedure has been used for several missions with excellent results.

—Submitted by Lt Col Campbell

6th How Bn (SP), 80th Arty
APO 7
San Francisco, California

A GEM FOR THE ELECTRONIC TECHNICIAN

Be safety conscious when using the Multimeter TS-352/U. When employing the multiplier unit to measure high voltage, make sure the equipment is turned "OFF" before attaching the test clip. When all personnel are clear, turn the equipment on, read the voltage, and then turn the equipment "OFF" before removing the test clip. Remember, the life you save may be your own.

Be cost conscious when using the Multimeter TS-352/U. The batteries, BA-31, are utilized only when using the R_x 10,000 ohms scale. When the meter falls to zero on this scale, DO NOT throw away all three of the BA-31's. Usually, only one of these batteries is weak. With the meter set up to measure ohms on the R_x 10,000 scale, short the test leads together, thereby putting a working load on the batteries. With a second meter, measure the voltage across each of the BA-31's and replace the defective battery. The meter is once more in operation and a savings to the Army has been effected by keeping the two good batteries.

—Submitted by M/Sgt James W. Peterson

Communications/Electronics Department

STATUS OF TRAINING LITERATURE

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

A. FIELD MANUALS (FM):

- 6-90 8-inch Howitzer, M2, Towed
- 6-135 Adjustment of Artillery Fire By The Combat Soldier
- 6-() 8-inch Howitzer, M110, SP
- 6-() 175-mm Gun, Motor Carriage, M107
- 6-() Operation and Field Artillery Application of Field Artillery Digital Automatic Computer (FADAC)
- 6-() 115-mm Multiple Rocket Launcher M91, and Toxic Rocket M55

B. ARMY TRAINING PROGRAMS (ATP):

- 6-615 Field Artillery Missile Battalion, Pershing

C. ARMY TRAINING TESTS (ATT):

- 6-4 Field Artillery Target Acquisition Headquarters and Headquarters Battery
- 6-16 FA Battalions, Gun or Howitzer, Heavy
- 6-117 Field Artillery Howitzer Battery, Light or Medium
- 6-137 FA Howitzer Battery, 8-inch, Infantry Division
- 6-() Field Artillery Target Acquisition Battery
- 6-() Field Artillery Missile Battalion, Pershing
- 6-() Field Artillery Missile Battalion, Sergeant

2. Training literature submitted to USCONARC:

- FM 6-40 Changes 1, Field Artillery Gunnery
- FM 6-75 Changes 1, 105-mm Howitzer, M2 Series, Towed
- FM 6-121 Field Artillery Target Acquisition
- FM 6-() Radar Set, AN/TPS-25
- ATP 6-545 Field Artillery Missile Battalion, Corporal
- ATP 6-585 Field Artillery Missile Battalion, Lacrosse
- ATP 6-635 Field Artillery Missile Battalion, Redstone

3. Training literature at the Government Printing Office:

- FM 6-15 Artillery Meteorology
- FM 6-25 FA Missile Battalion, Redstone (U)
- FM 6-45A Field Artillery Missile Battalion, Lacrosse Gunnery
- FM 6-36 Changes 1, FA Missile, Redstone Firing Procedures
- FM 6-56A FA Missile Battalion (Battery), Little John Rocket (U)
- FM 6-81 155-mm Howitzer, M1, Towed
- FM 6-92 155-mm Howitzer, M44, SP
- FM 6-140 The Field Artillery Battery
- FM 6-() FA Missile Battalion, Sergeant (U)
- FM 6-() FA Missile, Sergeant (U)
- ATP 6-555 FA Missile Battalion, Sergeant

4. Training literature recently printed:

FM 6-10 Field Artillery Communications
FM 6-20-2 FA Techniques
FM 6-35 FA Missile, Redstone
FM 6-61 Changes 2, FA Missile Battalion, Honest John Rocket
FM 6-61A FA Missile Battalion, Honest John Rocket (U)
FM 6-73 Field Artillery Graphical Firing Equipment
FM 6-120 FA Target Acquisition Battalion and Batteries
ATP 6-100 Field Artillery Unit
ATP 6-302 FA Rocket Units (Honest John, Little John)
ATP 6-575 FA Target Acquisition Battalion
ATT 6-155 FA Howitzer Battalion, Light, Towed or SP

5. Artillery training films currently under production and scheduled for release during calendar year 1962:

Field Artillery, RSOP
Part I. Deliberate
Part II. Rapid

6. Artillery training films currently under production and scheduled for release during calendar year 1963:

The 762-mm Rocket
Part I. Introduction to the system
Part II. Mechanical assembly and electrical checkout
Part III. Loading, preparation for action, firing, and march order
Field Artillery Target Acquisition Battalion
The Infantry Division Artillery Forward Observer

7. Artillery training films production completed and scheduled for release in calendar year 1962:

Ground Surveillance Radar, AN/TPS-25
Part I. Theory, installation and operation
Part II. Moving target detection
Countermortar Radar AN/MPQ-4A
Part II. Preparation and performance checks
Laying the Field Artillery Battery
Fire Direction Procedure
Part I. Precision Fire
Part II. Area Fire
Part III. Observed Firing Chart

8. Artillery training films scheduled for production and release during calendar year 1962:

None

9. Artillery training films recently released:

None

10. Status of Army Subject Schedules (MOS):

A. UNDER PREPARATION OR REVISION BY THE US ARMY ARTILLERY AND MISSILE SCHOOL:

- ASubjScd 6-104 MOS Technical Training of the Field Illumination Crewman
- ASubjScd 6-141 MOS Technical Training of the Light and Medium FA Crewman
- ASubjScd 6-156 MOS Technical Training of the Radar Crewman
- ASubjScd 6-161 MOS Technical Training of the FA Missile Crewman (Sergeant)
- ASubjScd 6-166 MOS Technical Training of the FA Missile Crewman (Lacrosse)
- ASubjScd 6-167 MOS Technical Training of the FA Missile Fire Control Crewman (Lacrosse)

B. SUBMITTED TO USCONARC:

None

C. AT GOVERNMENT PRINTING OFFICE:

None

D. RECENTLY PUBLISHED:

None

11. Status of Army Subject Schedules (Non-MOS):

A. UNDER PREPARATION OR REVISION BY THE US ARMY ARTILLERY AND MISSILE SCHOOL:

- ASubjScd 6-32 Command Post Exercises

B. SUBMITTED TO USCONARC:

- ASubjScd 6-1 Care and Handling of Ammunition

C. At Government Printing Office:

- ASubjScd 6-5 Communications training for sections and platoons

D. Recently Published:

None

ARTILLERY INFORMATION LETTERS

The following artillery information letter containing items of technical nature has been published by the US Army Artillery and Missile School since the FEBRUARY 1962 issue of ARTILLERY TRENDS. Distribution is made *only* to the units and their controlling headquarters which are authorized the equipment discussed in this letter:

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