Sgt. Schluppeck

THE SERGEANT GUIDED MISSILE SYSTEM

U. S. ARMY
ARTILLERY AND MISSILE SCHOOL
Guided Missile Department

Fort Sill, Oklahoma

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*GM 2700
T 4700
Mar 63

Reference Note

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PART ONE

INTRODUCTION

1. REFERENCES

FM 6-20-1 (Oct 61); FM 6-20-2 (Jan 62); FM 6-38; and TOE 6-555, TOE 6-556, and TOE 6-557 (tentative).

2. INTRODUCTION

In the early 1950's, a requirement existed for a field artillery missile system possessing such qualities as reliability, ruggedness, accuracy, simplicity of operation, immunity to known countermeasures, and a high degree of mobility. The Sergeant missile system has been developed to meet these operational requirements. In 1955, Jet Propulsion Laboratories (JPL), the developing agency for the Corporal, was called upon to begin work on the Sergeant system. The vast experience gained by Jet Propulsion Laboratories in its development of the Corporal made this agency the logical choice to develop the Sergeant. In 1956, Sperry Utah Engineering Laboratory entered the program as the cocontractor for research and development of the Sergeant system and as the prime contractor for equipment production. Complete responsibility for the system has now been assigned to Sperry Utah Engineering Laboratory. The Sergeant missile system has been designated to replace the Corporal and will have the mission of supporting the army/corps in the field.

3. OBJECTIVE

The objective of this publication is to provide students at the U. S. Army Artillery and Missile School with an unclassified reference outlining the organization, capabilities, operations, and method of employment and deployment of the field artillery battalion, Sergeant. This material is based on tentative doctrine and concepts; therefore, changes may be effected when troop and user tests are completed. The Sergeant system is considered primarily a nuclear delivery system; therefore, in the discussion of tactical concepts the field army is assumed to be deployed for a nuclear war.

PART TWO

EXPLANATION

4. CHARACTERISTICS

a. The Sergeant is a field artillery ballistic missile.

b. As a second-generation artillery guided missile system, the Sergeant possesses several outstanding advantages and major improvements over its predecessor, the Corporal.

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*Supersedes RN GM 2700, T 4700, Jul 62

The Sergeant utilizes an inertial guidance system and a solid-propellant motor. The principal advantages of these two improvements are simplicity, permitting reduced ground handling equipment and crew training requirements, and an improved reaction time in comparison to the command-guided, liquid-fuel system of the Corporal. A brief description of the Sergeant missile system is as follows:

(1) Range--25 to 75 nautical miles.

(2) Length--10.5 meters (34.5 feet).

(3) Diameter--79 centimeters (31 inches).

(4) Weight--4,500 kgs (10,000 pounds).

(5) Warhead--nuclear.

(6) Guidance--inertial.

(7) Propulsion--high-energy solid propellant.

(8) Mobility--100 percent ground mobile (fig 1).

(9) Transportability--air transportable (fig 2).

(10) Power equipment--self-contained.

Figure 1. Missile transporter.

Figure 2. Launching station emerges from C-130 cargo transport plane.

c. Because of the Sergeant's reliability, mobility, and high degree of immunity to known electronic countermeasures, the field army is provided with a sophisticated weapons system that is comparable in ease of maintenance and operation to shorter range, unguided rockets.

5. MISSILE STRUCTURAL GROUPS

The missile is composed of four major sections (fig 3). The sections are transported to the firing position in special containers which permit a functional check of each section while within its sealed container. The sections are assembled just before firing. Similar missile sections are interchangeable. For example, any rocket motor section can be replaced by any other Sergeant rocket motor section. The missile sections are as follows:

a. The warhead section contains the nuclear payload.

b. The guidance section contains the inertial guidance system consisting primarily of an inertial platform, a computer, and a control assembly.

c. The rocket motor section contains the high-energy solid propellant and the ignition circuitry.

d. The control surface assemblies provide aerodynamic stability and a means to control the attitude and limited path maneuver of the missile.

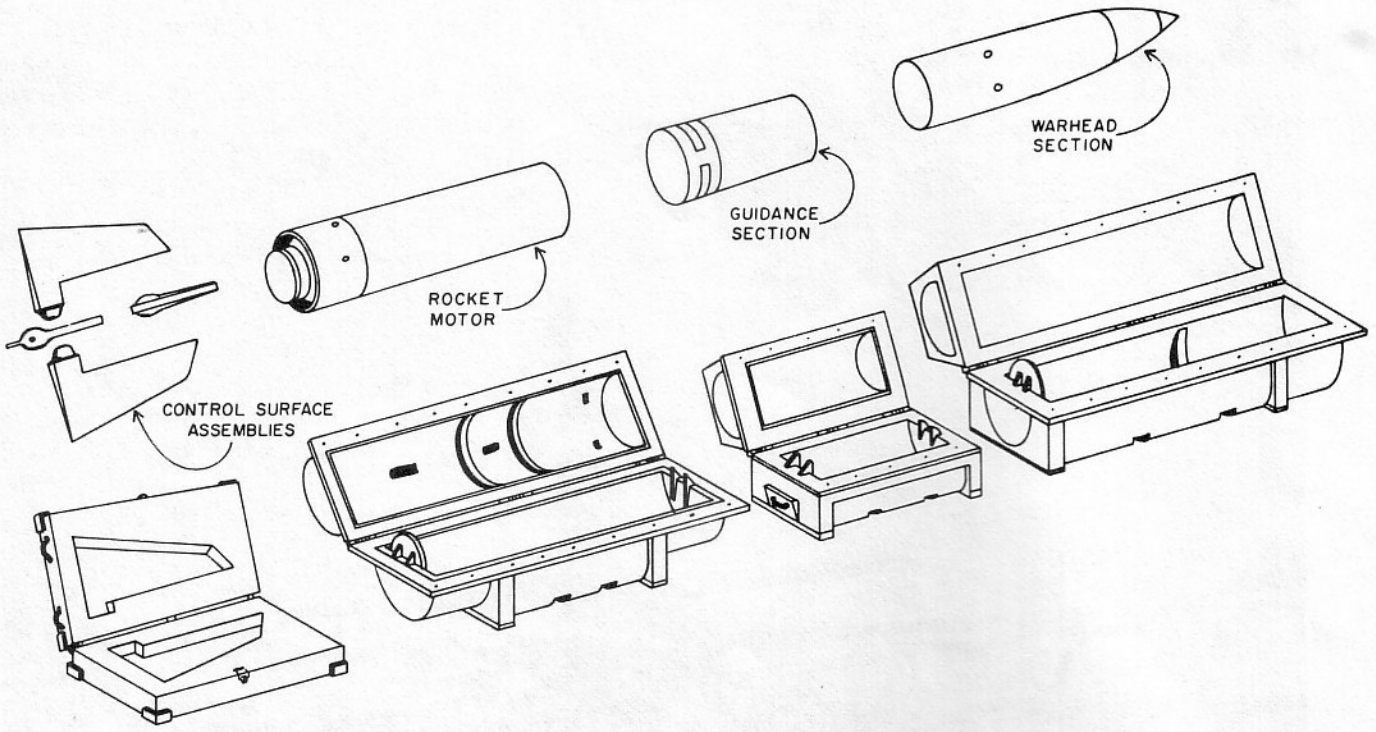


Figure 3. Missile sections and containers.

6. GROUND HANDLING EQUIPMENT

In a tactical situation the major items of ground handling equipment will be found in three general areas--the ordnance support service area, the battery missile test area, and the firing position (fig 4). The major items of ground handling equipment are the launching station, organizational maintenance test station, field maintenance test station, semitrailer transporter, and warhead transporter.

a. Launching Station. The launching station (fig 5) is mounted on a modified semitrailer towed by an M52, 5-ton, 6 x 6 tractor-truck. The launching station weighs 16,760 pounds. It is 31.4 feet long, 7.8 feet wide, and 11 feet high in the travel position. The launching station consists of five major components--the semitrailer, firing set, gas turbine generator set, azimuth orientation system, and superstructure.

(1) Semitrailer. The semitrailer provides a level, stable platform for assembling and firing the Sergeant missile. The semitrailer also houses the other major components of the launching station. The hydraulic system for the semitrailer operates two outrigger jacks, a rear jack, a cable reel drive assembly, and a blast shield actuator.

(a) The three hydraulic jacks provide the means for emplacing and leveling the launching station on ground slopes up to 10 percent without advance preparation. Leveling is accomplished by operating three manual control valves, one for each jack. Two bubble level assemblies are provided to aid the operator during leveling. When the launching station is leveled, the underside of the structural ring of the semitrailer should be 21 to 40 inches from the ground.

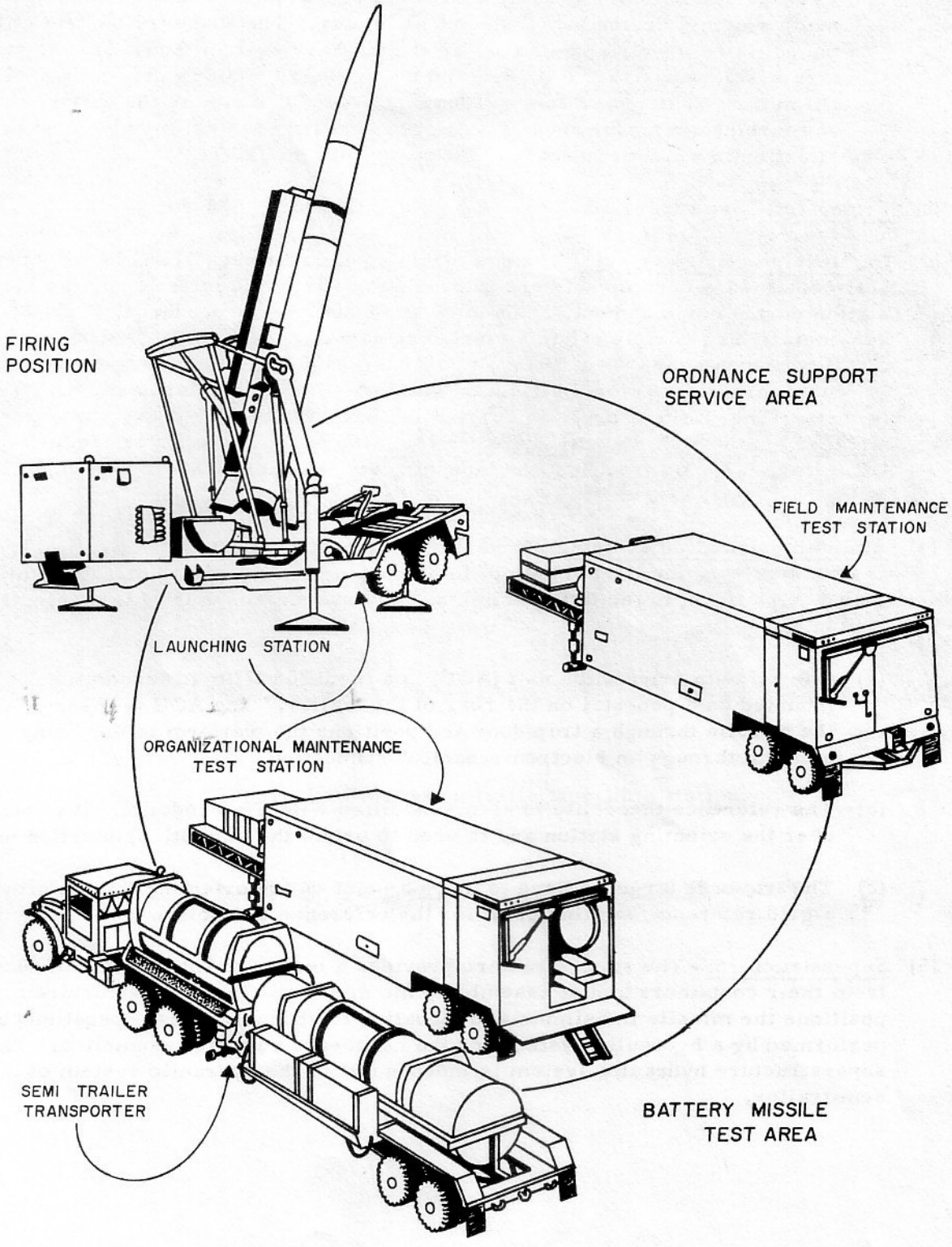


Figure 4. Sergeant ground handling equipment.

(b) The semitrailer hydraulic components can be operated by the primary hydraulic system or an auxiliary system. The primary hydraulic system has an operating pressure of 3,000 psi and an idling pressure of 300 to 375 psi. Pressurization is achieved by a variable pressure, variable displacement pump which is driven by a 208-volt AC motor. The auxiliary system utilizes the same reservoir and network as the primary system; however, the auxiliary system operates at 300 psi and the auxiliary pump is driven by a 24-volt DC motor. The power source for the 24-volt DC motor is the battery of the gas turbine generator set (GTGS). The auxiliary system may be used in a situation in which it is not feasible to operate the GTGS.

(2) Firing set. See paragraph 9.

(3) Gas turbine generator set. The gas turbine generator set (GTGS) is a lightweight, self-contained generator set used to provide power to the missile and the launching station during emplacement, assembly, and countdown procedures. The GTGS can operate on a variety of fuels, including gasoline, diesel oil, and JP4. The GTGS produces an output of 208-volt, 3-phase, 400-cps alternating current which is routed through a power distribution box to the launching station electrical components. The GTGS alternating current is converted to 28-volt direct current by a transformer rectifier unit located on the main boom of the superstructure. The DC voltage is used throughout the launching station and by the missile prior to firing.

(4) Azimuth orientation system. The azimuth orientation system (AOS) (fig 17, 18) is used to determine the azimuth of the launching station and to orient the missile guidance platform to the firing azimuth. The system consists of three items of equipment.

(a) The azimuth orientation unit (AOU) is a modified Wild T2 theodolite. It is mounted on a pedestal on the rear of the trailer. The AOU is inserted into the missile through a trap door and positions the platform to the firing azimuth through an electromechanical connection.

(b) The reference theodolite is also a modified Wild T2 theodolite. It is placed over the orienting station and is used to orient the azimuth orientation unit.

(c) The traverse target is used to mark a point on the orienting line; it provides a grid reference sighting point for the reference theodolite.

(5) Superstructure. The superstructure provides a means of lifting missile sections from their containers and of assembling the missile. The superstructure also positions the missile in azimuth and elevation for firing. These operations are performed by a hydraulic system and the necessary support assemblies. The superstructure hydraulic system is independent of the hydraulic system of the semitrailer.

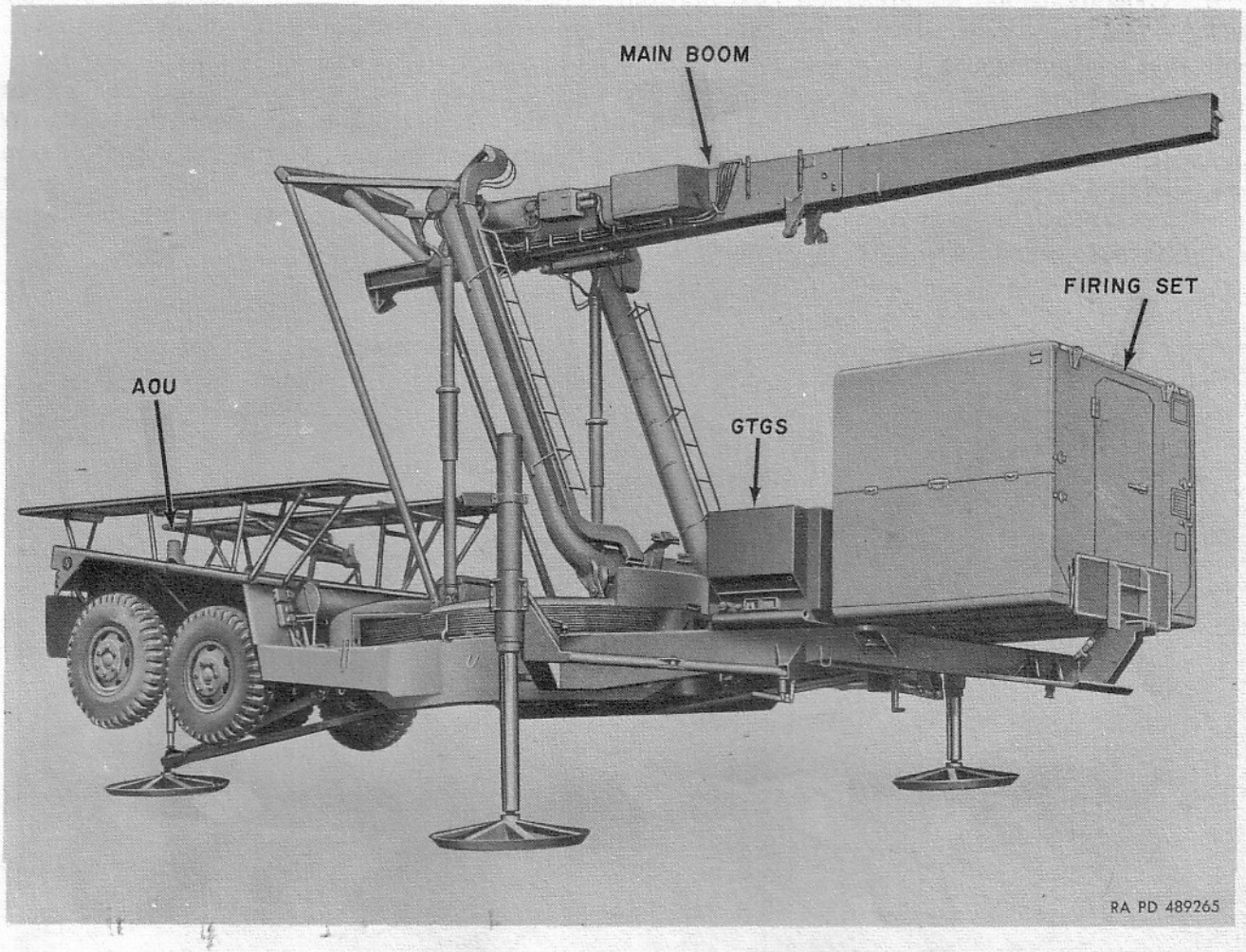


Figure 5. Sergeant missile launching station.

b. Organizational Maintenance Test Station. The organizational maintenance test station (OMTS) consists of a semitrailer chassis on which an enclosure, housing the automatic electronic test equipment (fig 6), is mounted. The OMTS is capable of self-test and will isolate malfunctions to an electronic assembly level (fig 8 ①). After a self-test of its own equipment, the OMTS performs an automatic test of the missile sections while they are in their sealed containers (fig 7). If a malfunction is detected during the missile testing, the replacement assemblies, carried in the OMTS basic load, can be replaced in the battery area. A boom on the aft end of the OMTS is used to move a faulty missile section from the container into the van, where assembly replacement and retest are performed.

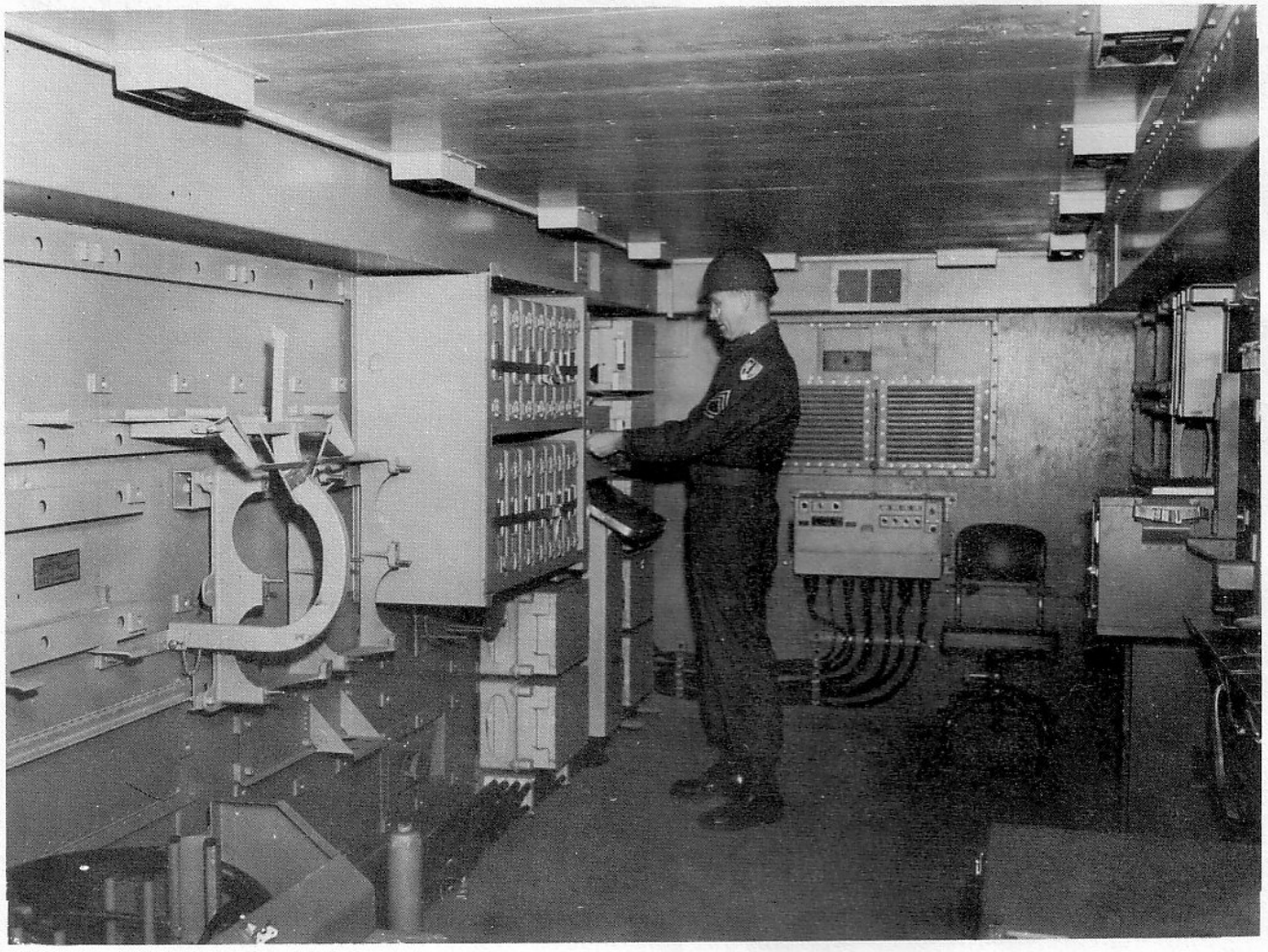


Figure 6. Organizational maintenance test station interior.

c. Field Maintenance Test Station. The field maintenance test station (FMTS) has the same external configuration as the OMTS but has a greater test capability. It has the capability of isolating malfunctions to the subassembly level (fig 8 ②). Sufficient replacement subassemblies are carried in the FMTS to make repairs as faults appear in the system.

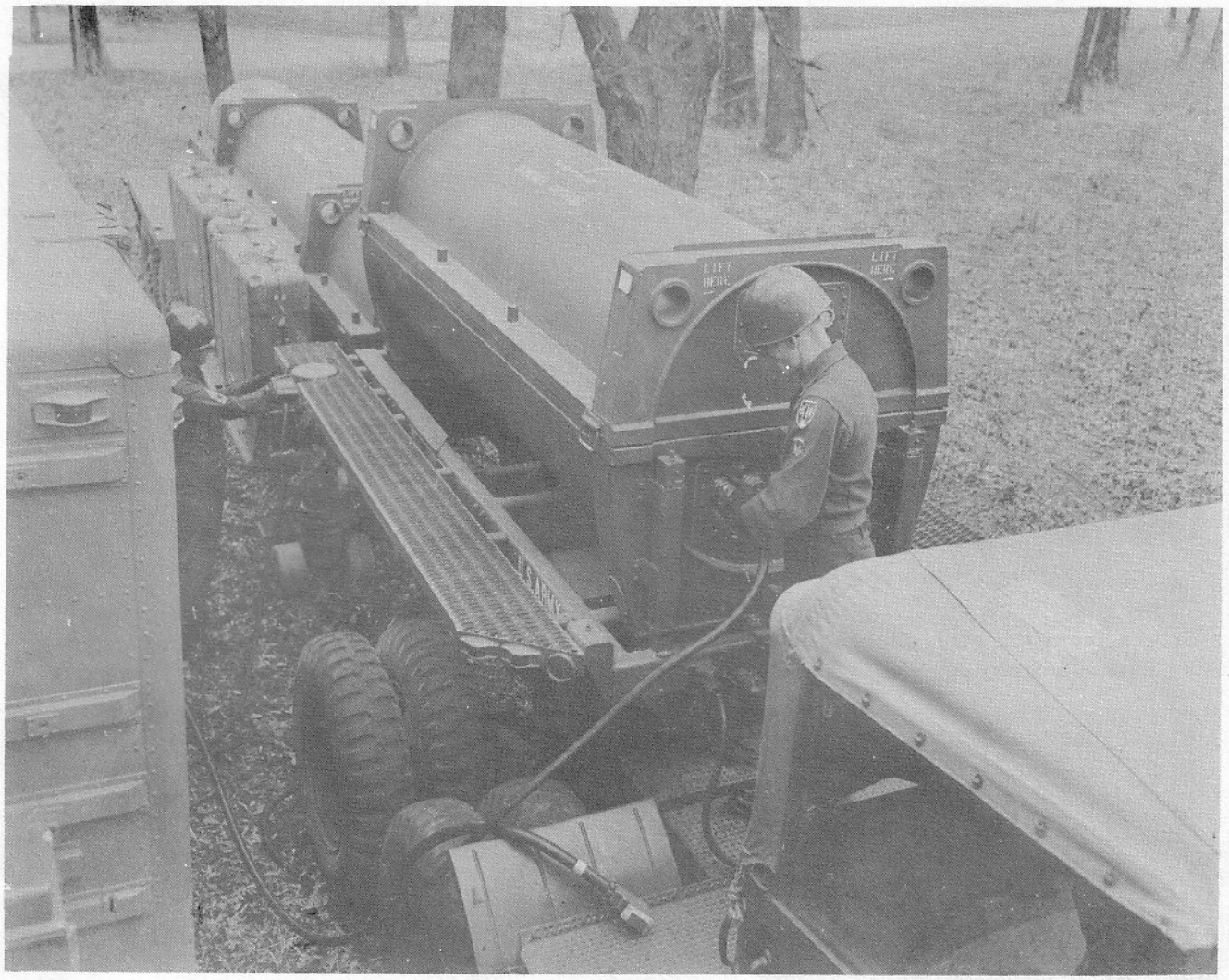


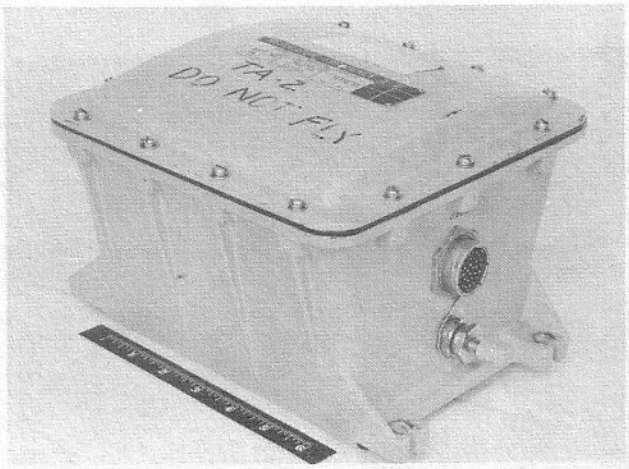
Figure 7. Connections to the sealed containers.

d. Semitrailer Transporter. The semitrailer transporter is used to transport the guidance section, the rocket motor section, and the control surfaces in their containers. A standard truck-tractor is used as a prime mover (fig 4).

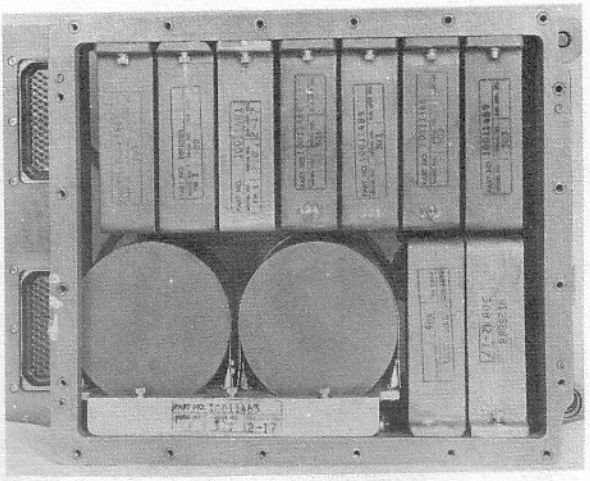
e. Warhead Transporter. The warhead transporter is a standard 2 1/2-ton truck.

7. MAINTENANCE CONCEPT

The maintenance concept is based on the replacement of assemblies and subassemblies (fig 8). Detection and replacement of faulty assemblies is the responsibility of the artilleryman through the use of the organizational maintenance test station (OMTS). Detection and replacement of faulty subassemblies is the responsibility of the organic ordnance missile maintenance platoon. To isolate subassembly malfunctions, the ordnance platoon uses the field maintenance test station (FMTS). Little or no piece part repair work will be performed in the Sergeant battalion.



(1) Unit assembly.



(2) Subassemblies.

Figure 8. Unit assembly and subassemblies.

8. MISSILE ASSEMBLY

a. The launcher is delivered to a surveyed position and emplaced by extending two forward leveling jacks until all the weight is removed from the prime mover (fig 9). The prime mover is driven from the site, and the launcher is leveled approximately 18 inches off the ground, using three hydraulic jacks. The superstructure is raised while the launcher is leveled.

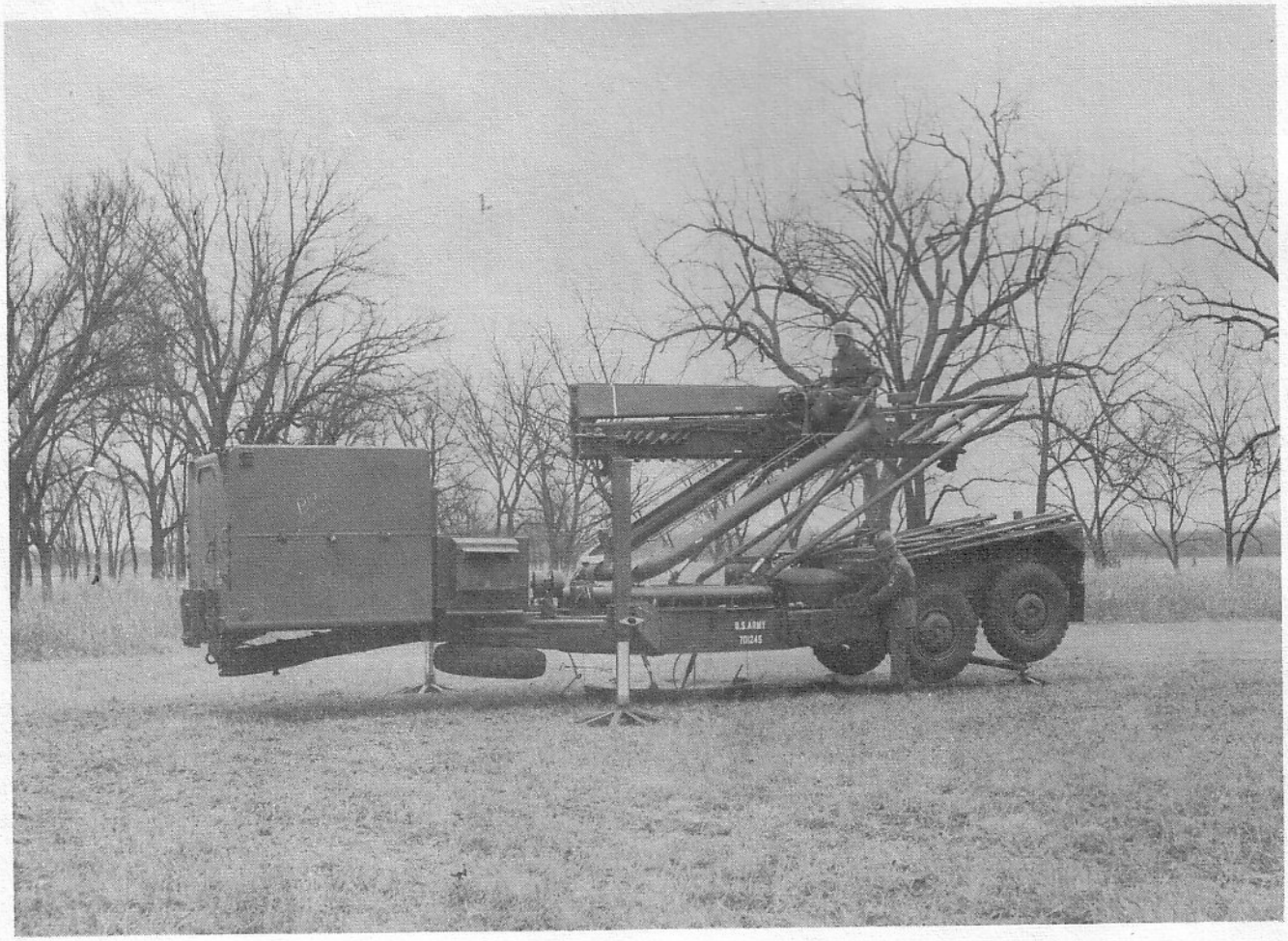


Figure 9. Launching station emplacement.

b. The rocket motor and guidance section transport vehicle is driven to the firing position and parked next to the launcher (fig 10).

Figure 10. Missile sections arriving at firing position.

c. The rocket motor is lifted out of its container by the hydraulic hoist and hung and locked to the underside of the boom by three hooks (fig 11).

Figure 11. Positioning the rocket motor.

d. After the rocket motor is secured to the boom, the guidance section is lifted out of its container and assembled to the rocket motor (fig 12) by four quick-connect swing-type bolts.

Figure 12. Rocket motor and guidance section assembly.

e. Once the guidance section has been secured to the rocket motor, their transport trailer leaves the area. The warhead transporter moves into position, and the warhead is assembled to the guidance section (fig 13) by four quick-connect swing-type bolts.

Figure 13. Warhead assembly.

f. The final step in missile assembly is the attachment of the four control surfaces to the rocket motor section. The control surfaces are snapped on and locked into position (fig 14). The level of the launching station is rechecked when missile assembly is completed.

Figure 14. Control surface attachment.

g. The entire assembly operation can be completed by a seven-man crew in a very few minutes. It should be emphasized that the launching station, with its self-contained power supply, is the only piece of equipment required in the firing area after the missile has been assembled. All other signature items of equipment peculiar to the Sergeant battery can leave the position.

9. FIRING SET AND MISSILE LAUNCH COUNTDOWN OPERATIONS

a. The firing set located on the launching station is, in effect, the fire direction center of the Sergeant missile system. The firing set is capable of--

(1) Accepting firing data.

(2) Generating flight parameters and inserting them in the missile.

Figure 15. Firing set enclosure.

(3) Checking its computations.

(4) Controlling the automatic countdown.

(5) Controlling the automatic firing.

b. In addition to the above capabilities, the firing set monitors the missile functions continuously during countdown by making GO and NO GO checks.

c. All firing set operations are automatic after the target data and firing data are inserted at the operator control panel. When the firing set operations are completed, the missile is traversed, elevated, and fired automatically.

d. Missile assembly and receipt of firing data can be completed concurrently.

(1) The firing set operator completely self-tests the firing set and inserts the fire mission data (fig 15).

(2) The firing set enclosure houses two identical banks of electrical components. A malfunction in one bank does not preclude the completion of the mission. The operator can quickly switch to the other system, restart the countdown, and continue the mission.

(3) Prior to firing, the firing set operator evacuates his enclosure and continues monitoring the countdown from a remote firing position (fig 16).

Figure 16. Remote firing position.

(4) A manual override capability to hold or stop the firing sequence exists throughout the operation.

(5) In addition to a manual hold capability, the firing set provides automatic holds if, during the countdown, a malfunction occurs.

10. TRAJECTORY

a. The trajectory of the Sergeant missile has three phases--initial, midcourse, and final.

(1) The initial phase starts at FIRE and continues until motor burnout.

(2) The midcourse phase begins at motor burnout and lasts until the start of the final maneuver.

(3) The final phase maneuver lasts until impact. During the final phase maneuver, the missile makes the final trajectory correction to cause it to impact on the target.

b. Range control is achieved by the use of an aerodynamic dragbrake system. These dragbrakes extend periodically from the body of the missile and cause a resultant drag which is translated into a desired change in range.

c. Trajectory control is accomplished by an in-flight comparison of the actual trajectory and a preflight programmed trajectory.

11. SURVEY

a. The Sergeant battalion is authorized three survey parties, one party in headquarters and headquarters battery and one party in each of the two firing batteries. Each party is the standard eight-man party except that in the headquarters battery survey party a chief surveyor and a radiotelephone operator/driver for the battalion reconnaissance and survey officer have been added. The battalion reconnaissance and survey officer is a member of the battalion staff and is responsible for the supervision of all survey operations in the battalion. Each party is equipped with the mil-graduated T2 (0.002 mil) theodolite, the gyro azimuth orienting instrument, and a survey set, third order, for use in survey operations. The parties are equipped to extend survey control under all conditions to a prescribed accuracy of fifth order (1:1,000) in a position location and to provide direction accurate to three-tenths of a mil at the firing position.

b. Probably the most frequently used means of obtaining control, and certainly the most desirable, will be to obtain data from a control point established by an engineer topographic unit or a field artillery target acquisition battalion. The control provided should have a horizontal and vertical accuracy of fourth order (1:3,000) and direction accurate to fifteen-hundredths of a mil. When possible, the control point should be established within 1,000 meters of the firing site.

c. If survey control is not available close to the firing position to permit transfer of the control within the prescribed accuracy limitations, the battalion survey officer must establish a control point and obtain data by map inspection. Directional control is obtained by astronomic observation or by using the gyro azimuth orienting instrument.

d. Within the firing position the survey team (battery or battalion) must establish--

(1) The universal transverse mercator (UTM) grid zone.

Figure 17. Azimuth orientation system.

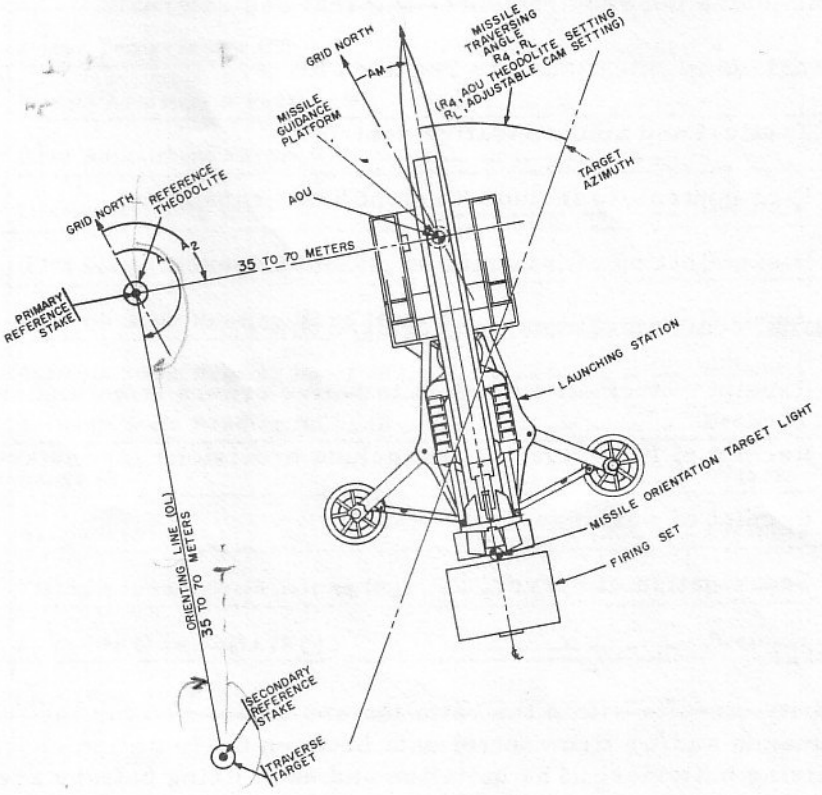


Figure 18. Azimuth orientation procedures.

(2) Three-dimensional grid coordinates (1:1,000).

(3) Grid azimuth of an orienting line in the firing position (0.3 mil).

e. The control data listed in d above is relayed to the firing battery and the battalion operations center where it is made a part of the firing orders. Missile azimuth is determined by using a modified reciprocal laying method (fig 17 and 18).

12. FIRE DIRECTION

a. Fire direction procedures in the Sergeant system are extremely simple. Personnel in the operations center at either battalion or the firing battery need only compile data supplied from various agencies into a fire order (fig 19). Information for the parameters in the first block is provided by the headquarters which orders the mission to be fired. With the exception of parameters 08 and 12, the information provided is in the form acceptable by the firing set. Transformation of spheroid and warhead parameter information requires only a simple conversion. The time of flight must be determined in order to provide an accurate firing time. The parameters in the local data and azimuth reference readings blocks are determined at the firing site and, except for motor temperature and azimuth scale readings, will be the same for all targets attacked from that position.

b. The information on the firing data sheet is inserted into the computer by the firing set operator. The computer converts this information to firing parameters, which are stored in a form acceptable by the missile. At the appropriate time the firing set operator initiates the firing countdown, and the parameters are automatically programmed into the missile.

13. COMMUNICATIONS

a. Communication Requirements. The Sergeant battalion, as all field artillery units, has two classes of communication requirements--internal and external.

(1) Internal communications are required for--

(a) Tactical and administrative control.

(b) Fire control (to include "instant hold" capability).

(c) Dissemination of information and intelligence.

(2) External communications are required for--

(a) Receipt of tactical and administrative orders from higher headquarters.

(b) Receipt of fire missions (to include provisions for instant hold).

(c) Receipt of warnings.

(d) Coordination of survey.

b. Wire System.

(1) Priority circuits within the battalion are those used for the transmission of fire commands and/or fire control data between the battalion operations center and the firing batteries. The battalion and each firing battery are equipped with terminal equipment, AN/TCC-14, to allow teletype, as well as voice transmissions, over these circuits (fig 20). If the distance to batteries is too great to lay

Firing Data Sheet

Firing Date ___ Day ___ Month ____ Year	Time on Target _____ hours	Conc No _____	Time of Flight _____ Seconds

	Para No.	Parameter		Para No.
Data From Battalion Headquarters	00	Target Easting (ET)	Meters	00
	01	Target Zone (ZT)		01
	02	Target Northing (NT)	Meters	02
	03	Target Million Section (MT)	Megameters	03
	08	Spheroid (SP)		08
	10	Target Altitude (YT)	Meters	10
	12	Warhead Parameter (WP)		12
	13	Arming Bound (B)		13
Local Data	04	Launch Easting (EL)	Meters	04
	05	Launch Zone (ZL)		05
	06	Launch Northing (NL)	Meters	06
	07	Launch Million Section (ML)	Megameters	07
	09	Launch Altitude (YL)	Meters	09
	11	Motor Temperature (Q)	°F	11
	14	Weight Adjustment Factor (W)		14
	15	Baro Adjustment Factor (C)		15
Azimuth Reference Readings	16	Missile Azimuth (AM)	Decimils	16
	20	UTM Survey Reference Line (A_1)	Decimils	20
	21	Azimuth Scale Reading No. 1 (R_1)	Decimils	21
	22	Azimuth Scale Reading No. 2 (R_2)	Decimils	22
	23	Azimuth Scale Reading No. 3 (R_3)	Decimils	23
Readouts	18	Range (R)	Meters	18
	19	Azimuth (A)	Decimils	19
	24	Firing Azimuth Scale Setting (R_4)	Decimils	24
	17	Launcher Slew Angle (R_L)	Decimils	17
	25	Burst Time (T_B)		25

Figure 19. Firing data sheet.

wire, these same capabilities may be obtained through the area system by means of sole-user circuits. In any event, the battalion headquarters and the firing batteries should tie into the area system for an alternate communication capability. Trunk circuits between the battery switchboard and the battalion command switchboard are installed for administrative use when time and distances permit.

(2) The wire system of the battalion is designed to allow the transmission of both voice and teletypewriter traffic over the same system without mutual interference. This capability is made possible by the use of telegraph terminal group AN/TCC-14 at the firing battery and at the battalion. Local circuits are installed within the battalion headquarters and within the firing batteries as required.

c. Teletype System.

(1) Teletype provides the most rapid means of transmitting a printed copy of a fire mission. The printed copy is passed to the battalion operations center and, while the mission is being processed, the teletype operator uses the tape copy on the reperforator transmitter to check the mission with higher headquarters. This provides a check on whether the mission was received correctly by the battalion and insures the transmission of correct data to the firing battery. While the taped mission is being transmitted to the originating headquarters, the same data can be sent to the firing battery, thus providing still another check on the data that is sent from the battalion headquarters.

(2) From the time a fire mission is originated at the controlling headquarters until the missile is fired at the battery, a circuit is kept open to permit instantaneous communication with the firing set operator. This capability is necessary in order that last minute changes or holds may be transmitted to the firing set operator at any time. This is called an instant hold capability.

d. Radio System.

(1) The Sergeant battalion operates two internal radio nets. The battalion command/fire direction net (CF), FM (fig 21), is used for command and control of the batteries within FM range of the battalion and for command, control, and coordination of staff activities and personnel. This net is also used by the firing batteries for internal control and coordination. The battalion command/fire direction net, AM (fig 21), provides a secure means of transmitting fire missions and fire control by radioteletype from the battalion operations center to the firing batteries. The same general procedures for processing a fire mission over wire circuits are applicable to radioteletype.

(2) A Sergeant battalion attached to a corps artillery operates in four external radio nets (fig 21).

(a) The corps artillery command/fire direction net, FM, is used primarily for control and coordination within corps artillery headquarters and between the headquarters and attached aircraft. The battalion commander, executive officer, and a base set in the operations center of the Sergeant battalion operate in this net, if distance permits.

(b) The Sergeant battalion receives fire missions over the corps artillery command/fire direction net, AM (RATT). This net may be used for command and administrative traffic if required.

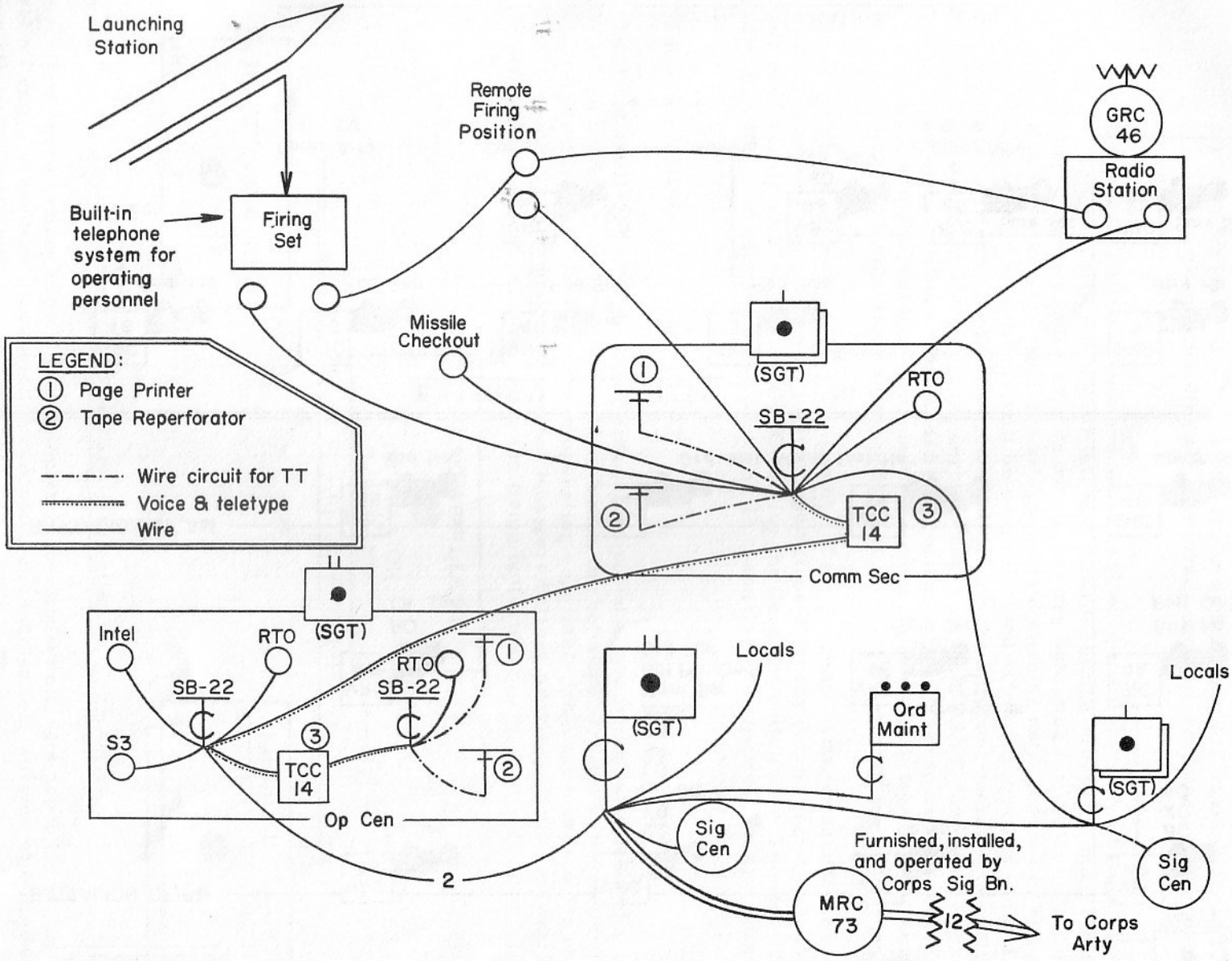


Figure 20. Type wire system, field artillery battalion, Sergeant.

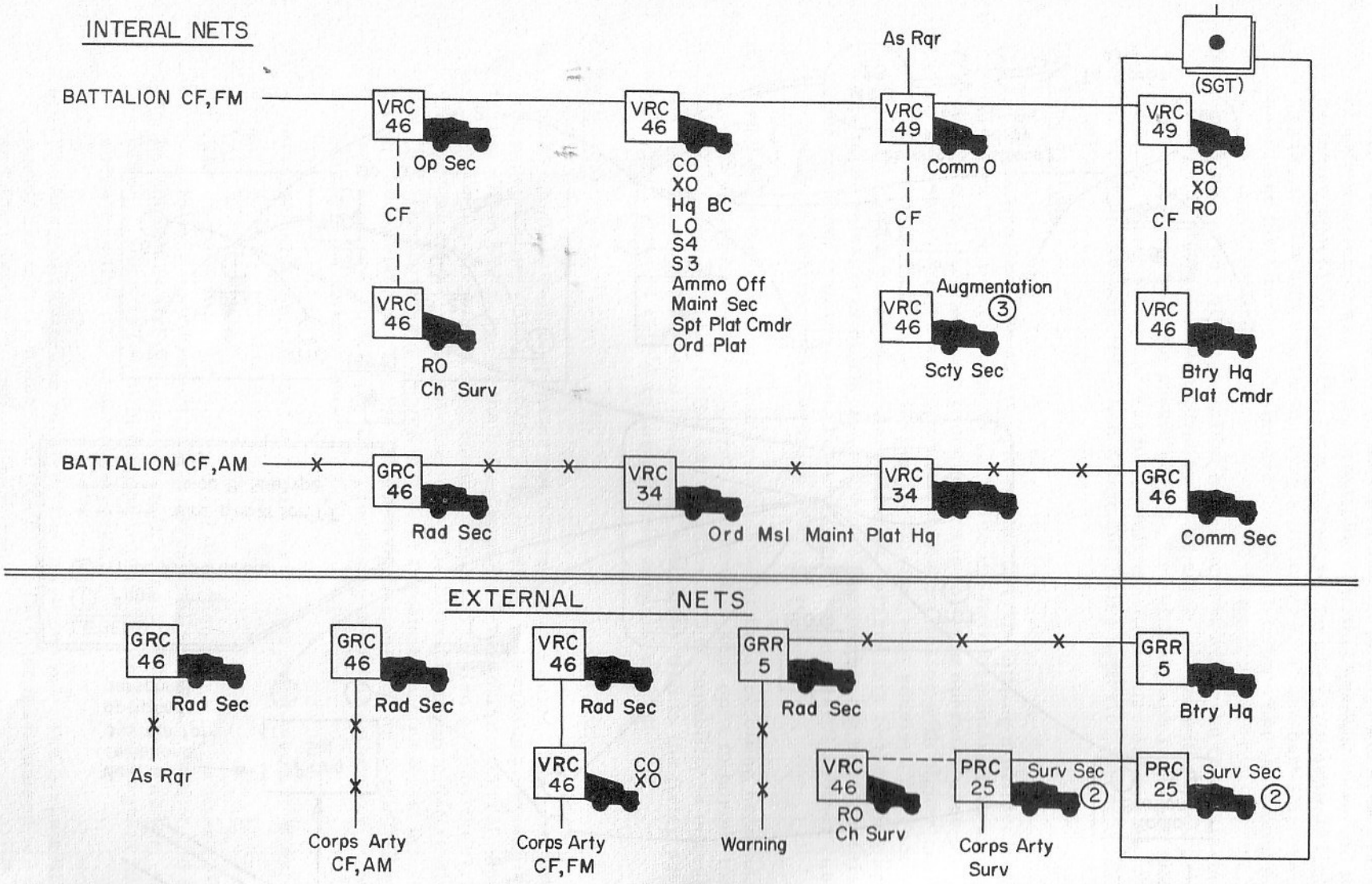


Figure 21. Type radio nets, field artillery battalion, Sergeant.

(c) The corps artillery survey channel, FM, is a common frequency used within the corps sector to provide local radio communication within or between all artillery survey sections.

(d) The Sergeant battalion monitors an appropriate AM warning net to receive warnings of impending air, airborne, nuclear, chemical, and biological attacks.

(3) A Sergeant battalion retained under control of the field army utilizes assigned FM and AM frequencies for internal control and the survey frequency of the corps artillery in the area in which they are operating for control and coordination of survey and monitors an appropriate warning net. Normally, communication with army artillery will be over allocated sole-user circuits in the army area system. If other communication with the Sergeant battalion is desired by the army artillery commander, the necessary AM RATT equipment to establish an army artillery command/fire direction net will have to be furnished by one of the army signal battalions under the control of the army signal group and as directed by the army signal officer.

e. Very High Frequency (VHF) Equipment. If the Sergeant battalion is attached to corps artillery, the radio relay platoon of the field operations company (corps signal battalion) will provide and operate VHF equipment (MRC-73) for the Sergeant battalions. This equipment is in addition to the TOE equipment and provides 12 channels of communication with corps artillery.

14. ORGANIZATION

The field artillery battalion, Sergeant, is composed of two firing batteries and a headquarters and headquarters battery (fig 22). Within the battalion structure, the basic fire unit is the firing battery, which is capable of operating separately from the battalion for short periods of time. The headquarters and headquarters battery provides command control and administrative and logistical support for the firing batteries.

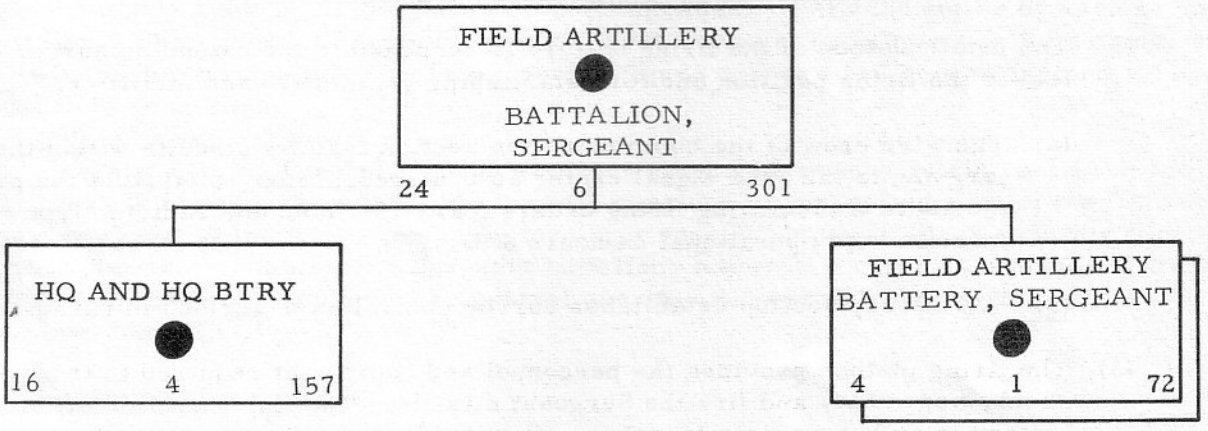


Figure 22. Field artillery battalion, Sergeant.

a. The firing battery (fig 23) is a completely functional unit. Its capabilities include missile firing and checkout, ammunition resupply, communication, survey, and limited administrative and logistical functions.

(1) The battery headquarters provides tactical control and mess, maintenance, supply, and administrative support for the battery.

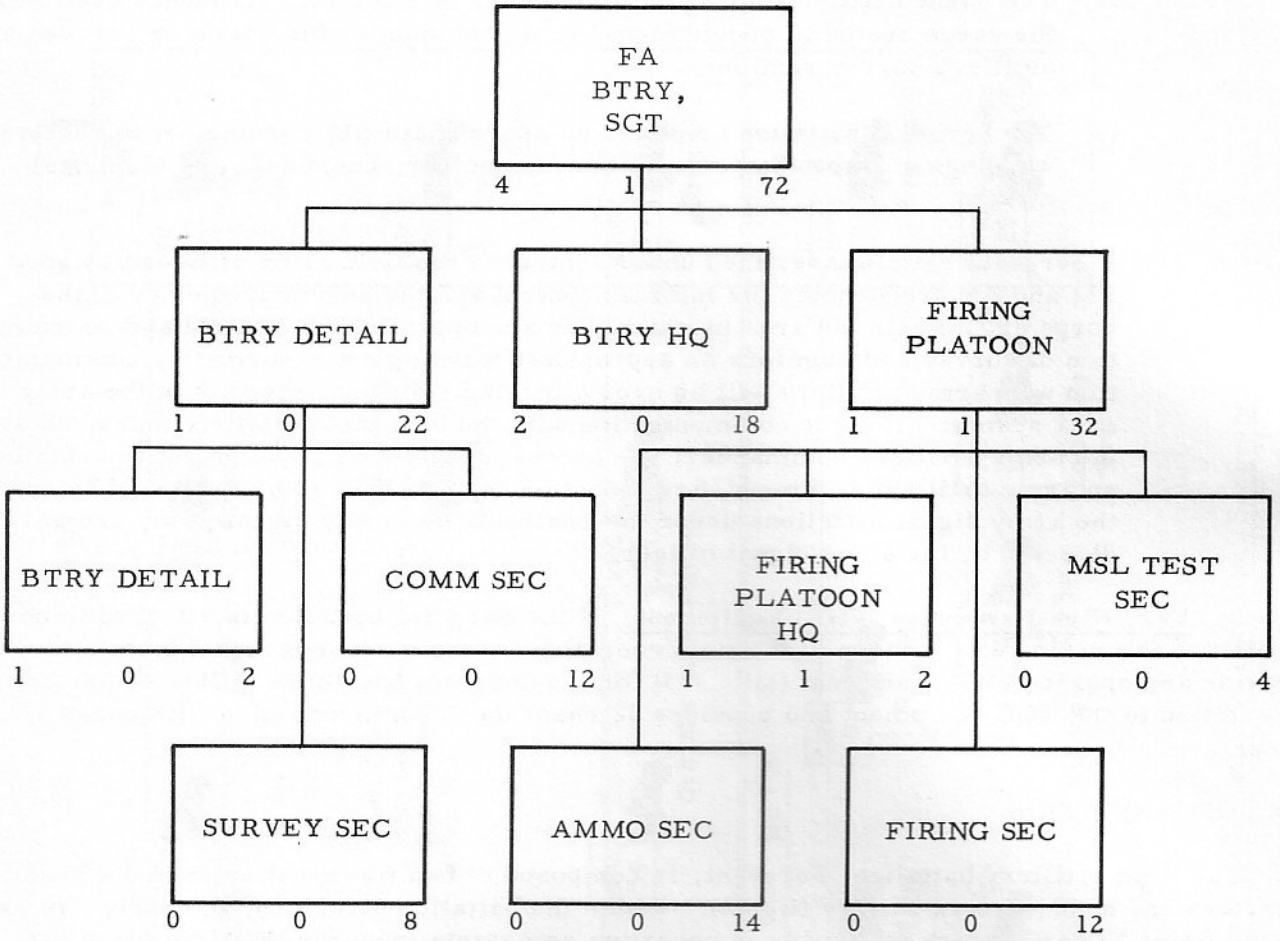


Figure 23. Field artillery battery, Sergeant.

(2) The detail platoon of the firing battery is responsible for extending survey control to the firing position and for establishing communication facilities.

(a) The wire crew of the communication section installs circuits within the battery and to the area signal center as required. Since teletype is the primary means of transmitting firing orders (para 13), land and radioteletype circuits must be kept operational 24 hours a day.

(b) The survey section establishes survey control as described in paragraph 11.

(3) The firing platoon provides the personnel and equipment required to transport, check, assemble, and fire the Sergeant missile. The firing section of the firing battery is authorized one launcher. Personnel in the firing section include a firing set operator, an azimuth orientation crew, and other launcher crewmen whose primary functions are missile handling. The missile test section is equipped with one organizational maintenance test station (OMTS), which has the function of testing missile sections in the shipping containers. The ammunition section is equipped to carry the components of two complete missiles and one Sergeant training round.

b. The headquarters and headquarters battery (fig 24) provides support for the firing batteries in the form of survey control, installation of communications, organizational vehicle maintenance, administration, and logistics.

(1) Since there is no surveillance requirement in the Sergeant battalion and no capability for target area survey and since the fire direction function is extremely limited, the operations and intelligence section is primarily concerned with training and operational control of the subordinate elements.

(2) The survey section is provided to augment the battery survey teams, when necessary.

(3) Because of the special requirements imposed on the storage of nuclear material, three augmentation security sections are provided in the table of organization and equipment. These elements will be provided when authorized by the Department of the Army.

(4) The ordnance missile maintenance platoon, which is organic to headquarters and headquarters battery, provides third-echelon maintenance and replacement parts for Sergeant equipment in the unit.

(5) The battalion staff (fig 24) coordinates the activities of the firing and support elements. The organization and functions of the staff are much the same as those in any artillery unit with the exception that the assistant S3 performs the limited S2 functions (internal security, document control, and counterintelligence) required in the Sergeant battalion (FM 6-20-2).

15. EMPLOYMENT

a. Assignment and Allocation. The Sergeant was designed to replace the Corporal as the corps general support missile system. The Sergeant battalion will be assigned and allocated in the same manner as the Corporal battalion. Thus, Sergeant battalions will be assigned to the field army and made available to the corps commander by attachment or by assignment of a mission. The current allocation provides three Sergeant battalions per field army, but it should be borne in mind that this is a planning figure only and is likely to have no relation to actual field conditions.

b. Organization for Combat. Army artillery commanders may retain control of the Sergeant battalions and assign them the tactical missions of general support of the field army or general support of the field army, reinforcing a specific corps or other separate force. The most appropriate status for a Sergeant battalion, however, is that of attachment to a corps, since this gives the corps commander control over the nuclear delivery system which will support his operation.

c. Capabilities.

(1) The Sergeant missile is primarily a nuclear fire support weapon; and, since the Sergeant has no high explosive capability, all tactics are based on the premise that it will be employed in a nuclear war. In nonnuclear war, the Sergeant (and other nuclear delivery means) will be deployed on the battlefield ready for employment in nuclear war should it develop. The mission of the Sergeant battalion under these conditions will be to maintain a posture which will permit firing on the enemy's nuclear delivery means and other suitable targets in a minimum amount of time.

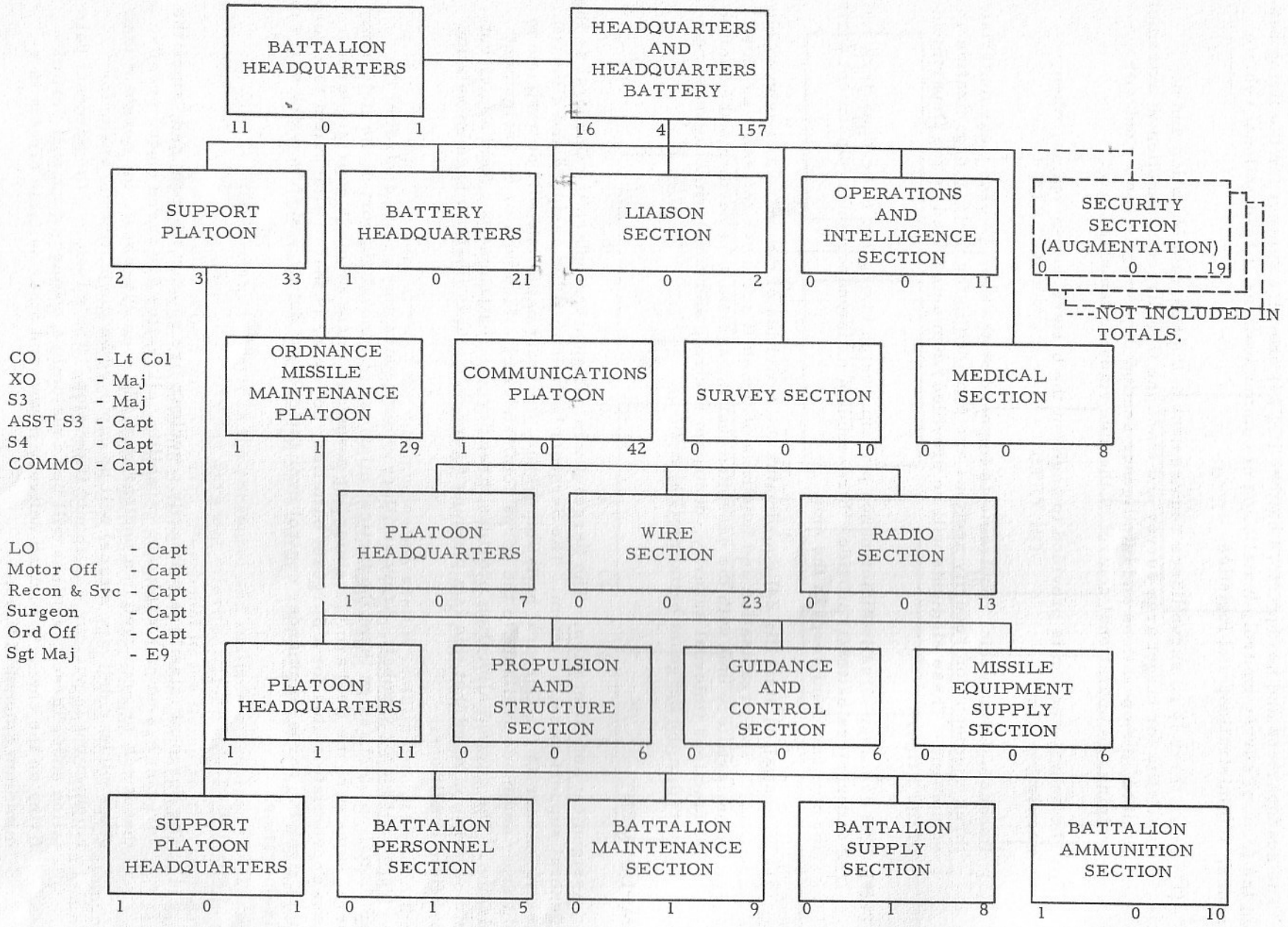


Figure 24. Headquarters and headquarters battery, field artillery battalion, Sergeant.

(2) The Sergeant battalion is 100 percent mobile. Of the vehicles in the firing battery, five are towed, special purpose, trailer-type vehicles. These are the launcher, the organizational maintenance test station, and three missile transport semitrailers. All Sergeant equipment is air transportable in C-130 or C-133 aircraft.

d. Considerations in Tactical Employment.

(1) The Sergeant battalion represents a departure from the battalion fire unit concept under which all first-generation missile systems were organized. Since the Sergeant battalion has two firing batteries, the commander of the supported force is insured of continuous fire support, regardless of displacement requirements.

(2) Target acquisition is a responsibility of the supported headquarters and is, in itself, a problem. The artillery target acquisition battalions must exert every effort to obtain suitable targets for Sergeant and other long-range systems. One of the most important missions in the target acquisition field is education. All elements of the Army must be thoroughly indoctrinated in the concept of a battlefield greatly expanded in depth--both in front and to the rear of the forward edge of the battle area (FEBA). Targets that may have been completely ignored in World War II or left for attack by the Air Force are now within range of weapons controlled by the ground force commander. Only those commanders who are fully aware of the potential--and the requirements--of Sergeant and other missile systems will be able to achieve the greatest success in future wars. Timely warning orders which alert the battalion to possible fire missions will greatly enhance the effective utilization of the Sergeant firing batteries. No specific targets for the Sergeant system can be enumerated. At the outset of a nuclear war, Sergeant and other nuclear delivery means will be primarily concerned with obtaining nuclear superiority on the battlefield. In the initial stages of a nuclear war, then, the targets for Sergeant and other nuclear means will be the enemy's nuclear artillery, nuclear ammunition supply points, control centers associated with nuclear delivery means, and air defense artillery sites. After artillery has attained nuclear superiority, fires may be diverted to the attack of other targets.

(3) The missions of general support or general support-reinforcing place certain inherent responsibilities on the controlling headquarters, in addition to those already mentioned. A unit with the mission of general support may expect the supported headquarters to install communications, but a unit with a general support-reinforcing mission is required to install communications to the reinforced unit. In practice, this is usually a joint effort between both elements. Next, the supported force must designate and coordinate position areas for the Sergeant battalion. Normally, separate position areas will be required for each of the three batteries in the battalion, and each firing battery will require several separate firing positions. These separate firing positions may be 5 or 10 kilometers from the battery position area and will vary in number, depending on the space available and the time available to establish survey and communications. The individual batteries will be separated sufficiently to preclude the loss of more than one battery from a single nuclear attack. The specific separation distance will vary, depending on the capability of the enemy. To give an example, if the enemy is capable of attacking with a 100-KT weapon, units must be separated by at least 15,000 meters. Finally, the supported force is responsible for insuring timely displacement of the Sergeant batteries.

(4) In the employment of nuclear delivery artillery, one of the greatest problems is logistics. This problem is generally in two areas--that of resupply of complete

rounds of ammunition and resupply of component parts for the ground support equipment. Even though the logistical and maintenance problems of the Sergeant are considerably less than those of the first-generation missiles, commanders at all echelons must vigorously apply themselves to these problems.

e. Fire Planning and Fire Support Coordination.

(1) Authority to fire a Sergeant missile, regardless of the type of warhead, is retained by the commander of the supported force. The decision to attack a specific target with a Sergeant missile should be based on a recommendation by the target analyst; however, in many cases, Sergeant may be the only system capable of attacking the target. Thus, the decision to fire may be based on expediency rather than mathematical computations. While the Sergeant battery is capable of firing large numbers of Sergeant missiles in any given time period, the actual expenditure will be based on the availability of ammunition and special ammunition load as prescribed by the field army. The minimum and maximum ranges of the Sergeant are such that its area of coverage is beyond the capabilities of the Honest John and Lacrosse systems and short of those of the Redstone and Pershing systems. The fire plan for a specific operation will coordinate and integrate the fires of Sergeant battalions with the fires of other field artillery. In past wars the plan of fire support was built around a plan of maneuver of the supported force, but, with the advent of the guided missile and the nuclear capability within the field army, the plan of maneuver, in some instances, may be built around the plan of fire support.

(2) Normally, fire missions sent to the Sergeant battalion will be encoded for reasons of security; however, in emergency situations fire missions may be transmitted in the clear. Specific items of information required by the Sergeant battalion include target coordinates and altitude, height of burst desired, type of warhead, yield desired, and time on target. This information is usually transmitted to the battalion, using a standard format for nuclear fire orders. The actual means of transmission utilized will vary with the situation and the means of communication available. The most desirable means is on-line crypto transmission, and the least desirable means is voice transmission utilizing a numerical code.

f. Reconnaissance, Selection, and Occupation of Position. The Sergeant firing battery is small in terms of personnel and equipment, its position area requirements are easily satisfied, and it is easily handled on the battlefield. Therefore, the problems of tactical employment are minor and few in number. The basic principles of RSOP (reconnaissance, selection, and occupation of position) apply to all field artillery; therefore, only the specific points applicable to the employment of the Sergeant battalion will be discussed.

(1) Sergeant battalions will displace only on order or authority of the controlling artillery commander. In organizing the firing battery for movement, the battery commander will put those vehicles necessary for the conduct of fire at the head of the column. Since certain pieces of equipment, such as the launcher and the missile transport semitrailer, are easily recognized as Sergeant equipment, a battery should move during periods of limited visibility in order to prevent the enemy from identifying these signature items.

(2) Position area requirements for the firing battery are easily satisfied. A cleared area approximately 20 meters in diameter is necessary for the launcher. This will provide sufficient space for placing the warhead vehicle and the transport semitrailer alongside the launcher during the loading operation. The firing position should be fairly level, and there should be separate routes into and out of the position. The Sergeant system has nearly all-round fire capability; therefore,

the battery commander has a great amount of latitude in positioning a launcher. Position area requirements for the organizational maintenance test station are the same as those for the launcher.

(3) The entire battery can be placed within a "goose egg" 300 to 400 meters in diameter, depending on the amount of natural or artificial concealment available. Firm ground and adequate road nets are desirable in a field position. It is conceivable that Sergeant firing batteries will use small towns or villages as position areas, since the garage- and barn-type structures afford excellent concealment for the distinctive vehicles in the unit and roads and hardstands are plentiful. Other installations within the battery are emplaced so that they can accomplish their mission and make the best use of the terrain. In the final analysis, any position area that permits the battery to accomplish its mission is acceptable regardless of the terrain features.

(4) The only absolute requirement for a headquarters and headquarters battery position area is that it be located where communication can be established with the firing batteries and the supported force headquarters.

(5) Generally, Sergeant battalions will be positioned where they can attack targets beyond the capabilities of the Honest John and the Lacrosse (36 kilometers in front of the FEBA). However, variations of this rule must be expected because of specific requirements. Firing positions may be established considerably farther forward for specific missions, and the firing batteries may be echeloned to the rear when a withdrawal is contemplated. A further consideration in positioning is resupply of Sergeant ammunition. Generally, the positions should be located so that one of the three SASP's (special ammunition supply points) within the corps is readily accessible. Resupply of nuclear ammunition is one of the greater problems of nuclear warfare, and each warhead is carefully controlled down through the chain of command. The relative scarcity of nuclear warheads precludes large stocks being accumulated in any artillery unit. Since missiles and warheads remain on the transporters until loaded, the amount of time required for resupply is especially important for a Sergeant unit. Further, because of their large inventory of missiles, the SASP's are not very maneuverable and are likely to be some distance to the rear, requiring long turnaround times from the firing units.

PART THREE

SUMMARY

16. SUMMARY

Although the Sergeant is primarily a nuclear delivery system, its influence will be felt on the battlefield even during a nonnuclear war, since its presence represents an "ace in the hole" for the commander who controls its fires. In the hands of well-trained crews and energetic and competent leaders, the Sergeant system provides the commander with potent means of influencing the battle.

17. SPECIAL NOTES

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