TM 9-1340-418-14

TECHNICAL MANUAL

OPERATOR, ORGANIZATIONAL, DS AND GS MAINTENANCE MANUAL

FOR

BALLISTIC AERIAL TARGET SYSTEM (BATS)

This copy is a reprint which includes current pages from Changes 1 through 6.

HEADQUARTERS, DEPARTMENT OF THE ARMY

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Change
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Operator, Organizational, DS & GS Maintenance Manual
FOR
BALLISTIC AERIAL TARGET SYSTEM (BATS)

TM 9-1340-418-14, dated 6 September 1978, is changed as follows:

1. Remove old pages and insert new pages as indicated below. New or changed material is indicated by a vertical bar in the margin of the page. Added or revised illustrations are indicated by a vertical bar adjacent to the identification number.

Remove Pages	*Insert Pages*
i thru iii/(iv blank)	i thru v/(vi blank)
1-1 thru 1-4	1-1 thru 1-4
1-11 thru 1-13/(1-14 blank)	1-11 thru 1-13/(1-14 blank)
2-11 thru 2-14	2-11 thru 2-14.2
4-1/(4-2 blank)	4-1/(4-2 blank)
B-3, B-4	B-3, B-4
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No. 9-1340-418-14

HEADQUARTERS
DEPARTMENT OF THE ARMY
Washington, D.C., *6 September 1978*

OPERATOR, ORGANIZATIONAL, AND DS/GS MAINTENANCE MANUAL FOR BALLISTIC AERIAL TARGET SYSTEM (BATS)

REPORTING ERRORS AND RECOMMENDING IMPROVEMENTS

You can help improve this manual. If you find any mistakes, or if you know of a way to improve the procedures, please let us know. Mail your letter or DA Form 2028 (Recommended Changes to Publications and Blank Forms) direct to: Commander, U.S. Army Missile Command, ATTN: AMSMI-MMC-SM-AT, Redstone Arsenal, AL 35898-5238. A reply will be furnished to you.

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CHAPTER 1

INTRODUCTION

Section I. GENERAL

1-1. Scope.

a. This manual covers the operation and maintenance of the Ballistic Aerial Target System (BATS) (fig. 1-1). The manual includes: a description of the three major components of the BATS (Target, Launcher, and Rocket firing box), emplacement, assembly, checkout, and operating procedures; a discussion of the theory of operation; operator, organizational, and DS/GS maintenance instructions; and instructions for handling the propulsion and ordnance devices.

b. Additional data essential to the operation and maintenance of the BATS are in the appendices to this manual.

1. Target
2. Launcher
3. Rocket firing box

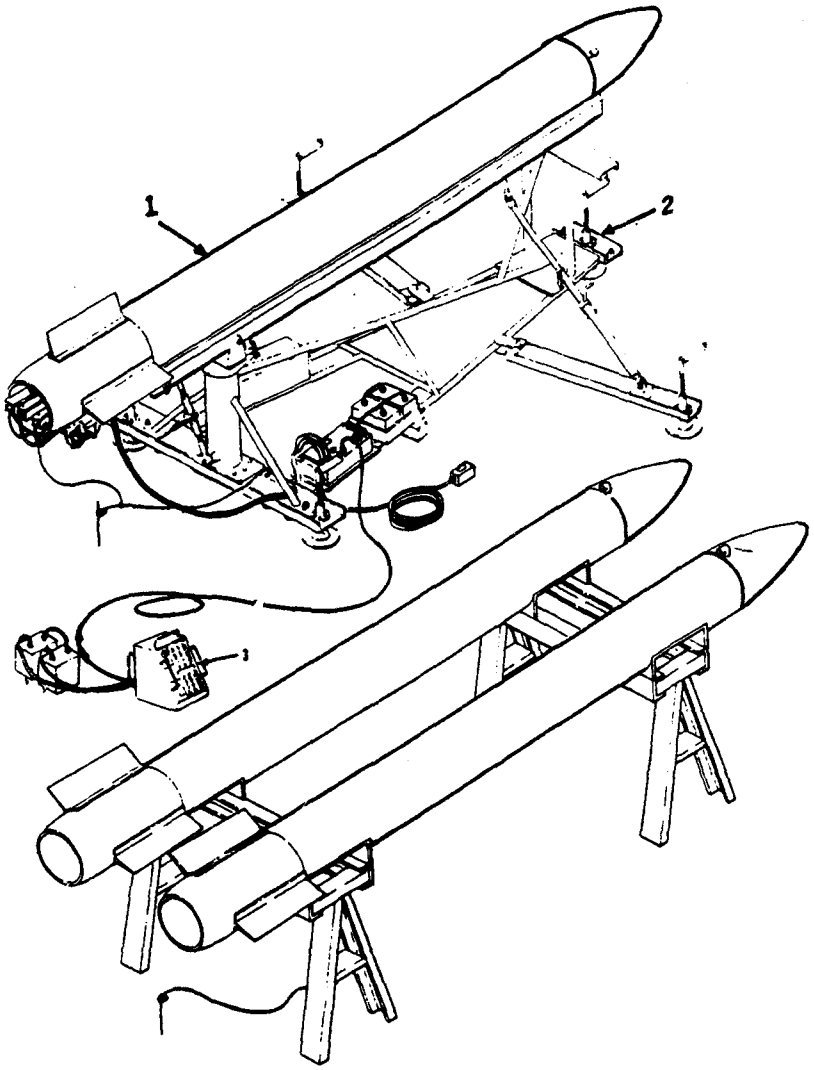


Figure 1-1. Ballistic aerial target system.

1-2. Forms and Records.

a. Reports of Maintenance and Unsatisfactory Equipment. Use equipment forms and records in accordance with instructions in DA PAM 738-750.

b. Report of Damaged or Improper Shipment. Fill out and forward DD Form 6 (Report of Damaged or Improper Shipment) as prescribed in AR 700-58.

1-3. Difference Among Models.

a. There are two configurations of the rocket firing box covered in this manual. Firing box 11507250 will replace the original version (10286402) by attrition. The boxes are essentially the same, except that the new firing box uses silicon-controlled rectifiers (SCRs) instead of relays for improved reliability.

b. Some targets are not suitable for use with sustainer cartridges installed. These "Boost-coast-only" targets are identifiable by serial number, Targets with serial numbers 224497 thru 225761 and 229363 thru 229688 cannot be used with sustainer cartridges.

Section II. DESCRIPTION

1-4. Target (Fig. 1-2).

The empty target weight is approximately 130 pounds; loaded weight is approximately 192 pounds. It is 17 feet long, 15 inches in diameter; and provides a 22.5 square-foot broadside area. The metal skin and fins provide radar reflectivity. The target is painted a bright international orange color for easier visual target acquisition. The Ballistic Aerial Target (BAT) was designed as an expendable target for training in Air Defense Gunnery.

b. Boost propulsion for the target is provided by two, three, four, or five 2.75-inch low-spin folding fin aircraft rockets (LSFFAR) or MK66 motors.

c. Sustainer thrust for the target is provided by two jet engine starter cartridges mounted in the sustainer motor case in the forward end of the target body. Two thrust nozzles exit from the side of the target just aft of the nose cone assembly. The nozzles are canted to impart a roll torque to the target for initial spin while providing thrust to overcome air drag during flight. The sustainer motor burns for approximately 15.7 sec.

d. The target spin is initiated by the canted sustainer motor nozzles and the scarfed rocket motor nozzles and is maintained by the canted fins.

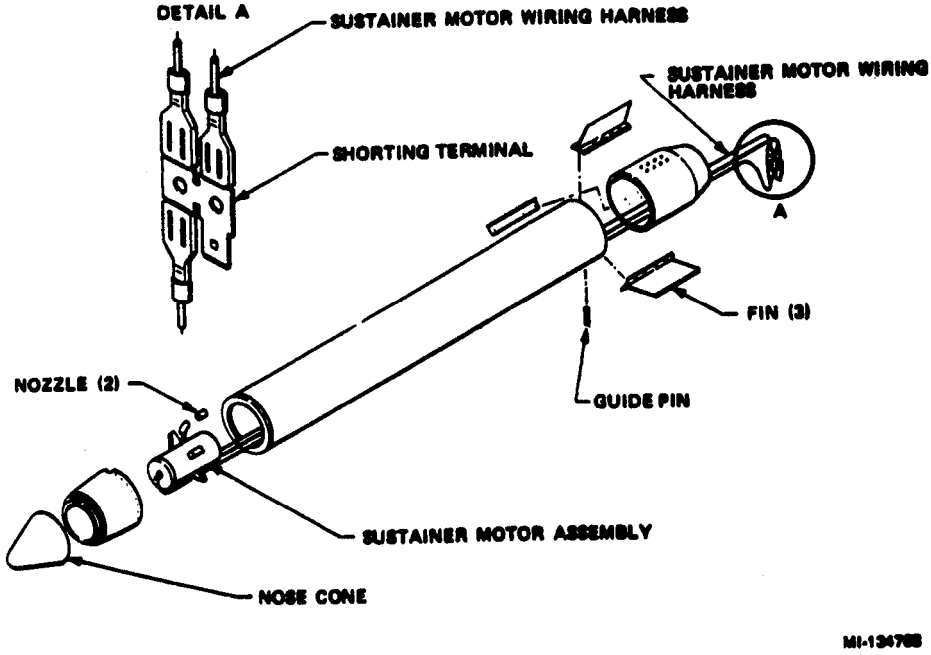


Figure 1-2. Target.

e. Average target velocities between 297 knots and 510 knots may be obtained in variable increments depending on the number of rocket motors and launch angle quadrant elevation (Q.E.).

f. The flight path of the target may be affected by winds. Because of its aerodynamic characteristics, the target has a tendency to weather-vane, or turn into the wind. During final aiming of the launcher, the wind correction data of appendix D and appendix E are used.

g. BATS is currently being used as a target for AVENGER, CHAPARRAL, REDEYE, and STINGER. These are described in table 1-1. The trajectory and speed of the target may be varied by using additional rocket motors. When additional rocket motors are utilized it is also necessary to requisition an equal number of wiring harnesses and clamps.

h. Infrared augmentation is provided for AVENGER, CHAPARRAL, REDEYE, and STINGER by MK 33 Mod ø parasitic flares. The flare also serves as a source of light for day and night engagements.

i. A special scoring device to provide missile miss distance can be obtained when requested by letter from Commander, U.S. Army Missile Command, ATTN: AMSMI-ITTS-QS, Redstone Arsenal, AL 35898-5798. This support is contractor operated and must be requested by MACOM 30 days in advance.

Table 1-1. Target Configurations

Use	Consisting of: Quantity	Item Name	NSN
AVENGER CHAPARRAL or STINGER	1	Target, Ballistic Aerial, MTR-15A	1550-00-261-9799
	2	Cartridge, Engine Starter, MXU-4A/A	1377-00-863-9387
	2	Flare, MK 33 Mod ø	1370-01-208-0686
	3-4[2]	Rocket Motor: 2.75 Inch, MK 40 Mod 3	1340-00-935-6021
	2	Rocket Motor: 2.75 Inch MK 66 Mod 3	1340-01-267-4223
	3[1]	Wiring Harness (for Rocket Motor)	5995-00-937-2699
	4[1]	Clamp (for MK 33 Mod ø Flare)	4730-00-908-6292
	3[1]	Clamp (for Rocket Mtr Fins)	4730-00-908-6292
REDEYE	1	Target, Ballistic Aerial, MTR-15A	1550-00-261-9799
	2	Cartridge, Engine Starter, MXU-4A/A	1377-00-863-9387
	2	FIare, MK 33 Mod ø	1370-01-208-0686
	2-3[2]	Rocket Motor: 2.75 Inch, MK 40 Mod 3	1340-00-935-6021
	2	Rocket Motor: 2.75 Inch, MK66 Mod 3	1340-01-267-4223
	3[1]	Wiring Harness (for Rocket Motor)	5995-00-937-2699
	4[1]	Clamp (for MK 33 Mod ø Flare)	4730-00-908-6292
	3[1]	Clamp (for Rocket Mtr Fins)	4730-00-908-6292

[1]These items are stored in the sustainer motor section of Ballistic Aerial Target (NSN 1550-00-261-9799).
[2]Units are expected to exercise prudence in determining the number of MK 40 rocket motors to achieve optimum training benefit (i.e., altitude at Ft. Bliss where an additional motor may be required to provide suffcient flight time.

1. Screw jack
2. Tool box
3. Battery platform
4. Fire control slave unit mounting base
5. Rear stand
6. Launcher slide
7. Elevating actuator
8. Telescoping supports
9. Stabilizer arm
10. Universal joint
11. Launcher frame
12. Tube assembly
13. Ball lock pin
14. Stabilizer arm support
15. Firing cable assembly
16. Terminal block
17. Cutter slide
18. Elevation indicator
19. Leveling bubble
20. Support arm center pipe
21. Pipe assembly
23. Stop lug
24. Azimuth Actuator

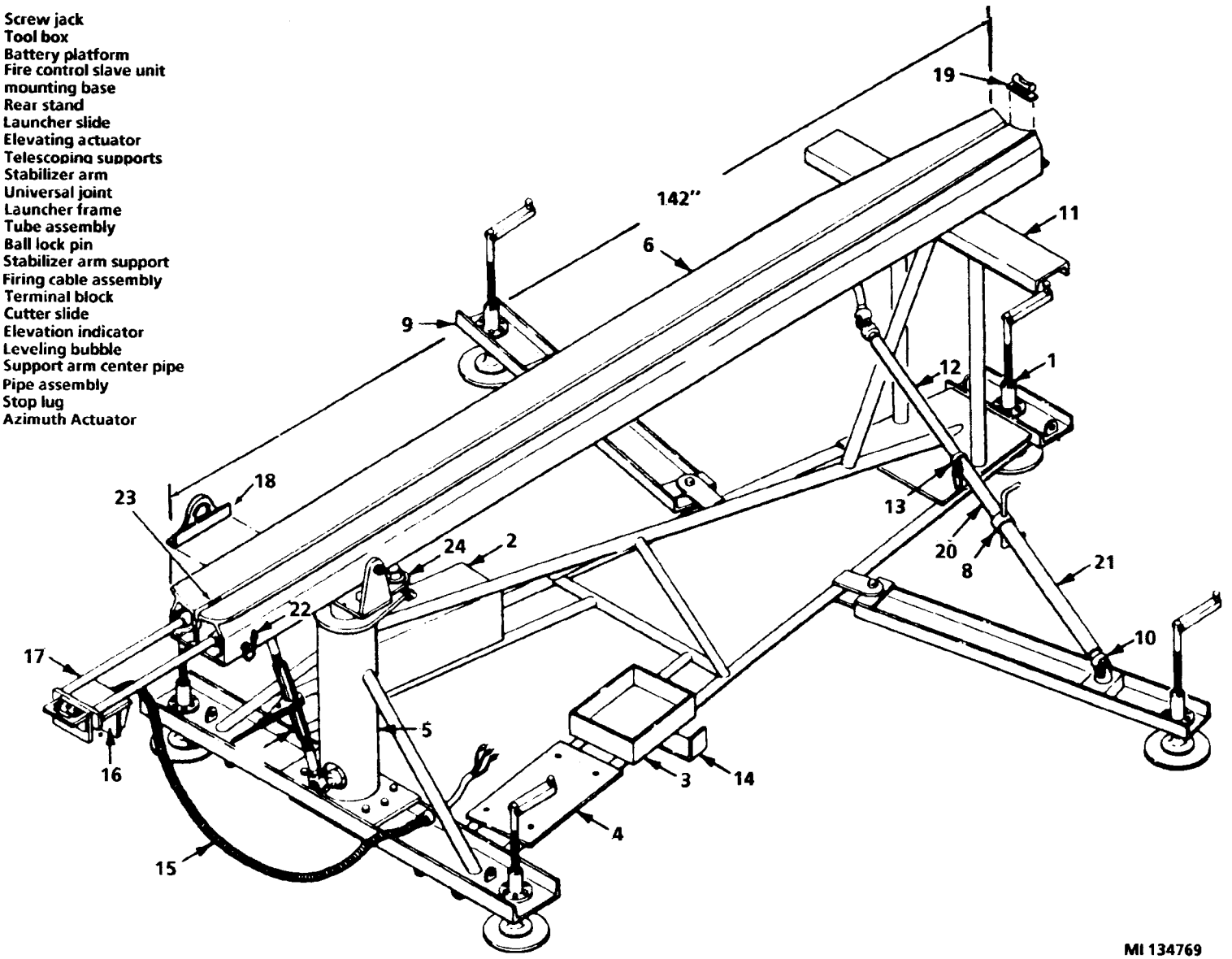


Figure 1-3. Launcher.

1-5. Launcher (Fig. 1-3).

a. The base structure of the launcher is welded alumimum with three-point suspension for stability. Screw jacks are provided (one front, two rear) to provide a means of leveling the launcher slide when emplaced on slopes of up to 4.5 degrees in any direction. The base structure contains a tool box for storing tools, a platform for the launcher batteries, and a mounting base for the fire control slave unit. See appendix B for basic issue items.

b. The rear stand supports the launcher slide, provides a means of aiming the launcher in azimuth (± 9 degrees), and serves as the lower attach point of the elevating actuator.

c. The slide supports the target and provides directional control. A slot in the center of the slide serves as a track for the guide pin located on the bottom of the target. Refer to figure 1-2 for location of guide pin.

d. The front stand supports the front end of the slide at 0 degrees elevation.

e. The telescoping supports support the forward end of the slide in all elevated positions. These supports are provided with screw leeks which must be locked for launching and unlocked when raising or lowering the launcher slide. The telescoping supports are attached at the lower ends to pivoting stabilizer arms. The stabilizer arms are attached to the base structure and are pivoted outward for launching. Two screw jacks are provided on the ends of the arms for support. Universal joints on the ends of the telescoping supports permit free lateral motion. The maximum angle of elevation obtainable, using the elevating actuator, is 45 degrees. For a larger QE, it is necessary to place the launcher on an incline. When the slide is elevated above 25 degrees, the locking pins on the support arms are removed, the arms extended and the pins reinstalled.

f. Two work stands (fig. l-l) are provided for supporting the target during tin installation and sustainer motor preparation.

1-6. Fire Control System.

a. General. The fire control system consists of a rocket firing box (fig. 1-4), a fire control slave unit (fig. 1-5), batteries, and connecting wires. The. tire control system provides for remote launching of one or more targets (maximum of 6). The targets may be fired simultaneously or individually from location of up to two miles from the launcher. One pair of wires (telephone cable (WD-1/TT)) must be provided between the rocket firing box and the fire control slave unit for each launcher. Refer to figure 1-6 for system schematic.

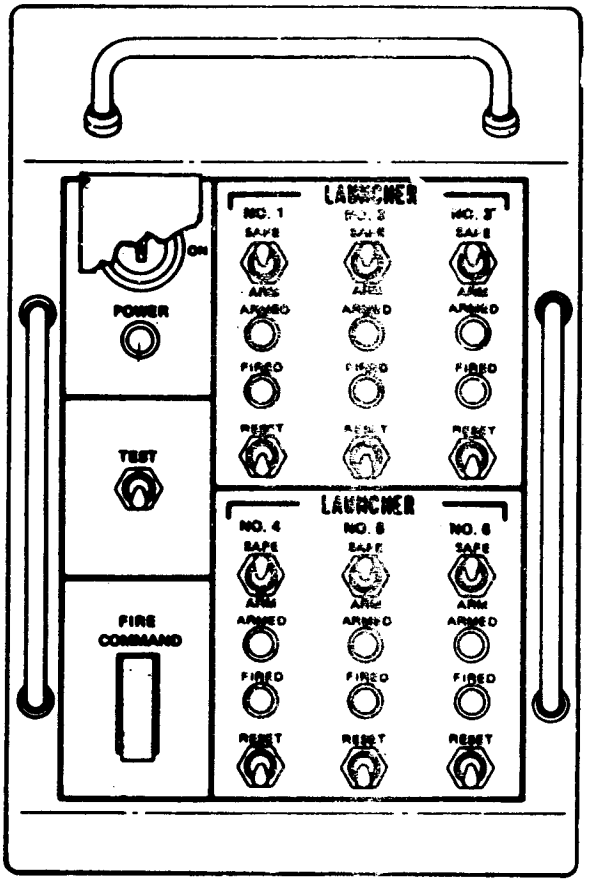


Figure 1-4. Rocket firing box.

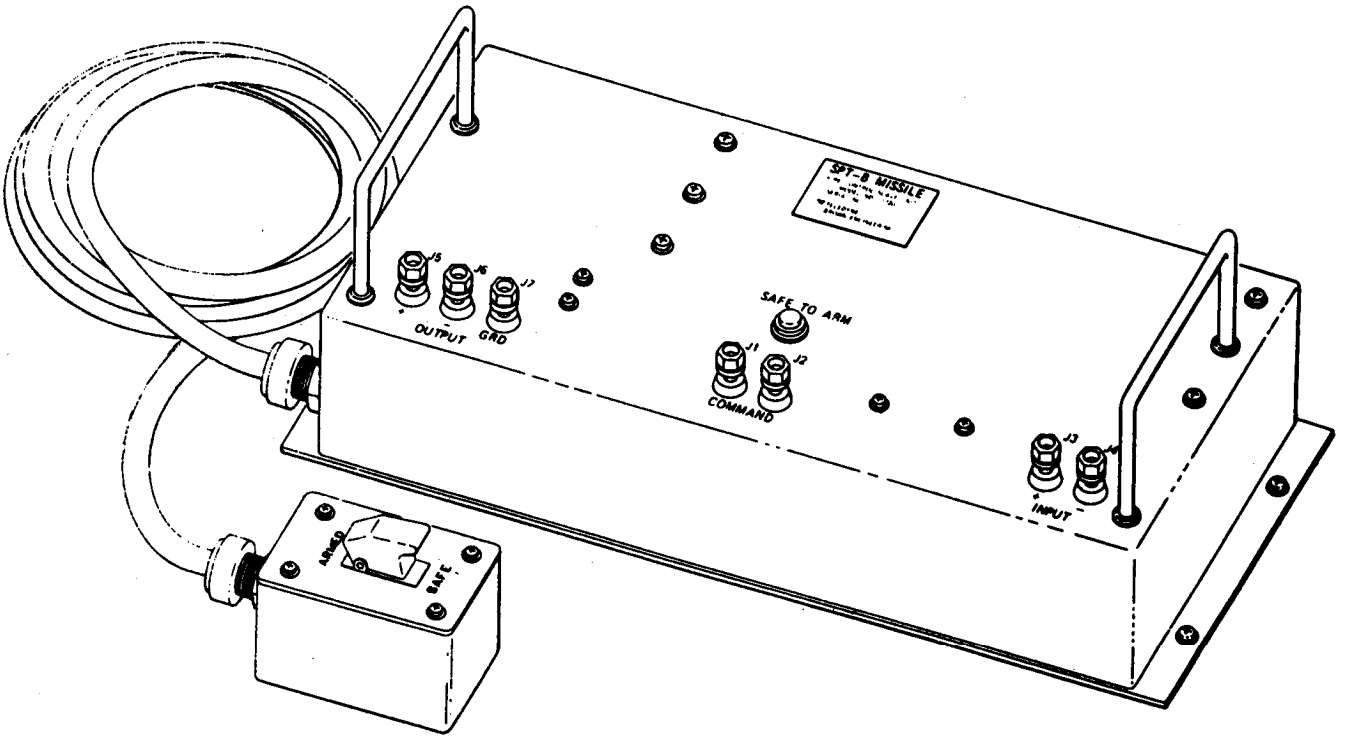


Figure 1-5. Fire control slave unit. MI-134771

b. Rocket Firing Box 10286402 Theory of Operation (fig. 1-7).

(1) The rocket firing box power source consists of two 12-volt batteries in series, providing 24 volts dc power input to the firing box power input connectors J1 (+) and J2 (-). The positive side of the 24 vdc is applied to fuse Fl. Fuse F1 is wired into POWER switch S1. F1, rated at 3 amperes, can carry the current necessary to provide the output fire command signals to the six launcher firing circuits simultaneously.

(2) With the POWER. switch set to the ON position, 24 vdc is applied to the following components: POWER indicator DS1; normally open wiper of FIRE COMMAND switch S3; normally open contacts of relay K1; normally open wipers of lamp TEST switch S2; and normally open contacts of the RESET switch. After power has been applied to POWER indicator DS 1, the indicator will illuminate.

(3) The TEST switch circuits are used to functionally test launcher ARMED and FIRED indicators DS2 - DS13 for all six launchers simultaneously. When the TEST switch is actuated, power is applied through voltage blocking diodes CR1 - CR12 to the lamps of all the ARMED and FIRED indicators.

(4) When FIRE COMMAND switch S3 is actuated, power is applied to the coil of relay K1. The coil of relay K1 is energized, closing the set of normally open (NO) contacts located in the fire command bus. The 24 vdc is then applied to the fire command bus through the normally closed (NC) contacts of thermal delay relay K2, which is in series with relay K1 contacts in the fire command bus. The thermal delay relay K2 contacts will remain closed until the coil of K2 activates (approximately 4 seconds, adjustable by resistor R1) and opens the circuit of the fire command bus, removing the fire command voltage from the fire command bus.

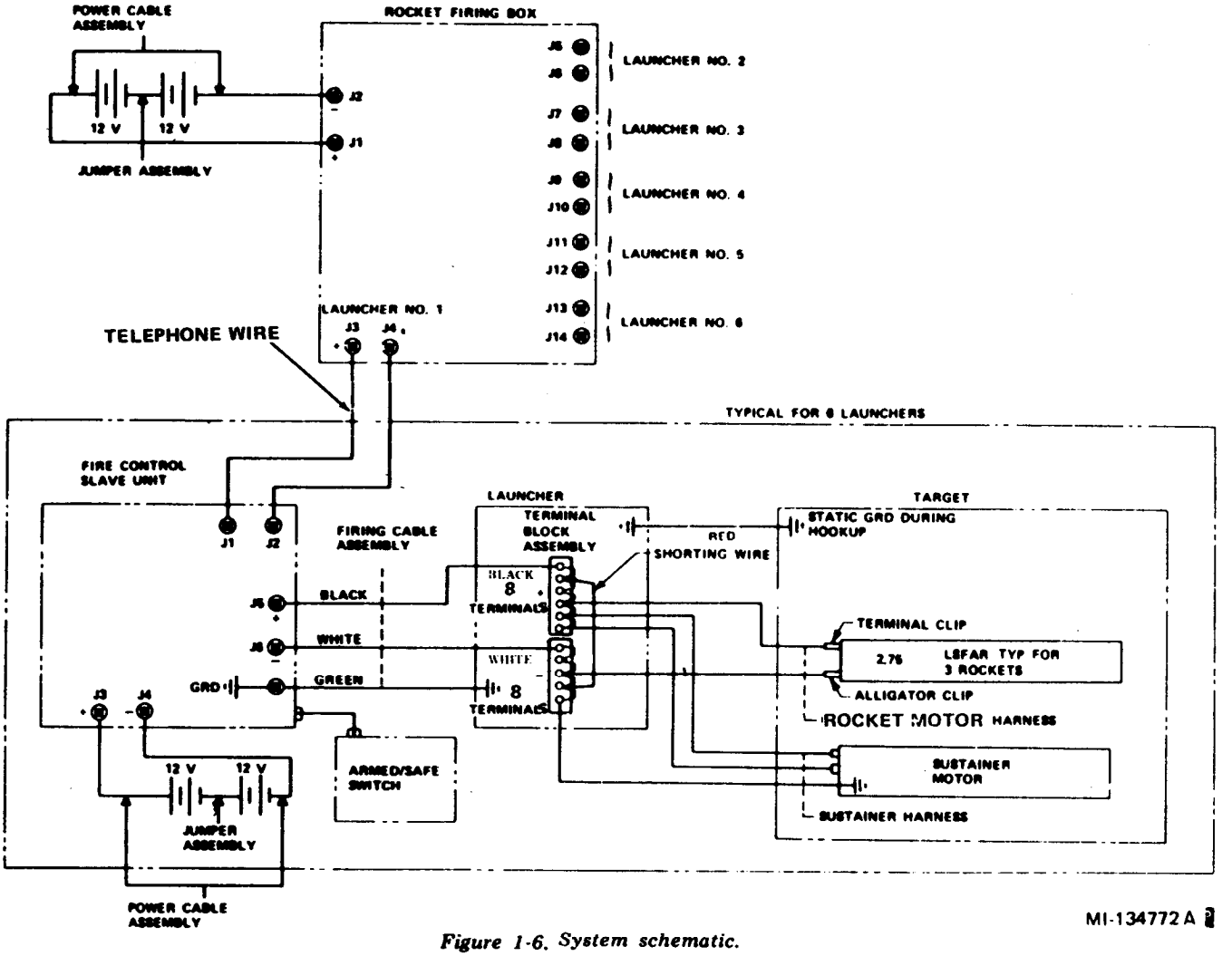


Figure 1-6. System schematic.

(5) The SAFE/ARM switches of the six launcher circuits provide the operator with the option of selecting any combination of the launcher circuits desired. The SAFE position of this switch prevents the application of power from the fire command bus and shorts the positive and negative output terminals. With SAFE/ ARM switch S4 set to the ARM position and FIRE COMMAND switch S3 set to the FIRE COMMAND position, 24 vdc is applied to the fire command bus, and a fire command will be initiated at launcher 1 output terminals J3 and J4 on the rocket firing box. When the output signal appears at the launcher output terminals, FIRED indicator DS5 - DS13 will illuminate for each of the selected launchers. The output fire command (24 vdc pulse) is applied across coil K3A - K8A of latching relay K3A - K8A, energizing the relay coil in parallel with the output fire command signal, opening contacts K3A - K8A in series with the ARMED indicator; and closing contacts K3A - K8A in series with the FIRED indicator; thus applying voltage to the FIRED indicator lamp.

(6) Closing reset switch S7 applies power across the coil of K3B of latching relay K3A (one each per circuit) and provides the operator with a method of resetting the launch indicators from the FIRED to ARMED status. With the SAFE/ARM switches set to the ARM position, power is applied to the ARMED indicator through a set of K3A contacts in a series with the ARMED indicator for each launcher circuit (if RESET switch has been pressed) or to the FIRED indicator through a set of K3A contacts in series with the FIRED indicator for each launcher circuit (if RESET stitch has not been pressed).

RELAY, COIL ASSEMBLY K1
RELAY, CONTACT ASSEMBLY K1
RELAY, LATCHING K3 THRU K8A
SWITCH, KEYLOCK S1
RELAY, DELAY K2
BINDING POST, WHITE J2
BINDING POST, GREEN
J4, 6, 8, 10, 12, 14
BINDING POST, RED
J3, 5, 7, 9, 11, 13
BINDING POST, BLACK J1

SEMICONDUCTOR, DEVICE
DIODE CR1 THROUGH CR 12
LAMP, INCANDESCENT
MINIATURE DS1 THROUGH DS13
SWITCH, TOGGLE S2
SWITCH, TOGGLE, ONE POLE
S3, 7, 8, 9, 13, 14, 15
SWITCH, TOGGLE FOUR POLE
S4, 5, 6, 10, 11, 12
RESISTOR, ADJUSTABLE, R1

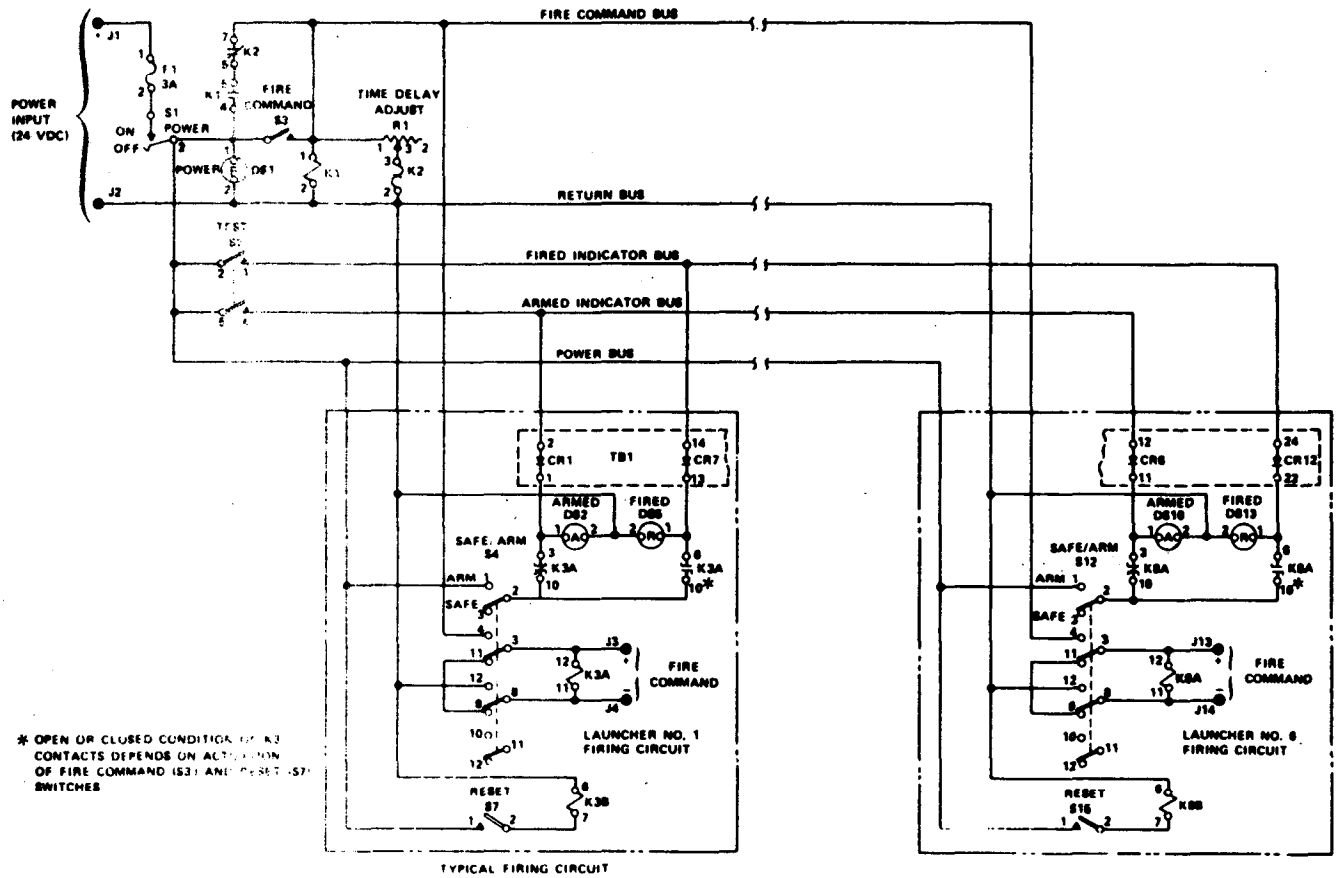


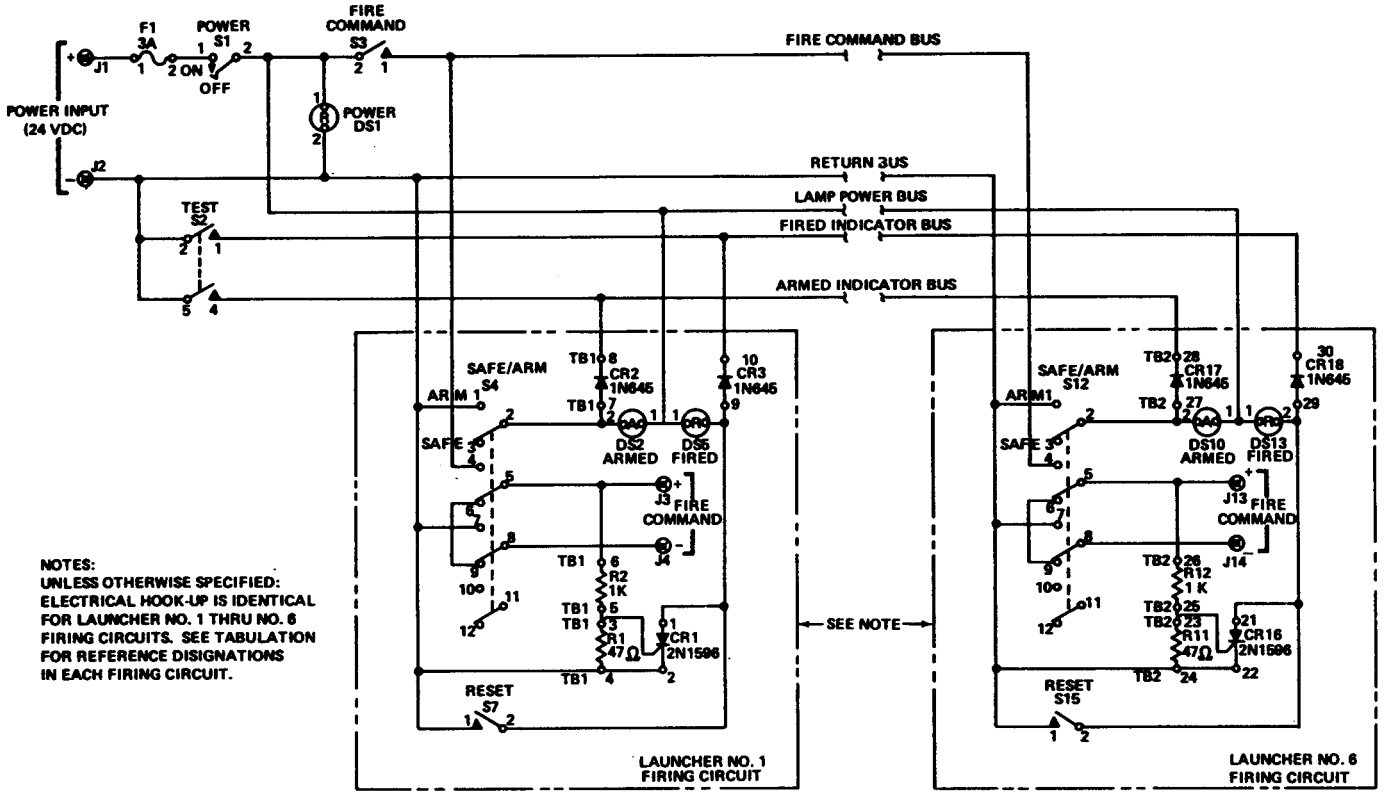
Figure 1-7. Rocket firing box 10286402—schematic. MI-134773

c. Rocket Firing Box 1150725 Theory of Operation (Figure 1-8).

(1) The rocket Firing box power source consists of two 12-volt batteries in series, providing 24 volts dc power input ot the firing box power input connectors J1 (+) and J2 (-). The positive side of the 24 vdc is applied to fuse F1. Fuse F1 is wired into power switch S1. F1, rated at 3 amperes, can carry the current necessary to provide the output fire command signals to the six launcher firing cirucuits simultaneously.

(2) With the power switch set to the ON position, 24 vdc is applied to the following components power indicator DS1; normally open wiper of FIRE COMMAND switch S3. After power has been applied to POWER indicator DS1, the indicator lamp will illuminate.

(3) The test switch circuits arc used to functionally test launchcr ARMED and FIRED indicator lamps DS2 - DS 13 for all six launchers simultaneously. When the TEST switch is actuated, -28 vdc is applied through voltage blocking diodes CR2, CR3, CR5, CR6, CR8, CR9, CR11, CR12, CR14, CR15, CR17, and CR18 to illuminate all the ARMED and FIRED indicator lamps.



LAUNCHER FIRING CIRCUIT NO.	SAFE/ ARM SWITCH	ARMED LAMP	FIRED LAMP	RESET SWITCH	2N1596		RES 47Ω		RES 1 K		1N645 ARMED IND		1N645 FIRED IND		OUTPUT TERMINAL	
					TERMINAL BD/NO.		TERMINAL BD/NO.		TERMINAL 3D/NO.		TERMINAL BD/NO.		TERMINAL BD/NO.		+	–
1	S4	DS2	DS6	S7	CR1	TB1/1&2	R1	TB1/3&4	R2	TB1/5&6	CR2	TB1/7&8	CR3	TB1/9&10	J3	J4
2	S5	DS3	DS6	S8	CR4	TB1/ 11&12	R3	TB1/13&14	R4	TB1/15&16	CR5	TB1/17&18	CR6	TB1/19&20	J5	J6
3	S6	DS4	DS7	S9	CR7	TB1/21&22	R5	TB1/23&24	R6	TB1/25&26	CR8	TB1/27&28	CR9	TB1/29&30	J7	J8
4	S10	DS8	DS11	S13	CR10	TB2/ 1&2	R7	TB2/ 3&4	R8	TB2/5&6	CR11	TB2/7&8	CR12	TB2/9&10	J9	J10
5	S11	DS9	DS12	S14	CR13	TB2/11&12	R9	TB2/13&14	R10	TB2/15&16	CR14	TB2/17&18	CR15	TB2/19&20	J11	J12
6	S12	DS10	DS13	S15	CR16	TB2/21&22	R11	TB2/23&24	R12	TB2/25&26	CR17	TB2/27&28	CR18	TB2/29&30	J13	J14

MS009030

Figure 1-8. Rocket firing box 11507250 — schematic.

(4) When the FIRE COMMAND switch S3 is actuated, 24v is applied to the FIRE COMMAND bus. The S3 switch is spring loaded and the 24v is removed from the FIRE COMMAND bus when the switch is released.

(5) The SAFE/ARM switches of the six launcher circuits provide the operator with the option of selecting any combination of the launcher circuits desired. The SAFE position of this switch prevents the application of power from the FIRE COMMAND bus and shorts the positive and negative output terminals. With SAFE/ARM switch S4 set to the ARM position and FIRE COMMAND switch S3 to the FIRE COMMAND position 24 vdc is applied to the FIRE COMMAND bus, and a FIRE COMMAND will be initiated at launcher output terminals J3 and J4 on the rocket firing bus. When the output signal appears at the launcher output terminals, FIRED indicator lamps DS5, DS6, DS7, DS11, DS12, or DS13 will illuminate for each of the selected launchers. The output FIRE COMMAND (24 vdc pulse) is applied across resistors (R1 - R12) energizing SCR (CR1, CR4, CR7, CR10, CR13, or CR16) thus applying voltage to the fired indicator lamp.

(6) Closing reset switch S7 deenergizes SCR (one each per circuit) and provides the operator with a method of resetting the launch indicators from the FIRED to the ARMED position.

(7) Return the SAFE/ARM switch to SAFE. The ARMED lamp will extinguish.

d. Fire Control Slave Unit Theory of Operation (fig. 1-9).

(1) The slave unit power source consists of two 12-volt batteries in series, providing 24 vdc power input to power connectors J3(+) and J4 (–) of the slave unit.

(2) A fire command signal applied at COMMAND terminals J1 and J2 of the slave unit provides a voltage across the voltage divider network consisting of resistor R4 and the coil of relay K1, resulting in energizing the relay coil of K1. Voltage dropping resistor R4 limits the voltage of the fire command signal when the rocket firing box and fire control slave unit are connected at close range.

(3) When the coil of *relay* K is energized, the set of NO contacts of K1 are closed, applying voltage to power relay coil K2. With coil K2 energized, the two sets of K2 NC contacts in series with positive and negative sides of the SAFE TO ARM indicator are open, resulting in the extinguishing of the SAFE TO ARM indicator located on the fire control slave unit. Simultaneously, the two sets of K2 NO contacts located in the positive and negative power output lines are closed. The negative side of the launch command signal is applied through the closed contacts of relay K2 to slave negative output terminal J6. The positive side of the launch command is applied through the closed contacts of relay K2 and routed to fire control slave unit remote ARMED/SAFE switch S1.

(4) If the ARMED/SAFE switch is set to the ARMED position, the launch command signal passes through the switch and three 225-watt, 3-ohm, parallel, current-limiting resistors R1, R2, R3 in series with the positive output line to output terminal J5. The current limiting resistors regulate the launch current for the target, and provide internal overload circuit protection for the fire control slave unit.

(5) If the ARMED/SAF E switch is set to the SAFE position, the input circuit of the fire control slave unit is isolated from the output and the negative and positive output terminals are shorted together through ARMED/SAFE switch S1 and parallel current limiting resistors R1, R2, R3.

NOTES:

RELAY, DPDT (24 Vdc) K2
RELAY, SPDT (12 Vdc) K1
BINDING POST, WHITE (J4,J6)
BINDING POST, GREEN (J2, J7)
BINDING POST, INSULATED, BLACK J3, J5)
BINDING POST, INSULATED, RED (J1)
RESISTOR, CARBON, ELECTRONIC (R4)
RESISTOR, WIREBOUND, ELECTRONIC (R1, R2, R3)
SWITCH, TOGGLE DT-SP (S-1)
BULB, INCANDESCENT, 28 V (DS1)

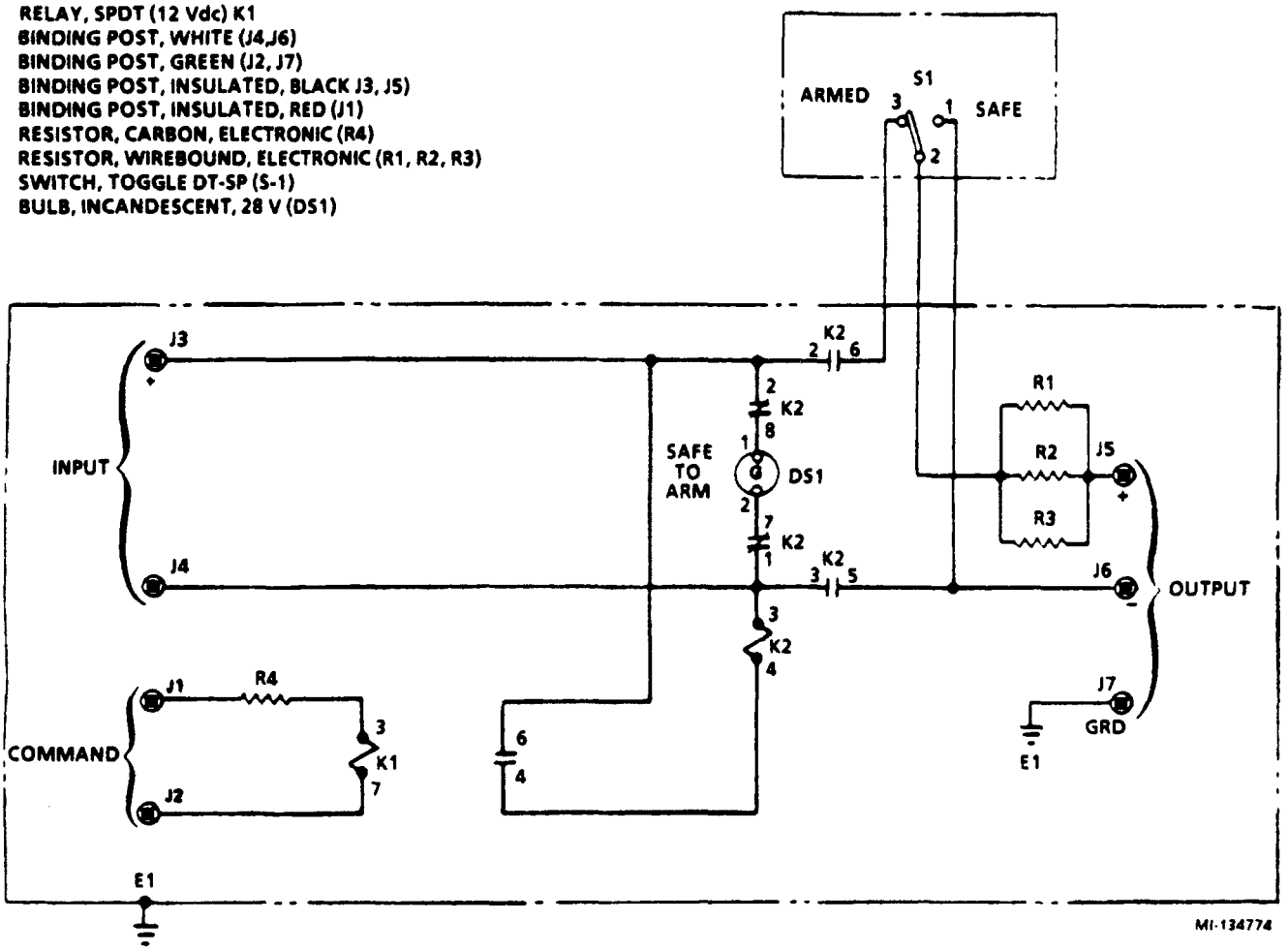


Figure 1-9. Fire control slave unit—schematic.

Section III. PERSONNEL SAFETY

1-7. Radar Field Intensities.

The rocket motors and sustainer motor cartridges are susceptible to inadvertent ignition when exposed to certain communication and radar field intensities. Precautions shall be taken to ensure that the target buildup area, storage area, or any handling operations when ordnance items are involved do not have excessive radar or radio frequency energy levels.

1-8. Surface Danger Area.

Figure 1-10 defines the limits of safety when launching the BATS Target. Strict adherence to the surface danger area will ensure that participating unprotected personnel will be safe from any erratic performance of the target. The danger areas are those for launches of maximum elevation with a forty (40) knot tail and/or broadside wind for which no correction has been applied. In addition, the 205 meter radius about the launch point reflects the danger area from fragments to unprotected personnel in the event that all propulsive units explode, (Reference TM 9-1300-206).

1-9. Handling Precautions.

a. Launcher. The launcher is 13.3 x 5.6 x 7.0 feet with a weight of 560 pounds. When the launcher is being loaded or unloaded from a vehicle a crane should be used. If minor movement of the launcher is required for alinement purposes, personnel in the area can be used. If the launcher is moved the launcher slide should be lowered and the stabilizer arms folded back to the launcher frame.

b. Target. The target is 17.0 x 1.25 feet with a weight of 140 pounds without ordnance items installed. [With ordnance items (2 rocket motors and 2 sustainer cartridges) installed the weight is approximately 175 pounds.] When the target is being loaded on the launcher a sufficient number of personnel should be utilized to prevent injury.

WARNING

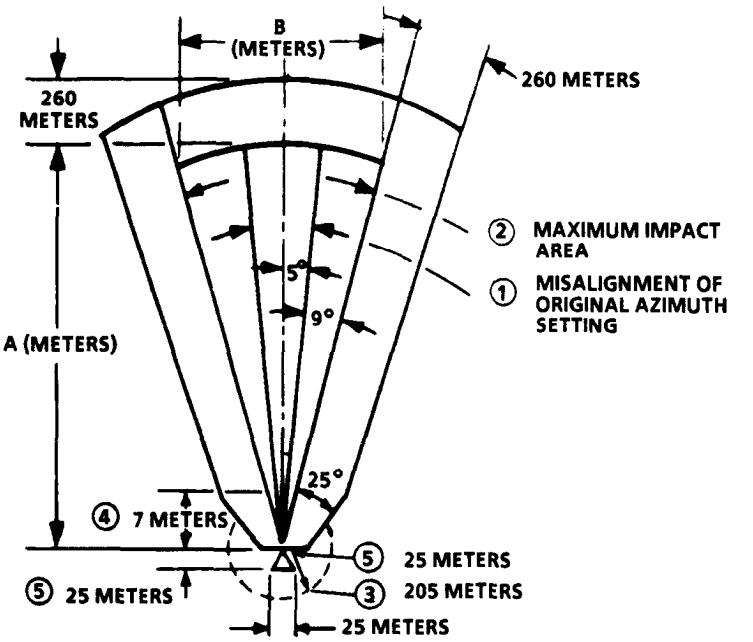
Assembly must be performed in an approved area which does not have excessive radar or radio energy levels. Do not operate mobile radio transmitters within 100 meters of any BATS propulsion or ordnance components that have been removed from their shipping containers.

If a 2.75-inch rocket motor or MXU4A/A sustainer motor, crated or uncrated, is dropped a distance exceeding 2 feet on a hard surface such as wood, concrete, metal, or hard-packed earth, reject the motor, and contact the applicable command headquarters for disposition instructions.

When handling the MK40 rocket motor, personnel should avoid touching the exposed firing contact disk and exposed circuitry with the hands, except when necessary to connect the firing lead terminal clip. Never touch the contact disk with any metallic object such as screwdriver, probe, pliers, etc.

The use of battery powered tools (i.e., power screw drivers) to facilitate the ease of assembly of BATS when explosives or other energetic materials are involved is prohibited. The possibility exists for inadvertent activation of the rocket motors or other explosive devices due to stray currents generated by the power tools.

c. Precautions. Handling and safety precautions cannot be overemphasized. The warnings must be heeded and practiced. The MXU4A/A, LSFFAR, MK66 rocket motor and flare demand the highest regard in their handling. You should avoid when possible standing directly forward or aft of the ordnance.



CONFIGURATION	QE 45° A	45° B	40° A	40° B	35° A	35° B	30° A	30° B	25° A	25° B
* 2-ROCKET MOTORS WITH SUSTAINER	4530	2260	4070	2030	3430	1710	2660	1330	2020	1010
3-ROCKET MOTORS WITHOUT SUSTAINER	3330	1660	3300	1640	3220	1600	3120	1550	3030	1510
3-ROCKET MOTORS WITH SUSTAINER	6070	3030	5970	2980	5440	2710	4850	2420	3990	1990
4-ROCKET MOTORS WITH SUSTAINER	7130	3550	6930	3450	6640	3310	6170	3080	5420	2700
5-ROCKET MOTORS WITH SUSTAINER	8000	3990	7990	3980	7820	3900	7210	3590	6600	3290

* RESTRICTED TO LAUNCHES IN SURFACE WINDS EQUAL TO OR LESS THAN 30 KNOTS.

MS004871

Figure 1-10. Recommended surface danger areas.

1-10. Temperature-Time Exposure.

WARNING

Firing motors that are outside of the specified operating temperature limits could cause erratic flight or motor blowup. The firing limits of the MK40 and MK66 motors are from -50 to 150°F.

The operating temperature range specified on the rocket and sustainer motors shall be strictly observed. If the motor has been exposed to temperatures outside of these limits, the motor shall be reconditioned for a period of 6 hours, within the specified temperature limits, prior to use.

1-11. Hazardous Weather Conditions.

a. Lightning. If lightning is prevalent after ordnance items have been brought to the launch site, personnel should be evacuated to a safe distance in case of detonation caused by lightning.

b. High Winds. If winds over 40 knots are prevalent the launch operations should be stopped. The launcher(s) should be lowered and targets removed and placed on the ground.

CHAPTER 2

OPERATING INSTRUCTIONS

Section I. CONTROLS AND INSTRUMENTS

2-1. Rocket Firing Box (Fig. 1-4).

See table 2-1 for a description of rocket firing box controls and indicators.

2-2. Fire Control Slave Unit (Fig. 1-5).

See table 2-2 for a description of slave unit controls and indicators.

2-3. Azimuth Control (Fig. 2-1).

The azimuth control (fig. 2-1) is a crank-operated device for fine adjustment of the azimuth alinement. It is located directly below the slide at the slide pivot point. The azimuth indicator is graduated in degrees of azimuth from "0" to "30"; however, the limit of travel is 9 degrees to either side of the 15-degree or center mark.

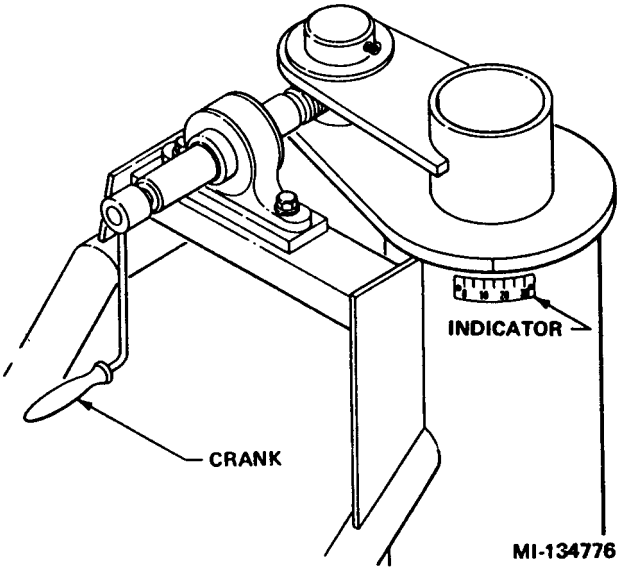


Figure 2-1. Azimuth control.

Table 2-1. Rocket. Firing Box Controls and Indicators (see Fig. 1-4)

Control or indicator	Type	Function
POWER Switch	Key-Operated (covered on firing box 11507250)	In the ON position, the switch applies 24 vdc to the launch system of the rocket firing box. In OFF position, the switch blocks all power from the rocket firing box.
POWER Indicator	Red Lamp	Indicates that the power is on.
TEST Switch	Toggle	Illuminate all ARMED and FIRED lamps in all six launcher circuits. This switch only tests the lamps, not the circuits.
SAFE/ARM Switch	Toggle	In the SAFE position, the switch prevents application of a fire command to the slave unit. In the ARM position, the switch connects the fire command bus to the output terminals, applies voltage to the ARMED light, and removes a short from across the two output lines.
ARMED Indicator	Amber Lamp	Indicates the launcher circuit that will receive the next fire command.
FIRED Indicator	Red Lamp	Indicates that the rocket firing box has transmitted fire command signal to a slave unit.
RESET Switch	Toggle	Extinguishes the FIRED lamp and resets circuit to allow a voltage pulse to be transmitted on the. next fire command signal.
FIRE COMMAND Switch	Covered Toggle	Sends fire command to all launcher circuits which are armed.

Table 2-2. Fire Control Slave Unit Control and Indicator (see Fig. 1-5)

Control or indicator	Type	Function
SAFE TO ARM Indicator	**Green Lamp**	**Indicates that a fire command is not being received from the master unit and that it is safe to arm the target.**
ARMED/SAFE Switch	**Covered Toggle**	**In the SAFE position, the switch shorts out the output lines. In the ARMED position, the switch removes the short in the output lines and completes the circuits for fire command signal to the slave unit output.**

2-4. Elevation Indicator (Fig. 2-2).

The elevation indicator (fig. 2-2) is a protractor type device for adjusting elevation of the slide. It is located to the rear of the slide on the left side (when viewed from the rear of the launcher). The elevation indicator is graduated in degrees.

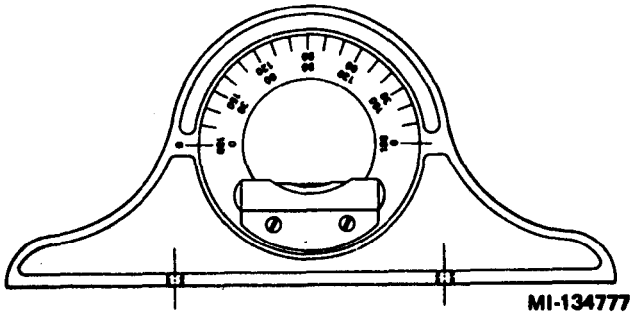


Figure 2-2. Elevation indicator.

2-5. Leveling Bubble (Fig. 2-3).

The leveling bubble (fig. 2-3) is a bubble-type device for leveling the launcher. It is located on the forward end of the launcher slide and is bolted to the slide.

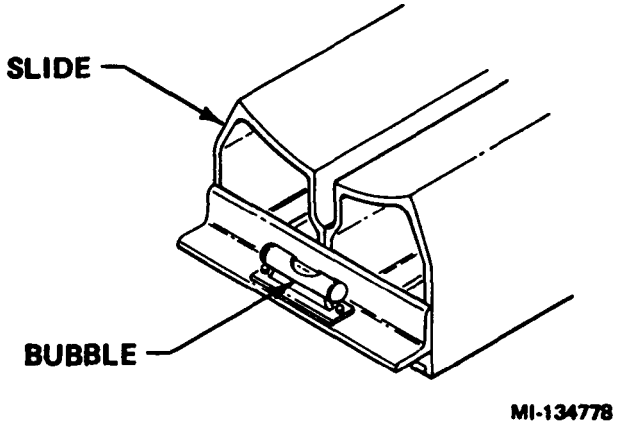


Figure 2-3. Leveling bubble.

2-6. Wind Meter (Fig. 2-4).

a. The wind meter (fig. 2-4) is a hand-held device used for measuring wind velocity and is located in the launcher tool box. The wind meter contains a split scale and is divided in miles per hour with conversion tables for nautical miles per hour. Weather data may be used as an alternate when available.

b. To use the wind meter, the approximate direction from which the wind is blowing must be located. To accomplish this, you may drop dirt or sand from shoulder-height and note the direction in which it falls, or you may use any other method which you deem effective. The relative direction will be noted on the work sheet in appendix D.

c. Face the wind. Hold the meter in front of you in the vertical position, with the scale side toward you. Do not block the bottom holes. The height of the ball indicates the wind velocity. For the high scale, cover the hole at the extreme top with your finger.

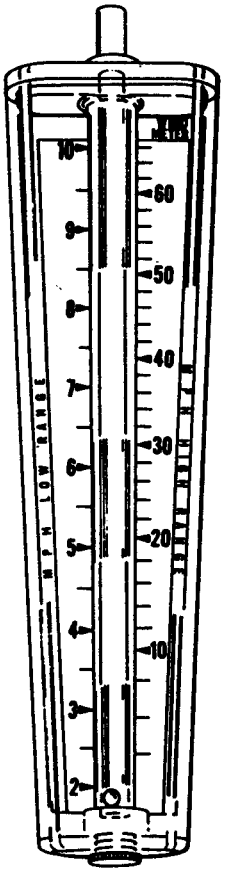


Figure 2-4. Wind meter. MI-134779

Section II. OPERATING UNDER USUAL CONDITIONS

2-7. Launcher Emplacement (Fig. 1-3).

The launcher equipment is shipped fully assembled (except for two [2] storage batteries and installation of the fire control slave unit), and is ready for emplacement upon completion of "Service-On-Receipt Inspection." Launcher emplacement, leveling, and preparation for use are as follows:

a. Locate the emplacement point for the launcher, and mark on the ground. (Location may be provided by physical location on the ground, or by map coordinate reference.)

b. Determine, or obtain the azimuth or line-of-fire (base angle) along which the Target will be launched.

(1) If location of launch site is given in map coordinates, an azimuth of fire, base angle from an orienting line, or angular reference from an easily definable terrain feature shown on the map and easily located on the ground may be used.

(2) If the launch site location is physically identified on the ground, an azimuth or angular reference from a prominent terrain feature may be used to identify the Target line-of-fire.

(3) Since the necessary angle-measuring instrument may not be available within the unit responsible for the laying and operation of the launcher and target preparation, the use of both personnel and equipment from a supporting unit should be requested in advance. These personnel and equipment may be from: Corps of Engineer Topographical Survey Unit; Target Acquisition

Battalion; Division Artillery Headquarters Survey Platoon; Range Command Office; or the survey section of any artillery battalion. The M2 compass may be satisfactorily used if other instruments are not available. Precision laying (pointing) of the launcher requires the use of a horizontal angle-measuring survey or fire control instrument, a theodolite, transit, timing circle, battery commander's telescope, or M2 compass.

c. After determining the exact location of the launcher site, set up the angle-measuring instrument, and proceed as follows:

(1) Set up the instrument over the designated point for launcher emplacement, and zero the instrument.

(2) Using the given azimuth, or base angle, or angular reference from a distant aiming point, establish the line-of-fire direction in which the launcher will be oriented.

(3) Without disturbing the position of the instrument, turn to a "back-azimuth" (3200 roils) from the line-of-fire direction. Sight with the, instrument along this new direction line; measure off a distance from the instrument of approximately 10 meters, and mark.

(4) Relocate the instrument to the point marked off in paragraph c(3) above. Turn the instrument (in direction) to the original line-of-fire direction, using the designated point of launcher emplacement as a sighting point.

d. Position the launcher, in rough orientation, with the center of the pivot column directly over the emplacement point.

e. Place the azimuth control in the center of travel (15 degrees).

f. Using the angle measuring instrument, sight down the slot in the launcher slide. Shift the launcher until the slot is in approximate alinement with the vertical hairline or sight of the instrument. Check to assure that, the pivot column remainted directly over the emplacement point.

g. Extend the leveling jacks until the launcher frame is clear of the ground and resting on the jack pads.

h. Set the elevation dial (fig. 2-2) at 0 degrees and insure that the launch rail is resting on the front stand.

i. Unlock the telescoping support arm locks by loosening the telescoping support, arm locking screws (fig. 2-5)

j. Pivot the stabilizer arms outward to an approximate 90 degree angle to the launcher.

k. Center the leveling bubble (fig. 2-3) on the front of the launcher, using the low side jack to level the bubble.

l. Center the bubble on the elevation dial (fig. 2-2) by, raising the low end of the launcher. Then recheck front leveling bubble. Relevel if required

Set the elevation dial to 35 degrees.

NOTE

When elevating launcher 24 degrees or more, it is necessary to extend telescoping supports by removing the locking pins (fig. 2-5) and repositioning them in the lower hole of the upper support.

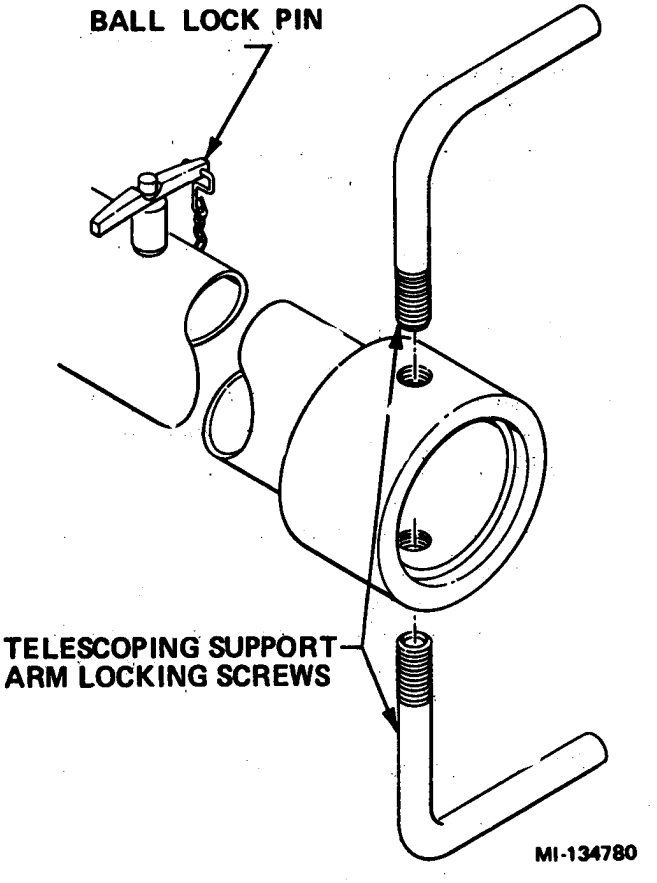


Figure 2-5. Telescoping support arm.

n. Elevate the launcher slide until the bubble on the elevation dial is centered.

o. Pivot the stabilizer arms outward until they form a straight line with the telescoping supports.

p. Lower the launcher slide.

q. Using the angle-measuring instrument, located approximately 10 meters to the rear of the launcher, sight along the right edge of the slot in the launcher slide. Adjust the azimuth control until the edge of the launcher slide slot is in alinement with the vertical hair or sight of the instrument along the entire length of the slot. If more than 4 degrees movement is required on the azimuth adjustment control, the launcher must be relocated laterally until tolerance can be met.

r. Place the charged batteries on battery platform.

s. Record the reading on the launcher azimuth indicator.

t. Extend the cutter slide and secure in the extended position.

u. Drive the grounding rod (provided with the launcher) into the ground. Leave the rod protruding one foot.

v. Attach the static grounding wire to the clamp on the grounding rod and the launcher grounding post.

w. The launcher is now properly emplaced.

2-8. Work Stands (Fig. 2-6).

a. One pair of work stands is provided with each launcher. Stands may be used for target preparation (fig. 2-8).

b. Place the stands parallel to the launcher, approximately 20 feet to the opposite side from the slave unit remote ARMED/SAFE switch. (The slave unit remote ARMED/SAFE switch is placed to the side of the launcher from which personnel will leave after the final arming.)

c. Position the stands approximately 10 feet apart.

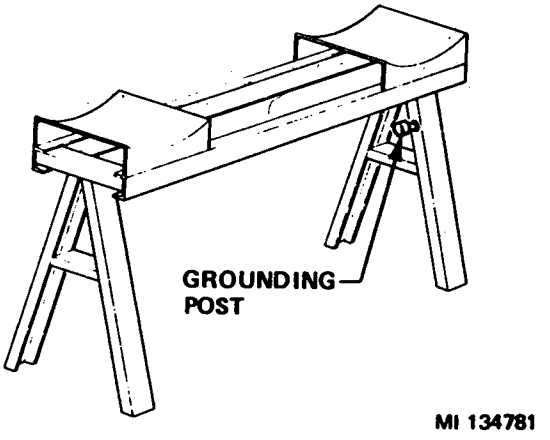


Figure 2-6. Work stand.

d. Drive the work stand grounding rod (provided with the launcher) into the ground. Leave the rod protruding one foot.

e. Attach the grounding wire (provided with the launcher) to the rod and the work stand grounding post.

2-9. Installation and Checkout of Rocket Firing Box (Fig. 2-7).

a. Unpackage the rocket firing box. See chapter 3, section I, for unpackaging instructions.

b. Place the rocket firing box in the desired location.

NOTE

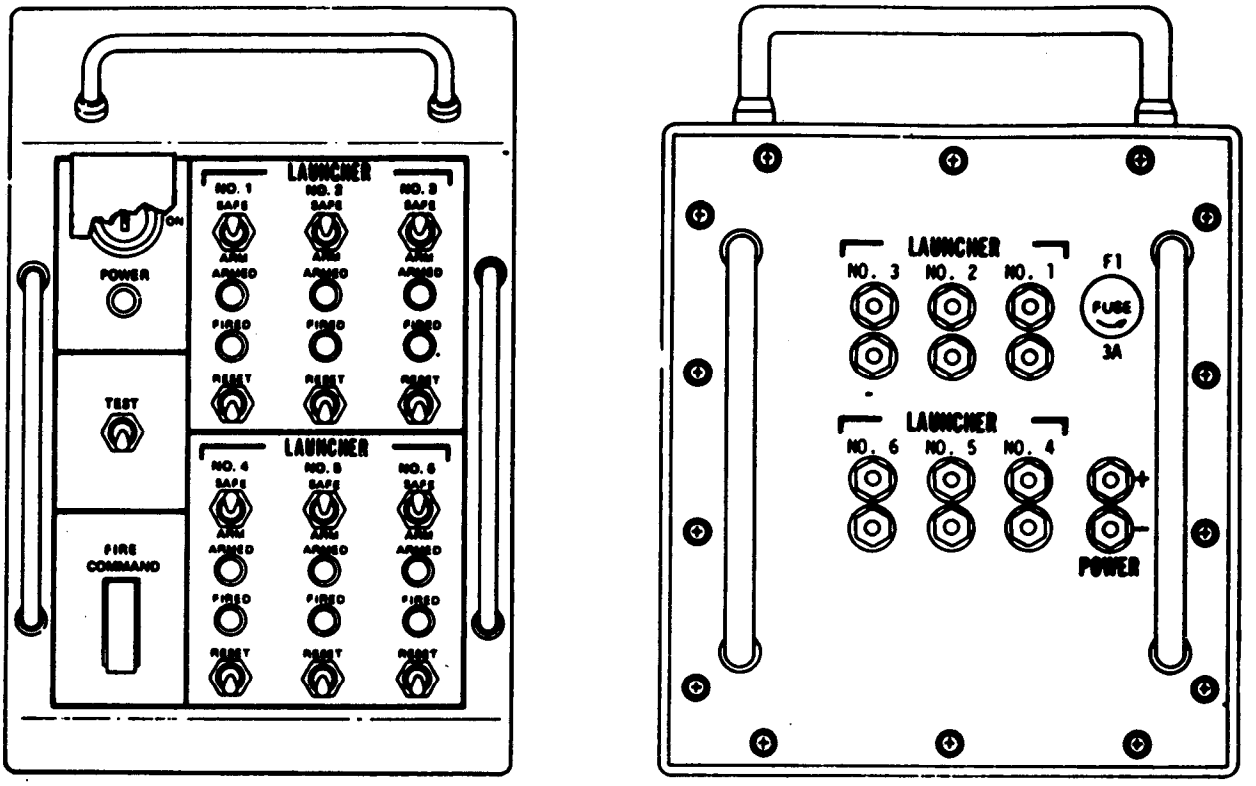
Field telephones may be required for communication between the launcher and the rocket firing box and the Fire Control Officer. The telephones are not furnished with the target system.

The rocket firing box must be within two miles of the associated launchers.

c. Connect the 24 vdc power source normally supplied with the rocket firing box to the power terminals on the rear panel of the rocket firing box observing the indicated polarity (fig. 2-7).

WARNING

Do not connect any slave unit output wires at this time.



NOTE:

FIRE CONTROL BOX 11507250 HAS COVERED POWER SWITCH.

MS007893

Figure 2-7. Rocket firing box.

NOTE

This power source is normally two 12-volt batteries connected in series.

d. Insert the key into the POWER switch and turn to ON (fig. 2-7).

e. Observe that the POWER lamp illuminates.

f. Activate the TEST switch and check that all the lamps illuminate.

g. Check that all the SAFE/ARM switches are in the SAFE position.

h. Position the SAFE/ARM switch for one launcher to the ARM position and observe that the ARMED lamp illuminates.

NOTE

Step *i* below is applicable to rocket firing box 10286402 only.

i. If the FIRED lamp illuminates, actuate the RESET switch for that launcher. The FIRED lamp should extinguish.

j. Actuate the FIRE COMMAND switch and observe:

(1) The ARMED lamp for firing box 10286402 extinguishes and the ARMED lamp for firing box 11507250 remains illuminated.

(2) The FIRED lamp illuminates.

k. Actuate the RESET switch and observe that the FIRED lamp extinguishes and for firing box 10286402 the ARMED lamp illuminates; for firing box 11507250 the FIRED lamp extinguishes and the ARMED lamp remains illuminated.

NOTE

When using rocket firing box 10286402, it is necessary to wait three to five seconds after initiating the fire command signal before resetting the circuit.

l. Set the SAFE/ARM switch to the SAFE position, and observe that the ARMED lamp extinguishes.

m. Repeat steps h through l above for each launcher circuit.

NOTE

When rocket firing box 11507250 is momentarily deenergized the FIRED lamp will extinguish and will not illuminate if power is reapplied. The operator is responsible for noting which launchers have fired.

n. Turn the POWER switch to OFF; remove the key.

WARNING

Insure that the FIRE COMMAND switch guard is closed.

NOTE

The key should be retained by the Fire Control Officer.

The rocket firing box is now ready to be connected to the fire control slave units.

2-10. Installation and Checkout of Fire Control Slave Unit (Fig. 2-8).

a. Unpackage the fire control slave unit. See chapter 3, section I, for unpackaging instructions.

WARNING

All installation and checkout of the fire control slave unit will be accomplished prior to placing a target on the launcher.

b. Install the launcher fire control slave unit on the launcher with provided attaching hardware.

c. Insure that the slave unit remote ARMED/SAFE switch is in the SAFE position.

d. Connect the 24 vdc power source normally sup plied with the launcher, observing the polarity indicated.

NOTE

Insure that the batteries are fully charged.

e. Check that the green SAFE TO ARM lamp illuminates.

f. Extend the cutter slide and secure in place with the ball lock pins.

g. Connect firing line from launcher terminal block to the fire control slave unit, observing the polarity indicated (black to positive (+), white to negative (-), and green to ground).

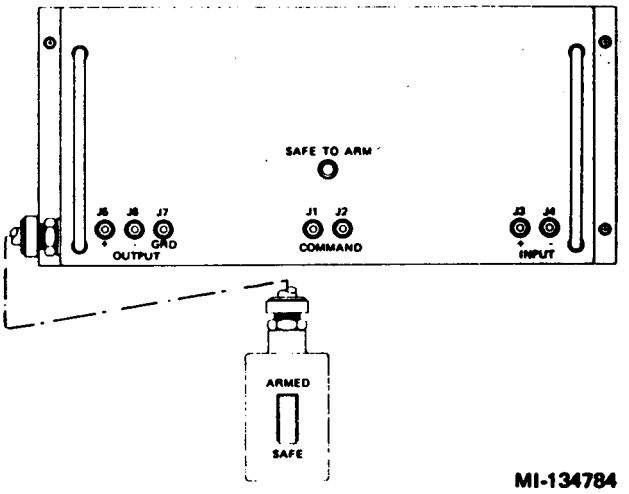


Figure 2-8. Fire control slave unit.

WARNING

Under no circumstances is the **WRE-300/M multimeter to be used to measure continuity of the booster or sustainer.**

If a voltage is indicated at this time, the slave unit is defective and should not be used.

h. Connect the WRE-300/M multimeter or test light assembly to the launcher terminal block. Connect the positive lead to the positive terminal (black) and the negative lead to the negative terminal (white). There should not be any AC or DC voltage indicated.

i. Connect the wires from the LAUNCHER terminals of the rocket firing box to the COMMAND terminals on the slave unit.

NOTE

Use an RL-31 Reel to lay and retrieve the WD-1/TT Cable.

Polarity need not be observed. However, use care to insure that wires do not touch adjacent terminals.

j. Check that the SAFE TO ARM lamp remains illuminated and that no voltage is indicated on the voltmeter.

k. Contact the operator at the rocket firing box and have a fire command signal sent to the launcher. The SAFE TO ARM lamp should extinguish for three to five seconds. The voltmeter should not indicate any voltage.

NOTE

Step *l* below is applicable to rocket firing box 10286402 only.

l. Place the slave unit remote ARMED/SAFE switch to the ARMED position. Contact the operator at the rocket firing box and have a fire command signal sent to the launcher. The SAFE TO ARM lamp should extinguish and the voltmeter should indicate 24 vdc for three to five seconds. After three to five seconds, the voltmeter should read zero and the SAFE TO ARM lamp should illuminate.

NOTE

Step *l.1* below is applicable to rocket firing box 11507250 only.

l. 1. Place the slave unit remote ARMED/SAFE switch to the ARMED position. Contact the operator of the rocket firing box and have him depress and hold the fire command switch. The SAFE TO ARM lamp should extinguish and the voltmeter should indicate 24 vdc. Have the operator release the fire command switch, the voltmeter should read "0" and the SAFE TO ARM lamp should illuminate immediately.

NOTE

If improper indications are obtained, refer to chapter 3, section V.

m. Disconnect the voltmeter.

n. Set the slave unit remote ARMED/SAFE switch to SAFE. Move the remote ARMED/SAFE switch the maximum distance from the launcher in the direction of the safe area. Put the remote ARMED/SAFE switch on a styrofoam end of the target shipping container. This will enhance visibility of the switch and prevent possible damage by vehicles, or personnel walking or stepping on the switch.

NOTE

Insure that the remote ARMED/SAFE switch guard is closed.

o. Inform the operator at the rocket firing box that you have concluded your preflight checks and tell him to place your launcher on SAFE.

WARNING

The key should be removed from the power switch and retained by the Fire Control Officer.

2-11. Uncrating and Assembly of Target.

a. Uncrate the target and place it on the work stands. (See chapter 3, section I, for the uncrating procedures.)

NOTE

Two or more personnel are required to remove the target as it weighs 130 pounds.

The targets may be assembled on the saddles from the shipping container.

b. Inspect the target for shipping damage. The target will be considered to be serviceable if it meets all of the following criteria:

(1) It can be lifted by the nose cone and the aft body assembly and remain structurally rigid along the center line of the target.

(2) The sustainer motor assembly is rigidly attached to the target body.

(3) The sustainer motor nozzles are present and the headers are firmly attached to the sustainer motor assembly.

(4) A sufficient number of rocket motors can be correctly mounted in the aft body assembly.

(5) The three fins can be attached as described in step *i* below, using a minimum of six rivets.

(6) The target guide pin is firmly attached to the bottom of the target body, and the guide pin is straight enough to engage the launcher slide slot.

(7) Dents or tears in the target skin do not preclude any of the conditions set forth in (1) through (6) above.

(8) Failure to meet any of the above criteria will be sufficient cause to reject the target as unserviceable. Disposal of unserviceable targets will be in accordance with AR 735-11.

c. Remove the nose cone by removing the screws (save the screws).

d. Insure that the sustainer nozzles are hand tight and that the red plastic caps are installed over the nozzles.

e. Insure that the sustainer motor firing leads are shorted together with the shorting terminal (fig. 1-2) at aft end of the target.

CAUTION

Do not confuse the sustainer motor with the sustainer cartridges (fig. 2-9).

f. Disconnect the firing lead and remove the end cap from the sustainer motor. Save the wing nut.

g. Remove the contents from the sustainer motor.

NOTE

The sustainer motor should contain one bag of rivets for the tail fin installation three rocket motor electrical harnesses, three rocket motor fin clamps, four flare clamps, two plastic end inserts, and one metal Spacer.

h. Connect a static ground from the target to the work stand, using the alligator clips.

WARNING

Wear safety glasses or goggles and stand to one side when using the rivet gun, since possible injury may be inflicted when the unused portion of the rivet is ejected.

i. Install the fins as follows:

(1) Place fin on the target body with the point to the rear (fig. 1-1).

(2) Before clinching any rivets insert all of the rivets through the fin into the target body.

(3) Clinch one forward rivet and one aft rivet on the opposite side.

(4) Clinch the remaining rivets.

NOTE

If some rivets become misplaced, the target can be launched without rivets in the forward center two holes.

If rivet gun becomes jammed refer to chapter 3, section II.

2-12. Sustainer Cartridge Installation (Fig. 2-9).

NOTE

Sustainer cartridge installation is not required for boost coast configuration.

WARNING

Refer to chapter 1, section III for personnel safety prior to removing the sustainer cartridge from the shipping container.

a. Remove one sustainer cartridge from the shipping container.

NOTE

See chapter 4 for the sustainer cartridge information.

b. Place one end insert on the sustainer cartridge, with the curved surface against the cartridge so that the firing contact protrudes through the hole in the end insert. Press it firmly in place.

c. Rotate and snip the shorting clip (fig. 2-10) with the filament snips or metal hand shears to insure that the shorting clip remains in the disengaged position and will not rotate in a clockwise direction. When snipping the shorting clip with the metal hand shears it is necessary to bend the clip as illustrated in figure 2-10.

NOTE

Place the cartridge on a clean surface when snipping the shorting clip.

d. Insert the cartridge and the end insert into the sustainer motor with the end insert to the rear of the motor. Push the cartridge and the end insert to the rear until contact is made with the back of the sustainer motor. (The cartridge gas screen holes are visible.)

e. Insert the spacer, sliding it in until it touches the installed sustainer cartridge.

f. Remove the second sustainer cartridge from the shipping container.

g. Place the remaining end insert on the sustainer cartridge, with the curved surface against the cartridge so that the firing contact protrudes through the hole in the end insert. Press it firmly in place.

h. Prepare shorting clip in accordance with paragraph c above.

i. Install the cartridge and the end insert into the sustainer motor with the end insert toward the front of the target. Slide it in until contact is made with the metal spacer. (The cartridge shorting clip is visible.)

j. Replace the end cap and screw the end cap clockwise until the threads bottom out. (Outer surface of the end cap should be approximately l/4-inch inside of the motor case edge.)

k. Reconnect the firing lead. Secure it with the wing nut which was originally removed.

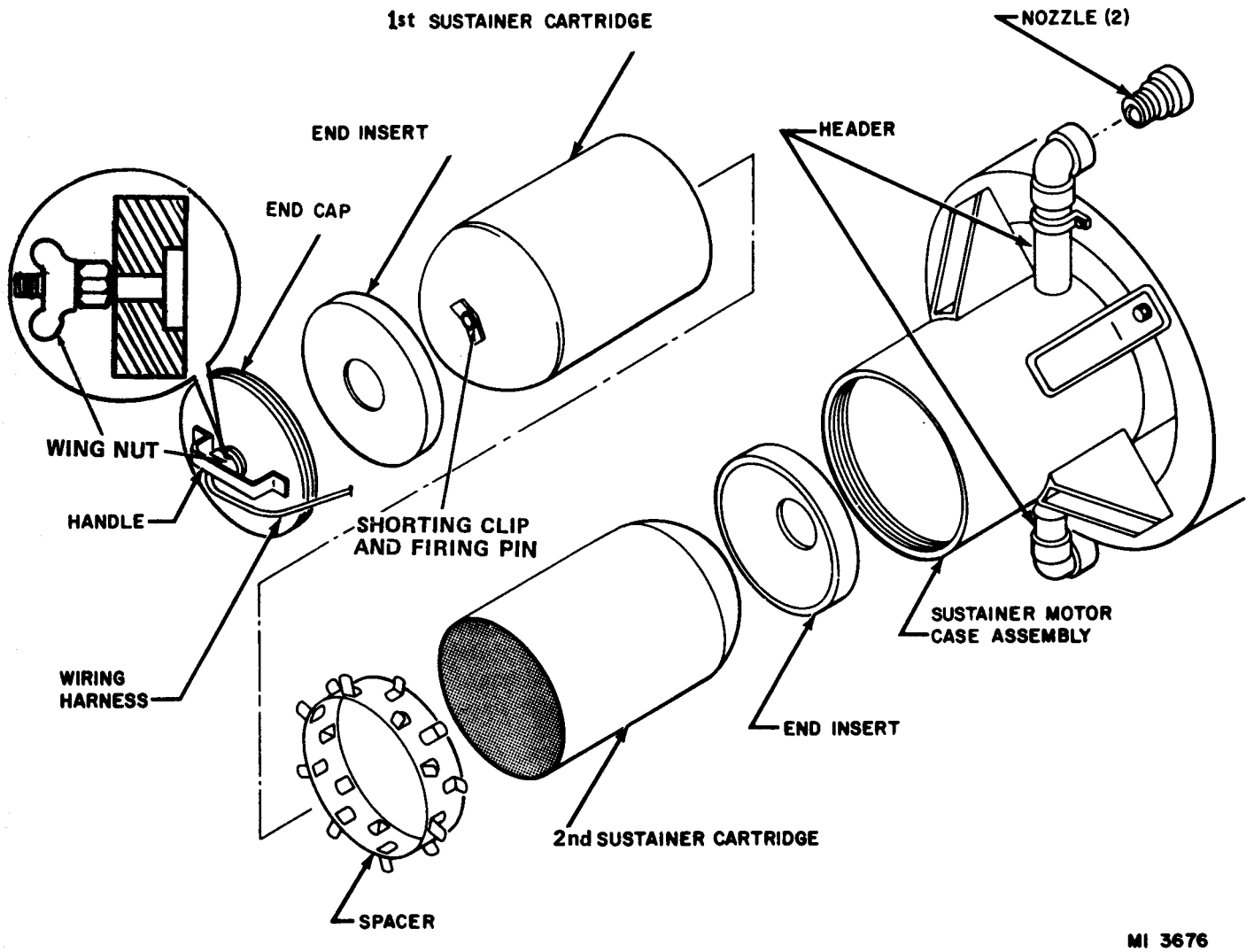


Figure 2-9. Sustainer cartridge installation.

NOTE

Ensure that the metal terminal end is not close to the end cap - if so bend away.

l. Replace the nose cone and attach it using the metal screws which were originally removed.

m. The nose cone can be installed with three screws when the screws are alternately spaced (normally six screws are used).

2-13. Target and Launcher Mating and Rocket Motor Installation.

a. Remove the static ground wire from the target.

b. Install red shorting wire across launcher terminal block.

NOTE

Use a shorting wire with alligator clip instead of the quick release lugs when firing with five rocket motors and a electrically initiated flare.

c. Place the target on the launcher so that the target guide pin is engaged in the launcher slide slot; then push the target to the rear until the guide pin is set against the stop in the rear of the slot. (Refer to fig. 1-3).

d. Connect a static ground wire between the target and the launcher. Ensure that the clips make contact with the bare metal.

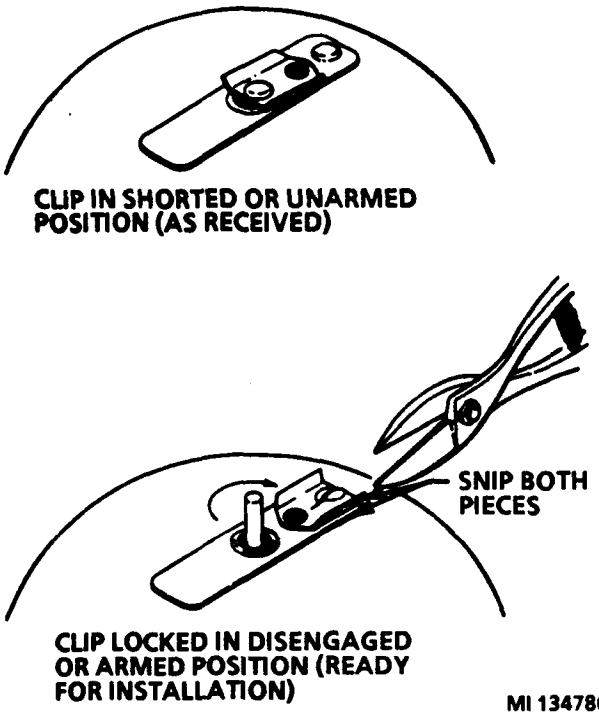


Figure 2-10. Locking sustainer cartridge shorting clip.

NOTE

It may be necessary to scrape some paint from the target to ensure a good connection.

WARNING

Use only the MK 40, Mods 1, 3 and 4, or MK 66 rocket motors in this target. Use of other motors may cause catastrophic failure. See chapter 4 for rocket motor information.

Refer to chapter 1, section III for personnel safety prior to removing the cap from the 2.75-inch rocket motor container.

e. For the MK 40 rocket motor, remove the cap from the 2.75-inch rocket motor container. Leave the rocket motor in the container with the fins exposed.

f. Visually ensure that the rocket motor shorting clip (fig. 2-11) is properly installed and is firmly against the contact disk.

f.1 For the MK 66 rocket motor, remove cap from rocket motor container, perform a visual inspection, and go to step *i*.

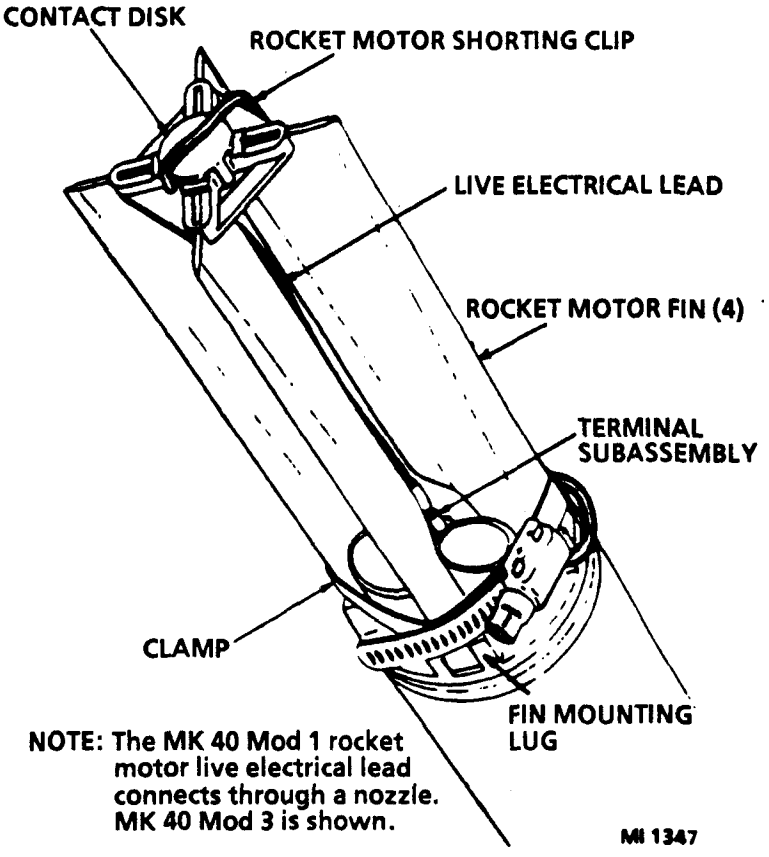


Figure 2-11. Restraining rocket motor fins.

g. Visually ascertain that the live electrical lead makes connection with the terminal subassembly and contact disk (fig. 2-11).

NOTE

Do not use if this condition is not met. Turn into Supporting Ordnance Unit for disposition.

h. Restrain the rocket motor fins with the provided clamp (fig. 2-11). Position the clamp outside of the shorting clip so that it touches the fin mounting lug and tighten the clamp.

WARNING

Ensure that the slave unit remote ARMED/SAFE switch is in the SAFE position, the red shorting wire is connected across the terminal blocks (fig. 2-14), and the SAFE TO ARM lamp is illuminated prior to making any electrical connections. Make connections only if the SAFE TO ARM lamp is illuminated.

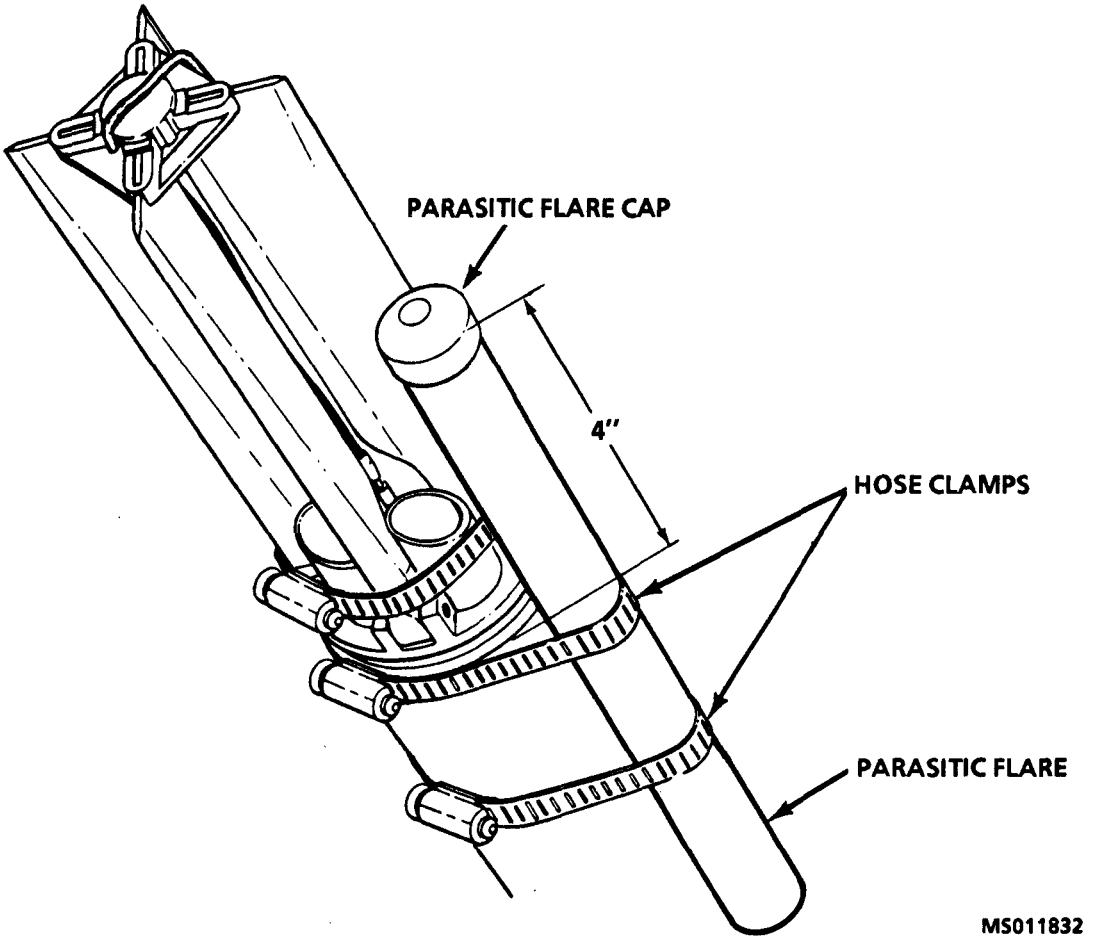


Figure 2-12. Mounting the flare on the rocket motor.

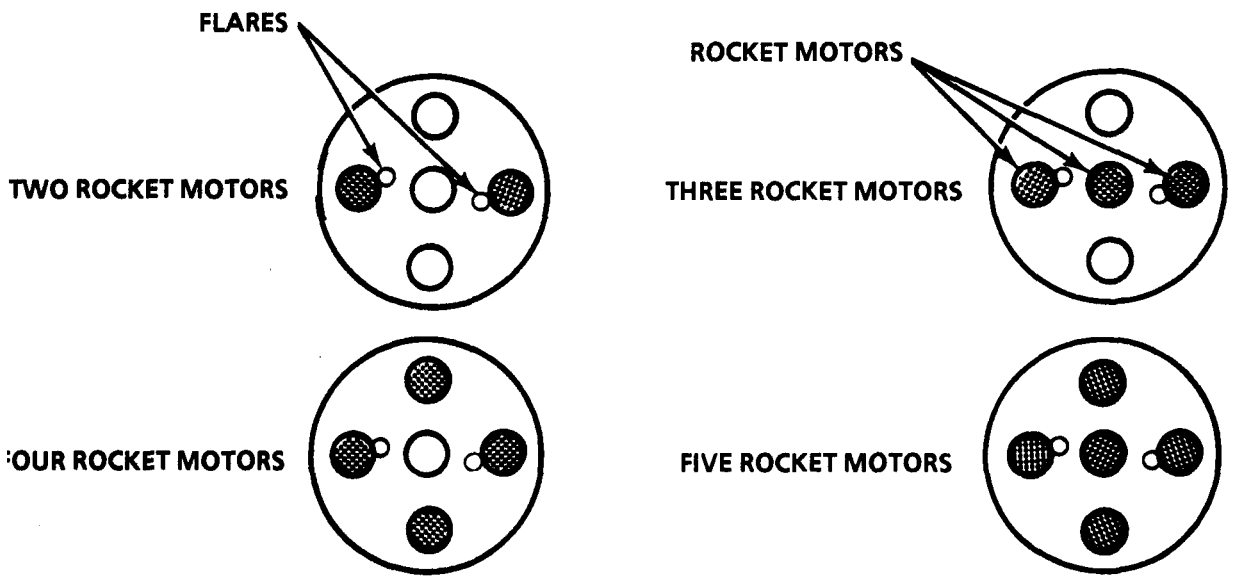


Figure 2-13. Positioning rocket motors and flares.

WARNING

The MK40 and MK66 rocket motors are classified as DOT Class B explosive, quantity-distance storage Class 1.3, and compatibility group C. Handle with care and observe all existing service regulations governing the handling of explosive ordnance. Reference TM 9-1300-206.

The body of the rocket should be held for the screwing operation to avoid accidentally dislodging the ground clip.

i. If the target is to be used as an IR target, install the rocket motors which will carry the flares in accordance with step *j* below, prior to installation of other rocket motors (See figs. 2-12 and 2-13 for flare arrangement.) Then install the flares as follows (omit) if not an IR target):

(1) Place the flares as indicated in figure 2-13 to maintain target balance.

(2) Center the flare between the fins of the MK 40 rocket motor or outside the fin restraint/EMI shield of the MK 66 rocket motor as indicated in figure 2-13 to ensure flare ignition.

(3) Place the clamps over the flare and rocket motor (See figure 2-12 for the MK 40 and figure 2-14.2 for the MK 66.). Check the flare length and orientation and tighten the clamps.

j. Remove the rocket motor from the container and insert it through the appropriate hole in the aft motor mount frame (the five-hole plate) and tighten, until hand tight, onto the associated plug on the thrust plate. Repeat this procedure for the remaining rocket motors to be used as boosters for the target. See figure 2-13 for the proper position arrangement of rocket motors and flares.

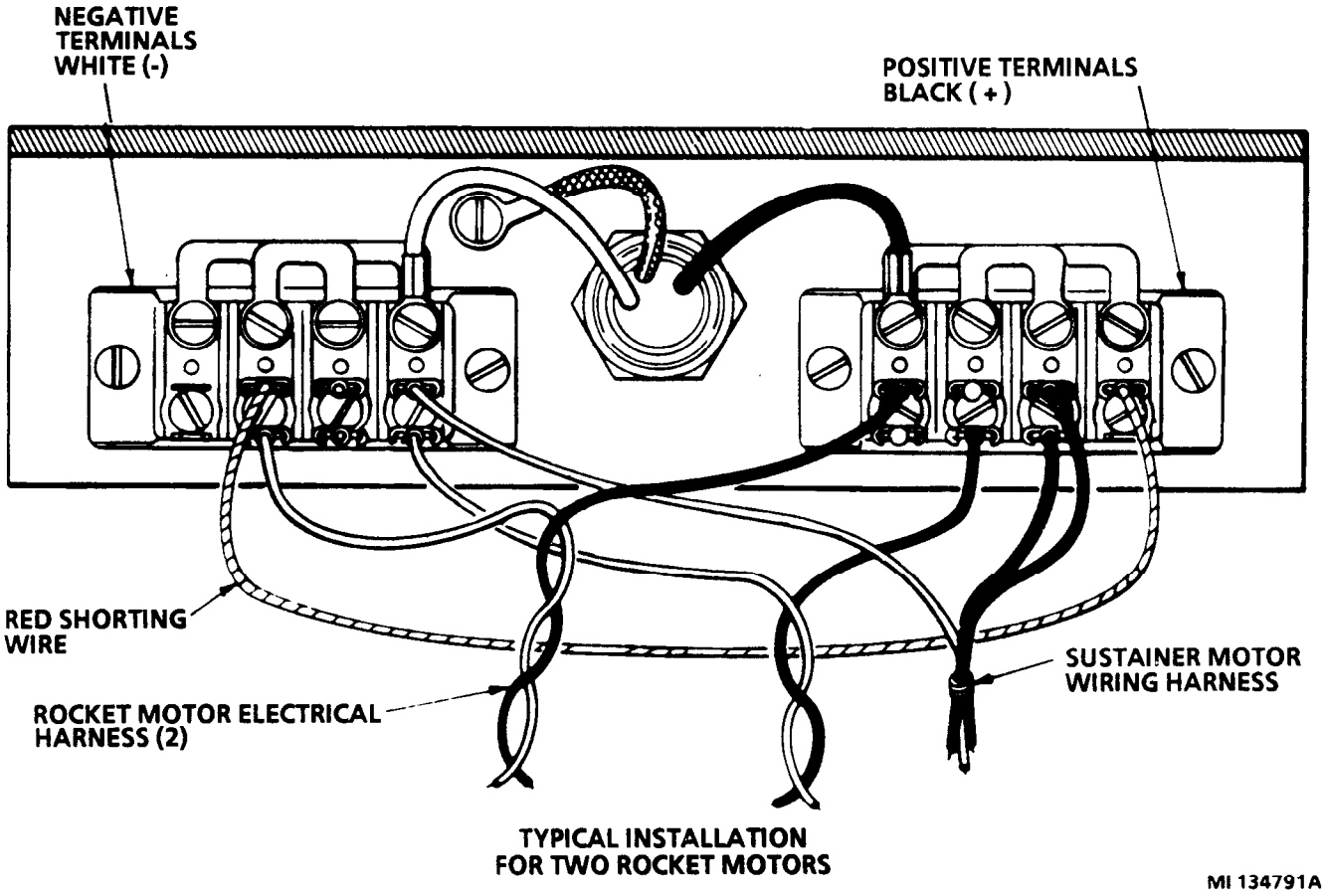


Figure 2-14. Launcher terminal block wiring installation.

k. Repeat steps *e* through *j* above, and install the remaining rocket motors in a pattern as indicated in figure 2-13.

k.1 For the MK 66 rocket motor, if not using a flare slip two hose clamps onto the rocket motor to position shown in figure 2-14.1.

k.2 For the MK 66 rocket motor, connect alligator clip end of firing contactor assembly to the rocket motor metal case.

NOTE

This connection will provide a positive electrical short circuit across the rocket motor firing squib once the firing contactor assembly is in place and tightened.

k.3 Loosen clamp and place the plastic insulator block of the firing contactor assembly over the firing contact ring groove (figure 2-14.1). Tighten so that plastic insulator block is secure and is centered in the rocket motor contact ring groove.

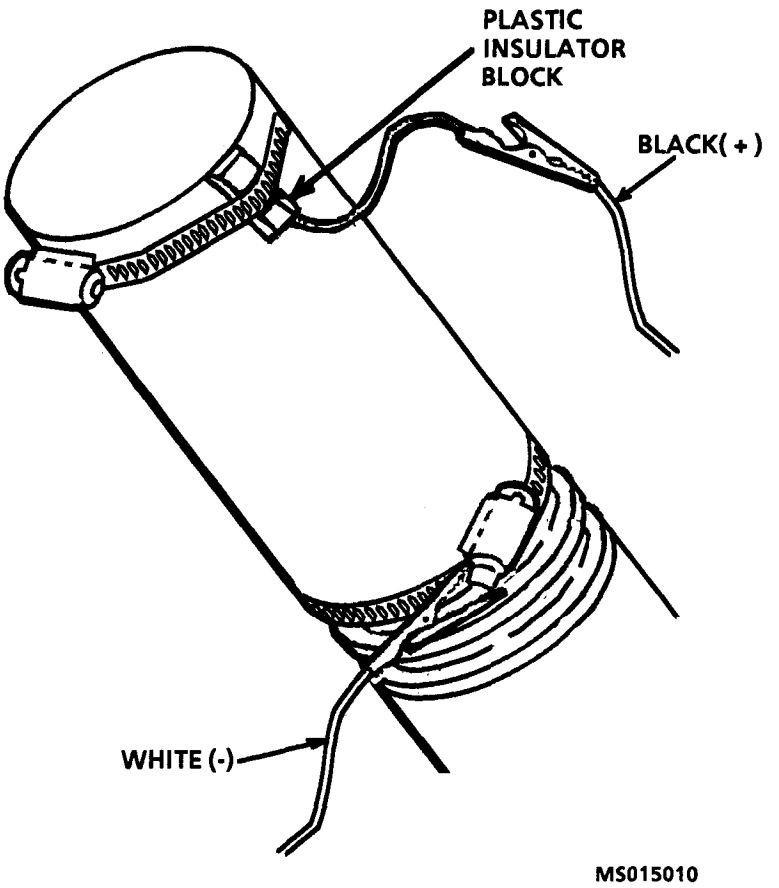


Figure 2-14.1.

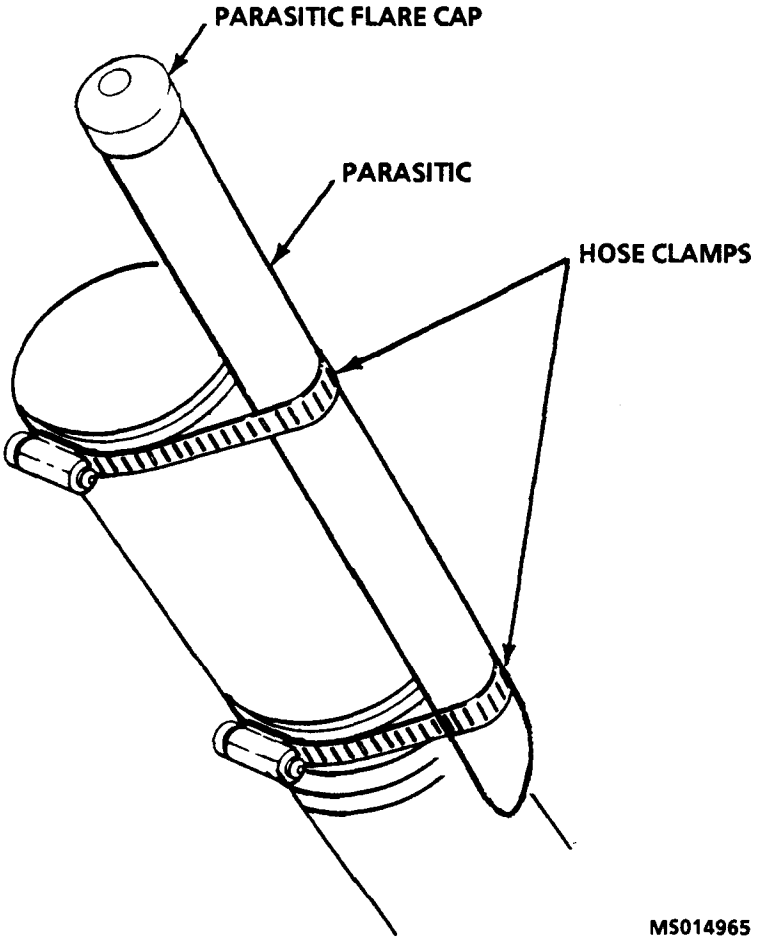


Figure 2-14.2. Mounting the flare on the MK 66 rocket motor.

l. Remove the shorting terminal (fig. 1-2) from the sustainer motor firing leads and connect the black wires to any of the terminals on the black terminal block and the white wire to any terminal on the white terminal block. (Save the shorting terminal.)

WARNING

When performing steps *m* and *n* below, ensure that the rocket motor shorting clip is in contact with the rocket motor contact disk at all times.

When handling the 2.75-inch rocket motor, personnel should avoid touching the exposed firing contact disk and exposed circuitry with the hands, except when necessary to connect the firing lead terminal clip. Never touch the contact disk with any metallic object such as a screwdriver, probe, pliers, etc.

m. Position the shorting clip of one rocket motor as shown in figure 2-16.

CAUTION

Do not connect any white wires to a black (positive [+]) terminal of the launcher terminal block or black wires to a white (negative [-]) terminal of the launcher terminal block, since a short circuit will result, causing a misfire or abnormal launch.

n. Install the rocket motor electrical harness as follows:

(1) Connect the female snap-on connectors to the terminals on the launcher terminal blocks (black wire to black positive [+] terminal block,

white wire to white negative [-] terminal block) (fig. 2-14).

(2) For the MK 40 rocket motor, connect the wiring harness alligator clip (white wire) to a nozzle on the rocket motor opposite to the rocket motor shorting clip (fig. 2-16). Ensure that the alligator clip makes contact with metal only.

NOTE

If the MK 40 Mod 1 rocket motor is used, place the clip on one of the nozzles that does not have the live wire emerging (fig. 2-16).

(3) For the MK 40 rocket motor, secure the terminal clip (black wire) on the rocket motor contact disk.

o. Repeat paragraphs *m* and *n* above, until all rocket motors are connected.

o.1 For the MK 66 rocket motor, perform the following steps:

(1) Break wiring harness (black wire) contactor clip by grasping wire end terminal and clip and bending clip back and forth until clip separates from wire end terminal.

(2) Disconnect firing contactor assembly alligator clip from rocket motor case and connect it to firing harness (black wire) end terminal.

(3) Ensure that alligator clip and black wire terminal connection is secure and not touching other wires or metal surfaces.

(4) Connect firing harness white wire alligator clip to rocket motor metal case.

(5) Perform steps (1) through (4) until all MK 66 rocket motors are connected.

p. After all the leads have been connected, recheck to ensure that all the wires are properly connected and are positioned in the wire cutter (fig. 2-15).

q. Tape the slot of the wire cutter assembly to retain the wires in the assembly.

2-14. Launcher Elevation and Final Aiming.

a. Calculate the elevation using the instructions provided in appendix D and appendix E.

NOTE

Desired flight information is contained in appendix D and appendix E.

b. Loosen the elevation indicator locking screws.

c. Position the elevation indicator until the desired elevation is opposite the index.

d. Holding the indicator in that position, tighten the locking screws. (Care should be taken not to over-tighten.)

CAUTION

Do not elevate the launcher slide to greater than 45 degrees using the elevation actuator only. Under no circumstances is the target to be launched at a QE that exceeds 50 degrees.

e. Operate the launcher elevation actuator until the level bubble in the elevation indicator is exactly centered between the lines on the level vial.

f. Correct the launch azimuth for the wind condition (refer to appendix D and appendix E).

g. Using the telescoping support arm locking screws (fig. 2-5), lock the telescoping supports into position.

h. Extend the screw jacks on the stabilizer arms one and one-half (1 1/2) turns.

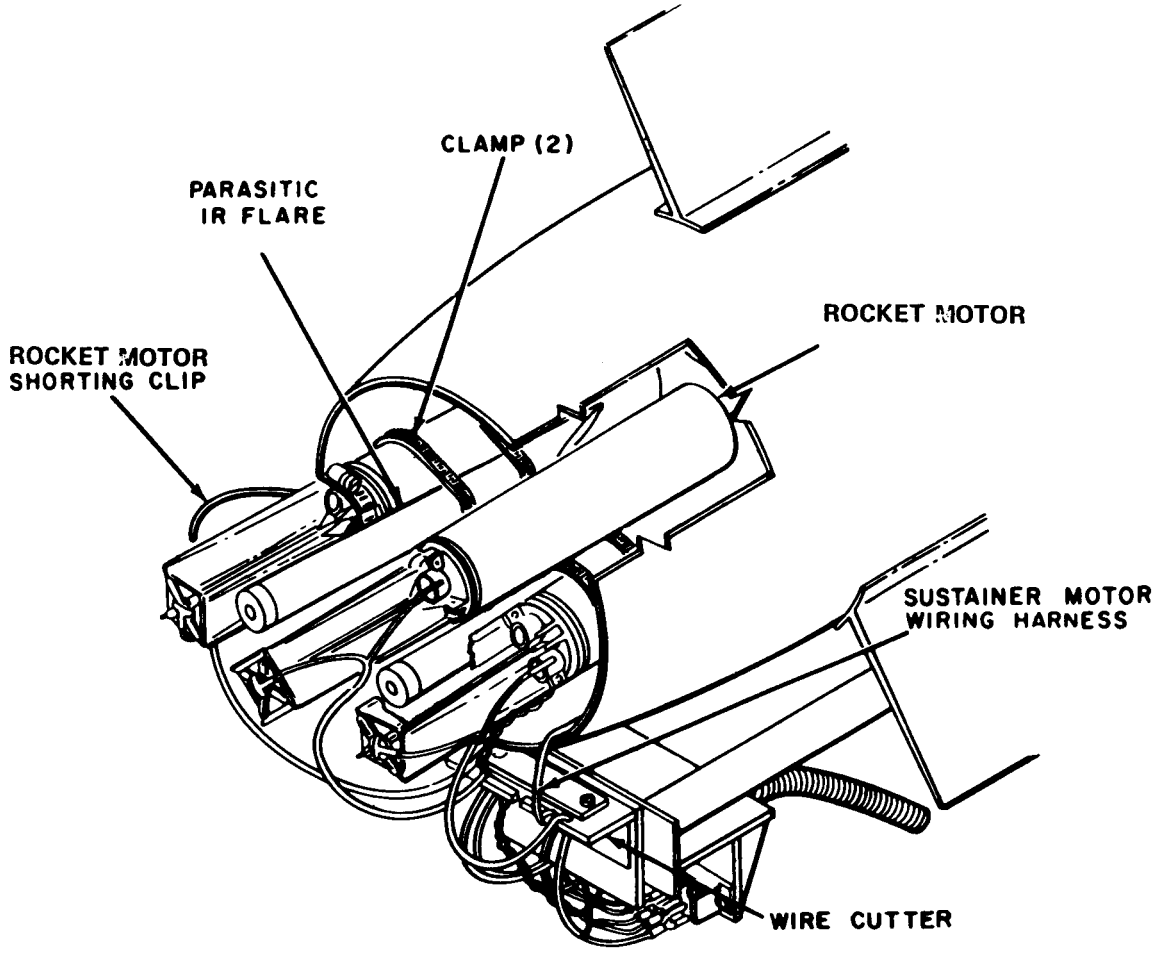


Figure 2-15. Rocket motor *and flare installation (typical three rocket motor configuration).*

i. Recheck the bubble on the elevation dial to insure that the bubble is still centered. If the bubble is not centered, perform steps *e* through *h* above.

2-15. Arming Target.

WARNING

Prior to arming, clear the area of all personnel other than the two individuals performing the arming function (chapter 1, section III).

a. Check that the SAFE TO ARM lamp on the fire control slave unit is illuminated and that the ARMED/SAFE switch is in the SAFE position.

b. Remove the rocket motor shorting clip from the contact disk and bend the shorting clip back so that it cannot touch the contact disk (fig. 2-17).

c. Remove the shorting wire from the launcher terminal block and the static ground wire between the target and launcher.

d. Move the slave unit remote ARMED/SAFE switch to the maximum distance to the side of the launcher and then place the switch in the ARMED position. (Do not close the switch cover.)

e. Evacuate the surface danger area indicated in figure 1-10.

f. Notify the Fire Control Officer that the launch area is clear.

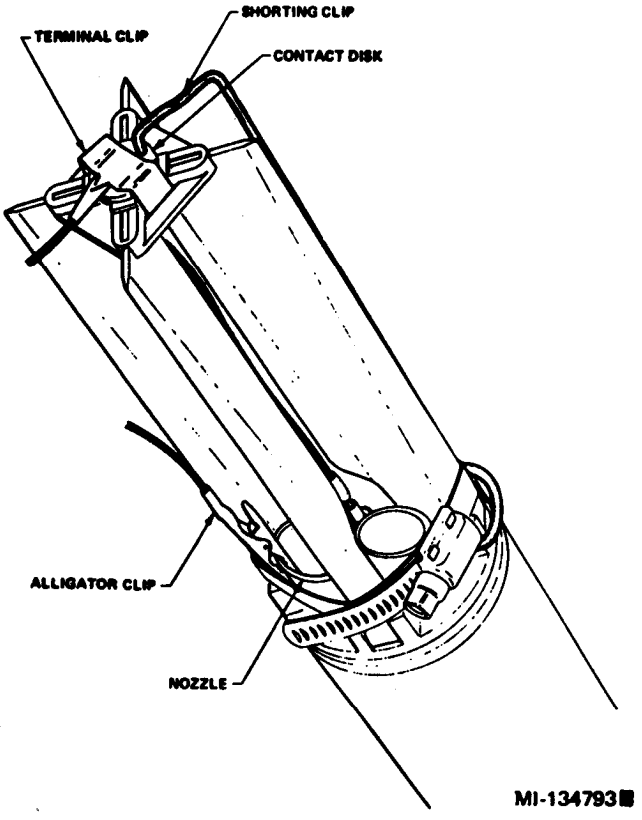


Figure 2-16. **ROCKET MOTOR** *wiring installation.*

NOTE

The target is now aimed, armed, and ready for the launch signal from the rocket firing box.

2-16. Launching Procedure.

WARNING

Prior to launching. clear the launch area of all personnel (chapter 1, section III).

a. Insure that all the rocket firing box SAFE/ ARM switches are in the SAFE position.

WARNING

Insert the key only after proper authorization has been received.

b. Insert the key into the rocket firing box and turn the POWER switch to the ON position.

c. Move the desired launcher SAFE/ARM switch(es) to the ARM position. The ARMED lamp for that launcher should illuminate.

d. Press the reset switch(es) for any launcher(s) which have been reloaded but indicate a FIRED condition.

e. Activate the FIRE COMMAND switch.

NOTE

If the targets do not launch, refer to paragraph 2-17.

2-17. Misfire Procedure.

a. The term "misfire" includes all situations in which the rocket motor fails to fire after the entire sequence of events prescribed for launching have occurred. When a misfire occurs, one of the following situations exists:

(1) A "hangfire" may be in effect. A "hangfire" is an undesired delay in the firing of the rocket after the FIRE COMMAND switch has been closed.

(2) An interruption of the firing circuit may have occurred, preventing the application of firing voltage to the rocket igniter terminals.

(3) An ignition failure may have occurred. In this situation, firing voltage has been applied to the rocket igniter terminals, but the igniter has failed to ignite.

NOTE

There is no way to distinguish this situation from a hangfire until sufficient time has elapsed after a second attempt to fire the target to rule out the possibility that a hang. fire is in effect. A 30-minute wait is sufficient.

b. Perform the following operations:

(1) Move the SAFE/ARM switch on the rocket firing box to SAFE.

(2) Press the RESET switch associated with that launcher.

(3) Move the SAFE/ARM switch to the ARM position.

(4) Attempt to fire a second time by activating the FIRE COMMAND switch.

(5) If the target again fails to fire, place the SAFE/ARM switch in the SAFE position. (Other targets connected to the rocket firing box may be fired without delay.)

(6) Turn the key-operated POWER switch to the OFF position and remove the key. The key should be retained by the Fire Control Officer or his designated representative.

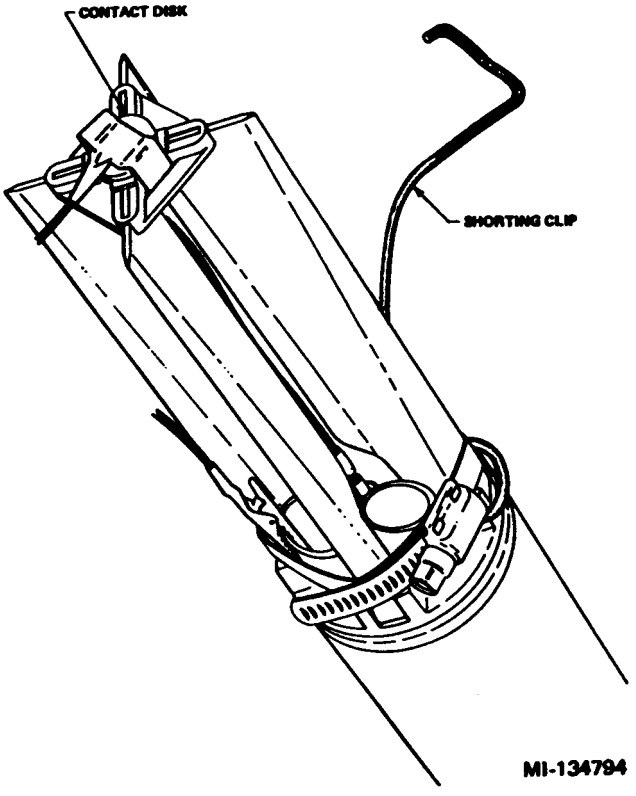


Figure 2-17. Shorting clip position.

WARNING

If the rocket motor is emitting smoke or flame, evacuate to 205 meters minimum.

(7) Wait thirty minutes before approaching the misfired target.

WARNING

The following steps should be performed by two men, with one man performing the operations and one man observing. No other exposed personnel should be within 205 meters of the launcher until the procedures through step (13) below have been accomplished.

Refer to chapter 1, section III for personnel safety.

(8) Close the cover on the slave unit remote ARMED/SAFE switch and move the switch to a protected area.

WARNING

Connect the red shorting wire to the negative (white) terminal first.

(9). Install the shorting wire on the firing terminal bored, remove the power from the slave unit and install the static ground wire from the launcher to the target.

WARNING

Do NOT, under any circumstances, stand directly forward or aft of the target launcher.

(10) Position the shorting clip on each rocket motor as shown in figure 2-16 and disconnect the firing leads from the terminal block. If, due to breakage or damage, the shorting clip cannot be positioned, disconnect the firing leads from the terminal blocks. Using the alligator clip on the white wire, clip the connector of the black lead to a nozzle.

(11) Repeat step (10) above until all rocket motors have been shorted.

(12) Disconnect the sustainer motor leads and short by reinstalling the cross adapter.

(13) The target has now been disarmed and other personnel may approach the launcher.

(14) Lower the launcher slide.

(15) Remove the target from the launcher.

(16) See chapter 3, section V, for troubleshooting the firing circuit.

WARNING

Handling and disposal of the defective Class V components resulting from misfires is the responsibility of the EOD (Explosive Ordnance Disposal) personnel.

(17) If it is determined that the firing circuits were at fault and that an ignition failure did not occur, remove the ordnance in reverse order of assembly. Place in a segregated storage area and notify EOD personnel.

NOTE

It is necessary to depress the firing pin on the starter cartridges prior to rotating the shorting clip.

c. In the event of a hangfire or a short round (some motors fire but the target does not travel full trajectory or leave the launcher), notify EOD personnel.

2-18. Post Launching and Disarming Procedures.

a. Post Launching Procedures.

(1) Move the fire control master unit SAFE/ARM switch(es) to the SAFE position.

(2) Turn the POWER switch to the OFF position and remove the key.

(3) Close the cover on the FIRE COMMAND switch.

(4) Close the cover on the slave unit remote ARMED/SAFE switch and move the assembly to a protected area.

NOTE

Precautions should be taken to insure that this switch is not damaged.

(5) Inspect the launcher, slave unit, and batteries for damage.

(6) Insure that the slave unit SAFE TO ARM lamp is illuminated.

WARNING

Do not reload the launcher if the SAFE TO ARM lamp is not illuminated. Refer to chapter 3 if the lamp does not illuminate.

(7) Remove any remaining wires from the launcher terminal block.

(8) Install the red shorting wire on the terminal block.

(9) Unlock the telescoping support arm locks and lower the launcher slide until the slide rests on the front stand. (Reposition the ball locking pins as necessary.)

NOTE

The target may be placed on the launcher while the launcher is in the desired firing elevation. If this method is followed, the nozzles and boosters (and flares if used) must be installed prior to placing the target on the launcher. Additional personnel are required to place a loaded target on the elevated launcher.

b. Target Disarming Procedure. Whenever it becomes necessary to remove a target from a launcher after the target has been armed, the following procedure will be followed:

(1) On the firing box place the SAFE/ARMED switch to SAFE.

(2) Turn the POWER switch to OFF and remove the key.

WARNING

The following steps should be performed by two men with one man standing off to the side with a clear view of the safing operations.

(3) Close the cover on the slave unit remote ARMED/SAFE switch.

(4) Remove the power from the slave unit and install the static ground wire from the launcher to the target.

(5) Remove the nozzles (fig. 1-2) from the sustainer motor.

(6) Reinstall the shorting clip on each rocket motor (fig. 2-15) and disconnect the firing leads from the terminal blocks. If the shorting clip cannot be reinstalled, disconnect the firing leads from the terminal blocks, and clip the connector of a black lead to a nozzle using the alligator clip on the white lead.

(7) Repeat step (6) above until all rocket motors have been shorted.

(8) Disconnect the sustainer motor leads from the terminal blocks, and short the leads together by reinstalling the shorting terminal.

(9) Loosen the clamps on the IR flare (if present) and remove the flare. Replace the flare into its original container. Seal the container, and return to storage.

(10) The target has now been disarmed, and other personnel may approach the launcher.

(11) Remove the target from the launcher and place it on a work stand, or complete the disassembly on the launcher.

c. Disassembly of a Disarmed Target.

WARNING

Disassembly must be performed in an approved area which does not have excessive radar or radio energy levels. Do not operate any mobile radio transmitters within 100 meters of any BATS propulsion or ordnance components removed from their shipping containers.

If a 2.75-inch rocket motor or MXU4A/A sustainer motor, crated or uncrated, is dropped a distance exceeding 2 feet on a hard surface such as wood, concrete, metal, or hard-packed earth, reject the motor, and contact the applicable command headquarters for disposition instructions.

When handling the 2.75-inch rocket motor, personnel should avoid touching the exposed firing contact disk and exposed circuitry with the hands except when necessary to connect the firing lead terminal clip. Never touch the contact disk with any metallic object such as a screwdriver, probe, pliers, etc.

(1) If shorting clip (fig. 2-16) is intact, remove terminal clip (fig. 2-16) from the contact disk on one rocket motor, and secure the shorting clip against the contact disk. Remove the firing leads, and retain leads for reuse.

(2) If the shorting clip (fig. 2-16) cannot be secured against the contact disk as described above, keep the firing leads clipped to a nozzle. DO NOT remove the firing leads from the rocket.

(3) Remove the rocket motors from the target.

(4) Remove the fin clamps (fig. 2-11). Place the rockets into their original shipping containers. (Reference TM 9-1340-201.)

(5) Mark the container for storage and return the rocket to storage if it meets the criteria step (1). Rockets which meet the criteria step (2) should be marked for EOD, and set aside for disposal.

(6) Remove the target nose cone.

(7) Remove the wing nut (fig. 2-9) and the wiring harness (firing lead) and end cap.

(8) Depress the firing pin on the sustainer cartridge, and rotate the shorting clip into such a position over the firing pin that the pin is held in its depressed position.

(9) Remove the end insert and the first sustainer cartridge (fig. 2-9). Replace the sustainer cartridge into its original shipping carton, seal, and return to storage.

(10) Remove the spacer (fig. 2-9).

(11) Remove the second sustainer cartridge and repeat step (8) above for the second sustainer cartridge and its end insert.

(12) Replace the rocket motor firing leads, fin and flare clamps, two end inserts, and one spacer into the sustainer motor case assembly (fig. 2-9). Replace the end cap, wiring harness (firing lead) and the wing nut.

(13) Replace the nose cone.

(14) Replace two nozzles on the sustainer motor assemby headers. Place plastic covers on the nozzles.

NOTE

Do not remove the fins from the target.

d. March Order of Launcher.

(1) Disconnect launcher batteries from the fire control slave unit.

(2) Remove static grounding wires from the launcher.

(3) Remove the fire control slave unit from the launcher.

(4) Lower the launcher slide, and secure the telescoping support arm locking screws.

(5) Return the cutter slide to the storage position, and secure it with the two ball locking pins (fig. 1-3).

(6) Remove the two launcher batteries.

(7) Pivot the stabilizer arms inward and place them in the stabilizer arm supports (fig. 1-3).

(8) Retract the leveling jacks until the launcher frame is as close to the ground as possible. Secure the leveling jack handles against the leveling jacks.

(9) The launcher is now ready to be loaded upon the transport vehicle for movement to a new launching site or to storage.

Section III. OPERATING UNDER UNUSUAL CONDITIONS

2-19. Operating Under Cold Conditions.

a. Care must be exercised to insure that the batteries retain their charge when operating under extreme cold conditions.

NOTE

This system is not designed to operate under conditions colder than -20 degrees F.

b. Do not move the rocket firing box or slave unit from extreme cold to heat and then back into the cold in a short period of time, since humidity could condense and freeze on the relays or other electrical components. This does not preclude storing the units in a heated mea overnight.

c. Other than those precautions previously noted, operate the system as prescribed in section II.

2-20. Operating Under Hot Conditions.

NOTE

This system is not designed to operate under conditons which exceed +120 degrees F.

a. Any metal parts which must be touched should be shaded from the sun to keep from burning the operator.

b. There are no special precautions which must be adhered to. The system may be operated as prescribed in section II.

2-21. Operating Under Blowing Dirt Conditions.

a. Insure that dirt does not obstruct the operation of the screw surfaces.

b. Insure that no dirt has obstructed the switches or connections on the rocket firing box or slave unit.

c. Other than those precautions previously noted, operate the system as prescribed in section II.

2-22. Operating in Rain and Snow.

a. Protect the rocket firing box and slave unit from excessive rain or melting snow. Water within the units could cause a short in the electrical system.

NOTE

The system has been water proofed; however, after the rocket firing box and slave unit have been opened several times, they may become susceptible to damage by driving rain.

b. When operating on snow or very soft ground, it may become necessary to relevel the launcher after several launches.

c. Do not place the slave unit ARMED/SAFE switch where it could become submerged in water.

d. Insure that the target is not frozen to the launcher.

e. Other than those precautions previously noted, operate the system as prescribed in section II.

2-23. Operating During Hazardous Weather Conditions.

For operation during hazardous weather conditions, refer to chapter 1, section III.

CHAPTER 3

MAINTENANCE INSTRUCTIONS

Section I. SERVICE UPON RECEIPT OF MATERIEL

3-1. Unpackaging Target.

a. All components of the target airframe (except ordnance) are shipped in one container (fig. 3-1). The target is fully assembled except for the tail fins. These are permanently attached in the field.

WARNING

Wear safety goggles or glasses and gloves when cutting the steel bands.

b. Place the packaged target at the side of the work stands with the folded top surface up, and cut the steel bands using the filament snips supplied with the launcher. Remove the steel bands to avoid injury to personnel.

c. Lift off the cardboard top cover and fold the sides down to expose the wooden frame of the shipping container.

d. Remove the packages holding the tail fins and place them in a safe area.

e. Remove the plywood end panels by pulling straight up, and discard.

f. Remove the wood frame side panels by pulling straight out, then discard panels.

g. Lift off the top support rack, then discard the rack and cardboard .

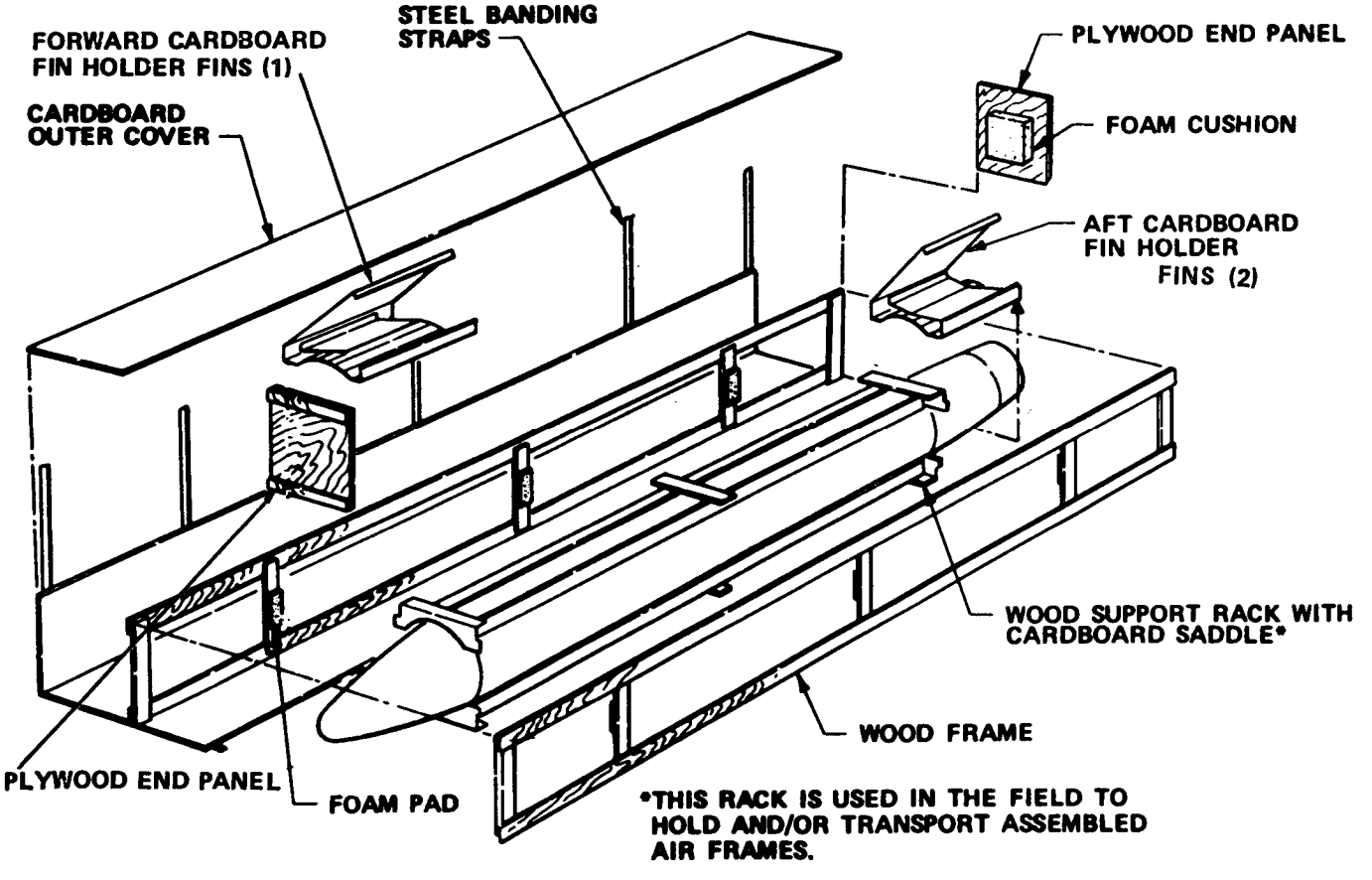


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Figure 3-1. Unpackaging target.

h. See chapter 2, section II, for loading and assembly instructions.

3-2. Unpackaging Launcher.

WARNING

Wear safety goggles or glasses and gloves when cutting the steel bands.

To unpackage the launcher, cut the steel bands holding the packing boards to the slide and the jack pads and cut the steel bands holding the tool box. Remove the packing boards. Cut and remove the steel bands holding the slide to the front stand. No other service is necessary for preparing the launcher for use (other than installing the fire control slave unit).

NOTE

It maybe necessary to jack the launcher up with the leveling jacks to remove the pallet.

3-3. Unpackaging Fire Control System.

The rocket firing box and slave unit are shipped in separate fiberboard containers. Remove rocket firing box and slave unit from fiberboard containers. Pour the acid in the batteries.

3-3.1. Preparation of Batteries.

Batteries for launcher and Fire Control System should be prepared for use by adding acid to batteries and placing on charger for initial charge. The automotive shop or motor pool area is recommended for this procedure.

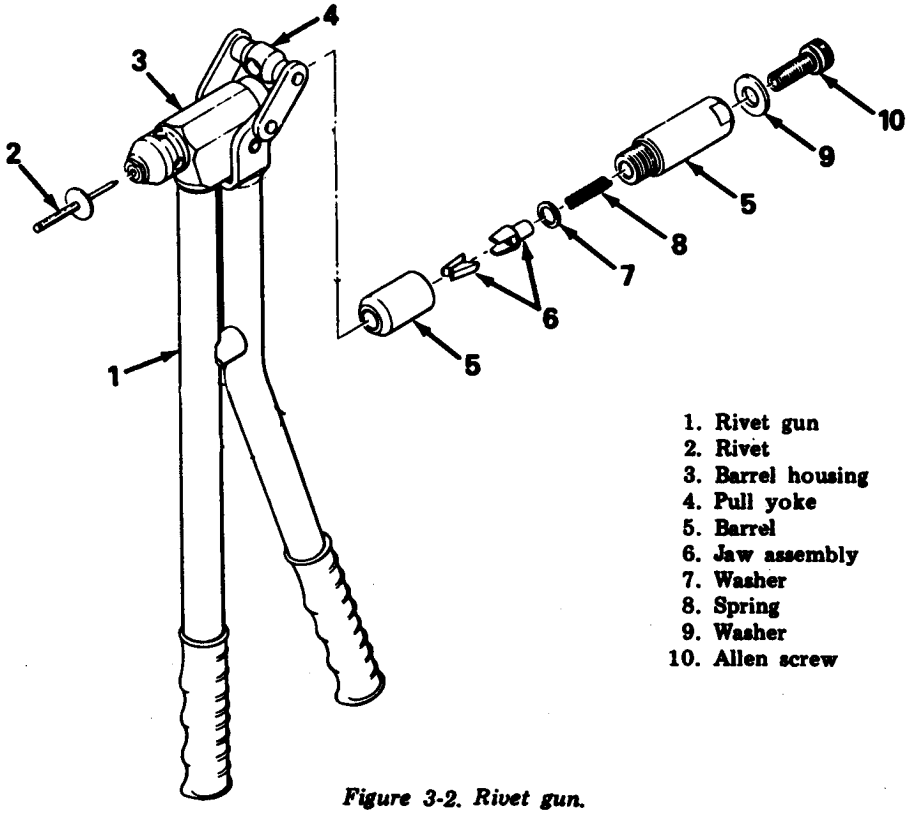
Section II. TOOLS AND EQUIPMENT

3-4. Tools and Equipment.

Tools and equipment necessary for maintenance are listed in appendix B of this manual.

3-5. Rivet Gun.

When installing the fins on the target, the rivet gun may become jammed due to bent rivets. The following procedure may be used to clear the rivet gun (fig. 3-2).



1. Rivet gun
2. Rivet
3. Barrel housing
4. Pull yoke
5. Barrel
6. Jaw assembly
7. Washer
8. Spring
9. Washer
10. Allen screw

Figure 3-2. Rivet gun.

a. Remove the allen screw (10) and the washer (7) from the pull yoke (4).

b. Rotate the pull yoke (4) and remove the barrel (5) from the rivet gun housing (3).

c. Using an adjustable wrench and a pair of slip joint pliers unscrew the two portions of the barrel (6) assembly.

NOTE

Grip the barrel at the flat portions on each end. Care should be taken to avoid burring the barrel surface. Burrs may make assembly difficult.

Disassembly of the barrel should be made in a clean area or over a box to prevent loss of the small components of the barrel assembly.

d. The bent rivet can now be removed.

e. Reassemble in reverse order.

Section III. LUBRICATION

3-6. Lubricating Threaded Surfaces (Fig. 3-3).

Apply a light coat of grease (MIL-G-109-24B) to the threaded surfaces of the launcher screw jacks, elevating actuator, wire cutter, and azimuth actuator, as indicated on figure 3-3, after each day's launching activities.

3-7. Elevation Actuator Lubrication.

The elevation actuator is also lubricated using the grease fitting on the barrel of the assembly.

3-8. Lubricating Rear Stand Bearings (Fig. 3-4).

The two rear stand bearings must be cleaned and greased at least once a year, or at any time binding is evidenced. Remove and clean the bearings as follows:

a. Remove the ball-lock pins holding the cutter slide and pull the cutter slide out of the launcher slide (fig. 1-3).

NOTE

The cable need not be disconnected at either end.

b. Place the terminal block slide as far away from the launcher as the cable will permit.

c. Remove the attaching hardware from the upper "U" joint (fig. 1-3 [8]) and remove the telescoping support arms from the launcher slide.

d. Remove the attaching hardware (l), (4), (5), and (14) from the launcher slide and rear stand. Remove the bolts and self-locking nuts and remove the elevation actuator (fig. 1-3).

e. Lift the launcher slide from the launcher.

f. Loosen the jam-nut (13) on the lug (12) and remove the lug from the center pipe plug (11, fig. 3-4).

g. Remove the cotter pin (6) and washer (3) from the azimuth actuator shaft (2) and loosen the two bolts which secure the azimuth shaft pillow block.

h. Turn the azimuth actuator crank counter-clockwise until the azimuth actuator (2) shaft is disengaged from the threaded pivot on the center pipe pivot arm (7).

i. Turn the center pipe pivot arm (7) clock-wise until the pivot arm will clear the azimuth actuator shaft (2).

j. Lift the center section (7, 8), top bearing (10), and bearing race from the rear stand.

NOTE

If binding is evidenced when lifting the center section, a mallet may be employed to tap upward on the pivot arm. The plug may become disengaged from the center pipe at this time.

k. Remove the attaching hardware and remove the lower plate (9) from the bottom of the rear stand.

NOTE

If the plug has fallen from the center pipe, it may be removed with the lower bearing and bearing race at this time, or it can be removed from the top after the upper bearing race has been removed.

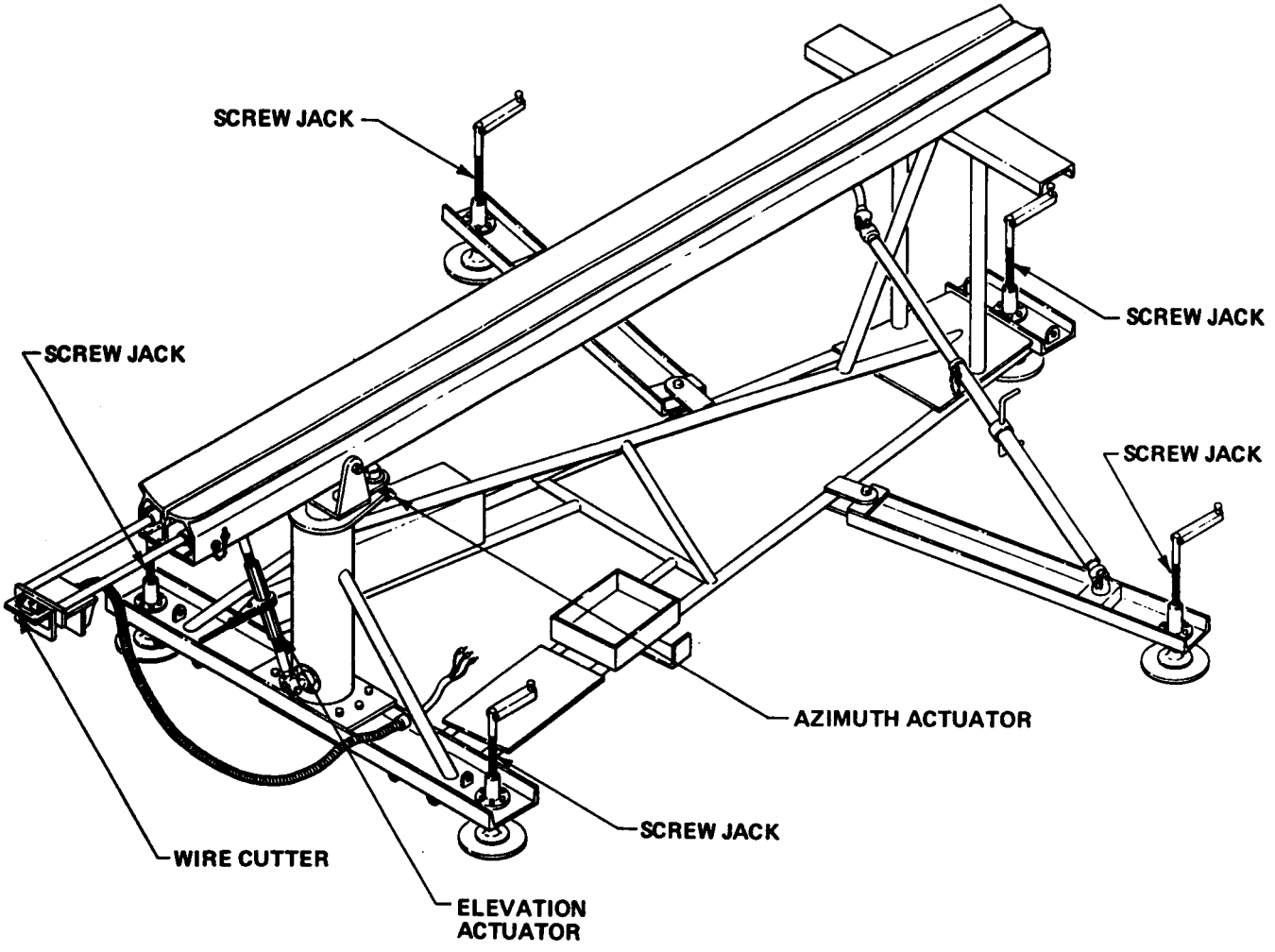


Figure 3-3. Lubrication.

l. Clean the bearings and races (10) with kerosene.

m. Dry the bearings (10) and repack them with grease (MIL-G-109-24B).

3-9. Reassembly of Rear Stand.

Reassemble the rear stand and previously removed components of the launcher as follows:

a. Replace the lower bearings and race (10).

b. Reinstall the plate (9) on the bottom of the rear stand.

c. Reinstall the upper bearing and race (10) on the center pipe.

d. Reinstall the plug (11) in the center pipe (8).

NOTE

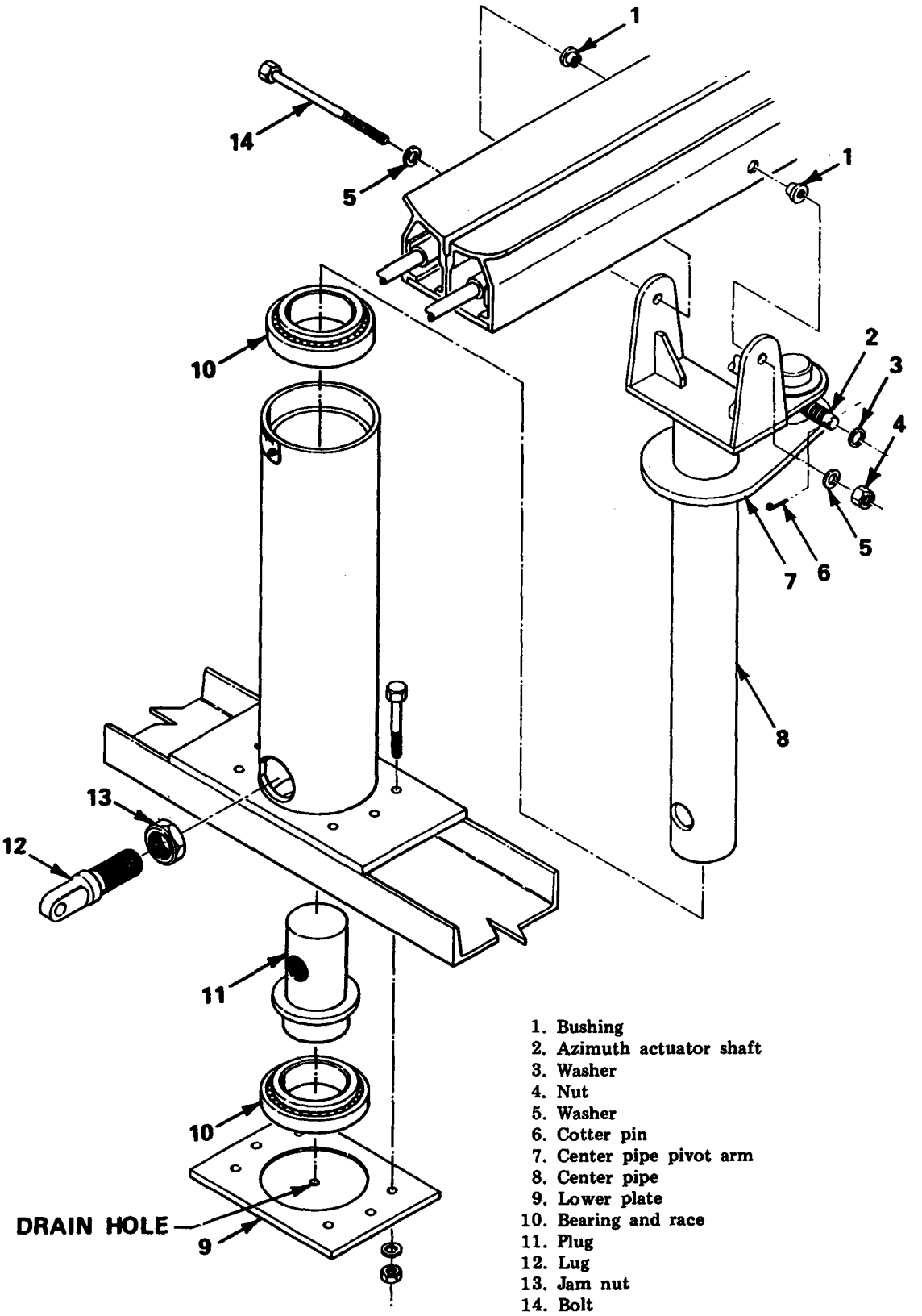
The hole in the center pipe must be alined with the threaded hole in the plug.

e. Insert the center section (7, 8) in the rear stand.

f. Aline the threaded pivot on the center pipe pivot arm (9) with the azimuth actuator shaft (2) and start the threads by turning the actuator crank clockwise.

g. Turn the actuator crank clockwise until the pointer on the center pipe pivot arm (7) is alined with the 15-degree mark on the azimuth indicator (fig. 2-1) and tighten the two bolts which secure the azimuth shaft pillow block.

h. Reinstall the washer (3) and cotter pin (6) on the azimuth actuator shaft (2).



1. Bushing
2. Azimuth actuator shaft
3. Washer
4. Nut
5. Washer
6. Cotter pin
7. Center pipe pivot arm
8. Center pipe
9. Lower plate
10. Bearing and race
11. Plug
12. Lug
13. Jam nut
14. Bolt

Figure 3-4. Disassembly of rear stand.

MI-134798

i. Insure the jam-nut (13) is installed on the lug (12).

j. Reinstall the lug (12) in the center pipe plug (11) and finger tighten the jam-nut (13) to lock the lug in place.

h. Place the launcher slide on the launcher and reinstall to the rear pivot point using the attaching hardware (fig. 3-4).

l. Reinstall the elevation actuator to the launcher slide and lug using the attaching hardware (fig. 1-3).

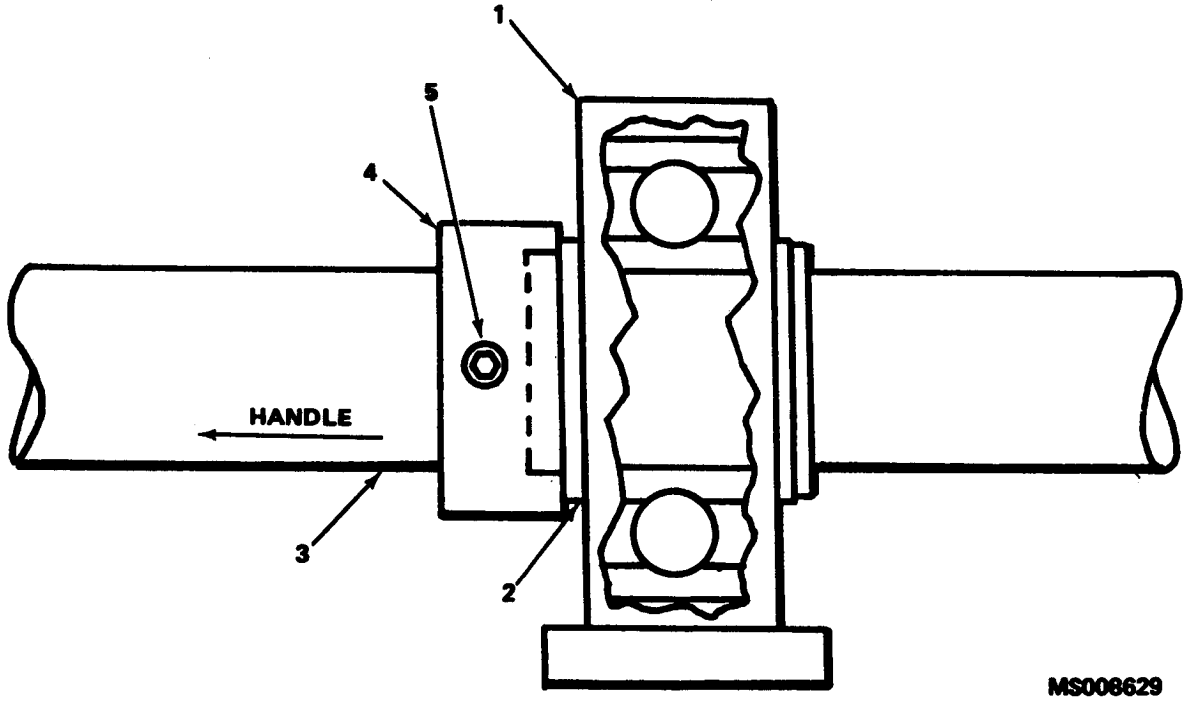
NOTE

Insure that the grease fitting is above the handle of the elevation actuator.

m. Reinstall the telescoping support arms to the launcher slide using the bolts and self-locking nuts.

n. Reinstall the cutter slide in the launcher slide and lock it in place using the ball-lock pins.

o. Mount pillow block bearing (1, fig. 3-4.1) onto launcher with the eccentric step aide of the inner bearing race (2) oriented away from the launcher. Center the launcher rail on mount to 15° reading on azimuth plate. Install shaft (3) and center the shaft in its threaded area of travel. The collar (4) has an eccentric cut-out on the inside of one edge that mates with the eccentric step on the inner bearing race (2). Place the collar against the bearing race and rotate until the collar slips onto the step of the bearing race. Rotate collar by hand, then with a spanner wrench until the eccentric coupling is very tight. This will lock the collar and race together on the shaft. Secure the locking collar setscrew (5).



1—Pillow block bearing
2—Inner bearing race
3—Shaft
4—Collar
5—Locking collar setscrew

Figure 3-4.1. Mating of pivot shaft (10286285) to pillow block bearing (10286311).

Section IV. PREVENTIVE MAINTENANCE CHECK AND SERVICES

3-10. Preventive Maintenance.

Preventive maintenance for the Ballistic Aerial Target System will be accomplished in accordance with table 3-1. These checks are not required if the system is not scheduled to be used; however, a thorough examination of the equipment items should be made 30 days prior to each firing to make sure that the equipment is functionally ready for firing.

3-11. Service Checks.

The specified checks represent the minimum number of essential checks. After each firing period the equipment items should be cleaned and inspected prior to storage. If your equipment fails to operate, troubleshoot with proper equipment. Report any deficiencies which cannot be corrected on DA Form 2404.

Table 3-1. ***Preventive Maintenance Checks and Services***

NOTE: Within designated interval, these checks are to be performed in the order listed.

B—Before D—During A—After W—Weekly M—Monthly

Item No.	Interval B	D	A	W	M	Item to be Inspected	Procedures Check for and have repaired or adjusted as necessary
1	●	●	●	●	●	Launcher	Inspect for obvious physical damage.
				●	●		Inspect the moving parts for excessive wear, paying particular attention to the elevating screw attach points and the trunnion point.
					●		Inspect for chipped paint. Spot paint as required.
							NOTE Do not paint the slide trough as it has a special coating. Slide coating need not be replaced. Do not paint the electrical contacts.
							Inspect the structural members of the launcher for evidence of bending and metal fatigue (small cracks in the metal or a stretched appearance). Particular attention should be given to the welded seams for evidence of cracks or broken welds.
2	●		●	●	●	Leveling jacks	Check for free movement and wipe exposed screwjack threads. Apply grease MIL-G-109-24B as required.

Table 3-1. Preventive Maintenance Checks and Services—Continued

Item No.	erva B	D	A	W	M	Item to be inspected	Procedures Check for and have repaired or adjusted as necessary
3	●		●	●	●	Elevation actuator	Check for free movement, clean, and apply grease MIL-G-109-24B to exposed threads.
				●	●		With the launcher slide lowered and resting on the front stand, wipe the exposed threads of the elevating screw with a clean dry cloth.
							Using a grease gun fill the barrel of the elevating actuator with grease MIL-G-109-24B.
4	●		●	●	●	Azimuth screw	Check for free movement. Wipe exposed threads of the azimuth screw with a clean dry cloth and apply grease MIL-G-109-24B as required.
5				●	●	Elevation indicator	Remove the screws which lock the elevation dial and remove the dial. Wipe the entire dial and mating surfaces on the dial and launcher with a clean dry cloth. Apply grease MIL-G-109-24B to all surfaces. Replace the dial and check that the dial can be operated without binding.
							NOTE Handle the dial carefully to avoid scars, burrs, or chips on the mating surfaces. Do not use force when removing or replacing the dial.
6	●		●	●	●	Launcher terminal blocks	Check for damaged terminals. Remove and replace damaged terminal blocks. Clean and tighten the terminal connections as required.
7	●		●	●	●	Wire cutter	Check for sharpness, sharpen if necessary.
8	●					Batteries	Check that batteries are fully charged. Batteries stored by the automotive shop should be checked for a full charge before taking them to the field.
9				●	●	Battery platform	Wipe the battery platform with a clean dry cloth. If there is corrosion, wash the box with a solution of soda water. After drying, spot paint the box with an acid resistant paint as required.
10	●		●	●	●	Telescoping support arms	Check for free movement.
11	●		●	●	●	Fire control system	Inspect the electrical connectors for corrosion and dirt. Check for broken or frayed wires. Perform installation and checkout of the rocket firing box and fire control slave unit.
					●		Inspect for chipped paint. Spot paint as required.

Section V. TROUBLESHOOTING

3-12. General

This section contains the most common causes for trouble in the fire control system. Operator maintenance is limited to cleaning of the electrical connections, replacement of the fuse and bulbs in the indicator lights. Other maintenance functions, except those involving use of a soldering iron, should be performed at the organizational level. Maintenance operations involving soldering must be performed at the DS/GS level.

3-13. Troubleshooting the Fire Control System.

See table 3-2 for troubleshooting the rocket firing box and table 3-3 for troubleshooting.

Table 3-2. Troubleshooting the Rocket Firing Box

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION
1. POWER LAMP FAILS TO ILLUMINATE WHEN POWER SWITCH IS ON
Step 1. Check for defective lamp and/or fuse.
Replace lamp and/or fuse.
Step 2. Using a multimeter, check for a discharged battery.
Replace battery.
Step 3. Check for loose or defective electrical connectors.
Tighten or replace connectors to the battery and rocket firing box.
2. SOME ARMED OR FIRED LAMPS DO NOT ILLUMINATE WHEN THE TEST SWITCH IS ACTUATED
Step 1. Check for defective lamps.
Replace lamps.
Step 2. Refer to figure 1-7 or 1-8 and use a multimeter to check for an open diode.
Replace the diode. (DS/GS Maintenance.)
3. NO ARMED OR FIRED LAMPS ILLUMINATE WHEN THE TEST SWITCH IS ACTUATED
Step 1. Check polarity of battery leads to the fire control master unit.
Reverse the battery leads.
Step 2. Using a multimeter check for defective test switch.
Replace switch. (DS/GS Maintenance.)
4. RESET SWITCH FAILS TO RESET THE FIRED TO ARMED INDICATOR LAMPS
Step 1. Using a multimeter, check for defective reset switch.
Replace reset switch. (DS/GS Maintenance.)
Step 2. Refer to figure 1-7 or 1-8 and use a multimeter to check for defective relay (K3-K8) in firing box 10286402 or defective diode or SCR in firing box 11507250.
Replace defective component. (DS/GS Maintenance.)

Table 3-2. Troubleshooting the Rocket Firing Box—Continued

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION
5. FIRE COMMAND SWITCH FAILS TO ACTIVATE THE FIRING CIRCUITS
Step 1. Using a multimeter, check for defective FIRE COMMAND switch.
Replace switch. (DS/GS Maintenance.)
Step 2. Using a multimeter, check for defective SAFE/ARM switch.
Replace switch. (DS/GS Maintenance.)
6. FIRE COMMAND SIGNAL IS ALWAYS APPLIED
Using a multimeter, check for defective FIRE COMMAND switch.
Replace switch. (DS/GS Maintenance.)
7. FIRE COMMAND CYCLES OFF AND ON (ROCKET FIRING BOX 10286402 ONLY)
Refer to figure 1-7 and use a multimeter to check for defective relay K1.
Replace relay. (DS/GS Maintenance.)
8. FIRE COMMAND CAUSES ALL FIRED INDICATORS TO ILLUMINATE
Refer to figure 1-7 or 1-8 and use a multimeter to check for a shorted diode in the FIRED circuit.
Replace diode. (DS/GS Maintenance.)
9. ACTIVATING SAFE/ARM SWITCH CAUSES ALL ARMED INDICATORS TO ILLUMINATE
Refer to figure 1-7 or 1-8 and use a multimeter to check for a shorted diode in the ARMED circuit.
Replace diode. (DS/GS Maintenance.)

Table 3-3. Troubleshooting the Fire Control Slave Unit

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION
1. SAFE TO ARM LAMP DOES NOT ILLUMINATE WHEN ELECTRICAL CONNECTIONS ARE MADE
Step 1. Check for defective lamp.
Replace lamp.
Step 2. Check for discharged batteries.
Replace batteries.
Step 3. Check for loose or defective connections.
Tighten or replace electrical connections. (DS/GS Maintenance if soldering required.)

Table 3-3. Troubleshooting the Fire Control Slave Unit—Continued

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION
2. SAFE TO ARM LAMP EXTINGUISHES BUT THE VOLTMETER DOES NOT INDICATE PROPER VOLTAGE WHEN THE FIRE COMMAND IS RECEIVED
Step 1. Insure ARMED/SAFE switch is in the armed position. If symptom remains, use multimeter and check for defective ARMED/SAFE switch.
Replace switch. (DS/GS Maintenance.)
Step 2. Check for loose or defective connections.
Tighten or replace electrical connections. (DS/GS Maintenance.)
Step 3. Refer to figure 1-9 and use a multimeter to check for open resistors (R1, R2, or R3) or a defective relay K2.
Replace resistor or relay. (DS/GS Maintenance.)
3. SAFE TO ARM LAMP DOES NOT REMAIN EXTINGUISHED FOR 3 TO 5 SECONDS AFTER SENDING FIRE COMMAND (ROCKET FIRING BOX 10286402 ONLY)
Step 1. Check that resistor R1 in the rocket firing box is properly adjusted.
Step 2. Refer to figure 1-7 and use a multimeter to check for a defective resistor R1 or relay K2, both in the rocket firing box.
Replace resistor or relay. (DS/GS Maintenance.)
4. SAFE TO ARM LAMP DOES NOT EXTINGUISH AFTER SENDING FIRE COMMAND
Step 1. Check cable connection between rocket firing box and the fire control slave unit.
Tighten connection; repair or replace cable. (DS/GS Maintenance if soldering required.)
Step 2. Refer to figure 1-9 and use a multimeter to check for defective relay K1 or open resistor R4.
Replace relay or resistor. (DS/GS Maintenance.)

Section VI. MAINTENANCE

3-14. Target.

This target is expendable and maintenance will be limited to inspection and assembly.

3-15. Launcher.

NOTE

Maintenance operations involing soldering must be performed at DS/GS level.

a. Remove and replace the Parts as indicated in figure 3-5.

b. If binding is evident in the telescoping stabilizer arms, remove the center section by elevating the slide and removing the stop pins. Wipe with a clean dry cloth and inspect for burrs or foreign objects on the center section or in the collar of the lower section. Remove any foreign objects and smooth out any burrs.

c. The launcher is made of anodized aluminum. If it requires welding, Heli-arc welding equipment should be used.

3-16. Fire Control System.

NOTE

Maintenance operations involving soldering must be performed at DS/GS level.

a. Rocket Firing Box 10286402.

(1) Remove and replace repair parts as indicated in figures 1-7 and 3-6.

(2) In the areas where like parts (switches, bulbs, etc.) are used, only one repair part is shown; however, all common parts are replaced in the same manner.

(3) When adjustable resistor R1 is replaced, it must be adjusted so that a fire command signal will be transmitted for approximately four seconds. Use the following procedure for this adjustment:

(a) Remove the back from the rocket firing box (fig. 3-6), leaving the wires connected.

(b) Connect a 24 vdc power source.

(c) Insert the key into the POWER switch and turn to ON.

(d) Move the SAFE/ARM switch for one launcher to the ARM position.

(e) Actuate the FIRE COMMAND switch.

(f) Observe that thermal delay relay K2 contacts close and remain closed for three to five seconds.

(g) If the time period is too short, increase the resistance of adjustable resistor R1 by sliding the wiper away from the fixed terminal.

(h) If the time period is too long, decrease the resistance of adjustable resistor R1 by sliding the wiper toward the fixed terminal.

(i) When the time period is properly adjusted, replace the back of the rocket firing box.

b. Rocket Firing Box 11507250.

(1) Remove and replace repair parts as indicated in figures 1-8 and 3-8.

(2) In the areas where like parts (switches, bulbs, etc.) are used, only one repair part is shown; however, all common parts are replaced in the same manner.

(3) When replacing a diode semiconductor or scr, first remove the conformal coating from the circuit area of the board being repaired using a small stiff bristled, non-metallic brush and denatured alcohol. Use a suitable heatsink and insure that the semiconductor are connected as indicated on the terminal board. Note that the first two leads clockwise from the key connect to odd terminals and the third to an even terminal. After repair reapply conformal coating 8030-00-738-1725 to the terminal board.

c.Fire Control Slave Unit. Remove and replace the repair parts as indicated in figures 1-9 and 3-8.

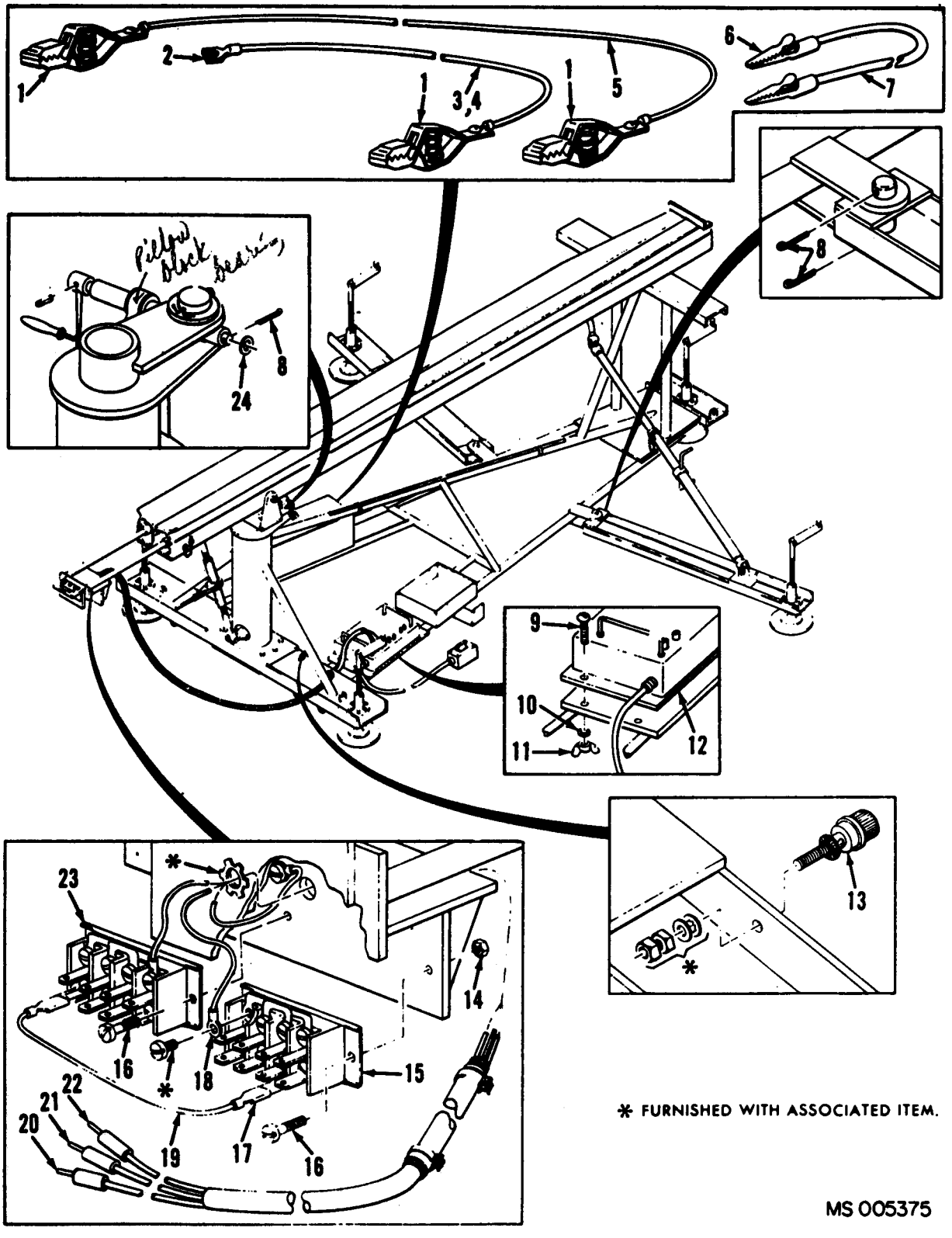


Figure 3-5. Launcher repair parts.

1. Clip, electrical
2. Lug, terminal
3. Cable, power
4. Cable, power
5. Cable, jumper
6. Clip, electrical
7. Wire, static ground
8. Pin, cotter
9. Screw
10. Washer
11. Nut, wing
12. Slave unit
13. Post, binding
14. Nut, hex
15. Board, terminal (Black)
16. Screw
17. Lug, quick disconnect
18. Lug, terminal
19. Wire, shorting
20. Plug, banana (White)
21. Plug, banana (Black)
22. Plug, banana (Green)
23. Board, terminal (White)
24. Washer, flat

Figure 3-5. Launcher repair parts—Continued.

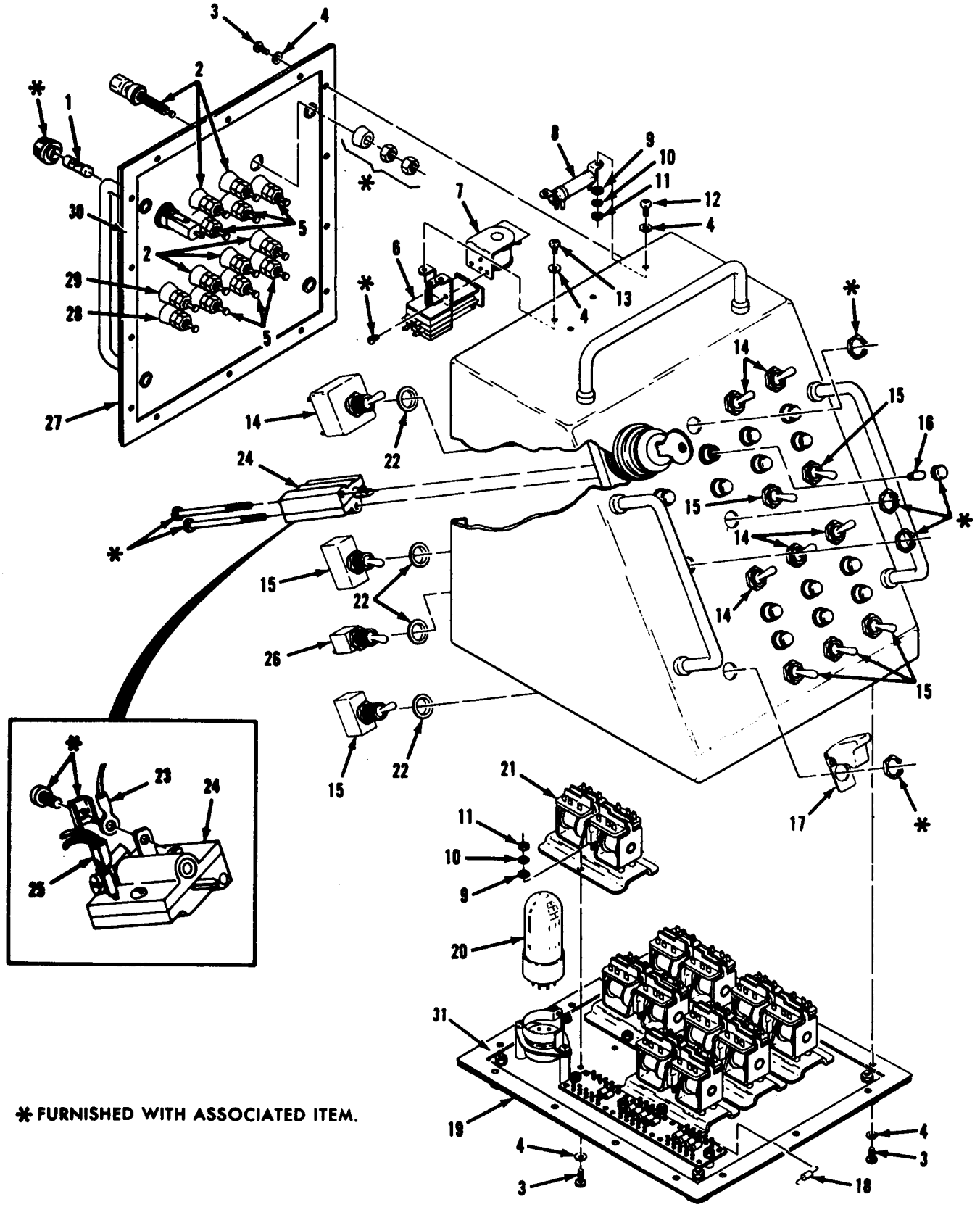


Figure 3-6. Rocket firing box 10286402 repair parts.

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1. Fuse
2. Post, binding (Red)
3. Screw
4. Washer
5. Post, binding (Green)
6. Contact assembly (K1)
7. Coil assembly (K1)
8. Resistor adjustable (R1)
9. Washer, flat
10. Washer, lock
11. Nut, hex
12. Screw
13. Screw
14. Switch (S4, 5, 6, 10, 11, 12)
15. Switch (S3, 7, 8, 9, 13, 14, 15)
16. Lamp (DS1)
17. Guard switch
18. Diode (CR1-CR12)
19. Base
20. Relay, delay (K2)
21. Relay, latching (K3-K8)
22. Seal
23. Lug, terminal
24. Block contact (S1)
25. Lug, terminal
26. Switch (S2)
27. Panel, rear
28. Post, binding (White)
29. Post, binding (Black)
30. Gasket, rear panel
31. Gasket, base panel

Figure 3-6. ***Rocket firing box 10286402 repair parts—Continued.***

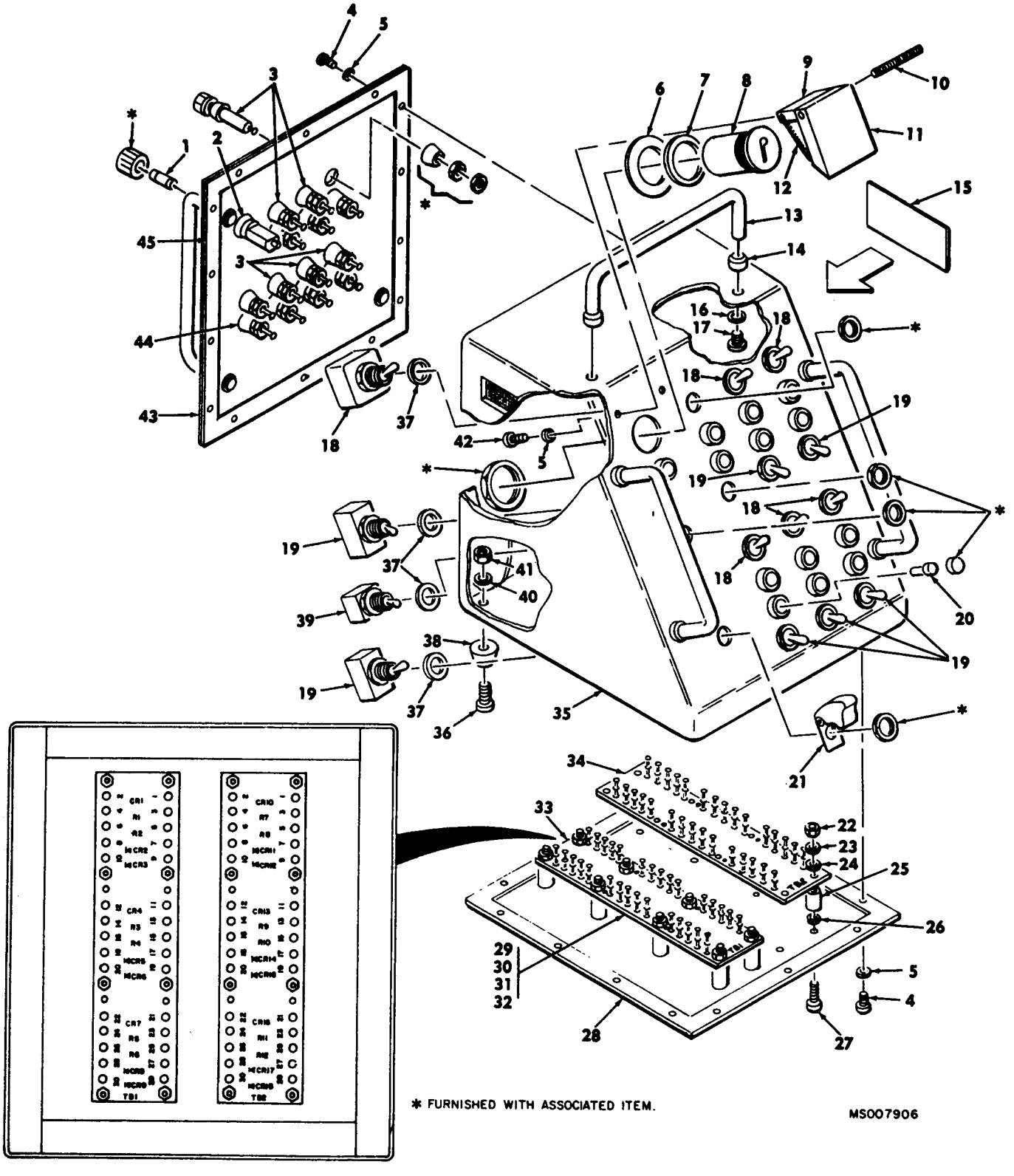


Figure 3-7. Rocket firing box 11507250 repair parts.

1. Fuse
2. Fuseholder
3. Binding post (Red)
4. Screw
5. Washer, sealing
6. Washer, sealing
7. Washer, flat
8. Switch, keylock (S1)
9. Pivot, shield
10. Pin, spring
11. Shield
12. Spring, helical
13. Handle, bow
14. Socket, bow handle
15. Plate, identification
16. Washer, sealing
17. Screw
18. Switch, toggle (S4, 5, 6, 10, 11, 12)
19. Switch, toggle (S3, 7, 8, 9, 13, 14, 15)
20. Lamp, incandescent (DS1 through DS13)
21. Guard, switch
22. Nut, hex
23. Washer, lockspring
24. Washer, flat
25. Spacer
26. Washer, sealing
27. Screw
28. Panel, enclosure base
29. Diode (CR2, 3, 5, 6, 8, 9, 11, 12, 14, 15, 17, 18)
30. SCR (CR1, 4, 7, 10, 13, 16)
31. Resistor, 47 Ω (R1, 3, 5, 7, 9, 11)
32. Resistor, 1K Ω (R2, 4, 6, 8, 10, 12)
33. Terminal board (TB1)
34. Terminal board (TB2)
35. Enclosure assembly
36. Screw
37. Seal, bushing
38. Bumper, recessed
39. Switch, toggle (S2)
40. Washer, lockspring
41. Nut, hex
42. Screw
43. Panel, enclosure back
44. Binding post (Black)
45. Gasket, panel

Figure 3-7. ***Rocket firing box 11507250 repair parts—Continued.***

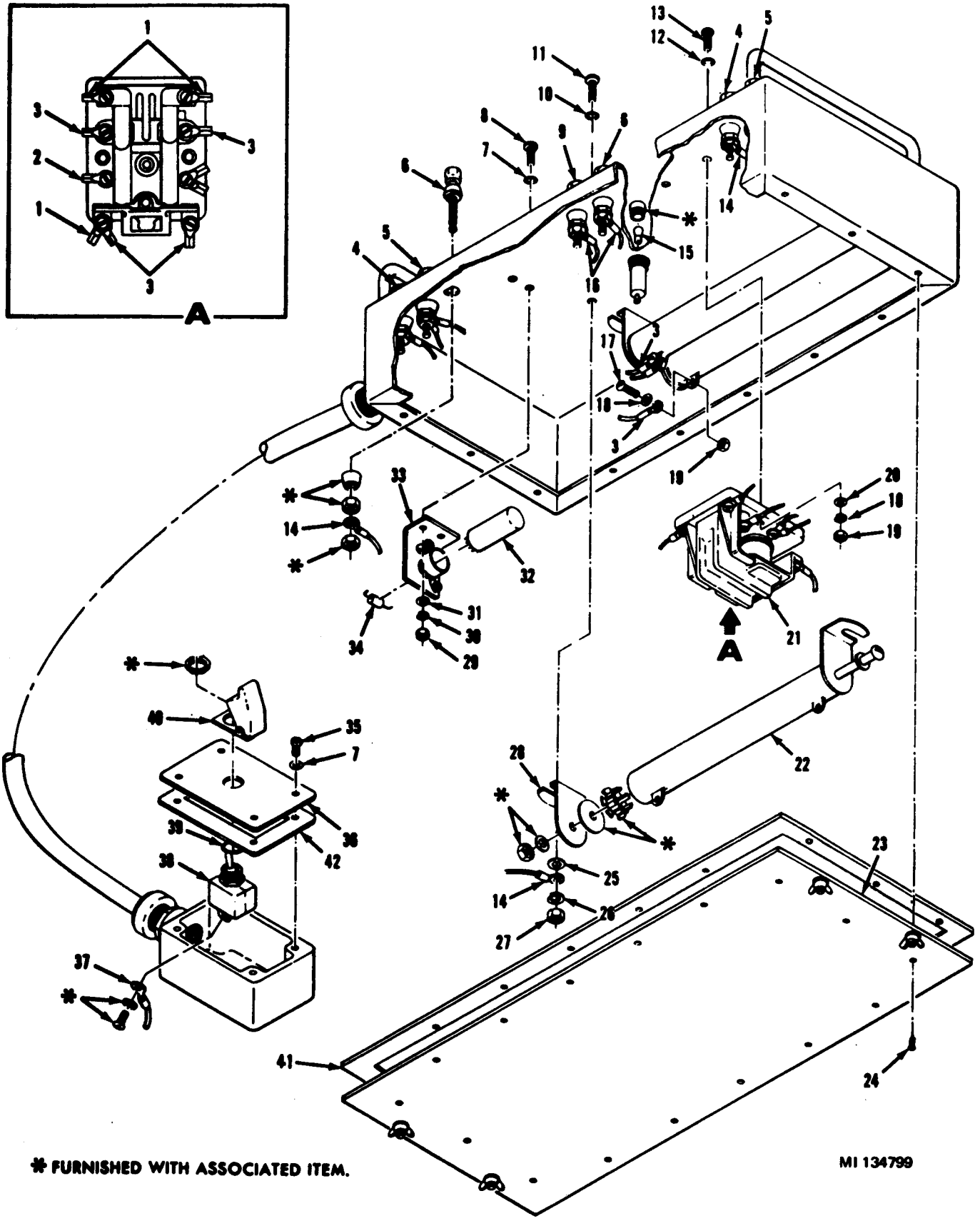


Figure 3-8. Fire control slave unit repair parts.

1. Lug, terminal
2. Lug, terminal
3. Lug, terminal
4. Post, binding (J3, J5) (Black)
5. Post, binding (J4, J6) (White)
6. Post, binding (J2, J7) (Green)
7. Washer, sealing
8. Screw
9. Post, binding (J1) (Red)
10. Washer, sealing
11. Screw
12. Washer, sealing
13. Screw
14. Lug, terminal
15. Lamp (DS1)
16. Lug terminal
17. Screw
18. Washer, lock
19. Nut
20. Washer, flat
21. Relay, DPDT (K2)
22. Resistor (R1, 2, 3)
23. Panel, base
24. Screw
25. Washer, flat
26. Washer, lock
27. Nut
28. Bracket
29. Nut
30. Washer
31. Washer
32. Relay SPDT (K1)
33. Bracket, relay
34. Resistor (R4)
35. Screw
36. Cover
37. Lug, terminal
38. Switch (S1)
39. Seal
40. Guard, switch
41. Gasket, panel base
42. Gasket, condulet

Figure 3-8. ***Fire control slave unit repair parts—Continued***

CHAPTER 4

PROPULSION AND ORDNANCE DEVICES

4-1. Engine Starter Cartridge.

a. The MXU-4A/A engine starter cartridge is used to provide the sustainer thrust for the BATS target. Characteristics of the starter cartridge area are as follows:

Type. MXU-4A/A
NSN 1377-00-863-9387
Shelf Life . . . . . Indefinite
Service Life[1]. . . . . 45 days
Storage Temperature Limits . . . -65 to + 165 °F
OD Classification 2
Compatibility Group . . . . . J
D.O.T. Class C
Fire Hazard 3
Squib Resistance Range . . . . . 0.5 to 4.5 ohms
Squib Firing Current . . . . . 1.2 Amps
minimum for 100% firing current

[1]Service Life is the length of time the cartridge is serviceable after it has been unpackaged.

b. For further information covering the engine starter cartridge, refer to Air Force Technical Manual T.O. 11A18-13-7.

c. Only cartridges from lot OL12 and subsequent lots are acceptable.

4-2. Low-Spin Folding Fin Aircraft Rocket (LSFFAR) Motor.

a. The low-spin folding fin aircraft rocket (LSFFAR) motor which is used to provide boost propulsion for the BATS target has scarfed nozzles and an integral bulkhead motor tube. The motor tube does not use a blowout diaphragm and is propulsive at all times upon ignition of the propellant grain. Characteristics of the LSFFAR motor are as follows:

Type . . . . . .MK 40 Mods 1, 3, or 4
NSN 1340-00-935-6021
Shelf Life . . . . . .20 years
Stroage Temperature Limits . . . . . -50 to +160 °F
(marked on individual rocket motor)
QD Classification 1.3
Compatibility Group C
D.O.T. Class .. . . . . .B
Fire Hazard 3
Squib Resistance Range . . . . . .0.7 to 2.0 ohms
Firing Current . . . . . Minimum 1 amp for
10 milliseconds

b. For further information concerning the LSFFAR motor refer to Department of Army Technical Manual TM 9-1340-201.

c. Characteristics of the MK 66 rocket motor are as follows:

Type . . . . . MK 66 Mod3
NSN 1340-01-267-4223
Shelf Life . . . . . .6 years
Storage Temperature Limits . . . . . .-50 to + 160 °F
(marked on individual rocket motor)
QD Classification 1.3
Compatibility Group C
D.O.T. Class . . . . . .B
Fire Hazard 3
Squib Resistance Range . . . . .0.7 to 2.0 ohms
Squib Firing Current . . . . . .1.5 amp
10 milliseconds minimum

4-3. Infrared Target Flare.

a. The flare, which serves as an IR source when the BATS target is used during training operations involving guided missiles equipped with infrared homing capabilities is as follows:

Type MK33
NSN 1370-01-208-0686
Shelf Life . . . . . Indefinite
Storage Temperature Limits . . . -65 to + 160 °F
QD Classification 2
Compatibility Group . . . . . .N
D.O.T. Class . . . . . .B
Fire Hazard 3

b. For further information covering the infrared target flare, refer to MIL-F-705-18.

CHAPTER 5

ADMINISTRATIVE STORAGE

Section I. LAUNCHER

5-1. Protective Covering.

The launcher does not require protective covering during periods of storage.

5-2. Preservative (For Periods of Storage Exceeding One Month).

a. Apply a coat of grease (MIL-G-109 -24B) to threaded surfaces of launcher screw jacks (5), elevation actuator, and azimuth actuator (refer to fig. 3-3).

b. Remove elevation indicator (fig. 2-2) by removing two screws. After the indicator is removed, replace the two screws. Wrap it in an oily cloth and place it in the tool box.

c. Clean wire cutter blade assembly and apply a light coat of grease (MIL-G-109-24B).

5-3. Remove From Storage.

a. Clean threaded and cutting surfaces and apply a light coat of grease (MIL-G-109-24B).

b. Clean mating surfaces of elevation indicator, lubricate with a light coat of grease (MIL-G-109-24B), and reinstall elevation indicator.

Section II. PROTECTIVE COVERING

5-4. Fire Control System.

The rocket firing box and slave units should be stored in a clean, dry environment and protected from physical damage.

5-5. Target.

The packaged targets should be stored in a building or warehouse.

APPENDIX A

REFERENCES

Refer to TM 9-1425-585-L for publications applicable to the Ballistic Aerial Target System (BATS).

APPENDIX B
COMPONENTS OF END ITEM
AND BASIC ISSUE ITEMS LISTS

Section I. INTRODUCTION

B-1. SCOPE.

This appendix lists components of end item and basic issue items for the BATS to help you inventory items required for safe and efficient operation.

B-2. General.

The Components of End Item and Basic Issue Items Lists are divided into the following sections:

a. Section II. Components of End Item. This listing is for informational purposes only and is not authority to requisition replacements. These items are part of the end item, but are removed and separately packaged for transportation or shipment. As part of the end item, these items must be with the end item whenever it is issued or transferred between property accounts. Illustrations are furnished to assist you in identifying the items.

b. Section III. Basic Issue Items. These are the minimum essential items required to place the BATS in operation, to operate it, and to perform emergency repairs. Although shipped separately packaged, Basic Issue Items (BII) must be with the BATS during operation and whenever it is transferred between property accounts. The illustrations will assist you with hard-to-identify items. This manual is your authority to request/requisition replacement BII, based on TOE/MTOR authorization of the end item.

B-3. Explantion of Columns.

The following provides an explanation of columns found in the tabular listings:

a. Column (1) - Illustration Number (Item Fig. No). Indicates the item and figure number of the illustration in which the item is shown.

b. Column (2) - National Stock Number. Indicates the national stock number assigned to the item and will be used for requisitioning purposes.

c. Column (3) - Description. Indicates the Federal item name and, if required, a minimum description to identify and locate the item. The last line for each item indicates the FSCM (in parentheses) followed by the part number.

d. Column (4) - Unit of Measure (U/M). Indicates the measure used in performing the actual operational/maintenance function. This measure is expressed by a two-character alphabetical abbreviation (for example, ea, in, pr).

e. Column (5)- Quantity Required (Qty Rqrd). Indicates the quantity of the item authorized to be used with/on the equipment.

Section II. COMPONENTS OF END ITEM

(1) Illustration Item Fig. No	(2) National Stock Number	(3) Description FSCM and Part Number	(4) U / M	(5) Qty Rqrd

NOT APPLICABLE.

Section III. BASIC ISSUE ITEMS

(1) Illustration Item and Fig, No.	(2) National Stock Number	(3) Description FSCM and Part Number	(4) U/M	(5) Qty Rqrd
1	B-1, Sh 1 1550-00-261-9799	**Target** 8035878	ea	1
		Consisting of: (Items 2 thru 7)		
2	B-1, Sh 2 4730-00-908-6292	Clamp Hose, Worm Gear (Shipped in sustainer motorcase) (96906) MS35842-14	ea	7
3	B-1, Sh 1 No Stock Number Listed (NSNL)	End Inserts, Plastic (Shipped in sustainer motorcase) (for starter cartridges) (18876) 10286378	ea	2
4	B-1, Sh 1 NSNL	Fins (Shipped loose in package) (18876) 10286394	ea	3
5	B-1, Sh 1 5995-00-937-2699	Harness, Wiring for Rocket Motor (Shipped in sustainer motorcase) (18876) 10286307	ea	3
6	B-1, Sh 1 NSNL	Rivets (8 per Fin) (Shipped in sustainer motorcase) (18876) 10286404-2	ea	24
7	B-1, Sh 1 1340-00-217-6311	Spacer, Metal (Shipped in sustainer motorcase) Goes between starter cartridges in sustainer. (18876) 8035865	ea	1
8	B-1, Sh 2 1340-00-152-3224	**Firing Box Rocket (BATS) M57** (18876) 10399070	ea	1
		Consisting of: (Items 9 thru 13)		
9	B-1, Sh 2 1340-00-311-5334 (Old) 1340-00-035-2477 (New)	Firing Box Rocket (18876) 1086402 or 11507250 11507250 is the preferred item Use 10286402 older configuration only until stock is exhausted.	ea	1
10	B-1, Sh 2 6140-00-057-2553	Battery (12 volt automotive type) (96906) MS35000-1		2
11	B-1, Sh 2 6810-00-249-9354	Acid, Battery (81349) OS801CL3-1GL	gal	2
12	B-1, Sh 2 NSNL	Jumper Cable Assembly (30”) (18876) 10286278	ea	1
13	B-1, Sh 2 NSNL	Power Cable Assembly (72”) (18876) 10286279-1	ea	1

Section III. BASIC ISSUE ITEMS - Continued

(1) Illustration Item and Fig, No.	(2) National Stock Number	(3) Description FSCM and Part Number	(4) U/M	(5) Qty Rqrd
15 B-1, Sh 3	1055-00-152-3223	**Launcher, Monorail Rocket M-221** 10399071	ea	1
		Consisting of: (Items 10, 11, 14, 25, 26, 27)		
14 B-1 Sh 3	NSNL	**Launcher Assembly** 10286270		
		Consisting of: (Items 12, 17, 16, 18, 19, 20, 21, 22, 23, 24, 28, 29, 30, 31)		
11 B-1 Sh 2	6810-00-249-9354	Battery Acid (81349) OS801CL3-1GL	gal	2
10 B-1, Sh 2	NSNL	Battery (12-volt automotive type)	ea	2
12 B-1, Sh 2	NSNL	*Jumper Cable (30”)	ea	1
17 B-1, Sh 3	NSNL	*Light Assembly, Test (Launcher)	ea	1
31 B-1, Sh 5	NSNL	*Power Cable (36”) (18876) 10286279-2	ea	2
18 B-1, Sh 3	NSNL	*Shorting Wire Assembly (18876) 10286275	ea	1
19 B-1, Sh 3	NSNL	*Static Ground Wire Assembly (18876) 10286276	ea	3
		Tools		
		Consisting of:		
20 B-1, Sh 4	NSNL	*Aviation Snips (18876) 10286321	ea	1
21 B-1, Sh 4	NSNL	*Filament Snips (18876) 10286340	ea	1
22 B-1, Sh 4	5130-00-133-3162	“Riveting Tool (18876) 10286314	ea	1
23 B-1, Sh 4	NSNL	*Screwdriver (18876) 10286332	ea	1
24 B-1, Sh 4	NSNL	Tool Box 10286292	ea	1

Section III. BASIC ISSUE ITEMS - Continued

(1) Illustration Item and Fig. No.		(2) National Stock Number	(3) Description FSCM and Part Number	(4) U/M	(5) Qty Rqrd
25	B-1, Sh 5	6680-833-7010	Air Velocity Meter MPN-5100-454	ea	1
26	B-1, Sh 5	6145-243-8466	Cable, Telephone (TT-1) (WD-1/TT MIL-C-13294C) Issued on DR-3 Reels (1 mile per reel)	ea	2
27	B-1, Sh 5	1055-00-306-9203	Fire Control Slave Unit (18876) 10286293	ea	1
16	B-1, Sh 3	NSNL	*Ground Rod clamp (18876) 10286338	ea	2
28	B-1, Sh 5	NSNL	Ground Rod (18876) 10286303	ea	2
29	B-1, Sh 5	NSNL	Workstand (18876) 10286293	ea	2
30	B-1, Sh 5	NSNL	*Wire (grounding) 60” (18876) 10286437-1	ea	2

***NOTE: Items are shipped in the Launcher Tool Box (Item 24).**

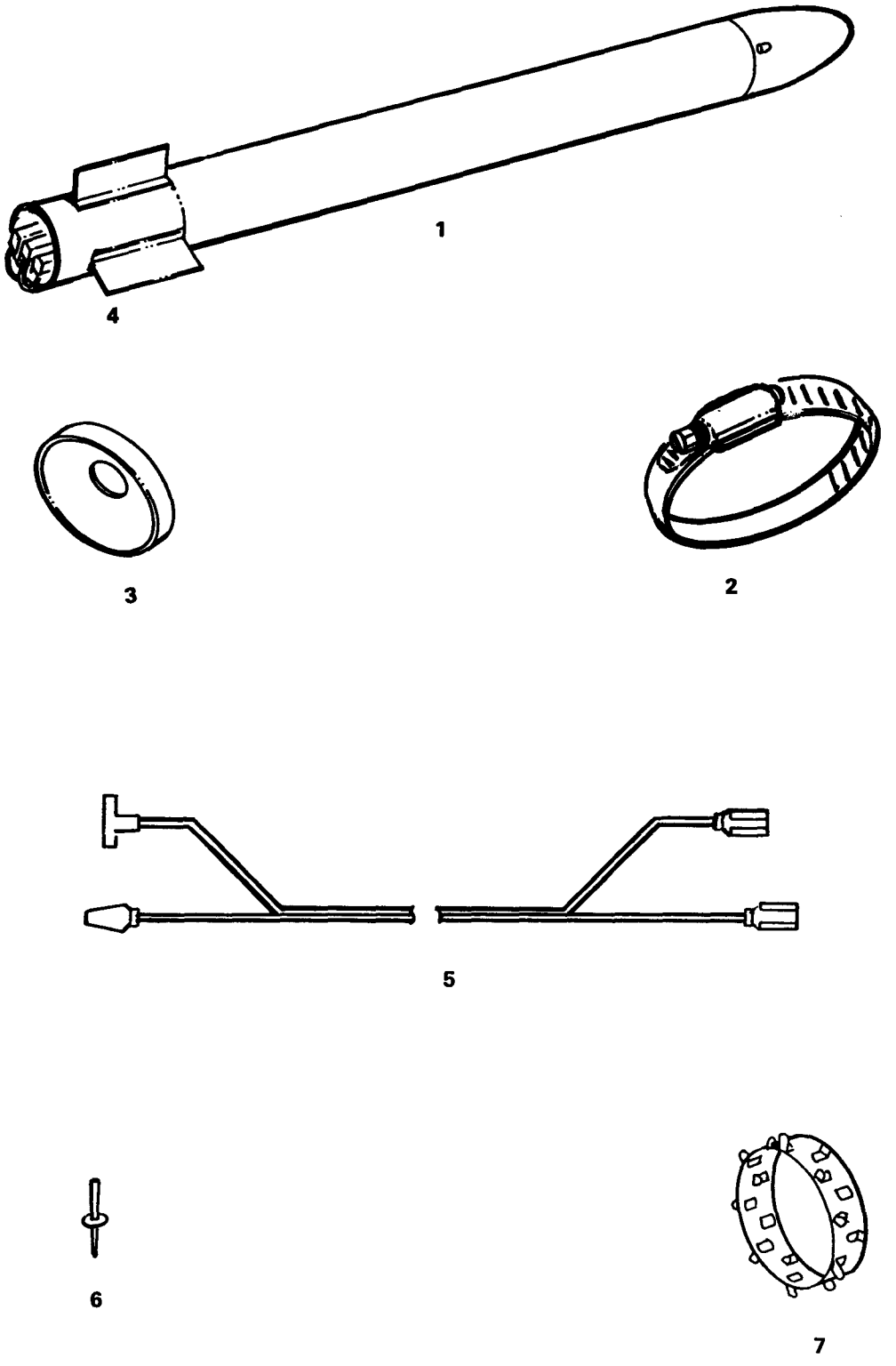
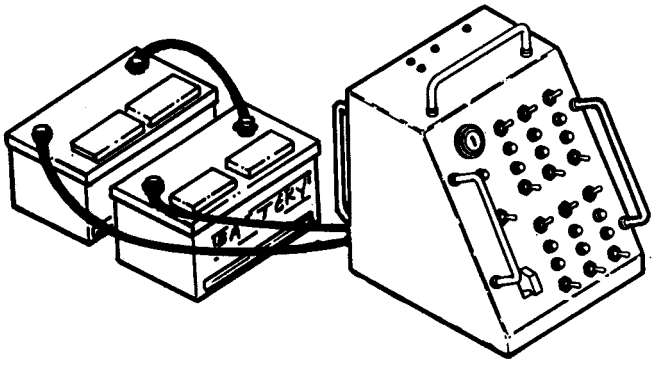


Figure B-1. BATS Basic Issue Items List (Sheet 1).



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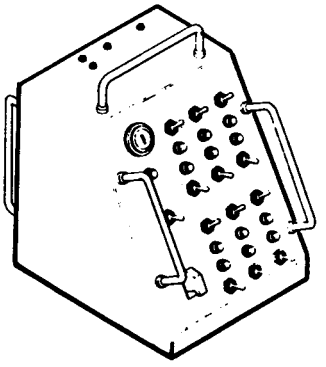

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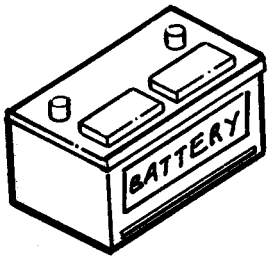

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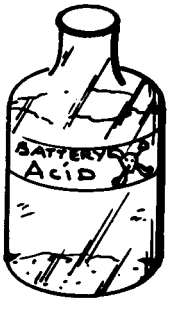

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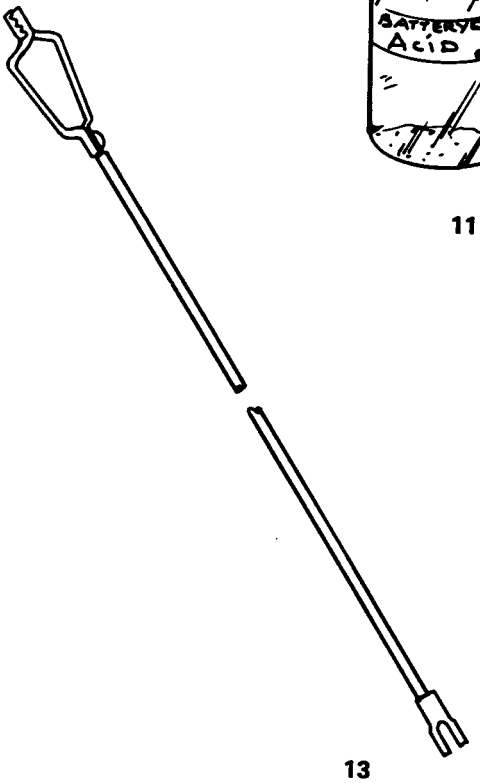

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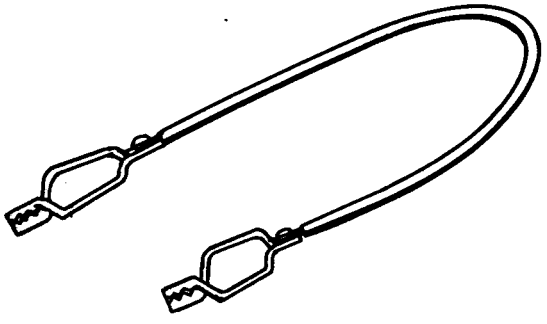

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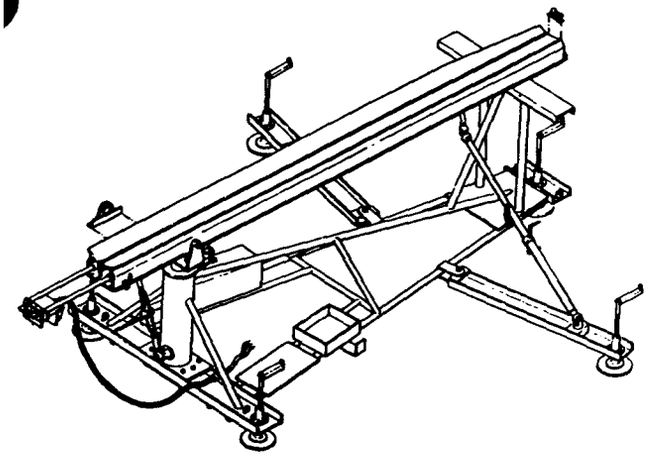
Figure B-1. BATS Basic Issue Items List (Sheet 2).



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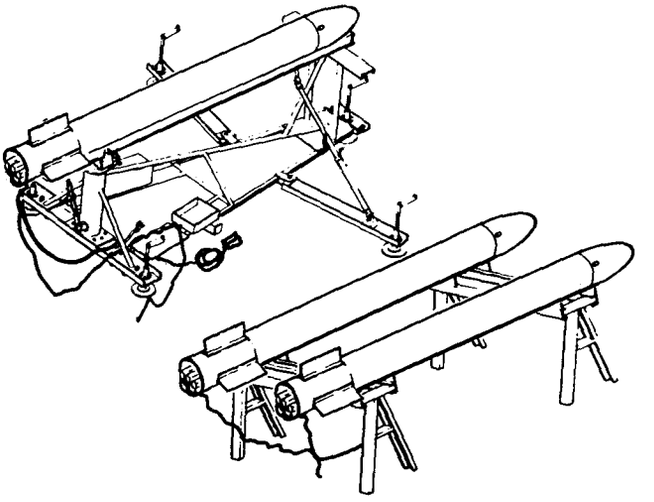

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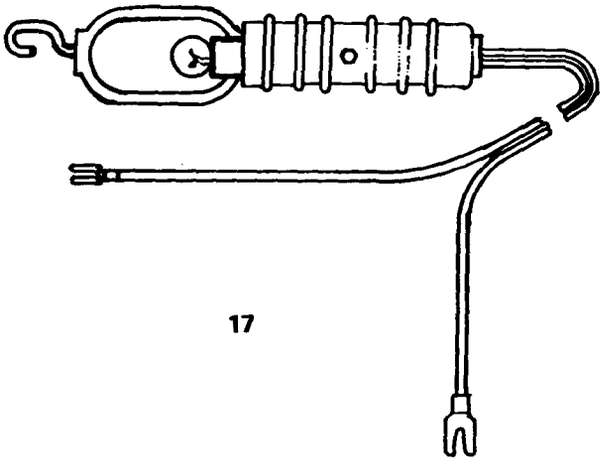

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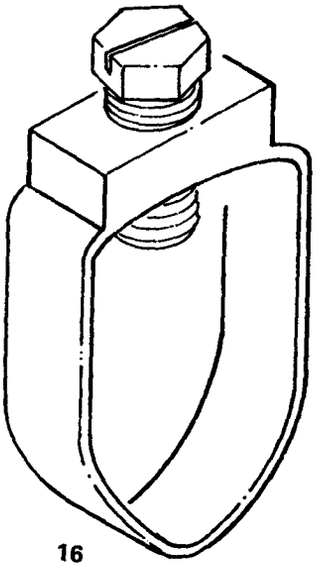

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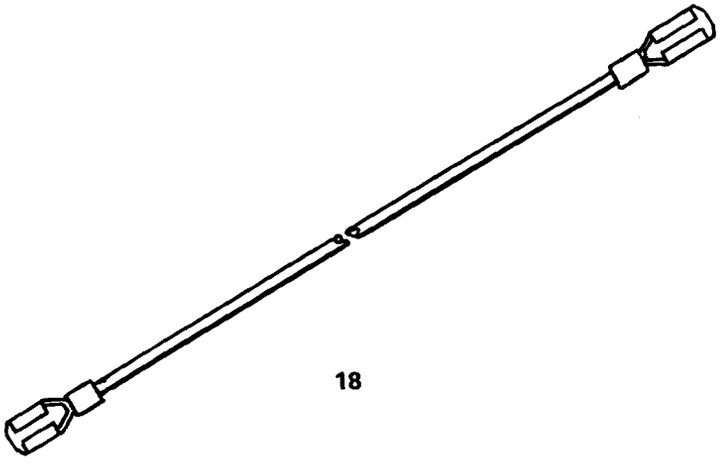

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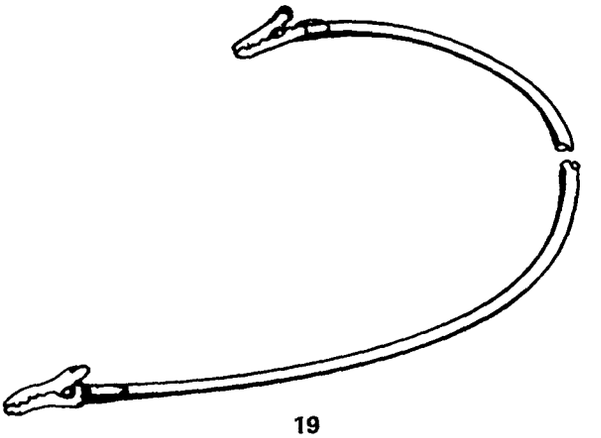

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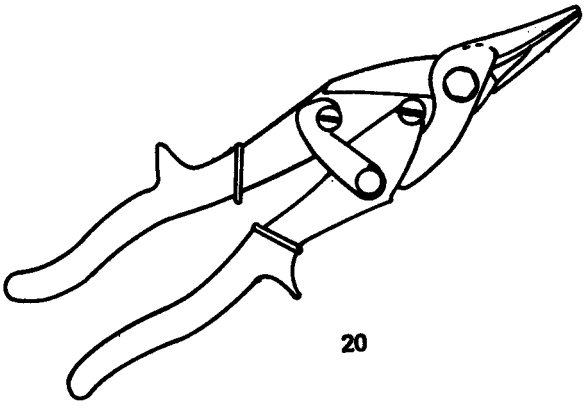
Figure B-1. BATS Basic Issue Items List (Sheet 3).



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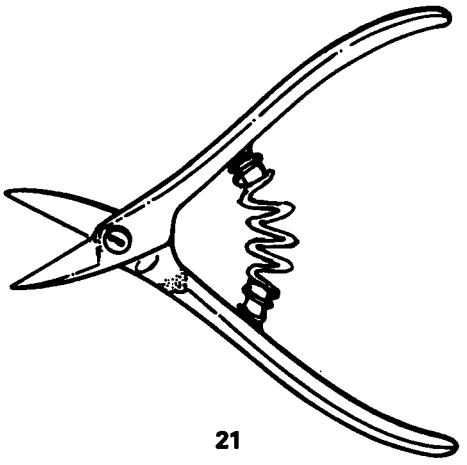

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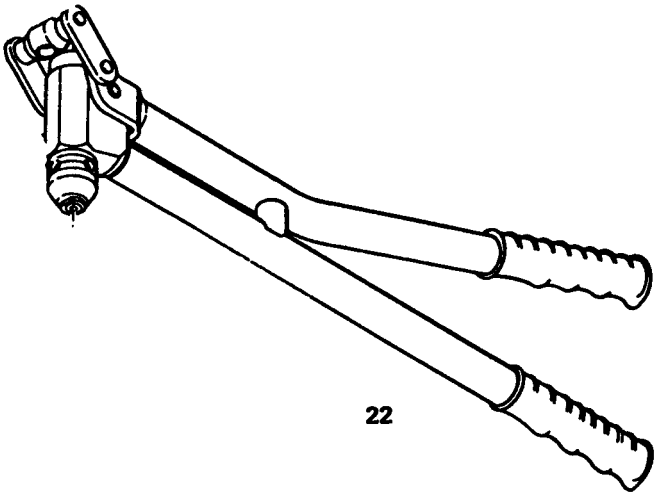

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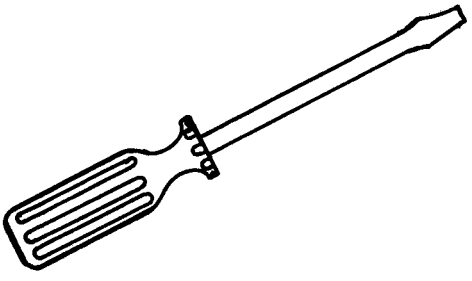

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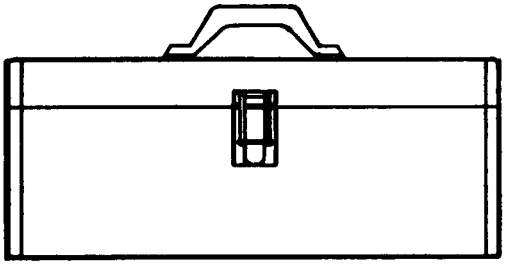

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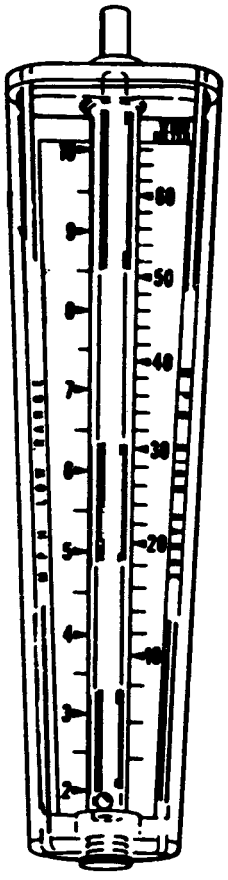
Figure B-1. BATS Basic Issue Items List (Sheet 4).



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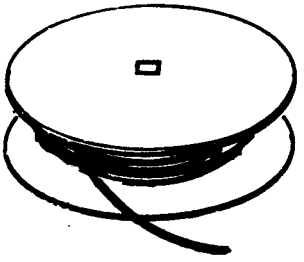

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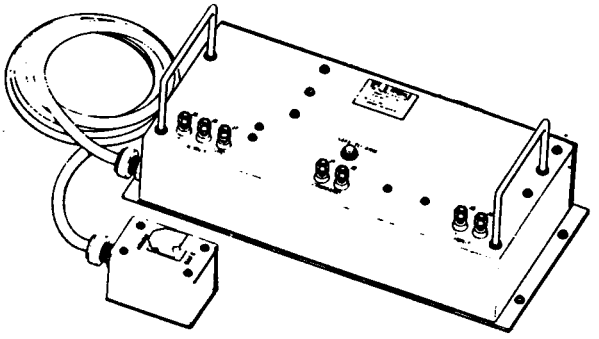

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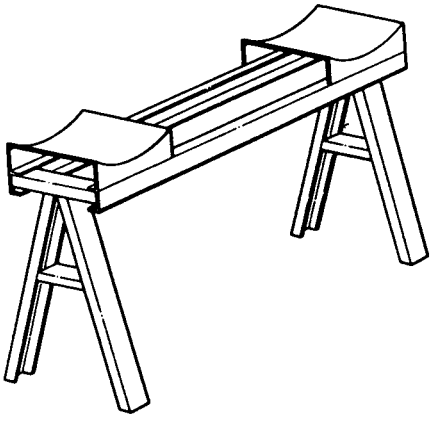

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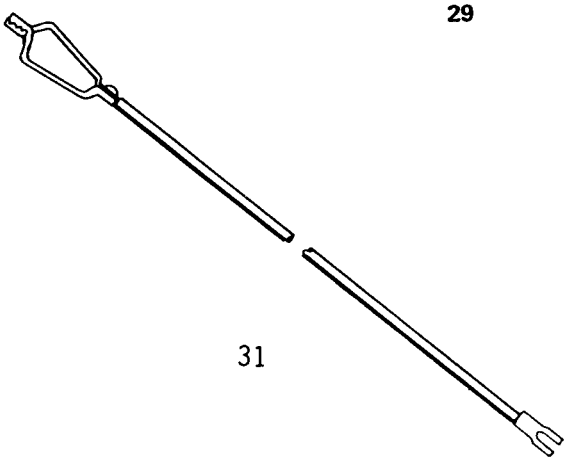

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Figure B-1. BATS Basic Issue Items List (Sheet 5).

APPENDIX C

MAINTENANCE ALLOCATION CHART

C-1. General.

This appendix provides a summary of the maintenance operations covered in the equipment manual for the Ballistic Aerial Target System. It authorizes categories of maintenance for specific maintenance functions on repairable items and components, and the tools and equipment required to perform each function. This appendix may be used as an aid in planning maintenance operations.

C-2. Explanation of Format for MAC Page.

a. Group *Number.* The numbers in this column identify component, assemblies, and modules within the next higher assembly.

b. Functional Group. This column lists the item names of component units, assemblies, subassemblies, and modules on which maintenance is authorized.

c. Maintenance Functions. This column indicates the maintenance category at which performance of the specific maintenance function is authorized. Authorization to perform a function at any category also includes authorization to perform that function at higher categories. Maintenance functions will be limited to and defined as follows:

(1) *Inspect.* To determine serviceability of an item by comparing its physical, mechanical, and/or electrical characteristics with established standards.

(2) *Test.* To verify serviceability and to detect electrical or mechanical failure by use of test equipment.

(3) Service. To clean, to preserve, to charge, and to add fuel, lubricants, cooling agents, and air.

(4) *Adjust.* To rectify to the extent necessary to bring into proper operating range.

(5) *Aline.* To adjust specified variable elements of an item to bring to optimum performance.

(6) *Calibrate.* To determine the corrections to be made in the readings of instruments of test equipment used in precise measurement. Consists of the comparison of two instruments, one of which is a certified standard of known accuracy, to detect and adjust any discrepancy in the accuracy of the instrument being compared with the certified standard.

(7) *Install.* To set up for use in an operational environment such as an emplacement site, or vehicle.

(8) *Replace.* To replace unserviceable items with serviceable assemblies, subassemblies, or parts.

(9) *Repair.* To restore an item to serviceable condition. This includes, but is not limited to, inspection, cleaning, preserving, adjusting, replacing, welding, riveting, and strengthening.

(10) *Overhaul.* To restore an item to a completely serviceable condition as prescribed by maintenance serviceability standards, using the Inspect and Repair Only as Necessary (IROAN) technique.

(11) *Rebuild.* To restore an item to a standard as nearly as possible to original or new condition in appearance, performance, and life expectancy. This is accomplished through complete disassembly of the item, inspection of all parts of components, repair or replacement of worn or unserviceable elements (items) using original manufacturing tolerances and specifications, and subsequent reassembly of the item.

The codes used represent the various maintenance categories as follows:

Code	*Maintenance category*
C	Operator/Crew
O	Organizational maintenance
F	Direct support maintenance
H	General support maintenance
D	Depot maintenance

d. Tools Required. The numbers appearing in this column refer to specific tools and equipment which are identified by these numbers in the tools required page.

e. Remarks. The letters appearing in this column refer to specific remarks which appear on the remarks page.

C-3. Explanation of Format for Tools Required Pages.

u. Tool Code. The numbers in this column correspond to the numbers used in the tool required column of the MAC. The numbers indicate the applicable tool for the maintenance function.

b. Maintenance Category. The codes in this column indicate the maintenance category normally allocated the facility.

c. Nomenclature. This column lists tools, test, and maintenance equipment required to perform the maintenance functions.

d. Tool Number. This column lists the National stock number.

MAINTENANCE ALLOCATION CHART for

LAUNCHER ASSEMBLY W/UNIT, FIRE CONTROL, SLAVE (10286270)

(1) GROUP NUMBER	(2) COMPONENT/ASSEMBLY	(3) MAINTENANCE FUNCTION	(4) MAINTENANCE CATEGORY* C	O	F	H	D	(5) TOOLS AND EQUIPMENT
0020	LAUNCHER ASSY	INSPECT	0.1					
		TEST	0.2					1
		SERVICE	0.2					2,3,4,5,6, 7,8,9,10,11
		ADJUST	0.2					
		INSTALL	0.2					12,13
		REPLACE	0.5	1.0				13,14,15, 16
		REPAIR		1.0				
0020	JACK, RATCHET, ELEVATION ACTUATOR	SERVICE	0.1					5,10,17,18, 19
		ADJUST	0.1					
		INSTALL		0.3				
0020	SCREW JACK, LAUNCHER LEVEL	SERVICE	0.1					5,10
		ADJUST	0.1					
	BATTERY, STORAGE	INSPECT	0.1					
		TEST	0.l					20
		SERVICE	0.1					21
		INSTALL	0.1					
		REPLACE	0.1					
		REPAIR		1.0				22
0020	LAUNCHER SLIDE ASSY	SERVICE	0.1					5,10,13, 17,23,24
		ADJUST	0.1					
0020	SLIDE, CUTTER	SERVICE	0.1					13,23,25, 26
		INSTALL	0.1					
		REPLACE		0.3				13,16,27
		REPAIR		0.3				
0020	SLIDE SUPPORT ASSY (TELESCOPIC)	SERVICE	0.1					28,29
		ADJUST	0.1					
0020	CENTER PIPE PIVOT ARM	SERVICE	0.2	0.5				5,10,17,30, 31,32,33,34
		REPLACE	1.0					34

* C - operator/crew O - organizational F - direct support H - general support D - depot

MAINTENANCE ALLOCATION CHART for
LAUNCHER ASSEMBLY W/UNIT, FIRE CONTROL, SLAVE (10286270)

(1) GROUP NUMBER	(2) COMPONENT/ASSEMBLY	(3) MAINTENANCE FUNCTION	(4) MAINTENANCE CATEGORY* C	O	F	H	D	(5) TOOLS AND EQUIPMENT
0020	WORK STAND, ASSY, TARGET	INSTALL	0.1					12,13
		REPLACE		0.2				14
0025	UNIT, FIRE CONTROL, SLAVE	INSPECT	0.1					
		TEST	0.2					
		SERVICE	0.2					
		INSTALL	0.1					
		REPLACE		1.0				13
		REPAIR		1.0				1,14,15,16 27,29,35, 36,37,38, 39,40,41
9998	JUMPER CABLE ASSY (BATTERY)	INSPECT	0.1					
		INSTALL	0.1					
		REPAIR		0.1				13,15,16
9998	POWER CABLE ASSY	INSPECT	0.1					
		INSTALL	0.1					
		REPAIR		0.1				13,15,16

* C - operator/crew O - organizational F - direct support H - general support D - depot

END ITEM: LAUNCHER ASSY W/UNIT, FIRE CONTROL, SLAVE

TOOL AND TEST EQUIPMENT REQUIREMENTS

Tool or Test Equipment Reference Code	Maintenance Category	menclature	National/NATO Stock Number	Tool Number
1	F, H	MULTIMETER, DIGITAL WRE-300/M	6625-00-933-2406	10240028
2	C	GLOVES	8415-00-268-7859	KKG486
3	C	GOGGLES	4240-00-269-7912	5023A
4	C	SHEARS , METAL CUTTING	5110-00-221-1085	MS16506-1
5	C	RAG, WIPING	7920-00-205-1711	
6	C	SODA, BAKING	8950-00-292-9611	EEB86
7	C	BRUSH , PAINT	8020-00-245-4509	
8	C	PAINT, ACID RESISTANT	8010-00-166-1667	TTL54
9	C	PAINT, O.D.	8010-00-297-2124	TTE485
10	C	GREASE	9150-00-269-8255	8643130
11	C	CLEANER, ELECTRICAL CONTACT	6850-00-973-3122	9100
12	C	HAMMER, HAND, SLEDGE 12 LB	5120-00-224-4130	GGGH86
13	C	SCREWDRIVER, FLAT TIP	5120-00-293-3183	7577858
14	C	WRENCH, SOCKET, SPINNER TYPE 11/32"	5120-00-293-0796	GGGW00657
15	O	STRIPPER WIRE, HAND	5110-00-268-4224	766M
16	O	CRIMPING TOOL	5120-00-251-3990	5417
17	C	WRENCH, OPEN END, ADJ, 0" to 1.322" OPNG	5120-00-264-3796	943A7533
18	C	WRENCH, OPEN END, ADJ, 0" to 3-5/8" OPNG	5120-00-264-3793	664666
19	C	GREASE GUN, HAND	4930-00-223-3391	MILG385951ZE1
20	C	TESTER, BATTERY, ELECTROLYTE	5930-00-191-5126	20110481
21	C	SYRINGE, BATTERY FILLING, 6 oz	6140-00-643-4490	

END ITEM: LAUNCHER ASSY W/UNIT, FIRE CONTROL, SLAVE

TOOL AND TEST EQUIPMENT REQUIREMENTS

Tool or Test Equipment Reference Cod	Maintenance Category	Nomenclature	National/NATO Stock Number	Tool Number
22	O	CHARGER, BATTERY	6130-00-940-7866	
23	C	TAPE , MASKING	7510-00-290-2023	UUT106
24	C	WRENCH, OPEN END, FIXED , 15/16" and 1-1/16" OPNG	5120-00-277-2693	136568
25	C	FILE, FLAT, HAND, 12 INCH	5110-00-234-6539	41F863
26	C	HANDLE, FILE, WOOD	5110-00-236-0349	QQ8750
27	O	WRENCH, SOCKET, SPINNER TYPE, 3/8"	5120-00-596-1263	
28	C	WRENCH, SOCKET, SPINNER TYPE, 7/16"	5120-00-222-1499	
29	C	WRENCH, OPEN END, FIXED, 3/8" AND 7/16" OPNG	5120-00-277-2342	H14
30	C	DRY CLEANING SOLVENT, 1 GAL CAN	6850-00-281-1985	PD680
31	C	WRENCH, OPEN END, FIXED, 3/4" AND 7/8" OPNG	5120-00-240-5609	1731A
32	O	MALLET	5120-00-293-3397	4
33	O	PULLER KIT, MECHANICAL 1" to 6-3/4" RANGE	5120-00-313-9496	405-6D
34	C	PLIERS, SLIP JOINT	5120-00-223-7397	41P1633
35	O	SCREWDRIVER, CROSS TIP, PHILLIPS NO. 1	5120-00-240-8716	9682
36	O	WRENCH, SOCKET, SPINNER TYPE 5/16"	5120-00-224-2596	3010
37	O	WRENCH, OPEN END, FIXED, 1/2" AND 9/16" OPNG	5120-00-187-7124	1090D
38	O	PLIERS, LONG NOSE	5120-00-247-5177	SD56
39	O	PLIERS, DIAGONAL CUTTING	5110-00-239-8253	108286

END ITEM: LAUNCHER ASSY W/UNIT, FIRE CONTROL, SLAVE

TOOL AND TEST EQUIPMENT REQUIREMENTS

Tool or Test Equipment Reference Code	Maintenance Category	Nomenclature	National/NATO Stock Number	Tool Number
40	F, H	OLDERING GUN, LIGHT DUTY	5139-00-965-0156	
41	F, H	OLDER	5139-00-269-9610	QQ5571

MAINTENANCE ALLOCATION CHART for

FIRING BOX, ROCKET (10286402)

(1)	(2)	(3)	(4)					(5)
GROUP NUMBER	COMPONENT/ASSEMBLY	MAINTENANCE FUNCTION	MAINTENANCE CATEGORY*					TOOLS AND EQUIPMENT
			C	O	F	H	D	
0030	FIRING BOX, ROCKET	INSPECT	0.1					
		SERVICE		0.1				-
		ADJUST		0.4				
		INSTALL	0.2					
		REPLACE		1.00				?,3,4,5, 6,7,8,9, 10,11,19
		REPAIR					1.00	?,3,4,5, 6,7,8,9, 10,11,19
0030	PANEL , ENCLOSURE BACK	SERVICE		0.3				-
0030	PANEL , ENCLOSURE BASE	SERVICE		0.3				-
0030	POWER CABLE AS SY (BATTERY	INSPECT	0.1					
		SERVICE	0.1					
		INSTALL	0.1					
		REPLACE		0.3				12,13
		REPAIR		0.3				12,13
0030	JUMPER CABLE ASSY	INSPECT	0.1					
		SERVICE	0.1					
		INSTALL	0.1					
		REPLACE		0.3				12,13
		REPAIR		0.3				12,13
0030	BATTERY , 12V	INSPECT	0.1			-		
		TEST	0.1			-		14
		SERVICE	0.1			-		15
		INSTALL	0.1			-		16
		REPLACE	0.1			-		17
		REPAIR		1.0				18

* C operator/crew O - organizational F direct support H general support D - depot

END ITEM: FIRING BOX, ROCKET (10286402)

TOOL AND TEST EQUIPMENT REQUIREMENTS

Tool or Test Equipment Reference Code	Maintenance Category	Nomenclature	National/NATO Stock Number	Tool Number
1	O	CLEANER, ELECTRICAL CONTACT	5850-00-973-3122	9100
2	O	SCREWDRIVER, CROSS TIP, PHILLIPS NO. 1	5120-00-240-8716	
3	O	PLIERS , LONG NOSE	5120-00-247-5177	108285
4	O	WRENCH, SOCKET , SPINNER TYPE, 5/16"	5120-00-224-2596	3010
5	F, H	SOLDER	3439-00-269-9610	804606
6	O	WRENCH, SOCKET , SPINNER TYPE, 3/8"	5120-00-596-1263	
7	O	WRENCH, SOCKET , SPINNER TYPE, 1/4"	5120-00-241-3188	3408
8	O	SCREWDRIVER, FLAT TIP, 3/16 INCH WIDE	5120-00-293-3183	7577858
9	O	WRENCH, OPEN END , 9/16 INCH AND 1/2 INCH OPENINGS	5120-00-187-7124	1725B
10	F, H	HEATSINK, ELECTRICAL, ELECTRONIC COMPONENTS	5999-00-076-1279	30A
11	F, H	MULTIMETER, DIGITAL WRE-300/M	6625-00-933-2406	300M
12	O	CRIMPING TOOL, TERMINAL, HAND	5120-00-251-3990	
13	O	STRIPPER, WIRE , HAND	5120-00-268-4224	GA116
14	C	BATTERY TESTER, ELECTROLYTE	6630-00-121-5126	MIL C38300-0217
15	C	SODA, BACKING	3950-00-292-9611	EE 886
16	C	SYRINGE , BATTERY FILLING	6140-00-643-4490	NOREF
17	C	CARRIER, STORAGE BATTERY	5120-00-570-4316	B62

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END ITEM: FIRING BOX, ROCKET (10286402)

TOOL AND TEST EQUIPMENT REQUIREMENTS

Tool or Test Equipment Reference Code	Maintenance Category	Nomenclature	National/NATO Stock Number	Tool Number
18	O	CHARGER, BATTERY	6130-00-940-7866	MIL P52-457
19	F, H	SOLDERING GUN, LIGHT DUTY	3439-00-965-0156	

MAINTENANCE ALLOCATION CHART for

FIRING BOX, ROCKET (11507250)

(1) GROUP NUMBER	(2) COMPONENT/ASSEMBLY	(3) MAINTENANCE FUNCTION	MAINTENANCE CATEGORY* C	O	F	H	D	(5) TOOLS AND EQUIPMENT
0030	FIRING BOX, ROCKET	INSPECT	0.1					
		SERVICE		0.1				1
		ADJUST		0.4				
		INSTALL	0.2					
		REPLACE		1.00				2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15
		REPAIR					1.00	2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15
0030	PANEL, ENCLOSURE BACK	SERVICE		0.3				1
0030	PANEL , ENCLOSURE BASE	SERVICE		0.3				1
0030	POWER CABLE ASSY (BATTERY	INSPECT	0.1					
		SERVICE	0.1					
		INSTALL	0.1					
		REPLACE		0.3				16, 17
		REPAIR		0.3				16, 17
0030	JUMPER CABLE ASSY	INSPECT	0.1					
		SERVICE	0.1					
		INSTALL	0.1					
		REPLACE		0.3				16, 17
		REPAIR		0.3				16, 17
0030	BATTERY , 12V	INSPECT	0.1					
		TEST	0.2					18
		SERVICE	0.1					19
		INSTALL	0.1					21
		REPLACE	0.1					20
		REPAIR		2.0				22

* C operator/crew O organizational F - direct support H - general support D - depot

END ITEM: FIRING BOX, ROCKET (11507250)

TOOL AND TEST EQUIPMENT REQUIREMENTS

Tool or Test Equipment Reference Code	Maintenance Category	menclat	National/NATO Stock Number	Tool Number
1	O	CLEANER, ELECTRICAL CONTACT	5850-00-973-3122	9100
2	O	SCREWDRIVER, CROSS TIP, PHILLIPS NO. 1	5120-00-240-8716	
3	O	PLIERS, LONG NOSE	5120-00-247-5177	108285
4	O	WRENCH, SOCKET, SPINNER TYPE 3/8"	5120-00-596-1263	
5	F, H	SOLDER	3439-00-269-9610	804606
6	O	WRENCH, SOCKET, SPINNER TYPE 1/4"	5120-00-241-3188	3408
7	O	SCREWDRIVER, FLAT TIP, 3/16 INCH WIDE	5120-00-293-3183	7577858
8	O	WRENDH, OPEN END, FIXED, 9/16 INCH AND 1/2 INCH OPENINGS	5120-00-187-7124	1725B
9	F, H	HEATSINK, ELECTRICAL, ELECTRONIC COMPONENTS	5999-00-076-1279	30A
10	F, H	MULTIMETER, DIGITAL WRE-300/M	6625-00-933-2406	300M
11	F, H	SOLDERING GUN, LIGHT DUTY	3439-00-965-0156	
12	F, H	BRUSH, SMALL, STIFF BRISTLED NON-METALLIC	NOT AVAILABLE IN SYSTEM. PURCHASE MARKET .	FED SUPPLY ON OPEN
13	F, H	CONFORMAL COATING	8030-00-738-1725	
14	O	SCREWDRIVER, CROSS TIP, PHILLIPS NO. 2	5120-00-234-8913	
15	O	WRENCH, SOCKET, 1 INCH (DEEP LENGTH)	5120-00-243-7340	
16	O	STRIPPER, WIRE HAND	5110-00-268-4224	
17	O	CRIMPING TOOL, TERMINAL, HAND	5120-00-251-3990	
18	C	BATTERY TESTER, ELECTROLYTE	6630-00-171-5126	

END ITEM: FIRING BOX, ROCKET (11507250)

TOOL AND TEST EQUIPMENT REQUIREMENTS

Tool or Test Equipment Reference Cod	Maintenance Category	men	National/NATO Stock Number	Tool Number
19	C	SODA, BAKING	8950-00-292-9611	
20	C	CARRIER, STORAGE BATTERY	5120-00-570-4316	
21	C	SYRINGE, BATTERY FILLING, 6 OZ.	6140-00-643-4490	
22	O	CHARGER, BATTERY	6130-00-940-7866	
23	F, H	ALCOHOL, DENATURED	6810-00-205-6790	

MAINTENANCE ALLOCATION CHART for

ROCKET, TARGET, BALLISTIC , AERIAL (BATS)

(1) GROUP NUMBER	(2) COMPONENT/ASSEMBLY	(3) MAINTENANCE FUNCTION	(4) MAINTENANCE CATEGORY* C	O	F	H	D	TOOLS AND EQUIPMENT
0010	ROCKET, TARGET, BALLISTIC AERIAL	INSPECT SERVICE INSTALL REPLACE	).1).2).2).2					1,2,3
0010	TARGET, BALLISTIC AERIAL ASSY	INSPECT SERVICE INSTALL REPLACE	).1).2).2).1					4,5 3,6 7
0010	MOTOR, ROCKET 2.75 INCH, MARK 40, MOD 3.	INSTALL	).1					4
0010	FLARE, TARGET (W112B)	INSTALL	).1					4
0010	CARTRIDGE, ENGINE STARTER MXU-4A/A	INSTALL	).1					8

* C - operator/crew O - organizational F - direct support H - general support D - depot

END ITEM: ROCKET , TARGET, BALLISTIC, AERIAL (BATS)

TOOL AND TEST EQUIPMENT REQUIREMENTS

Tool or Test Equipment Reference Code	Maintenance Category	Nomenclature	National/NATO Stock Number	Tool Number
1	C	GLOVES	8415-00-268-7859	KKG486
2	C	SHEARS, METAL CUTTING	5110-00-221-1085	
3	C	GOGGLES , SAFETY	4240-00-269-7912	5023A
4	C	SCREWDRIVER, FLAT TIP 3/16 INCH WIDE	5120-00-293-3183	7577858
5	C	CLEANER, ELECTRICAL CONTACT , 5 oz CAN	6850-00-973-3122	9100
6	C	TOOL , RIVETING	5120-00-017-2849	
7	C	PLIERS, SLIP JOINT	5120-00-223-7397	712A
8	C	SNIPS , FILAMENT	5110-00-180-0653	42450

APPENDIX D

FIRING TABLES FOR MK 40 ROCKET MOTORS

D-1. Scope.

This appendix contains firing tables necessary for launching the target when using the MK 40 rocket motors.

a. Launch Quadrant Elevation (QE) Angle Correction. Tables D-1 through D-5 contain requirements for elevation of the launcher slide versus range, altutude, time of flight, and speed. Tables D-6 through D-21 contain corrections for temperature, altitude, and wind speed and direction which must be used in conjunction with tables D-1 through D-5. Tables D-6 through D-21 are differentiated by the number of degrees of launch elevation which tables D-1 through D-5 indicate as desired.

b. Launch Azimuth Correction. Tables D-22 through D-29 contain data for correcting the launch azimuth.

D-2. Launch QE Angle Correction.

a. Determine Slide Elevation. Using tables D-1 through D-5 note the slide elevation (QE) required by determining the nominal range, altitude, time of flight, and average velocity needed.

b. Temperature Correction Angle. Using chart 1 in tables D-6 through D-21, determine the number of degrees of elevation which must be added to, or subtracted from the initial slide elevation as determined in paragraph *a* above. Record in step 2 on work sheet.

NOTE

Add or subtract step 1 to, or from, step 2 and record in step 3 on work sheet.

c. Altitude Correction. Using chart 2 in tables D-6 through D-21, determine the number of degrees of elevation which must be subtracted from the total number of degrees as determined in paragraphs *b* and *c* above. Record in step 4 on work sheet.

NOTE

Subtract step 1 from step 3 on work sheet.

d. Wind Correction Angle. If wind is present in the launch or flight area, a wind correction must be calculated. Determine the direction from which the wind is flowing. (Record in step *6.a.* on work sheet.) Record launch azimuth in step *6.b.* on work sheet. Subtract the launch azimuth from the wind azimuth and record in step *6.c.* on work sheet. If the launch azimuth is greater than the wind azimuth, add 360 degrees to the wind azimuth. The resulting number is the clockwise angle from the launch azimuth to the wind azimuth (relative wind angle). Using the wind meter, determine the wind speed. With the relative wind angle and speed, go to chart 3 on tables D-6 through D-21 and calculate the wind correction angle. Record in step *6.d.* on work sheet.

NOTE

Add or subtract the wind correction angle to, or from, step 5 and record in step 7.

D-3. Launch Azimuth Angle Correction.

If wind is present in the launch or flight area, a wind correction must be calculated. Take the relative wind angle from step *6.c.* on the work sheet and record in step *8.a.* of the work sheet. Using the wind velocity and relative wind angle, determine the wind correction from tables D-22 through D-29. Record the wind correction angle in step *8.c.* Record launcher azimuth position in step *8.b.* Add or subtract *8.c.* to or from *8.b.* and record in step *8.d.* for the corrected azimuth indicator reading.

D-4. Azimuth Spin Correction.

Azimuth spin correction is negligible and is not considered in this appendix.

SAMPLE WORK SHEET

1. Launch Angle (Q. E.) _____

2. Temperature Correction _____

3. Launch angle corrected for temperature (algebraically add steps 1 and 2) _____

4. Altitude Correction _____

5. Launch angle corrected for altitude and temperature (algebraically add steps 4 and 3) _____

6. Wind correction

   a. Direction from which wind is blowing _____

   b. Launch azimuth _____

   c. Relative wind angle Subtract b from a (add 360 degrees) to a if necessary) _____

   d. Wind Correction Angle _____

7. Launch angle corrected for wind, temperature, and altitude. (algebraically add step 5 and 6d) _____

8. Azimuth Correction

   a. Relative wind angle (6, c above) _____

   b. Launcher azimuth scale at orientation _____

   c. Wind correction angle _____

   d. Corrected azimuth indicator reading (algebraically add step 8b and 8c) _____

Figure D-2. Launch (QE) angle and launch azimuth angle correction.

COUNTDOWN PROCEDURE AND CHECKLIST

Prior to Final Arming

Check:

- Nose Cone Replaced _____
- Fins correctly installed _____
- Sustainer Nozzles Hand Tight _____
- Telescoping Support Arm Locking Screws Tightened _____
- No debris in the area (particularly at rear or launcher or around Fire Control Slave Unit _____
- Azimuth Indicator is correct _____
- Rocket Motor Fin Clamps Installed _____
- Rocket Motor Terminal Clips Installed _____
- Rocket Motor Alligator Clips Installed _____
- Flare installed _____
- Area is Clear of all Personnel _____

Final Arming

- SAFE TO ARM Lamp on Slave Unit Illuminated _____
- Rocket Motor Shorting Clips Removed and Bent Clear of Contacts _____
- All wires are inside cutter bar _____
- Terminal Blocks have proper number of White and Black wires installed _____
- Static Ground Wire Removed _____
- Red Shorting Wire Removed _____
- ARMED/SAFE Switch to ARMED Position _____

Launch Procedure

- Inform Range Control Officer that BATS Launch Area is clear of personnel and targets are ready for launch. _____
- (At T - 1 Minute) Rocket Firing Box POWER Switch (Key) ON. _____
- (At T - 10 Seconds) Desired Launcher SAFE/ARM Switch to ARM. _____
- (AT FIRE COMMAND) FIRE COMMAND Switch Activated _____

Figure D-2. Sample countdown procedure and checklist.

Table D-1. QE Selection Table (2 Rocket Motors With Sustainer Motor)

QE		RANGE		ALTITUDE		TIME	V_{AVG}
(deg)	(mils)	(ft)	(m)	(ft)	(m)	(Sec)	(kts)
25	444	—	—	—	—	—	—
26	462	—	—	—	—	—	—
27	480	4,532	1,382	322		10.0	297
28	498	4,821	1,470	363	110	10.6	298
29	516	5,152	1,570	409	125	11.2	300
30	533	5,442	1,659	455	139	11.7	301
31	551	5,746	1,751	503	153	12.3	303
32	569	6,064	1,848	555	169	12.9	304
33	587	6,368	1,941	609	186	13.5	305
34	604	6,686	2,038	666	203	14.1	307
35	622	6,988	2,130	725	221	14.7	308
36	640	7,303	2,226	788	240	15.3	309
37	658	7,617	2,322	853	260	15.9	310
38	676	7,944	2,421	922	281	16.5	311
39	693	8,249	2,514	993	303	17.1	312
40	711	8,574	2,613	1,066	325	17.7	313
41	729	8,884	2,708	1,143	348	18.4	314
42	747	9,194	2,802	1,223	373	19.1	314
43	764	9,487	2,892	1,306	398	19.7	314
44	782	9,779	2,981	1,391	424	20.4	314
45*	800	10,068	3,069	1,480	451	21.2	313
46	818	10,341	3,152	1,572	479	21.9	311
47	836	10,609	3,234	1,666	508	22.6	310
48	853	10,861	3,311	1,764	538	23.4	308
49	871	11,097	3,382	1,865	569	24.1	306
50	889	11,328	3,453	1,970	600	24.9	304

*The maximum angle of elevation obtainable, using the elevation actuator, is 45 degrees. For a larger QE, it is necessary to place the launcher on an incline.

Table D-2. 3 Rocket Motors Without Sustainer Motor Summary

QE		RANGE		ALTITUDE		TIME	V_{AVG}
(deg)	(mils)	(ft)	(m)	(ft)	(m)	(sec)	(kts)
26	462	7,361	2,244	806	246	15.3	308
27	480	7,530	2,295	866	264	15.8	305
28	498	7,719	2,353	941	287	16.4	301
29	516	7,900	2.408	1,018	310	17.1	298
30	533	8,071	2,460	1,097	335	17.7	294
31	551	8,228	2,508	1,180	360	18.3	291
32	569	8,373	2,552	1,264	385	18.9	287
33	587	8,506	2,593	1,348	411	19.5	284
34	604	8,628	2,630	1.434	437	20.1	281
35	622	8,738	2,663	1.521	464	20.6	278
36	640	8,836	2,693	1.609	491	21.2	275
37	658	8,926	2,721	1,699	518	21.8	272
38	676	9,001	2,744	1,790	546	22.3	269
39	693	9,069	2,764	1.881	573	22.8	267
40	711	9,124	2,781	1,974	602	23.4	264
41	729	9,169	2,795	2,067	630	23.9	261
42	747	9,206	2,806	2,161	659	24.4	259
43	764	9,229	2,813	2,256	688	24.9	256
44	782	9,243	2,817	2,350	716	25.4	253
45	800	9,245	2,818	2,445	745	25.9	251

Table D-3. QE Selection Table (3 Rocket Motors With Sustainer Motor)

QE		RANGE		ALTITUDE		TIME	V_{AVG}
(deg)	(mils)	(ft)	(m)	(ft)	(m)	(see)	(kts)
20	356	6,118	1,865	351	107	10.4	383
21	373	6,561	2,006	407	124	11.1	383
22	391	7,060	2,152	467	142	11.9	383
23	409	7,521	2,292	531	162	12.6	384
24	427	7,979	2,432	599	183	13.3	384
25	444	8,452	2,576	672	205	14.1	384
26	462	8,905	2,714	748	228	14.8	385
27	480	9,372	2,857	829	253	15.6	385
28	498	9,836	2,998	914	279	16.3	385
29	516	10,292	3,137	1,003	306	17.0	385
30	533	10,733	3,272	1,097	334	17.8	385
31	551	11,186	3,410	1,194	364	18.6	385
32	569	11,456	3,492	1,258	383	19.1	385
33	587	11,888	3,624	1,362	415	19.9	384
34	604	12,151	3,704	1,431	436	20.4	383
35	622	12,562	3,829	1,543	470	21.3	381
36	640	12,952	3,948	1,659	506	22.1	378
37	658	13,321	4,060	1,778	542	23.0	375
38	676	13,705	4,177	1,908	582	23.9	372
39	693	14,034	4,278	2,036	621	24.8	369
40	711	14,356	4,376	2,168	661	25.6	366
41	729	14,658	4,468	2,304	702	26.5	362
42	747	14,931	4,551	2,445	745	27.4	359
43	764	15,196	4,632	2,589	789	28.2	355
44	782	15,448	4,709	2,744	836	29.1	352
45*	800	15,666	4,775	2,896	883	30.0	348
46	818	15,866	4,836	3,053	931	30.8	345
47	836	16,048	4,892	3,214	980	31.7	341
48	853	16,203	4,939	3,379	1,030	32.5	338
49	871	16,350	4,984	3,548	1,082	33.4	335
50	889	16,470	5,020	3,722	1,134	34.2	331

*The maximum angle of elevation obtainable, using the elevation actuator, is 45 degrees. For a larger QE, it is necessary to place the launcher on an incline.

Table D-4. QE Selection Table (4 Rocket Motors With Sustainer Motor)

QE		RANGE		ALTITUDE		TIME	V_{AVG}
(deg)	(mils)	(ft)	(m)	(ft)	(m)	(see)	(kts)
15							
16	248	7,108	2,167	333	101	10.1	455
17	302	7,744	2,360	399	121	11.0	454
18	320	8,374	2,553	470	143	11.9	452
19	338	8,999	2,743	548	167	12.8	451
20	356	9,518	2,932	631	192	13.6	450
21	373	10,213	3,113	720	220	14.5	448
22	391	10,823	3,298	815	248	15.4	447
23	409	11,420	3,481	915	279	16.2	446
24	427	12,010	3,661	1,020	311	17.1	445
25	444	12,577	3,834	1,131	345	18.0	444
26	462	13,150	4,008	1,248	380	18.9	442
27	480	13,694	4,174	1,369	417	19.8	440
28	498	14,226	4,336	1,496	456	20.8	437
29	516	14,731	4,490	1,628	496	21.7	433
30	533	15,210	4,636	1,765	538	22.7	429
31	551	15,678	4,779	1,908	581	23.7	425
32	569	16,121	4,914	2,055	626	24.6	420
33	587	16,528	5,038	2,207	673	25.6	416
34	604	16,912	5,155	2,365	721	26.5	411
35	622	17,288	5,269	2,527	770	27.5	407
36	640	17,629	5,374	2,694	821	28.5	403
37	658	17,940	5,468	2,866	874	29.4	398
38	676	18,241	5,560	3,043	928	30.3	394
39	673	18,513	5,643	3,225	983	31.3	390
40	711	18,765	5,720	3,411	1,040	32.2	386
41	729	18,998	5,791	3,602	1,098	33.1	382
42	747	19,203	5,853	3,798	1,158	34.0	378
43	764	19,389	5,910	3,999	1,219	34.9	374
44	782	19,548	5,958	4,203	1,281	35.8	371
45*	800	19,697	6,004	4,412	1,345	36.7	367
46	818	19,820	6,041	4,625	1,410	37.6	363
47	836	19,915	6,096	4,841	1,476	38.4	360
48	853	20,001	6,076	5,060	1,542	39.3	357
49	871	20,059	6,114	5,283	1,610	40.1	353
50	889	20,091	6,124	5,508	1,679	41.0	350

*The maximum angle of elevation obtainable. using the elevation actuator. is 45 degrees. For a larger QE, it is necessary to place the launcher on an incline.

Table D-5. QE Selection Table (5 Rocket Motors With Sustainer Motor)

QE		RANGE		ALTITUDE		TIME	V_{AVG}
(deg)	(mils)	(ft)	(m)	(ft)	(m)	(sec)	(kts)
15	267	9,157	2,791	437	133	11.5	510
16	284	9,938	3,029	524	160	12.5	508
17	302	10,708	3,264	617	188	13.5	505
18	320	11,448	3,489	718	219	14.5	503
19	338	12,179	3,712	824	251	15.4	500
20	356	12,898	3,931	939	286	16.4	496
21	373	13,618	4,151	1,061	323	17.4	493
22	391	14,305	4,360	1,189	362	18.4	489
23	409	14,957	4,559	1,319	402	19.4	486
24	427	15,607	4,757	1,460	445	20.5	483
25	444	16,223	4,945	1,608	490	21.5	480
26	462	16,806	5.123	1,762	537	22.6	475
27	480	17,374	5,296	1,922	586	23.6	470
28	498	17,885	5,451	2,085	635	24.7	464
29	516	18,396	5,607	2,257	688	25.7	458
30	533	18,867	5,751	2,435	742	26.8	453
31	551	19,299	5,883	2,619	798	27.8	448
32	569	19,700	6,005	2,803	854	28.8	442
33	587	20,087	6,123	2,998	914	29.8	437
34	604	20,451	6,234	3,199	975	30.9	432
35	622	20,783	6,335	3,405	1,038	31.9	426
36	640	21,096	6,430	3,614	1,102	32.9	422
37	658	21,376	6,515	3,832	1,168	33.8	418
38	676	21,636	6,595	4,055	1,236	34.8	414
39	693	21,876	6,668	4,282	1,305	35.8	409
40	711	22,087	6,732	4,515	1,376	36.7	404
41	729	22,274	6,789	4,746	1,447	37.7	400
42	747	22,447	6,842	4,988	1,520	38.6	396
43	764	22,591	6,886	5,234	1,595	39.5	393
44	782	22,717	6,924	5,483	1,671	40.5	389
45*	800	22,814	6,954	5,736	1,748	41.4	385
46	818	22,895	6,979	5,989	1,825	42.3	381
47	836	22,947	6,994	6,248	1,904	43.1	378
48	853	22,978	7,004	6,509	1,984	44.0	374
49	871	22,990	7,007	6,773	2,064	44.9	371
50	889	22,974	7,003	7,038	2,145	45.7	369

*The maximum angle of elevation obtainable, using the elevation actuator, is 45 degrees. For a larger QE, it is necessary to place the launcher on an incline.

Table D-6. Launch Angle Correction Table

24- THROUGH 35-DEGREE LAUNCH ANGLE (QE)

2 ROCKET MOTORS WITH SUSTAINER MOTOR

CHART 1. TEMPERATURE

	ATMOSPHERIC TEMPERATURES (°F)														
	-20	-10	0	+10	+20	+30	+40	+50	+60	+70	+80	+90	+100	+110	+120
CORRECTION ANGLE (deg)	+5	+5	+4	+3	+3	+2	+1	0	0	0	-1	-2	-2	-3	-3

CHART 2. ALTITUDE

	ALTITUDE ABOVE SEA LEVEL (ft)				
	1000	2000	3000	4000	5000
CORRECTION ANGLE	0	0	0	-1	-1

CHART 3. WIND

		RELATIVE WIND ANGLE (deg)												
		0 360	15 345	30 330	45 315	60 300	75 285	90 270	105 255	120 240	135 225	150 210	165 195	180
		CORRECTION ANGLE												
WIND VELOCITY (knots)	10	1	1	1	1	1	0	0	0	-1	-1	-1	-1	-1
	20	2	2	2	2	1	1	0	-1	-1	-2	-2	-2	-2
	30	4	3	3	3	2	1	0	-1	-2	-3	-3	-3	-4
NOTE: FLIGHT RESTRICTED TO SURFACE WINDS EQUAL TO OR LESS THAN 30 KNOTS														

Table D-7. Launch Angle Correction Table

36- THROUGH 42-DEGREE LAUNCH ANGLE (QE)

2 ROCKET MOTORS WITH SUSTAINER MOTOR

CHART 1. TEMPERATURE

	ATMOSPHERIC TEMPERATURE (°F)														
	-20	-10	0	+10	+20	+30	+40	+50	+60	+70	+80	+90	+100	+110	+120
CORRECTION ANGLE (deg)	+6	+6	+5	+4	+3	+2	+1	0	0	0	-1	-2	-3	-3	-4

CHART 2. ALTITUDE

	ALTITUDE ABOVE SEA LEVEL (ft)				
	1000	2000	3000	4000	5000
CORRECTION ANGLE	0	0	0	0	-1

CHART 3. WIND

		RELATIVE WIND ANGLE (deg)												
		0 360	15 345	30 330	45 315	60 300	75 285	90 270	105 255	120 240	135 225	150 210	165 195	180
		CORRECTION ANGLE												
WIND VELOCITY (knots)	10	2	2	1	1	1	0	0	0	-1	-1	-1	-2	-2
	20	3	3	3	2	2	0	0	-0	-2	-2	-3	-3	-3
	30	5	4	4	3	3	1	0	-1	-3	-3	-4	-4	-5
NOTE: FLIGHT RESTRICTED TO SURFACE WINDS EQUAL TO OR LESS THAN 30 KNOTS														

Table D-8. Launch Angle Correction Table

43- THROUGH 50-DEGREE LAUNCH ANGLE (QE)

2 ROCKET MOTORS WITH SUSTAINER MOTOR

CHART 1. TEMPERATURE

	ATMOSHPERIC TEMPERATURE (°F)														
	-20	-10	0	+10	+20	+30	+40	+50	+60	+70	+80	+90	+100	+110	+120
CORRECTION ANGLE (deg)	+6	+6	+5	+4	+3	+2	+1	+0	0	0	-1	-2	-3	-3	-4

CHART 2. ALTITUDE

	ALTITUDE ABOVE SEA LEVEL (ft)				
	1000	2000	3000	4000	5000
CORRECTION ANGLE	0	0	0	-1	-2

CHART 3. WIND

		RELATIVE WIND ANGLE (deg)												
		0 360	15 345	30 330	45 315	60 300	75 285	90 270	105 255	120 240	135 225	150 210	165 195	180
		CORRECTION ANGLE												
WIND VELOCITY (knots)	10	2	2	2	1	1	0	0	0	-1	-1	-2	-2	-2
	20	4	4	3	3	2	1	0	-1	-2	-3	-3	-4	-4
	30	6	6	5	4	3	2	0	-2	-3	-4	-5	-6	-6
NOTE: FLIGHT RESTRICTED TO SURFACE WINDS LESS THAN OR EQUAL TO 30 KNOTS														

Table D-9. 3 ROCKET MOTORS WITH SUSTAINER MOTOR

Wind Velocity (Knots)	RELATIVE WIND ANGLE (DEG)												
	0 360	15 345	30 330	45 315	60 300	75 285	90 270	105 255	120 240	135 225	150 210	165 195	180
	QE = 26 THRU 31 DEGREES CORRECTION ANGLE ~ DEG												
10	0	0	0	0	0	0	0	0	0	0	0	0	0
20	+1.0	+1.0	0	0	0	0	0	0	0	0	0	-1.0	-1.0
30	+1.0	+1.0	+1.0	+1.0	0	0	0	0	0	-1.0	-1.0	-1.0	-1.0
40	+1.0	+1.0	+1.0	+1.0	+1.0	0	0	0	-1.0	-1.0	-1.0	-1.0	-1.0
	QE = 32 THRU 39 DEGREES CORRECTION ANGLE ~ DEG												
10	0	0	0	0	0	0	0	0	0	0	0	0	0
20	+1.0	+1.0	+1.0	0	0	0	0	0	0	0	-1.0	-1.0	-1.0
30	+1.0	+1.0	+1.0	+1.0	+1.0	0	0	0	-1.0	-1.0	-1.0	-1.0	-1.0
40	+1.0	+1.0	+1.0	+1.0	+1.0	0	0	0	-1.0	-1.0	-1.0	-1.0	-1.0
	QE = 40 THRU 45 DEGREES CORRECTION ANGLE ~ DEG												
10	0	0	0	0	0	0	0	0	0	0	0	0	0
20	+1.0	+1.0	+1.0	+1.0	0	0	0	0	0	-1.0	-1.0	-1.0	-1.0
30	+1.0	+1.0	+1.0	+1.0	+1.0	0	0	0	-1.0	-1.0	-1.0	-1.0	-1.0
40	+2.0	+2.0	+2.0	+1.0	+1.0	0	0	0	-1.0	-1.0	-2.0	-2.0	-2.0

Table D-10. Launch Angle Correction Table

18- THROUGH 25-DEGREE LAUNCH ANGLE (QE)

3 ROCKET MOTORS WITH SUSTAINER MOTOR

CHART 1. TEMPERATURE

	ATMOSPHERIC TEMPERATURES (°F)														
	-20	-10	0	+10	+20	+30	+40	+50	+60	+70	+80	+90	+100	+110	+120
CORRECTION ANGLE (deg)	+6	+5	+4	+4	+3	+2	-1	0	0	0	-1	-2	-3	-3	-4

CHART 2. ALTITUDE

	ALTITUDE ABOVE SEA LEVEL (ft)				
	1000	2000	3000	4000	5000
CORRECTION ANGLE	0	0	-1	-1	-1

CHART 3. WIND

		RELATIVE WIND ANGLE (deg)												
		0 360	15 345	30 330	45 315	60 300	75 285	90 270	105 255	120 240	135 225	150 210	165 195	180
		CORRECTION ANGLE												
WIND VELOCITY (knots)	10	1	1	1	1	0	0	0	0	0	-1	-1	-1	-1
	20	2	3	2	1	1	0	0	0	-1	-2	-2	-3	-3
	30	4	4	3	2	1	1	0	-1	-1	-2	-3	-4	-4
	40	5	5	4	3	2	1	0	-1	-2	-3	-4	-5	-5

Table D-11. Launch Angle Correction Table

26- THROUGH 35-DEGREE LAUNCH ANGLE (QE)

3 ROCKET MOTORS WITH SUSTAINER MOTOR

CHART 1. TEMPERATURE

	ATMOSPHERIC TEMPERATURES (°F)														
	-20	-10	0	+10	+20	+30	+40	+50	+60	+70	+80	+90	+100	+110	+120
CORRECTION ANGLE (deg)	+6	+5	+4	+4	+3	+2	-1	0	0	0	-1	-2	-3	-3	-4

CHART 2. ALTITUDE

	ALTITUDE ABOVE SEA LEVEL (ft)				
	1000	2000	3000	4000	5000
CORRECTION ANGLE	0	0	-1	-1	-1

CHART 3. WIND

		RELATIVE WIND ANGLE (deg)												
		0 360	15 345	30 330	45 315	60 300	75 285	90 270	105 255	120 240	135 225	150 210	165 195	180
		CORRECTION ANGLE												
WIND VELOCITY (knots)	10	1	1	1	1	0	0	0	0	0	-1	-1	-1	-1
	20	2	3	2	1	1	0	0	0	-1	-2	-2	-3	-3
	30	4	4	3	2	1	1	0	-1	-1	-2	-3	-4	-4
	40	5	5	4	3	2	1	0	-1	-2	-3	-4	-5	-5

Table D-12. Launch Angle Correction Table

36- THROUGH 42-DEGREE LAUNCH ANGLE (QE)

3 ROCKET MOTORS WITH SUSTAINER MOTOR

CHART 1. TEMPERATURE

ATMOSPHERIC TEMPERATURE (°F)															
	-20	-10	0	+10	+20	+30	+40	+50	+60	+70	+80	+90	+100	+110	+120
CORRECTION ANGLE (deg)	+6	+5	+4	+4	+3	+2	+1	0	0	0	-1	-2	-3	-3	-4

CHART 2. ALTITUDE

ALTITUDE ABOVE SEA LEVEL (ft)					
	1000	2000	3000	4000	5000
CORRECTION ANGLE	0	0	0	0	-1

CHART 3. WIND

RELATIVE WIND ANGLE (deg)														
		0 360	15 345	30 330	45 315	60 300	75 285	90 270	105 255	120 240	135 225	150 210	165 195	180
		CORRECTION ANGLE												
WIND VELOCITY (knots)	10	1	1	1	1	0	0	0	0	0	-1	-1	-1	-2
	20	2	2	2	2	1	0	0	0	-1	-2	-3	-3	-3
	30	4	4	3	3	2	0	0	0	-2	-4	-4	-5	-5
	40	5	5	4	4	2	1	0	-1	-3	-5	-5	-6	-6

Table D-13. Launch Angle Correction Table

43- THROUGH 50-DEGREE LAUNCH ANGLE (QE)

3 ROCKET MOTORS WITH SUSTAINER MOTOR

CHART 1. TEMPERATURE

	ATMOSPHERIC TEMPERATURE (°F)														
	-20	-10	0	+10	+20	+30	+40	+50	+60	+70	+80	+90	+100	+110	+120
CORRECTION ANGLE (deg)	+6	+5	+4	+4	+3	+2	+1	0	0	0	-1	-2	-3	-3	-4

CHART 2. ALTITUDE

	ALTITUDE ABOVE SEA LEVEL (ft)				
	1000	2000	3000	4000	5000
CORRECTION ANGLE	0	0	0	0	-1

CHART 3. WIND

		RELATIVE WIND ANGLE (deg)												
		0 360	15 345	30 330	45 315	60 300	75 285	90 270	105 255	120 240	135 225	150 210	165 195	180
		CORRECTION ANGLE*												
WIND VELOCITY (knots)	10	2	1	1	1	0	0	0	0	-1	-1	-1	-2	-2
	20	4	3	2	2	1	1	0	-1	-1	-2	-3	-4	-4
	30	5	4	3	3	2	1	0	-1	-2	-3	-4	-5	-5
	40	6	5	4	4	3	2	0	-2	-3	-4	-5	-7	-7

*DO NOT ADJUST QE ABOVE 50 DEGREES.

Table D-14. Launch Angle Correction Table

15- THROUGH 25-DEGREE LAUNCH ANGLE (QE)

4 ROCKET MOTORS WITH SUSTAINER MOTOR

CHART 1. TEMPERATURE

ATMOSPHERIC TEMPERATURES (°F)															
	-20	-10	0	+10	+20	+30	+40	+50	+60	+70	+80	+90	+100	+110	+120
CORRECTION ANGLE (deg)	+7	+6	+5	+4	+3	2	1	0	0	0	-1	-1	-2	-3	-3

CHART 2. ALTITUDE

ALTITUDE ABOVE SEA LEVEL (ft)					
	1000	2000	3000	4000	5000
CORRECTION ANGLE	0	0	-1	-1	-1

CHART 3. WIND

RELATIVE WIND ANGLE (deg)														
		0 360	15 345	30 330	45 315	60 300	75 285	90 270	105 255	120 240	135 225	150 210	165 195	180
		CORRECTION ANGLE												
WIND VELOCITY (knots)	10	1	1	1	1	0	0	0	0	0	-1	-1	-1	-1
	20	2	2	2	1	1	0	0	0	-1	-1	-2	-2	-2
	30	2	2	2	2	1	1	0	-1	-1	-1	-2	-2	-2
	40	3	2	2	2	2	1	0	-1	-2	-2	-3	-3	-3

Table D-15. Launch Angle Correction Table

26- THROUGH 35-DEGREE LAUNCH ANGLE (QE)

4 ROCKET MOTORS WITH SUSTAINER MOTOR

CHART 1. TEMPERATURE

	ATMOSPHERIC TEMPERATURES (°F)														
	-20	-10	0	+10	+20	+30	+40	+50	+60	+70	+80	+90	+100	+110	+120
CORRECTION ANGLE (deg)	+6	+5	+4	+4	-3	+2	+1	0	0	0	-1	-1	-2	-3	-3

CHART 2. ALTITUDE

	ALTITUDE ABOVE SEA LEVEL (ft)				
	1000	2000	3000	4000	5000
CORRECTION ANGLE	0	0	0	-1	-1

CHART 3. WIND

		RELATIVE WIND ANGLE (deg)												
		0 360	15 345	30 330	45 315	60 300	75 285	90 270	105 255	120 240	135 225	150 210	165 195	180
		CORRECTION ANGLE												
WIND VELOCITY (knots)	10	1	1	1	1	0	0	0	0	0	-1	-1	-1	-1
	20	2	2	1	1	1	0	0	0	-1	-1	-2	-2	-2
	30	3	3	3	2	1	1	0	-1	-1	-2	-3	-3	-4
	40	4	4	4	3	2	1	0	-1	-3	-3	-4	-5	-5

Table D-16. Launch Angle Correction Table

36- THROUGH 42-DEGREE LAUNCH ANGLE (QE)

4 ROCKET MOTORS WITH SUSTAINER MOTOR

CHART 1. TEMPERATURE

	ATMOSPHERIC TEMPERATURE (°F)														
	-20	-10	0	+10	+20	+30	+40	+50	+60	+70	+80	+90	+100	+110	+120
CORRECTION ANGLE (deg)	+6	+5	+4	+4	+3	+2	+1	0	0	0	-1	-1	-2	-3	-3

CHART 2. ALTITUDE

	ALTITUDE ABOVE SEA LEVEL (ft)				
	1000	2000	3000	4000	5000
CORRECTION ANGLE	0	0	0	0	-1

CHART 3. WIND

		RELATIVE WIND ANGLE (deg)												
		0 360	15 345	30 330	45 315	60 300	75 285	90 270	105 255	120 240	135 225	150 210	165 195	180
		CORRECTION ANGLE												
WIND VELOCITY (knots)	10	1	1	1	1	1	0	0	0	-1	-1	-1	-2	-2
	20	2	2	2	1	1	1	0	-1	-1	-2	-2	-3	-3
	30	3	3	3	2	2	2	0	-2	-2	-2	-3	-4	-4
	40	5	4	4	3	3	2	0	-2	-2	-3	-4	-5	-6

Table D-17. Launch Angle Correction Table

43- THROUGH 50-DEGREE LAUNCH ANGLE (QE)

4 ROCKET MOTORS WITH SUSTAINER MOTOR

CHART 1. TEMPERATURE

	ATMOSPHERIC TEMPERATURE (°F)														
	-20	-10	0	+10	+20	+30	+40	+50	+60	+70	+80	+90	+100	+110	+120
CORRECTION ANGLE (deg)	+6	+5	+4	+4	+3	+2	+1	0	0	0	-1	-1	-2	-3	-4

CHART 2. ALTITUDE

	ALTITUDE ABOVE SEA LEVEL (ft)				
	1000	2000	3000	4000	5000
CORRECTION ANGLE	0	0	0	0	-1

CHART 3. WIND

		RELATIVE WIND ANGLE (deg)												
		0 360	15 345	30 330	45 315	60 300	75 285	90 270	105 255	120 240	135 225	150 210	165 195	180
		CORRECTION ANGLE*												
WIND VELOCITY (knots)	10	1	1	1	1	0	0	0	0	-1	-1	-1	-1	-2
	20	3	2	2	2	1	0	0	-1	-1	-2	-2	-3	-3
	30	4	4	3	3	2	1	0	-1	-2	-3	-3	-4	-5
	40	5	5	4	4	3	1	0	-2	-3	-4	-5	-6	-6

*DO NOT ADJUST QE ABOVE 50 DEGREES.

Table D-18. Launch Angle Correction Table

15- THROUGH 25-DEGREE LAUNCH ANGLE (QE)

5 ROCKET MOTORS WITH SUSTAINER MOTOR

CHART 1. TEMPERATURE

	ATMOSPHERIC TEMPERATURES (^{o}F)														
	-20	-10	0	+10	+20	+30	+40	+50	+60	+70	+80	+90	+100	+110	+120
CORRECTION ANGLE (deg)	+6	+5	+4	+4	+3	+2	+1	0	0	0	-1	-1	-2	-2	-3

CHART 2. ALTITUDE

	ALTITUDE ABOVE SEA LEVEL (ft)				
	1000	2000	3000	4000	5000
CORRECTION ANGLE	0	0	-1	-1	-1

CHART 3. WIND

		RELATIVE WIND ANGLE (deg)												
		0 360	15 345	30 330	45 315	60 300	75 285	90 270	105 255	120 240	135 225	150 210	165 195	180
		CORRECTION ANGLE												
WIND VELOCITY (knots)	10	1	1	1	0	0	0	0	0	0	0	0	-1	-1
	20	1	1	1	1	1	0	0	0	0	0	-1	-1	-1
	30	2	2	2	1	1	1	0	0	-1	-1	-1	-1	-2
	40	3	3	2	2	2	1	0	-1	-1	-2	-2	-2	-2

Table D-19. Launch Angle Correction Table

26- THROUGH 35-DEGREE LAUNCH ANGLE (QE)

5 ROCKET MOTORS WITH SUSTAINER MOTOR

CHART 1. TEMPERATURE

ATMOSPHERIC TEMPERATURES (°F)															
	-20	-10	0	+10	+20	+30	+40	+50	+60	+70	+80	+90	+100	+110	+120
CORRECTION ANGLE (deg)	+5	+5	+4	+3	+3	+2	+1	0	0	0	-1	-2	-2	-3	-3

CHART 2. ALTITUDE

ALTITUDE ABOVE SEA LEVEL (ft)					
	1000	2000	3000	4000	5000
CORRECTION ANGLE	0	0	-1	-1	-1

CHART 3. WIND

RELATIVE WIND ANGLE (deg)														
		0 360	15 345	30 330	45 315	60 300	75 285	90 270	105 255	120 240	135 225	150 210	165 195	180
		CORRECTION ANGLE												
WIND VELOCITY (knots)	10	1	1	1	1	0	0	0	0	0	-1	-1	-1	-1
	20	2	2	2	1	1	0	0	0	-1	-1	-2	-2	-2
	30	3	3	2	2	1	1	0	-1	-1	-2	-2	-3	-3
	40	4	4	3	3	2	1	0	-1	-2	-3	-3	-4	-4

Table D-20. Launch Angle Correction Table

36- THROUGH 42-DEGREE LAUNCH ANGLE (QE)

5 ROCKET MOTORS WITH SUSTAINER MOTOR

CHART 1. TEMPERATURE

	ATMOSPHERIC TEMPERATURE (°F)														
	-20	-10	0	+10	+20	+30	+40	+50	+60	+70	+80	+90	+100	+110	+120
CORRECTION ANGLE (deg)	+5	+5	+4	+3	+3	+2	+1	0	0	0	-1	-2	-3	-3	-4

CHART 2. ALTITUDE

	ALTITUDE ABOVE SEA LEVEL (ft)				
	1000	2000	3000	4000	5000
CORRECTION ANGLE	0	0	0	-1	-1

CHART 3. WIND

		RELATIVE WIND ANGLE (deg)												
		0 360	15 345	30 330	45 315	60 300	75 285	90 270	105 255	120 240	135 225	150 210	165 195	180
		CORRECTION ANGLE												
WIND VELOCITY (knots)	10	1	1	1	1	1	0	0	0	-1	-1	-1	-1	-1
	20	3	3	2	2	2	1	0	-1	-2	-2	-2	-3	-3
	30	4	4	3	3	2	2	0	-2	-2	-3	-3	-4	-4
	40	4	4	4	3	3	2	0	-2	-3	-3	-4	-4	-4

Table D-21. Launch Angle Correction Table

43- THROUGH 50-DEGREE LAUNCH ANGLE (QE)

5 ROCKET MOTORS WITH SUSTAINER MOTOR

CHART 1. TEMPERATURE

	ATMOSPHERIC TEMPERATURE (°F)														
	-20	-10	0	+10	+20	+30	+40	+50	+60	+70	+80	+90	+100	+110	+120
CORRECTION ANGLE (deg)	+5	+5	+4	+3	+3	+2	+1	0	0	0	-1	-2	-3	-3	-4

CHART 2. ALTITUDE

	ALTITUDE ABOVE SEA LEVEL (ft)				
	1000	2000	3000	4000	5000
CORRECTION ANGLE	0	0	0	0	-1

CHART 3. WIND

		RELATIVE WIND ANGLE (deg)												
		0 360	15 345	30 330	45 315	60 300	75 285	90 270	105 255	120 240	135 225	150 210	165 195	180
		CORRECTION ANGLE*												
WIND VELOCITY (knots)	10	1	1	1	1	1	0	0	0	-1	-1	-1	-1	-1
	20	3	3	2	2	2	1	0	-1	-2	-2	-2	-3	-3
	30	4	4	3	3	2	2	0	-2	-2	-3	-3	-4	-4
	40	5	5	4	4	3	2	0	-2	-3	-4	-4	-5	-5

*DO NOT ADJUST QE TO EXCEED 50 DEGREES MAXIMUM ELEVATION

Table D-22. Launch Azimuth Correction Angles

2 ROCKET MOTORS WITH SUSTAINER MOTOR

ALL QEs

WIND DIRECTION	WIND SPEED (knots)		
	10	20	30
15	+1	+2	+3
30	+2	+4	+6
45	+3	+5	+7
60	+3	+6	+8
75	+4	+7	+9
90	+4	+7	+9
105	+4	+7	+9
120	+3	+6	+8
135	+3	+5	+7
150	+2	+4	+6
165	+1	+2	+3
180	0	0	0
195	-1	-2	-3
210	-2	-4	-6
225	-3	-5	-7
240	-3	-6	-8
255	-4	-7	-9
270	-4	-7	-9
285	-4	-7	-9
300	-3	-6	-8
315	-3	-5	-7
330	-2	-4	-6
345	-1	-2	-3
360	0	0	0

Table D-23. 3 Rocket Motors Without Sustainer Motor

LAUNCH AZIMUTH CORRECTION TABLE

RELATIVE WIND ANGLE (deg)	WIND VELOCITY (knots)			
	10	20	30	40
	WIND CORRECTION ANGLE (deg)			
15	0	+1.0	+1.0	+1.0
30	+1.0	+1.0	+2.0	+3.0
45	+1.0	+2.0	+3.0	+4.0
60	+1.0	+3.0	+4.0	+5.0
75	+1.0	+3.0	+4.0	+6.0
90	+2.0	+3.0	+5.0	+6.0
105	+1.0	+3.0	+4.0	+6.00
120	+1.0	+3.0	+4.0	+5.0
135	+1.0	+2.0	+3.0	+4.0
150	+1.0	+l.0	+2.0	+3.0
165	0	+l.0	+1.0	+l.O
180	0	0	0	0
195	0	-1.0	-1.0	-1.0
210	-1.0	-1.O	-2.0	-3.0
225	-1.0	-2.0	-3.0	-4.0
240	-1.0	-3.0	-4.0	-5.0
255	-1.0	-3.0	-4.0	-6.0
270	-2.0	-3.0	-5.0	-6.0
285	-1.0	-3.0	-4.0	-6.0
300	-1.0	-3.0	-4.0	-5.0
315	-1.0	-2.0	-3.0	-4.0
330	-1.0	-1.0	-2.0	-3.0
345	0	-1.0	-1.0	-1.0
360	0	0	0	0

Table D-24. Launch Azimuth Correction Tables

3 ROCKET MOTORS WITH SUSTAINER MOTOR

15- THROUGH 35-DEGREE LAUNCH ANGLE (QE)

RELATIVE WIND ANGLE (deg)	WIND VELOCITY (knots)			
	10	20	30	40
	WIND CORRECTION ANGLE (deg)			
15	0	+1	+2	+2
30	+1	+2	+3	+4
45	+2	+3	+4	+5
60	+2	+4	+5	+7
75	+3	+5	+7	+9
90	+3	+5	+7	+9
105	+3	+5	+7	+9
120	+3	+5	+7	+9
135	+2	+4	+5	+7
150	+1	+2	+3	+4
165	0	+1	+2	+2
180	0	0	0	0
195	0	-1	-2	-2
210	-1	-2	-3	-4
225	-2	-4	-5	-7
240	-3	-5	-7	-9
255	-3	-5	-7	-9
270	-3	-5	-7	-9
285	-3	-5	-7	-9
300	-2	-4	-5	-7
315	-2	-3	-4	-5
330	-1	-2	-3	-4
345	0	-1	-2	-2
360	0	0	0	0

Table D-25. Launch Azimuth Correction Tables

3 ROCKET MOTORS WITH SUSTAINER MOTOR

36- THROUGH 50-DEGREE LAUNCH ANGLE (QE)

RELATIVE WIND ANGLE (deg)	WIND VELOCITY (knots)			
	10	20	30	40
	WIND CORRECTION ANGLE (deg)			
15	0	+1	+2	+2
30	+1	+2	+3	+4
45	+2	+4	+5	+7
60	+3	+5	+7	+9
75	+3	+5	+7	+9
90	+3	+5	+7	+9
105	+3	+5	+7	+9
120	+3	+5	+7	+9
135	+3	+5	+7	+9
150	+2	+3	+5	+6
165	+1	+2	+2	+3
180	0	0	0	0
195	-1	-2	-2	-3
210	-2	-3	-5	-6
225	-3	-5	-7	-9
240	-3	-5	-7	-9
255	-3	-5	-7	-9
270	-3	-5	-7	-9
285	-3	-5	-7	-9
300	-3	-5	-7	-9
315	-2	-4	-5	-7
330	-1	-2	-3	-4
345	0	-1	-2	-2
360	0	0	0	0

Table D-26. Launch Azimuth Correction Angle

4 ROCKET MOTORS WITH SUSTAINER MOTOR

15- THROUGH 35-DEGREE LAUNCH ANGLE (QE)

RELATIVE WIND ANGLE (deg)	WIND VELOCITY (knots)			
	10	20	30	40
	WIND CORRECTION ANGLE (deg)			
15	0	+1	+1	+1
30	+1	+2	+2	+3
45	+1	+2	+3	+4
60	+2	+3	+5	+6
75	+2	+4	+5	+7
90	+2	+4	+5	+7
105	+2	+4	+5	+7
120	+2	+4	+5	+7
135	+2	+3	+4	+5
150	+1	+2	+3	+4
165	0	+1	+2	+2
180	0	0	0	0
195	0	-1	-2	-2
210	-1	-2	-3	-4
225	-2	-3	-4	-5
240	-2	-4	-5	-7
255	-2	-4	-5	-7
270	-2	-4	-5	-7
285	-2	-4	-5	-7
300	-2	-3	-5	-6
315	-1	-2	-3	-4
330	-1	-2	-2	-3
345	0	-1	-1	-1
360	0	0	0	0

Table D-27. Launch Azimuth Correction Angles

4 ROCKET MOTORS WITH SUSTAINER MOTOR

36- THROUGH 50-DEGREE LAUNCH ANGLE (QE)

RELATIVE WIND ANGLE (deg)	WIND VELOCITY (knots)			
	10	20	30	40
	WIND CORRECTION ANGLE (deg)			
15	0	+1	+1	+2
30	+1	+2	+3	+4
45	+2	+3	+4	+5
60	+2	+4	+5	+7
75	+3	+5	+7	+9
90	+3	+5	+7	+9
105	+3	+5	+7	+9
120	+2	+4	+5	+7
135	+2	+3	+4	+5
150	+1	+2	+3	+4
165	0	+1	+2	+2
180	0	0	0	0
195	0	-1	-2	-2
210	-1	-2	-3	-4
225	-2	-3	-4	-5
240	-2	-4	-5	-7
255	-3	-5	-7	-9
270	-3	-5	-7	-9
285	-3	-5	-7	-9
300	-2	-4	-5	-7
315	-2	-3	-4	-5
330	-1	-2	-3	-4
345	0	-1	-1	-2
360	0	0	0	0

Table D-28. Launch Azimuth Correction Angles

5 ROCKET MOTORS WITH SUSTAINER MOTOR

15- THROUGH 35-DEGREE LAUNCH ANGLE (QE)

RELATIVE WIND ANGLE (deg)	WIND VELOCITY (knots)			
	10	20	30	40
	WIND CORRECTION ANGLE (deg)			
15	0	+1	+1	+1
30	+1	+2	+2	+3
45	+1	+2	+3	+4
60	+2	+3	+4	+6
75	+2	+4	+5	+7
90	+2	+4	+5	+7
105	+2	+4	+5	+7
120	+2	+4	+5	+7
135	+2	+3	+4	+5
150	+1	+2	+3	+4
165	0	+1	+1	+2
180	0	0	0	0
195	0	-1	-1	-2
210	-1	-2	-3	-4
225	-2	-3	-4	-5
240	-2	-4	-5	-7
255	-2	-4	-5	-7
270	-2	-4	-5	-7
285	-2	-4	-5	-7
300	-2	-3	-4	-6
315	-1	-2	-3	-4
330	-1	-2	-2	-3
345	0	-1	-1	-1
360	0	0	0	0

Table D-29. Launch Azimuth Correction Angles

5 ROCKET MOTORS WITH SUSTAINER MOTOR

36- THROUGH 50-DEGREE LAUNCH ANGLE (QE)

RELATIVE WIND ANGLE (deg)	WIND VELOCITY (knots)			
	10	20	30	40
	WIND CORRECTION ANGLE (deg)			
15	0	+1	+2	+2
30	-1	+2	+3	+4
45	-2	+3	+4	+5
60	-2	+4	+5	+7
75	+3	+5	+7	+9
90	+3	+5	+7	+9
105	+3	+5	+7	+9
120	+2	+4	+5	+7
135	+2	+3	+4	+5
150	+1	+2	+3	+4
165	0	+1	+2	+2
180	0	0	0	0
195	0	-1	-2	-2
210	-1	-2	-3	-4
225	-2	-3	-4	-5
240	-2	-4	-5	-7
255	-3	-5	-7	-9
270	-3	-5	-7	-9
285	-3	-5	-7	-9
300	-2	-4	-5	-7
315	-2	-3	-4	-5
330	-1	-2	-3	-4
345	0	-1	-2	-2
360	0	0	0	0

APPENDIX E

FIRING TABLES FOR MK 66 ROCKET MOTORS

E-1. Scope. This appendix contains firing tables necessary for launching the target when using the MK 66 rocket motors.

a. Launch Quadrant Elevation (QE) Angle Correction. Tables E-1 through E-5 contain the conditions obtained by firing at the elevation angles of column 1. Average velocity is computed between burnout of the rocket motors to burnout of the sustainer motor. If there are no sustainers the average velocity is computed between burnout of the rocket motors and apogee. The lowest elevation angle in each table is established at a 16-second time-of-flight, which corresponds to sustainer burnout. Tables E-6 through E-21 contain corrections for temperature, altitude, and wind speed and direction which must be used in conjunction with tables E-1 through E-5. The corrections, when applied, will give the same impact range as the original choice. In some cases, the notation "CORRECTION IS NOT POSSIBLE" occurs. This means that increasing the launch elevation will not correct for the loss-of range due to headwind.

b. Launch Azimuth Correction. Tables E-22 through E-31 contain data for correcting the launch azimuth to provide impact on the intended line of fire. Tables E-23 and E-24 have been added to better define the corrections for the two motors with sustainer case. There is a slight bias in all of the tables due to rotation of the vehicle.

c. Figure E-1 shows sample plots of velocity and rocket roll rate versus time for all motor combinations at a 45 degree QE.

E-2. Launch QE Angle Correction (See sample problem).

a. Determine Slide Elevation. Using tables E-1 through E-5, note the slide elevation (QE) required by determining the nominal range, altitude, time of flight, and average velocity needed.

b. Temperature Correction Angle. Using chart 1 in tables E-6 through E-21, determine the number of degrees of elevation which must be added to, or subtracted from the initial slide elevation as determined in paragraph a above. Record in step 2 on work sheet. **NOTE**

Add or subtract step 1 to or from step 2 and record in step 3 on work sheet.

c. Altitude Correction. Using chart 2 in tables E-6 through E-21, determine the number of degrees of elevation which must be subtracted from the total number of degrees as determined in paragraphs *b* and *c* above. Record in step 4 on work sheet.

NOTE

Select table using QE from previous step. See sample problem.

Algebraically add step 1 and step 3 on work sheet.

d. Wind Correction Angle. If wind is present in the launch or flight area, a wind correction must be calculated. Determine the direction from which the wind is blowing. (Record in step *6.a.* on work sheet.) Record launch azimuth in step *6.b.* on work sheet. Subtract the launch azimuth from the wind azimuth and record in step *6.c.* on work sheet. If the launch azimuth is greater than the wind azimuth, add 360 degrees to the wind azimuth. The resulting number is the clockwise angle from the launch azimuth h the wind azimuth (relative wind angle). Using the wind meter, determine the wind speed. With the relative wind angle and speed, go to chart 3 on tables E-6 through E-21 and calculate the wind correction angle. Record in step *6.d.* on work sheet.

NOTE

Add or subtract the wind correction angle to or from step 5 and record in step 7.

E-3. Launch Azimuth Angle Correction. If wind is present in the launch or flight area, a wind correction must be calculated, Take the relative wind angle from step *6.c.* on the work sheet and record in step *8.a.* of the work sheet. Using the wind velocity and relative wind angle, determine the wind correction from tables E-22 through E-31. Record the wind correction angle in step *8.c.* Record launcher azimuth position in step *8.b.* Add or subtract *8.c.* to or from *8.b.* and record in step *8.d.* for the corrected azimuth indicator reading.

E-4. Azimuth Spin Correction. Azimuth spin correction is negligible and is not considered in this appendix.

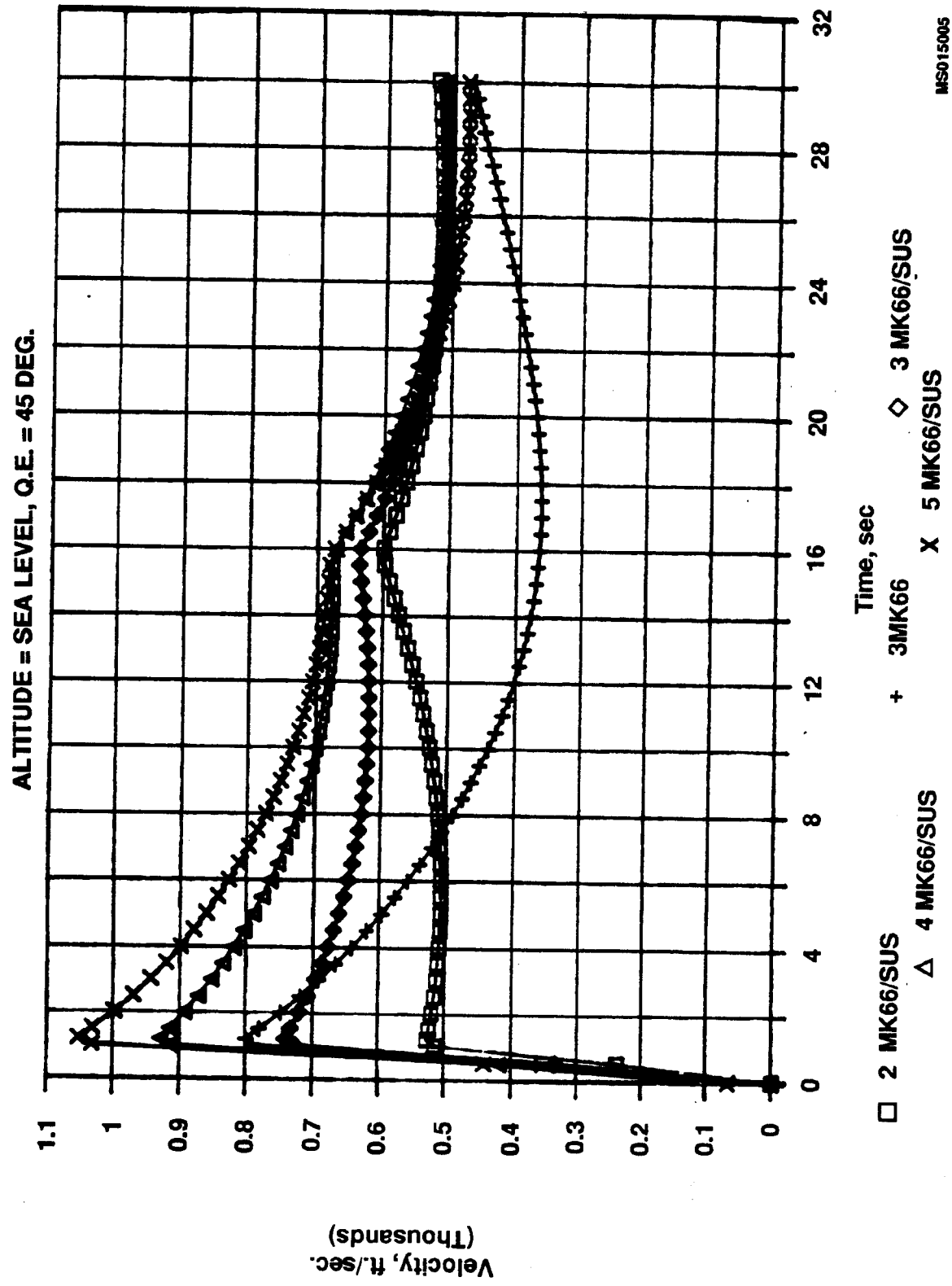

Figure E-1. BATS rocket with MK 66 motors (sheet 1 of 5).

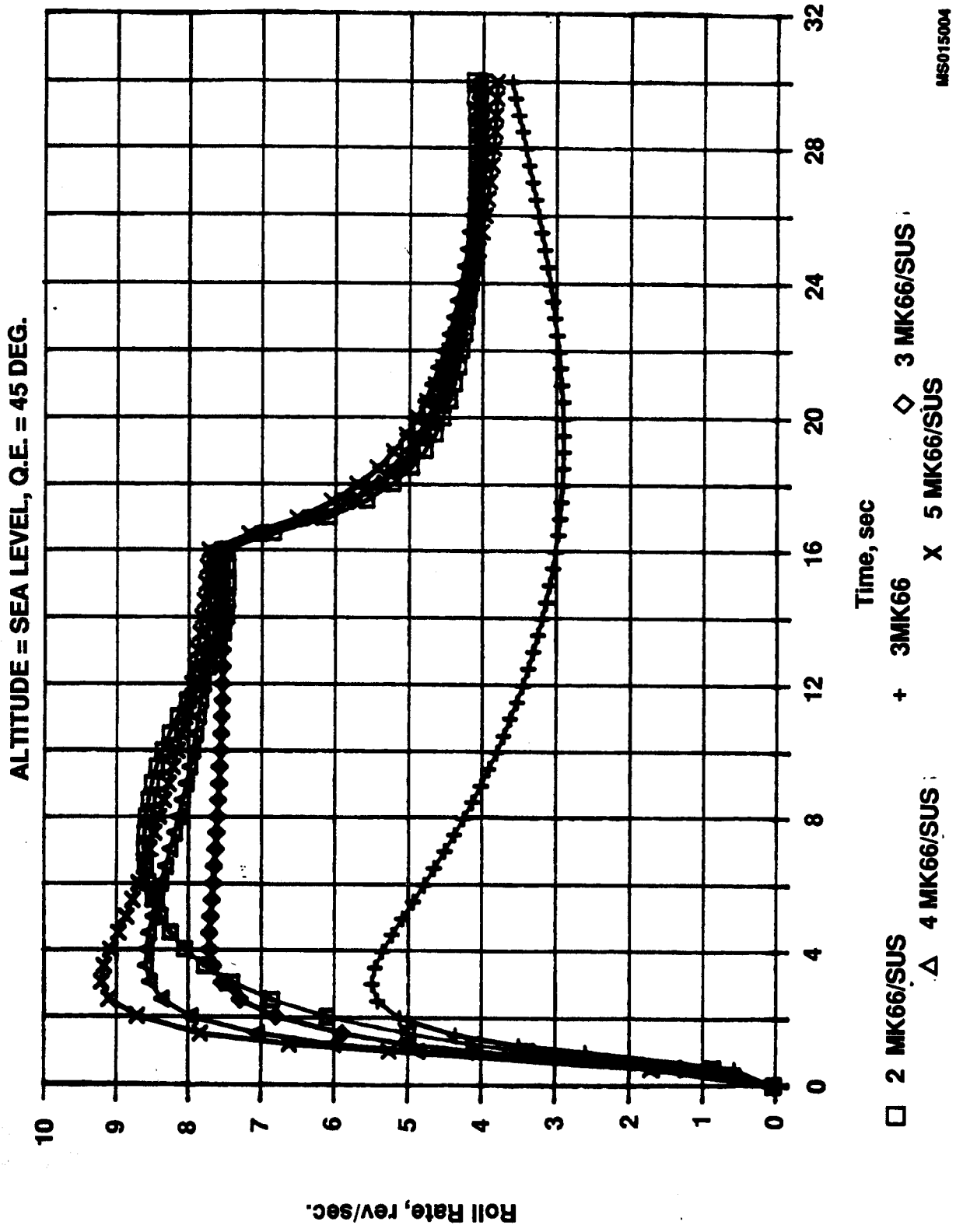

Figure E-1. BATS rocket with MK66 motors (sheet 2 of 5).

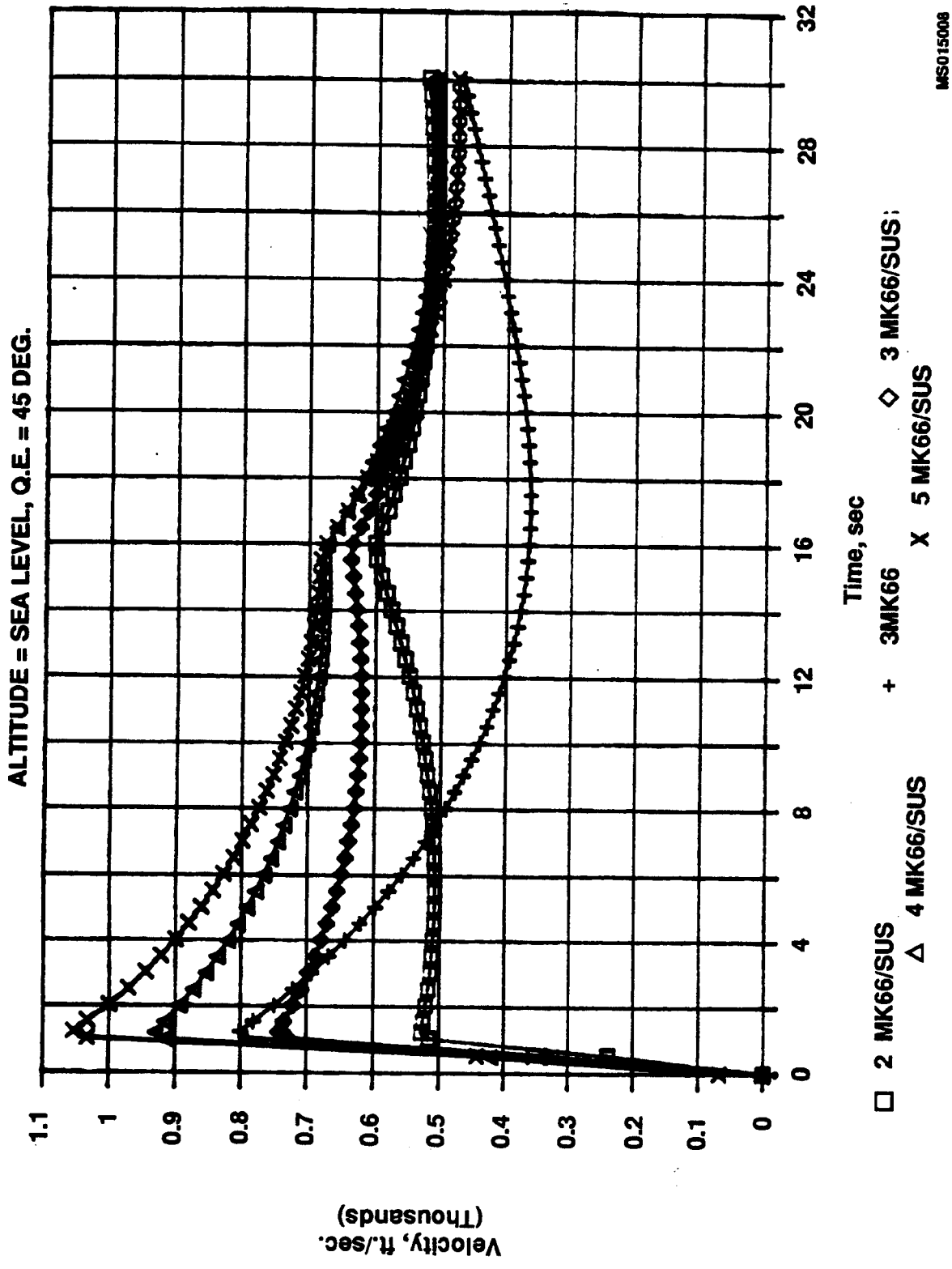

Figure E-1. BATS rocket with MK66 motors (sheet 3 of 5).

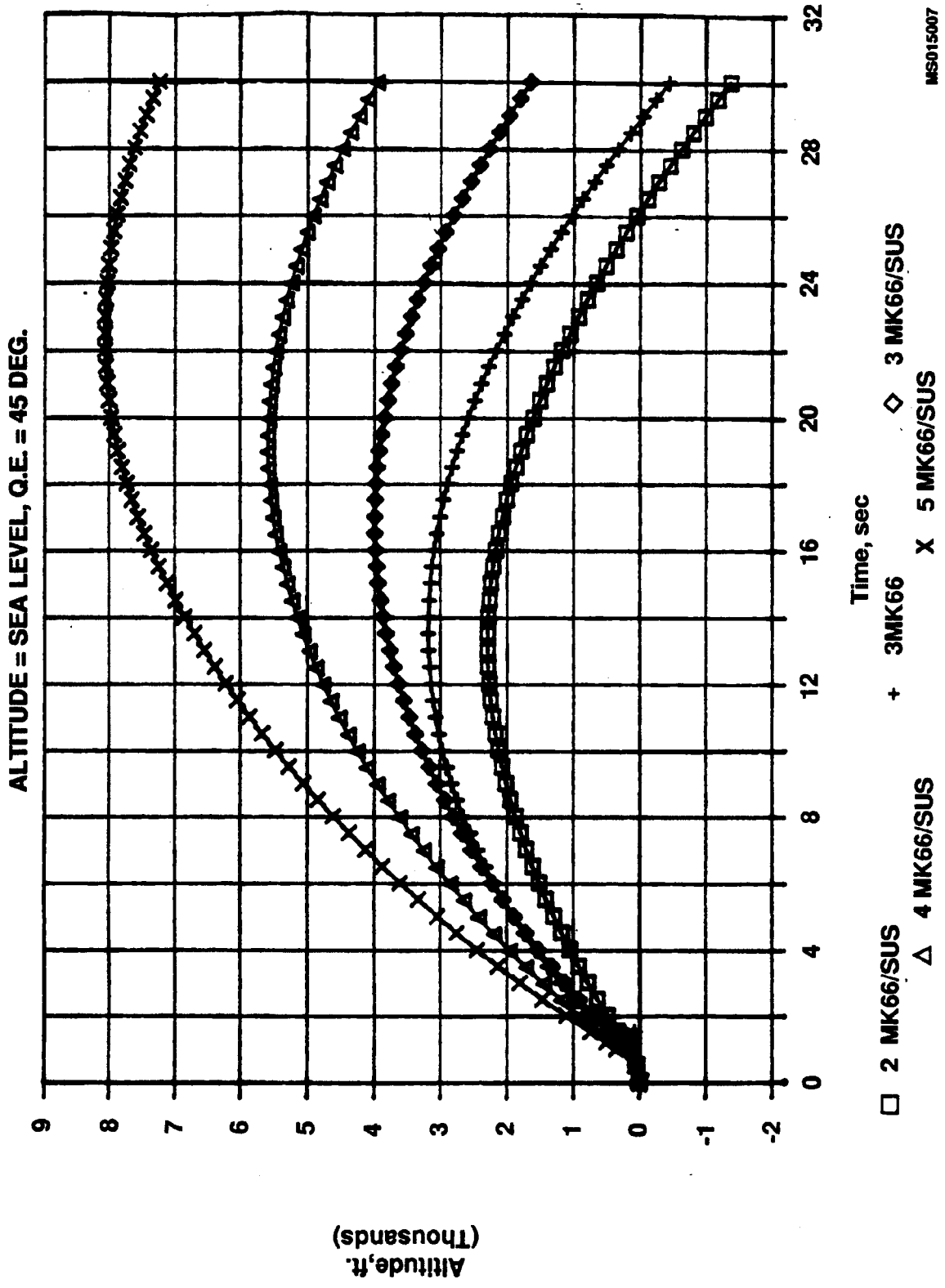

Figure E-1. BATS rocket with MK66 motors (sheet 4 of 5).

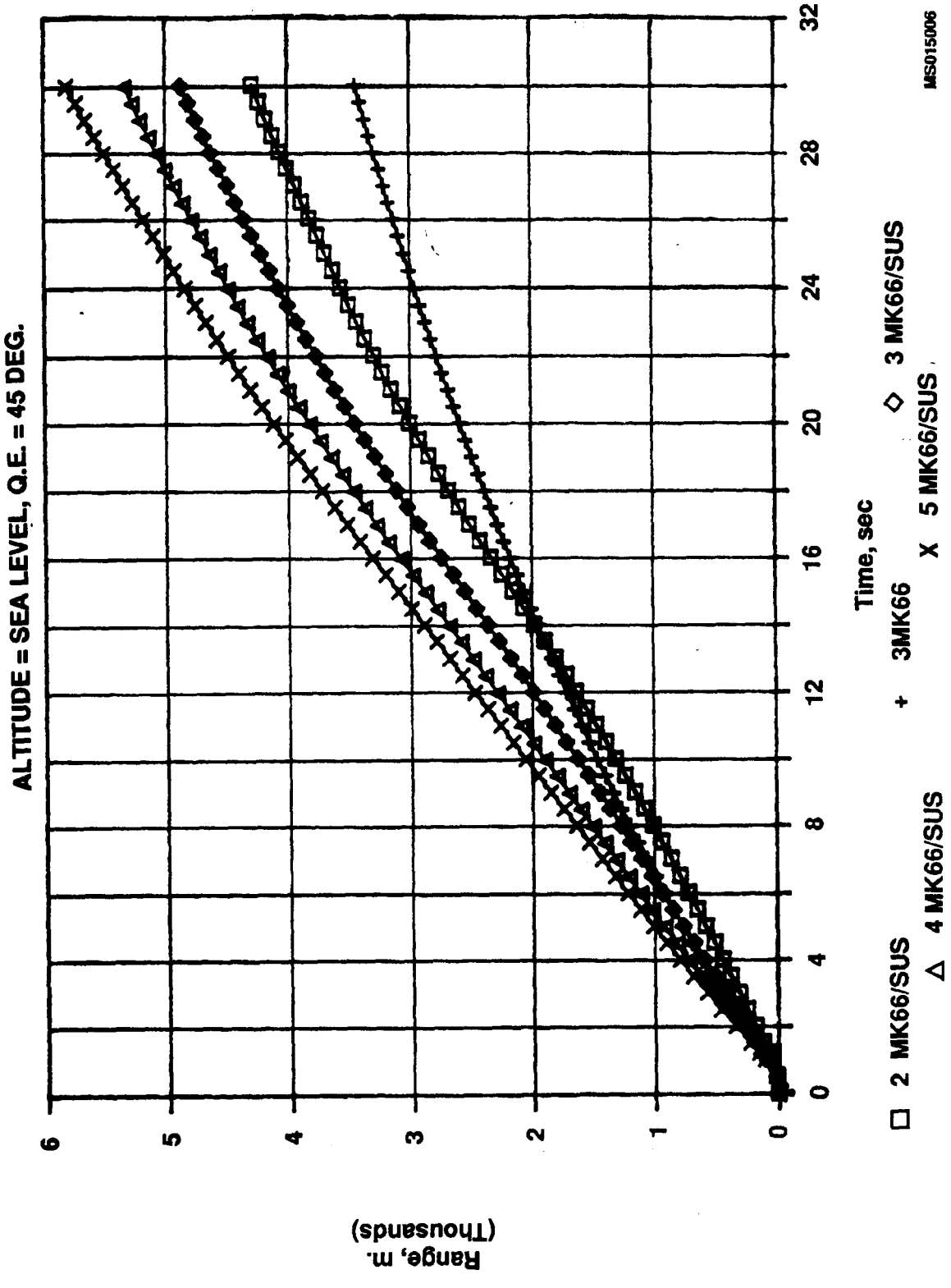

Figure E-1. BATS rocket with MK66 motors (sheet 5 of 5).

SAMPLE WORK SHEET

1. Launch Angle (Q. E.) - (Tables E-1 thru E-5) _____

2. Temperature Correction _____

3. Launch angle corrected for temperature (algebraically add steps 1 and 2) _____

4. Altitude Correction - (Use table for Q.E. spread encompassing launch angle obtained in step 3). Always negative for altitude above sea level. _____

5. Launch angle corrected for altitude and temperature (algebraically add steps 4 and 3) _____

6. Wind correction

   a. Direction from which wind is blowing _____

   b. Launch azimuth _____

   c. Relative wind angle
   Subtract b from a (add 360 degrees) to a if necessary) _____

   d. Wind correction angle (use table for Q.E. using spread encompassing launch angle obtained in step 5. _____

7. Launch angle corrected for wind, temperature, and altitude. (algebraically add step 5 and 6d) _____

8. Azimuth Correction

   a. Relative wind angle (6c above) _____

   b. Launcher azimuth scale at orientation * _____

   c. Wind correction angle (use table for Q.E. range encompassing launch angle obtained in step 7, and relative wind angle step 8a) _____

   d. Corrected azimuth indicator reading * (algebraically add step 8b and 8c) _____

*Note: Increase of azimuth indicator aims left (+ Azimuth correction).

Figure E-2. Launch (QE) angle and launch azimuth angle correction.

COUNTDOWN PROCEDURE AND CHECKLIST

Prior to Final Arming

Check:

Nose Cone Replaced _____
Fins correctly installed _____
Sustainer Nozzles Hand Tight _____
Telescoping Support Arm Locking Screws Tightened _____
No debris in the area (particularly at rear or launcher or around Fire Control Slave Unit _____
Azimuth Indicator is correct _____
Rocket Motor Fin Clamps Installed _____
Rocket Motor Terminal Clips Installed _____
Rocket Motor Alligator Clips Installed _____
Flare installed _____
Area is Clear of all Personnel _____

Final Arming

SAFE TO ARM Lamp on Slave Unit Illuminated _____
Rocket Motor Shorting Clips Removed and Bend Clear of Contacts _____
All wires are inside cutter bar _____
Terminal Blocks have proper number of White and Black wires installed _____
Static Ground Wire Removed _____
Red Shorting Wire Removed _____
ARMED/SAFE Switch to ARMED Position _____

Launch Procedure

Inform Range Control Officer that BATS Launch Area is clear of personnel and targets are ready for launch _____
(At T -1 Minute) Rocket Firing Box POWER Switch (Key) ON. _____
(At T -10 Seconds) Desired Launcher SAFE/ARM Switch to ARM _____
(AT FIRE COMMAND) FIRE COMMAND Switch Activated _____

Figure E-3. Sample countdown procedure and checklist.

SAMPLE PROBLEM

Problem: Fire a BATS Rocket to a desired range of 5000 meters using the least required number of MK 66 motors. Known and measured conditions: Temperature 90 degrees F, launch altitude 4000 ft., launch azimuth 95 degrees from true north, and wind is 10 knots blowing from 165 degrees from true north.

STEP 1. Use table E-3 where nearest QE to obtain 5000m range is 38 deg, with only 3 MK 66 motors with sustainers.

STEP 2. Use chart 2 table E-12 for -2 deg correction at QE = 38 deg and T = 90 deg F.

Step 3. Algebraically add Step 1 and Step 2. [38 + (-2)] = 36 degrees.

Step 4. Use chart 2 table E-12 for -3 deg correction at CE = 36 degrees (from step 3) and 4000 ft altitude.

Step 5. Algebraically add step 3 and step 4. [36 + (-3)] = 33 to get 33 degrees

STEP 6.

a. 165 deg

b. 95 deg

c. 30 deg relative wind angle

d. Use table E-11, chart 3, since QE from step 5 is 33 degrees, For a 10 knot wind at 70 degrees use 0.0 degrees correction since 70 degrees is closest to 75 relative wind angle.

STEP 7. Total QE angle corrected for wind is step 5 algebraically summed to step *6.c.* (33 + 0.0), and is 33 degrees.

STEP 8.

a. 70 deg from step *6.c.* above.

b. Value from launcher setting at orientation - normally in mid range at 15 deg.

c. Use table E-24. Since 70 degrees is between 60 and 75 where both are -1 degree. The correction angle is one full degree.

d. Algebraically add Step *8.b.* and *8.c.* (move pointer 1 degree higher)

SAMPLE WORK SHEET - For Sample Problem

1. Launch Angle (Q. E.) - (Tables E-1 thru E-5) _____

2. Temperature Correction _____

3. Launch angle corrected for temperature (algebraically add steps 1 and 2) _____

4. Altitude Correction - (Use table for Q.E. spread encompassing launch angle obtained in step 3), Always negative for altitude above sea level. _____

5. Launch angle corrected for altitude and temperature (algebraically add steps 4 and 3) _____

6. Wind correction

   a. Direction from which wind is blowing _____

   b. Launch azimuth _____

   c. Relative wind angle Subtract b from a (add 360 degrees) to a if necessary) _____

   d. Wind correction angle (use table for Q.E. using spread encompassing launch angle obtained in step 5. _____

7. Launch angle corrected for wind, temperature, and altitude. (algebraically add step 5 and 6d) _____

8. Azimuth Correction

   a. Relative wind angle (6c above) _____

   b. Launcher azimuth scale at orientation * _____

   c. Wind correction angle (use table for Q.E. range encompassing launch angle obtained in step 7, and relative wind angle step 8a) _____

   d. Corrected azimuth indicator reading * (algebraically add step 8b and 8c) _____

*Note: Increase of azimuth indicator aims left (+ Azimuth correction).

Figure E-4. Launch (QE) angle and launch azimuth angle correction.

Table E-1. QE Selection Table
2 MK66 Rocket Motors With Sustainer Motor

QE*		Range		Altitude		Time	Vavg
(deg)	(mils)	(ft)	(m)	(ft)	(m)	(see)	(kts)
31	551	8,825	2,690	946	288	16.3	336.8
32	569	9,155	2,790	1,022	311	16.9	335.6
33	587	9,479	2,889	1,101	336	17,6	334.4
34	604	9,796	2,986	1,184	361	18.3	333.2
35	622	10,106	3,080	1,271	388	18.9	332.0
36	640	10,409	3,173	1,362	415	19.6	330.6
37	658	10,703	3,262	1,456	444	20,3	329.3
38	676	10,987	3,349	1,553	473	21.0	327.9
39	693	11,261	3,432	1,654	504	21.7	326.6
40	711	11,524	3,513	1,758	536	22.4	325.2
41	729	11,776	3,589	1,864	568	23.2	323.0
42	747	12.014	3.662	1.873	601	23.9	320.7
43	764	12.239	3,730	2.085	635	24.6	318.5
44	782	12.449	3.794	2,199	670	25.3	316.2
45	800	12,644	3,854	2,314	705	26.1	314.0
46	818	12,822	3,908	2,431	741	26.8	310.5
47	835	12,983	3,957	2,549	777	27.5	307.0
48	853	13,126	4,001	2,668	813	28.2	303.5
49	871	13,249	4,038	2,788	850	28.9	300.0
50	889	13,352	4,070	2,907	886	29.6	296.5

The maximum angle of elevation obtainable, using the elevation actuator is 45 degrees. For a larger QE, it is necessary to place the launcher on an incline.

Table E-2. QE Selection Table
3 MK66 Rocket Motors With No Sustainer Motor

QE*		Range		Altitude		Time	Vavg
(deg)	(mils)	(ft)	(m)	(ft)	(m)	(sec)	(kts)
23	409	9,115	2,778	1,053	321	16.9	350.6
24	427	9,334	2,845	1,143	348	17.6	349.4
25	444	9,538	2,907	1,235	376	18.3	348.2
26	462	9.728	2,965	1,329	405	18.9	347.0
27	480	9,904	3,019	1,425	434	19.6	345.8
28	498	10,066	3,068	1,523	464	20.2	344.6
29	516	10,216	3,114	1,623	495	20.8	343.3
30	533	10,353	3,156	1,725	526	21.4	342.2
31	551	10,478	3,194	1,828	557	22.1	339.1
32	569	10,591	3,228	1,932	589	22.7	335.9
33	587	10,692	3,259	2,038	621	23.3	332.8
34	604	10,782	3,286	2,145	654	23.8	329,7
35	622	10,860	3,310	2,253	687	24.4	326.5
36	640	10,927	3,330	2,362	720	25.0	323.4
37	658	10,983	3,348	2,471	753	25.5	320.3
38	676	11,029	3,362	2,581	787	26.1	317.2
39	693	11,064	3,372	2,692	821	26.6	314.0
40	711	11,088	3,380	2,803	855	27.2	310.9
41	729	11,102	3.384	2,915	888	27.7	307.9
42	747	11,106	3,385	3,027	923	28.2	304.9

Table E-2. QE Selection Table
3 MK66 Rocket Motors With No Sustainer Motor - Continued

QE*		Range		Altitude		Time	Vavg
(deg)	(mils)	(f-t)	(m)	(ft)	(m)	(see)	(kts)
43	764	11,100	3,383	3,139	957	28.7	302.0
44	782	11,083	3,378	3,251	991	29.2	299.0
45	800	11,057	3,370	3,363	1,025	29.7	296.0
46	818	11,020	3,359	3,474	1,059	30.2	293.5
47	836	10,973	3,345	3,586	1,093	30.6	290.9
48	853	10.916	3,327	3,697	1,127	31.3	288.4
49	871	10,848	3,307	3,807	1,160	31.6	285.8
50	889	10,770	3,283	3,917	1,194	32.0	283.3

The maximum angle of elevation obtainable, using the elevation actuator is 45 degrees. For a larger QE, it is necessary to place the launcher on an incline.

Table E-3. Reselection Table
3 MK66 Rocket Motors With Sustainer Motor

QE*		Range		Altitude		Time	Vavg
(deg)	(mils)	(ft)	(m)	(ft)	(m)	(sec)	(kts)
23	409	10,820	3,298	836	285	16.0	414.9
24	427	11,315	3,449	1.032	314	16.8	413.2
25	444	11,797	3,596	1,131	345	17.6	411.6
26	462	12,265	3,738	1,236	377	18.5	410.0
27	480	12,718	3,876	1,345	410	19.3	408.3
28	498	13,155	4,009	1,459	445	20.2	406.7
29	516	13,575	4,138	1,577	481	21.0	405.0
30	533	13,977	4,260	1,700	518	21.9	403.4
31	551	14,362	4,377	1,828	557	22.7	401.7
32	569	14,727	4,489	1,960	597	23.6	400.1
33	587	15,074	4,595	2,096	639	24.5	398.4
34	604	15,401	4,694	2,237	682	25.3	396.8
35	622	15,709	4,788	2,382	726	26.2	395.2
36	640	15,996	4,876	2,531	771	27.0	393.5
37	658	16,264	4,957	2,684	818	27.9	391.9
38	676	16,511	5,033	2,840	866	28.7	390.2
39	693	16,738	5,102	3,000	914	29.6	388.6
40	711	16,946	5,165	3,162	964	30.4	386.9
41	729	17,135	5,223	3,327	1.014	31.3	385.3
42	747	17,304	5,274	3,494	1,065	32.1	383.6
43	764	17,455	5,320	3,663	1,117	32.9	382.0
44	782	17,588	5,361	3,834	1,169	33.7	380.4
45	800	17,703	5,396	4,005	1,221	34.5	378.7
46	818	17,801	5,426	4,178	1,273	35.3	377.1
47	835	17,884	5,451	4,350	1,326	36.1	375.4
48	853	17,952	5,472	4,521	1,378	36.9	373.8
49	871	18,006	5,488	4,692	1,430	37.6	372.1
50	889	18,047	5,501	4,861	1,482	38.3	370.5

The maximum angle of elevation obtainable, using the elevation actuator is 45 degrees. For a larger QE it is necessary to place the launcher on an incline.

Table E-4. QE Selection Table
4 MK66 Rocket Motors With Sustainer Motor

QE*		Range		Altitude		Time	Vavg
(deg)	(mils)	(ft)	(m)	(ft)	(m)	(sec)	(kts)
19	338	12,586	3,836	957	292	16.1	483.8
20	355	13,213	4,027	1,074	327	17.1	481.6
21	373	13,815	4,211	1,196	364	18.1	479.4
22	391	14,393	4,387	1,324	403	19.0	477.3
23	409	14,946	4,556	1,457	444	20.0	475.1
24	427	15,475	4,717	1,596	486	21.0	473.0
25	444	15,980	4,871	1,740	530	22.0	470.8
26	462	16,461	5,017	1,889	576	23.0	468.7
27	480	16,918	5,157	2,044	623	24.0	466.5
28	498	17.351	5,288	2,204	672	25.0	464.4
29	516	17.759	5,413	2,369	722	25.9	462.2
30	533	18,144	5,530	2,540	774	26.9	460.1
31	551	18,505	5,640	2,715	827	27.9	458.6
32	569	18.843	5,743	2,894	882	28.8	457.1
33	587	19,158	5,839	3,079	938	29.7	455.6
34	604	19.450	5,928	3,268	996	30.7	454.1
35	622	19.719	6,010	3,462	1,055	31.6	452.5
36	640	19.965	6,085	3,660	1,115	32.5	451.0
37	658	20,190	6,154	3,862	1,177	33.4	449.5
38	676	20,393	6,216	4,068	1,240	34.3	448.0
39	693	20,574	6,271	4,278	1,304	35.2	446.5
40	711	20,735	6,320	4,491	1,369	36.0	445.0
41	729	20,875	6,363	4,708	1,435	36.9	443.6
42	747	20,995	6,399	4,928	1,502	37.7	442.4
43	764	21,096	6,430	5,152	1,570	38.6	440.8
44	782	21,177	6,455	5,378	1,639	39.4	439.4
45	800	21,241	6,474	5,607	1,709	40.2	438.0
46	818	21,286	6,488	5,838	1,779	41.0	436.6
47	835	21,314	6,497	6,071	1,851	41.8	435.2
48	853	21,326	6,500	6,307	1,922	42.7	433.8
49	871	21,321	6,499	6,544	1,995	43.5	432.4
50	889	21,301	6,493	6,783	2,067	44.3	431.0

*The maximum angle of elevation obtainable, using the elevation actuator is 45 degrees. For a larger QE, it is necessary to place the launcher on an incline.

Table E-5. QE Selection Table
5 MK66 Rocket Motors With Sustainer Motor

QE*		Range		Altitude		Time	Vavg
(deg)	(mils)	(ft)	(m)	(ft)	(m)	(sec)	(kts)
17	302	14,300	4,359	1,056	322	16.9	526.8
18	320	15,019	4,578	1,193	363	17.9	525.2
19	338	15,703	4,786	1,335	407	19.0	523.5
20	355	16,354	4,985	1,484	452	20.1	521.9
21	373	16,972	5,173	1,639	500	21.2	52.03
22	391	17,558	5,352	1,801	549	22.2	518.6
23	409	18,112	5,521	1,969	600	23.3	517.0
24	427	18,627	5,680	2,143	653	24.3	515.4
25	444	19,132	5,831	2,323	708	25.4	513.8
26	462	19,598	5,973	2,509	765	26.4	512.0
27	480	20,036	6,107	2,701	823	27.5	510.5
28	498	20,448	6,232	2,898	883	28.5	508.9
29	516	20,833	6,350	3,102	945	29.5	507.3
30	533	21,192	6,459	3,310	1,009	30.5	505.6
31	551	21,526	6,561	3,524	1,074	31.5	504.0
32	569	21,835	6,655	3,743	1,141	32.5	502.4
33	587	22,120	6,742	3,967	1,209	33.5	500.8
34	604	22,382	6,822	4,196	1,279	34.5	499.1
35	622	22,621	6,895	4,429	1,350	35.5	497.5
36	640	22,837	6,961	4,667	1,423	36.4	495.9
37	658	23,032	7,020	4,909	1,496	37.3	494.3
38	676	23,204	7,073	5,155	1,571	38.3	492.6
39	693	23,355	7,119	5,404	1,647	39.2	491,0
40	711	23,486	7,158	5,657	1,724	40.1	489.4
41	729	23,595	7,192	5,913	1,802	41.0	487.9
42	747	23,684	7,219	6,172	1,881	41.8	486.4
43	764	23,753	7,240	6,433	1,961	42.7	484.8
44	782	23,802	7,255	6,697	2,041	43.6	484.3
45	800	23,831	7,264	6,963	2,122	44.4	481.8
46	818	23,841	7,267	7,230	2,204	45.2	481.0
47	835	23,830	7,263	7,499	2,286	46.1	480.1
48	853	23,801	7,254	7,769	2,368	46.9	479.3
49	871	23,752	7,239	8,040	2,451	47.7	478.4
50	889	23,683	7,219	8,311	2,533	48.5	477.6

*The maximum angle of elevation obtainable, using the elevation actuator is 45 degrees. For a larger QE, it is necessary to place the launcher on an incline.

Table E-6, Launch Angle Correction Table
2 MK66 Rocket Motors With Sustainer Motor
30- through 35-Degree Launch Angle (QE)

CHART 1. TEMPERATURE

	ATMOSPHERIC TEMPERATURES (Deg F)														
	-20	*-10*	*0*	*10*	*20*	*30*	*40*	*50*	*60*	*70*	*80*	*90*	*100*	*110*	*120*
CORRECTION ANGLE (Deg)	1	1	1	1	1	0	0	0	0	0	0	0	-1	-1	-1

CHART 2. ALTITUDE

	ALTITUDE ABOVE SEA LEVEL (Feet)				
	1000	*2000*	*3000*	*4000*	*5000*
CORRECTION ANGLE (Deg)	0	0	-1	-1	-1

CHART 3. WIND

		RELATIVE WIND ANGLE (Degrees)												
	Wind Velocity (Knots)	*0 360*	*15 345*	*30 330*	*45 315*	*60 300*	*75 285*	*90 270*	*105 255*	*120 240*	*135 225*	*150 210*	*165 195*	*180*
CORRECTION ANGLE (Deg)	10	2	2	1	1	1	0	0	0	-1	-1	-1	-2	-2
	20	3	3	3	2	2	1	0	-1	-1	-2	-2	-3	-3
	30	5	5	5	4	3	1	0	-1	-2	-3	-3	-4	-4

NOTE: FLIGHT RESTRICTED TO SURFACE WINDS EQUAL TO OR LESS THAN 30 KNOTS. DO NOT FIRE AT Q.E. GREATER THAN 50 DEGREES

Table E-7. Launch Angle Correction Table
2 MK66 Rocket Motors With Sustainer Motor
36- Through 42-Degree Launch Angle (QE)

CHART 1. TEMPERATURE

	ATMOSPHERIC TEMPERATURES (Deg F)														
	-20	*-10*	*0*	*10*	*20*	*30*	*40*	*50*	*60*	*70*	*80*	*90*	*100*	*110*	*120*
CORRECTION ANGLE (Deg)	2	2	2	1	1	1	1	0	0	0	0	-1	-1	-1	-2

CHART 2. ALTITUDE

	ALTITUDE ABOVE SEA LEVEL (Feet)				
	1000	*2000*	*3000*	*4000*	*5000*
CORRECTION ANGLE (Deg)	0	-1	-1	-1	-2

CHART 3. WIND

		RELATIVE WIND ANGLE (Degrees)												
	Wind Velocity (Knots)	*0 360*	*15 345*	*30 330*	*45 315*	*60 300*	*75 285*	*90 270*	*105 255*	*120 240*	*135 225*	*150 210*	*165 195*	*180*
CORRECTION ANGLE (Deg)	10	2	2	2	2	1	1	0	-1	-1	-1	-2	-2	-2
	20	5	5	4	4	2	1	0	-1	-2	-3	-3	-4	-4
	30	8	8	7	6	4	2	0	-1	-2	-3	-4	-5	-5

NOTE: FLIGHT RESTRICTED TO SURFACE WINDS EQUAL TO OR LESS THAN 30 KNOTS. DO NOT FIRE AT Q.E. GREATER THAN 50 DEGREES

Table E-8. Launch Angle Correction Table
2 MK66 Rocket Motors With Sustainer Motor
43- Through 50-Degree Launch Angle (QE)

CHART 1. TEMPERATURE

	ATMOSPHERIC TEMPERATURES (Deg F)														
	-20	*-10*	*0*	*10*	*20*	*30*	*40*	*50*	*60*	*70*	*80*	*90*	*100*	*110*	*120*
CORRECTION ANGLE (Deg)	5	4	4	3	2	1	1	0	0	-1	-1	-2	-2	-3	-4

CHART 2. ALTITUDE

	ALTITUDE ABOVE SEA LEVEL (Feet)				
	1000	*2000*	*3000*	*4000*	*5000*
CORRECTION ANGLE (Deg)	-1	-1	-3	-3	-3

CHART 3. WIND

		RELATIVE WIND ANGLE (Degrees)												
	Wind Velocity (Knots)	*0 360*	*15 345*	*30 330*	*45 315*	*60 300*	*75 285*	*90 270*	*105 255*	*120 240*	*135 225*	*150 210*	*165 195*	*180*
CORRECTION ANGLE (Deg)	10	4	4	3	3	2	1	0	-1	-1	-2	-3	-3	-3
	20	7	7	7	6	4	2	0	-1	-3	-4	-5	-5	-5
	30	7	7	7	7	7	4	0	-1	-3	-5	-6	-7	-7

NOTE: FLIGHT RESTRICTED TO SURFACE WINDS EQUAL TO OR LESS THAN 30 KNOTS. DO NOT FIRE AT Q.E. GREATER THAN 50 DEGREES

Table E-9. Launch Angle Correction Table
3 MK66 Rocket Motors With No Sustainer Motor

CHART 1. TEMPERATURE

	ATMOSPHERIC TEMPERATURES (Deg F)														
	-20	*-10*	*0*	*10*	*20*	*30*	*40*	*50*	*60*	*70*	*80*	*90*	*100*	*110*	*120*
CORRECTION ANGLE (Deg)															
QE 24-30 Deg	5	4	4	3	2	2	1	1	0	0	-1	-1	-1	-1	-2
QE 31-40 Deg	CORRECTION IS								0	-1	-2	-3	-3	-4	-5
QE 41-50 Deg	NOT POSSIBLE								0	-1	-2	-4	-5	-6	-7

CHART 2. ALTITUDE

	ALTITUDE ABOVE SEA LEVEL (Feet)				
	1000	*2000*	*3000*	*4000*	*5000*
CORRECTION ANGLE (Deg)					
QE 24-30 Deg	0	-1	-1	-2	-2
QE 31-40 Deg	-1	-2	-3	-4	-6
QE 41-50 Deg	-2	-5	-7	-10	-12

CHART 3. WIND

		RELATIVE WIND ANGLE (Degrees)												
		0 360	15 345	30 330	45 315	60 300	75 285	90 270	105 255	120 240	135 225	150 210	165 195	180
		QE = 24 THROUGH 30 DEGREES CORRECTION ANGLE IN DEGREES												
WIND VELOCITY (knots)	10	2	2	2	1	1	0	0	0	0	-1	-1	-1	-1
	20	4	4	3	3	2	1	0	0	-1	-2	-2	-2	-2
	30	6	6	5	4	3	2	0	0	-2	-2	-3	-3	-3
	40	8	8	7	6	4	2	0	-1	-2	-3	-4	-4	-4
		QE = 31 THROUGH 40 DEGREES CORRECTION ANGLE IN DEGREES												
WIND VELOCITY (Knots)	10	10	10	9	7	5	3	0	-1	-1	-1	-2	-2	-2
	20	CORRECTION				10	5	0	-1	-2	-3	-3	-4	-4
	30	IS NOT					8	0	-2	-3	-4	-5	-6	-6
	40	POSSIBLE						0	-2	-4	-6	-7	-8	-8
		QE = 31 THROUGH 40 DEGREES CORRECTION ANGLE IN DEGREES												
WIND VELOCITY (Knots)	10	CORRECTION						0	-1	-2	-3	-3	-4	-4
	20	IS						0	-2	-4	-5	-7	-7	-8
	30	NOT						0	-3	-6	-8	-10	-10	-11
	40	POSSIBLE						0	-4	-8	-11	-13	-14	-15

Table E-10. Launch Angle Correction Table
3 MK66 Rocket Motors With Sustainer Motor
23 Through 25 Degree Launch Angle (QE)

CHART 1. TEMPERATURE

	ATMOSPHERIC TEMPERATURES (Deg F)														
	-20	*-10*	*0*	*10*	*20*	*30*	*40*	*50*	*60*	*70*	*80*	*90*	*100*	*110*	*120*
CORRECTION ANGLE (Deg)	1	1	1	1	1	0	0	0	0	0	-1	-1	-1	-1	-1

CHART 2. ALTITUDE

	ALTITUDE ABOVE SEA LEVEL (Feet)				
	1000	*2000*	*3000*	*4000*	*5000*
CORRECTION ANGLE (Deg)	0	0	0	-1	-1

CHART 3. WIND

		RELATIVE WIND ANGLE (Degrees)												
	Wind Velocity (Knots)	*0 360*	*15 345*	*30 330*	*45 315*	*60 300*	*75 285*	*90 270*	*105 255*	*120 240*	*135 225*	*150 210*	*165 195*	*180*
CORRECTION ANGLE (Deg)	10	1	1	1	1	0	0	0	0	0	-1	-1	-1	-1
	20	2	2	2	1	1	1	0	0	0	-1	-1	-2	-2
	30	3	3	3	2	1	1	0	-1	-1	-2	-2	-2	-2
	40	4	4	4	3	2	1	0	-1	-1	-2	-2	-3	-3

Table E-1 1. Launch Angle Correction Table
3 MK66 Rocket Motors With Sustainer Motor
26- Through 35-Degree Launch Angle (QE)

CHART 1. TEMPERATURE

	ATMOSPHERIC TEMPERATURES (Deg F)														
	-20	*-10*	*0*	*10*	*20*	*30*	*40*	*50*	*60*	*70*	*80*	*90*	*100*	*110*	*120*
CORRECTION ANGLE (Deg)	2	2	2	1	1	1	1	0	0	0	0	-1	-1	-2	-2

CHART 2. ALTITUDE

	ALTITUDE ABOVE SEA LEVEL (Feet)				
	1000	*2000*	*3000*	*4000*	*5000*
CORRECTION ANGLE (Deg)	0	-1	-1	-2	-2

CHART 3. WIND

		RELATIVE WIND ANGLE (Degrees)												
	Wind Velocity (Knots)	*0 360*	*15 345*	*30 330*	*45 315*	*60 300*	*75 285*	*90 270*	*105 255*	*120 240*	*135 225*	*150 210*	*165 195*	*180*
CORRECTION ANGLE (Deg)	10	2	2	2	1	1	0	0	0	-1	-1	-1	-1	-1
	20	3	3	3	3	2	1	0	0	-1	-2	-2	-2	-2
	30	5	5	5	4	2	1	0	-1	-2	-2	-3	-3	-3
	40	7	7	6	5	1	2	0	-1	-2	-3	-4	-4	-4

Table E-12. Launch Angle Correction Table
3MK66 Rocket Motors With Sustainer Motor
36- Through 42-Degree Launch Angle (QE)

CHART 1. TEMPERATURE

	ATMOSPHERIC TEMPERATURES (Deg F)														
	-20	*-10*	*0*	*10*	*20*	*30*	*40*	*50*	*60*	*70*	*80*	*90*	*100*	*110*	*120*
CORRECTION ANGLE (Deg)	5	4	4	3	3	2	1	1	0	0	-1	-2	-2	-3	-3

CHART 2. ALTITUDE

	ALTITUDE ABOVE SEA LEVEL (Feet)				
	1000	*2000*	*3000*	*4000*	*5000*
CORRECTION ANGLE (Deg)	-1	-2	-2	-3	-4

CHART 3. WIND

		RELATIVE WIND ANGLE (Degrees)												
	Wind Velocity (Knots)	*0 360*	*15 345*	*30 330*	*45 315*	*60 300*	*75 285*	*90 270*	*105 255*	*120 240*	*135 225*	*150 210*	*165 195*	*180*
CORRECTION ANGLE (Deg)	10	3	3	2	2	1	1	0	-1	-1	-1	-2	-2	-2
	20	6	6	5	4	3	2	0	-1	-2	-3	-3	-4	-4
	30	CORRECTION			6	5	2	0	-2	-3	-5	-5	-6	-6
	40	IS NOT POSSIBLE				6	3	0	-2	-4	-5	-7	-7	-8

Table E-13. Launch Angle Correction Table
3 MK66 Motors With Sustainer Motor
43- Through 50-Degree Launch Angle (QE)

CHART 1. TEMPERATURE

	ATMOSPHERIC TEMPERATURES (Deg F)														
	-20	*-10*	*0*	*10*	*20*	*30*	*40*	*50*	*60*	*70*	*80*	*90*	*100*	*110*	*120*
CORRECTION ANGLE (Deg)	7	7	6	5	4	3	2	1	0	-1	-2	-3	-4	-6	-6

CHART 2. ALTITUDE

	ALTITUDE ABOVE SEA LEVEL (Feet)				
	1000	*2000*	*3000*	*4000*	*5000*
CORRECTION ANGLE (Deg)	-2	-3	-5	-6	-8

CHART 3. WIND

		RELATIVE WIND ANGLE (Degrees)												
	Wind Velocity (Knots)	*0 360*	*15 345*	*30 330*	*45 315*	*60 300*	*75 285*	*90 270*	*105 255*	*120 240*	*135 225*	*150 210*	*165 195*	*180*
CORRECTION ANGLE (Deg)*	10	7	7	6	5	4	2	0	-1	-1	-2	-2	-3	-3
	20	CORRECTION				7	4	0	-2	-3	-4	-5	-5	-6
	30	IS NOT					5	0	-2	-4	-6	-7	-8	-8
	40	POSSIBLE					7	0	-3	-6	-8	-10	-11	-11

*Do not adjust QE above 50 degrees.

Table E-14. Launch Angle Correction Table
4 MK66 Rocket Motors With Sustainer Motor
19- Through 25-Degree Launch Angle (QE)

CHART 1. TEMPERATURE

	ATMOSPHERIC TEMPERATURES Deg F)														
	-20	*-10*	*0*	*10*	*20*	*30*	*40*	*50*	*60*	*70*	*80*	*90*	*100*	*110*	*120*
CORRECTION ANGLE (Deg	1	1	1	1	1	1	0	0	0	0	0	-1	-1	-1	-1

CHART 2. ALTITUDE

	ALTITUDE ABOVE SEA LEVEL (Feet)				
	1000	*2000*	*3000*	*4000*	*5000*
CORRECTION ANGLE (Deg)	0	0	-1	-1	-1

CHART 3. WIND

		RELATIVE WIND ANGLE (Degrees)												
	Wind Velocity (Knots)	*0 360*	*15 345*	*30 330*	*45 315*	*60 300*	*75 285*	*90 270*	*105 255*	*120 240*	*135 225*	*150 210*	*165 195*	*180*
CORRECTION ANGLE (Deg)	10	1	1	1	1	0	0	0	0	0	0	-1	-1	-1
	20	2	2	2	2	1	1	0	0	-1	-1	-1	-1	-2
	30	3	3	3	2	2	1	0	-1	-1	-2	-2	-2	-2
	40	4	4	4	3	2	1	0	-1	-1	-2	-3	-3	-3

Table E-15, Launch Angle Correction Table
4 MK66 Rocket Motors With Sustainer Motor
26- Through 35-Degree Launch Angle (QE)

CHART 1. TEMPERATURE

	ATMOSPHERIC TEMPERATURES (Deg F)														
	-20	*-10*	*0*	*10*	*20*	*30*	*40*	*50*	*60*	*70*	*80*	*90*	*100*	*110*	*120*
CORRECTION ANGLE (Deg)	4	3	3	2	2	1	1	1	0	0	-1	-1	-2	-2	-2

CHART 2. ALTITUDE

	ALTITUDE ABOVE SEA LEVEL (Feet)				
	1000	*2000*	*3000*	*4000*	*5000*
CORRECTION ANGLE (Deg)	-1	-1	-2	-2	-3

CHART 3. WIND

		RELATIVE WIND ANGLE (Degrees)												
	Wind Velocity (Knots)	*0 360*	*15 345*	*30 330*	*45 315*	*60 300*	*75 285*	*90 270*	*105 255*	*120 240*	*135 225*	*150 210*	*165 195*	*180*
CORRECTION ANGLE (Deg)*	10	2	2	2	1	1	0	0	0	-1	-1	-1	-1	-1
	20	4	4	3	3	2	1	0	-1	-1	-2	-2	-3	-3
	40	10	9	8	7	5	3	0	-1	-3	-4	-4	-5	-5

*Do not adjust QE above 50 degrees.

Table E-16. Launch Angle Correction Table
4 MK66 Rocket Motors With Sustainer Motor
36- Through 42-Degree Launch Angle (QE)

CHART 1. TEMPERATURE

	ATMOSPHERIC TEMPERATURES (Deg F)														
	-20	*-10*	*0*	*10*	*20*	*30*	*40*	*50*	*60*	*70*	*80*	*90*	*100*	*110*	*120*
CORRECTION ANGLE (Deg)	9	8	7	6	5	4	3	2	0	-1	-2	-3	-4	-5	-6

CHART 2. ALTITUDE

	ALTITUDE ABOVE SEA LEVEL (Feet)				
	1000	*2000*	*3000*	*4000*	*5000*
CORRECTION ANGLE (Deg)	-1	-2	-4	-5	-6

CHART 3. WIND

		RELATIVE WIND ANGLE (Degrees)												
	Wind Velocity (Knots)	*0 360*	*15 345*	*30 330*	*45 315*	*60 300*	*75 285*	*90 270*	*105 255*	*120 240*	*135 225*	*150 210*	*165 195*	*180*
CORRECTION ANGLE (Deg)*	10	8	7	6	5	4	4	0	-1	-1	-2	-2	-2	-2
	20	CORRECTION			11	8	4	0	-1	-2	-3	-4	-4	-4
	30	IS NOT				11	6	0	-2	-3	-4	-6	-6	-7
	40	POSSIBLE				13	7	0	-2	-4	-6	-7	-8	-9

*Do not adjust QE above 50 degrees.

Table E-17, Launch Angle Correction Table
4 MK66 Rocket Motors With Sustainer Motor
43- Through 50-Degree Launch Angle (QE)

CHART 1. TEMPERATURE

	ATMOSPHERIC TEMPERATURES (Deg F)														
	-20	*-10*	*0*	*10*	*20*	*30*	*40*	*50*	*60*	*70*	*80*	*90*	*100*	*110*	*120*
CORRECTION ANGLE (Deg)	7	7	7	7	5	4	2	1	0	-1	-3	-4	-5	-7	-8

CHART 2. ALTITUDE

	ALTITUDE ABOVE SEA LEVEL (Feet)				
	1000	*2000*	*3000*	*4000*	*5000*
CORRECTION ANGLE (Deg)	-2	-4	-7	-9	-11

CHART 3. WIND

		RELATIVE WIND ANGLE (Degrees)												
	Wind Velocity (Knots)	*0 360*	*15 345*	*30 330*	*45 315*	*60 300*	*75 285*	*90 270*	*105 255*	*120 240*	*135 225*	*150 210*	*165 195*	*180*
CORRECTION ANGLE (Deg)*	10	CORRECTION						0	-1	-2	-3	-3	-4	-4
	20	IS NOT						0	-2	-3	-5	-6	-7	-7
	30	POSSIBLE						0	-3	-5	-8	-9	-10	-11
	40							0	-4	-7	-10	-12	-14	-14

*Do not adjust QE above 50 degrees.

Table E-18. Launch Angle Correction Table
5 MK66 Rocket Motors With Sustainer Motor
17- Through 25-Degree Launch Angle (QE)

CHART 1. TEMPERATURE

	ATMOSPHERIC TEMPERATURES (Deg F)														
	-20	*-10*	*0*	*10*	*20*	*30*	*40*	*50*	*60*	*70*	*80*	*90*	*100*	*110*	*120*
CORRECTION ANGLE (Deg)	2	2	1	1	1	1	1	0	0	0	0	-1	-1	-1	-1

CHART 2. ALTITUDE

	ALTITUDE ABOVE SEA LEVEL (Feet)				
	1000	*2000*	*3000*	*4000*	*5000*
CORRECTION ANGLE (Deg)	0	-1	-1	-1	-1

CHART 3. WIND

		RELATIVE WIND ANGLE (Degrees)												
	Wind Velocity (Knots)	*0 360*	*15 345*	*30 330*	*45 315*	*60 300*	*75 285*	*90 270*	*105 255*	*120 240*	*135 225*	*150 210*	*165 195*	*180*
CORRECTION ANGLE (Deg)	10	1	1	1	1	0	0	0	0	0	-1	-1	-1	-1
	20	2	2	2	1	1	0	0	0	-1	-1	-1	-2	-2
	30	3	3	2	2	1	1	0	-1	-1	-2	-2	-2	-2
	40	4	4	3	3	2	1	0	-1	-1	-2	-3	-3	-3

Table E-19. Launch Angle Correction Table
5 MK66 Rocket Motors With Sustainer Motor
26- Through 35-Degree Launch Angle (QE)

CHART 1. TEMPERATURE

	ATMOSPHERIC TEMPERATURES (Deg F)														
	-20	*-10*	*0*	*10*	*20*	*30*	*40*	*50*	*60*	*70*	*80*	*90*	*100*	*110*	*120*
CORRECTION ANGLE (Deg)	4	4	3	3	2	2	1	1	0	0	-1	-1	-2	-2	-3

CHART 2. ALTITUDE

	ALTITUDE ABOVE SEA LEVEL (Feet)				
	1000	*2000*	*3000*	*4000*	*5000*
CORRECTION ANGLE (Deg)	-1	-1	-2	-3	-3

CHART 3. WIND

		RELATIVE WIND ANGLE (Degrees)												
	Wind Velocity (Knots)	*0 360*	*15 345*	*30 330*	*45 315*	*60 300*	*75 285*	*90 270*	*105 255*	*120 240*	*135 225*	*150 210*	*165 195*	*180*
CORRECTION ANGLE (Deg)	10	4	4	3	3	2	1	0	-1	-1	-1	-1	-1	-1
	20	7	7	6	5	4	2	0	-1	-1	-2	-2	-3	-3
	30	11	11	10	8	5	3	0	-1	-2	-3	-4	-4	-4
	40	15	14	13	10	7	4	0	-2	-3	-4	-5	-6	-6

Table E-20. Launch Angle Correction Table
5 MK66 Rocket Motors With Sustainer Motor
36- Through 42-Degree Launch Angle (QE)

CHART 1. TEMPERATURE

	ATMOSPHERIC TEMPERATURES (Deg F)														
	-20	-10	0	10	20	30	40	50	60	70	80	90	100	110	120
CORRECTION ANGLE (Deg)	6	6	6	5	4	3	2	1	0	-1	-2	-3	-4	-5	-6

CHART 2. ALTITUDE

	ALTITUDE ABOVE SEA LEVEL (Feet)				
	1000	2000	3000	4000	5000
CORRECTION ANGLE (Deg)	-2	-4	-5	-7	-9

CHART 3. WIND

		RELATIVE WIND ANGLE (Degrees)												
	Wind Velocity (Knots)	0 360	15 345	30 330	45 315	60 300	75 285	90 270	105 255	120 240	135 225	150 210	165 195	180
CORRECTION ANGLE (Deg)*	10	6	6	5	4	3	2	0	-1	-1	-2	-2	-2	-2
	20	11	11	10	8	6	3	0	-1	-3	-3	-4	-5	-5
	30	CORRECTION IS				9	5	0	-2	-4	-5	-7	-7	-8
	40	NOT POSSIBLE				11	6	0	-3	-5	-7	-9	-10	-10

*Do not Fire at QE greater than 50 degrees.

Table E-21. Launch Angle Correction Table
5 MK66 Rocket Motors With Sustainer Motor
43- Through 50-Degree Launch Angle (QE)

CHART 1. TEMPERATURE

	ATMOSPHERIC TEMPERATURES (Deg F)														
	-20	*-10*	*0*	*10*	*20*	*30*	*40*	*50*	*60*	*70*	*80*	*90*	*100*	*110*	*120*
CORRECTION ANGLE (Deg)	7	7	7	7	6	5	3	2	0	-2	-3	-5	-6	-8	-9

CHART 2. ALTITUDE

	ALTITUDE ABOVE SEA LEVEL (Feet)				
	1000	*2000*	*3000*	*4000*	*5000*
CORRECTION ANGLE (Deg)	-3	-6	-9	-12	-15

CHART 3. WIND

		RELATIVE WIND ANGLE (Degrees)												
	Wind Velocity (Knots)	*0 360*	*15 345*	*30 330*	*45 315*	*60 300*	*75 285*	*90 270*	*105 255*	*120 240*	*135 225*	*150 210*	*165 195*	*180*
CORRECTION ANGLE (Deg) *	10	CORRECTION						0	-1	-2	-3	-4	-4	-4
	20	IS						0	-2	-4	-6	-7	-8	-8
	30	NOT						0	-3	-8	-12	-14	-16	-16
	40	POSSIBLE						0	-4	-8	-12	-14	-16	-16

*Do not adjust QE above 50 degrees.

Table E-22. Launch Azimuth Correction Angles
2 MK66 Rocket Motors With Sustainer Motor
30- Through 35-Degree Launch Angle (QE)

WIND DIRECTION	WIND SPEED (Knots)			
	10	20	30	40
16	0	1	1	2
30	1	2	3	4
45	1	3	4	6
60	2	3	5	7
75	2	4	6	8
90	2	4	6	8
105	2	4	6	8
120	2	3	5	7
135	1	3	4	6
150	1	2	3	4
165	0	1	1	2
180	0	0	0	0
195	-1	-1	-2	-2
210	-1	-2	-3	-5
225	-2	-3	-5	-6
240	-2	-4	-6	-8
255	-2	-4	-6	-9
270	-2	-5	-7	-9
285	-2	-4	-6	-9
300	-2	-4	-6	-8
315	-2	-3	-5	-6
330	-1	-2	-3	-5
345	-1	-1	-2	-2
360	0	0	0	0

Table E-23. Launch Azimuth Correction Angles
2 MK66 Rocket Motors With Sustainer Motor
36- Through 42-Degree Launch Angle (QE)

WIND DIRECTION	*WIND SPEED (Knots)*			
	10	20	30	40
15	0	1	1	2
30	1	2	3	4
45	1	3	5	6
60	2	4	6	8
75	2	4	6	9
90	2	4	7	9
105	2	4	6	9
120	2	4	6	8
135	1	3	5	6
150	1	2	3	4
165	0	1	1	2
180	0	0	0	0
195	-1	-2	-2	-3
210	-1	-3	-4	-5
225	-2	-4	-5	-7
240	-2	-4	-6	-8
255	-3	-5	-7	-9
270	-3	-5	-7	-10*
285	-3	-5	-7	-9
300	-2	-4	-6	-8
315	-2	-4	-5	-7
330	-1	-3	-4	-5
345	-1	-2	-2	-3
360	0	0	0	0

*Exceeds launcher azimuth liimit.

Table E-24. Launch Azimuth Correction Angles
2 MK66 Rocket Motors With Sustainer Motor
43- Through 50-Degree Launch Angle (QE)

WIND DIRECTION	WIND SPEED (Knots)			
	10	20	30	40
16	1	1	2	2
30	1	2	3	5
45	2	3	5	7
60	2	4	6	9
75	2	5	7	10*
90	2	5	7	10*
106	2	5	7	10*
120	2	4	6	9
135	1	3	5	7
150	1	2	3	5
166	0	1	2	2
180	0	0	0	0
195	-1	-1	-2	-3
210	-2	-3	-4	-6
225	-2	-4	-6	-8
240	-3	-5	-7	-10*
255	-3	-6	-8	-11*
270	-3	-6	-8	-11*
285	-3	-6	-8	-11*
300	-3	-5	-7	-10*
315	-2	-4	-6	-8
330	-2	-3	-4	-6
345	-1	-1	-2	-3
360	0	0	0	0

*Exceeds launcher azimuth limit.

Table E-25. Launch Azimuth Correction Angles
3 MK66 Rocket Motors Without Sustainer Motor
All QEs

WIND DIRECTION	*WIND SPEED (Knots)*			
	10	*20*	*30*	*40*
15	0	0	0	1
30	0	1	1	1
45	0	1	2	2
60	0	1	2	2
75	1	1	2	3
90	1	1	2	3
105	1	1	2	3
120	0	1	2	2
135	0	1	2	2
150	0	1	1	1
165	0	0	0	1
180	0	0	0	0
195	0	-1	-1	-1
210	-1	-1	-1	-2
225	-1	-1	-1	-2
240	-1	-2	-2	-3
255	-1	-2	-2	-3
270	-1	-2	-3	-3
285	-1	-2	-3	-3
300	-1	-2	-3	-3
315	-1	-1	-2	-2
330	-1	-1	-1	-2
345	0	-1	-1	-1
360	0	0	0	0

Table E-26. Launch Azimuth Correction Angles
3 MK66 Rocket Motors Without Sustainer Motor
23- Through 35-Degree Elevation Angle (QE)

WIND DIRECTION	WIND SPEED (Knots)			
	10	20	30	40
15	0	1	1	1
30	1	1	2	3
45	1	2	3	4
60	1	3	4	5
75	1	3	4	6
90	1	3	5	6
105	1	3	4	6
120	1	3	4	5
135	1	2	3	4
150	1	1	2	3
165	0	1	1	1
180	0	0	0	0
195	-1	-1	-1	-2
210	-1	-2	-3	-3
225	-1	-2	-4	-5
240	-2	-3	-4	-6
255	-2	-3	-5	-6
270	-2	-3	-5	-7
285	-2	-3	-5	-6
300	-2	-3	-4	-6
315	-1	-2	-4	-5
330	-1	-2	-3	-3
345	-1	-1	-1	-2
360	0	0	0	0

Table E-27. Launch Azimuth Correction Angles
3 MK66 Rocket Motors With Sustainer Motor
36- Through 50-Degree Elevation Angle (QE)

WIND DIRECTION	WIND SPEED (Knots)			
	10	20	30	40
15	0	1	1	1
30	1	1	2	3
45	1	2	3	5
60	1	3	4	6
75	1	3	5	7
90	1	3	5	7
105	1	3	5	7
120	1	3	4	6
135	1	2	3	5
150	1	1	2	3
165	0	1	1	1
180	0	0	0	0
195	-1	-1	-2	-2
210	-1	-2	-3	-4
225	-2	-3	-4	-5
240	-2	-3	-5	-6
255	-2	-4	-6	-7
270	-2	-4	-6	-8
285	-2	-4	-6	-7
300	-2	-3	-5	-7
315	-2	-3	-4	-5
330	-1	-2	-3	-4
345	-1	-1	-2	-2
360	0	0	0	0

Table E-28, Launch Azimuth Correction Angles
4 MK66 Rocket Motors With Sustainer Motor
19- Through 35-Degree Elevation Angle (QE)

WIND DIRECTION	*WIND SPEED (Knots)*			
	10	*20*	*30*	*40*
15	0	0	1	1
30	0	1	2	2
45	1	1	2	3
60	1	2	3	4
75	1	2	3	4
90	1	2	3	4
105	1	2	3	4
120	1	2	3	4
135	1	2	2	3
150	0	1	2	2
165	0	1	1	1
180	0	0	0	0
195	0	-1	-1	-1
210	-1	-1	-2	-3
225	-1	-2	-3	-4
240	-1	-2	-3	-4
255	-1	-2	-4	-5
270	-1	-3	-4	-5
285	-1	-2	-4	-5
300	-1	-2	-3	-4
315	-1	-2	-3	-4
330	-1	-1	-2	-3
345	0	-1	-1	-1
360	0	0	0	0

Table E-29. Launch Azimuth Correction Angles
4 MK66 Rocket Motors With Sustainer Motor
36- Through 50-Degree Elevation Angle (QE)

WIND DIRECTION	***WIND SPEED (Knots)***			
	10	*20*	*30*	*40*
15	0	1	1	1
30	0	1	2	2
45	0	2	2	3
60	1	2	3	4
75	1	2	3	4
90	1	2	3	5
105	1	2	3	4
120	1	2	3	4
135	0	2	2	3
150	0	1	2	2
165	0	1	1	1
180	0	0	0	0
195	-1	-1	-1	-2
210	-1	-2	-2	-3
225	-1	-2	-3	-4
240	-1	-3	-4	-5
255	-2	-3	-4	-5
270	-2	-3	-4	-5
285	-2	-3	-4	-5
300	-1	-3	-4	-5
315	-1	-2	-3	-4
330	-1	-2	-2	-3
345	-1	-1	-1	-2
360	0	0	0	0

Table E-30. Launch Azimuth Correction Angles
5 MK66 Rocket Motors With Sustainer Motor
17- Through 35-Degree Elevation Angle (QE)

WIND DIRECTION	*WIND SPEED (Knots)*			
	10	*20*	*30*	*40*
15	0	0	0	1
30	0	1	1	1
45	0	1	2	2
60	0	1	2	3
75	1	1	2	3
90	1	1	2	3
105	1	1	2	3
120	0	1	2	3
135	0	1	2	2
150	0	1	1	1
165	0	0	0	1
180	0	0	0	0
195	0	-1	-1	-1
210	-1	-1	-1	-2
225	-1	-1	-2	-3
240	-1	-2	-2	-3
255	-1	-2	-3	-3
270	-1	-2	-3	-3
285	-1	-2	-3	-3
300	-1	-2	-2	-3
315	-1	-1	-2	-3
330	-1	-1	-1	-2
345	0	-1	-1	-1
360	0	0	0	0

Table E-31. Launch Azimuth Correction Angles
5 MK66 Rocket Motors With Sustainer Motor
36- Through 50-Degree Elevation Angle (QE)

WIND DIRECTION	WIND SPEED (Knots)			
	10	20	30	40
15	0	0	0	0
30	0	0	1	1
45	0	1	1	2
60	0	1	2	2
75	0	1	2	3
90	0	1	2	3
105	0	1	2	3
120	0	1	2	2
135	0	1	1	2
150	0	0	1	1
165	0	0	0	0
180	0	0	0	0
195	-1	-1	-1	-1
210	-1	-1	-2	-2
225	-1	-2	-2	-3
240	-1	-2	-3	-3
255	-1	-2	-3	-4
270	-1	-2	-3	-4
285	-1	-2	-3	-4
300	-1	-2	-3	-3
315	-1	-2	-2	-3
330	-1	-1	-2	-2
345	-1	-1	-1	-1
360	0	0	0	0

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INDEX

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To be distributed in accordance with DA Form 12-32, Section II, organizational maintenance requirements for Ballistic Aerial Target System.

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RECOMMENDED CHANGES TO EQUIPMENT TECHNICAL MANUALS

SOMETHING WRONG WITH THIS MANUAL?

THEN. . .JOT DOWN THE DOPE ABOUT IT ON THIS FORM, TEAR IT OUT, FOLD IT AND DROP IT IN THE MAIL!

FROM: (YOUR UNIT'S COMPLETE ADDRESS)
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ATTN: SP4 John Doe
Key West, FL 33040

DATE 14 January 1975

PUBLICATION NUMBER	DATE	TITLE
TM 9-1430-550-34-1	7 Sep 72	Unit of Radar Set AN/MPQ-50 Tested at the HFC

BE EXACT. . .PIN-POINT WHERE IT IS				IN THIS SPACE TELL WHAT IS WRONG AND WHAT SHOULD BE DONE ABOUT IT:
PAGE NO.	PARAGRAPH	FIGURE NO.	TABLE NO.	
9-19		9-5		"B" Ready Relay K11 is shown with two #9 contacts. That contact which is wired to pin 8 of relay K16 should be changed to contact #10.
21-2	step 1C		21-2	Reads: Multimeter B indicates 600 K ohms to 9000 K ohms. Change to read: Multimeter B indicates 600 K ohms minimum. Reason: Circuit being checked could measure infinity. Multimeter can read above 9000 K ohms and still be correct.

SAMPLE

NOTE TO THE READER:

Your comments will go directly to the writer responsible for this manual, and he will prepare the reply that is returned to you. To help him in his evaluation of your recommendations, please explain the reason for each of your recommendations, unless the reason is obvious.

All comments will be appreciated, and will be given immediate attention. Handwritten comments are acceptable.

For your convenience, blank "tear out" forms, preprinted, addressed, and ready to mail, are included in this manual.

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