ARMY CORRESPONDENCE COURSE PROGRAM OF THE US ARMY AIR DEFENSE SCHOOL

ADA SUBCOURSE 703-3

NIKE HERCULES LAUNCHING AREA
(14 Credit Hours)

INTRODUCTION

This subcourse consists of five lessons and an examination as shown below. Schedule your own program for completion of this subcourse by filling in a target date for completion of each lesson. We suggest that you allow no more than 1 week for each lesson.

Lesson Number	Lesson Title	Credit Hours	Scheduled Completion Date	Date Mailed
1	Launching Area Layout and Launching Platoon Equipment	2		
2	Nike Hercules Missile	2		
3	Nike Hercules Missile Preparation	2		
4	Launcher and Associated Equipment	2		
5	Launching Platoon Control Equipment	3		
Exam	(This will be sent to you after you complete the lessons.)	3		

Texts furnished: Attached memorandums.

The Nike Hercules launching area contains the equipment for launching the Nike Hercules missile and for exercising tactical control over the launching area. In addition, the launching area contains the Nike Hercules missiles and the facilities for assembling, servicing, and testing these missiles. This subcourse describes launching area configurations, launching platoon equipment and operations, the Nike Hercules missile and missile functioning, and missile assembly, servicing, and testing.

You may spend as much time as you wish to complete the subcourse and the examination. You may use the attached memorandums in solving the lesson and examination exercises. Read the exercises carefully. For each exercise, select the CORRECT choice. If more than one choice is correct, select the BEST one. Record your solutions on the optical scan answer form. Read the directions on the sample optical scan answer form provided with the subcourse.

This subcourse reflects the current thought of the US Army Air Defense School and conforms as closely as possible to published Department of the Army doctrine. The material presented herein is subject to change due to development and progress; therefore, you are cautioned to base your solutions on the text assignments and not on individual or unit experience.

MOS APPLICATION: Officer area 1 - Air defense missile unit commander (Nike Hercules) - Job proficiency.

LESSON ASSIGNMENT SHEET

ADA SUBCOURSE 703-3	--Nike Hercules Launching Area.
LESSON 1	--Launching Area Layout and Launching Platoon Equipment.
CREDIT HOURS	--2.
TEXT ASSIGNMENT	--Attached memorandum.
MATERIALS REQUIRED	--None.
SUGGESTIONS	--See appendix for unfamiliar terms and abbreviations.

TRAINING OBJECTIVES

Listed below are the training objectives for this lesson. These objectives tell you what you should be able to do as a result of your studies. Therefore, you should be familiar with the objectives before you start to study.

When you have completed this lesson, you should be able to:

1. List the three subdivisions of the Nike Hercules launching area (LA).
2. Recognize the configurations for the underground launching section, three types of permanent aboveground launching sections, and the mobile launching section.

3. List the six major items of equipment of the launching platoon and state the purpose of each.

4. Recognize the personnel involved in organizational and direct support maintenance of launching platoon equipment.

5. State the priorities for emplacement of launching platoon equipment.

6. State the limiting factors for separation distances between the battery control area (BCA) and LA. Battery Control area (BCA) Launching Area (LA)

7. Recognize the separation distances and leveling requirements for major items of equipment.

8. Recognize five mandatory and five desirable requirements for emplacing launching area equipment.

9. List the three categories of data flow in the LA and state the purpose of each.

ATTACHED MEMORANDUM

(This memorandum consists of material approved for resident instruction in the US Army Air Defense School and conforms to current Department of Army doctrine.)

1. LAUNCHING AREA LAYOUT

a. General. The launching area consists of three functional subareas: assembly area, service area, and launching section area (fig 1-1). Assembly area operations include air and oil servicing of the missile hydraulic power unit (HPU) and missile electrical checkout. The forward and rear body sections are temporarily joined for these operations. Service area operations include installing the missile rocket motor in the rear body section, joining the forward, warhead, and rear body sections, and installing the missile wiring harnesses. Because explosive components are checked and installed in this area, it is revetted. Launching section area operations include missile body and rocket-motor cluster joining, ready missile storage and maintenance, final preparation of the missile, and missile launching. Launching platoon equipment consists of a trailer-mounted launching control station (LCS) and three launching sections. The launching sections may be one of two general types—permanent (fig 1-2) or mobile (fig 1-3). In the permanent installation, the LCS undercarriage is removed and the trailer emplaced on logs on a concrete pad.

b. Launching section configurations. Launching section configurations are of three types: permanent underground, permanent aboveground, and mobile. Permanent installations vary to some degree because of geographical location and individual site requirements.

(1) The permanent underground launching section (fig 1-4) is used in the continental United States (CONUS). This configuration consists of three launchers emplaced aboveground and one launcher on a hydraulic elevator. Three launcher control-indicators (LCI) are underground at test stations and one is aboveground. The section control group (SCG) is in a separate blast-proof room. Variations in the underground configuration include an additional room for the rotary converter (power source), a three-launcher configuration that has a loading (storage) rack on the elevator in place of a launcher, and a four-launcher configuration that has two LCI's aboveground and two underground.

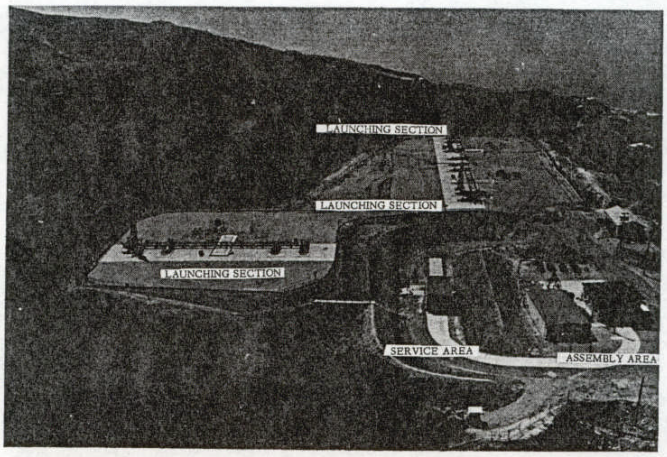


Figure 1-1. Nike Hercules launching area.

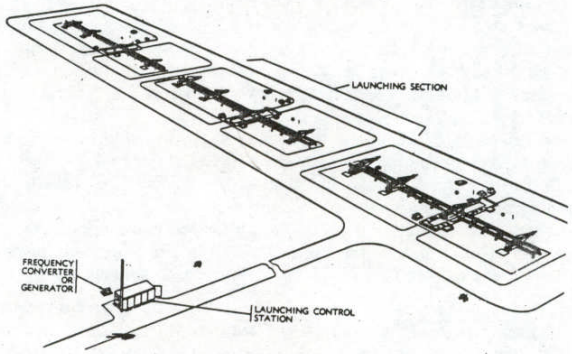
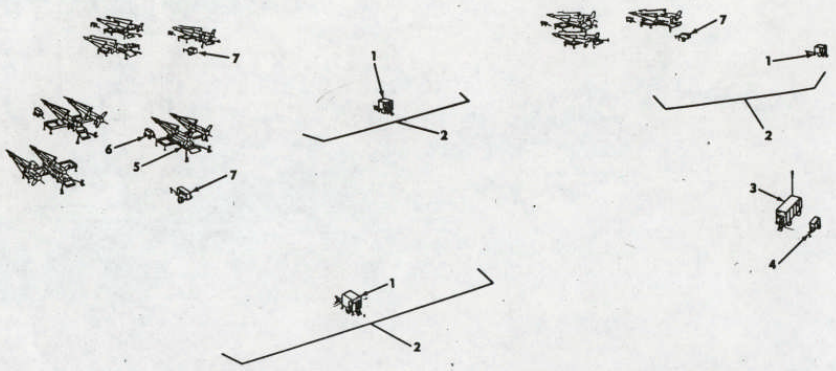


Figure 1-2. Permanent launching section installation

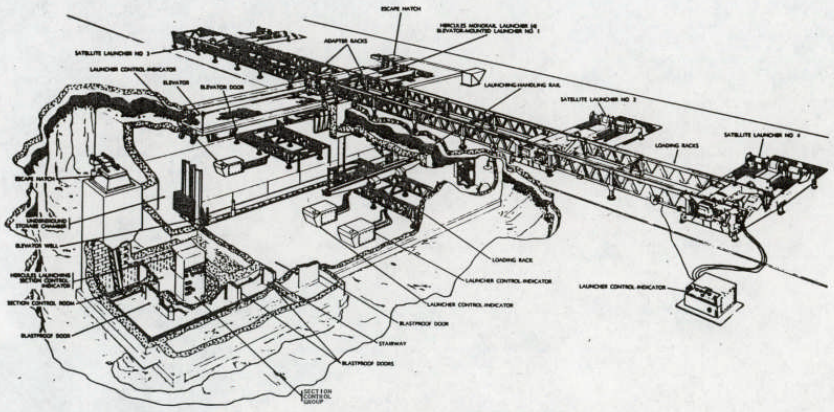
(2) The permanent aboveground launching section shown in figure 1-5 is used in Europe and to a limited extent in CONUS. It has three launchers. Loading (storage) racks provide the means for transporting missiles from the missile storage building to the launchers.

(3) The permanent aboveground launching section used in Alaska has four launchers. The two end launchers are fixed. The two center launchers can be moved by rail into the missile storage building in front of the launchers. The SCG is in a separate room at the rear of the missile storage building.



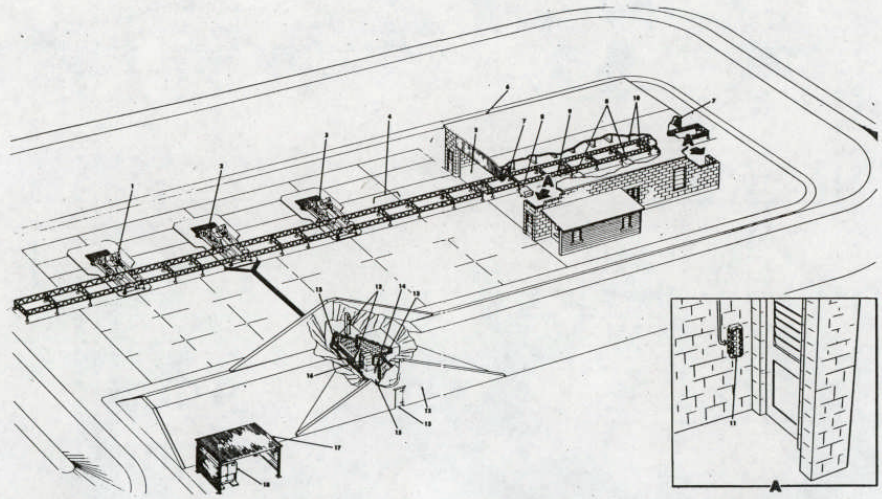
1. Section operating equipment trailer
2. Nike Hercules mobile launching section
3. Launching control station
4. 400-Hz generator
5. Nike Hercules launcher
6. Launcher control-indicator
7. 400-Hz generator

Figure 1-3. Mobile launching section emplacement.



Note. Six launching-handling rails omitted for clarity.

Figure 1-4. Underground launching section.

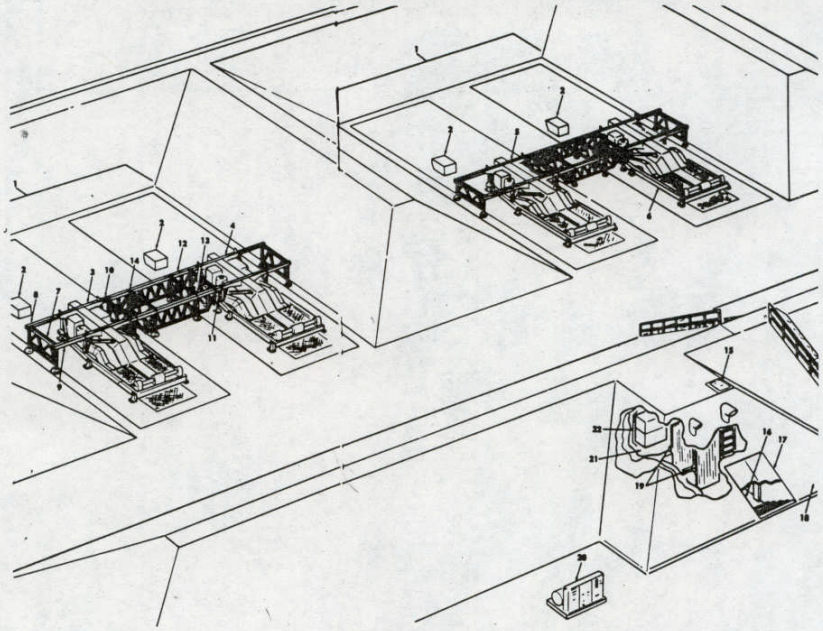


1—Launcher No. 2
2—Launcher No. 2
3—Launcher No. 1
4—Storage rack section
5—Bridge frame
6—Missile storage building
7—Roll-up door
8—Launcher control-indicator
9—Test station hydraulic pumping unit
10—Storage rack
11—Roll-up door control panel
12—Section control center
13—Door
14—Section control room
15—Passageway
16—Section control group
17—Generator shed
18—400-cps generator

Figure 1-5. Aboveground launching section (Europe).

(4) The permanent aboveground launching section used in Hawaii (fig 1-6) has revetments for each pair of launchers in the section. The SCG is built into the revetment to the rear of the launchers.

(5) The mobile launching section (fig 1-3) is used in the field army. It has three mobile launchers and associated storage racks, a trailer-mounted 400-Hz generator, and a section operating equipment trailer that contains the SCG.



1. Revetted area
2. Launcher control-indicator
3. Launcher No. 1
4. Launcher No. 2
5. Launcher No. 3
6. Launcher No. 4
7. Storage rack support (12)
8. Forward adapter assembly (4)
9. Rear adapter assembly (4)
10. Forward track section assembly (4)
11. Rear track section assembly (4)
12. Forward storage rack bridge (4)
13. Rear storage rack bridge (4)
14. Side truss (4)
15. Escape hatch
16. Passageway
17. Entrance
18. Section control center
19. Door
20. 400-Hz rotary converter
21. Section control room
22. Section control group

Figure 1-6. Aboveground launching section (Hawaii).

2. LAUNCHING PLATOON EQUIPMENT

Major items of launching platoon equipment are the launching-handling rail, Nike Hercules launcher, LCI, SCG, and LCS. In addition, mobile units use the ready-round transporter.

a. Launching-handling rail. The launching-handling rail (fig 1-7) provides support for the Nike Hercules missile and furnishes initial guidance at launch. It supports the missile body and rocket-motor cluster for joining, moving the missile along the loading and storage racks, and launching operations. The launching-handling rail also provides signal voltage paths between the missile and launcher or test station.

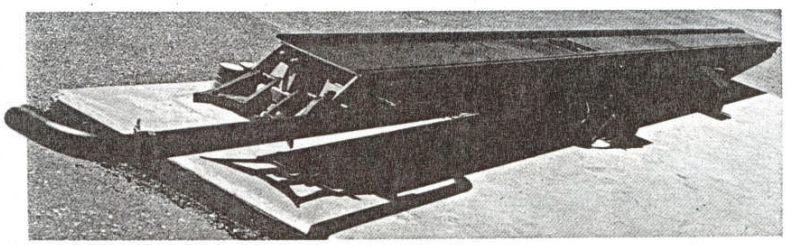


Figure 1-7. Launching-handling rail.

b. Nike Hercules launcher. The Nike Hercules launcher (fig 1-8) erects the Nike Hercules missile (on its launching-handling rail) to the firing position and provides signal paths between the launching-handling rail and the LCI. The mobile launcher (fig 1-9) is a Nike Hercules launcher with the addition of a field adaption modification kit, transport modification kit, and blast deflector.

c. Ready-round transporter. The ready-round transporter (fig 1-10) is used by mobile Nike Hercules units. It transports a completely assembled missile round on a launching-handling rail. The transporter has hydraulic adjustments for height and level, transfer rails, a hand-operated winch, and a 3-kw generator that furnishes power for conditioning the round during travel.

d. Launcher control-indicator. An LCI (fig 1-11) is associated with each Nike Hercules launcher. It provides a testing and monitoring capability for as many as four missiles (one

on the launcher and up to three at the associated test stations) and local control of the launcher. It also provides signal paths between the launcher and SCG.

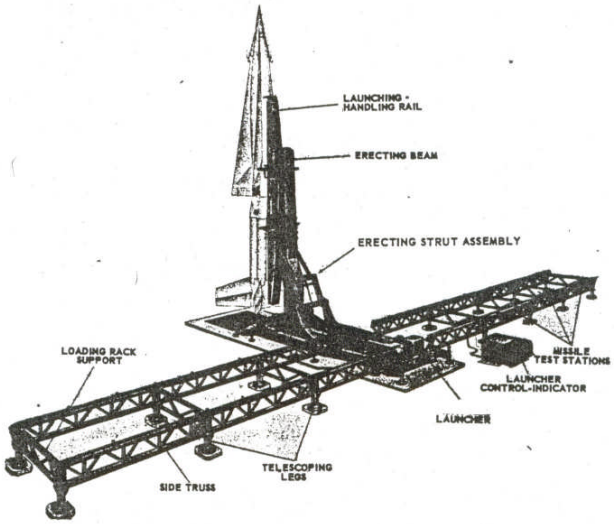


Figure 1-8. Nike Hercules launcher and associated equipment.

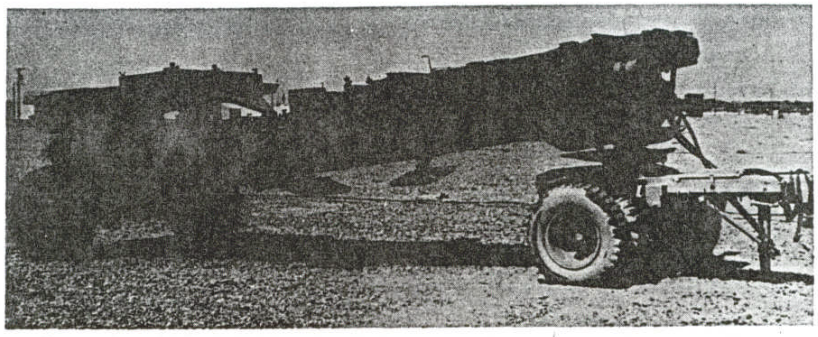


Figure 1-9. Nike Hercules mobile launcher.

e. Section control group. The SCG (fig 1-12) consists of a section control-indicator (SCI) and a section simulator group (SSG). It provides control of the launchers in a launching section and distributes power to the launchers. The SCG also provides signal paths between the LCS and LCI's. In a mobile unit, the SCG is housed in the section operating equipment trailer (fig 1-13).

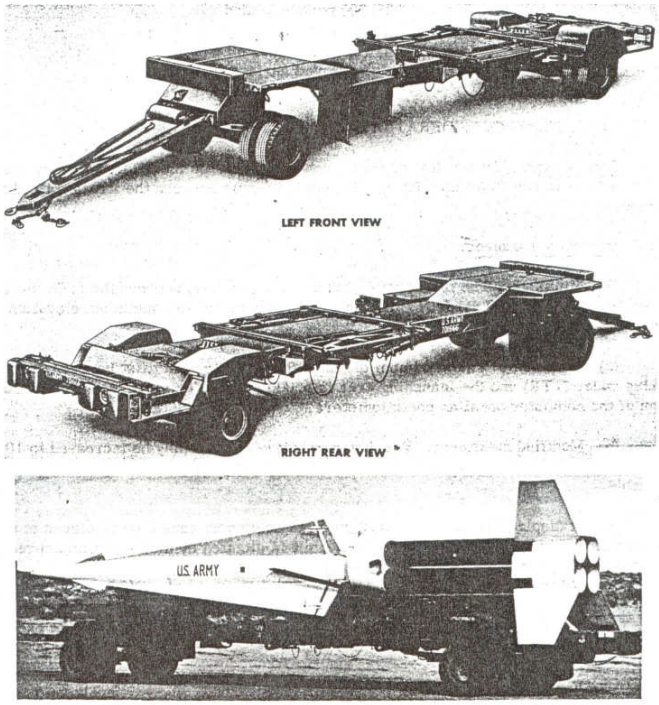


Figure 1-10. Ready-round transporter.

f. Launching control station. The LCS (fig 1-14) provides tactical control over the LA and coordination of activities between the battery control area (BCA) and the launching area. To perform these functions, the LCS has a launching control console (5) and a communications switchboard (in the intercommunication cabinet (7)). The LCS provides signal paths between the director station in the BCA and the SCG's.

Figure 1-11. Launcher control-indicator.

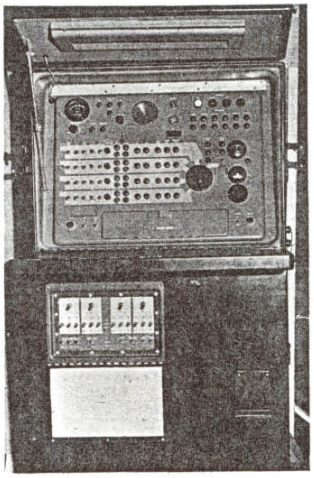


Figure 1-12. Section control group.

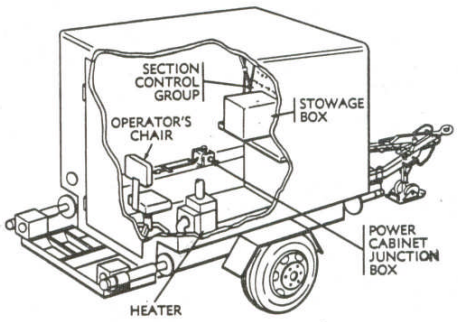


Figure 1-13. Section operating equipment trailer.

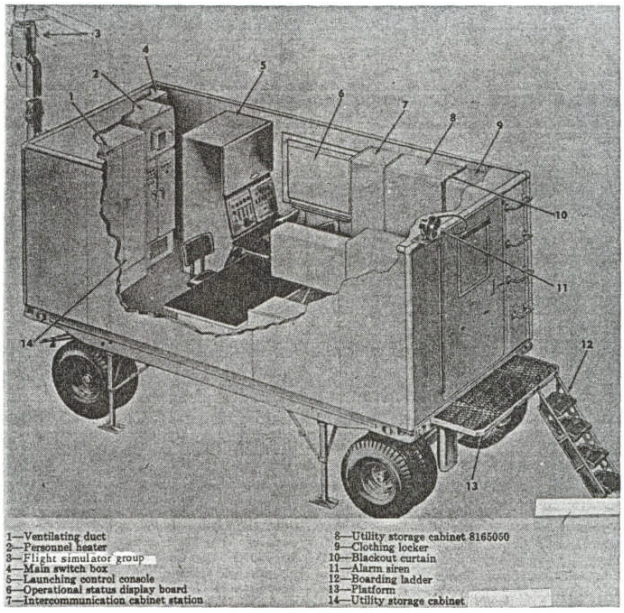


Figure 1-14. Launching control station.

3. ORGANIZATION FOR MAINTENANCE

a. General. Organizational maintenance for the launching platoon is provided by personnel organic to the platoon. Direct support maintenance for field army units is provided by the support platoon, which is organic to the headquarters and headquarters battery (HHB) of the Nike Hercules battalion. Direct support maintenance for CONUS units is provided by CONARC agencies and installations facilities.

b. Organizational maintenance. The following personnel are assigned to the launching platoon.

(1) Field army battery (TOE 44-537G).

Section	Title	Grade	MOS	Nr
Platoon Hq	AD Missile Assembly Technician	WO	221B0	2
	Equipment Reports Clerk	E-4	71T20	1
	Repair Parts Specialist	E-4	76R20	1
	Multipurpose Power Generator Operator/Mechanic	E-4	52B30	1
Assembly and Service	Electrical/Mechanical Materiel Chief	E-7	24U40	1
	Assembly Sergeant	E-6	24U40	1
	Electrical/Mechanical Materiel Specialist	E-5	24U20	3
	Multipurpose Power Generator Operator/Mechanic	E-4	52B30	1 *

(*Also 1 E-4 and 2 E-3 for 3 launching sections.)

(2) CONUS battery (TOE 44-547G).

Platoon Hq	AD Missile Assembly Technician	WO	221B0	1
	Engineer Missile Equipment Mechanic	E-4	62C20	2
Assembly and Service	AD Missile Assembly Technician	WO	221B0	1
	Electrical/Mechanical Materiel Chief	E-7	24U40	1
	Assembly Sergeant	E-6	24U40	1
	Electrical/Mechanical Materiel Specialist	E-5	24U20	1
	Equipment Maintenance Clerk	E-4	71T20	1
	Prescribed Load List (PLL) Clerk	E-4	76R20	1

c. Direct support maintenance. The following personnel are assigned to the HHB support platoon of the field army battalion for launching platoon maintenance support (TOE 44-536G).

Section	Title	Grade	MOS	Nr
Platoon Hq	Repair Parts Specialist (Missile)	E-4	76R20	4
Missile-Ground Handling Support	AD Missile Repair Technician	WO	251B0	1
	Nike Maintenance Supervisor	E-7	23W50	1
	Missile Repair Foreman	E-6	22M40	1
	Senior Launcher Repairman	E-6	22G20	1
	Senior Missile Repairman	E-6	22M20	2
	Launcher Repairman	E-5	22G20	2
	Missile Repairman	E-5	22M20	4
	Assistant Launcher Repairman	E-4	22G20	2
	Assistant Missile Repairman	E-4	22M20	3
	Multipurpose Power Generator Operator/Mechanic	E-4	52B30	2
	Launcher Repair Apprentice	E-3	22A10	1
	Missile Repair Apprentice	E-3	22A10	2
Power-Air Conditioning Support *	Repair Foreman	E-6	52D40	1
	Power Generator Equipment Repairman	E-5	52D20	4
	Senior Engineer Missile Equipment Specialist	E-5	62C30	1
	Engineer Missile Equipment Specialist	E-4	62C30	2
	Power Generator Equipment Repair Assistant	E-4	52B30	2
	Engineer Missile Equipment Repair Apprentice	E-3	62B10	1

* This section also supports the fire control platoon.

4. SITING REQUIREMENTS

Siting requirements include emplacement priorities, area separation distances, distances between major components of the launching set, safety, and leveling conditions. They also include requirements that insure maximum system accuracy. The requirements described in this paragraph pertain primarily to mobile sites. Permanent sites are prepared with a suitable building, concrete pads, and underground facilities prior to the installation of the launching set.

a. Priorities for emplacement. When emplacing the launching set, priority of placement of major items of equipment is as follows:

(1) Top priority is given to the launcher complex because the slope of the terrain on which the launchers are emplaced must not exceed 17 mils to permit leveling. Also, line of sight is required between each erected missile and the missile-tracking radar (MTR) antenna. Consideration must be given to rocket-motor cluster disposal. NOTE

(2) Second highest priority is given to the LCS to insure that it will not mask any erected missile from the MTR antenna.

(3) Third priority is given to the SCG.

(4) The remaining items of the launching set may be placed anywhere in the launching site within reach of the issued cables, providing the safety and line-of-sight requirements are met.

b. Area separation distances. The minimum distance between the LA and BCA is 1,000 yards (914 meters). This distance is determined by the maximum tracking rate of the MTR antenna during the boost phase of the missile. The maximum distance between areas is 6,000 yards (5,486 meters). This maximum distance is limited by the design of the computer parallax circuits. Modification of these circuits can increase the maximum distance to 10,000 yards (9,144 meters). Also, maximum separation distances may be limited by the number of interarea cable lengths that are available.

c. Distance requirements between major components. Minimum distances cited below are influenced primarily by safety considerations; maximum distances are influenced primarily by cable lengths:

(1) Between launching sections - 450 feet (137 meters) minimum.

(2) Between the LCS and launchers - 800 feet (244 meters) minimum.

(3) Between the LCS and section operating equipment trailers - 300 feet (91 meters) minimum, 750 feet (228 meters) maximum.

(4) Between the section operating equipment trailer and launchers - 425 feet (130 meters) minimum, 500 feet (153 meters) maximum.

(5) Between the section operating equipment trailer and generator - 375 feet (114 meters) minimum.

d. Leveling requirements. Leveling limitations require that slopes on which equipment is placed not exceed the following: trailer-mounted LCS - 89 mils longitudinally and 160 mils transversely; mobile launchers - 17 mils in either direction.

e. Mandatory requirements to achieve maximum system capability.

(1) Equipment must be emplaced so as not to exceed the usable length of supplied cables. Cables are issued in 126- and 252-foot lengths. Usable lengths are usually 115 feet and 230 feet, respectively. Usable length depends primarily on terrain variations and distances between the ground and junction boxes on the equipment.

(2) Large metallic surfaces, other than chain-link fences, must not be present in the area to the rear of each erected launcher. This area extends from 60 yards

(55 meters) to 180 yards (165 meters) behind the missile and to 20 mils on either side of the missile as measured from the MTR antenna.

(3) Line of sight must exist between each erected missile and the MTR antenna and between the MTR antenna and the flight simulator group mounted on the LCS mast.

(4) The angle of depression between the MTR antenna and an erected missile must not exceed 200 mils, which is the angular depression limit of the MTR.

(5) Minimum safe distances between components of the launching set and areas or buildings to be safeguarded must be provided. These distances are dependent upon the quantities of explosives expected to be stored in the LA at any one time.

f. Desirable requirements. The following requirements must be met when possible:

(1) Terrain should be fairly level or suitable for leveling and as free as possible from obstructions such as boulders, trees, and structures. The soil should not be too rocky or marshy.

(2) Crossroads that can be extended or reconditioned should exist within the selected site. Roads are required to connect the subareas and allow access for missiles to the launchers and storage racks.

(3) The launchers should be emplaced within a 180° sector centered about the primary field of fire, and in front of, and directed away from, the BCA.

(4) The direction of fire should be toward the primary field of fire. Firing in another direction is permissible but increases missile time of flight.

(5) The rocket-motor cluster disposal area should be selected to minimize the possibility of damage to manmade structures. It should be in front of the LA, away from the defended area.

5. LAUNCHING AREA DATA FLOW

Data flow in the LA can be divided into three categories: fire command, gyro azimuth (A_G) transmission, and control and indicating. Data flow in the LA is shown in figure 1-15.

a. Fire command. The fire command originates at the battery control console in the director station. It is initiated by the battery control officer (BCO) when the target being engaged is within firing range. The fire command is transmitted from the BCA to the LA through the interarea cable. It is received at the LCS and routed to the SCI of the selected section. The SCI routes the signal through the LCI associated with the designated launcher. If the interarea cable is not functioning, an emergency firing procedure may be initiated, using controls on the launching control console or the SCI.

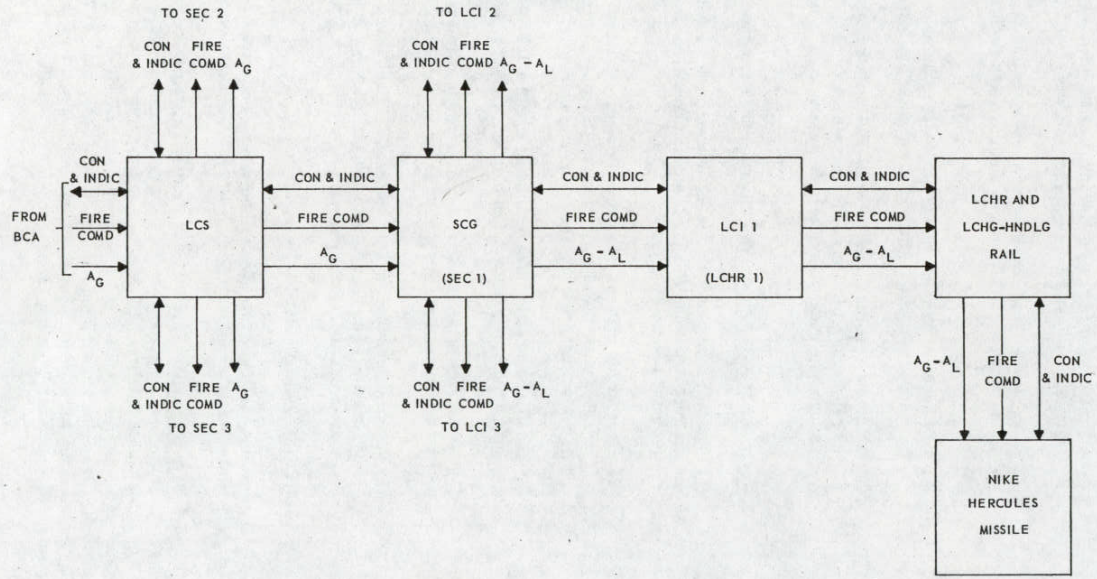


Figure 1-15. Launching area data flow.

b. A_G transmission. A_G is the azimuth from the center of the LA to the predicted intercept point (fig 1-16). It is computed by the computer and transmitted through the LCS to the SCG of the section selected to fire. Since the target is moving and its azimuth is changing continuously, A_G also changes continuously until the missile is fired. A_G is used to preset the roll-amount gyro in the missile. The roll-amount gyro causes the missile to roll to the correct attitude with respect to the predicted intercept point shortly after launch. However, because A_G is measured from true north and the roll-amount gyro is referenced to the azimuth of the launcher (A_L), A_L must be subtracted from A_G before applying A_G to the roll-amount gyro. In figure 1-15, A_G at a particular instant is computed at 1,800 mils. The launcher azimuth (A_L) is 600 mils. Therefore, the azimuth applied to the roll-amount gyro is 1,200 mils (A_G - A_L). A_L for each launcher is preset in the SCG. When a launcher is designated for firing, the SCG automatically computes A_G - A_L and transmits it to the missile on the designated launcher. If the interarea cable fails, A_G may be set into the A_G transmission system by controls on the SCI; however, the data must be relayed by voice from the computer to the SCI operator.

c. Control and indicating circuits. The control and indicating circuits provide control of the launchers and lamp indications of the progress of events in the LA. They also provide an interchange of information between the BCA and LA. Controls and indicators are on the launching control console, SCI, and LCI.

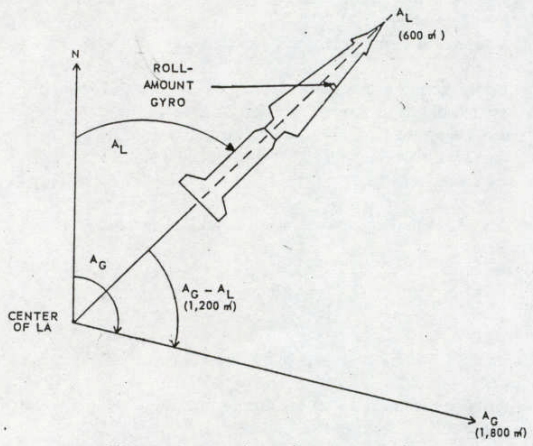


Figure 1-16. A_G - A_L computation.