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CHAPTER 1

PART ONE - AN/PRC-25 RADIO OPERATION AND FIELD TECHNIQUES

PART TWO - FRAGMENT IDENTIFICATION AND CRATER ANALYSIS

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PART ONE

AN/PRC-25 RADIO OPERATION AND FIELD TECHNIQUES

OBJECTIVE

To learn operation, maintenance, and field techniques of the AN/PRC-25 radio set.

INTRODUCTION

The AN/PRC-25 radio set is a light weight portable-transmitter that is suited to the basic needs of EOD personnel in SEA. A working knowledge of normal and emergency operations of this radio is a must to the EOD man in the field. The material covered in this section is general in nature. Further information may be obtained from applicable technical orders.

AN/PRC-25 OPERATION AND OPERATOR'S MAINTENANCE

1-1. Description. The radio set AN/PRC-25 is a short range, back pack portable, very high frequency, frequency modulated (VHF-FM) receiver-transmitter, used to provide two-way voice communication.

1-2. Technical Characteristics

Frequency range:

Low band--30.00 to 52.95 mc.

High band--53.00 to 75.95 mc.

Number of channels: 920

Types of transmission and reception:

Transmission--Voice and 150 cps squelch tone

Reception--Voice (no squelch), or voice and 150 cps squelch tone

Type of modulation: Frequency

Transmitter output power: 1.1 to 2.0 watts

Type of squelch: Tone operated by 150 cps signal

Distance range: 5 miles (8 km)

Power source:

Dry battery--BA-386/U

Dry battery--BA-398/U

Dry battery--BA-4386/U

Battery life: 20 hours with a 9 to 1 receive transmit ratio (BA-386/U)

1-3. General Description.

a. Radio set AN/PRC-25 consists of receiver-transmitter, radio RT-505/PRC-25 and minor components (see figure 1-1).

b. Minor Components:

(1) Antenna, AT-892/PRC-25. The AT-892/PRC-25 is a one-section, 3-foot whip antenna. A spring at its base allows for positioning of the antenna to keep it in a vertical position regardless of the position of the RT-505/PRC-25. This antenna is used for general short-range service and because of its steel tape construction, can be folded into a small space.

(2) Antenna AT-271A/PRC-25. The AT-271A/PRC-25 is composed of six sections; each section fits into the end of the wider section. A stainless steel plastic covered cable (or braided plastic cord), under spring tension, is threaded through the sections to keep them together in the operating condition. When the sections are folded, the cable keeps them together as a group to prevent loss of individual sections. Spring tension is provided by a spiral spring in the base section. This antenna is used when maximum range is required.

(3) Antenna support, AB-591/PRC-25. The AB-591/PRC-25, which is of rigid rubber tubular construction, is used as a main support of the AT-271A/PRC-25 antenna.

(4) Electrical, equipment harness, ST-138/PRC-25. The ST-138/PRC-25 is made of cotton duck. It is used to secure the RT-505/PRC-25 so it can be carried on the operator's back.

(5) Cotton duck bag, CW-503/PRC-25. The CW-503/PRC-25 is sectionalized into several pockets which are used to store the two antennas, the antenna support, and the handset H-138/U.

(6) H-138/U handset. The H-138/U consists of a microphone and a receiver section for transmitting and receiving signals. The microphone section has two elements, each under a separate opening, for cancellation of outside noise. The retractable cord is terminated in a five-pin connector. A push to talk switch is mounted in the handle.

c. Batteries:

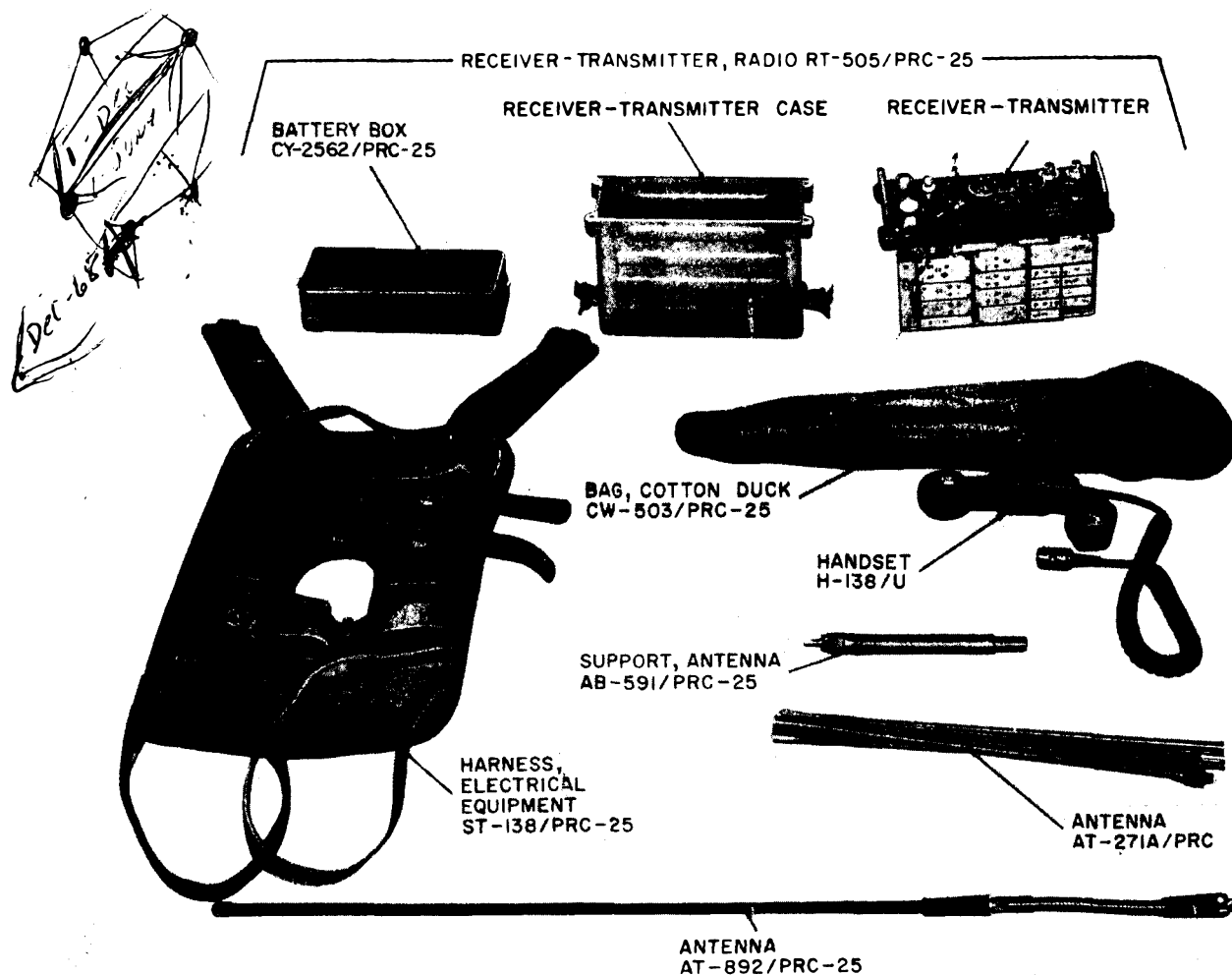
(1) Dry battery, BA-386/U or BA-4386/U is not supplied as part of the AN/PRC-25 but is required for its use. The battery is supported and housed in the CY-2562/PRC-25. Either battery supplies 3 and 15 volts and is provided with a female connector to mate with the RT-505/PRC-25 battery plug.

(2) The BA-386/U (originally designated BA-386/PRC-25) is a standard carbon dry cell battery; the BA-4386/U is a magnesium cell battery that will operate the radio approximately twice as long as the BA-386/U. It is known that the BA-386/U, FSN 61358585712, has been available through local supply channels in SEA.

(3) The dry battery, BA-398/U, may be used for arctic operation.

CAUTION

The battery must be removed from the radio if it is not to be used for one or more days.



TM 5820-398-10-2

Figure 1-1. RT-505 IRRC-25 Receiver-Transmitter AN Miner Components

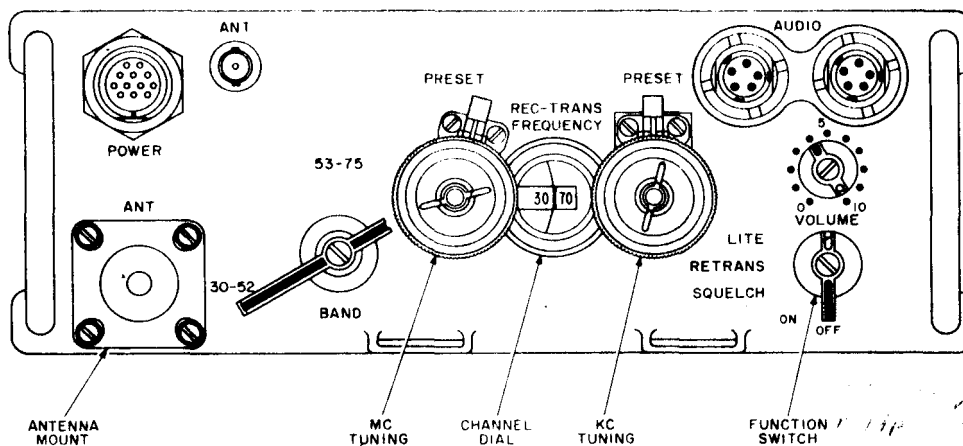


Figure 1-2. AN/PRC-25

1-4. Radio receiver transmitter, RT-505/PRC, controls, indicators, and connectors (see figure 1-2):

- a. Function Switch:
 - (1) Off--turns power off
 - (2) On--applies power
 - (3) Squelch--applies power and reduces rushing noise when no signal is received.
 - (4) Retrans--permits radio relay operation
 - (5) Lite--spring loaded position, lights channel dial
- b. Band Switch:
 - (1) 30-52--selects lower frequency band
 - (2) 53-75--selects higher frequency band
- c. Mc tuning control--tunes AN/PRC-25 in 1-mc steps as indicated by channel dial.
- d. Kc tuning control--tunes AN/PRC-25 in 50-kc steps as indicated by channel dial.
- e. Rec-Trans frequency dial--indicates operating frequency
- f. Volume control--varies receiver volume
- g. Audio connectors--connections for handset or retrans cable
- h. Ant-Mount--connection for antenna, AT-271A/PRC-25 or AT-892/PRC-25
- i. Ant-Connector--connection for fixed antenna
- j. Power connector--connection for power supply when RT-505/PRC-25 is used as part of radio set AN/GRC-125 or AN/VRC-53. When RT-505/PRC-25 is part of AN/PRC-25, if the cover for the power connector is not in place, the AN/PRC-25 will not operate.

1-5. Siting. The AN/PRC-25 operates at low power and on high frequencies; therefore, the location of the equipment greatly affects the operating range. Normally, a line of sight range can be expected; that is, if the other station can be seen, satisfactory operation is probable. An intervening hill or tall building may hamper or prevent contact with other stations. Valleys, densely wooded areas, or low spots are poor sites. Location on a hilltop or a tower will increase the operating distance. If possible, avoid locations near a source of electrical interference, such as power or telephone lines, radar sites, and field hospitals. In some cases use of field expedient antennas may be necessary.

1-6. Condensed Operating Instructions for Radio Set AN/PRC-25 (reference figure 1-2):

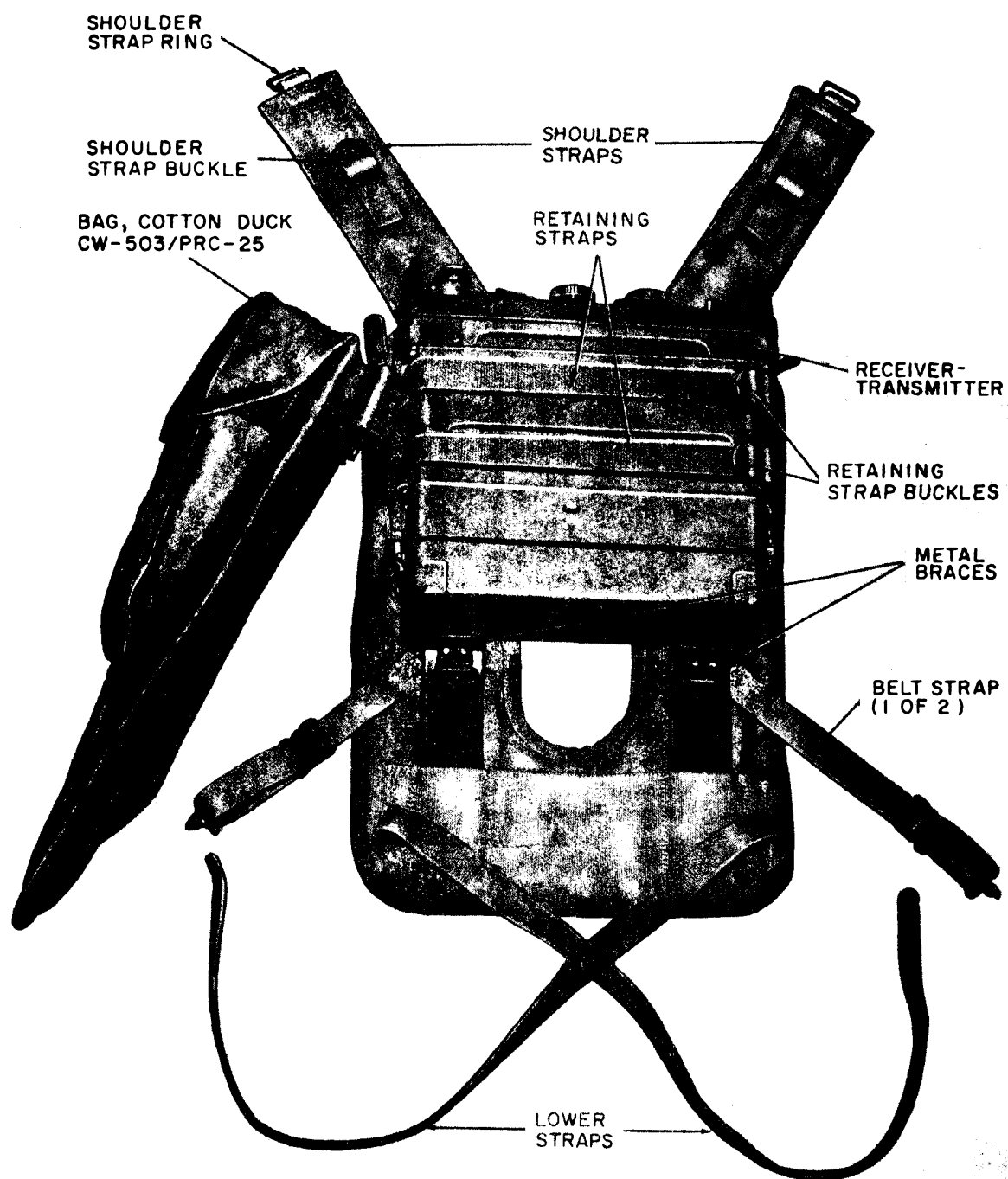
- a. Install the antenna required for the type of operation in the antenna mount.
- b. Attach handset H-138/U to either audio connector.
- c. Turn the function switch to ON.
- d. Turn the band switch to the desired operating frequency band.
- e. Turn the mc tuning and kc tuning control knobs until the desired frequency appears in the channel dial.
- f. Turn the volume control to 4.
- g. Press the handset push-to-talk switch and speak into handset. Release the push-to-talk switch to listen.
- h. Adjust the volume control for a desirable sound level.
- i. To reduce the rushing noise when no signal is being received, turn function switch to squelch.
- j. When operation is terminated, turn function switch to OFF.

1-7. Assembly Procedures (see figures 1-3 and 1-4):

- a. Install dry battery BA-386/U or BA-4386/U:
 - (1) Release the two clamps and remove the CY-2562/PRC-25 from the RT-505/PRC-25.
 - (2) Place the battery so its connector mates with the connector on the RT-505/PRC-25.
 - (3) Reinstall the CY-2562/PRC-25 and fasten the two clamps.
- b. Attach the RT-505/PRC-25 to the ST-138/PRC-25.
- c. Clip the CW-503/PRC-25 to the ST-138/PRC-25.
- d. Connect the handset to one of the audio connectors.
- e. Install the desired antenna in the antenna mount or connect a fixed antenna to the antenna connector. Be sure the antenna is firmly seated in mount.
- f. Mount the complete unit on the operator's back.

1-8. Operating Procedures:

- a. Set the function switch to ON. A rushing noise should be heard in the handset.
- b. Set the band switch to 30-52 or 53-75, depending on the channel used.



TM 5820-398-10-5

Figure 1-3. AN/PRC-25 Radio Set Assembled



TM 5820-398-10-1

Figure 1-4. AN/PRC-25, Radio Set in Operation

c. Turn the mc and kc tuning controls so the desired channel shows in the channel dial.

d. Set the volume control at 4; readjust for desired sound level in the handset.

e. Transmit as follows:

(1) Press the push to talk switch on the handset.

(2) Speak into the handset.

NOTE

Do not speak into both elements of the handset. The handset has two microphones for noise cancellation. Speaking into both elements simultaneously will cancel out your voice.

f. To receive, release the push-to-talk switch on the handset.

g. The receiver rushing noise can be eliminated by operating the function switch to squelch during periods when the other station is not transmitting.

h. For use of the squelch position of the function switch, refer to TM 11-5820-398-12.

1-9. Stopping Procedures: To stop the AN/PRC-25, set the function switch to OFF.

1-10. Operator Maintenance:

a. The operator is responsible for inspecting the AN/PRC-25 for the following:

(1) Completeness

(2) Cleanliness

(3) Corrosion

b. Discrepancies should be corrected by the operator.

c. Troubleshooting:

(1) Turn function switch to OFF and check switches and controls are in the proper position.

(2) Check the antenna to be sure it is securely tightened.

(3) Check handset for loose connections.

(4) Check battery for weakness by replacing it with a new one.

d. If accomplishment of the above does not clear up the trouble, the radio set requires higher level maintenance.

e. The Air Force unit which has the capabilities to repair this radio should be radio maintenance shop for the forward air controllers. These people are trained to

maintain Army-type radios. Most Air Force communications units are not equipped to repair Army frequency modulated (FM) radios.

1-11. References:

a. TM 11-5820-398-12, Organizational Maintenance Manual, including repair, parts, and special tools lists, radio set AN/PRC-25.

b. TM 11-5965-257-15, Organizational, DS, GS, and Depot Maintenance Manual, including repair parts and special tool lists, handset H-138/U.

1-12. Field Radio Techniques:

a. The tactical effectiveness of any communication equipment is no greater than the skill of the operators. The most efficient communication within a net or command is attained when the operators habitually use the proper procedures in the transmission and reception of messages.

NOTE

Profane language and unnecessary transmissions are strictly prohibited. Restrict your use of a net to the bare minimum.

b. Instructions pertaining to radio communications are contained in the Standing Operating Procedures (SOP), Signal Operating Instructions (SOI), and Standing Signal Instructions (SSI). The SOI outlines the organization of stations into nets, assigns call signs, designates net control stations (NCS), assigns frequencies, and provides information on changes to alternate frequencies and authentication. Security procedures to be adopted by radio operators in the command are included in the SSI. The SOP governs routine operations of a unit.

c. Radiotelephony is a system of telecommunication that is normally used for short-distance tactical communications and between mobile and air units. It provides rapid, person to person communication in highly mobile situations.

d. Radiotelephony uses procedure words (prowords) and procedure phrases. Authorized prowords are covered later in this section.

e. When communicating in a radio-telephone net, one of the following calls is used:

(1) Full Call: DANO THIS IS BUTTER DIESEL OVER.

(2) Abbreviated Call: THIS IS BUTTER DIESEL OVER.

(3) Net Call: BUTTER DIESEL THIS IS BUTTER DIESEL 6 OVER.

f. When using radio-telephony, the operator must:

(1) Listen before transmitting to avoid interference with other traffic.

(2) Speak in natural phrases, not word by word.

(3) Speak slowly and distinctly.

g. To avoid confusion and errors during voice transmissions, special procedures have been developed for pronouncing letters and numerals. These special procedures are the phonetic alphabet and phonetic numerals.

h. The phonetic alphabet is used by the operator to spell difficult words and thereby prevent misunderstanding on the part of the receiving operator. The words of the phonetic are a word alphabet and not a code.

i. The word that might be misunderstood: if it can be pronounced, it is spelled out phonetically, and then spoken again. For example, "PIDCOKE, I SPELL--PAPA INDIA DELTA CHARLIE OSCAR KILO ECHO--PIDCOKE."

j. The phonetic alphabet is also used for the transmission of interrupted messages. For example, the cipher group CMVVX is spoken, "CHARLIE MIKE VICTOR VICTOR XRAY."

k. Numbers are spoken digit by digit, but the words HUNDRED and THOUSAND are used for even hundreds and thousands. 84 is "AIT FOU-er," 2,500 is "TOO FIVE HUNDRED," and 16,000 is "WUN SIX THOUSAND."

l. The time date group is always spoken digit by digit, followed by the time zone indication. For example: 291205Z is "TOO NIN-er WUN TOO ZERO FIFE ZOO-LOO."

m. Map coordinates and call sign suffixes also are spoken digit by digit.

n. Phonetic alphabet and numerals:

A	ALFA	<u>AL</u> FAH	N	NOVEMBER	NO <u>VEM</u> BER
B	BRAVO	<u>BRAH</u> VOH	O	OSCAR	<u>OSS</u> CAH
C	CHARLIE	<u>CHAR</u> LEE	P	PAPA	PAH <u>PAH</u>
D	DELTA	<u>DELL</u> TAH	Q	QUEBEC	KEH <u>BECK</u>
E	ECHO	<u>ECK</u> OH	R	ROMEO	<u>ROW</u> ME OH
F	FOXTROT	<u>FOKS</u> TROT	S	SIERRA	SEE <u>AIR</u> RAH
G	GOLF	<u>GOLF</u>	T	TANGO	<u>TANG</u> GO
H	HOTEL	<u>HOH</u> TELL	U	UNIFORM	<u>YOU</u> NEE FORM
I	INDIA	<u>IN</u> DEE AH	V	VICTOR	<u>VIK</u> TAH
J	JULIETT	<u>JEW</u> LEE <u>ETT</u>	W	WHISKEY	<u>WISS</u> KEY
K	KILO	<u>KEY</u> LOH	X	XRAY	<u>ECKS</u> RAY
L	LIMA	<u>LEE</u> MAH	Y	YANKEE	<u>YANK</u> KEY
M	MIKE	<u>MIKE</u>	Z	ZULU	<u>ZOO</u> LOO
1.	WUN		6.	SIX	
2.	TOO		7.	SEV-en	
3.	THUH-ree		8.	AIT	
4.	FOU-er		9.	NIN-er	
5.	FIFE		10.	ZERO	

o. To keep voice transmissions as short as possible, radio operators use procedure words (prowords) to take the place of long sentences. Some prowords and their meanings are listed below.

<u>PROWORD</u>	<u>MEANING</u>
ALL AFTER	I refer to the portion of the message that follows _____.
ALL BEFORE	I refer to the portion of the message that precedes _____.
BREAK	I hereby indicate the separation of the text from other portions of the message, or, I have completed the text of the message, signature follows, etc. (When "break-in" is permitted, receiving operator may interrupt the transmitting operator to request retransmission of a portion of the message. This proword is the interruption sign.)
CORRECTION	An error has been made in this transmission. Transmission will continue with the last word correctly transmitted. •
DISREGARD THIS TRANSMISSION	This transmission is in error. Disregard it.
DO NOT ANSWER	Station called is not to answer this call. When this proword is employed, the transmission shall be ended with the proword OUT.
FIGURES	Numerals or numbers follow.
I READ BACK	The following is my response to your instructions to read back.
I SAY AGAIN	I am repeating transmission (or portion) indicated.
I SPELL	I shall spell the word phonetically.
OUT	This is the end of transmission to you and no answer is required or expected.
OVER	This is the end of my transmission and a response is necessary. Go ahead, transmit.
READ BACK	Repeat this entire transmission back to me exactly as received.
ROGER	I have received your last transmission satisfactorily.
SAY AGAIN	Repeat all of your last transmission. Followed by identification data means "Repeat _____ (portion indicated).
 SPEAK SLOWER	Your transmission is at too fast a speed. Reduce speed of transmission.

THAT IS CORRECT	You are correct or what you have transmitted is correct.
THIS IS	This transmission is from the station whose designation immediately follows.
UNKNOWN STATION	The identity of the station with whom I am attempting to establish communications is unknown.
WAIT	I must pause for a few seconds.
WAIT OUT	I must pause longer than a few seconds.
WILCO	I have received your message, understand it, and will comply. (To be used only by the addressee.) Since the meaning of the word ROGER is included in that of WILCO, the two words are never used together.

p. Call signs are used primarily for establishing and maintaining communications. They consist of any combination of characters or pronounceable words that identify a communication facility, a command, an authority, or a unit. There are many times when a headquarters is given a single call sign for use in the different nets in which the headquarters is required to operate.

q. Authentication is a security measure designed to protect a communication system against fraudulent transmissions. There are many circumstances in which authentication must be used, depending upon the needs or desires of each command. The policy of the commander is published in the SSI. Authentication tables are contained in the SOI.

1-13. EOD Net Procedures (Recommended)

a. The AN/PRC-25 set is an ideal radio set for EOD use throughout the world, so long as the radio is used as designed and proper procedures for transmission are adhered to. With this radio it is possible for each team to get field support as it becomes necessary. There are four types of support which may be necessary. These are: Medevac, airlift, air support, and artillery support. Communications with all the supporting units require the use of proper and authorized radio-telephone procedures. It is necessary to insure the supporting agency understands your request. FM 24-18 covers field radio procedures, and excerpts of FM 24-18 are attached. In addition to these excerpts, a few basic radio items shall be discussed here, which when used with FM 24-18 will insure the supporting agency understands your transmission.

(1) The Net Control Station (NCS) is assigned a callword. Each station within the net is assigned a suffix. Example: NCS (EOD office): BUTTER DIESEL; OIC: BUTTER DIESEL 6; NCOIC: BUTTER DIESEL 5; RANKING NCO: BUTTER DIESEL 1; PRIMARY TRUCK: UNIT ALFA; SECONDARY TRUCK: UNIT BRAVO.

NOTE

() OIC and NCOIC suffixes are standard Army suffixes for their positions. All remaining team members follow from 1 to 4 and 7 to include all personnel. The use of a second suffix ALFA indicates an alternate for that position.

(2) An example of a radio message is shown below. This example is broken down into three parts: (1) the call, (2) the message, (3) the closing. Example: (1) BUTTER DIESEL THIS IS BUTTER DIESEL 2 OVER. THIS IS BUTTER DIESEL OVER. (2) THIS IS BUTTER DIESEL 2 HAVE COMPLETED ASSIGNMENT AT SIERRA PAPA. Any traffic for this station? OVER. THIS IS BUTTER DIESEL ROGER, negative traffic, what is your ETA this location OVER. THIS IS BUTTER DIESEL 2 ETA THREE FIVE MINUTES OVER. (3) THIS IS BUTTER DIESEL ROGER OUT.

b. To enable the operator, using proper radio procedures, to obtain contact with supporting units, it is necessary that the operator know (1) his callword, (2) the supporting unit's callword, (3) the supporting unit's frequency, (4) proper authentication procedures, and (5) proper smoke and signal procedures. All this information is available to the unit in an SOL. The SOI should provide the following information and parts:

- (1) General section, index
- (2) Distribution
- (3) General information
- (4) Air-Ground/Air-Sea authentication and coordinate codes
- (5) Medevac frequency and callword
- (6) Advisor operations net
- (7) Artillery advisor net
- (8) Sector advisor net
- (9) Advisor callwords
- (10) Pyrotechnic and smoke signals

NOTE

The frequency and callwords of the nearest EOD unit can be obtained through a visit to that unit.

c. Air Force EOD teams should be placed on advisory nets as these nets are stable and are always open. In this same respect, Air Force EOD needs only a callword with which to identify itself. Assignment of a frequency would only reduce the open frequencies available to Army units. Also, the Air Force does not require continuous use of frequencies within the AN/PRC-25 range. The office to request EODs placement on the SOIs is the signal advisor for the teams in the area.

1-14. Field Expedient Antennas. In some cases, when on an operation, the range of the AN/PRC-25 radio may not be far enough to reach help in an emergency situation. In this case it may be advantageous to improvise a field antenna. Many factors have to be taken into consideration for this, such as correct antenna length, frequency, materials available, and location.

(1) Antenna length formulas:

f = frequency in megacycles, answer is antenna length in feet.

$$\frac{1}{4} \text{ wave} = \frac{234}{f} \qquad \frac{1}{3} \text{ wave} = \frac{468}{f} \qquad \text{full wave} = \frac{936}{f}$$

NOTE

For center-fed antenna(s), 1/2 of desired antenna length to each side of insulator.

NOTE

Symbol for wave is λ

(2) Frequency: Be sure to select an antenna that is compatible with the frequency to be used during an operation.

(3) Materials Available: When going into the field, it may be desirable to carry some extra wire and some insulators. See figure 1-5 for field expedient insulators.

(4) Location: The line of sight rule still holds true for expedient antennas so the higher you can get the better. Also, remain clear of obstructions and other power sources.

(5) Field expedient antennas compatible with the AN/PRC-25 radio:

(a) Half Rhombic (see figure 1-6a)

(b) Jungle Antenna (see figure 1-6b)

(c) Field Expedient Antenna (see figure 1-6c)

1-15. In cases where radios become inoperative due to breakdown or damage, ground to air signal panel codes may be used (see figure 1-7).

1-16. In some units, the AN/GRC-125 radio set may be authorized. This set consists of the AN/PRC with minor components, and additionally includes a vehicle mounting kit with base, loudspeaker, and power supply. This set is to adapt the AN/PRC-25 to vehicle-mounted use.

1-17. References:

FM 24-18, General Field Radio Procedures

ST 31-179, Mata Handbook for Vietnam

TM 11-5820-398-12, Organizational Maintenance Manual, Radio Set AN/PRC-25

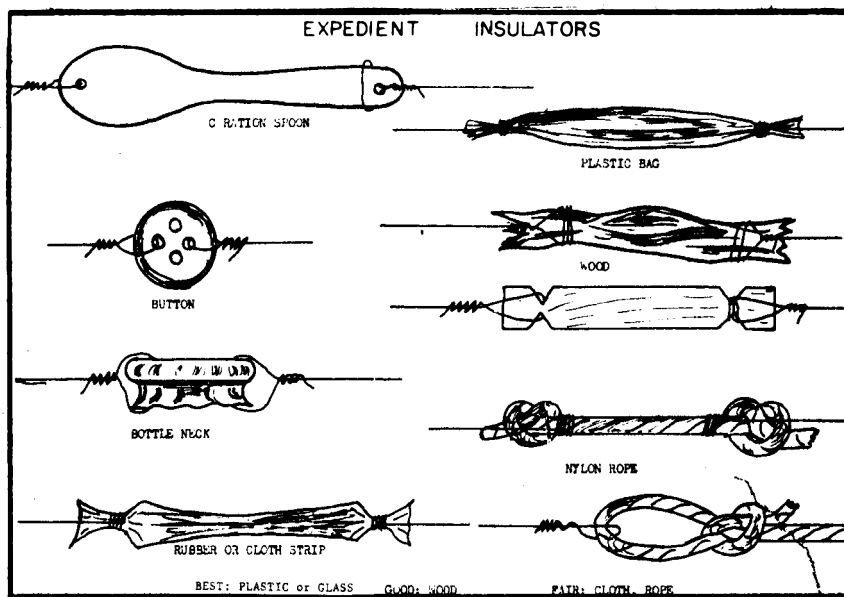
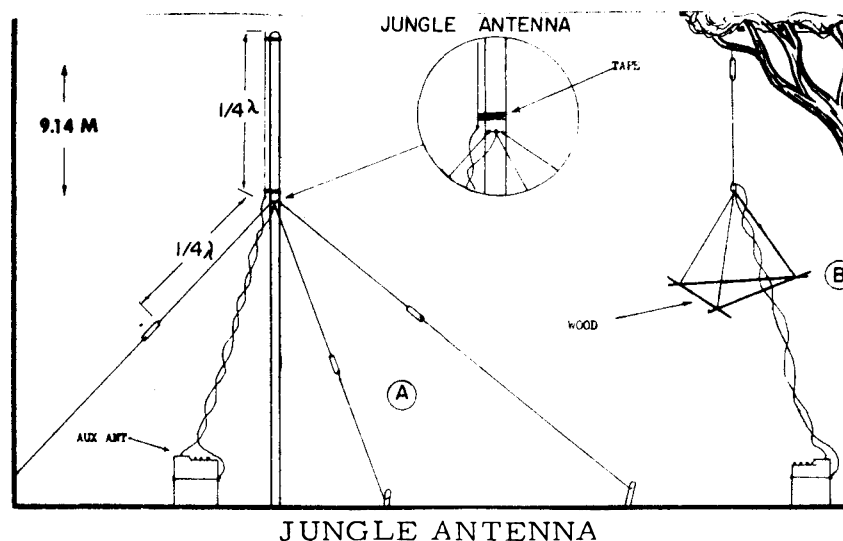
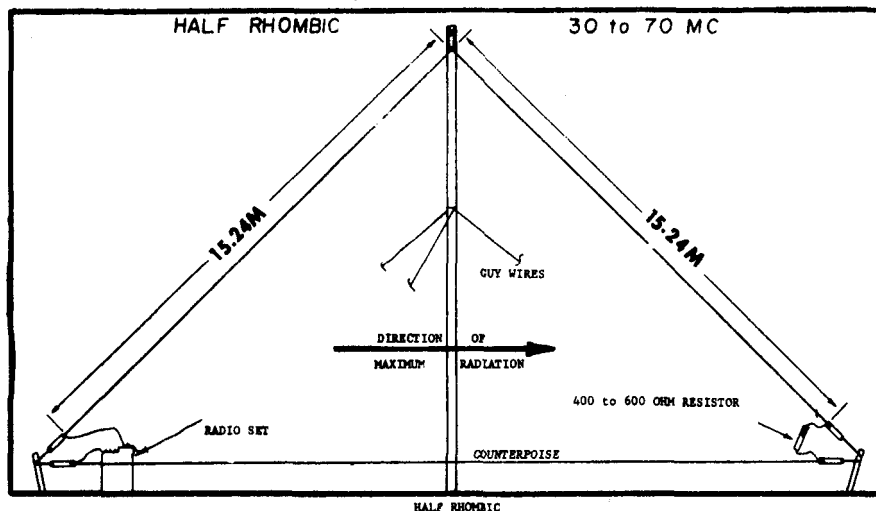


Figure 1-5. Field Expedient Insulators



The Jungle Antenna is a field expedient version of the issue antenna RC-292, Omni-directional, frequency range above 20 MC if vertical element in "A" is supported from above pole can be eliminated, the three ground plane elements should be at 45 degrees and must be grounded to radio set.

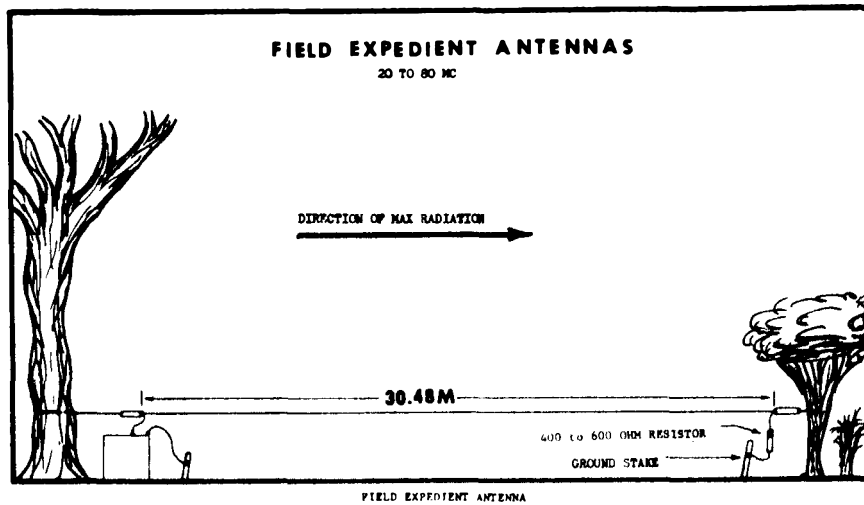
Figure 1-6A.



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THE HALF RHOMBIC ANTENNA TERMINATED WITH A 500 OHM RESISTOR HAS A HIGH GAIN (4 to 10 TIMES).
 HEIGHT SHOULD BE 9.14 METERS. BOTH ARMS MUST BE EQUAL.
 WITHOUT THE RESISTOR THE ANTENNA BECOMES BI-DIRECTIONAL.

Figure 1-6B.



THE 30.48 - METER WAVE ANTENNA IS PRACTICAL WHERE THERE IS NO OVERHEAD SUPPORT. ERECTED .61 to .90 METERS ABOVE THE GROUND, IT CAN BE LAID OUT ON TALL GRASS OR BUSHES. WITHOUT THE RESISTOR AND GROUND STAKE THE ANTENNA IS BI-DIRECTIONAL.

Figure 1-6C.

GROUND-AIR EMERGENCY PANEL CODE

REQUIRE DOCTOR, SERIOUS INJURIES	1
REQUIRE MEDICAL SUPPLIES	1 1
UNABLE TO PROCEED	X
REQUIRE FOOD AND WATER	F
REQUIRE FIREARMS AND AMMUNITION	
REQUIRE MAP AND COMPASS	
REQUIRE SIGNAL LAMP WITH BATTERY AND RADIO	
INDICATE DIRECTION TO PROCEED	K
AM PROCEEDING IN THIS DIRECTION	
WILL ATTEMPT TAKEOFF	
AIRCRAFT SERIOUSLY DAMAGED	
PROBABLY SAFE TO LAND HERE	
REQUIRE FUEL AND OIL	L
ALL WELL	LL
NO	N
YES	Y
NOT UNDERSTOOD	
REQUIRE ENGINEER	W
OPERATION COMPLETED	LLL
WE HAVE FOUND ALL PERSONNEL	<u>LL</u>
WE HAVE FOUND ONLY SOME PERSONNEL	++
WE ARE NOT ABLE TO CONTINUE. RETURNING TO BASE	XX
HAVE DIVIDED INTO TWO GROUPS, EACH PROCEED- ING IN DIRECTION INDICATED	
INFORMATION RECEIVED THAT AIRCRAFT IS IN THIS DIRECTION	
NOTHING FOUND. WILL CONTINUE TO SEARCH	N N

NOTE: A SPACE OF 3.05 METERS BETWEEN
ELEMENTS WHENEVER POSSIBLE

Figure 1-7. Ground-Air Emergency Panel Code

PART TWO

CRATER ANALYSIS AND FRAGMENT IDENTIFICATION

OBJECTIVES

To learn the general guide lines in analyzing craters to determine the direction of entry and the general area of the launch or firing site. To ascertain the size and type of the munition by identifying the fragments removed from the impact areas.

INTRODUCTION

The enemy is using launched and fired ground to ground-type munitions in their attacks on air bases in SEA. At the end of such an attack, EOD technicians are requested to qualify information pertaining to crater size and fragment identification of the munitions used, and pass on this information to intelligence agencies for use in the suppression of future enemy actions using these munitions.

CRATER ANALYSIS

2-1. The art of analyzing craters depends largely on the experience and know how of the EOD technician. By considering the following factors and by examining all the available evidence, the approximate direction and angle of the incoming round can possibly be determined.

- a. Crater shape
- b. Fragmentation patterns (striation marks)
- c. Position of components found in crater
- d. Fuze setting determined by crater size
 - (1) Small crater-non-delay
 - (2) Large crater-delay

2-2. When the above information has been analyzed, the use of a Lensatic Compass may be used to assist in determining the direction from where the round was fired.

2-3. When all the evidence in or near the crater has been analyzed or documented, components and/or fragments may be moved and used for ordnance identification. See section on fragment identification.

2-4. If the approximate direction and angle of entry, the type of round, and the possible weapon from which it was projected are known, the area from which it came can be approximated.

FRAGMENT IDENTIFICATION

2-5. The ability to identify shell fragments as to caliber and type comes mainly from experience. Many factors such as machining, rotating band seat shape, band seat keying, bourrelet width, fragment size, thickness, and shape may enter into the identification. Each fragment should be carefully examined and all possible dimensions should

be taken and recorded. However, it should be remembered that the fragments will be somewhat stretched and deformed from the source of the explosion, and that measurements obtained will not be entirely accurate.

2-6. The comparison method is used in identifying fragments with the aid of a fragment identification manual. Example: A fragment has been recovered with a section of rotating band in good condition. Its general form, as to thickness, radius, and surface, is noted and compared with photographs contained in the manual. When a photograph is found to match closely the features of the fragment, measurements given with the photograph are compared with those of the fragment to further identify it. Photographs may be of complete rounds or of fuzes, fins, fragments, or rotating bands of a round. See figures 1-8 through 1-11.

2-7. Definition of measurements. Figure 1-12 shows a drawing of a typical artillery projectile with a nose adapter. This figure will serve as a basis for definition of measurement.

2-8. Certain tools and measuring instruments are desirable for taking dimensions of fragments. Most of these can probably be obtained from local sources. Some recommended tools and instruments are as follows:

a. WIRE BRUSH--may be used to remove dirt or other foreign matter from a fragment so that an accurate measurement may be obtained (see figure 1-13a).

b. 12-inch STEEL RULE--used to obtain measurements, should preferably be graduated in 32nds, 64ths, and millimeters (see figure 1-13b).

c. MAGNIFYING GLASS--used to read fine measurements and ordnance identification markings such as stenciling, metal stamping, etc (see figure 1-13c).

d. SCREW PITCH GAUGE--used to obtain pitch and number per inch of threads in fuze wells, etc. Should be in American standard and metric sizes (see figure 1-13d).

e. 12-inch VERNIER CALIPER--used to find length and distances along projectile surfaces (see figure 1-13e).

f. CONTOUR GAUGE--used to identify curvatures of projectile surfaces (see figure 1-13f).

g. 1-inch INSIDE MICROMETER--used to obtain diameters of small fuze wells, width of lands, etc (see figure 1-13g).

h. 2-inch OUTSIDE MICROMETERS--used to obtain thicknesses of projectile walls, width of rotating bands, etc (see figure 1-13h).

i. 3-inch NEEDLE POINT DIVIDERS--by adjusting the needles from point to point on a projectile and then placing them on the rule, the distance can be obtained in inches or millimeters (see figure 1-13i).

j. CALIPERS--by adjusting the calipers against the inside or outside surfaces of a projectile and then on the rule, diameters in inches or millimeters can be obtained. Suggested sizes of calipers are:

(1) 8-inch spring joint outside calipers (see figure 1-13j).

SOVIET FUZE DKZ-B

FUZE

Type:

Settings:

Nomenclature:

Point Detonating
Instantaneous, Short Delay,
and Long Delay
DKZ-B (VC Designation)

DESCRIPTION

Material:

Total length:

Major diameter:

Number of threads per inch:

Body - Aluminum

Base - Bakelite

4.59 in

2.52 in

13

USING PROJECTILE

Soviet 122mm Fin-Spin Stabilized Rocket



Figure 1-8. Photograph of a Fuze Key to Identification of a Rocket.

U.S. 60mm MORTAR PROJECTILE M49A2

FIN SHAFT

Length:	2.40 in
Outside diameter:	.94 in
Inside diameter:	.66 in
Length of igniter cartridge cavity:	1.87 in
Length of threading:	.36 in
Number of threads per inch:	16
Vents	
Diameter:	.18 in
Number per row:	2
Number of vertical rows:	8

FINS

Width:	.75 in
Number:	8
Thickness:	.06 in
Maximum length:	1.91 in
Maximum diameter:	2.41 in

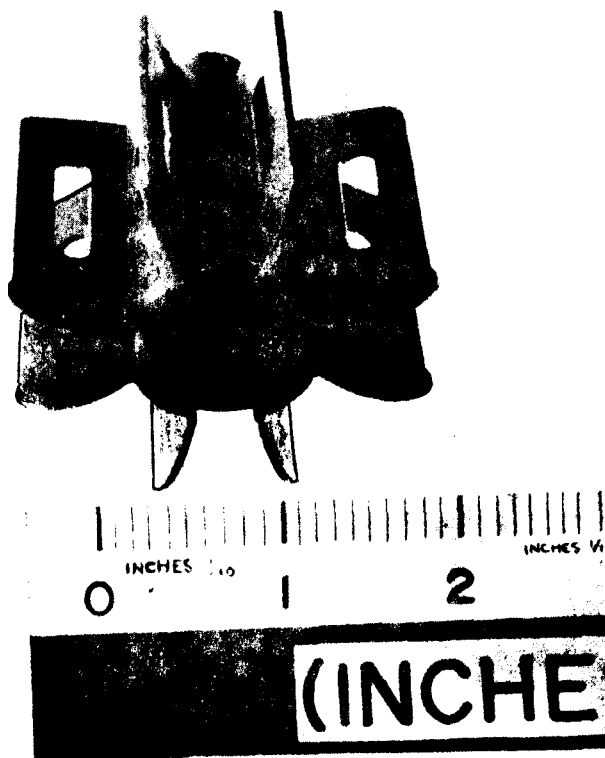


Figure 1-9. Photograph of a Fin Key to Identification of a Mortar Round.

U.S. 105mm PROJECTILE M1

NOSE

Diameter of fuze well:

1.68 in

Length of threaded portion:

1.44 in

Number of threads per inch:

12

FUZE

Models used:

M18, M51, M54, M55,
M57, M67, M78, M502,
M500, M520, M535,
M557, and M564

Location and type:

Nose PD and Time

Material:

Brass, Steel and
Aluminum

Threads per inch:

12



Figure 1-10. Photograph of Fragments Key to Identification of Projectiles

U.S. 75mm PROJECTILE M48

ROTATING BAND SEAT

Type of band:	Copper alloy
Width of seat at surface:	.48 in
Width of seat at bottom:	.48 in
Depth of band seat:	.09 in
Number of bands:	1
Number of rows of keying:	3
Width of keying of each row:	.06 in
Width between each row of keying:	.06 in
Width of space in front of keying:	.08 in
Width of space in back of keying:	.10 in
Number of keys per inch:	8
Diameter of rotating band:	3.02 in

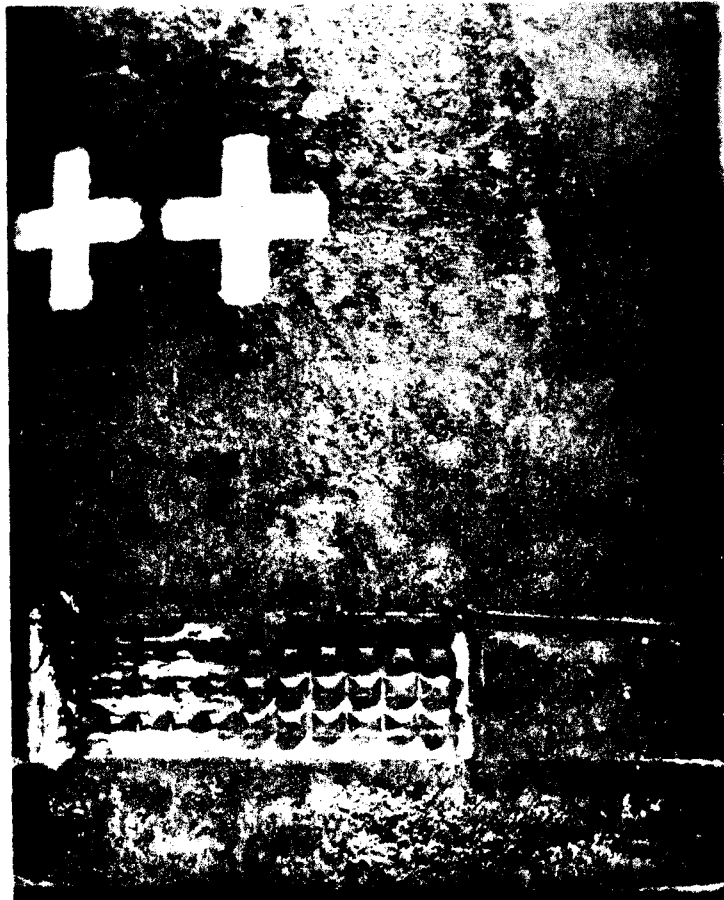


Figure 1-11. Photograph of a Rotating Band Seat Key to Identification of Projectiles

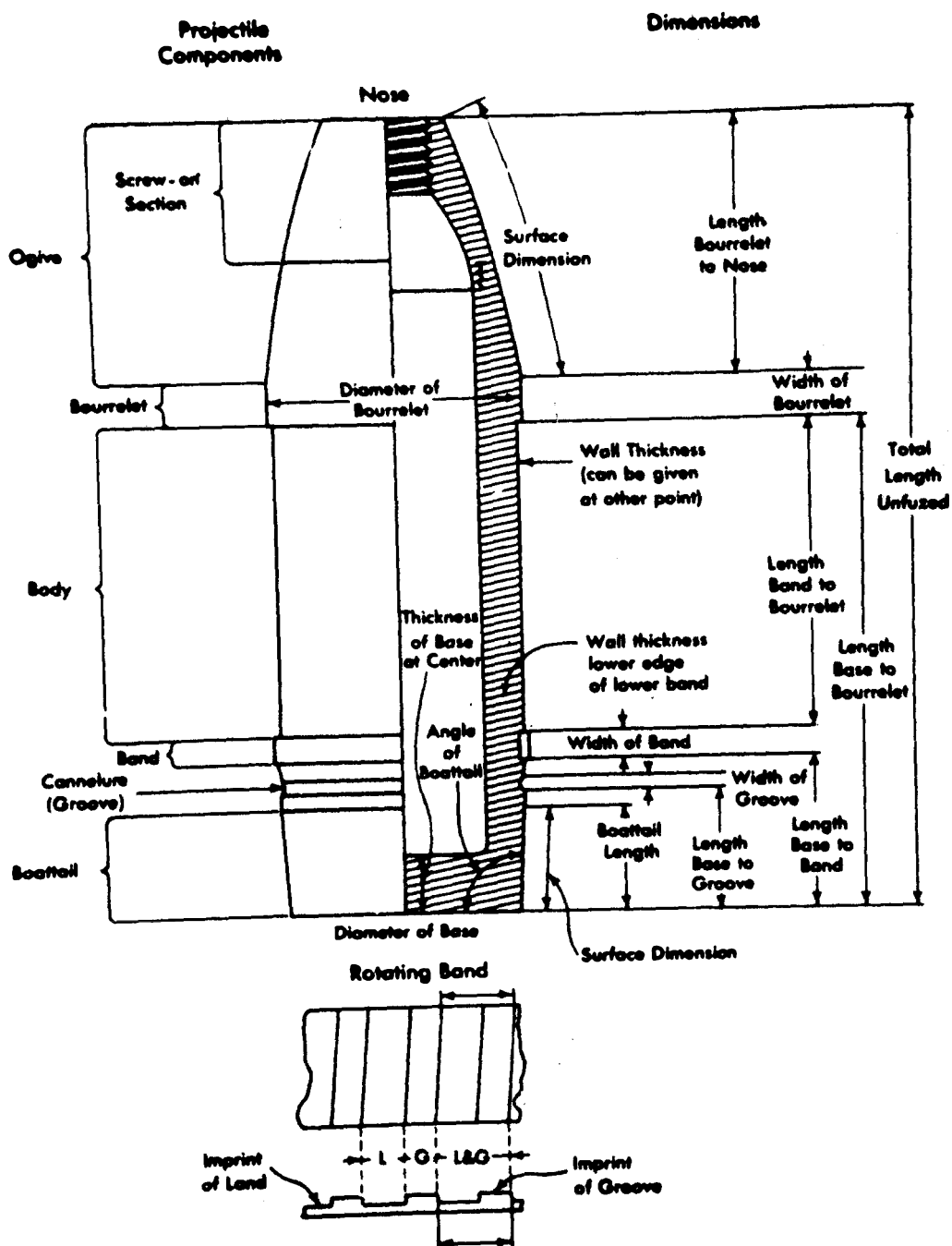


Figure 1-12. Definitions and Locations of Measurements for Fragment Identification of Projectiles.

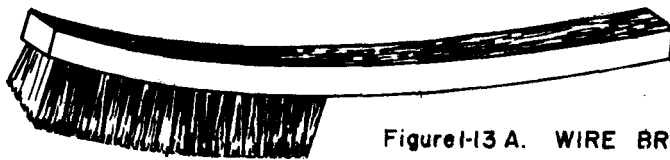


Figure I-13 A. WIRE BRUSH

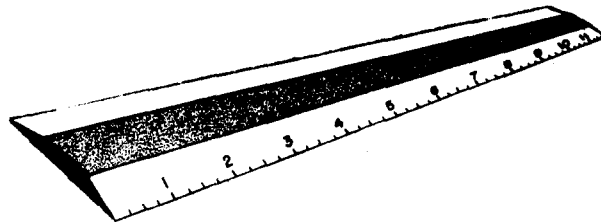


Figure I-13B STEEL RULE



Figure I-13C MAGNIFYING GLASS

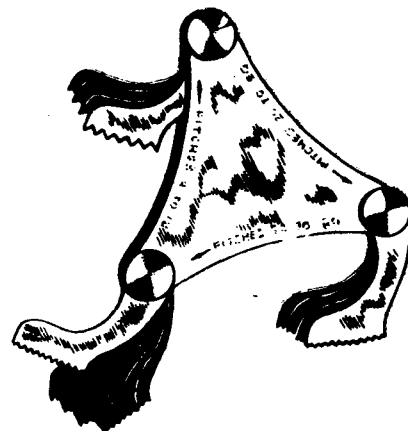


Figure I-13D SCREW PITCH GAUGE

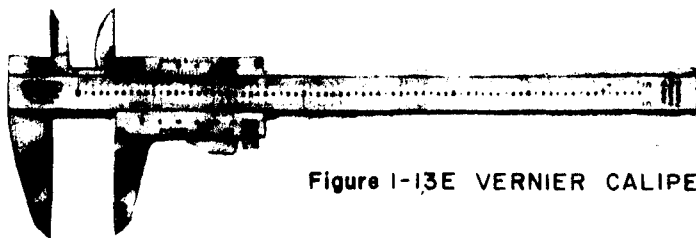


Figure I-13E VERNIER CALIPER

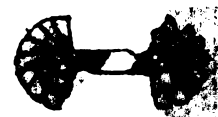


Figure I-13F CONTOUR GAUGE

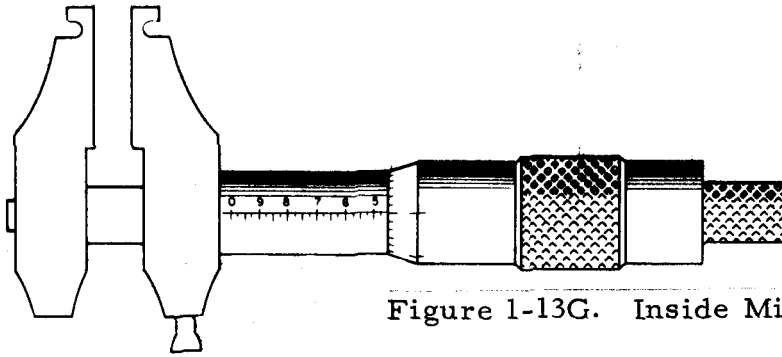


Figure 1-13G. Inside Micrometer

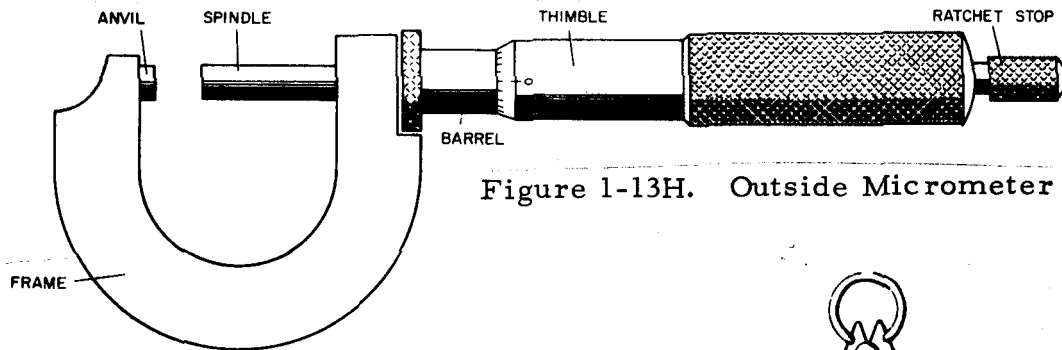


Figure 1-13H. Outside Micrometer

Figure 1-13I. Outside Calipers

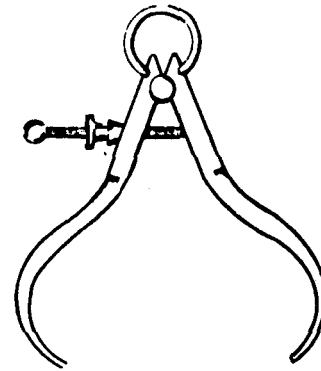


Figure 1-13J. Dividers.

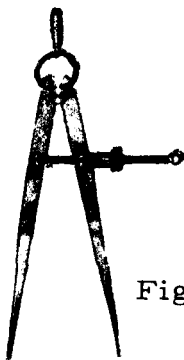
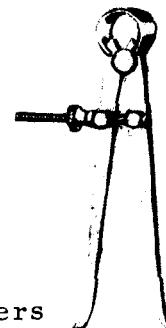


Figure 1-13K. Inside Calipers



- (2) 8-inch spring joint inside calipers (see figure 1-13k).
- (3) 3-inch spring joint outside calipers
- (4) 3-inch spring joint inside calipers

NOTE

Some of these instruments are very precise. The measurements taken with them should be read very carefully.

2-9. Conversion of measurements from fractions to decimals or from inches to millimeters can be obtained from tables 1 through 3.

2-10. Another valuable aid to fragment identification is a fragment board. On a sheet of plywood are mounted typical fragments of various types of ordnance found in the area. The fragments should show in particular the rotating band seat and keying, surface machining, bourrelet width, fuze well threading, etc. Each fragment should be positively identified and the type of ordnance from which it came should be stenciled or marked on the board. Such a board provides a simple and convenient reference for identification work.

2-11. Use of stencils or metal stampings on ordnance can also be used in identification. Charts containing translations of foreign scriptures and symbols into English are found in almost all fragment identification manuals.

FRACTIONS OF AN INCH TO DECIMAL INCHES AND MILLIMETERS

Fractions			Decimal	Milli- meters
1/4	1/8	1/64	0.105625	0.396875
		1/32	.031250	.793750
		3/64	.046875	1.196025
		1/16	.062500	1.587500
		5/64	.078125	1.984375
		3/32	.093750	2.381250
		7/64	.109375	2.778125
			.125000	3.175000
	3/16	9/64	.140625	3.571875
		5/32	.156250	3.968750
		11/64	.171875	4.365625
			.187500	4.762500
	1/2	13/64	.203125	5.159375
		7/32	.218750	5.556250
		15/64	.234375	5.953125
			.250000	6.350000
3/8	5/16	17/64	.265625	6.746875
		9/32	.281250	7.143750
		19/64	.296875	7.540625
			.312500	7.937500
	3/4	21/64	.328125	8.334375
		11/32	.343750	8.731250
		23/64	.359375	9.128125
			.375000	9.525000
	7/16	25/64	.390625	9.921875
		13/32	.406250	10.318750
		27/64	.421875	10.715625
			.437500	11.112500
	15/32	29/64	.453125	11.509375
			.468750	11.906250
		31/64	.484375	12.303125
			.500000	12.700000

TABLE 1

FRACTIONS OF AN INCH TO DECIMAL INCHES AND MILLIMETERS
(Cont'd)

Fractions		Decimal	Milli- meters
3/4	5/8	33/64	.515625 13.096875
		17/32	.531250 13.493750
	9/16	35/64	.546875 13.890625
			.562500 14.287500
	11/16	37/64	.578125 14.684375
		19/32	.593750 15.081250
	13/16	39/64	.609375 15.478125
			.625000 15.875000
	15/16	41/64	.640625 16.271875
		21/32	.656250 16.668750
	7/8	43/64	.671875 17.065625
			.687500 17.462500
		45/64	.703125 17.859375
		23/32	.718750 18.256250
		47/64	.734375 18.653125
			.750000 19.050000
1/2	3/4	49/64	.765625 19.446874
		25/32	.781250 19.843750
	5/8	51/64	.796875 20.240625
			.812500 20.637500
	7/8	53/64	.828125 21.034375
		27/32	.843750 21.431250
		55/64	.859375 21.828125
			.875000 22.225000
1/4	1/2	57/64	.890625 22.621875
		29/32	.906250 23.081750
	3/4	59/64	.921875 23.415625
			.937500 23.812500
1/8	1/4	61/64	.953125 24.209375
		31/32	.968750 24.606250
1/16	1/8	63/64	.984375 25.003125
			1.000000 25.400000

TABLE 1 (Cont'd)

MILLIMETERS TO INCHES

Basis: 1 inch = 25.4 Millimeters

Milli- meters	Inches	Milli- meters	Inches	Milli- meters	Inches	Milli- meters	Inches
1....	0.03937	26....	1.023622	51....	2.007874	76....	2.992126
2....	.078740	27....	1.062992	52....	2.047244	77....	3.031496
3....	.118110	28....	1.102362	53....	2.086614	78....	3.070866
4....	.157480	29....	1.141732	54....	2.125984	79....	3.110236
5....	.196850	30....	1.181102	55....	2.165354	80....	3.149606
6....	.236220	31....	1.220472	56....	2.204724	81....	3.188976
7....	.275591	32....	1.259843	57....	2.244094	82....	3.228346
8....	.314961	33....	1.299213	58....	2.283465	83....	3.267717
9....	.354331	34....	1.338583	59....	2.322835	84....	3.307087
10....	.393701	35....	1.377953	60....	2.362205	85....	3.346457
11....	.433071	36....	1.417323	61....	2.401575	86....	3.385827
12....	.472441	37....	1.456693	62....	2.440945	87....	3.425197
13....	.511811	38....	1.496063	63....	2.480315	88....	3.464567
14....	.551181	39....	1.535433	64....	2.519685	89....	3.503937
15....	.590551	40....	1.574803	65....	2.559055	90....	3.543307
16....	.629921	41....	1.614173	66....	2.598425	91....	3.582677
17....	.669291	42....	1.653543	67....	2.637795	92....	3.622047
18....	.708661	43....	1.692913	68....	2.677165	93....	3.661417
19....	.748031	44....	1.732283	69....	2.716535	94....	3.700787
20....	.787402	45....	1.771654	70....	2.755906	95....	3.740157
21....	.826772	46....	1.811024	71....	2.795276	96....	3.779528
22....	.866142	47....	1.850394	72....	2.834646	97....	3.818898
23....	.905512	48....	1.889764	73....	2.874016	98....	3.858268
24....	.944882	49....	1.929134	74....	2.913386	99....	3.897638
25....	.984252	50....	1.968504	75....	2.952756	100....	3.937008

TABLE 2

INCHES TO MILLIMETERS

Basis: 1 inch = 25.4 Millimeters

Inches	Milli- meters	Inches	Milli- meters	Inches	Milli- meters	Inches	Milli- meters
1....	25.4	26....	660.4	51....	1,295.4	76....	1,930.4
2....	50.8	27....	685.8	52....	1,320.8	77....	1,955.8
3....	76.2	28....	711.2	53....	1,346.2	78....	1,981.2
4....	101.6	29....	736.6	54....	1,371.6	79....	2,006.6
5....	127.0	30....	726.0	55....	1,397.0	80....	2,032.0
6....	152.4	31....	787.4	56....	1,433.4	81....	2,057.4
7....	177.8	32....	812.8	57....	1,447.8	82....	2,082.8
8....	203.2	33....	838.2	58....	1,473.2	83....	2,108.2
9....	228.6	34....	863.6	59....	1,498.6	84....	2,133.6
10....	254.0	35....	889.0	60....	1,524.0	85....	2,159.0
11....	279.4	36....	914.4	61....	1,549.4	86....	2,184.4
12....	304.8	37....	939.8	62....	1,574.8	87....	2,209.8
13....	330.2	38....	965.2	63....	1,600.2	88....	2,235.2
14....	355.6	39....	990.6	64....	1,625.6	89....	2,260.6
15....	381.0	40....	1,016.0	65....	1,651.0	90....	2,286.0
16....	406.4	41....	1,041.4	66....	1,676.4	91....	2,311.4
17....	431.8	42....	1,066.8	67....	1,701.8	92....	2,336.8
18....	457.2	43....	1,092.2	68....	1,727.2	93....	2,362.2
19....	482.6	44....	1,117.6	69....	1,752.6	94....	2,387.6
20....	508.0	45....	1,143.0	70....	1,778.0	95....	2,413.0
21....	533.4	46....	1,168.4	71....	1,803.4	96....	2,438.4
22....	558.8	47....	1,193.8	72....	1,828.8	97....	2,463.8
23....	584.2	48....	1,219.2	73....	1,854.2	98....	2,489.2
24....	609.6	49....	1,244.6	74....	1,879.6	99....	2,514.6
25....	635.0	50....	1,270.0	75....	1,905.0	100....	2,540.0

TABLE 3

Department of Aerospace Munitions Training
Lowry Technical Training Center

Student Text 3AZR46470-1
1 February 1970

CHAPTER 2

PART ONE - DROPPED MUNITIONS

PART TWO - FUZES

PART ONE

DROPPED MUNITIONS

OBJECTIVES

To learn identification, operation, explosive fillers, hazards, related equipment, and the disposal procedures for dropped munitions.

INTRODUCTION

This text will provide a review of the older type bombs and a more detailed study of the newer type bombs being used in SEA. Most EOD technicians do not get involved in the build up of munitions and are not completely familiar with the installation, or removal of the bomb fins, or the set screws that physically lock items in place.

This text will also provide a review of the operation of arming lanyards and associated components for bombs equipped with internal conduits. The review will be helpful to those who have not been working with conventional weapons the last few years. This text will be used in conjunction with classroom discussion.

GP OLD SERIES BOMBS

1-1. Type: GP Old Series Bombs (reference figures 2-1, 2-2, and 2-3)

1-2. Identification:

a. Sizes: 100- to 2000-pounds

b. Markings: In yellow or black. The number of yellow bands on the nose and tail indicate the explosive filler.

c. Lugs and Fins: 14- and 30-inch suspension. These bombs may use box or conical fins.

1-3. Fillers: (50 percent weight ratio)

a. TNT

b. Tritonal

c. Amatol

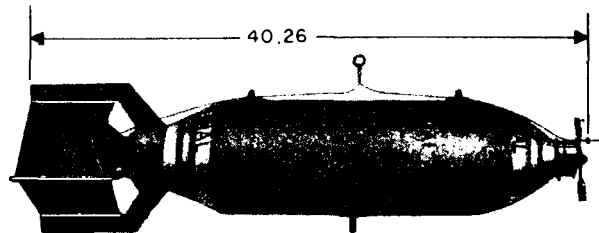
d. Comp B

1-4. Hazards: The smoke and fumes from burning TNT is highly toxic. Comp B and tritonal are more sensitive to drop.

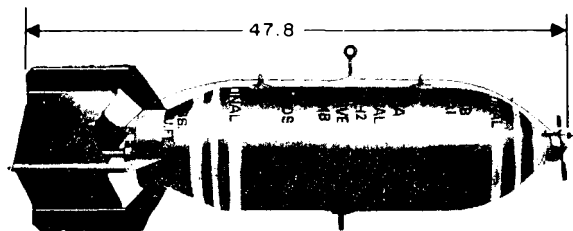
1-5. Related Equipment: (reference figure 2-3)

a. Fuzes (nose and/or tail)

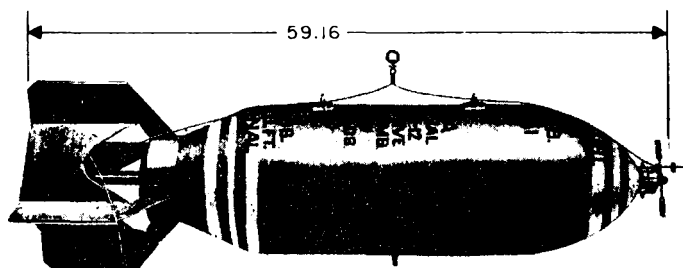
b. Fin assembly



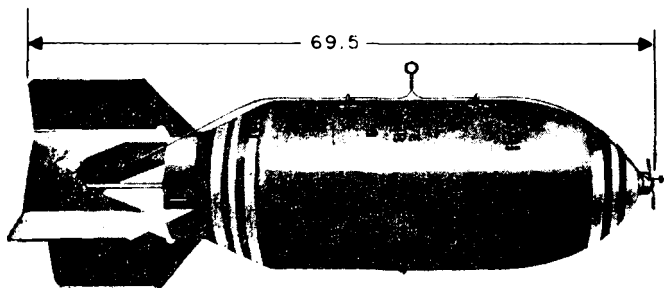
Bomb, GP, tritonal, 100-lb, AN-M30A1



Bomb, GP, tritonal, 250-lb, AN-M57A1



Bomb, GP, tritonal, 500-lb, AN-M64A1



Bomb, GP, tritonal, 1,000-lb, AN-M65A1

Figure 2-1. Bomb, General Purpose, Series

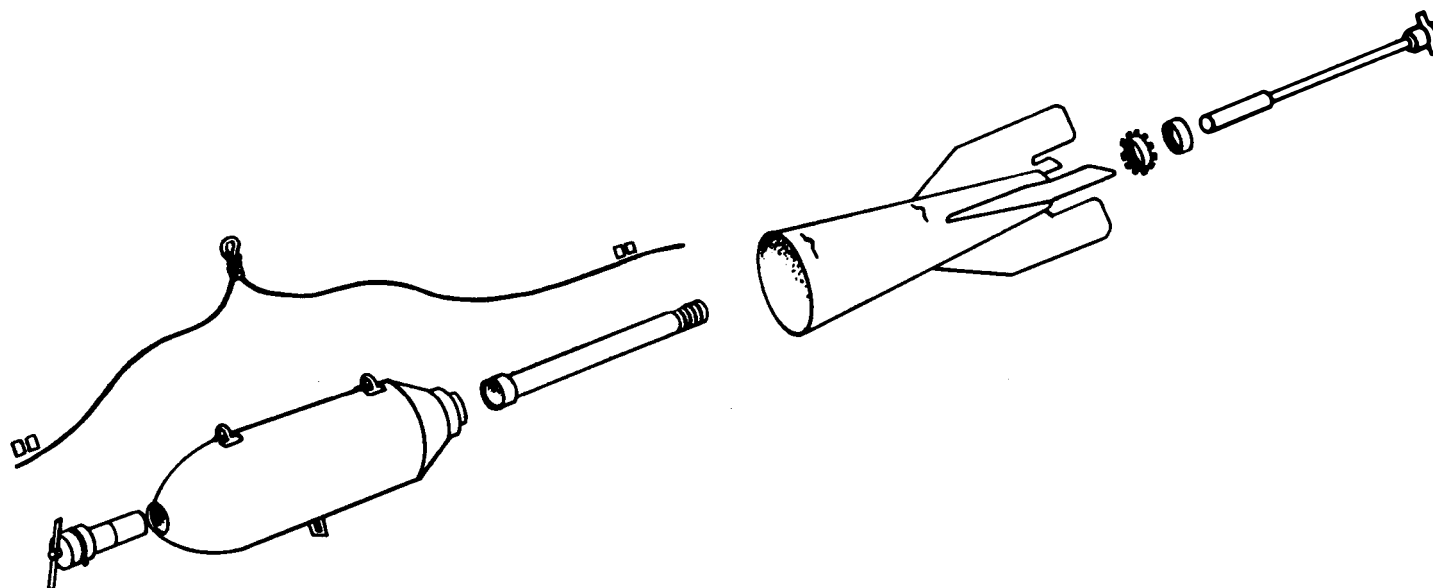


Figure 2-2. Bomb, General Purpose, w/Conical Fin

HORIZONTAL DANGEROUS RADIUS OF BOMB CASING FRAGMENTS

<u>BOMB</u>	<u>MAXIMUM DANGER RADIUS OF FRAGMENTS FROM POINT OF DETONATION</u>
100 lb GP	3000 feet
250 lb GP	3000 feet
500 lb GP	3000 feet
1000 lb GP	3000 feet
2000 lb GP	3000 feet

BLAST EFFECT ON PERSONNEL

<u>BOMB</u>	<u>APPROXIMATE MAXIMUM EFFECTIVE DISTANCE ON PERSONNEL</u>
100 lb GP	40 feet
250 lb GP	55 feet
500 lb GP	75 feet
1000 lb GP	90 feet
2000 lb GP	110 feet

<u>FILLER</u>	<u>USE</u>	<u>COLOR CODE</u>		
		<u>BASE COLOR</u>	<u>COLOR & NO OF BANDS</u>	<u>MARKINGS</u>
High Explosive	General Purpose	Olive Drab	3 Yellow/Tritonal 2 Yellow/Comp B 1 Yellow/Other HE	Black or Yellow
	Fragmentation		or 1, 3" Yellow/All HE	
Inert (w/ Spotting charges in most cases)	Practice	Blue (May also be black, metallic, or orange	None	White
Inert	Drill	OD	1 Black	Black
Leaflets	Leaflet	OD	1 Aluminum	Black

Figure 2-3. Classification of Aircraft Bombs

- c. Adapter booster
- d. Arming wire and fahnstock clips

1-6. Disposal: Detonate

GP NEW SERIES BOMBS

1-7. Type: GP New Series Bombs (reference figure 2-4)

1-8. Identification:

a. Sizes:

(1) 750-lb M 117

(2) 3000-lb M 118

b. Markings:

(1) OD bomb body

(2) Markings in yellow

(3) 1 wide yellow band (3 inch)

c. Lugs: 14- and 30-inch

d. Fins: Conical or retarded (MAU 91/B for M 117)

1-9. Fillers: Normally tritonal; minol can be used.

1-10. Hazards:

a. Tritonal is sensitive to drop.

b. Minol--do not trepan and steam.

1-11. Related Equipment:

a. Nose and tail plugs.

b. Arming wires/lanyards with fahnstock clips.

c. Charging well for special fuzing (electrical/mechanical).

d. Adapter boosters: T 45 and T 46 for older fuzes, M 59 and M 134 for the new type fuzes. The latter incorporates electrical detonators.

1-12. Disposal: Detonate

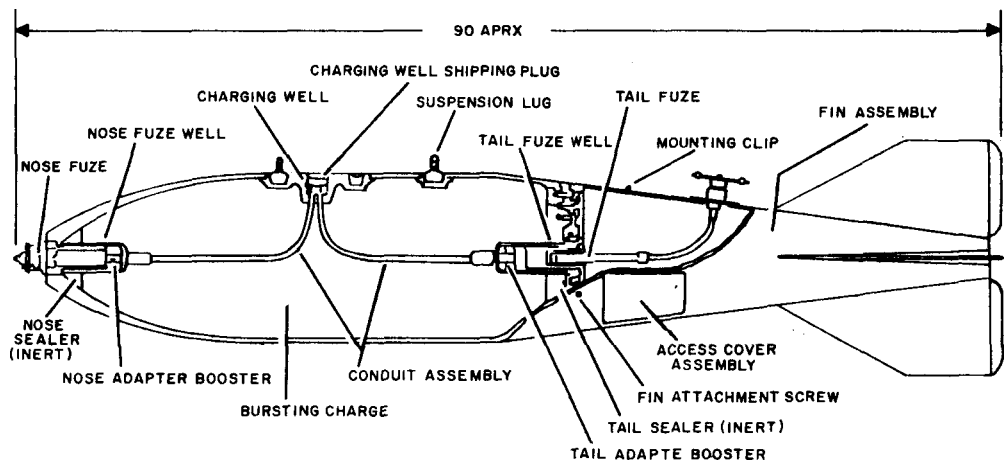


Figure 2-4. M117, 750-lb. GP Bomb w/Plumbing

GP LOW DRAG BOMBS

1-13. Type: GP Low Drag Bombs(reference figures 2-5, 2-6, and 2-7)

1-14. Identification:

a. Sizes:

- (1) 250-lb MK 81
- (2) 500-lb MK 82
- (3) 1000-lb MK 83
- (4) 2000-lb MK 84

b. Markings:

- (1) OD bomb body
- (2) Yellow markings
- (3) 1 wide yellow band (3 inch)

c. Lugs: 14- and 30-inch (screw-in type)

d. Fins: Conical and snakeye

1-15. Filler: Tritonal

1-16. Hazards: Tritonal is sensitive to drop (12 inches).

1-17. Related Equipment:

- a. Nose plugs and tail plugs are used with some fuzing.
- b. Internal conduit and charging wells.
- c. Retaining screw-in nose.
- d. Interchangeable adapter boosters, dependent on fuzing.
- e. Arming wires/lanyard with fahnstock clips.

1-18. Disposal: Detonate

NOTE: Fuze Extenders: Fuze extenders may be used on all GP series bombs. These extenders contain either tetryl or Comp B. M 103 or M 904 can be used for fuzing.

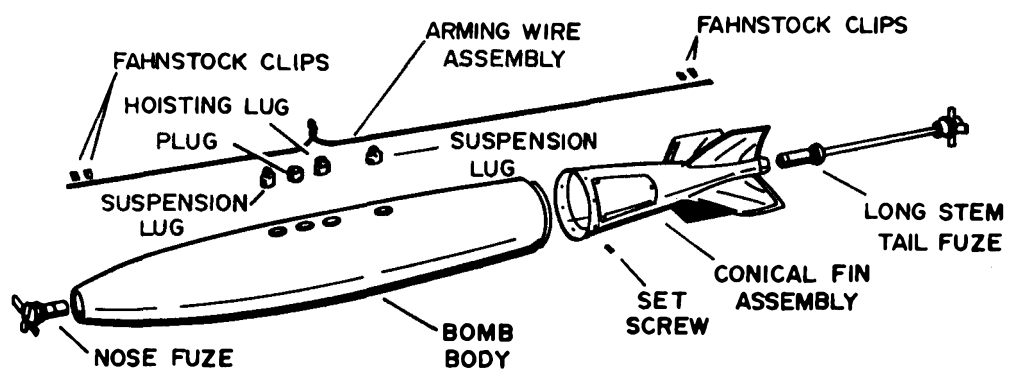


Figure 2-5. Bomb, General Purpose MK 82 Mod 1

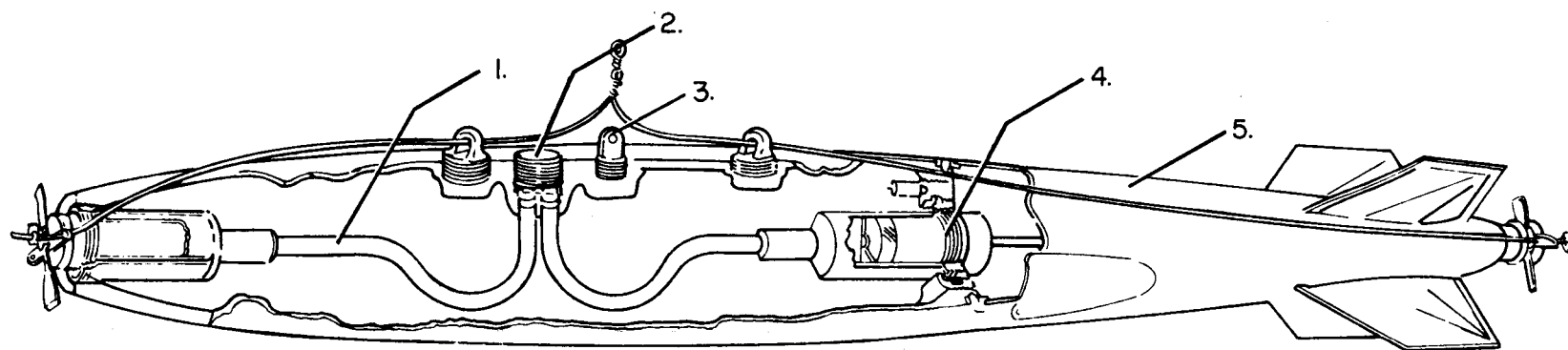
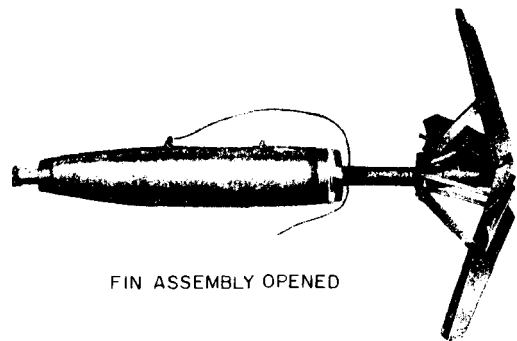


Figure 2-6. Bomb, General Purpose MK 81 Mod 1



FIN ASSEMBLY OPENED



FIN ASSEMBLY CLOSED
LOW-DRAG GP SNAKEYE I BOMB

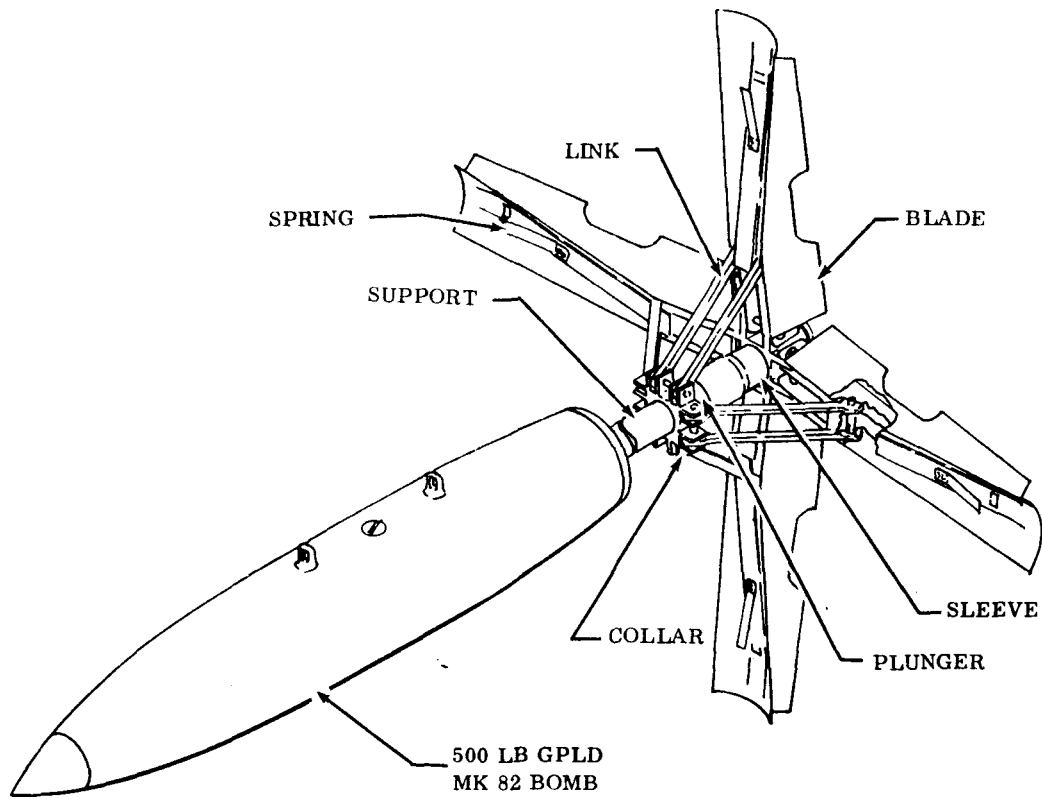


Figure 2-7. MK 81 Snakeye, Retarded (High Drag) Configuration

DEMOLITION BOMB, BLU 31/B

- 1-19. Type: Demolition Bomb, BLU 31/B (reference figure 2-8)
- 1-20. Identification:
- a. Size: 800-lb, bluff shape, anti-ricochet design.
 - b. Markings: OD color, black markings with yellow band on nose.
 - c. Lugs: 14-inch screw-in type suspension lugs. The rear suspension lug is positioned 29 inches forward of the base of the bomb.
 - d. Fin: Uses an MK 82 low drag fin.
- 1-21. Filler: 250 pounds of tritonal/destex.
- 1-22. Hazards: Tritonal is sensitive to shock (12 inch drop).
- 1-23. Related Equipment:
- a. Nose fuze (FMU 30/B)
 - b. Tail plug
 - c. Internal conduit and charging well
 - d. Battery firing device
- 1-24. Disposal: Detonate

FRAGMENTATION CLUSTER, M1A1, 100-lb

- 1-25. Type: Fragmentation Cluster, M1A1, 100-lb (reference figures 2-9 and 2-10)
- 1-26. Identification:
- a. Size: AN-M41A1, 20 pound (6 each)
 - b. Markings:
 - (1) OD bomb body
 - (2) Yellow band
 - (3) Black markings
 - c. Lugs: One lug welded to the body at the center of gravity.
 - d. Fins: A tail fin is threaded to the bomb and secured by a set screw.

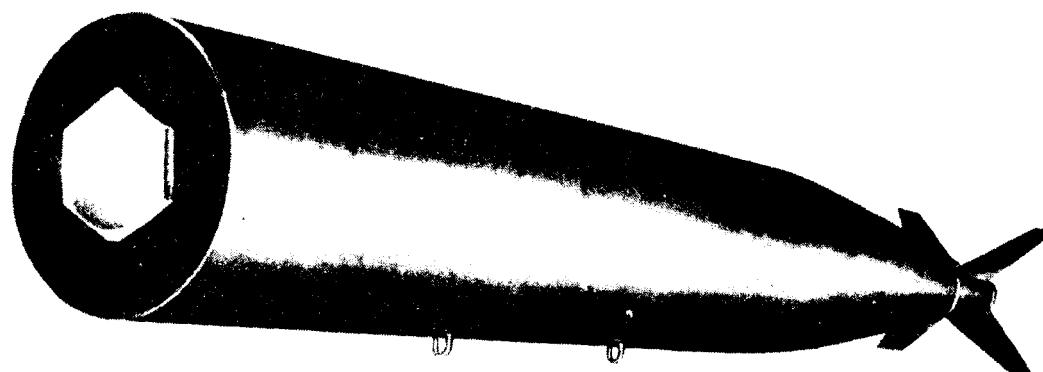


Figure 2-8. Bomb, Demolition, 800 pound, BLU 31/B

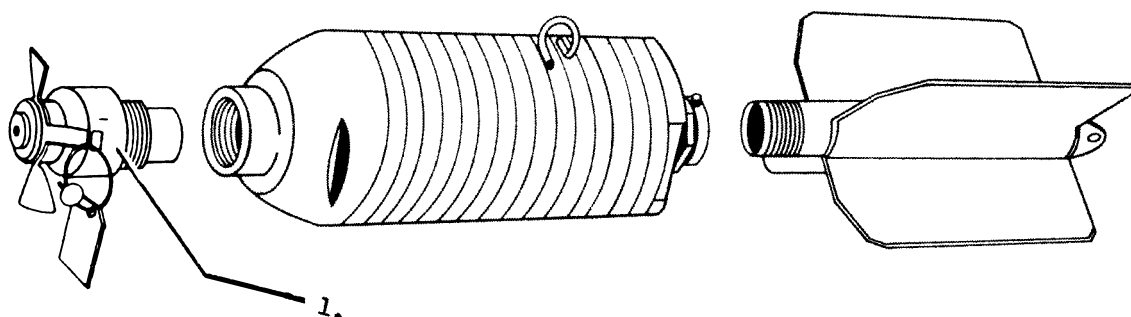


Figure 2-9. Bomb, Fragmentation, 20-1b, M 41

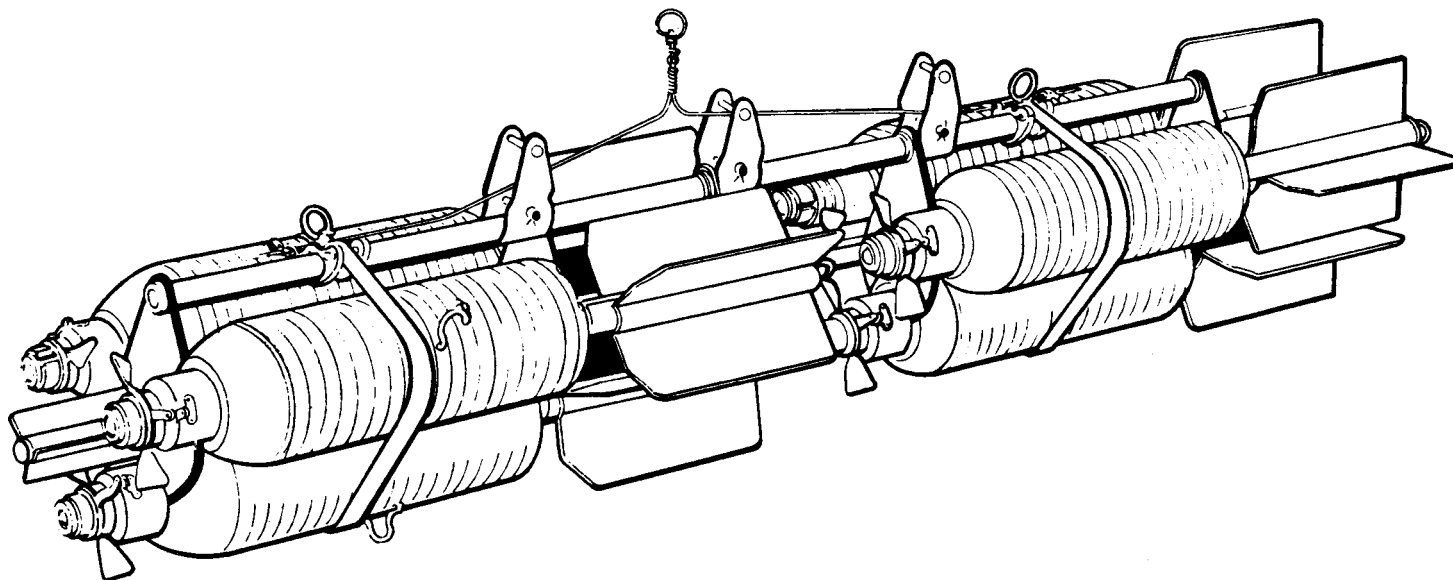


Figure 2-10. Bomb, Fragmentations Cluster M1A1

1-27. Cluster Operation: Upon release, the arming wire is extracted from the cluster allowing the bombs to separate. Fuze vane rotation begins at cluster bomb separation.

NOTE

An intact cluster (M1A1) must be disassembled prior to fuze removal.

1-28. Filler: TNT and Comp B (14 percent weight ratio)

1-29. Related Equipment: None. The AN-M41A1 bomb is issued assembled and completely fuzed in the M1A1 cluster.

1-30. Hazards: The smoke and fumes from burning TNT is highly toxic.

1-31. Disposal: Detonate

FRAGMENTATION CLUSTER, AN-M28A2, 100-lb

1-32. Type: Fragmentation Cluster, AN-M28A2, 100-lb (reference figures 2-11 and 2-12)

1-33. Identification:

a. Size: M 83, 4-lb (24 each)

b. Markings:

(1) OD bomb body

(2) Yellow band on nose

(3) Type of bomb fuzing marked on cluster body; that is, M 129, M 130, M 131, or "mixed."

c. Lugs: 14-inch suspension; may be carried by single suspension (Navy).

d. Fins: Box-type fin with drag plate.

1-34. Cluster Operation: Upon release, the arming wire is withdrawn and the fuze is allowed to arm. The fuze functions, permitting the cluster to open. The 24 M 83 frag bombs are dispersed by spring action.

1-35. Filler: TNT

1-36. Related Equipment:

a. Nose fuze

b. Arming wire--fahnstock clip

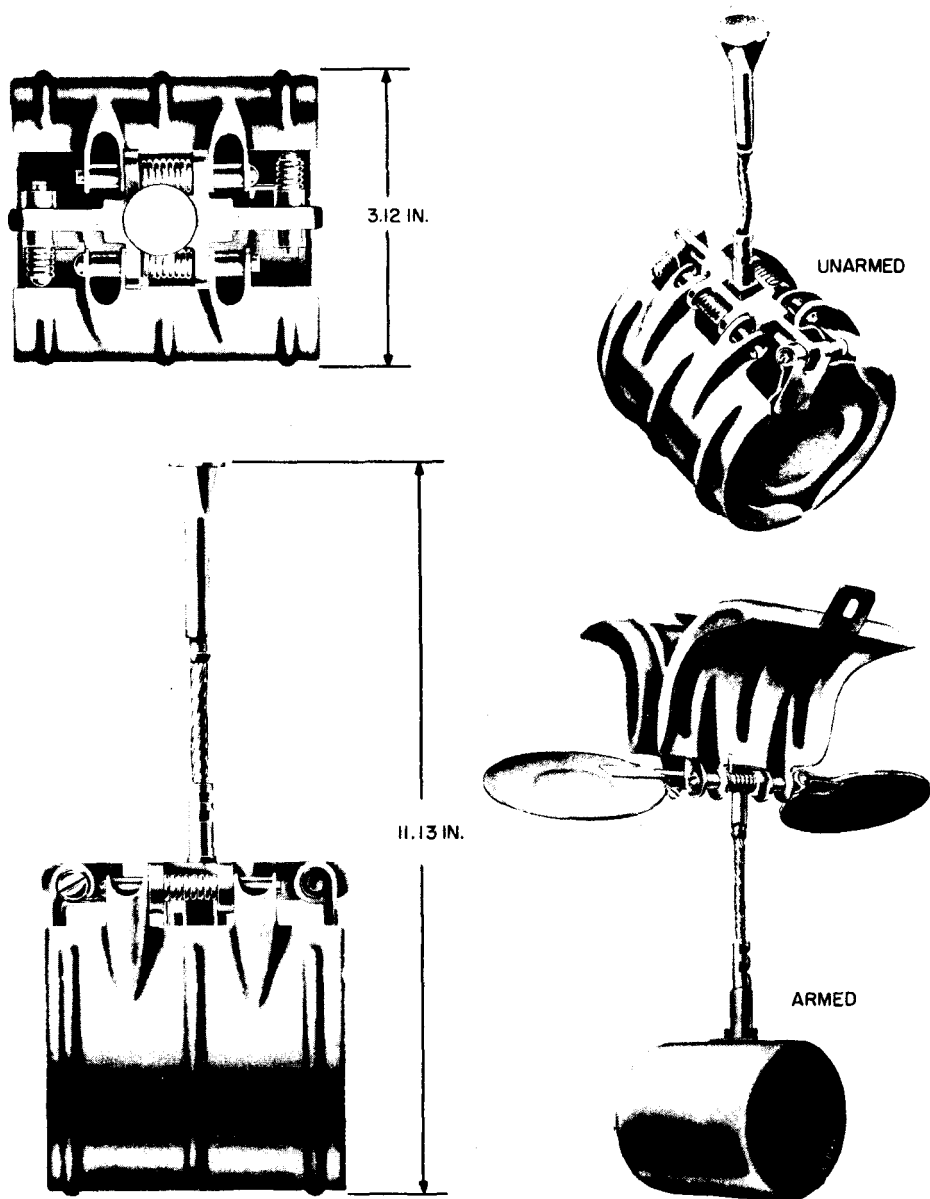


Figure 2-11. Bomb, Fragmentation; 4-Pound, M83

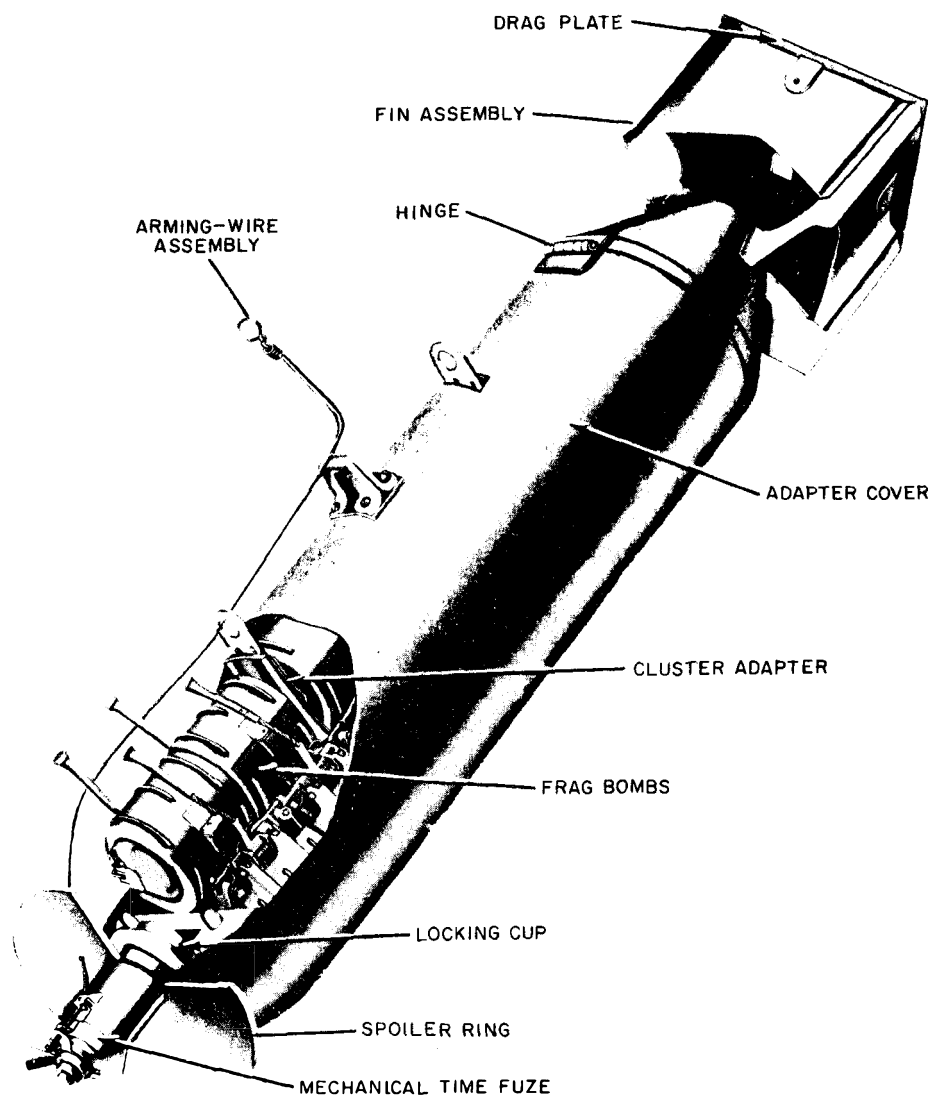


Figure 2-12. Cluster, Fragmentation Bomb:
100-lb. M28A2, Cutaway

1-37. Hazards: The smoke and fumes from burning TNT is highly toxic.

NOTE

The M 131 fuze contains an anti-disturbance
action.

1-38. Disposal: Detonate

FRAGMENTATION BOMBS, M 88 and M 81

1-39. Type: Fragmentation Bombs, M 88 and M 81 (reference figures 2-13 and 2-14)

1-40. Identification:

a. Sizes:

(1) 220-lb M 88

(2) 260-lb M 81

b. Markings:

(1) OD bomb body constructed of spirally wound square steel wire.
The size of the square steel wire is the only basic difference of the two bombs.
The 220-lb is 13/16 inch and the 260-lb is 1 inch.

(2) Yellow bands on nose and tail to identify the filler.

c. Lugs: 14-inch suspension; single suspension lug on opposite side.

d. Fins: Box or conical.

1-41. Filler: Comp B or TNT (220-lb may use ednatol).

1-42. Hazards: The smoke and fumes from burning TNT is highly toxic. Both bombs use auxiliary boosters.

1-43. Related Equipment:

a. Nose and tail fuzes.

b. Tail fins (box or conical).

c. Arming wire assembly with fahnstock clips.

1-44. Disposal: Detonate

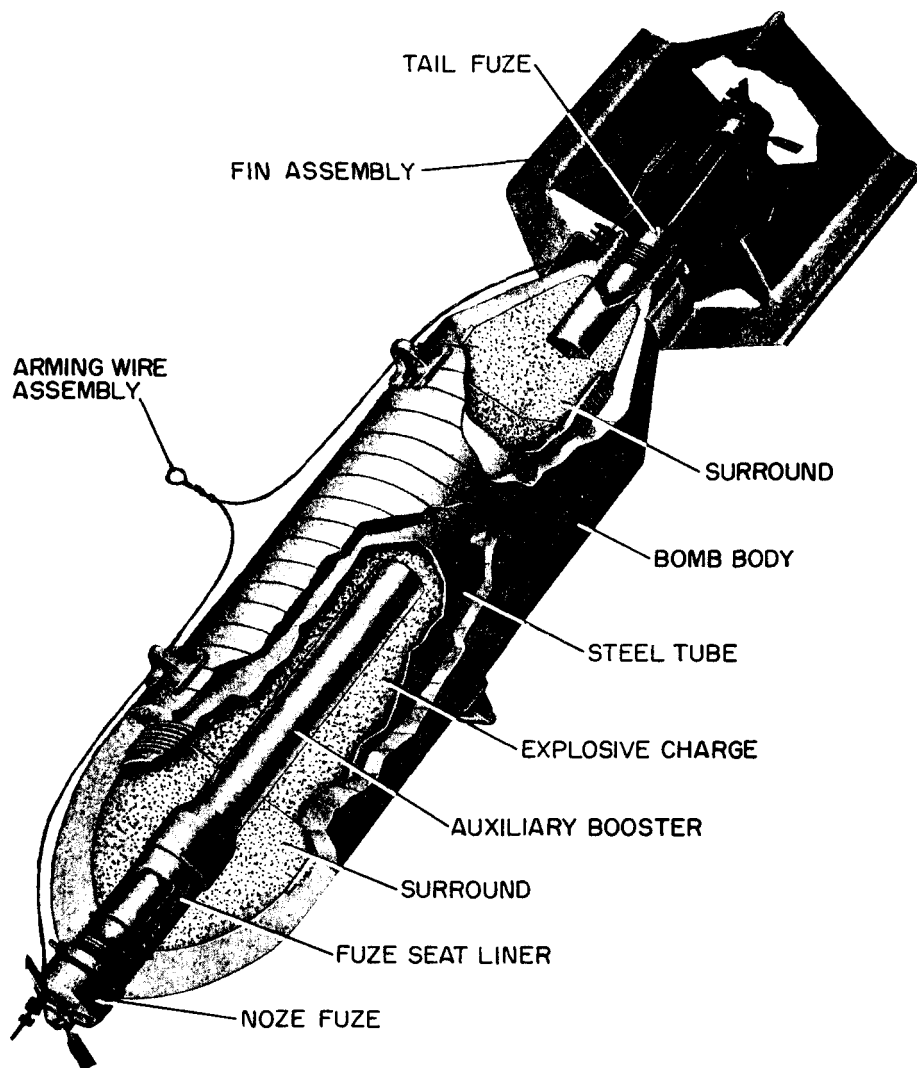


Figure 2-14. 260-lb. Fragmentation Bomb AN-M81 Cutaway

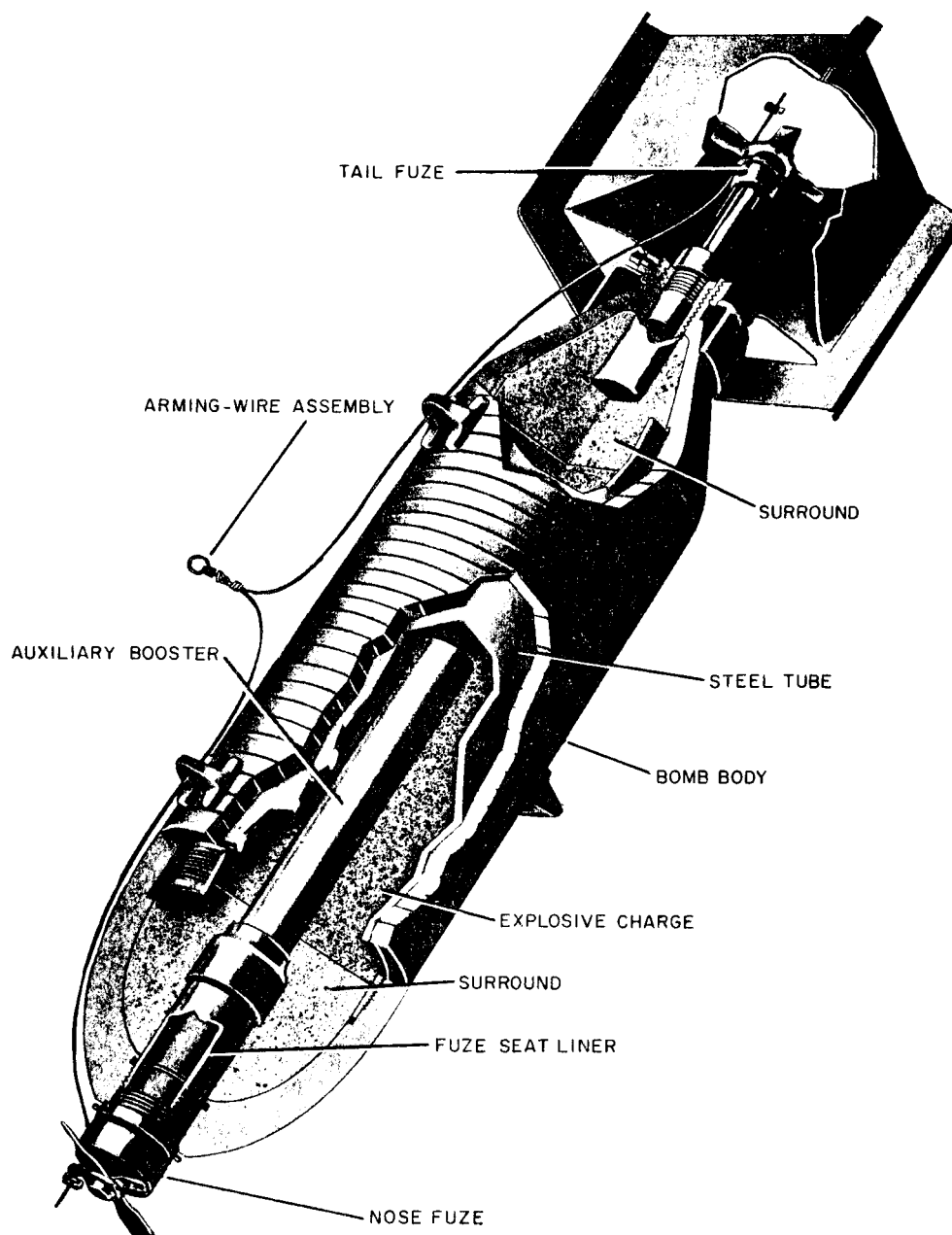


Figure 2-13. 220-lb. Fragmentation Bomb AN-M88 Cutaway

LEAFLET BOMBS, M 129 SERIES

- 1-45. Type: Leaflet Bombs, M 129 series (reference figures 2-15 and 2-16)
- 1-46. Identification:
- a. Sizes: 750-lb, the external configuration is similar to the 750-lb demolition bomb.
 - b. Markings: Olive green bomb body made of fiber glass. The bomb body is split in half longitudinally into two sections held together by four latches on each side.
 - c. Lugs: Three recesses, the two outside recesses are for 14-inch suspension, the center recess is for single suspension.
 - d. Fins: Four fiber glass sections glued and riveted together to form a cone. The fin assembly is attached to the bomb body with eight Dzus fasteners.
- 1-47. Cluster Operation: After release, the MT fuze functions at a predetermined time causing detonating cord to detonate, separating the two body sections, detaching the fin assembly and releasing the leaflets.
- 1-48. Filler: Leaflets
- 1-49. Hazards: Explosive components of the fuze, booster, and detonating cord.
- 1-50. Related Equipment:
- a. Nose fuze (MT) with adapter booster.
 - b. Arming wire assembly.
 - c. Fin assembly.
- 1-51. Disposal: Burn

INCENDIARY BOMB, AN-M47A4, 100-lb

- 1-52. Type: Incendiary Bomb, AN-M47A4, 100-lb (reference figures 2-17a and 17b)
- 1-53. Identification:
- a. Size: 100-lb AN-M47A4
 - b. Markings:
 - (1) Green body, yellow band with red markings.
 - (2) Cylindrical body, round nose, tapered aft section with welded on box fin constructed of thin sheet steel.
 - c. Lugs: Suspension bands equipped with heavy gauge suspension lugs. For single suspension, remove one band.

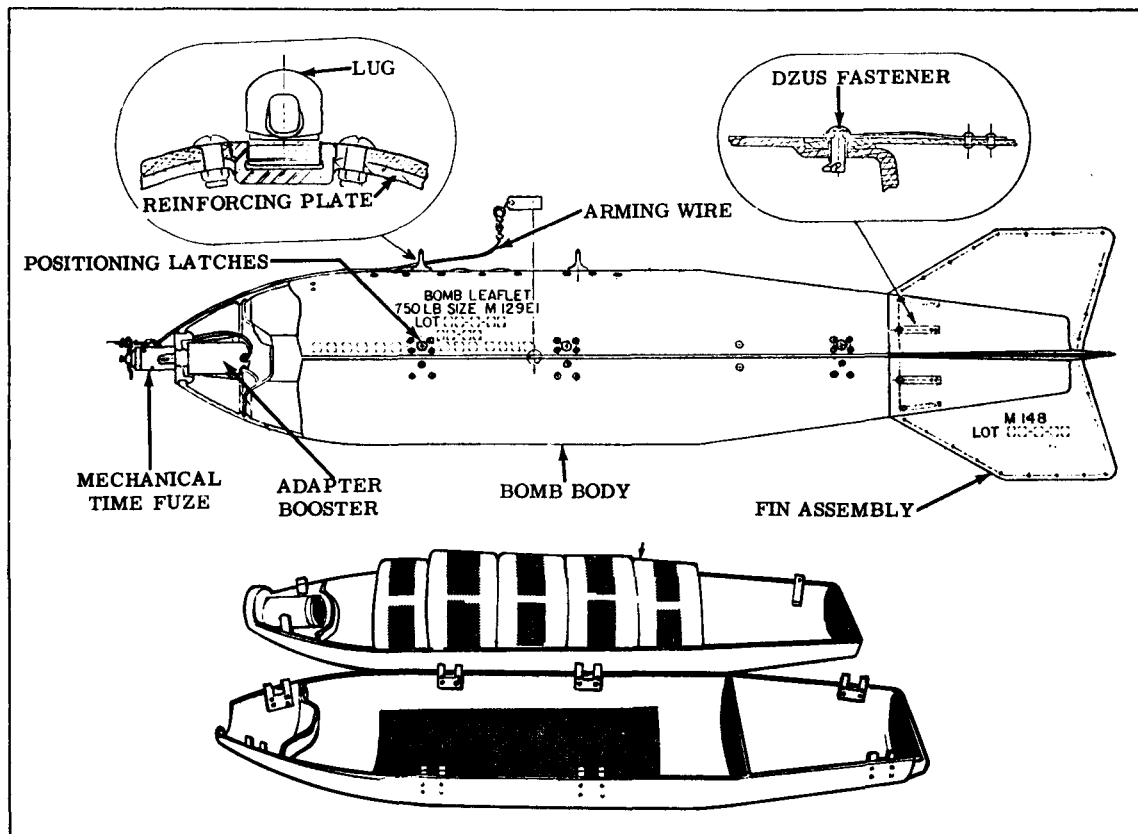
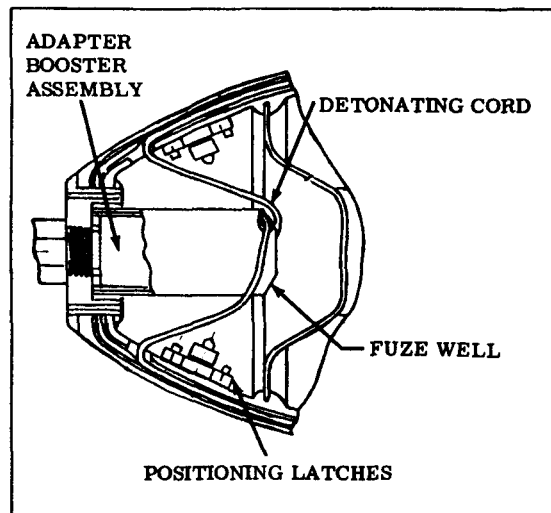


Figure 2-15. Bomb, 750-lb. Leaflet, M 129 Series



Positioning of Detonating Cord Through Opening in Base of Fuze Well

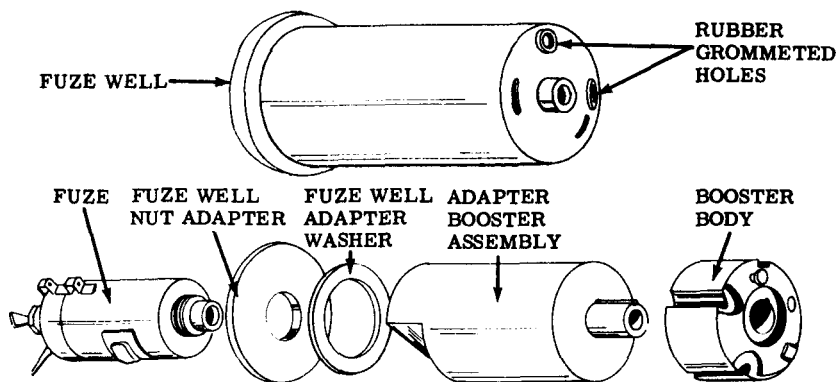
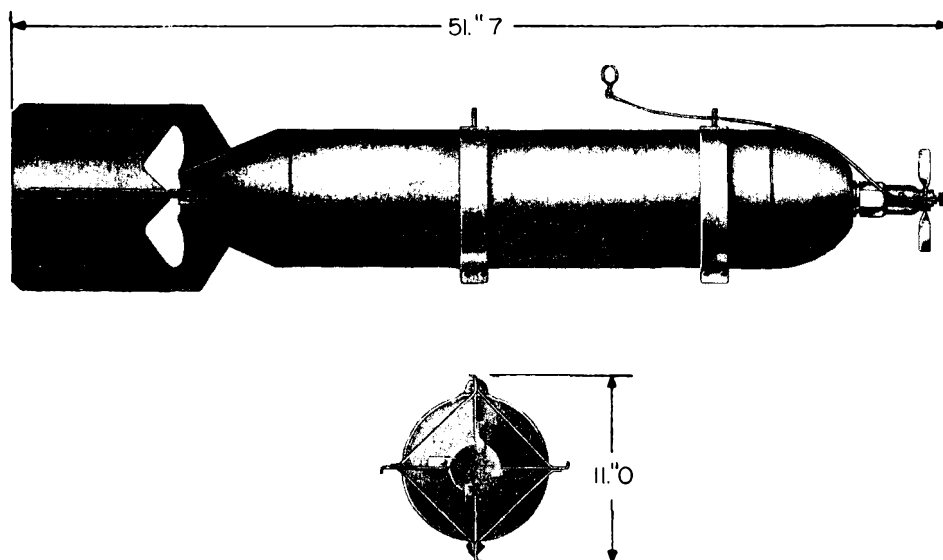


Figure 2-16. Fuzing Components of Leaflet Bomb, M129 Series



100-lb Smoke or Incendiary Bomb AN-M47A4, Exterior View
Figure 2-17A

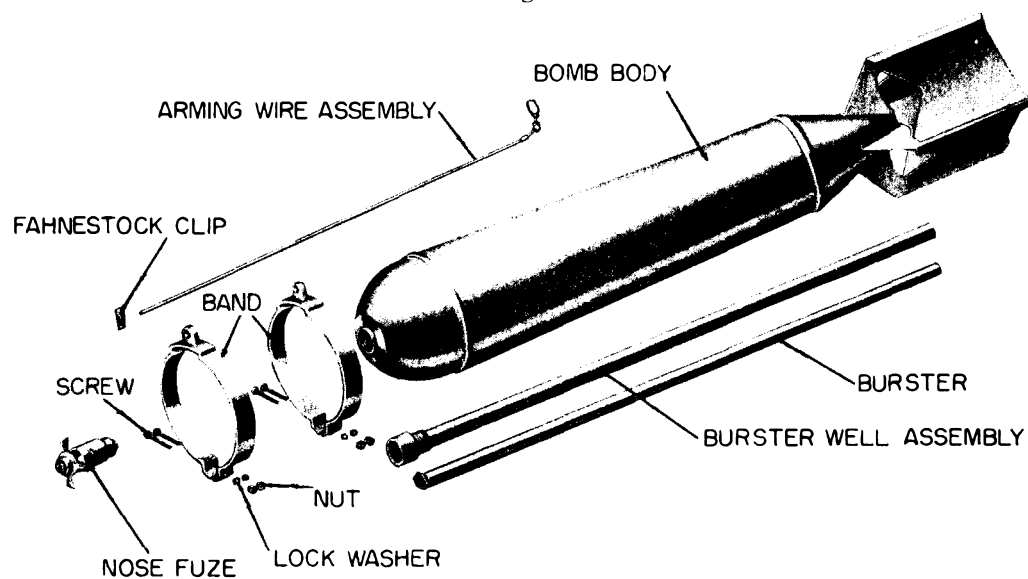


Figure 2-17B. 100-lb. Smoke or Incendiary Bomb AN-M47A4,
Exploded View

d. Fins: Welded on box type.

1-54. Filler: WP or PWP. PWP is more effective than WP because of its longer burning time, reduced pillaring, and increased antipersonnel effect.

1-55. Hazards: WP precautions apply. Leakers could detonate from heat.

1-56. Related Equipment:

a. Nose fuze.

b. Burst M 18 or M 20 (black powder/tetryl).

c. Arming wire assembly.

1-57. Disposal: Detonate

BLU SERIES FIRE BOMB

1-58. Type: BLU Series Fire Bomb (reference figure 2-18)

1-59. Identification:

a. Sizes:

(1) BLU 1/B series 750-lb

(2) BLU 10/B series 250-lb

(3) BLU 23/B 500-lb

(4) BLU 27/B prefilled 750-lb

(5) BLU 32/B prefilled 500-lb

b. Markings: Unpainted aluminum alloy construction. No color code on the prefilled (napalm B). The BLU-1, 10, and 23/B may have a 3-inch red band on the nose and tail. All bombs are tip tank type configuration.

c. Lugs: All BLU series fire bombs are equipped for 14-inch suspension.

d. Fins: The use of fin assemblies is optional except for the BLU 10 series. No fin assembly is provided for the BLU 10 series.

1-60. Filler: The BLU-1, 10, and 23 use napalm; the BLU-27 and 32 use napalm B.

1-61. Hazards: Fire. When fuzed, all bombs will contain "ALWAYS ACTION" fuzing.

1-62. Related Equipment:

a. Fuzes/igniters (nose and tail).

b. Fin assembly (optional).

c. Cable and initiator assemblies.

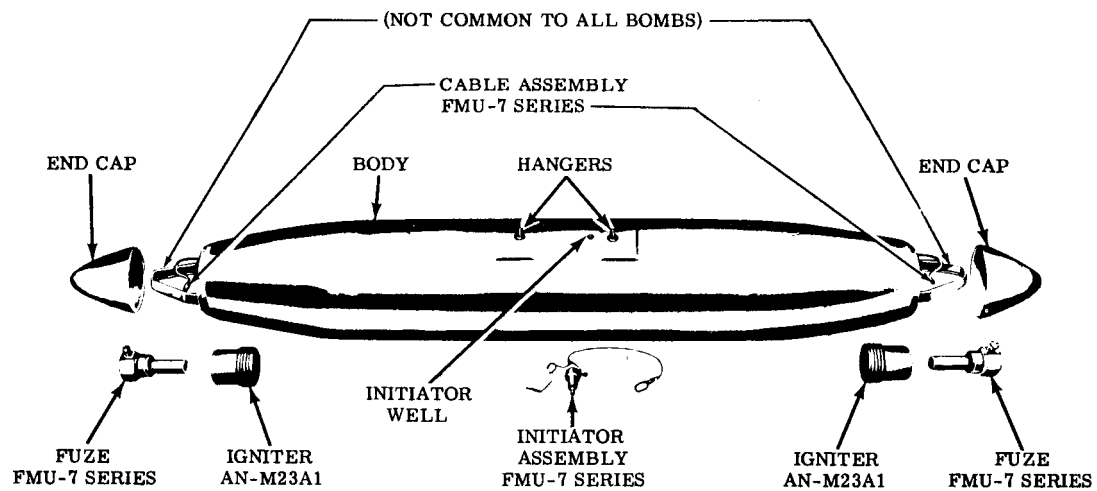


Figure 2-18. BLU Series Fire Bomb and Components (Typical)

1-63. Disposal: Burn

NOTE

Prefilled napalm B bombs have welded seams.

M 36 INCENDIARY CLUSTER/TH 3, 4-lb, M 126 BOMB

1-64. Type: M 36 Incendiary Cluster / TH 3, 4-lb, M 126 bomb (reference figures 2-19a and 2-19b)

1-65. Identification:

a. Sizes: The M 36 incendiary bomb cluster (750-lb) consists of an M 30 cluster adapter loaded with 182 M 126 incendiary bombs (4-lb).

b. Markings: Olive green color, clam shell type body; red band on nose of cluster.

c. Lugs: Three threaded suspension lug mounting holes. The two outer holes or the center hole may be used, depending on suspension used.

d. Fins: A conical type attached to the cluster by a lock ring and tie rod.

1-66. Cluster Operation: At release, the arming wire is withdrawn from the mechanical time fuzes allowing vane rotation to arm the fuzes. The fuzes function, detonating the detonating cord in the upper and lower cluster casings hinge tube, allowing the casings to separate. The M 126 bombs fall free of the cluster, arm on separation, and function on impact.

1-67. Filler: 182, 4-lb, TH 3 incendiary bombs (MG bomb body with TH 3 filler)

1-68. Hazards: A 22-foot length of detonating cord is located in the hinge tube of the cluster.

NOTE

The AN-M50XA3, 4-lb, TH 3 incendiary bomb, contains an explosive charge. This bomb, minus its fin assembly, looks identical to the M 126 bomb.

1-69. Related Equipment:

a. Two MT tail fuzes.

b. Fin assembly.

c. Arming wire assembly with fahnstock clips.

1-70. Disposal: Burn

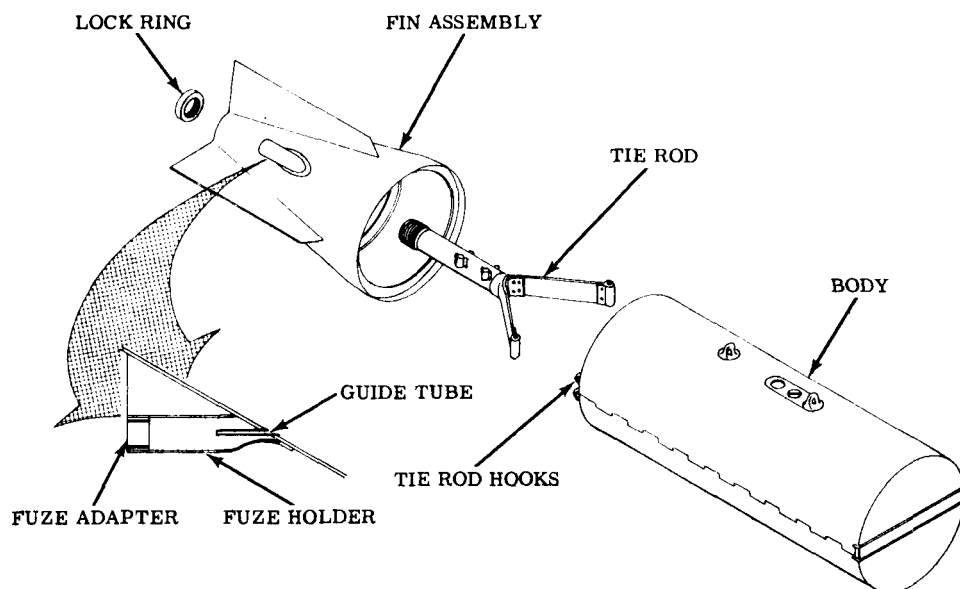


Figure 2-19A. Incendiary Bomb Cluster, M35 or M36,
Exploded View

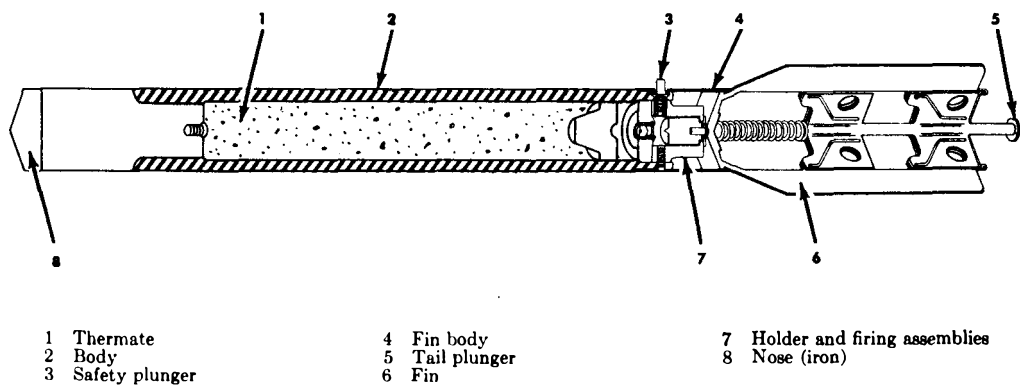


Figure 2-19B. Bomb, Incendiary: TH3, 4-Pound, M126
Cutaway View

CHEMICAL BOMBS, BLU 52/B and BLU 52 A/B

1-71. Type: Chemical Bombs, BLU 52/B and BLU 52 A/B (reference figures 2-20a, 2-20b, and 2-20c)

1-72. Identification:

a. Sizes: 750-lb modified BLU 1C/B fire bomb.

b. Markings:

(1) BLU 52/B--OD bomb body constructed of aluminum. Three gray stripes located on the nose, tail, and center sections. These stripes are 3-1/2 inches wide with a 1/2 inch red stripe centered on the gray.

(2) BLU 52 A/B--gray bomb body constructed of aluminum. Two decals, one each on nose and tail, 1-1/2 inches wide with two red stripes 1/2 inch wide centered in gray.

c. Lugs: 14-inch suspension.

d. Fins: Welded or bolted construction.

1-73. Filler:

a. BLU 52/B--259 pounds of CS-1

b. BLU 52 A/B--259 pounds of CS-2

1-74. Hazards: CS is an irritation chemical agent.

1-75. Related Equipment: Tail fin assembly.

NOTE

The bombs do not contain explosive components.
They function by bursting upon impact to
disseminate the chemical agent.

1-76. Disposal: Decontaminate (Disaster Preparedness)

FLARE, AIRCRAFT PARACHUTE, MK 24 SERIES

1-77. Type: Flare, Aircraft Parachute, MK 24 series (reference figure 2-21)

1-78. Identification:

a. Size: The flare is aluminum alloy construction, 35.9 inches long and 4.8 inches in diameter. Weight is 27 pounds.

b. Markings: A brown band on white located at the aft end of flare body.

c. Candlepower: 2,000,000

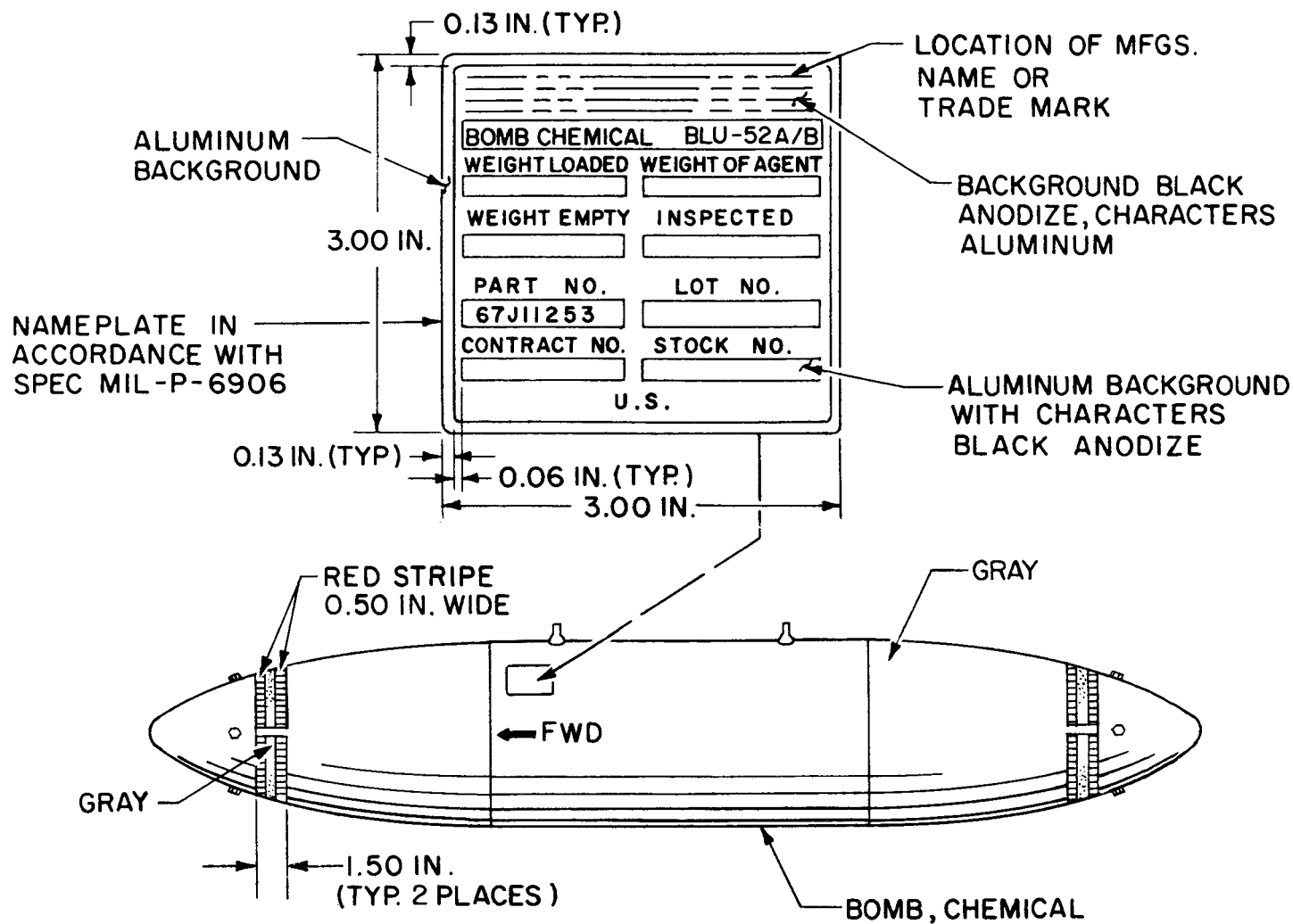


Figure 2-20A. Markings for Chemical Bomb, BLU-52 A/B

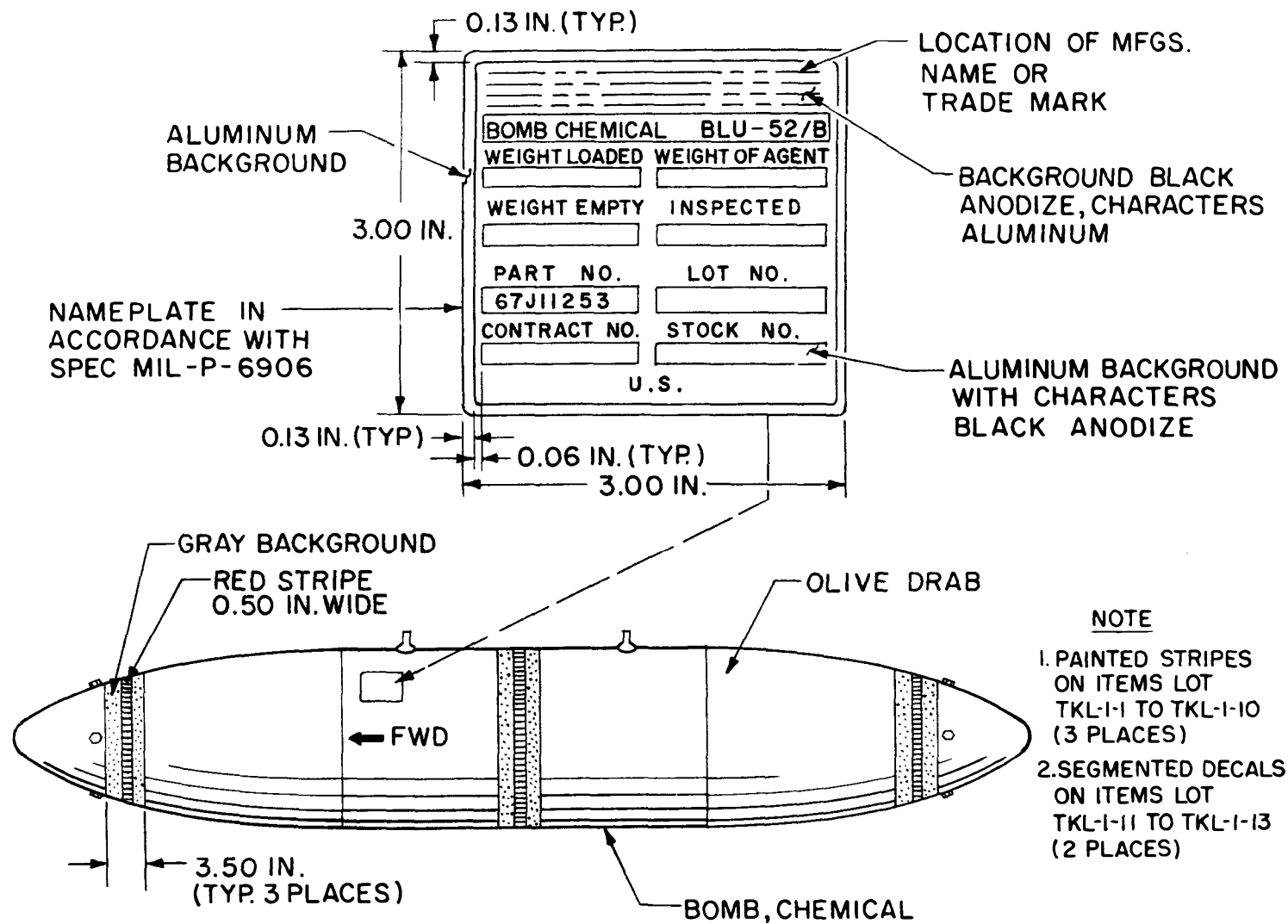


Figure 2-20B. Markings for Chemical Bomb, BLU-52/B

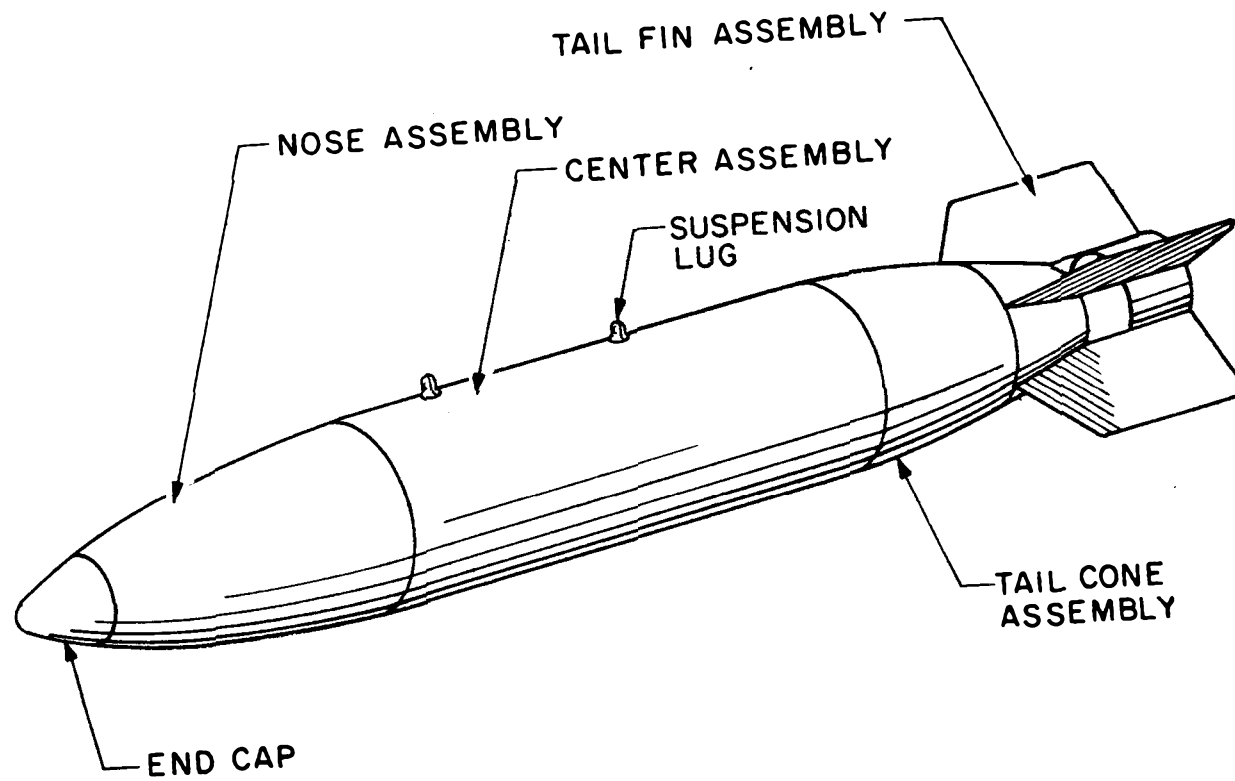


Figure 2-20C. Chemical Bomb, BLU-52/B and BLU-52 A/B

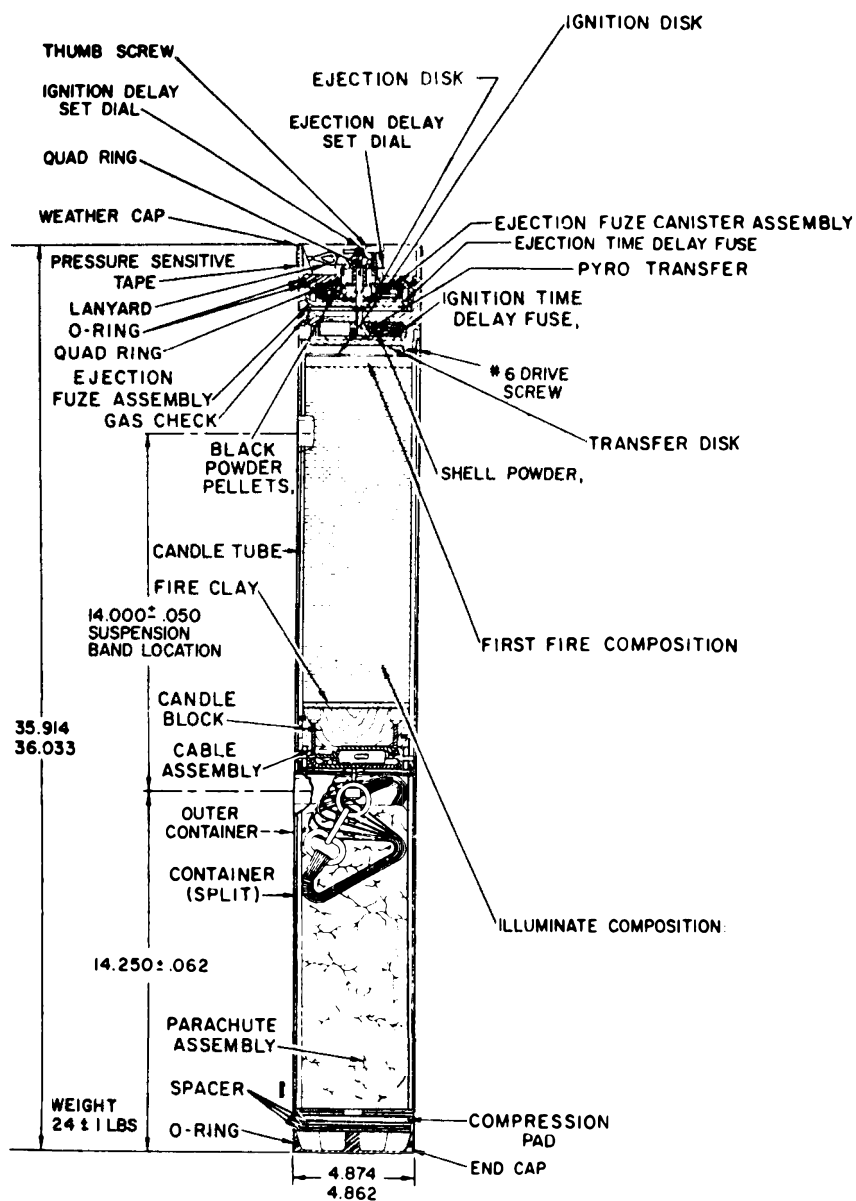


Figure 2-21. MK24, Aircraft Parachute Flare

- d. Burning time: 3 minutes, generates 3,500 degrees centigrade.
 - e. Launching method: Dropped, dispensed, or thrown by hand from aircraft.
- 1-79. Operation: Ignition and ejection settings are made on the fuze prior to launch. The safety pin is removed as last step prior to launch. At launch the ejection delay is actuated by the flexible steel cable when it receives 6 to 12 pounds of pull. At 50 pounds of pull the lanyard disconnect separates. When the parachute and illuminate composition are ejected, the ignition delay is initiated by hot gases from the ejection charge. The parachute opens and the illuminating composition is ignited upon expiration of the ignition delay.
- 1-80. Filler: 15 pounds of magnesium and sodium nitrate.
- 1-81. Hazards: Ejection charge, always approach and work from the side.
- 1-82. Disposal: Refer to AF TO 60K-2-2-4.

FLARE AIRCRAFT PARACHUTE, MK 45

- 1-83. Type: Flare Aircraft Parachute, MK 45 (reference figures 2-22a and 2-22b)
- 1-84. Identification:
- a. Size: The flare is of aluminum alloy construction, 36 inches long and 5 inches in diameter. The weight is 28 pounds.
 - b. Markings: A brown band on white located at the aft end of the flare body.
 - c. Candlepower: 2,000,000
 - d. Burning time: 2.5 to 3 minutes, generates 3,500 degrees centigrade.
 - e. Launching method: Clamped on suspension lugs.
- 1-85. Operation: At release, the lanyard removes the safety clip and releases a cocked striker to ignite a positive 2 second safe separation delay. At the expiration of the preset delay, the ejection charge separates the parachute and candle. Two sets of cables are attached to the parachute shroud lines, one of which is shorter than the other. As the parachute is deployed, the short set of cables exerts a pulling force on the firing pin assembly, cocking and releasing the firing pin which ignites the firing train and candle. As the candle approaches burnout, the resultant heat functions an explosive bolt releasing 10 shroud lines, collapsing the parachute.
- 1-86. Filler: Magnesium, sodium nitrate, and a binding agent.
- 1-87. Hazards: Flare candle, igniter assembly, explosive bolt in the parachute assembly, and the fuze MK 364.
- 1-88. Disposal: Refer to AF TO 60K-2-2-10.



Figure 2-22A. MK45 Aircraft Parachute Flare

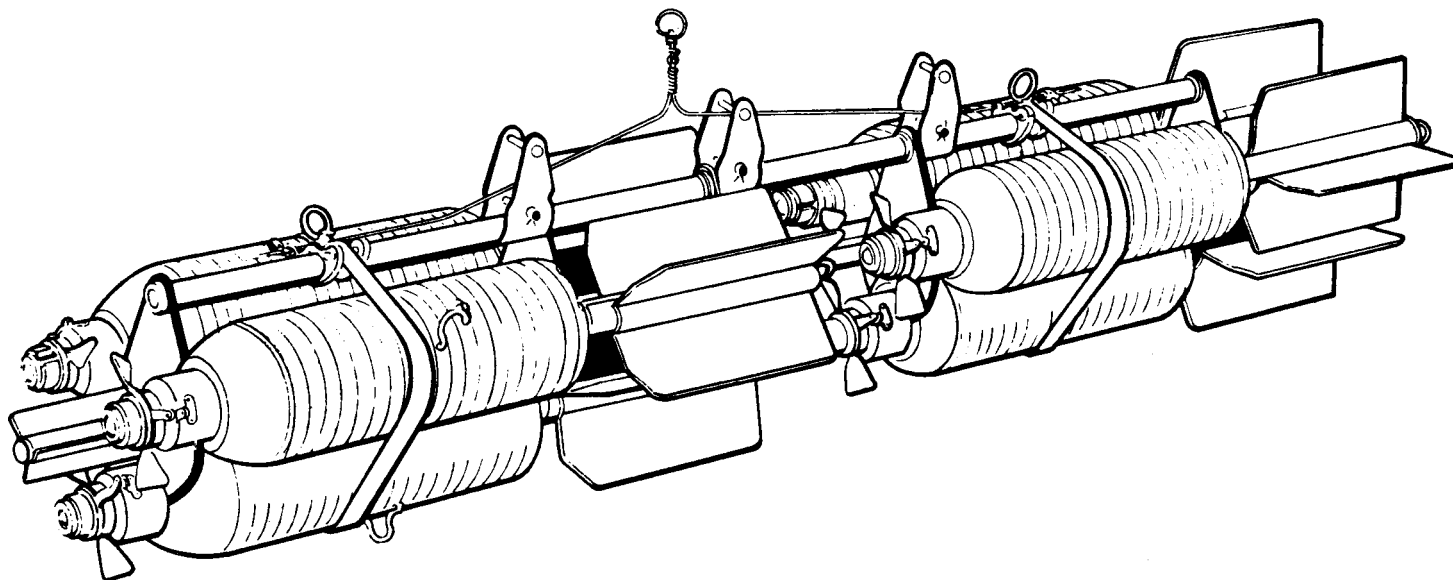


Figure 2-10. Bomb, Fragmentations Cluster M1A1

1-27. Cluster Operation: Upon release, the arming wire is extracted from the cluster allowing the bombs to separate. Fuze vane rotation begins at cluster bomb separation.

NOTE

An intact cluster (M1A1) must be disassembled prior to fuze removal.

1-28. Filler: TNT and Comp B (14 percent weight ratio)

1-29. Related Equipment: None. The AN-M41A1 bomb is issued assembled and completely fuzed in the M1A1 cluster.

1-30. Hazards: The smoke and fumes from burning TNT is highly toxic.

1-31. Disposal: Detonate

FRAGMENTATION CLUSTER, AN-M28A2, 100-lb

1-32. Type: Fragmentation Cluster, AN-M28A2, 100-lb (reference figures 2-11 and 2-12)

1-33. Identification:

a. Size: M 83, 4-lb (24 each)

b. Markings:

(1) OD bomb body

(2) Yellow band on nose

(3) Type of bomb fuzing marked on cluster body; that is, M 129, M 130, M 131, or "mixed."

c. Lugs: 14-inch suspension; may be carried by single suspension (Navy).

d. Fins: Box-type fin with drag plate.

1-34. Cluster Operation: Upon release, the arming wire is withdrawn and the fuze is allowed to arm. The fuze functions, permitting the cluster to open. The 24 M 83 frag bombs are dispersed by spring action.

1-35. Filler: TNT

1-36. Related Equipment:

a. Nose fuze

b. Arming wire--fahnstock clip

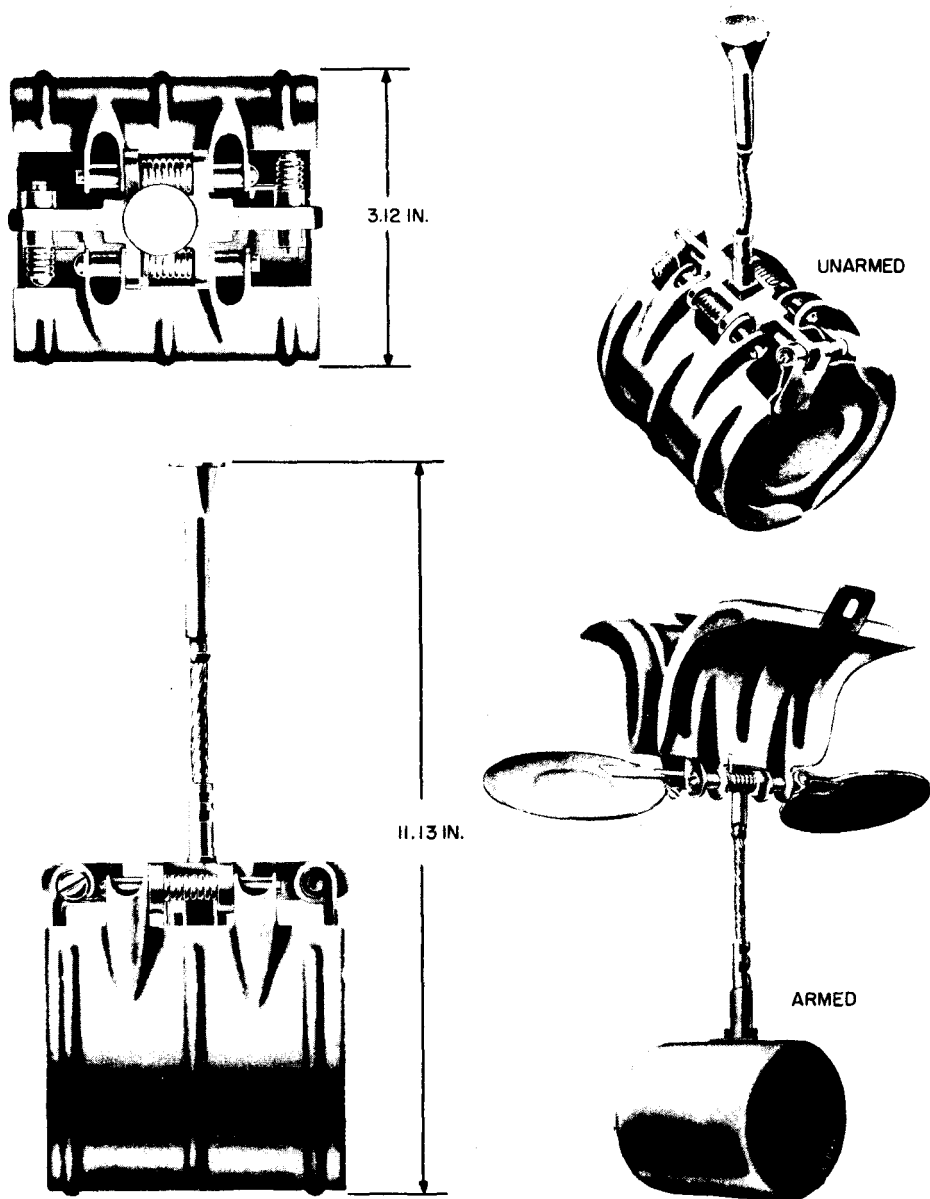


Figure 2-11. Bomb, Fragmentation; 4-Pound, M83

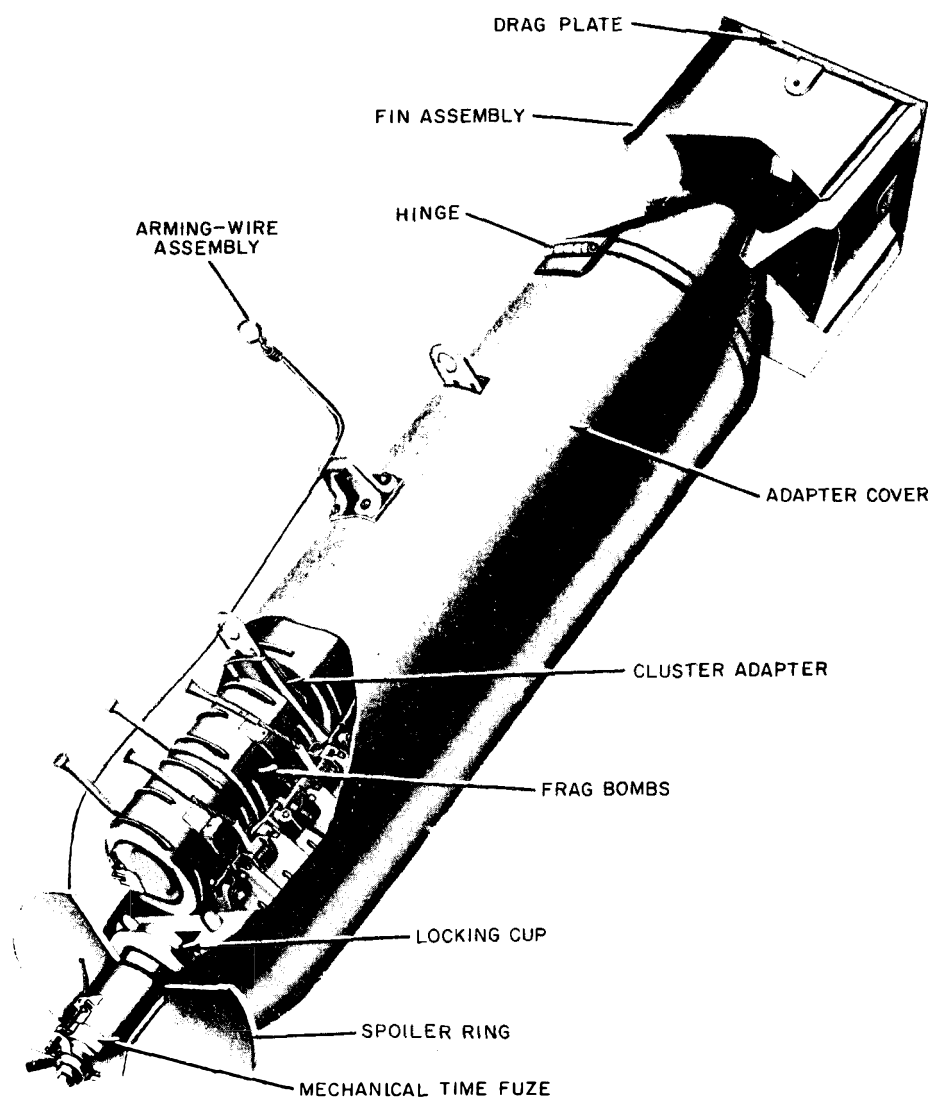


Figure 2-12. Cluster, Fragmentation Bomb:
100-lb. M28A2, Cutaway

1-37. Hazards: The smoke and fumes from burning TNT is highly toxic.

NOTE

The M 131 fuze contains an anti-disturbance
action.

1-38. Disposal: Detonate

FRAGMENTATION BOMBS, M 88 and M 81

1-39. Type: Fragmentation Bombs, M 88 and M 81 (reference figures 2-13 and 2-14)

1-40. Identification:

a. Sizes:

(1) 220-lb M 88

(2) 260-lb M 81

b. Markings:

(1) OD bomb body constructed of spirally wound square steel wire.
The size of the square steel wire is the only basic difference of the two bombs.
The 220-lb is 13/16 inch and the 260-lb is 1 inch.

(2) Yellow bands on nose and tail to identify the filler.

c. Lugs: 14-inch suspension; single suspension lug on opposite side.

d. Fins: Box or conical.

1-41. Filler: Comp B or TNT (220-lb may use ednatol).

1-42. Hazards: The smoke and fumes from burning TNT is highly toxic. Both bombs use auxiliary boosters.

1-43. Related Equipment:

a. Nose and tail fuzes.

b. Tail fins (box or conical).

c. Arming wire assembly with fahnstock clips.

1-44. Disposal: Detonate

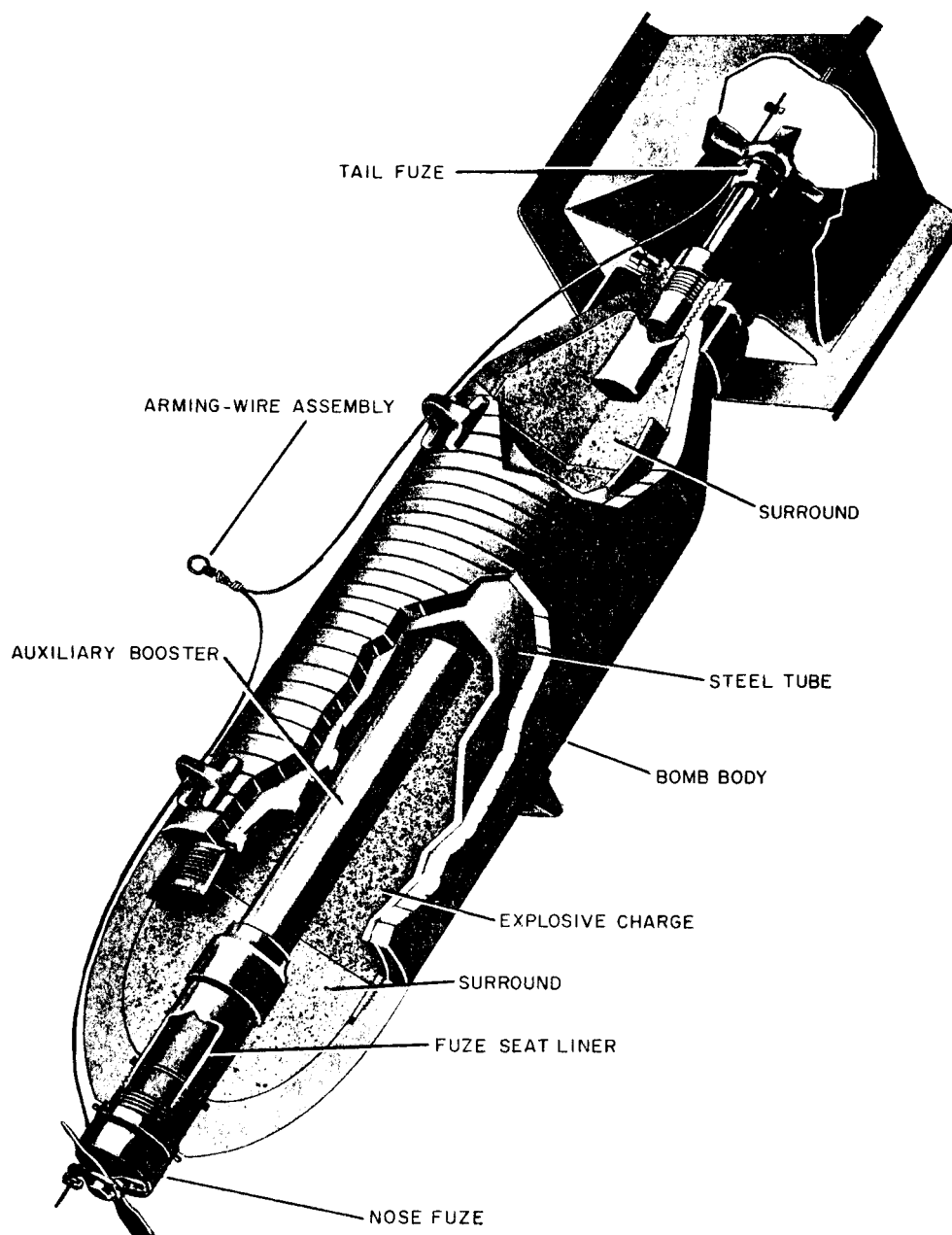


Figure 2-13. 220-lb. Fragmentation Bomb AN-M88 Cutaway

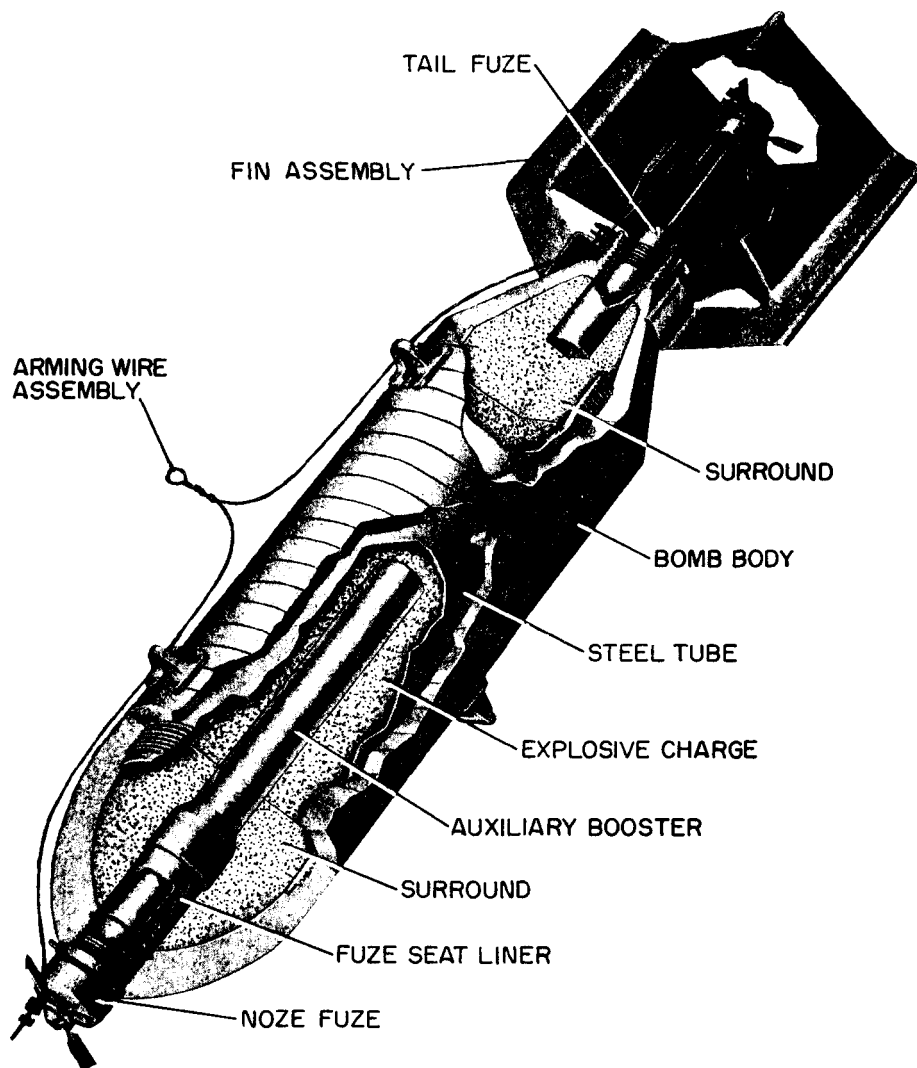


Figure 2-14. 260-lb. Fragmentation Bomb AN-M81 Cutaway

LEAFLET BOMBS, M 129 SERIES

- 1-45. Type: Leaflet Bombs, M 129 series (reference figures 2-15 and 2-16)
- 1-46. Identification:
- a. Sizes: 750-lb, the external configuration is similar to the 750-lb demolition bomb.
 - b. Markings: Olive green bomb body made of fiber glass. The bomb body is split in half longitudinally into two sections held together by four latches on each side.
 - c. Lugs: Three recesses, the two outside recesses are for 14-inch suspension, the center recess is for single suspension.
 - d. Fins: Four fiber glass sections glued and riveted together to form a cone. The fin assembly is attached to the bomb body with eight Dzus fasteners.
- 1-47. Cluster Operation: After release, the MT fuze functions at a predetermined time causing detonating cord to detonate, separating the two body sections, detaching the fin assembly and releasing the leaflets.
- 1-48. Filler: Leaflets
- 1-49. Hazards: Explosive components of the fuze, booster, and detonating cord.
- 1-50. Related Equipment:
- a. Nose fuze (MT) with adapter booster.
 - b. Arming wire assembly.
 - c. Fin assembly.
- 1-51. Disposal: Burn

INCENDIARY BOMB, AN-M47A4, 100-lb

- 1-52. Type: Incendiary Bomb, AN-M47A4, 100-lb (reference figures 2-17a and 17b)
- 1-53. Identification:
- a. Size: 100-lb AN-M47A4
 - b. Markings:
 - (1) Green body, yellow band with red markings.
 - (2) Cylindrical body, round nose, tapered aft section with welded on box fin constructed of thin sheet steel.
 - c. Lugs: Suspension bands equipped with heavy gauge suspension lugs. For single suspension, remove one band.

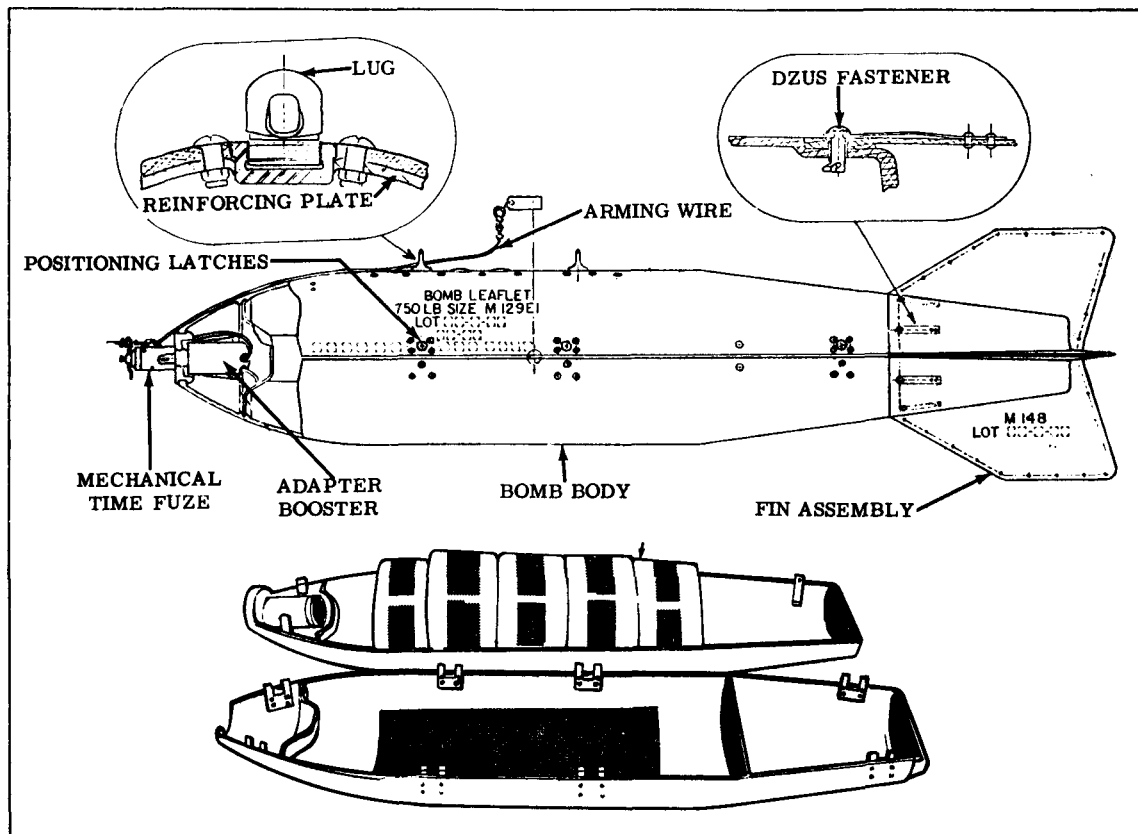
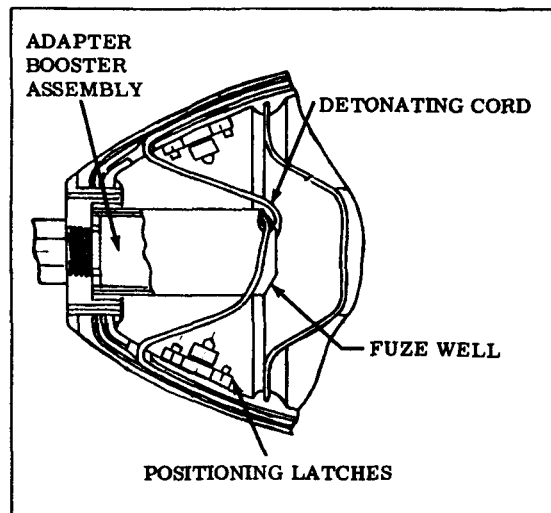


Figure 2-15. Bomb, 750-lb. Leaflet, M 129 Series



Positioning of Detonating Cord Through Opening in Base of Fuze Well

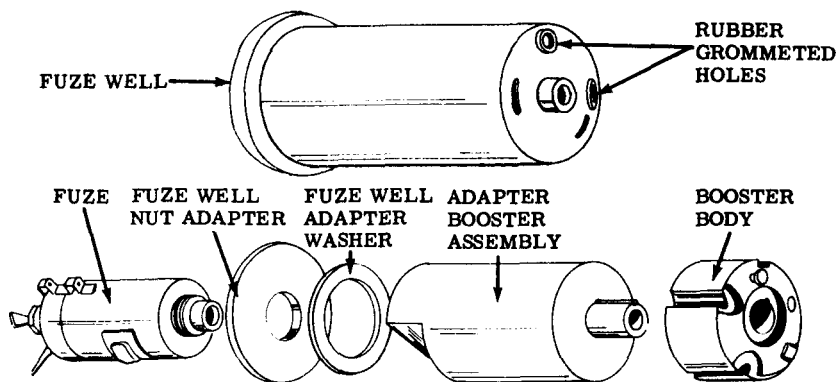
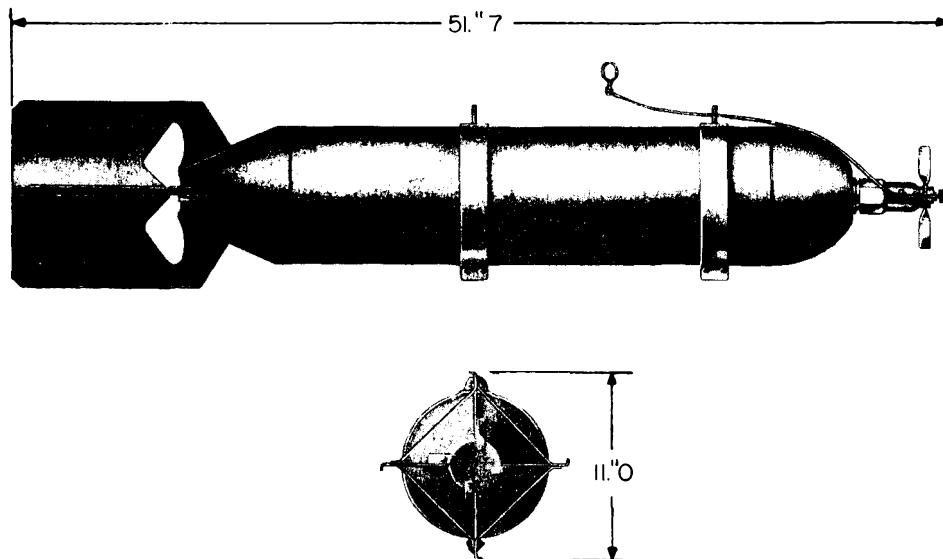


Figure 2-16. Fuzing Components of Leaflet Bomb, M129 Series



100-lb Smoke or Incendiary Bomb AN-M47A4, Exterior View
Figure 2-17A

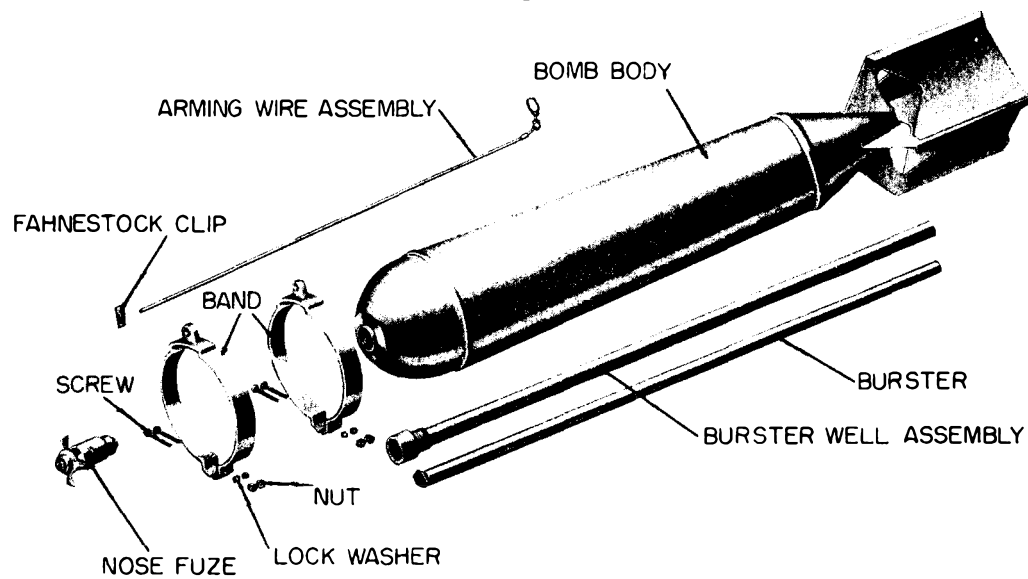


Figure 2-17B. 100-lb. Smoke or Incendiary Bomb AN-M47A4,
Exploded View

d. Fins: Welded on box type.

1-54. Filler: WP or PWP. PWP is more effective than WP because of its longer burning time, reduced pillaring, and increased antipersonnel effect.

1-55. Hazards: WP precautions apply. Leakers could detonate from heat.

1-56. Related Equipment:

a. Nose fuze.

b. Burst M 18 or M 20 (black powder/tetryl).

c. Arming wire assembly.

1-57. Disposal: Detonate

BLU SERIES FIRE BOMB

1-58. Type: BLU Series Fire Bomb (reference figure 2-18)

1-59. Identification:

a. Sizes:

(1) BLU 1/B series 750-lb

(2) BLU 10/B series 250-lb

(3) BLU 23/B 500-lb

(4) BLU 27/B prefilled 750-lb

(5) BLU 32/B prefilled 500-lb

b. Markings: Unpainted aluminum alloy construction. No color code on the prefilled (napalm B). The BLU-1, 10, and 23/B may have a 3-inch red band on the nose and tail. All bombs are tip tank type configuration.

c. Lugs: All BLU series fire bombs are equipped for 14-inch suspension.

d. Fins: The use of fin assemblies is optional except for the BLU 10 series. No fin assembly is provided for the BLU 10 series.

1-60. Filler: The BLU-1, 10, and 23 use napalm; the BLU-27 and 32 use napalm B.

1-61. Hazards: Fire. When fuzed, all bombs will contain "ALWAYS ACTION" fuzing.

1-62. Related Equipment:

a. Fuzes/igniters (nose and tail).

b. Fin assembly (optional).

c. Cable and initiator assemblies.

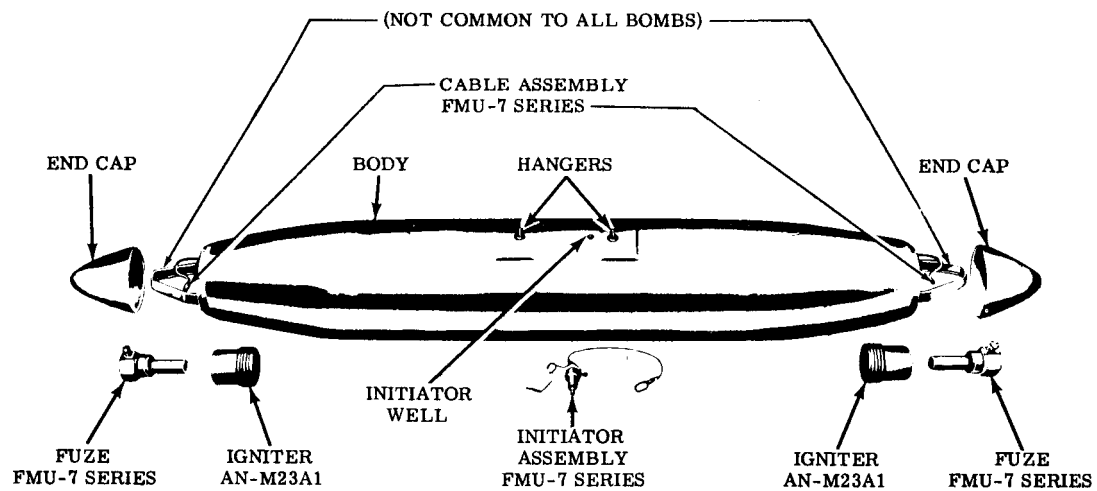


Figure 2-18. BLU Series Fire Bomb and Components (Typical)

1-63. Disposal: Burn

NOTE

Prefilled napalm B bombs have welded seams.

M 36 INCENDIARY CLUSTER/TH 3, 4-lb, M 126 BOMB

1-64. Type: M 36 Incendiary Cluster / TH 3, 4-lb, M 126 bomb (reference figures 2-19a and 2-19b)

1-65. Identification:

a. Sizes: The M 36 incendiary bomb cluster (750-lb) consists of an M 30 cluster adapter loaded with 182 M 126 incendiary bombs (4-lb).

b. Markings: Olive green color, clam shell type body; red band on nose of cluster.

c. Lugs: Three threaded suspension lug mounting holes. The two outer holes or the center hole may be used, depending on suspension used.

d. Fins: A conical type attached to the cluster by a lock ring and tie rod.

1-66. Cluster Operation: At release, the arming wire is withdrawn from the mechanical time fuzes allowing vane rotation to arm the fuzes. The fuzes function, detonating the detonating cord in the upper and lower cluster casings hinge tube, allowing the casings to separate. The M 126 bombs fall free of the cluster, arm on separation, and function on impact.

1-67. Filler: 182, 4-lb, TH 3 incendiary bombs (MG bomb body with TH 3 filler)

1-68. Hazards: A 22-foot length of detonating cord is located in the hinge tube of the cluster.

NOTE

The AN-M50XA3, 4-lb, TH 3 incendiary bomb, contains an explosive charge. This bomb, minus its fin assembly, looks identical to the M 126 bomb.

1-69. Related Equipment:

a. Two MT tail fuzes.

b. Fin assembly.

c. Arming wire assembly with fahnstock clips.

1-70. Disposal: Burn

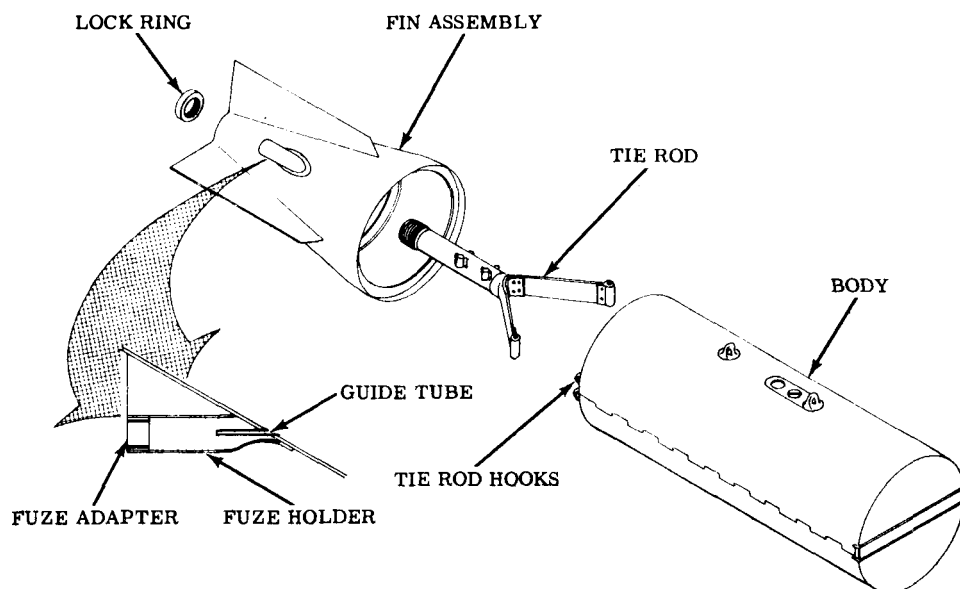


Figure 2-19A. Incendiary Bomb Cluster, M35 or M36,
Exploded View

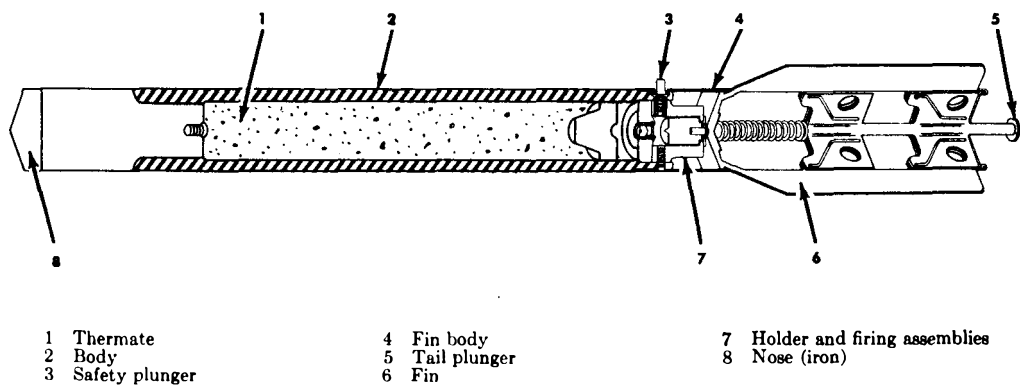


Figure 2-19B. Bomb, Incendiary: TH3, 4-Pound, M126
Cutaway View

CHEMICAL BOMBS, BLU 52/B and BLU 52 A/B

1-71. Type: Chemical Bombs, BLU 52/B and BLU 52 A/B (reference figures 2-20a, 2-20b, and 2-20c)

1-72. Identification:

a. Sizes: 750-lb modified BLU 1C/B fire bomb.

b. Markings:

(1) BLU 52/B--OD bomb body constructed of aluminum. Three gray stripes located on the nose, tail, and center sections. These stripes are 3-1/2 inches wide with a 1/2 inch red stripe centered on the gray.

(2) BLU 52 A/B--gray bomb body constructed of aluminum. Two decals, one each on nose and tail, 1-1/2 inches wide with two red stripes 1/2 inch wide centered in gray.

c. Lugs: 14-inch suspension.

d. Fins: Welded or bolted construction.

1-73. Filler:

a. BLU 52/B--259 pounds of CS-1

b. BLU 52 A/B--259 pounds of CS-2

1-74. Hazards: CS is an irritation chemical agent.

1-75. Related Equipment: Tail fin assembly.

NOTE

The bombs do not contain explosive components.
They function by bursting upon impact to
disseminate the chemical agent.

1-76. Disposal: Decontaminate (Disaster Preparedness)

FLARE, AIRCRAFT PARACHUTE, MK 24 SERIES

1-77. Type: Flare, Aircraft Parachute, MK 24 series (reference figure 2-21)

1-78. Identification:

a. Size: The flare is aluminum alloy construction, 35.9 inches long and 4.8 inches in diameter. Weight is 27 pounds.

b. Markings: A brown band on white located at the aft end of flare body.

c. Candlepower: 2,000,000

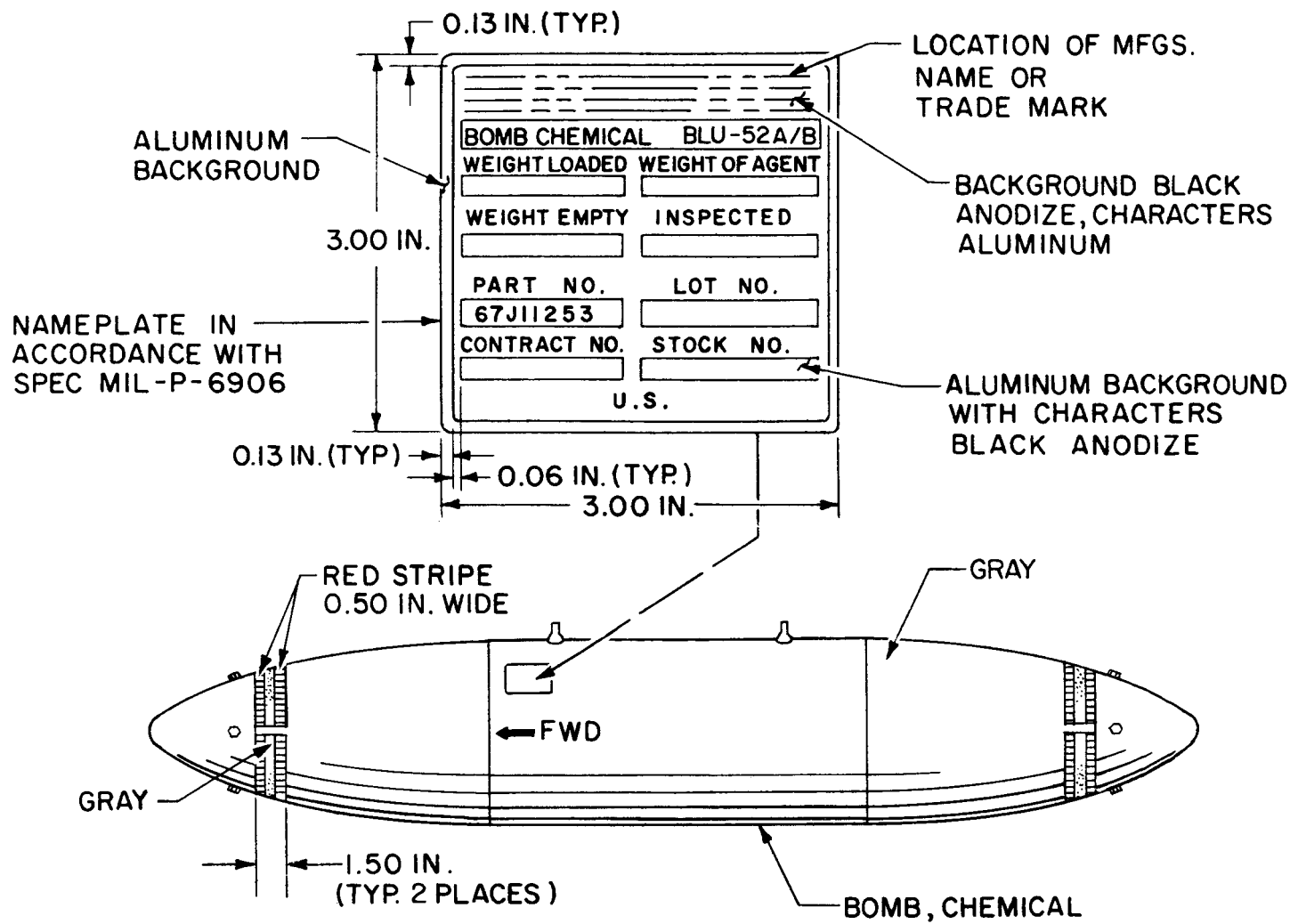


Figure 2-20A. Markings for Chemical Bomb, BLU-52 A/B

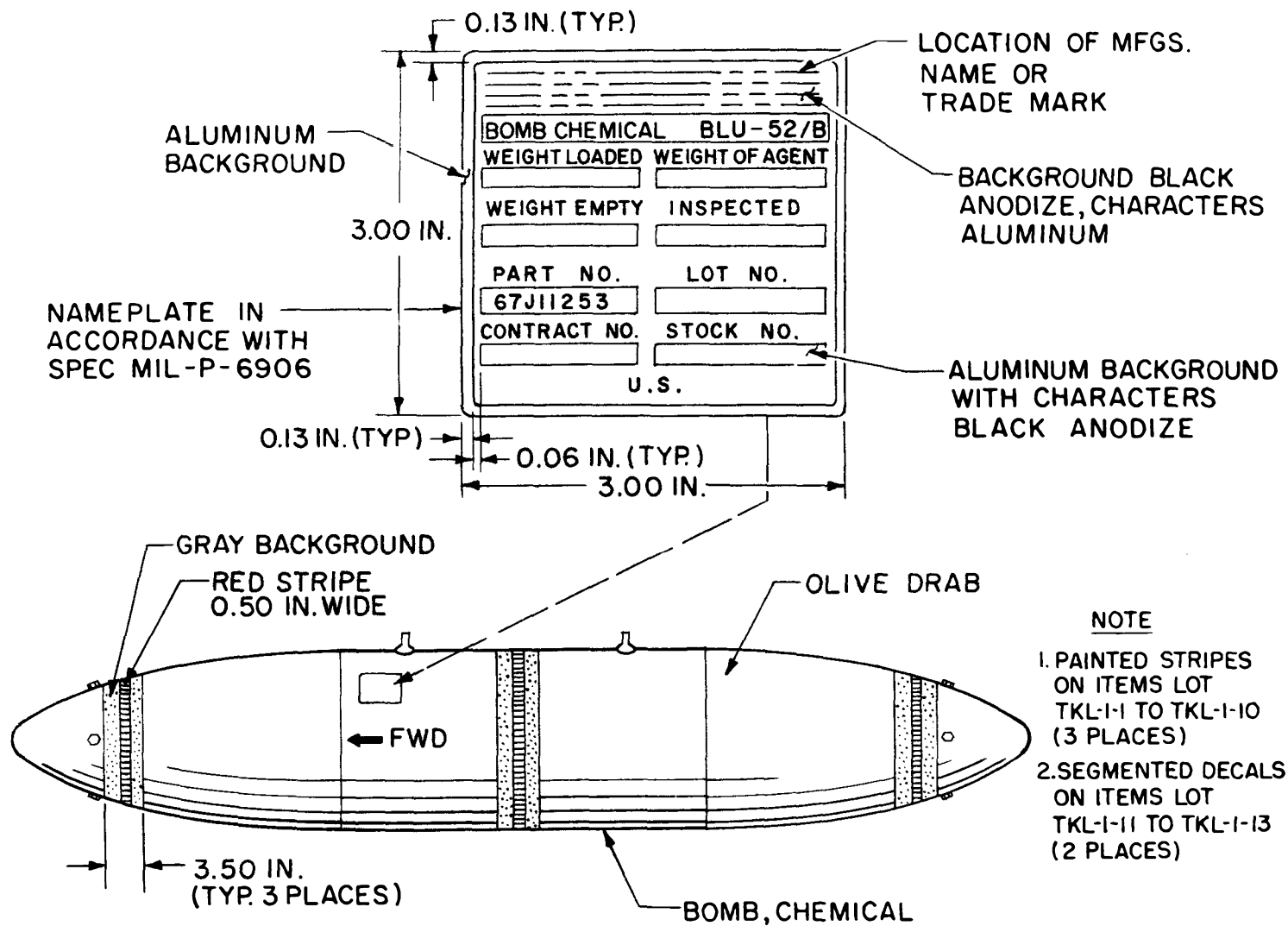


Figure 2-20B. Markings for Chemical Bomb, BLU-52/B

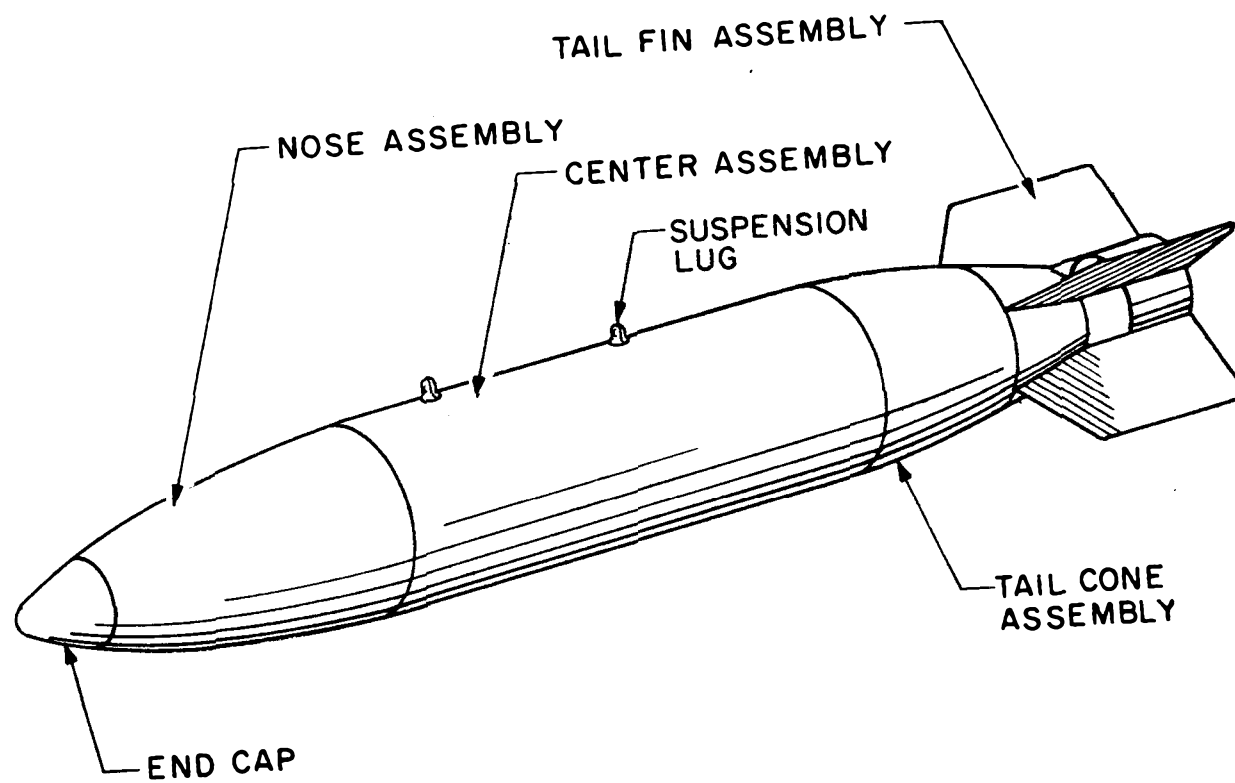


Figure 2-20C. Chemical Bomb, BLU-52/B and BLU-52 A/B

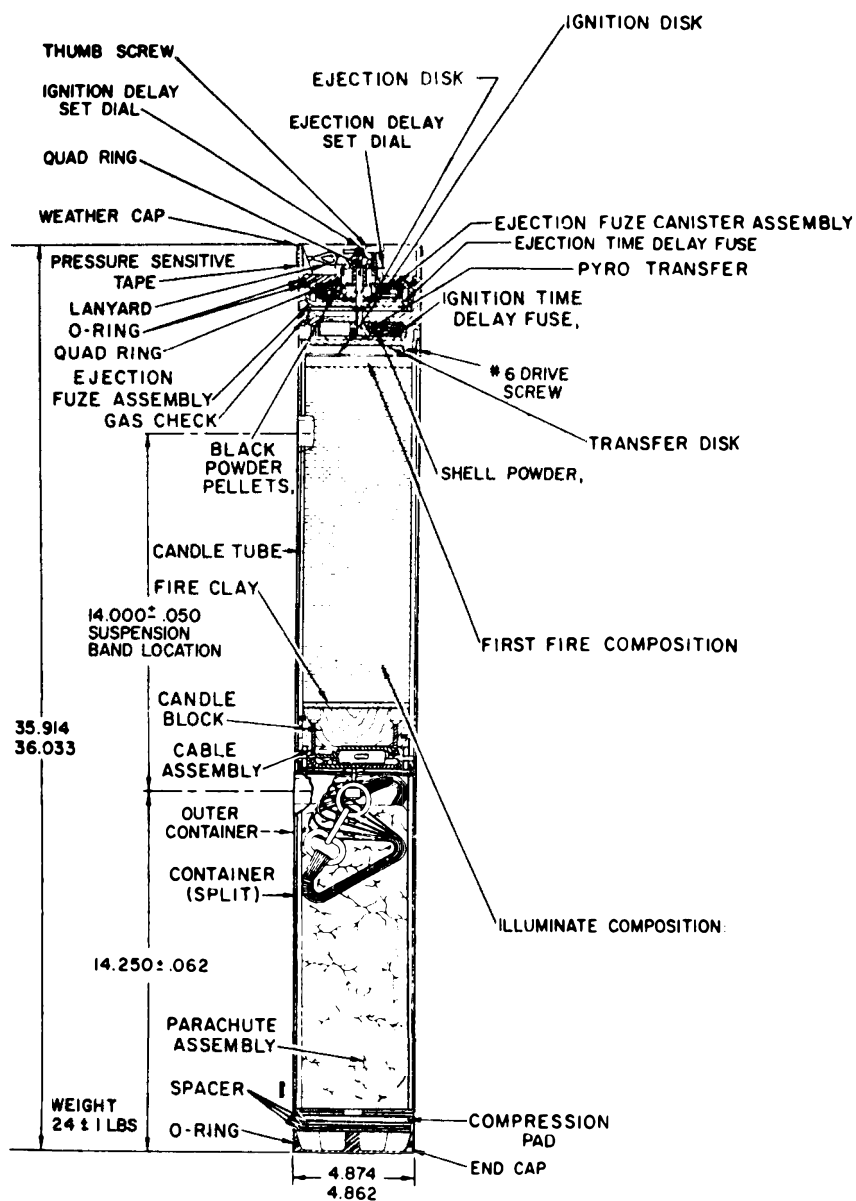


Figure 2-21. MK24, Aircraft Parachute Flare

- d. Burning time: 3 minutes, generates 3,500 degrees centigrade.
- e. Launching method: Dropped, dispensed, or thrown by hand from aircraft.

1-79. Operation: Ignition and ejection settings are made on the fuze prior to launch. The safety pin is removed as last step prior to launch. At launch the ejection delay is actuated by the flexible steel cable when it receives 6 to 12 pounds of pull. At 50 pounds of pull the lanyard disconnect separates. When the parachute and illuminate composition are ejected, the ignition delay is initiated by hot gases from the ejection charge. The parachute opens and the illuminating composition is ignited upon expiration of the ignition delay.

1-80. Filler: 15 pounds of magnesium and sodium nitrate.

1-81. Hazards: Ejection charge, always approach and work from the side.

1-82. Disposal: Refer to AF TO 60K-2-2-4.

FLARE AIRCRAFT PARACHUTE, MK 45

1-83. Type: Flare Aircraft Parachute, MK 45 (reference figures 2-22a and 2-22b)

1-84. Identification:

a. Size: The flare is of aluminum alloy construction, 36 inches long and 5 inches in diameter. The weight is 28 pounds.

b. Markings: A brown band on white located at the aft end of the flare body.

c. Candlepower: 2,000,000

d. Burning time: 2.5 to 3 minutes, generates 3,500 degrees centigrade.

e. Launching method: Clamped on suspension lugs.

1-85. Operation: At release, the lanyard removes the safety clip and releases a cocked striker to ignite a positive 2 second safe separation delay. At the expiration of the preset delay, the ejection charge separates the parachute and candle. Two sets of cables are attached to the parachute shroud lines, one of which is shorter than the other. As the parachute is deployed, the short set of cables exerts a pulling force on the firing pin assembly, cocking and releasing the firing pin which ignites the firing train and candle. As the candle approaches burnout, the resultant heat functions an explosive bolt releasing 10 shroud lines, collapsing the parachute.

1-86. Filler: Magnesium, sodium nitrate, and a binding agent.

1-87. Hazards: Flare candle, igniter assembly, explosive bolt in the parachute assembly, and the fuze MK 364.

1-88. Disposal: Refer to AF TO 60K-2-2-10.



Figure 2-22A. MK45 Aircraft Parachute Flare

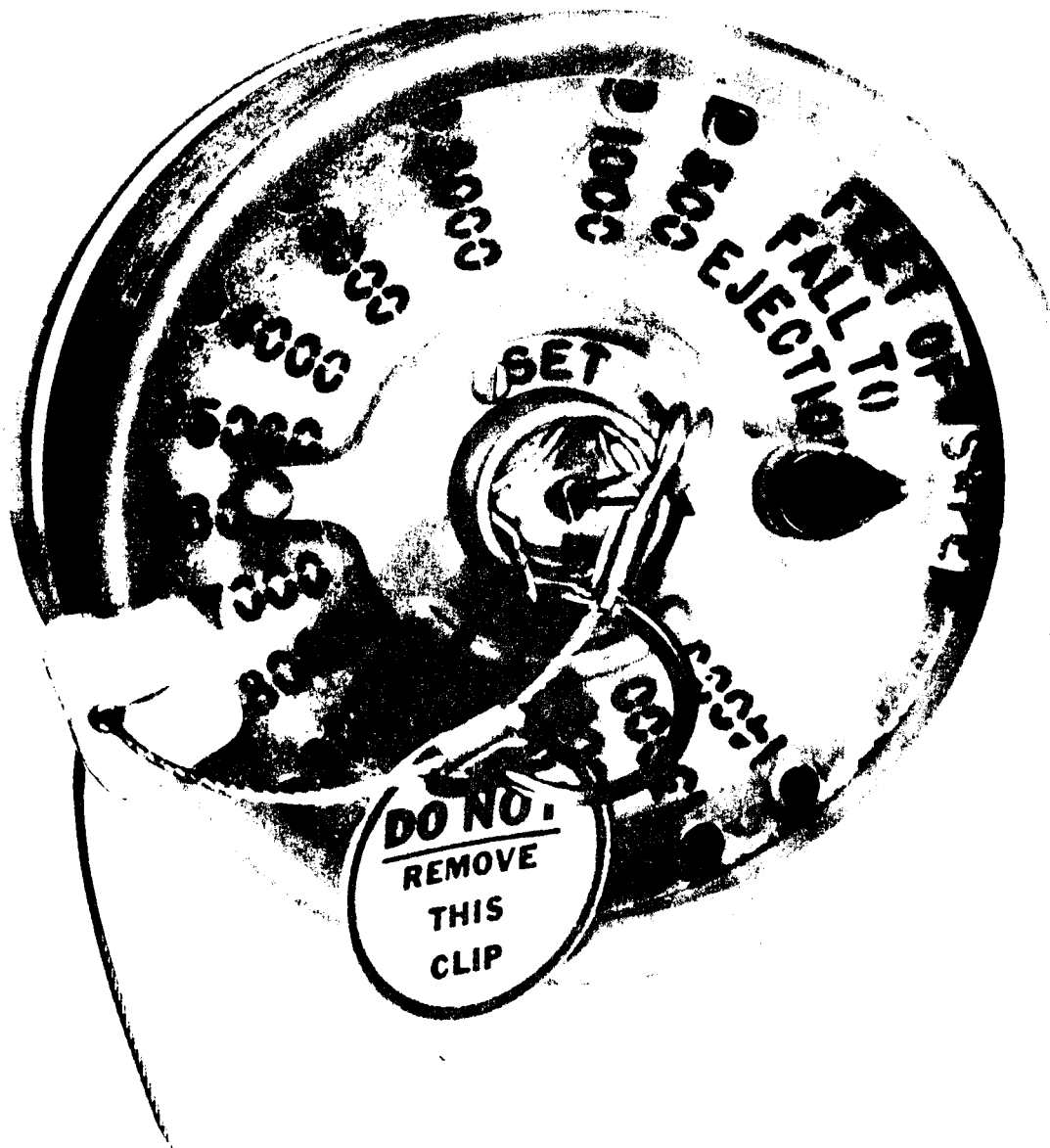


Figure 2-22B. MK45 Mod 0 Fuze Assembly

PART TWO

FUZES

MECHANICAL IMPACT FUZE, NOSE, VANE ARMING M 103 thru M 165 SERIES

2-1. Type: Mechanical Impact Fuze, Nose, Vane Arming M 103 thru M 165 Series (reference figure 2-23)

2-2. Identification:

a. Blunt nose vane cup with the words "DEEP SLOT DELAY" and "SHALLOW SLOT INST" stamped on the fuze body flange.

b. With the exception of the M 148 fuze, the M 103A1 is typical in size and appearance of the M 103 series. The M 148 has different body threads and the contour of its booster resembles that of the standard Japanese Navy fuze.

2-3. Hazardous Components:

a. Primer.

b. Delay column.

c. Detonator.

d. Two detonator leads.

e. Booster, approximately 7 ounces of tetrytol.

2-4. Function: At release, the arming wire is extracted allowing vane rotation, causing the arming screw to unthread, lifting the vane cup clear of the safety discs and allowing the detonator slider to position itself under one of the detonator leads. Impact causes detonation. The delay firing pin always strikes the delay primer, igniting the delay column which detonates the booster regardless of fuze setting.

MECHANICAL IMPACT FUZE, NOSE, VANE ARMED M 904 SERIES

2-5. Type: Mechanical Impact Fuze, Nose, Vane Armed M 904 Series (reference figures 2-24a, 2-24b, and 2-24c)

2-6. Identification:

a. The M 904 has a two-bladed arming vane, which may or may not be secured to the nose assembly by a one-inch hex nut.

b. The arming delay indicator plate is attached to the fuze body by four screws. Two flanges, 180° apart, extend outward from this plate.

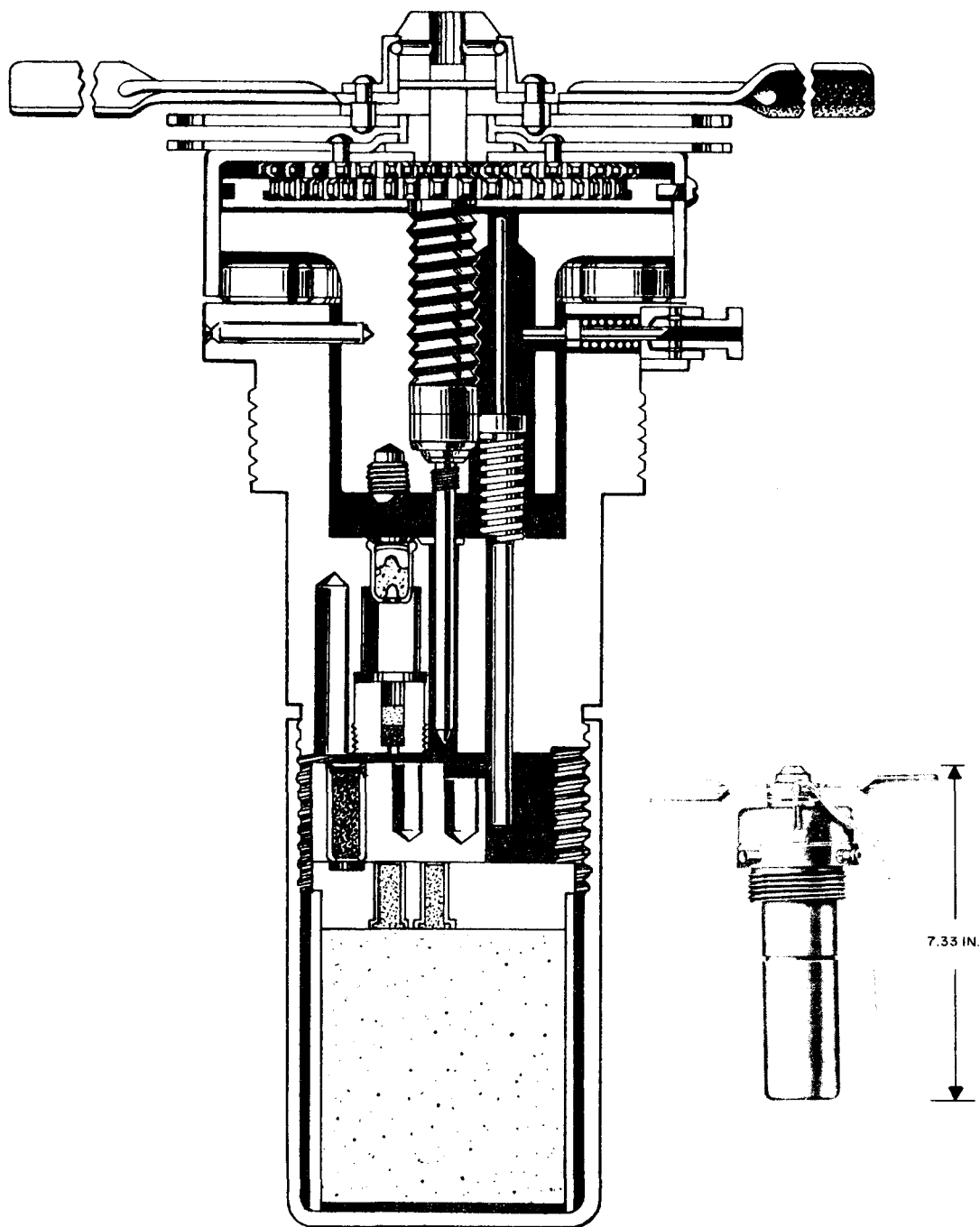


Figure 2-23. Bomb Nose Fuze M103 Thru M165 Series

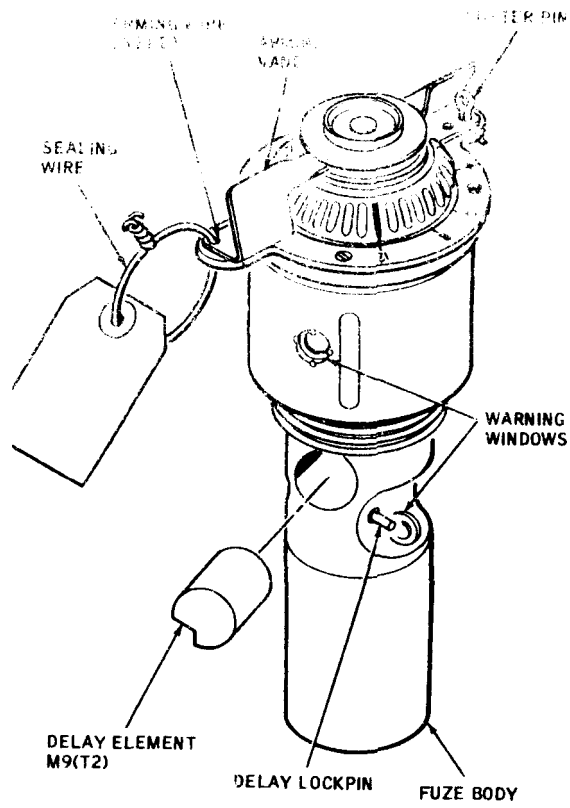


Figure 2-24A. Fuze Nose M904

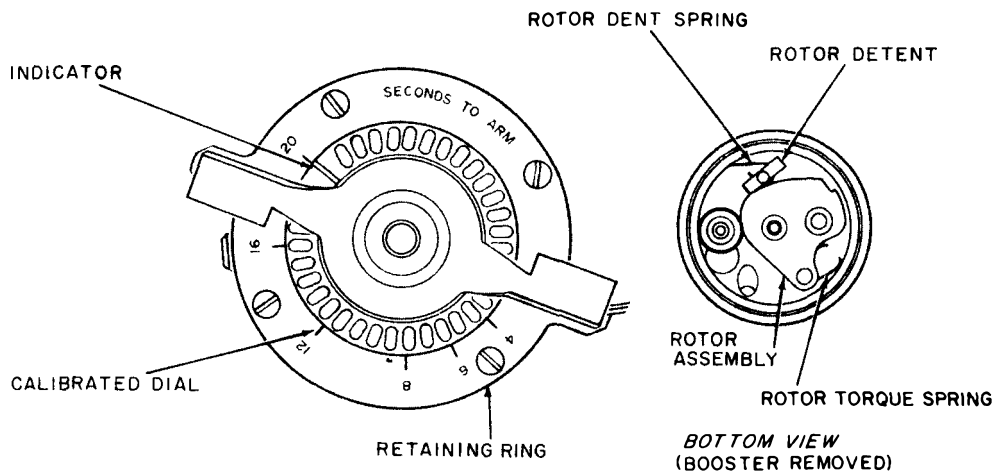


Figure 2-24B. Fuze M904 Top and Bottom View

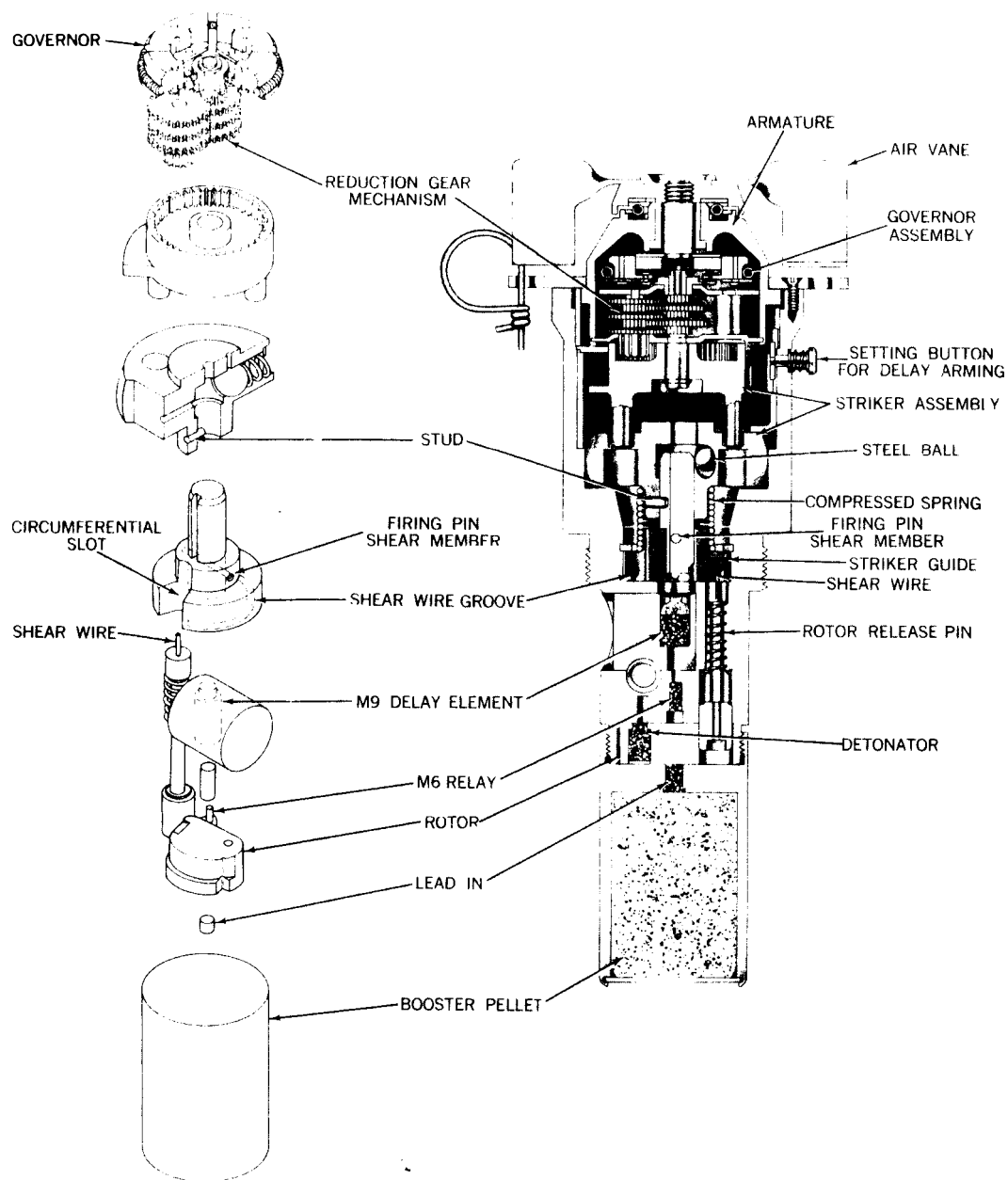


Figure 2-24C. Fuze M904 Cutaway View

2-7. Hazardous Components:

- a. Delay element.
- b. Relay element.
- c. Detonator.
- d. Detonator lead-in.
- e. Booster.

2-8. Function: Rotation of the arming vane turns the governor drum which turns the arming stop assembly and the striker. The firing pin is keyed to the striker, as a result the firing pin and firing pin guide turn with the striker. When arming time has elapsed, the striker spring forces the striker against the bottom of the arming stop assembly and the spring loaded striker ball is forced into the space above the firing pin. Simultaneously, a longitudinal slot aligns with the stem of the rotor release. This allows the rotor release to clear the rotor, the rotor pivots and aligns the detonator.

MECHANICAL IMPACT FUZE, NOSE, VANE ARMING
M 110, M 126, M 158, and M 159 SERIES

2-9. Type: Mechanical Impact Fuze, Nose, Vane Arming M 110, M 126, M 158, and M 159 Series (reference figures 2-25a, 2-25b, and 2-25c)

2-10. Identification:

- a. The M 110 has two arming wire guides, a "C" block, arming sleeve, and an in-line detonator.
- b. The M 126 is identical to the M 110 except it has a steel cylinder the same size as the booster.
- c. The M 158 and M 159 are similar to the M 110 except it has no "C" block; the striker moves up while arming and the detonator is held out of line. The difference between the M 158 and M 159 is the M 158 has a larger booster than the M 159.

2-11. Hazardous Components:

- a. Detonator
- b. Det lead (M 158 only)
- c. Booster charge (except the M 126)

2-12. Function:

- a. M 110 and M 126--vane rotation causes the movable gear and arming sleeve to move downward as the arming sleeve unthreads from the arming hub. When the arming sleeve clears the safety block, the block falls away, arming the fuze.
- b. M 158 and M 159--vane rotation causes the movable gear, arming sleeve firing pin and striker to move upward as the arming sleeve threads into the arming

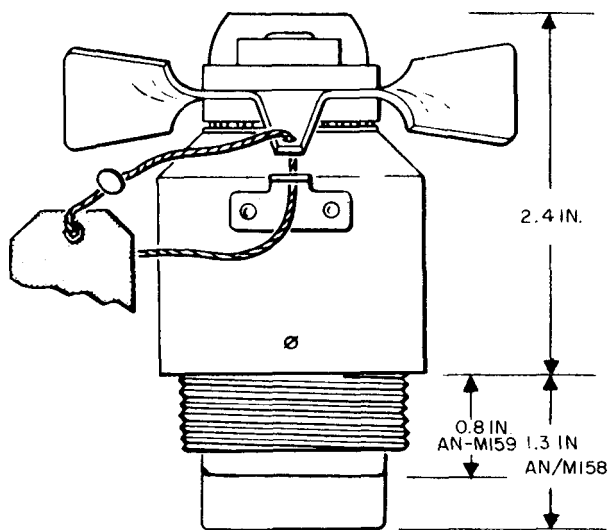


Figure 2-25A.

Nose Fuze AN-M158 and AN-159

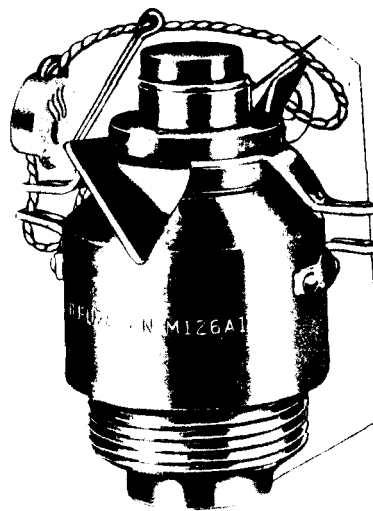


Figure 2-25B.

Nose Fuze AN-M126A1

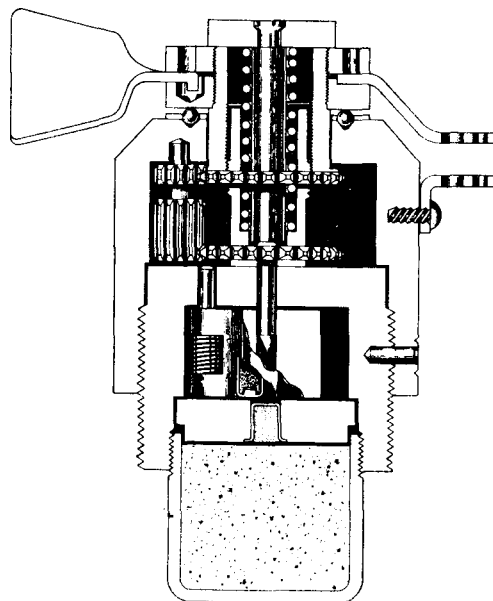


Figure 2-25C. Nose Fuze AN-M126A1 thru M193

hub. After required vane rotation, the firing pin clears the det rotor allowing it to rotate to the armed in-line position. The det rotor is locked in position.

MECHANICAL IMPACT FUZE, TAIL, VANE ARMING
M 100 and M 189 SERIES

2-13. Type: Mechanical Impact Fuze, Tail, Vane Arming M 100 and M 189 Series (reference figures 2-26, 2-27a, 2-27b, and 2-27c)

2-14. Identification:

a. The M 100 series fuzes differ externally from each other in arming stem tube length.

b. The M 189 series fuzes differ from each other in the length of the flexible drive shaft.

c. The two groups of fuzes differ from each other in the type of arming vane mechanism employed.

2-15. Hazardous Components:

a. Primer detonator.

b. Black powder delay column.

2-16. Function: Vane rotation causes the arming stem to unthread from the inertia plunger, arming the fuze. When the arming stem unthreads from the fuze body cap, the vanes, bearing cup assembly, and arming stem fall free from the fuze as a unit. The M 189 arming stem is unthreaded from the inertia plunger by rotation of the anemometer and the flexible shaft. The fuze is armed when the arming stem clears the inertia plunger.

MECHANICAL IMPACT FUZE, TAIL, VANE ARMING
M 112 and M 115 SERIES

2-17. Type: Mechanical Impact Fuze, Tail, Vane Arming M 112 and M 115 Series (reference figure 2-28)

2-18. Identification:

a. The fuze designation may be printed or stamped on the cylindrical surface of the fuze body.

b. These fuzes differ in their arming stem tube length. The M 115 series uses a gear reduction system identical to the M 100 series. The M 112 series uses a direct drive system.

2-19. Hazardous Components:

a. Primer detonator.

b. Delay mixture and relay.

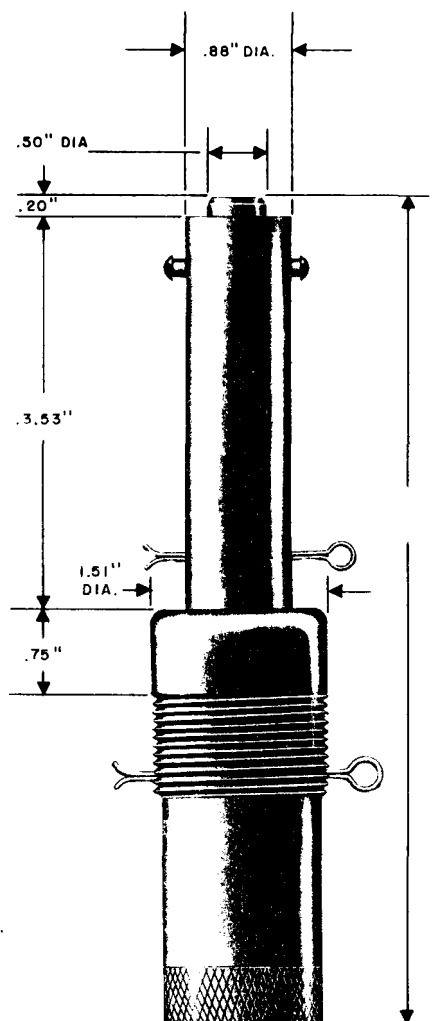


Figure 2-27A.

Tail Fuze M190
and M191

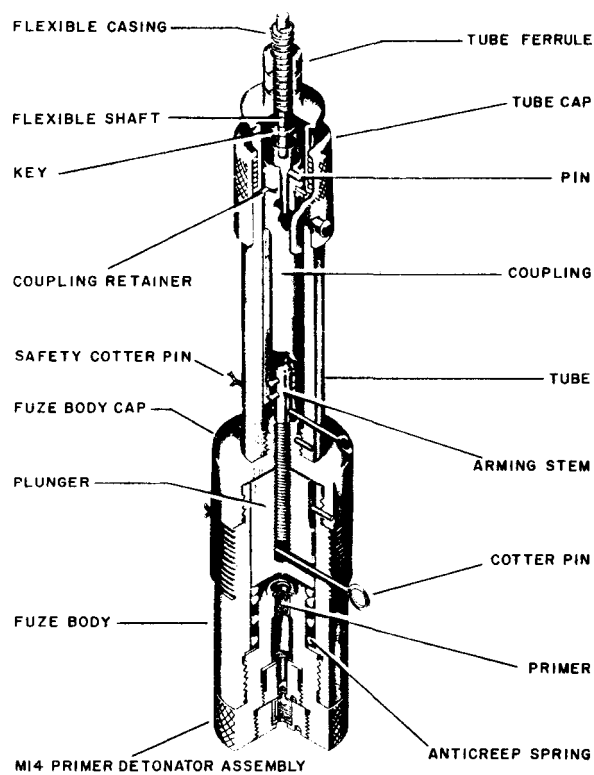


Figure 2-27B.

Tail Fuze M190 and M191
Cutaway View

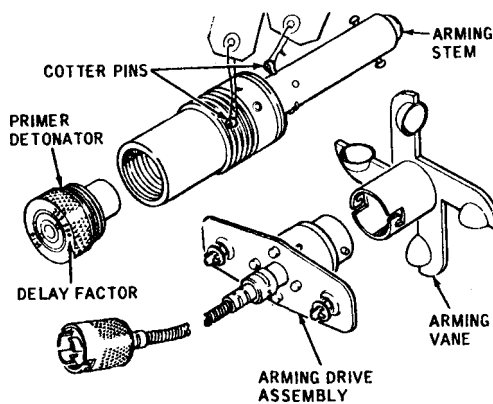


Figure 2-27C. Fuze M190 and M191
Arming Drive Assembly

2-20. Function: Vane rotation causes the arming stem to unthread from the inertia plunger, arming the fuze. Upon impact, the inertia plunger overcomes the creep spring and moves forward. When the plunger advances sufficiently, lockballs are cammed outward into counterbored areas of the fuze, releasing the cocked striker.

MECHANICAL IMPACT FUZE, TAIL M 905

2-21. Type: Mechanical Impact Fuze, Tail M 905 (reference figures 2-29a, 2-29b, and 2-29c)

2-22. Identification:

- a. The fuze designation is stamped on the cylindrical surface of the fuze body.
- b. The fuze has selective arming time delays of 4 to 20 seconds in 2-second and 4-second intervals which are marked on the fuze body.
- c. An upper inspection window provides visual indication of the condition of the fuze.

2-23. Hazardous Components:

- a. Delay element.
- b. Relay element.
- c. Detonator.

2-24. Function: Vane rotation causes rotation of the drive shaft, governor, reduction gear, and internal gear. The internal gear, firing pin and firing pin guide are keyed to rotate as a unit. Arming time is complete when the projection of the internal gear reaches a stop on the fuze body. Simultaneously, the firing pin is armed and the rotor release assembly allows the det rotor to align. The fuze functions on impact as inertia drives the firing pin into the delay element.

MECHANICAL IMPACT FUZE, TAIL, VANE ARMING M 906

2-25. Type: Mechanical Impact Fuze, Tail, Vane Arming M 906 (reference figures 2-30a, 2-30b, and 2-30c)

2-26. Identification:

- a. The fuze designation may be printed or stamped on the cylindrical surface of the fuze body.
- b. The fuze has no provision for selective arming delay. The arming time of 1.97 ± 0.4 seconds is predetermined by design.
- c. The T5 and T6 delay elements provide impact firing delays.

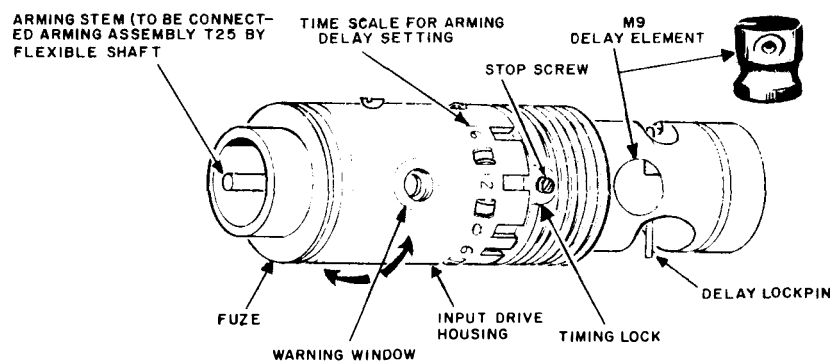


Figure 2-29A. Tail Fuze M905

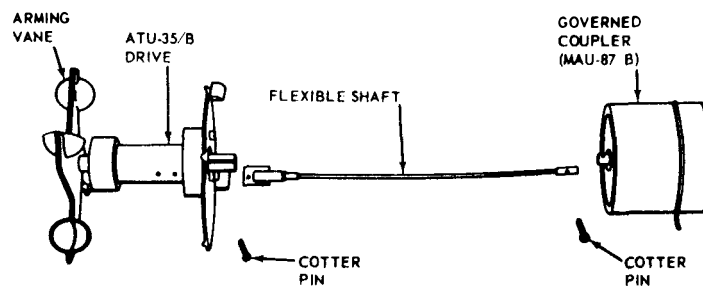


Figure 2-29B. Fuze M905 Arming Assembly

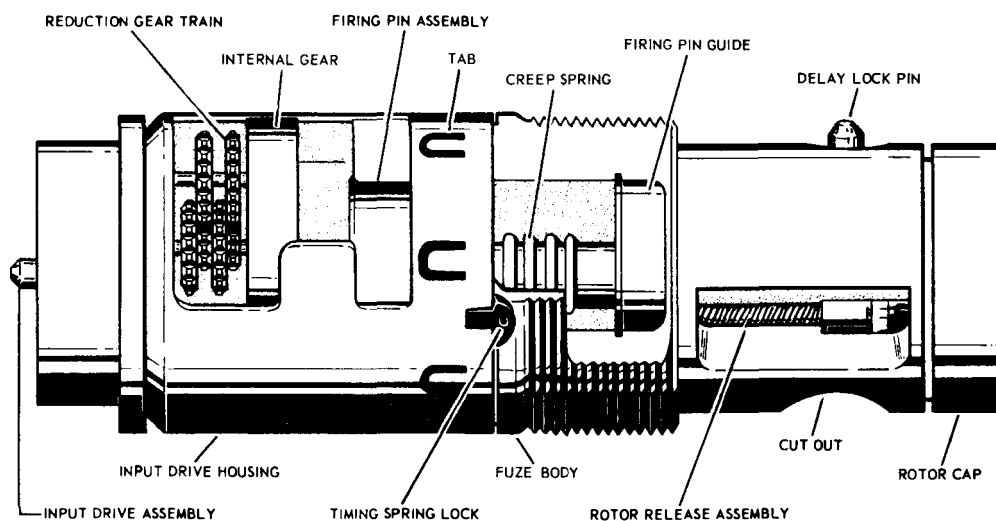


Figure 2-29C. Fuze M905 Cutaway View

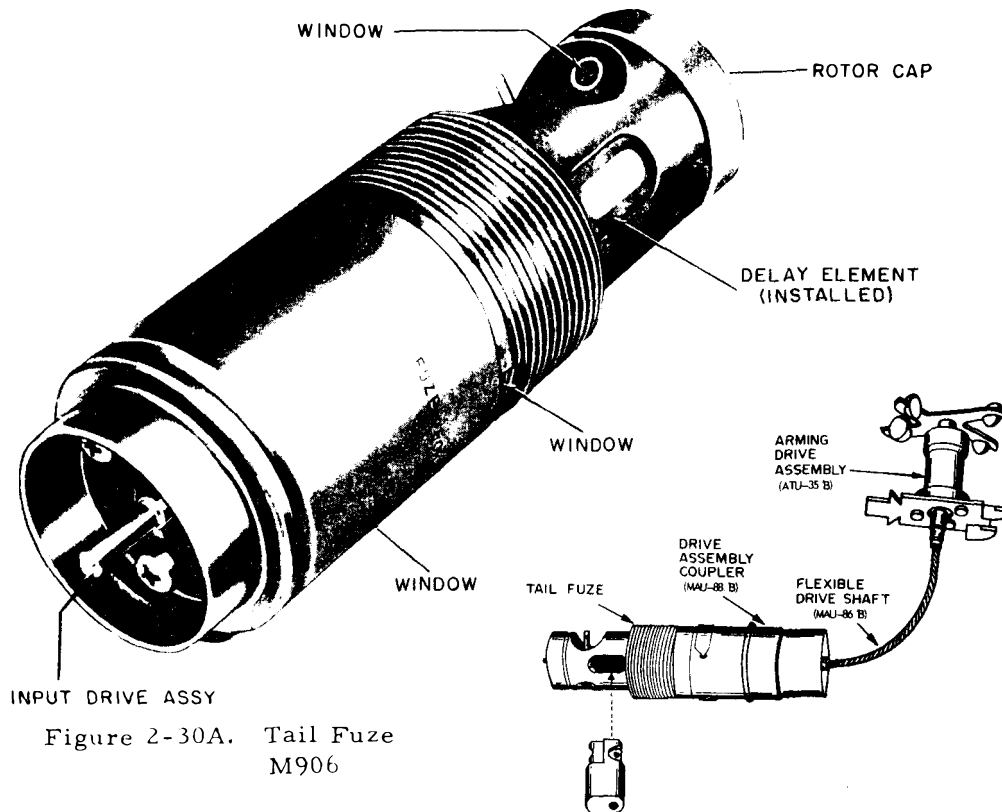
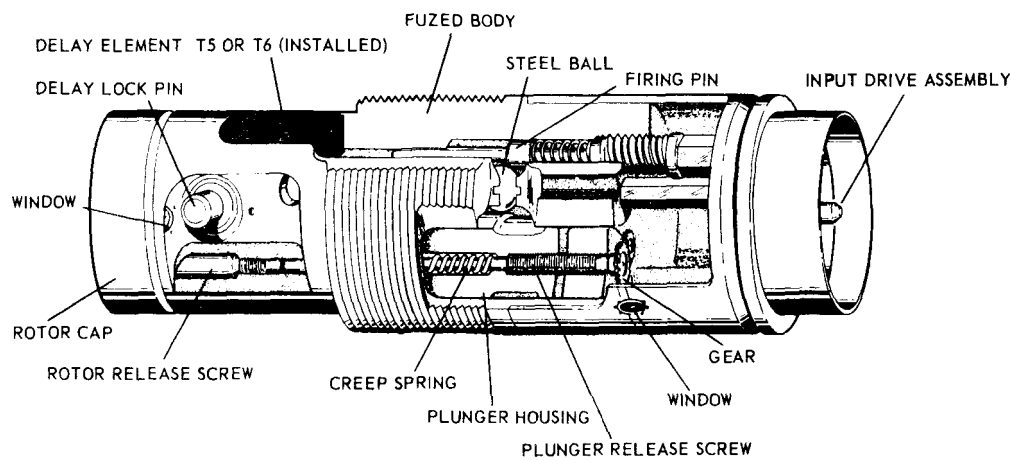


Figure 2-30B. Fuze M906 Drive Assembly



2-27. Hazardous Components:

- a. T5 or T6 series delay elements.
- b. Rotary detonator.

2-28. Function: Vane rotation is transmitted through the flexible shaft to the input drive assembly and reduction gear train which drive the plunger release screw. Rotation of the plunger release screw causes the screw to be withdrawn from the plunger assembly. As the plunger release screw rotates, the rotor release screw, which is keyed to the plunger release screw, withdraws from the rotary assembly cavity and frees the rotor to move to the aligned position. Upon impact, the plunger assembly moves forward. When the annular groove in the plunger aligns with the steel ball that restrains the firing pin, the ball is forced into the plunger groove and frees the firing pin.

FUZE, TAIL, CHEMICAL LONG DELAY, ANTI-WITHDRAWAL,
BOOBYTRAPPED M 123

2-29. Type: Fuze, Tail, Chemical Long Delay, Anti-Withdrawal, Boobytrapped M 123 (reference figures 2-31a and 2-31b)

2-30. Identification:

- a. This series fuze can always be identified by the two flat shoulders on the fuze body.
- b. The M 123, M 124, and M 124 fuzes are delay arming; the A1 and A1(A2) are direct arming.
- c. The M 123 series fuzes have a four-bladed arming vane and arming head assembly. The M 123A1 series have an eight-bladed arming vane and a direct drive arming mechanism. The A1(A2) series fuzes have a four-bladed arming vane, direct drive arming mechanism, and a reach rod that is coupled to the arming stem by a pin.

2-31. Hazardous Components: The detonator is the only explosive component of the fuze.

2-32. Function: Vane rotation causes the arming stem to thread into the fuze and into the solvent filled glass ampoule, breaking the ampoule and releasing the solvent to the absorber and delay collar. The solvent dissolves the delay collar sufficiently to allow the lockballs to be cammed inside and clear the firing pin screw. When this occurs, the firing pin spring drives the firing pin into the detonator. The anti-withdrawal boobytrap feature of the fuze is armed as soon as the safety clip is removed. Any action which separates the body extension from the fuze body $\frac{3}{32}$ inch (about $1\frac{1}{5}$ turns) will fire the fuze. When an attempt is made to unthread the fuze from the bomb, the anti-withdrawal ball binds the fuze body extension to the adapter booster in the bomb causing the fuze body to separate from the fuze body extension. As a result, the sleeve balls move outward releasing the spring-loaded firing pin.

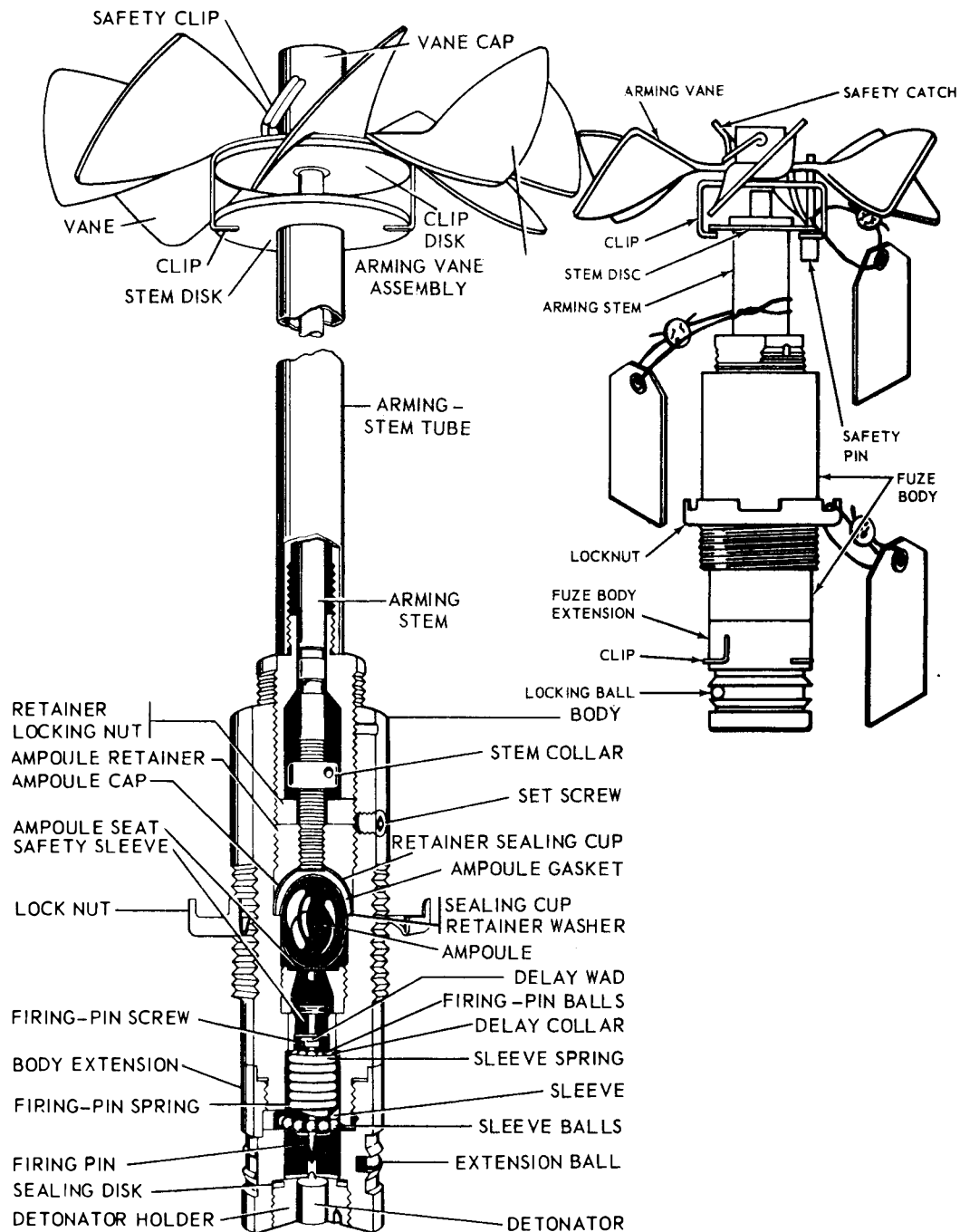
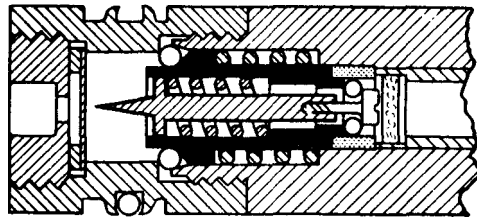
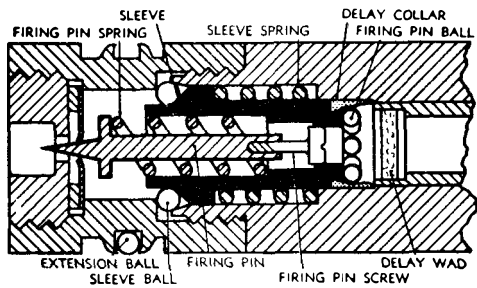


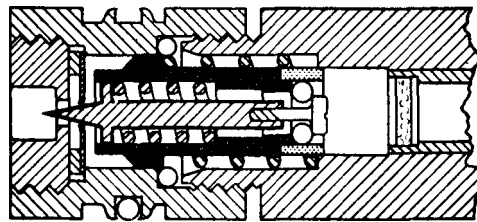
Figure 2-31A. Fuze, Tail, Long Delay Anti-Withdrawal M124A1 and Cutaway View



A. FIRING MECHANISM



B. FIRING PIN RELEASED WHEN CELLULOIDE DELAY COLLAR IS DISSOLVED BY FLUID CONTAINED IN AMPOULE (ONLY FIRING PIN SNAPS FORWARD)



C. FIRING PIN RELEASED BY ANTI-WITHDRAWAL DEVICE (COMPLETE FIRING PIN ASSEMBLY SNAPS FORWARD)

Figure 2-31B. M123A1 - Operation

MECHANICAL TIME FUZE NOSE M 147 SERIES

2-33. Type: Mechanical Time Fuze Nose M 147 Series (reference figures 2-32a and 2-32b)

2-34. Identification: This series fuze is mechanical time, vane armed, aerial burst type. A graduated time scale is stamped on the head of the fuze. The fuze designation may be stamped on the fuze body.

2-35. Hazardous Components:

- a. Booster
- b. Primer
- c. Detonator

2-36. Function: When the arming wire is extracted, the arming pin is ejected and vane rotation is allowed. When the arming pin is ejected, the time mechanism starts. After 4.5 seconds, the time mechanism allows the detonator to align with the explosive train. Fuze will airburst at the preset time. The arming vane assembly operates the delay arming mechanism to remove the safety block between the striker and the vane nut. If the fuze is armed and the preset firing time is greater than time of fall to target, the fuze will function at impact.

FUZE, MECHANICAL TIME, NOSE OR TAIL M 907 SERIES

2-37. Type: Fuze, Mechanical Time, Nose or Tail M 907 Series (reference figure 2-33)

2-38. Identification: The M 907 is a mechanical time, delayed arming (vane and pin armed cocked striker) fuze. Fuze markings are stamped on the fuze body near the fuze seating surface. Fuzes may be set from 4 to 92 seconds.

2-39. Hazardous Components:

- a. Booster.
- b. Primer.
- c. Detonator.

2-40. Function: When the arming wire is extracted, vane rotation occurs and the arming pin is ejected. This allows the timing disc assembly to rotate. Rotation of the timing disc allows the firing pin to retract to the firing position. When the arming gear slot is aligned with the arming stem, the arming stem moves upward allowing the slider to move to the in-line position. Continued rotation of the timing lever releases the cocking pin, which, in turn, releases the spring-loaded firing pin. If the fuze fails to function on airburst, it will function on impact.

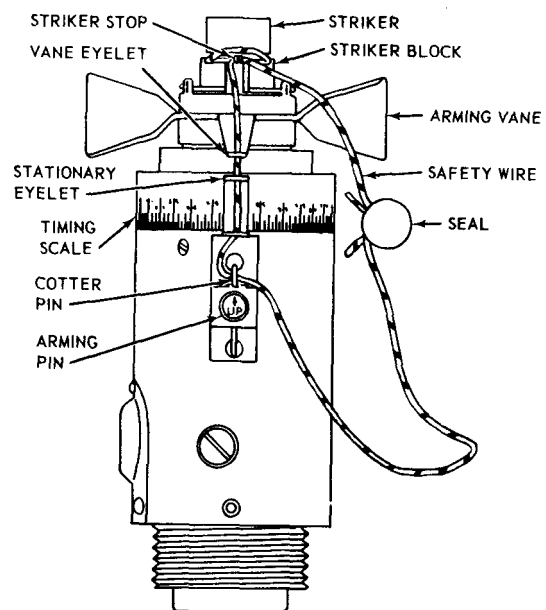


Figure 2-32A. Tail Fuze AN-M147A1

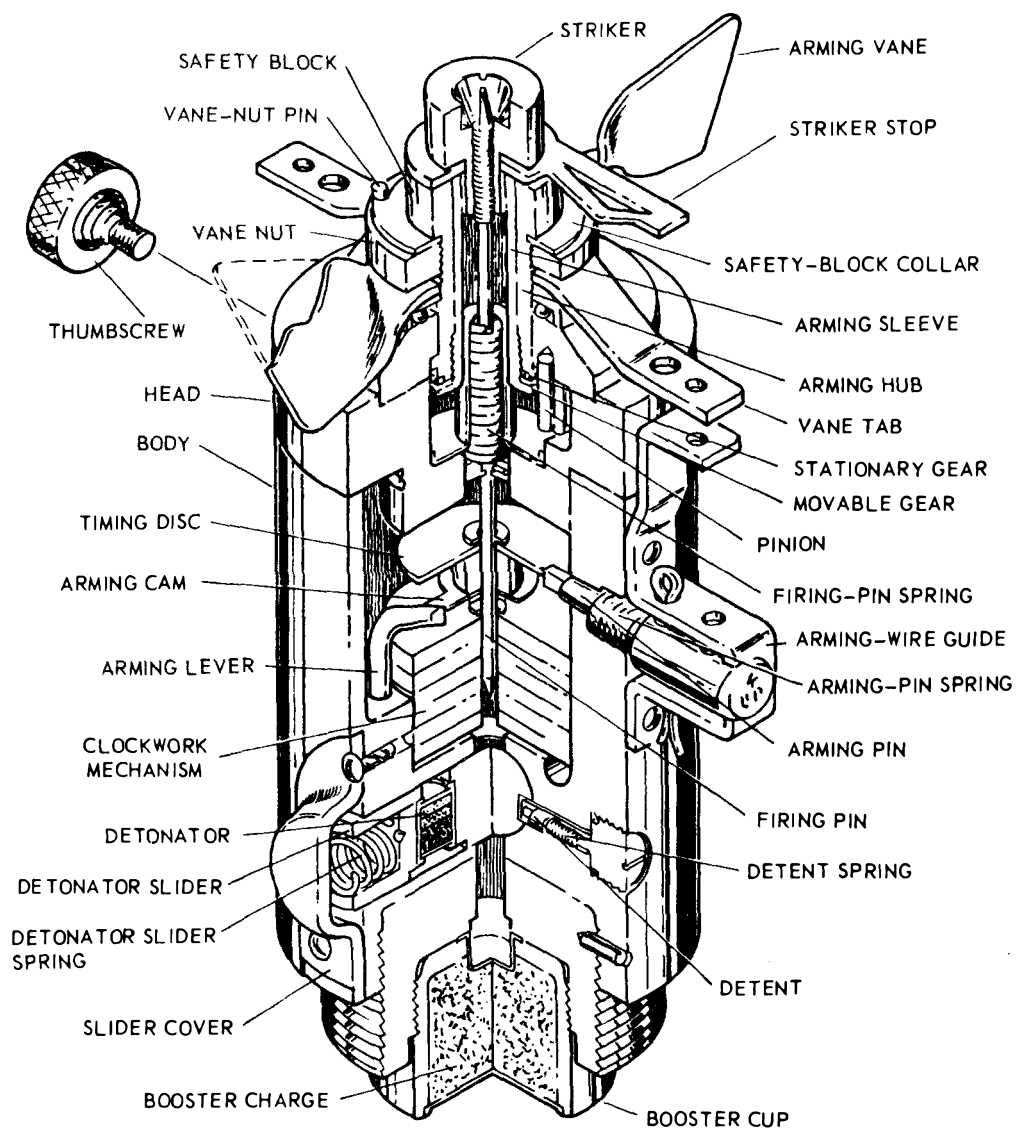


Figure 2-32B. Fuze, Tail, Mechanical Time AN-M147A1
Cutaway View

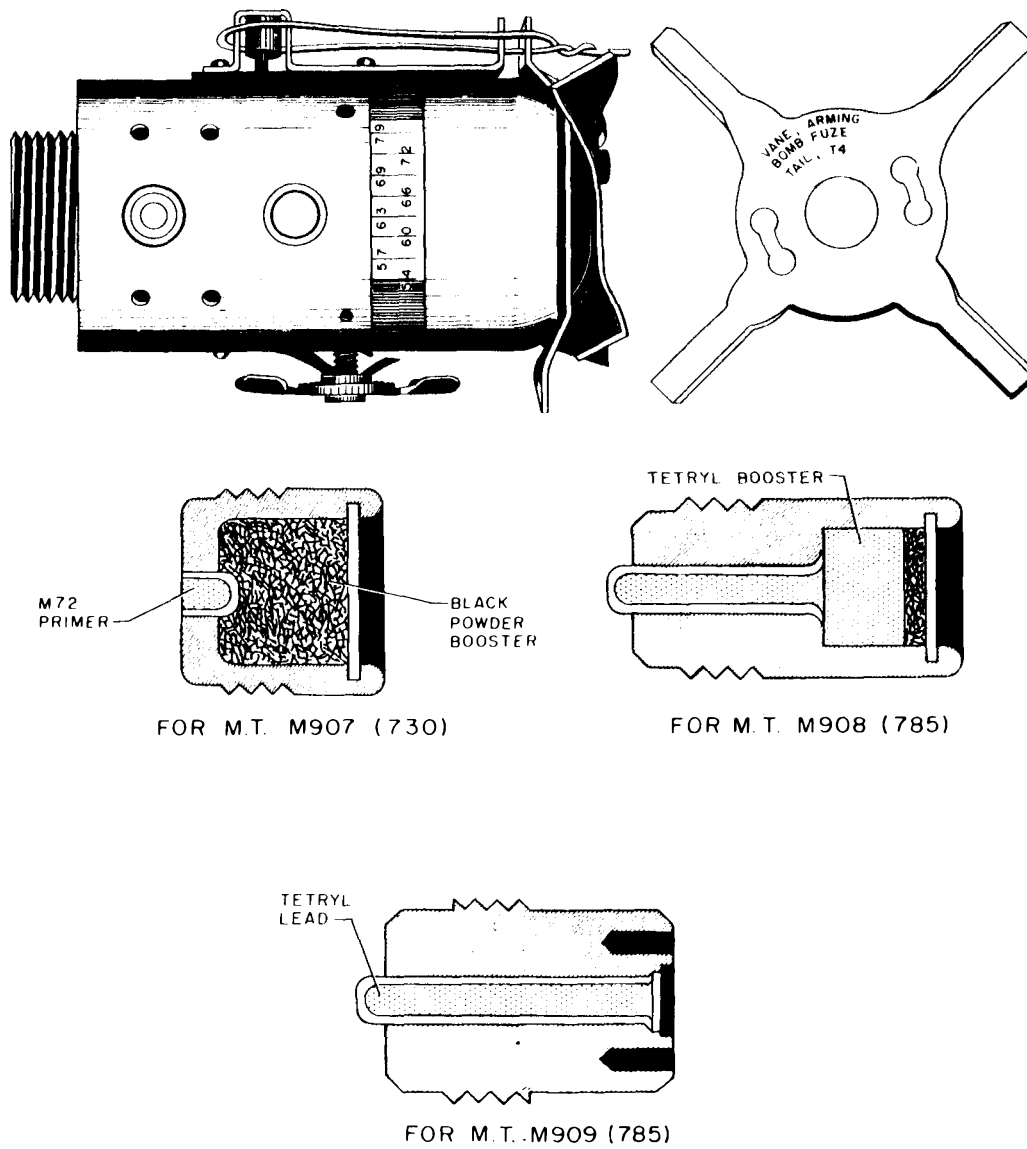


Figure 2-33. M907, M908, M909 Mechanical Time Fuzes and Applicable Boosters

PROXIMITY BOMB FUZE M 914

- 2-41. Type: Proximity Bomb Fuze M 914 (reference figures 2-34a and 2-34b)
- 2-42. Identification: This fuze is of the bar type, incorporating a transmitter and receiver. It is vane armed and proximity fired. Fuze designation and loading information is stenciled on the lower portion of the fuze body.
- 2-43. Hazardous Components:
- a. Electric detonator.
 - b. Explosive lead-in.
 - c. Booster.
- 2-44. Function: When the arming wire is extracted, the vanes turn a generator supplying power to transmitter/receiver circuits and firing capacitor. An arming rotor is attached to the generator shaft and is aligned to the armed condition at Min SAT. When a material object enters the zone of influence of the fuze, a reflected radio wave causes the receiver to close a firing switch, discharging the capacitors through the detonator.

IMPACT, AIRBURST, CLOCKWORK LONG DELAY AND ANTI-DISTURBANCE FUZES USED IN THE M 83, 4 POUND, BUTTERFLY BOMB M 129, M 130, AND M 131

- 2-45. Type: Impact, Airburst, Clockwork Long Delay and Anti-Disturbance Fuzes used in the M 83, 4 pound, Butterfly Bomb M 129, M 130, and M 131 (reference figures 2-35a, 2-35b, 2-35c, 2-35d, and 2-35e)
- 2-46. Identification: All three types of fuzes (M 129, M 130, and M 131) are direct arming. The M 129 is an impact or airburst mechanical time fuze. The M 130 is a clockwork long delay fuze with delays from 10 to 60 minutes in 10 minute increments. The M 131 is a mechanical anti-disturbance fuze.
- 2-47. Hazardous Components:
- a. Primer.
 - b. Detonator.
 - c. Booster.
- 2-48. Function:
- a. M 129: The arming stem is withdrawn allowing the segment gear to turn until stopped by the segment gear stop. Impact releases the inertia pellet clear of the stop allowing the segment gear to continue turning; thereby turning the half-round cam to a position that will allow the striker to impinge the primer. Airburst is selected by turning the selector to "AIR"; thereby depressing the inertia pellet allowing the camshaft to rotate until the half-round notch will allow the striker to impinge the primer.

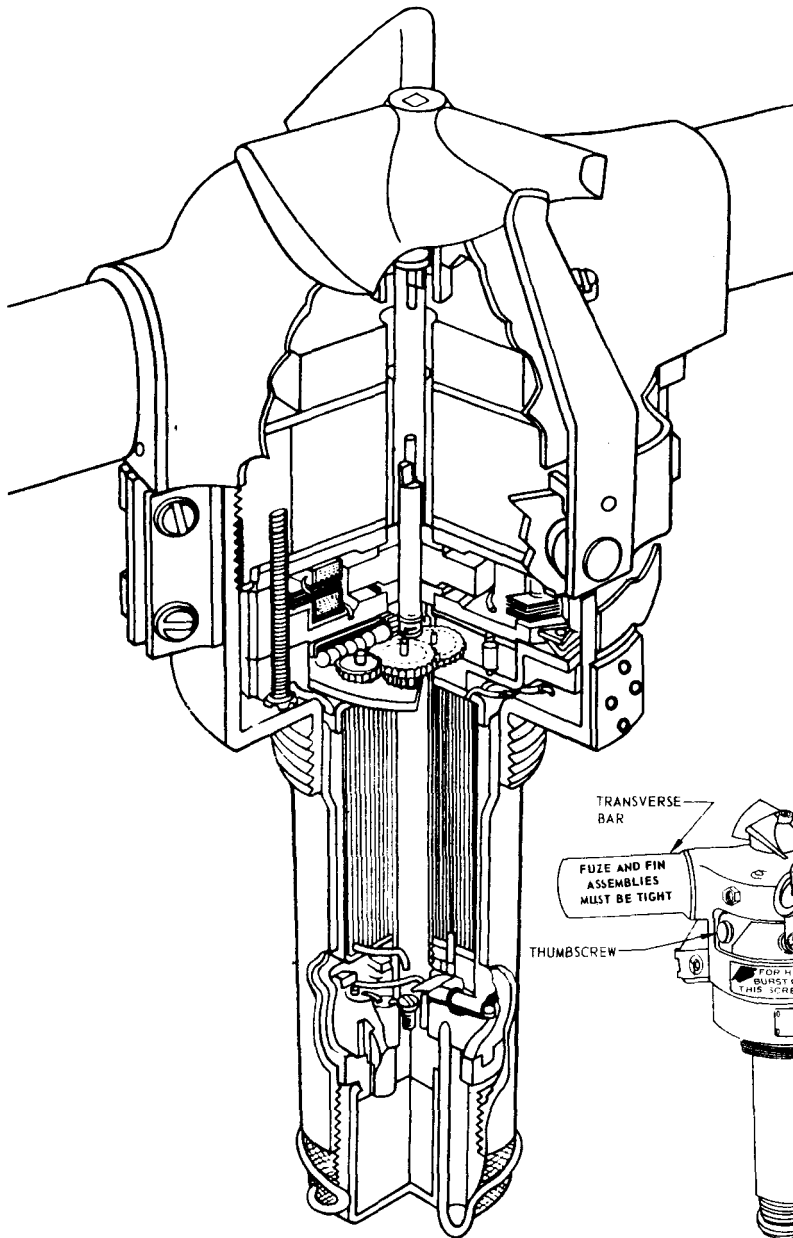


Figure 2-34A. Proximity Fuze M914 Cutaway

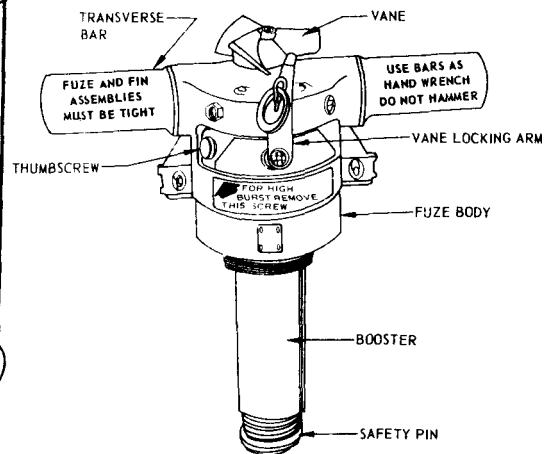


Figure 2-34B.
Proximity Fuze M914

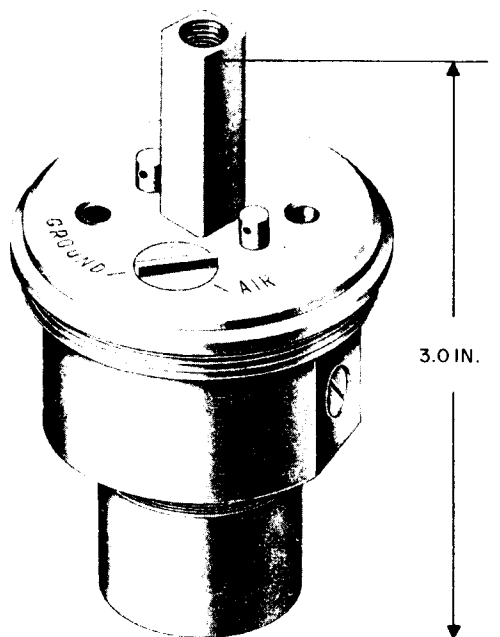
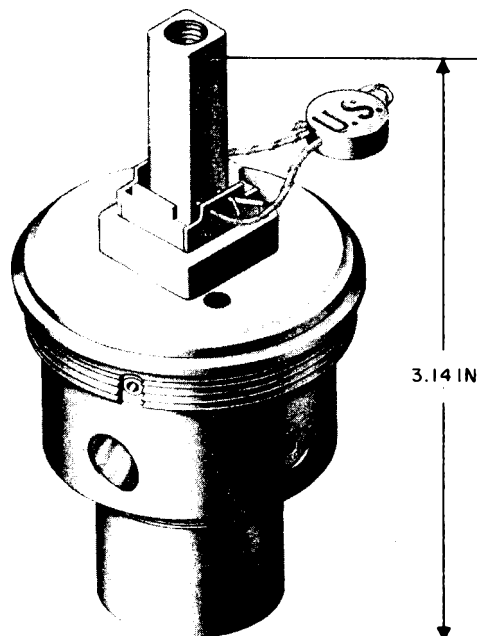


Figure 2-35A.
Fuze M129 Impact
and/or Airburst

Figure 2-35B.
Fuze M130
(Clockwork Long Delay)
M131(Anti-Disturbance)



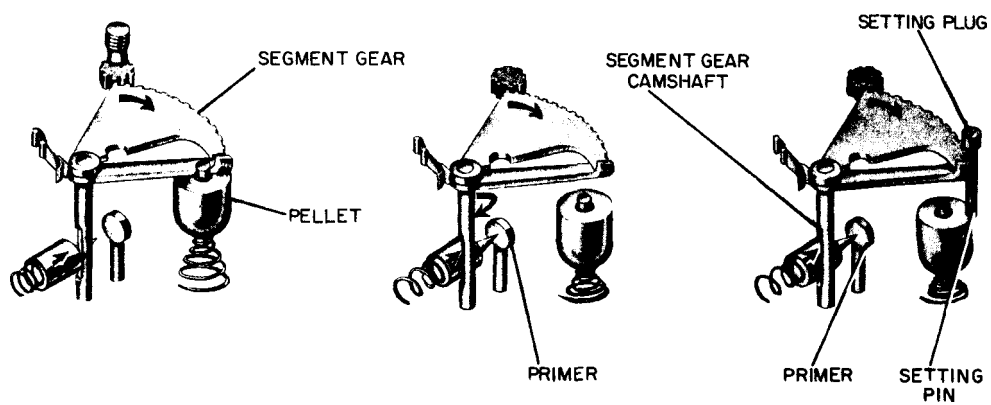
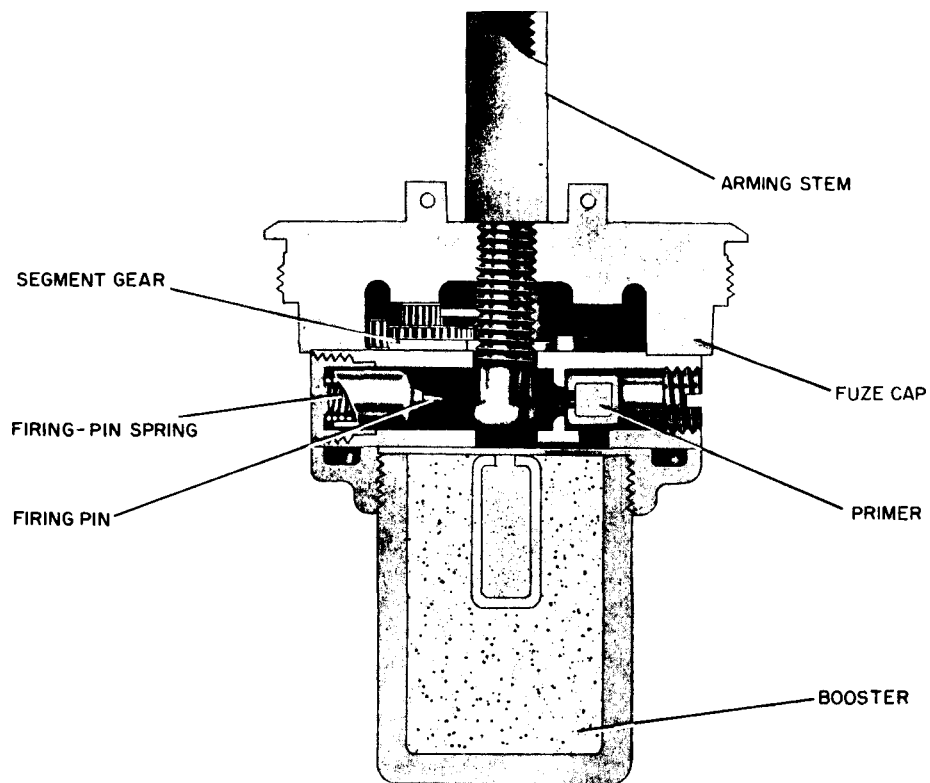


Figure 2-35C. Fuze M129, Cutaway View

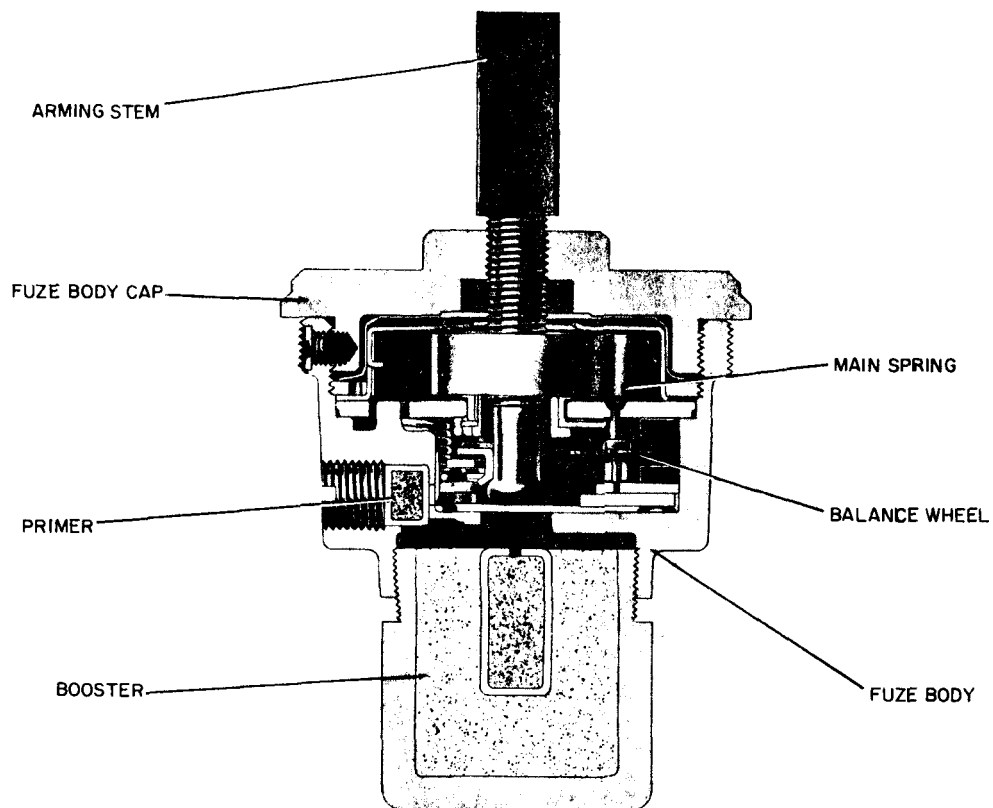


Figure 2-35D. Fuze M130A, Cutaway View

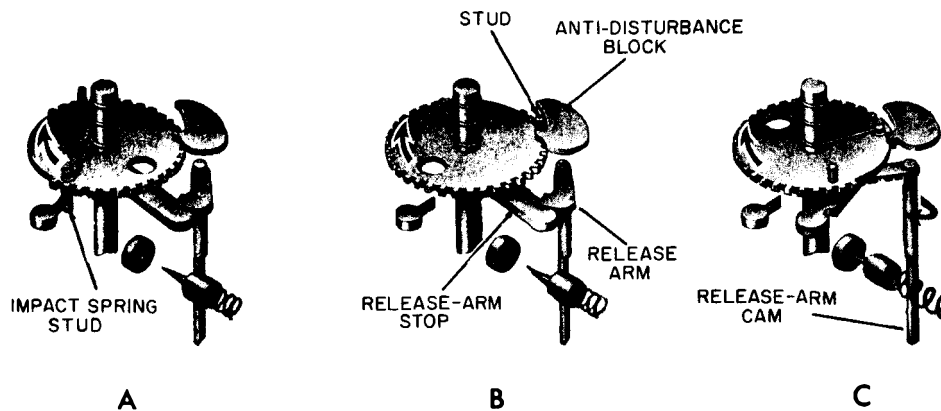
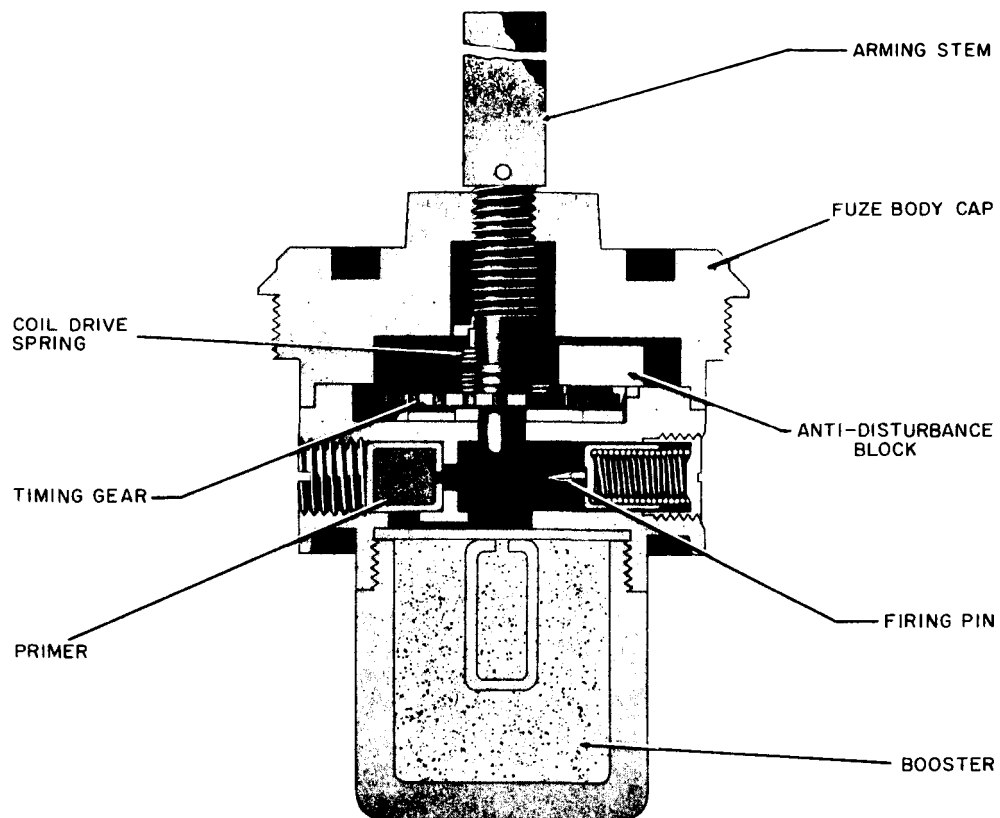


Figure 2-35E. Fuze M131A1 Cutaway View

b. M 130: The arming stem is withdrawn removing the positive block between the firing pin and the primer and the clockwork mechanism is started. When the preset time expires, the release cam releases the striker and impinges the primer.

c. M 131: The arming stem is withdrawn removing the positive block between the firing pin and primer and allows the fuze to become partially armed. Final arming occurs at impact. Any disturbance of the fuze will allow the timing gear to resume its rotation. The release arm pivots so that the half-round section of its shaft clears the firing pin, which is driven into the primer.

ALL-WAYS ACTING, IMPACT M 173, FUZE

2-49. Type: All-ways Acting, Impact M 173, Fuze (reference figures 2-36a, 2-36b, and 2-36c)

2-50. Identification: This fuze is used with fire bomb igniters. It is vane armed and impact fired. The vane is of the anemometer type. The fuze may or may not be marked.

2-51. Hazardous Components:

- a. Primer.
- b. Detonator.
- c. Booster.

2-52. Function: When the arming wire is extracted, the arming vanes rotate and unscrews the arming pin from the fuze; thereby completing the arming sequence. When the fuze receives impact in any direction it will function.

FMU SERIES FUZE ASSOCIATED EQUIPMENT

2-53. Type: FMU Series Fuze Associated Equipment (reference figures 2-37a and 2-37b)

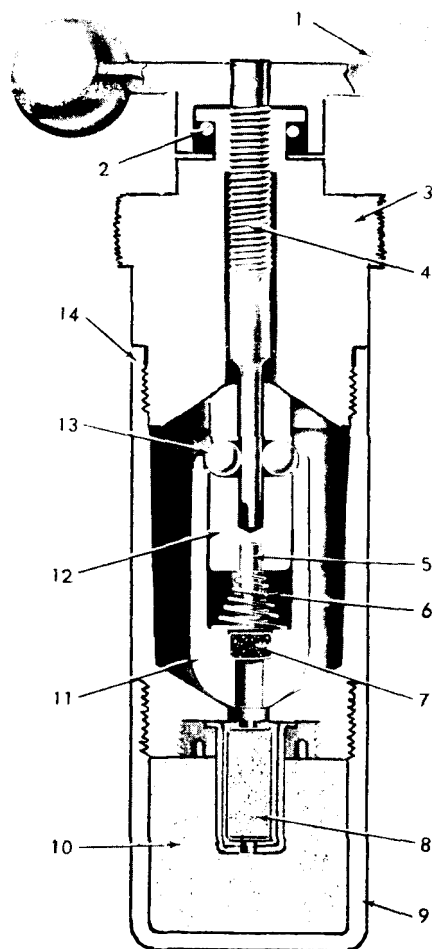
2-54. Physical and Functional Description of Components:

a. The battery firing device contains a firing pin, a compression spring, a spring loaded ball release mechanism, and a lanyard cable with a ball at one end. When the lanyard cable is pulled at release, a firing pin in the battery firing device impacts the primer in the fuze battery initiating the battery.

b. The lanyard lock is a cylindrical plug with holes for passage of the lanyard cable and setscrews for anchoring the cable to the plug. The lanyard lock serves as a guide for exit of the lanyard cable from the bomb's plumbing and has an anchor point for the free end of the lanyard cable after it is threaded through the swivel and link assembly.

c. The lanyard lock nut is an externally threaded spanner nut used to secure the lanyard lock within the charging well of the bomb.

d. The retaining clip is a clip designed to hold and retain the battery firing device in position in the fuze well.



- | | |
|------------------|------------------|
| 1 Arming vane | 8 Detonator |
| 2 Safety pin | 9 Booster cup |
| 3 Head assembly | 10 Booster |
| 4 Arming pin | 11 Primer holder |
| 5 Firing pin | 12 Striker |
| 6 Striker spring | 13 Steel balls |
| 7 Primer | 14 Case |

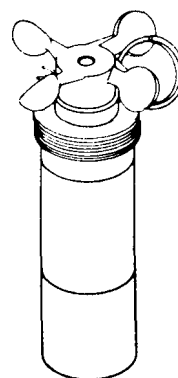


Figure 2-36A. Fuze Cutaway View (All-Ways Acting Impact)

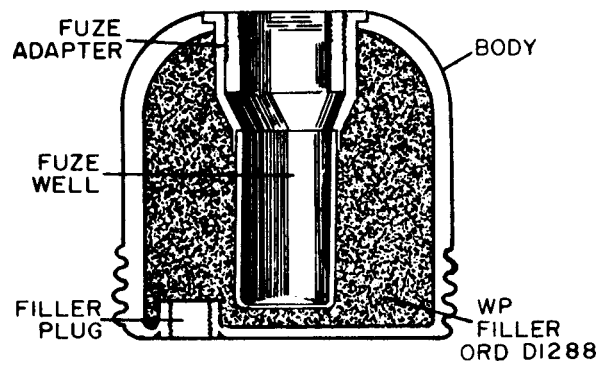


Figure 2-36B. Igniter AN-M23A1, Cutaway View

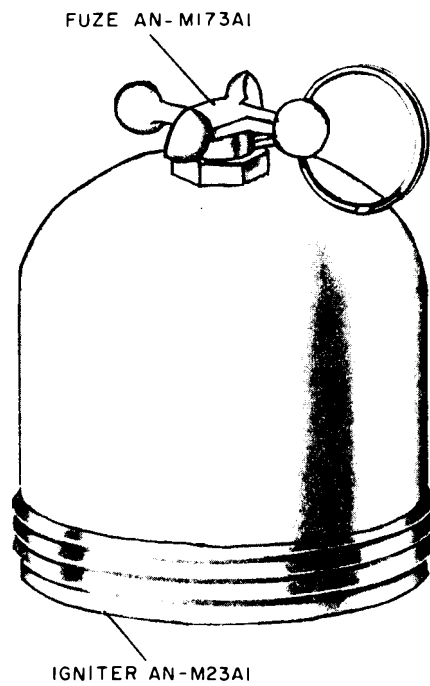


Figure 2-36C. Igniter AN-M23A1

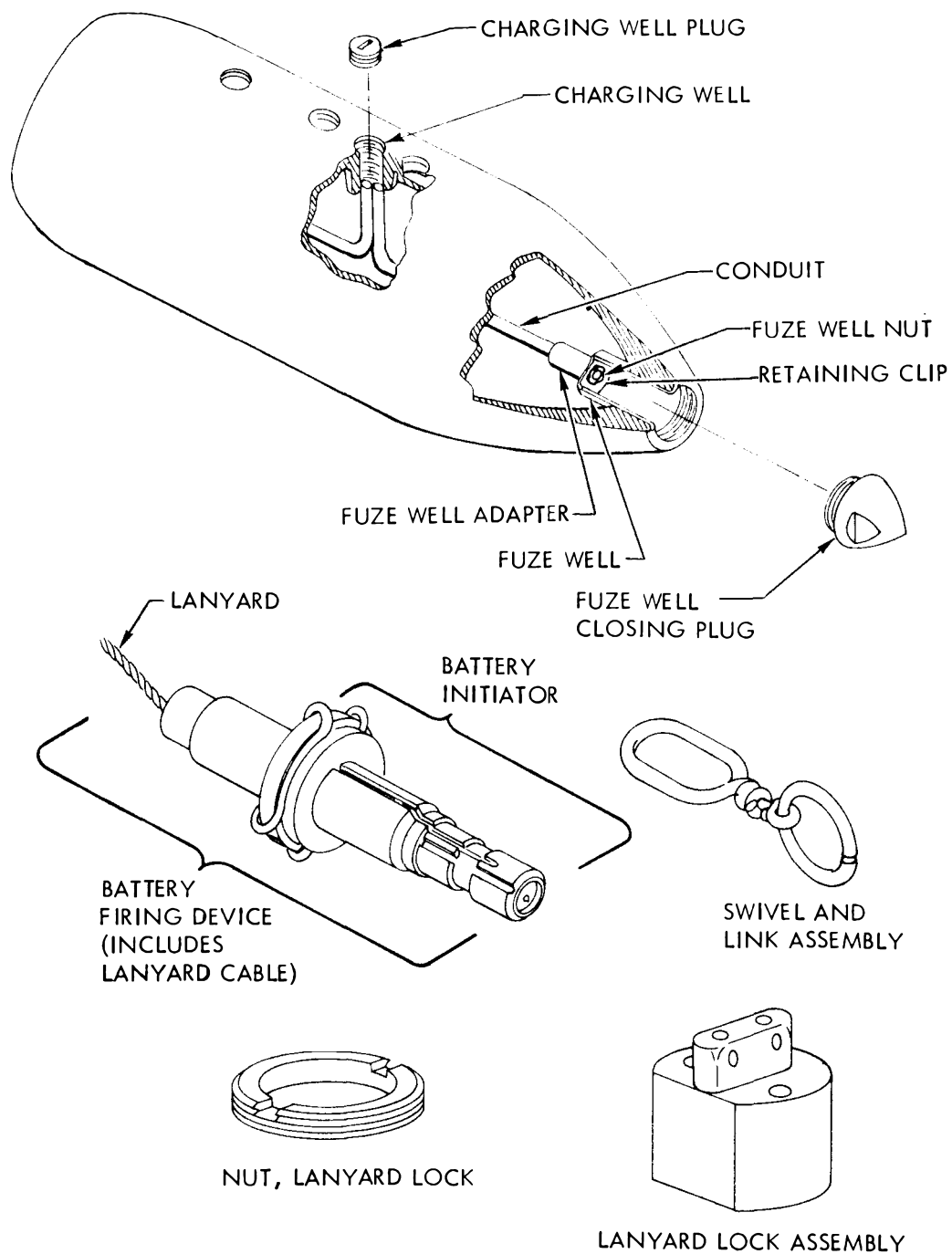


Figure 2-37A. New Series Bomb Components

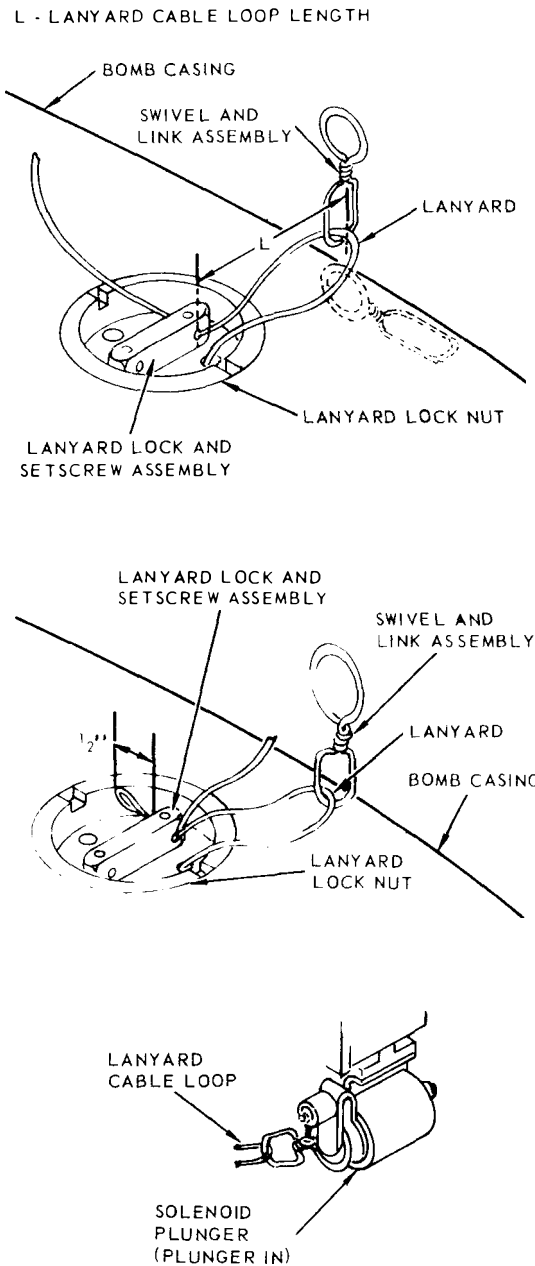


Figure 2-37B. Assembly of the Lanyard Lock, Lanyard and Swivel and Link Assembly

e. The swivel and link assembly consists of a circular wire ring and an oblong wire ring interconnected by a swivel, designed to serve as the mechanical link between the battery firing device lanyard and the ejector rack arming solenoid.

f. The fuze retainer is a metal ring installed over the end of the fuze to inhibit turning of the fuze in the bomb fuze well.

g. The bomb nose is a heavy metal cap which is threaded into the nose of the bomb after fuze installation. The bomb nose protects the fuze and streamlines the bomb.

h. The booster fuze holder is a copper plated spring steel clip used to hold the booster in place and to hold the safety switch selector in the airburst position on the FMU 26A/B and FMU 26B/B.

i. The safing plug is inserted into the hole at the rear center of the fuze container and provides protection against accidental initiation of the primer cap on the fuze battery. The safing plug is removed just prior to installation of the fuze.

FUZE SETS, BOMB, ELECTRIC FMU 7/B, FMU 7A/B, and FMU 7B/B

2-55. Type: Fuze Sets, Bomb, Electric FMU 7/B, FMU 7A/B, and FMU 7B/B (reference figures 2-38a, 2-38b, 2-38c, 2-39a, 2-39b, and 2-39c)

2-56. Identification: These fuze sets are fire bomb fuzing systems, each consisting of an initiator; two electrically armed, impact inertia fired, all-ways acting fuzes; and a cable assembly.

2-57. Hazardous Components:

- a. Thermal battery w/precussion primer.
- b. Explosive bellows.
- c. Precussion primer and detonator.
- d. Teteryl burster charge.

2-58. Function: Upon release, the initiator sends an electrical pulse to the fuze which initiates an explosive bellows. As the bellows expands it withdraws the arming pin from the all-ways action feature arming the fuze. Impact from any direction will function the fuze.

FMU 72/B

2-59. Type: FMU 72/B is a long-delay, anti-disturbance, electronically timed bomb fuze used with GP bombs with internal plumbing. May be used either nose or tail. (reference figures 2-40a and 2-40b)

2-60. Identification: The FMU 72/B is 3 inches in diameter and 7 inches in length. The nomenclature is painted on the face of the fuze and the identification plate is on the side.

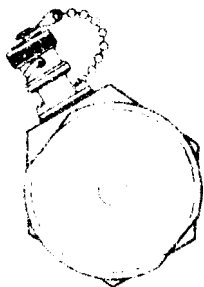


Figure 2-38A. Fuze FMU-7A/B

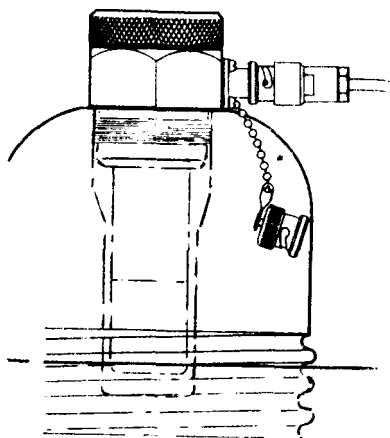


Figure 2-38B. Igniter AN-M23A1 with Fuze FMU-7A/B

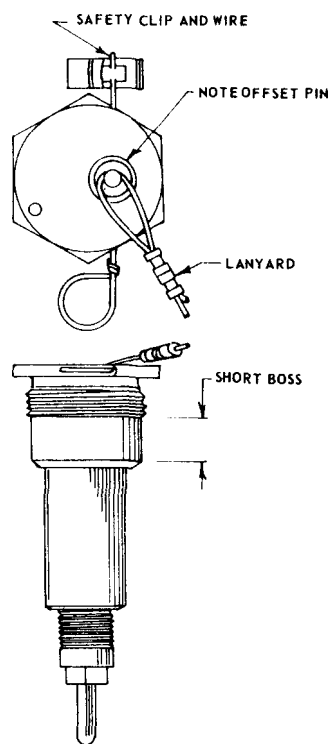


Figure 2-38C. Initiators FMU-7A/B and FMU-7B/B

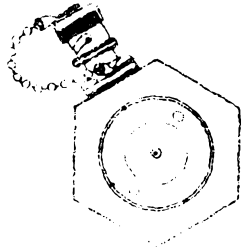


Figure 2-39A. Fuze FMU-7/B

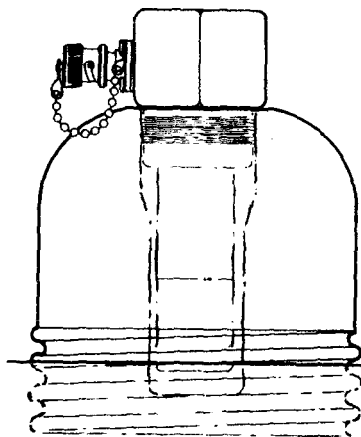
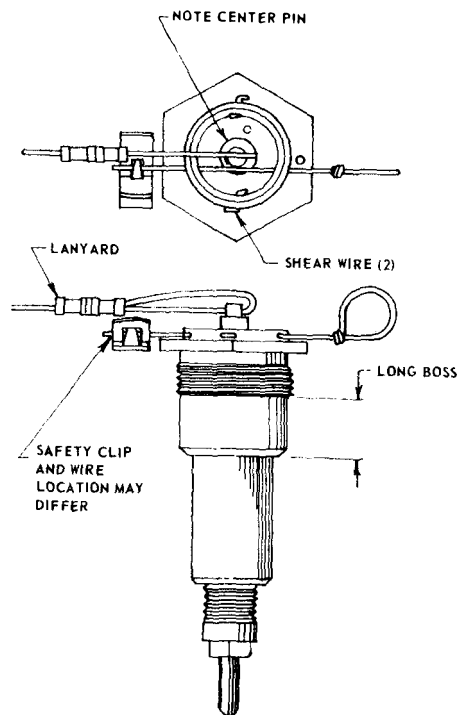
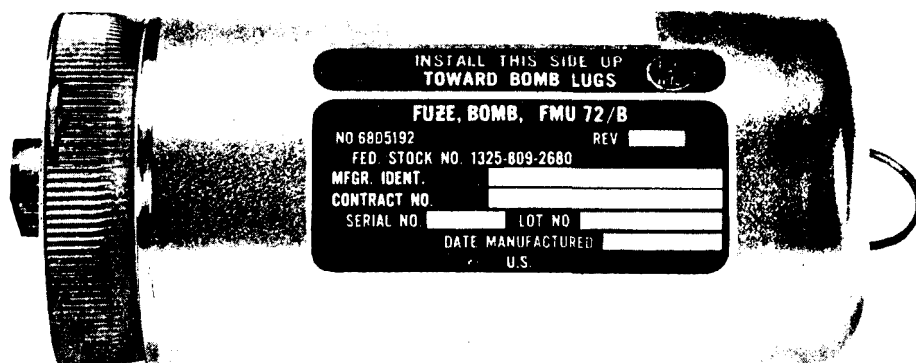


Figure 2-39B.
Igniter AN-M23A1 with
Fuze FMU-7/B



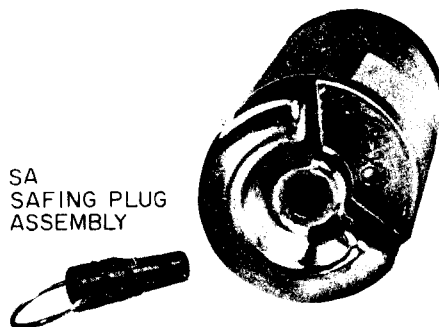
FMU-7 B INITIATOR

Figure 2-39C. Initiator, FMU-7/B



VIEW OF SELECTOR-SWITCH END

SA
SAFING PLUG
ASSEMBLY



VIEW OF EXPLOSIVE-TRAIN END

Figure 2-40A. Fuze, Bomb, FMU-72/B

COVER (YELLOW)



CAN OR CASE (YELLOW)

Figure 2-40B. FZU-2/B Booster and Tape, Assembly

2-61. Hazardous Components:

- a. Taped on booster.
- b. Detonator.
- c. Ammonia battery.

2-62. Function: The ammonia battery is fired by the BFD as the bomb leaves the aircraft providing electrical power for the fuze. The fuze arming timer fires a bellows motor which rotates the out-of-line detonator to the armed position. The fuze timing and counting circuitry provides the final event signal at the set event times after impact. If an attempt to move the fuze/bomb is made, an anti-disturbance switch will close and detonate the bomb.

NOTE

This fuze incorporates the following safety features:

- a. Impact switch: Initiates the preset long delay after the bomb impact.
- b. Safing switch: Inactivates the fuze if bomb impact occurs before 6.0 (+ 1.5 -1.0) seconds, such as an accidental drop to the ramp or an aircraft takeoff.
- c. Detonator enable switch: Shorts the detonator until subjected to a shock input equal to or greater than a half-sine wave input of 375 ± 125 "g" (3 microseconds duration). Switch actuates when acceleration causes the slug to move either in a direction parallel to the longitudinal axis of the bomb or in a direction toward the center of the fuze.

FMU 26/B, FMU 26A/B, FMU 26B/B

2-63. Type: FMU 26/B, A/B, B/B. Electrically functioned multi-purpose fuzes used for air or impact functioning. (reference figures 2-41a, 2-41b, 2-41c, and 2-41d)

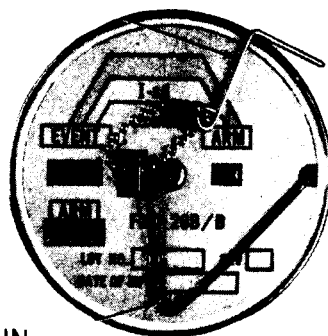
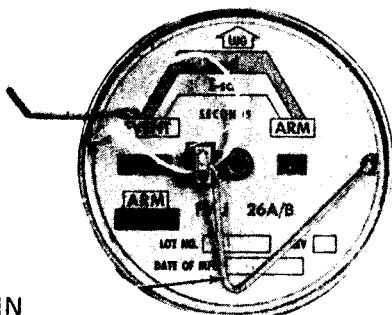
2-64. Identification: All three series of fuzes are cylindrically shaped, approximately 3 inches in diameter and 7 inches long. These fuzes may be used in either nose or tail and are completely enclosed within the bomb. The FMU 26/B is used for impact medium delay or skip bombing and impact short delay or dive bombing. The FMU 26A/B is used for impact medium delay or skip bombing, impact short delay or dive bombing and airburst. The FMU 26B/B is used for impact short delay or dive bombing and airburst.

NOTE

The airburst mode is used to open latches of clusters having 3-inch diameter nose fuzes.

SEAL PIN

SEAL PIN

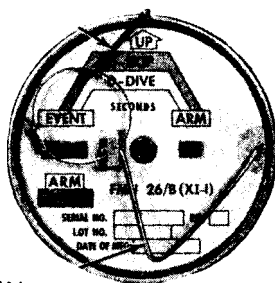


SAFE PIN

SAFE PIN

Figure 2-41A. Fuze FMU-26 A/B Figure 2-41B. Fuze FMU-26 B/B

SEAL PIN



SAFE PIN

Figure 2-41C. Fuze-26/B

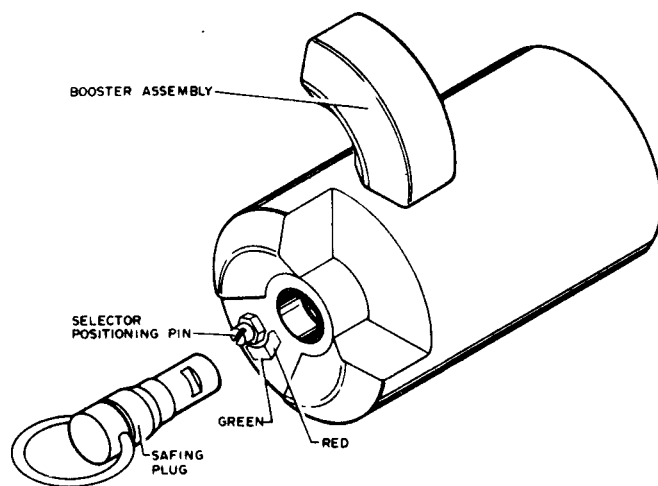


Figure 2-41D. Fuze FMU-26 Series and Components

2-65. Hazardous Components:

- a. Explosive bellows.
- b. Electric detonator.
- c. Thermal battery with percussion primer.
- d. Booster (either FZU 2/B or FZU 1/B).

2-66. Function: The arming sequence is the same for all fuzes. The primer in the thermal battery is initiated by lanyard pull and retracts the pinlock, unlocking the rotor and safing switch. Thermal battery power activates the arming circuits and the explosive bellows through the safing switch. The explosive bellows turns a rotor which aligns the fuze explosively. The thermal battery applies power to the impact circuit.

NOTE

If the ordnance impacts or is jarred within 1.35 seconds after its release, the safing switch opens the circuit to the explosive bellows and prevents fuze arming.

The airburst is accomplished with an electronic counter set before takeoff. Medium delay and short delay are accomplished by the use of varying delays contained in the fuze.

LAND MINE FUZE FMU 30/B

2-67. Type: Land Mine Fuze FMU 30/B (reference figure 2-42)

2-68. Identification: The FMU 30/B consists of a heavy machine steel forging, called the nose, and a cylindrical steel container which encloses the rear section of the fuze. The nose is hexagonal in shape and contains target sensors in three of the hexagonal sides. Two delivery mode setting switches are located in the nose, the target selector switch and the sensitivity switch. A cavity at the rear end of the cylindrical container is for installation of the booster. A hole at the rear center of the fuze contains the safing plug.

2-69. General Information: The fuze contains a safe/arm rotor that holds the electronic detonator in an out-of-line position until mechanical arming takes place. An arm/safe (A/S) rod passes through the rotor and holds it in the unarmed position until an axial impact of sufficient magnitude is experienced. After the A/S rod is released, the rotor is free to turn. At a given time after release of the A/S rod, two electrically initiated bellows motors drive the rotor into the armed position. Electrical contacts on the rotor assembly disconnect the dud circuits and connect the fire circuits when the rotor is driven to the in-line position.

Reference AFTO 11A7-11-7, dated 21 April 1969.

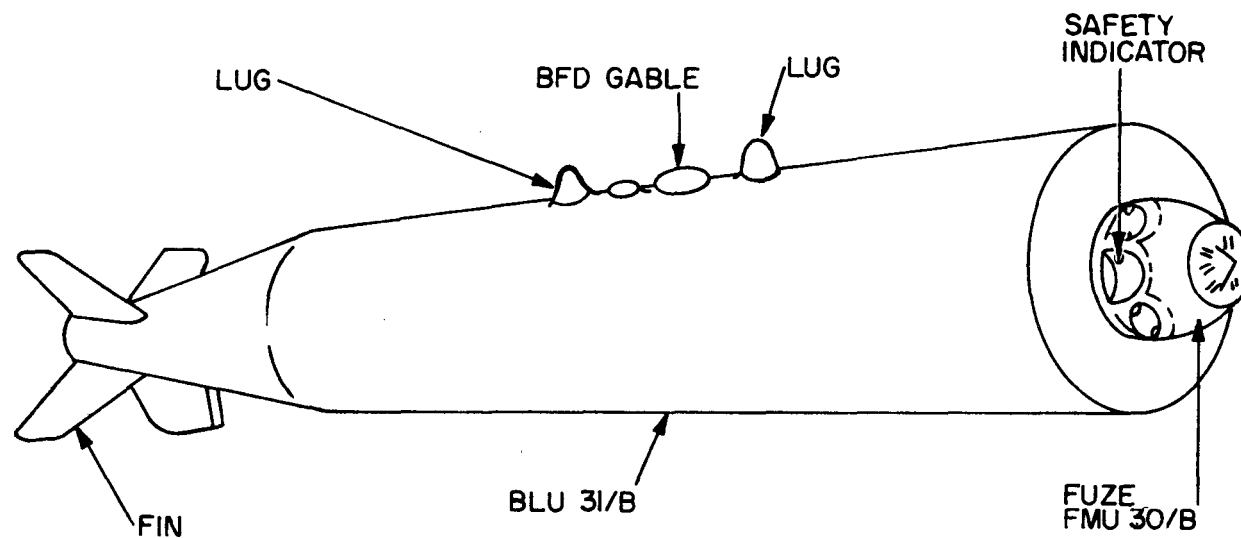


Figure 2-42. BLU-31/B Bomb with FMU-30/B Fuze

FMU 54/B FUZE

2-70. Type: The FMU 54/B fuze is a mechanically operated retardation sensing device that is used as a tail fuze and functions on impact only. (reference figures 2-43 and 2-44)

2-71. Identification: The FMU 54/B is approximately 3 inches in diameter and 7 inches long. A timing indicator with delays of .75 thru 3.5 seconds and an arming indicator window is located on the face of the fuze.

2-72. Hazardous Components:

- a. Detonator.
- b. Booster lead-in.
- c. Booster.

2-73. Function: At release, the lanyard pull unlocks three release pins to permit operation of the retardation sensor, timer, and slider. The retardation sensor functions when the snakeye fins are deployed, permitting the arming timer to run. At the end of the arming time (.75 to 3.5 seconds), the slider release shaft permits movement of the spring-loaded slider; thereby lining up the fuze explosively. Upon impact, the spring-loaded striker impinges the detonator and causes the bomb to detonate. If, however, the bomb should impact prior to completion of the arming cycle, the slider would be prevented from moving to the armed position.

PROXIMITY FUZE FMU 56/B

2-74. Type: Proximity Fuze FMU 56/B (reference figures 2-45 and 2-46)

2-75. Identification: The FMU 56/B is a self-powered Doppler radar proximity fuze used to function a free falling munitions cluster bomb unit (CBU).

2-76. Hazardous Components:

- a. Thermal battery.
- b. Detonator.
- c. Booster.

2-77. Function: Upon release, the battery firing device actuates the thermal battery which applies power to the fuze circuitry and starts the arming timer. The arming timer runs for its preset time, arming the fuze. When the CBU has reached the preset height of burst, as determined by the fuze radar, the detonator fires through the booster, opening the CBU.

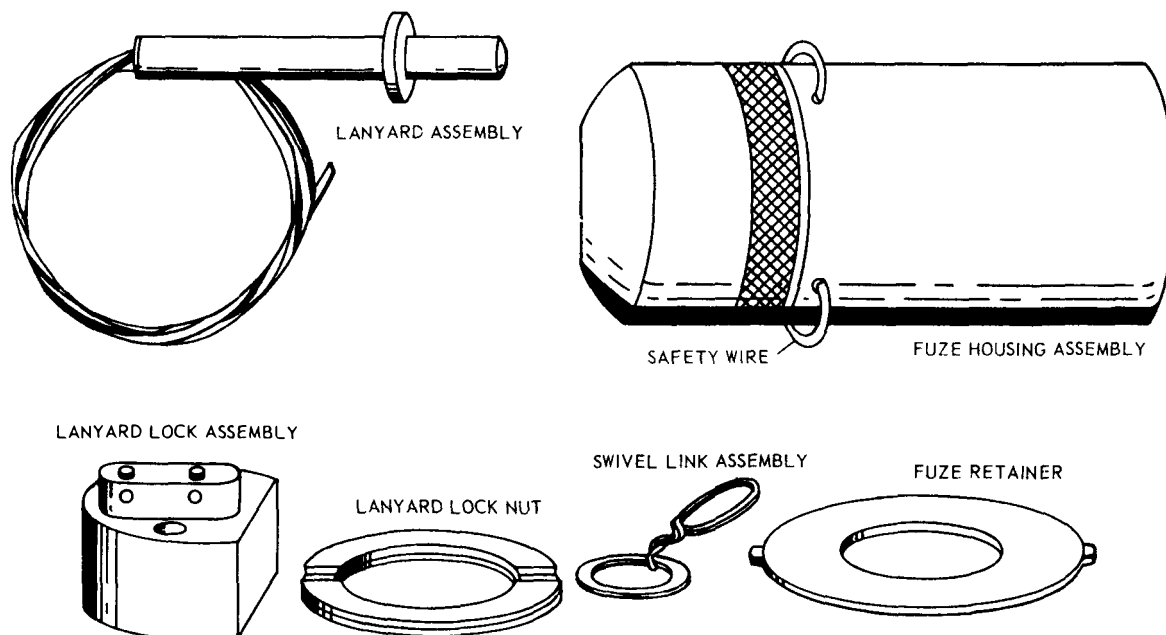


Figure 2-43. FMU 54/B Fuze Components

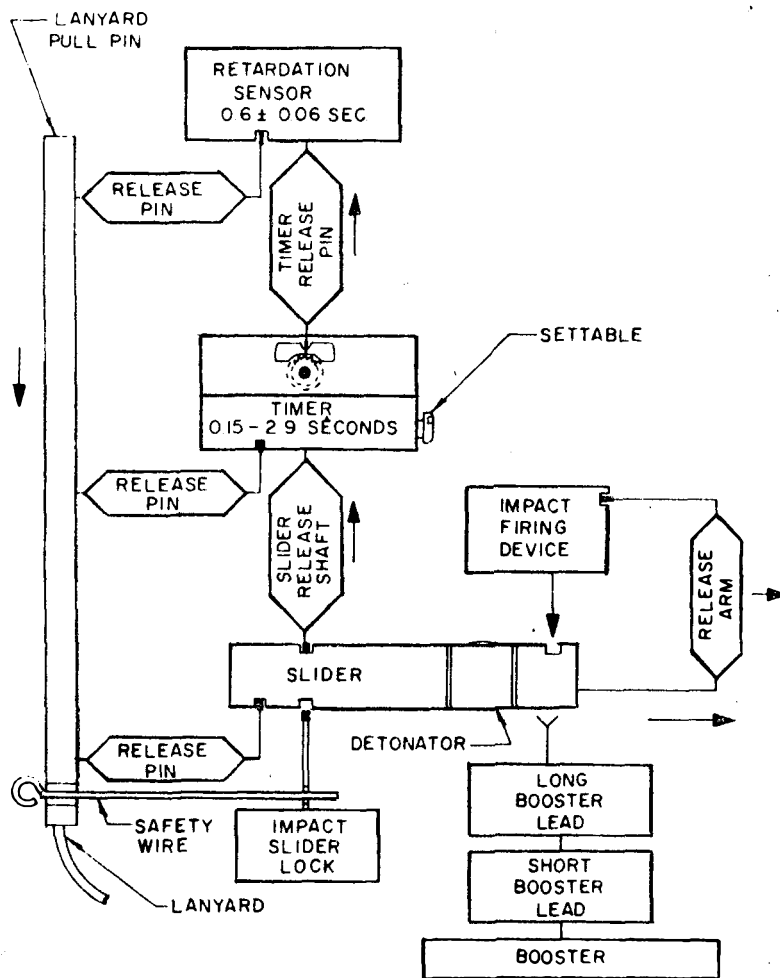


Figure 2-44. FMU-54/B Block Diagram

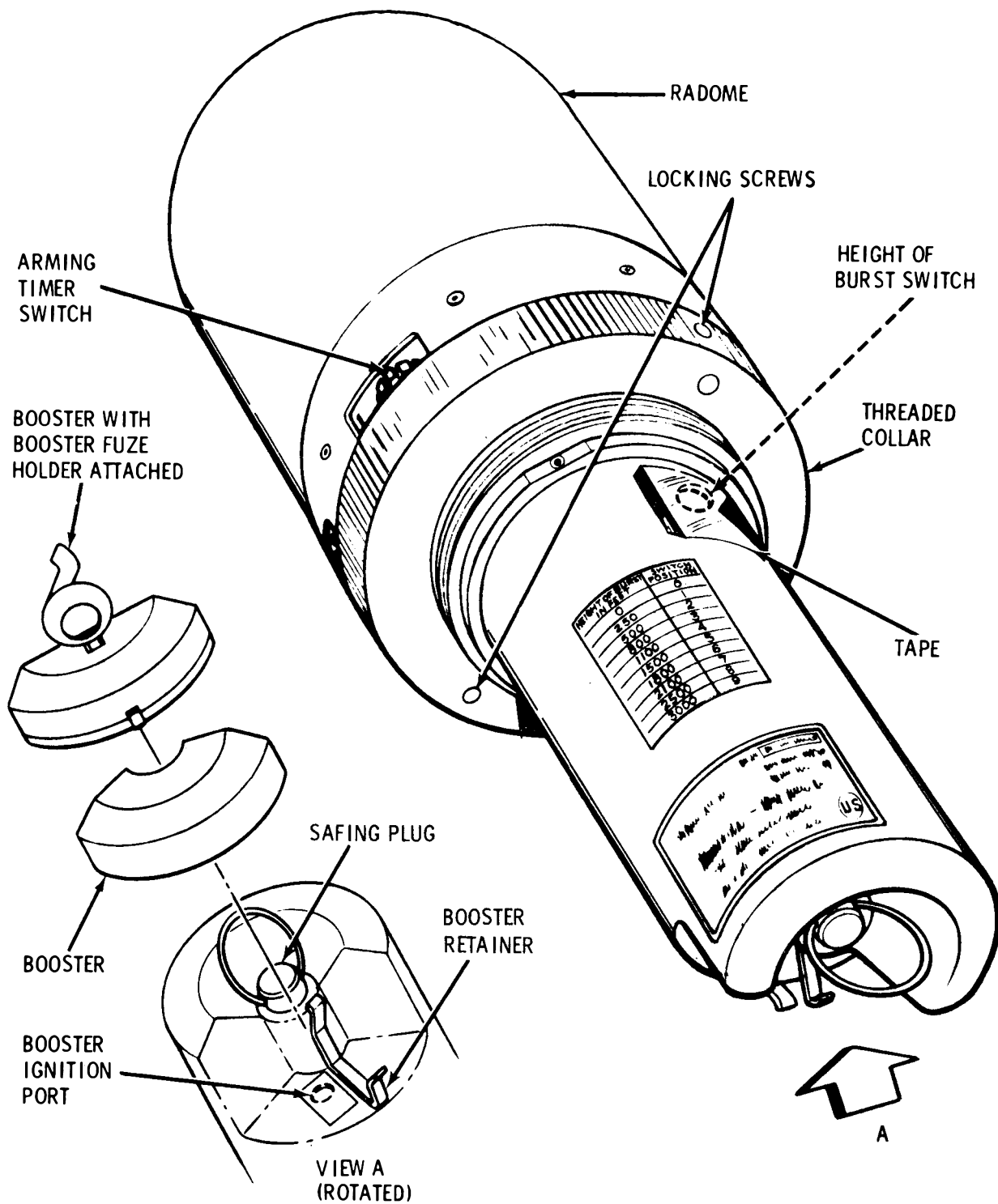


Figure 2-45. FMU-561B Rear View

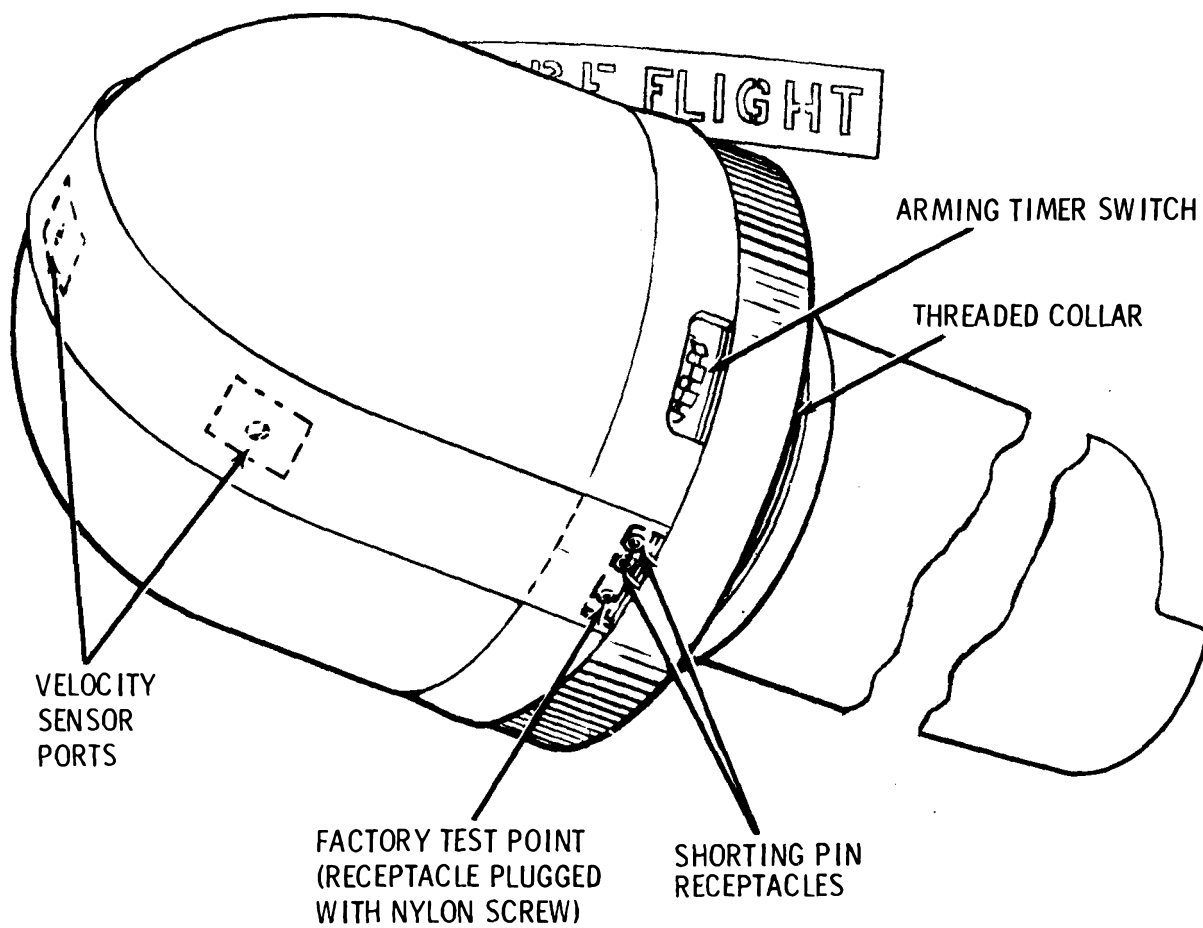


Figure 2-46. FMU-561B, Front View

PROXIMITY FUZE FMU 56A/B

- 2-78. Type: Proximity Fuze FMU 56A/B (reference figures 2-47 and 2-48)
- 2-79. Identification: The FMU 56A/B is a self-powered Doppler radar proximity fuze used to function a free falling munitions cluster bomb unit (CBU).
- 2-80. Hazardous Components:
- a. Thermal battery.
 - b. Detonator.
 - c. Booster.
- 2-81. Function: Upon release, the battery firing device actuates the thermal battery which applies power to the fuze circuitry and starts the first step of the two-step arming timer. At the end of the first step, the Pitot tube is extended to actuate the velocity sensor system. At the end of the second step, the fuze will arm, providing the velocity sensor switch has closed. When the CBU has reached the preset height of burst, as determined by the fuze's radar, the detonator fires through the booster, opening the CBU. Should the fuze impact prior to the preset arm time, the impact switch prevents the fuze from arming.

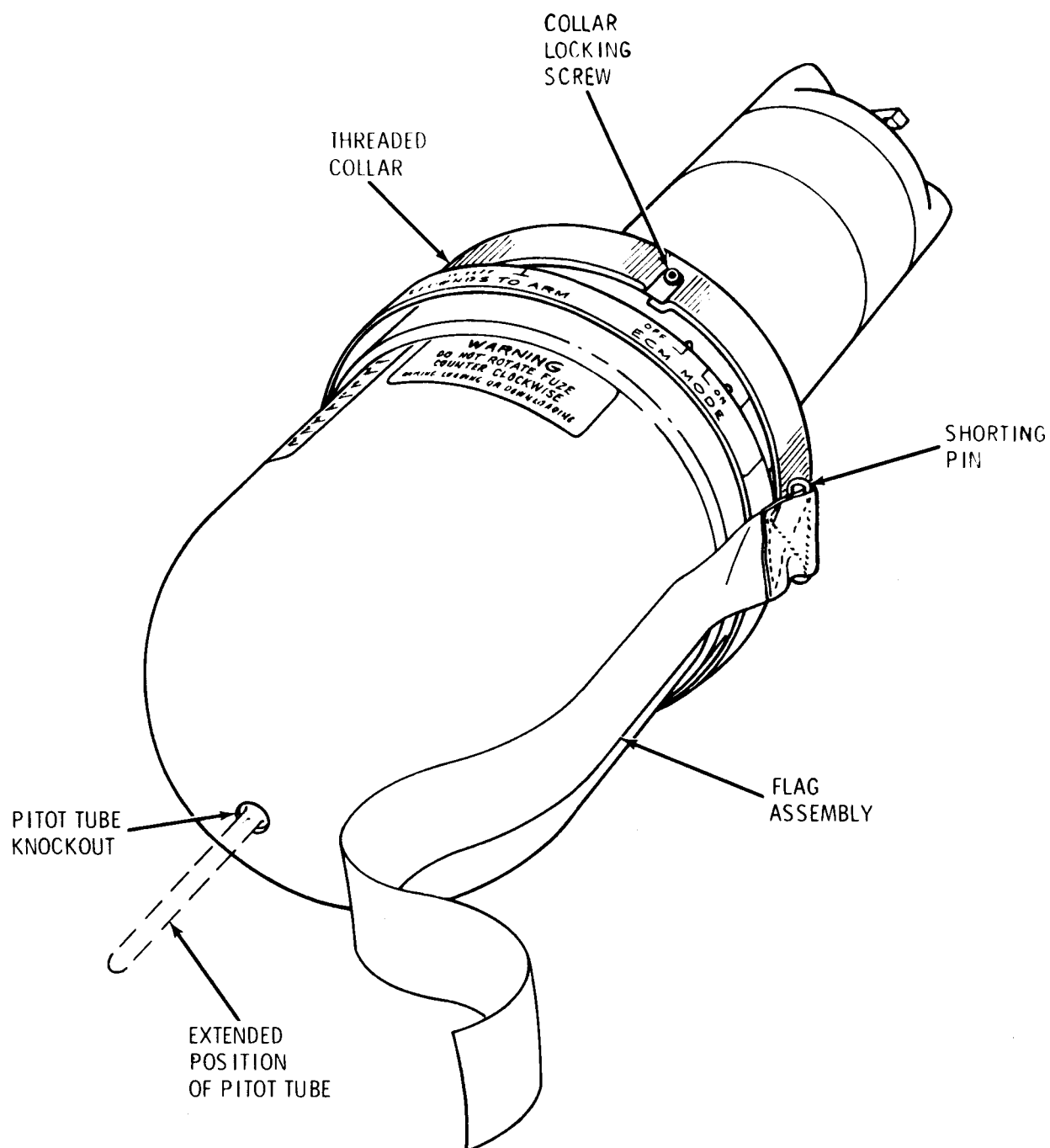


Figure 2-47. FMU-56 A/B, Front View

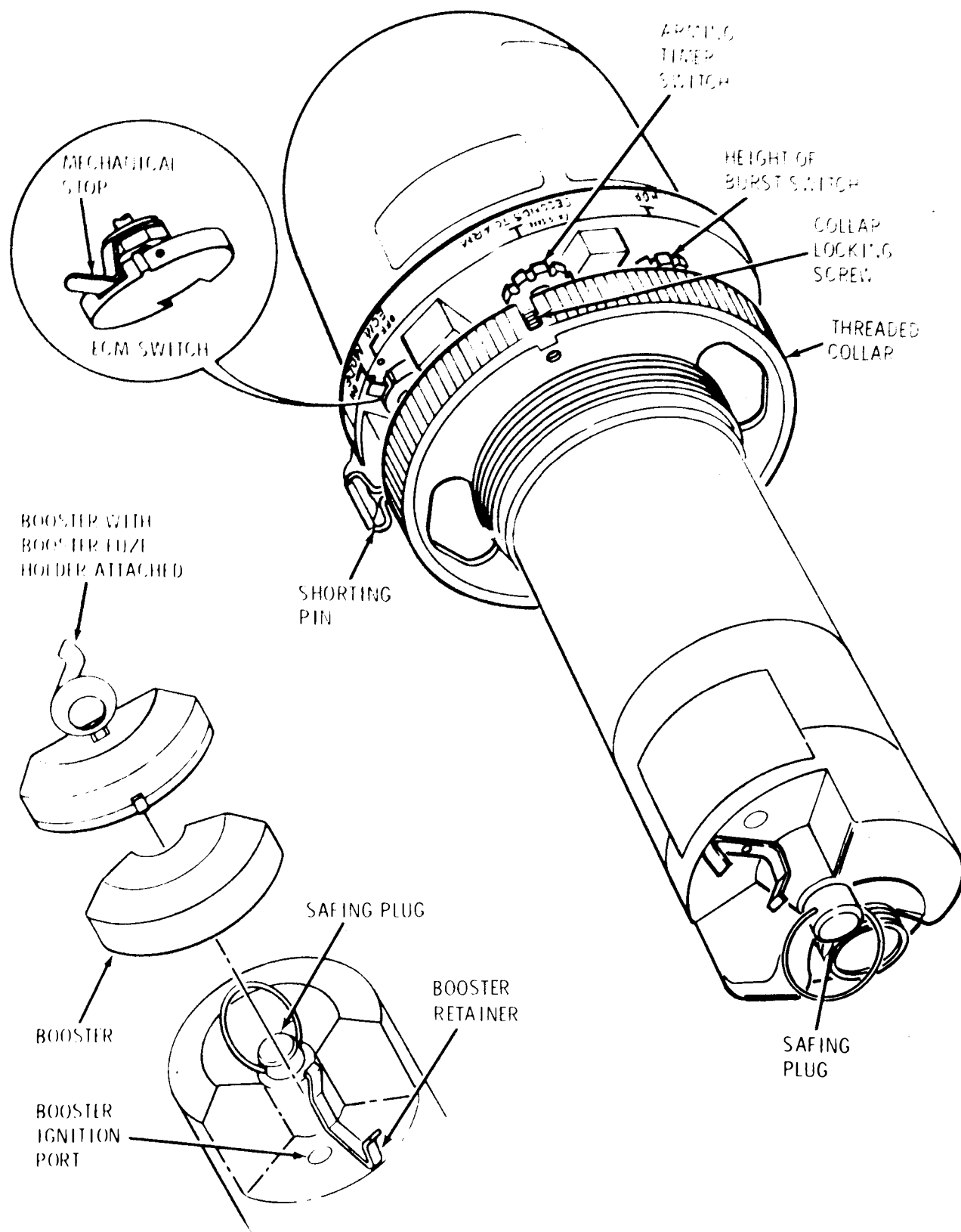


Figure 2-48. FMU-56A/B Rear View

MODEL	IDENTIFICATION	DELAYS	REVOLUTIONS TO ARM	AIR TRAVEL TO ARM	SAFETY DEVICES	THREAD DIAMETER	BOMBS IN WHICH USED
M103A1	Silver face with no black	.1 sec. & inst.	180 delay or 320 inst.	510 - 765	Safety blocks and detonator safe	2"	Nose position of all GP; 90-, 220-, and 260-pound frags; and 500-pound chemical bomb
M158	Arming vane hub & firing pin showing	None	375 to 512		Detonator safe	1.5"	Nose position of 20- pound frag bomb
M159A1	Arming vane, head and arming pin showing	None	400 to 500		Detonator safe; seal wire	1.5"	Nose position of AN- M47A3/A4, 100-lb., chemical bomb
M914	VT bar type	None	1550	2000	Detonator safe, safety pin, and vane lock pin	2"	Nose position of all GP's; 90-, 220-, and 260-pound frags and 500-pound chemical bomb
M904	Windows to determine arming	Inst., .1, .01, .05, .25, or .025 second	1800	4,6,8,12, 16 and 20 seconds	Detonator safe	2"	Nose position of all GP bombs
M907	Mechanical time	Airburst 4-92 seconds	Arming time is 1/2 the function time		Detonator safe, warning windows & seal wires	1.5"	Nose or tail position of M120/120A1 photo- flash bombs
M909							Nose or tail position of M129/129E1 leaflet bombs

Table 1. Bomb Fuze Chart

MODEL	LENGTH IN INCHES	ACTION	METHOD OF ARMING	REVOLUTIONS TO ARM	DELAY ON IMPACT (Seconds)	SAFETY DEVICES	THREAD DIAMETER	BOMBS IN WHICH USED
M100A2	9	Impact	Vane	158	PDU-M14: .1, .01, .24 and .025 sec.	Safety pin and cotter pin	1.5"	Tail position of GP fragmentation, SAP and chemical bombs
M112A1	9	Impact	Vane	18	PDU-M16 and M16A1: 4-5, 6-8, 8-15	Safety pin	1.5"	<u>Tail</u> position of GP and SAP bombs
M175	25	Impact	Vane	175	PDU-M14: .1, .01, .24, and .025 second	Arming stem pin	1.5 "	Tail position of GP and fragmen- tation bombs
M190	13	Impact	Vane	657	PDU-M14: .1, .01, .24, and .025	Arming stem pin	1.5 "	Tail position of 750-lb GP bombs
M123A1	9	Time antiwith- drawal	Vane	100 feet of air travel	1 - 144 hours	Safety pin	1.5 "	Tail position of all GP and SAP bombs
M905	N/A	Impact	Vane	1800	M9: inst.; .01; .025; .05; .1; and .25 second	Windows	2 "	Tail position of 750-lb GP bombs
M906	N/A	Impact	Vane	1800	T5 - 4.5 sec. T6 - 12.5 sec.	Windows	2 "	Tail position of 750-lb GP bombs
FMU-26/B	N/A	Airburst or impact	Electron- ically	Selectable	Selectable	Safing plug	N/A	Tail position of 750-lb, MK-81 and MK-82 bombs

MODEL	LENGTH IN INCHES	ACTION	METHOD OF ARMING	REVOLUTIONS TO ARM	DELAY ON IMPACT (Seconds)	SAFETY DEVICES	THREAD DIAMETER	BOMBS IN WHICH USED
FMU-54/B	N/A	Impact	Retarda- tion	0.75 - 3.50 seconds	N/A	Safety wire	N/A	Tail position of 750-1b, MK-81 and MK-82 GP bombs
FMU-56/B	N/A	Air- burst prox- imity	Doppler radar	Preset	Airburst action	Safing plug, arming timer switch, shorting pin and velocity sensor	N/A	Nose position of CBU-24B/B cluster
FMU-7/B FMU-7A/B	N/A	Impact	Bellows	N/A	None	Pin	1.5"	Fire bombs
FMU-30/B	N/A	Sig- nature sensi- tive device	Axial impact	N/A	N/A	Safing plug	N/A	BLU 31/B
FMU-72/B	N/A	Long delay anti- distur- bance	Bellows and impact	N/A	36.5 $\pm$ 10 seconds	Impact switch, safing switch, detonator enabling switch	N/A	GP bombs (nose or tail)

CHAPTER 3

US PROJECTED ORDNANCE AND FUZES

PART ONE - PROJECTILES

PART TWO - PROJECTILE FUZES

PART ONE

PROJECTILES

OBJECTIVES

To learn identification, hazards, function, and render safe/disposal of U. S. projected munitions employed in Viet Nam.

INTRODUCTION

A thorough knowledge of U. S. projected munitions employed by U. S. forces in Viet Nam is a must for USAF EOD personnel performing duty in that country. In addition to a routine EOD approach for these items, the V. C. recover or capture U. S. ordnance and modify it for use as booby traps and/or improvised mines. EOD responsibility does not end with USAF ordnance. Many times Air Force EOD personnel may be called upon to work on Army munitions as well as assist EOD teams in other services.

HE PROJECTILES

1-1. Type: HE Projectiles (reference 3-1).

1-2. General: This type of projectile may have different designations such as common, special common, high capacity and others. These projectiles are essentially the same, each capable of producing blast and fragmentation at the target. The weight of the high explosive filler is usually 10 per cent or less.

1-3. RECOGNITION FEATURES:

- a. Solid body or (1) one piece construction.
- b. May be fuzed either nose or tail or both.
- c. ^{75mm} 90MM, 105MM, 155MM, 175MM and the 8 inch HE round have the same basic ID features.

1-4. HAZARDS:

- a. HE
- b. FRAG
- c. VT if using VT type fuzing
- d. Some BD fuzes contain graze sensitive elements

1-5. TYPES OF FUZING: Any of the below listed of fuzes may be found in HE rounds.

- a. Point Detonating
- b. Base Detonating
- c. Time, Super Quick

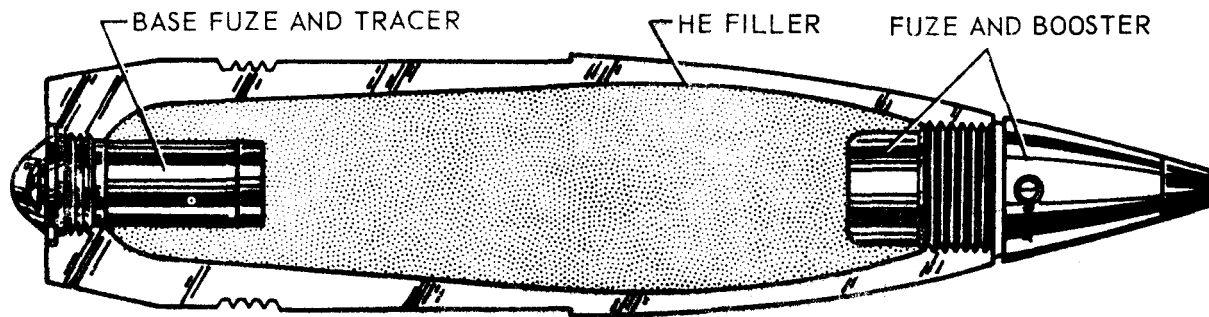


Figure 3-1. Typical HE Projectile

d. Mechanical Time, Super Quick

e. VT

1-6. OPERATION: HE rounds use spin for stabilization. Arming is usually accomplished with the following methods. More than one method may be used on any particular fuze:

a. Setback

b. Centrifugal force

c. Creep

d. Spring action

e. Clockwork

f. Electric power from batteries and generators

g. Deceleration

No fuze uses all these factors to arm and line up the firing train components; consequently, you must know the fuze mechanism in order to work on it. The most common actions to fire a fuze is as follows:

(1) Impact

(2) Impact inertia

(3) Clockwork

(4) Electric current (VT type fuzes)

(5) Deceleration

HEAT PROJECTILES

1-7. Type: Heat Projectiles (reference figures 3-2, 3-3 and 3-4).

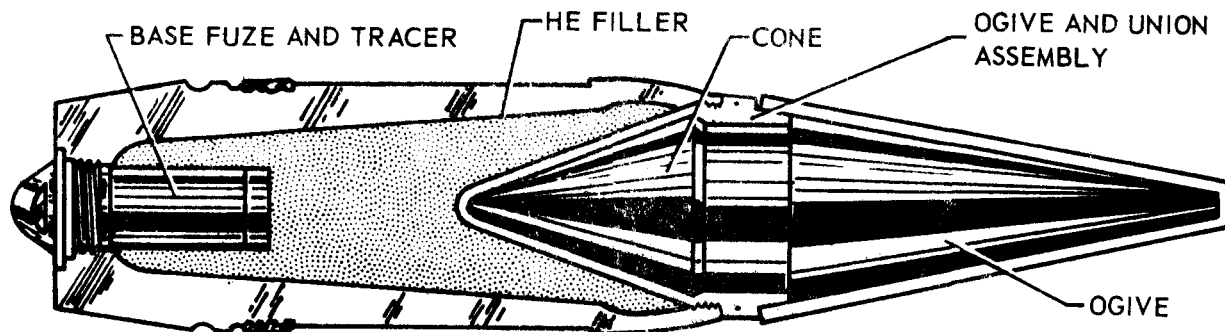
1-8. General: Heat projectiles are of two different designs - spin stabilized and fin stabilized. The spin stabilized loses some of the efficiency of its shape charge as a result of the spin distorting the jet as it is being formed. The fin stabilized round is fired from a rifled base; however, the round does not spin appreciably because the fins on the base of the round stop or slow the spin soon after the projectile leaves the muzzle. The shape charge is more effective due to the absence of spin.

1-9. Recognition Features:

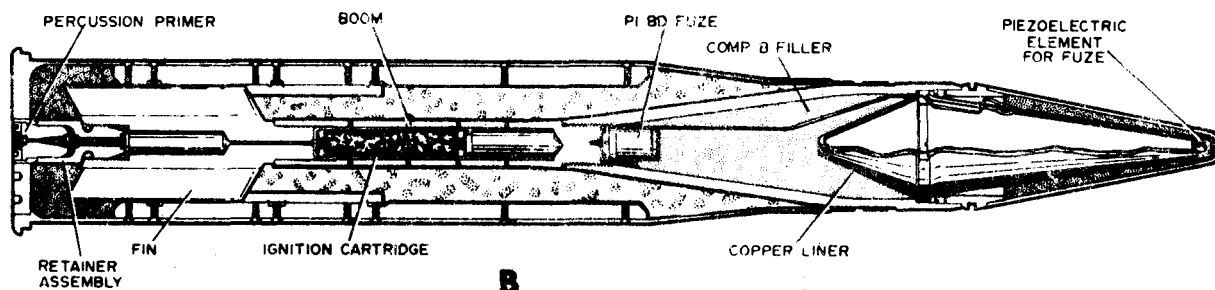
a. Two piece body construction

b. Bottleneck configuration (long snout on the nose)

c. Piezoelectric element on the nose.

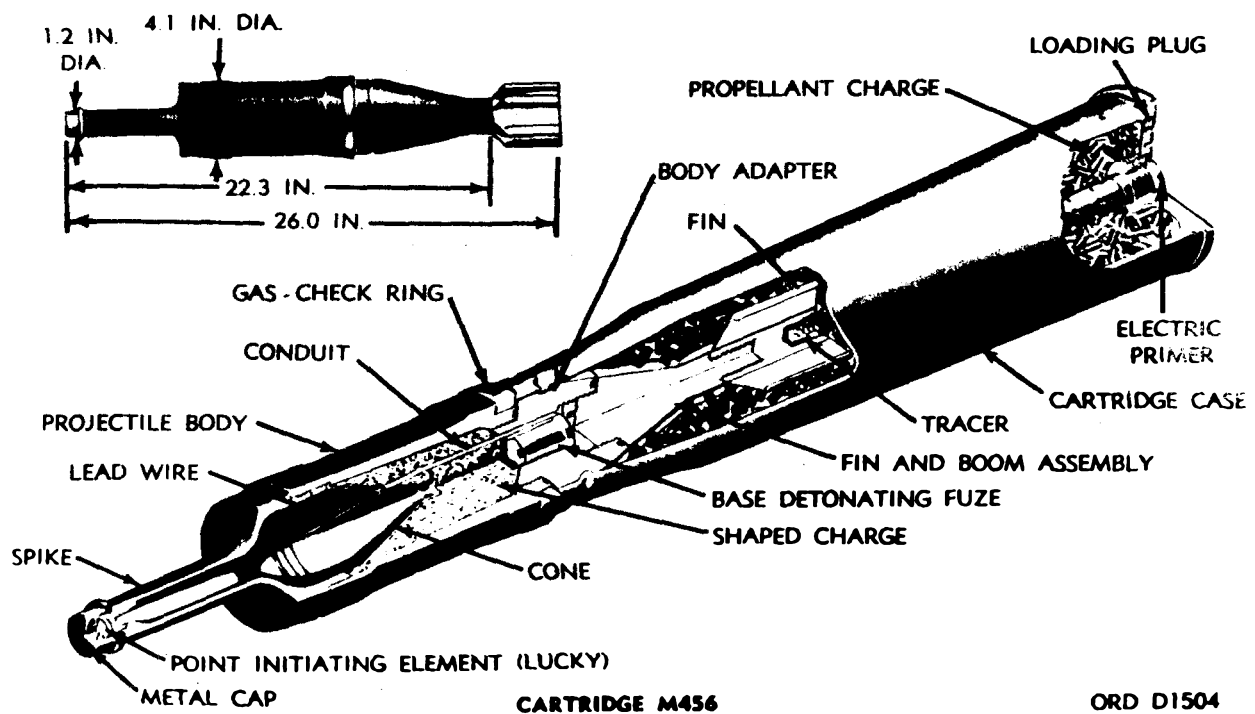
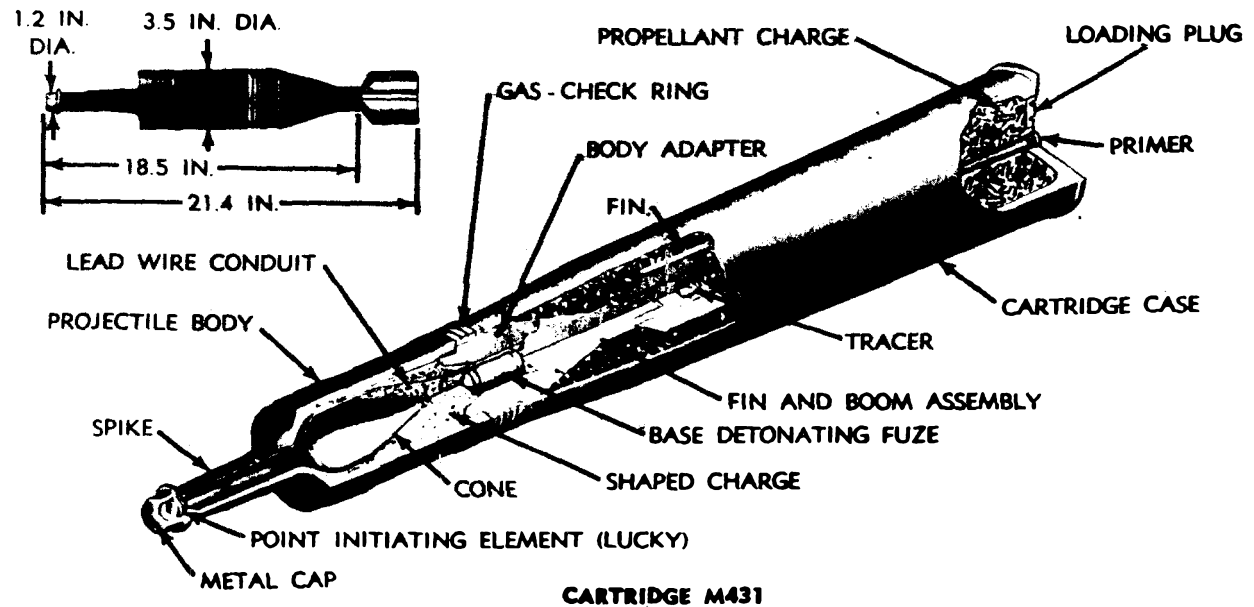


A



B

Figure 3-2. Typical HEAT Projectile



ORD D1504

Figure 3-3. Characteristics of Cartridges M431 and M456

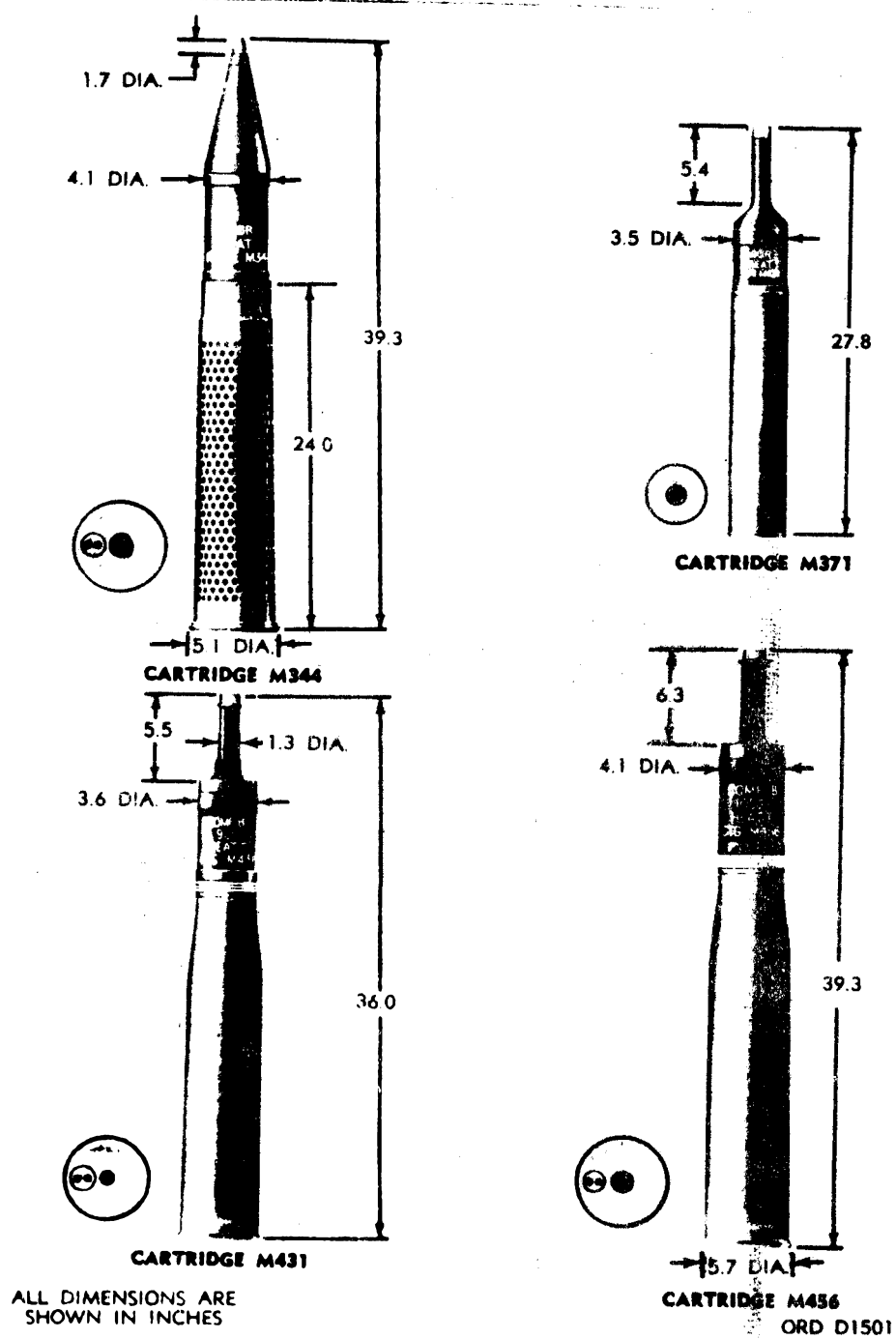


Figure 3-4. Typical HEAT Cartridges

1-10. Hazards:

- a. HE
- b. FRAG
- c. Jet
- d. "Lucky"

1-11. Types of Fuzing: Fuzing may vary considerably in HEAT rounds.

- a. BD
- b. PIBD (mechanical)
- c. PIBD (Lucky)

1-12. Operation: HEAT rounds are armed when fired from their gun or recoilless rifle. The same general motions arm a HEAT round as an HE round. When the round hits the target the BD fuze functions on impact inertia. The point initiated base detonating (PIBD) type of fuze functions when the point initiating element spits back to function the base detonating element. The PIBD, "Lucky" type functions the base element electrically when the crystal is stressed.

NOTE

Extreme caution must be exercised when working with "Lucky" fuzed rounds.

WP PROJECTILES

1-13. Type: WP Projectiles (reference figure 3-5)

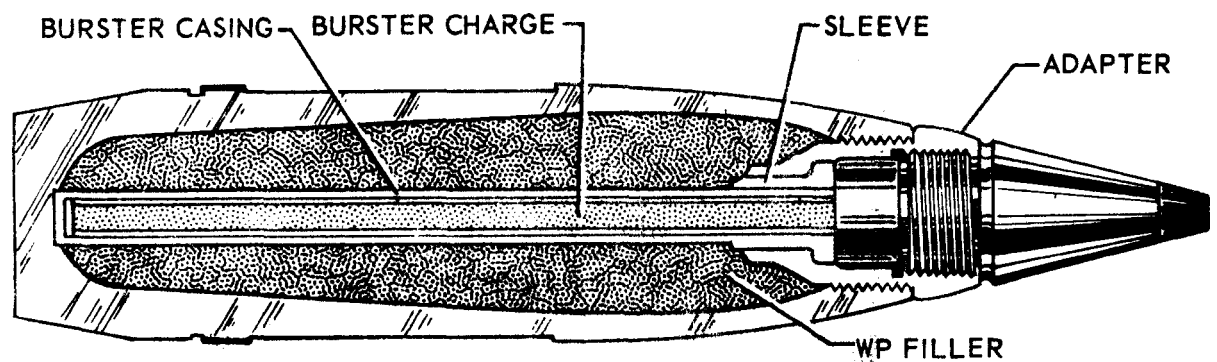
1-14. General: WP projectiles are primarily used as a smoke round for screening or spotting. Generally speaking these rounds will have a burster tube to break open the round and disperse the WP. The exception to this is the Navy type which is a base ejection round.

1-15. Recognition Features:

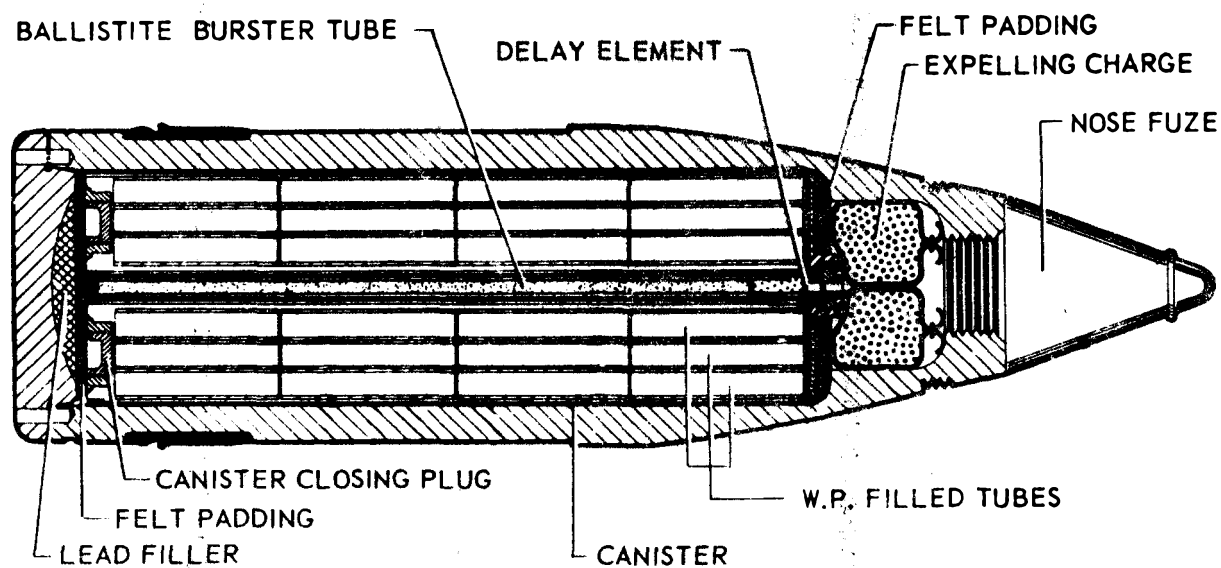
- a. An adapter ring between fuze and body.
- b. Absence of caulked on base plate.
- c. The navy type has no identifying feature.

1-16. Hazards:

- a. Blast
- b. FRAG
- c. Fire and smoke
- d. Ejection (Navy only)



A



B

Figure 3-5. Typical WP Projectiles

1-17. Types of Fuzing:

a. Point Detonating

b. Mechanical Time

c. *Black Powder AND Fuze*
1-18. Operation: This round functions similar to an HE round except in the case of the Navy type round which is base ejection.

BASE EJECTION PROJECTILES

1-19. Type: Base Ejection Projectiles (Reference figure 3-6).

1-20. General: Base Ejection projectiles are used to carry a payload to a predetermined location. When the projectile reaches the target, its contents are ejected. The payloads include illuminating candles, HC smoke candles, window rounds for blocking enemy radar, and other contents that have a tactical application. These rounds are always fuzed with either a time fuze or a proximity fuze. When the fuze functions, the payload is ejected by an expelling charge. The base plug may be screwed into the body or it may be held in the body by pins. The threads or the pins are sheared by the pressure created by the expelling charge.

1-21. Recognition Features:

a. Break between body and base plug

b. Time or proximity fuze is an indication only

c. Most projectile sizes.

1-22. Hazards:

a. Ejection

b. Fire

1-23. Types of Fuzing:

a. VT

b. Mechanical or Powder Train Time

NOTE

Flechette rounds are basically an ejection round. The difference is they are nose ejection instead of base ejection.

MORTARS

1-24. Type: Mortars (Reference figures 3-7, 3-8 and 3-9).

1-25. General: Mortars differ from artillery in that they have a high angle of fire while artillery has a relatively straight line of fire. Mortars have a short range compared to artillery; however, mortars can be lobbed into a target and artillery cannot. There are two different types of mortars. These are the fin stabilized and the spin stabilized. The fin stabilized mortar rounds are fired from a smooth bore tube. The

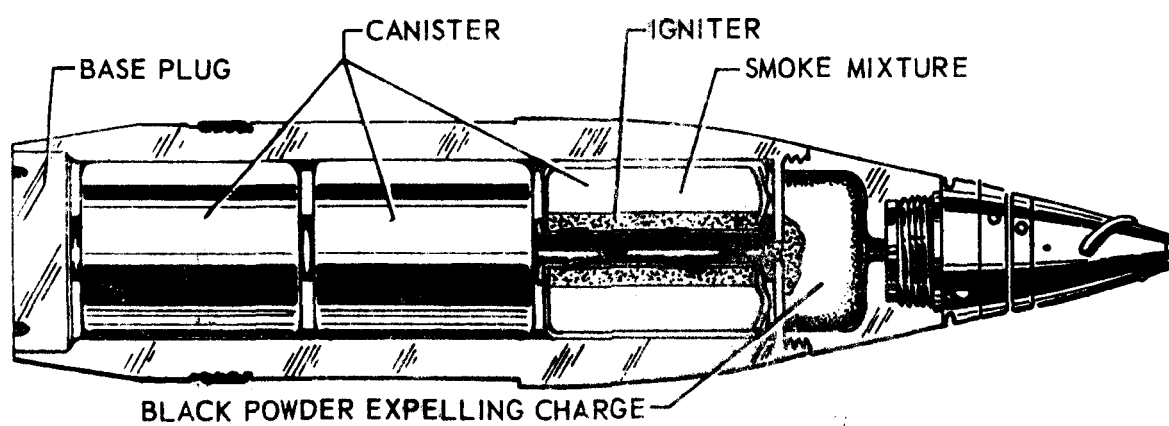


Figure 3-6. Typical Base Ejection Projectiles

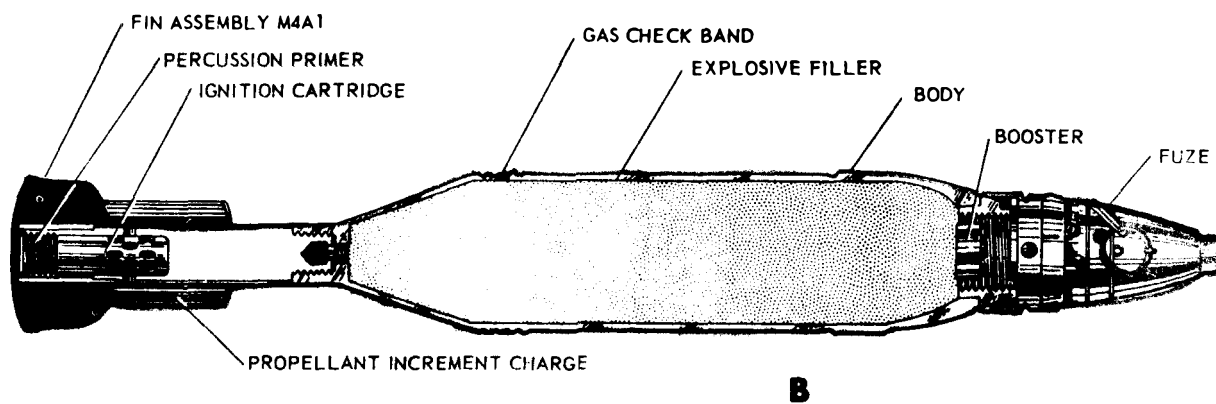
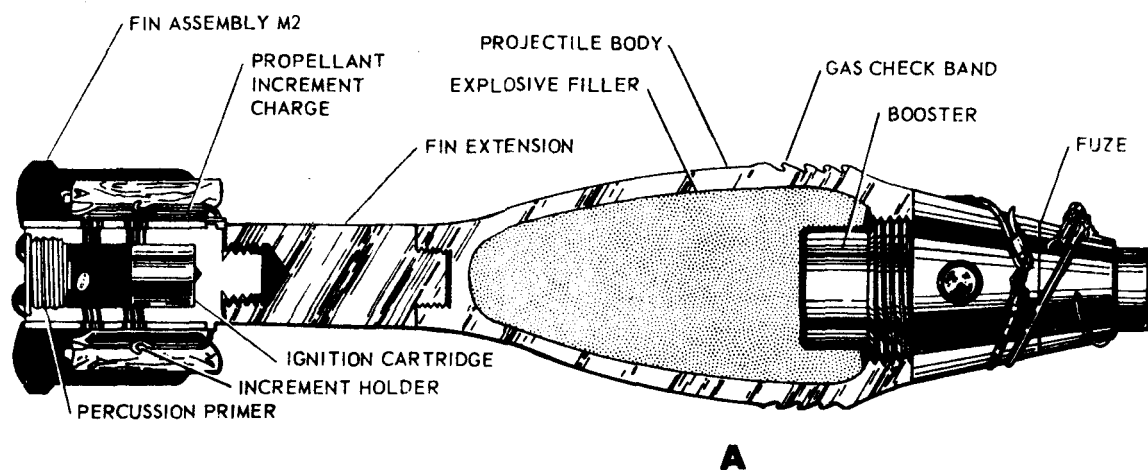
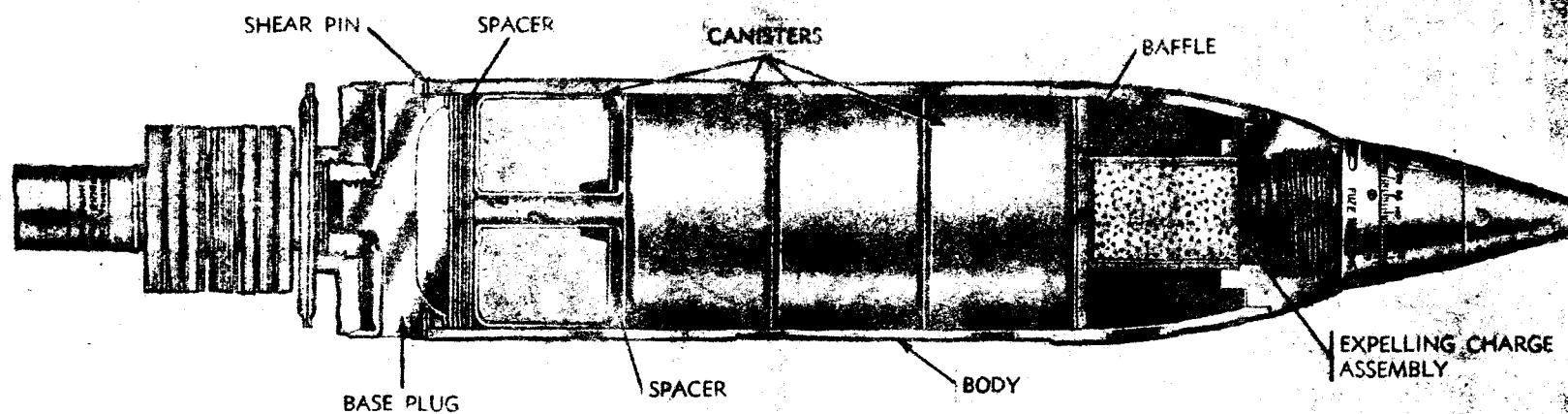
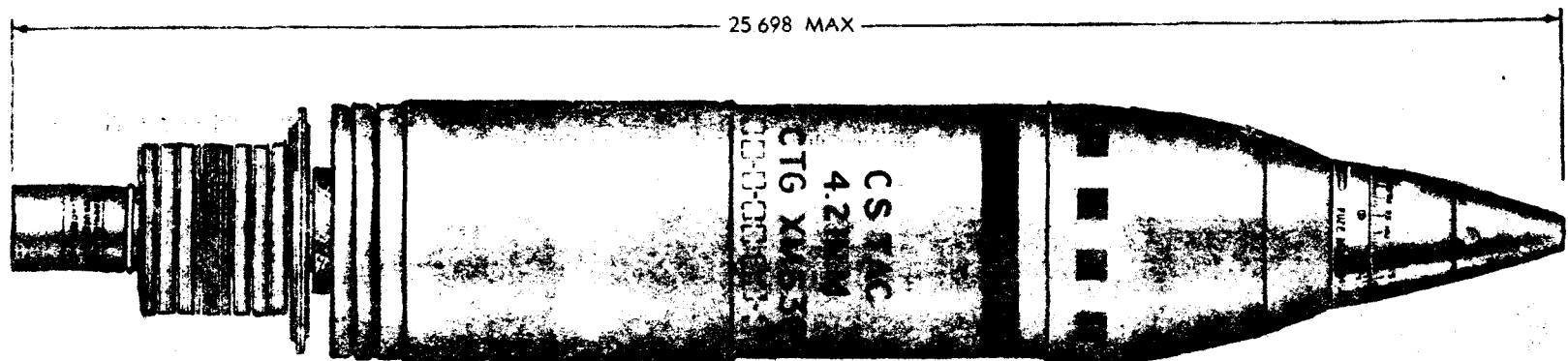


Figure 3-7. Typical Mortor Rounds



ORD 01750

Figure 3-8. 4.2 in. Mortar with Cutaway View

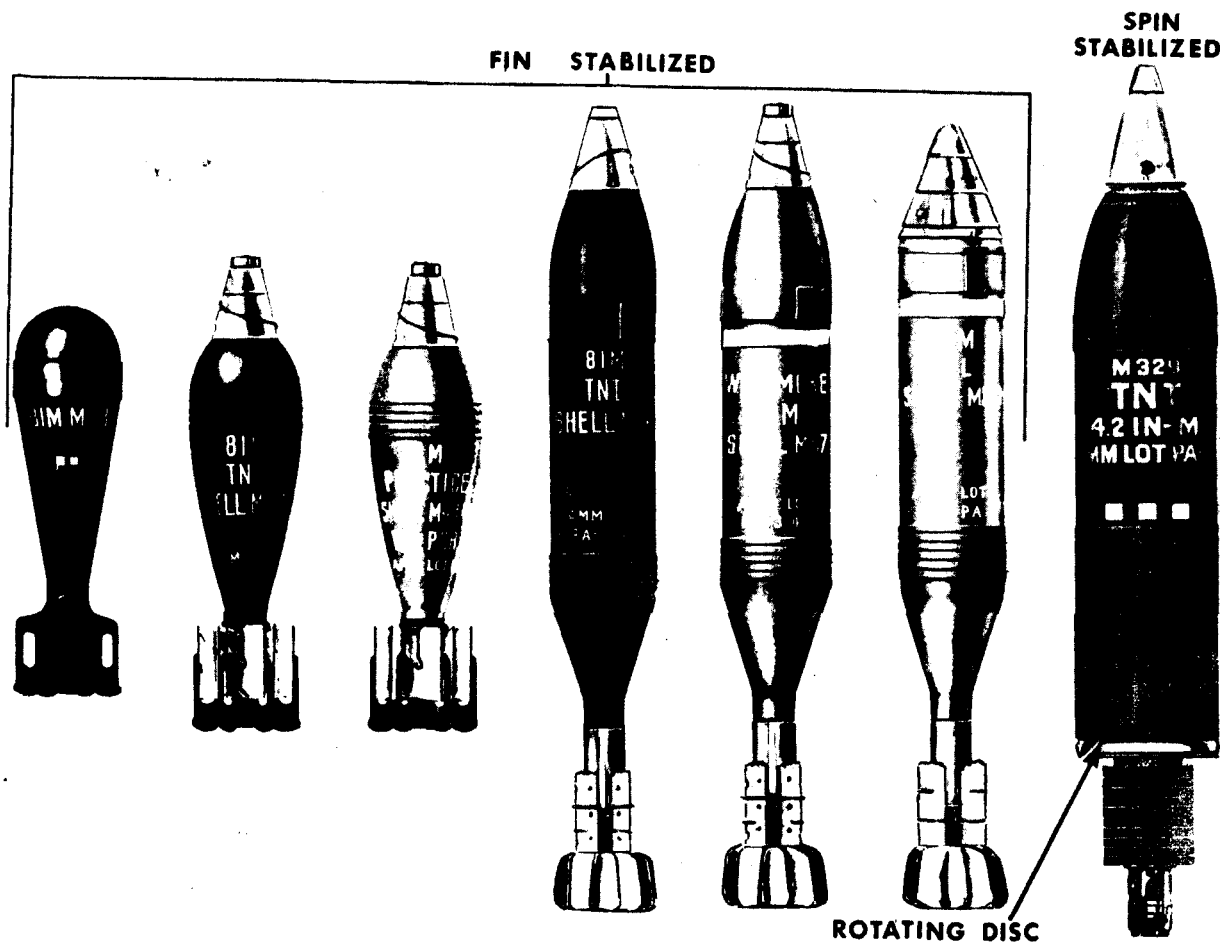


Figure 3-9. American Mortar Projectiles

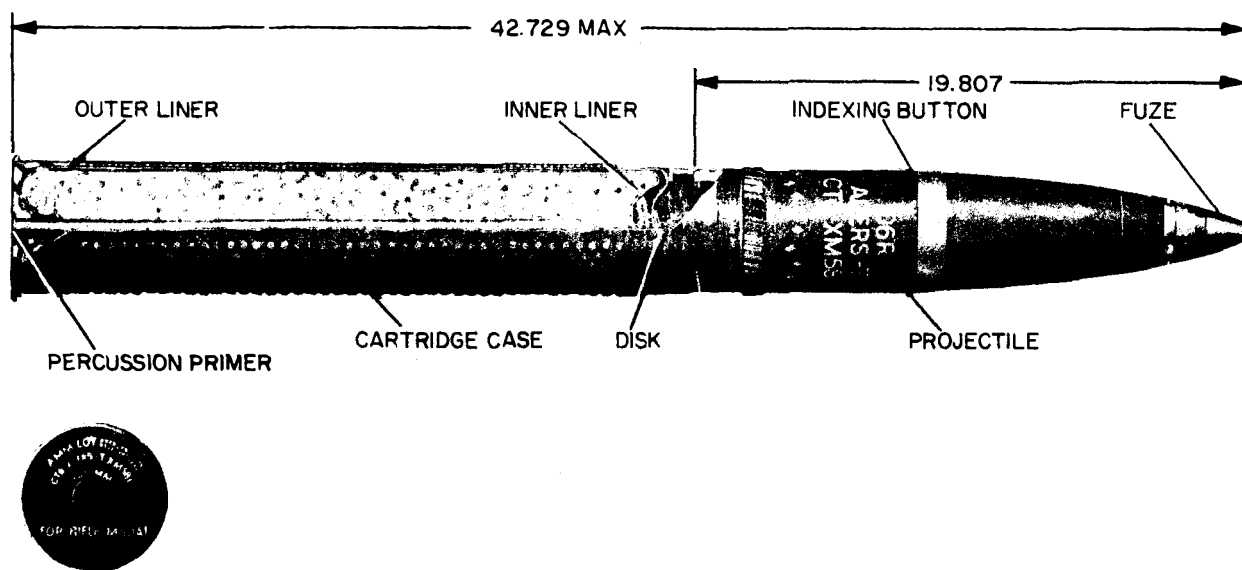


Figure 3-10. Typical Fuzed Flechette Loaded Cartridge

spin stabilized are fired from a mortar tube that is rifled like an artillery piece.

1-26. Types of Mortars:

- a. High Explosive
- b. White Phosphorus (WP)
- c. Ejection-type

1-27. I. D. Features:

- a. HE type--Solid body and nose fuze.
- b. WP--Solid body with fuze and adapter ring.
- c. Ejection type--Body break and time fuze.

1-28. Hazards:

- a. HE, FRAG
- b. Fire
- c. Ejection

1-29. Fuzing: Fuzing for mortar ammunition varies just as it does with other ammunition. The fuze is most always in the nose. Impact-type is the most common. To obtain an aerial burst, a mechanical or powder train time fuze is used. VT or proximity fuzes are also used for aerial burst. Mortar fuzes use setback and spring action to align the firing train in fin stabilized rounds. The spin stabilized round uses setback, spring action and centrifugal force for arming.

FLECHETTE LOADED (BEEHIVE) PROJECTILE XM 595

1-30. Type: Flechette Loaded (Beehive) Projectile XM 595 (reference figure 3-10)

1-31. Identification: This type of round may be found in 90MM, 105MM and 106MM. The model number of the projectile will be stamped on the projectile base. This round that will be covered is the XM 595 Cartridge, 106MM: Anti-Personnel, XM 581.

1-32. Recognition Features:

- a. 2 piece construction with a break at the nose for ejection.
- b. Indexing button located at the center of the projectile.
- c. Will always have a mechanical time fuze.
- d. Weighs 21.78 pounds and is 19.81 inches long.

1-33. Hazards:

- a. 5 Detonators (composed of tetryl lead azide, and ignition mixture)
- b. Lead azide relay
- c. Base charge of flake propellant

1-34. Type of Fuzing: Mechanical time.

1-35. Operation: When the fuze functions, the detonators will fire, breaking open the forward end of the round and firing the base ejection charge, dispersing the flechettes. Centrifugal force on the round also aids in the dispersal of the flechettes.

M381, 40MM HIGH EXPLOSIVE, ANTI-PERSONNEL , GROUND BURST
CARTRIDGE WITH M552 PD FUZE

1-36. Type: M381, 40MM High explosive, anti-personnel, groundburst cartridge with M552 PD Fuze (reference figure 3-11).

1-37. Identification:

- a. Weight, 0.5 pounds
- b. Four (4) inches long
- c. Loaded with Comp B
- d. Uses the M552 point-detonating fuze.

1-38. Hazards:

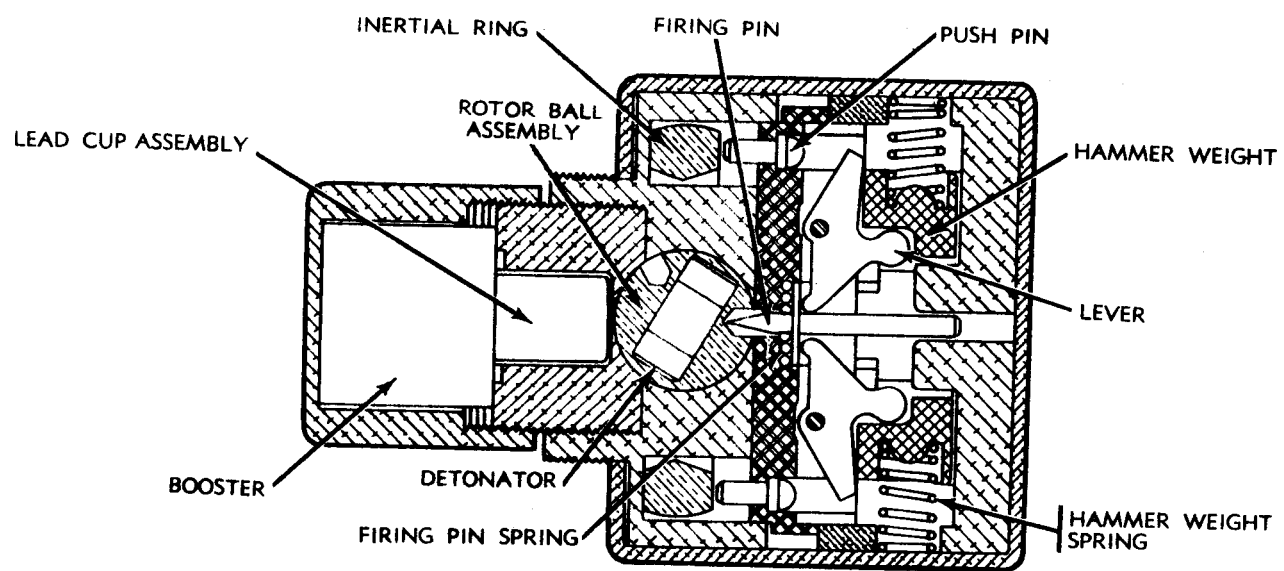
- a. Detonator (M552 Fuze)
- b. Lead cup assembly (M552 Fuze)
- c. Booster (M552 Fuze)
- d. M381 cartridge

1-39. Functioning:

- a. Rotation allows the firing pin to become cocked and the rotor to arm.
- b. Impact fires the round.

M384, 40MM HIGH EXPLOSIVE, ANTI-PERSONNEL CARTRIDGE
WITH M533 PD FUZE

1-40. Type: M384, 40MM high explosive, anti-personnel cartridge with M533 PD Fuze (reference figure 3-12A and 3-12B).



ORD L1177B

Figure 3-11. PD Fuze M552, Cutaway View Showing Unarmed Condition

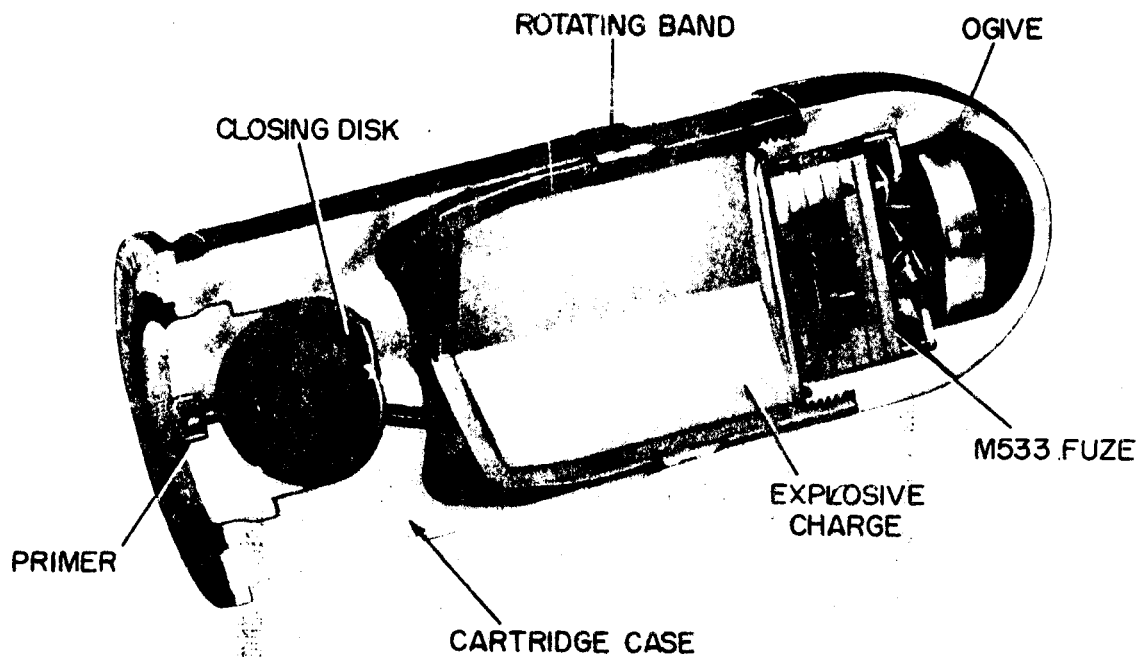
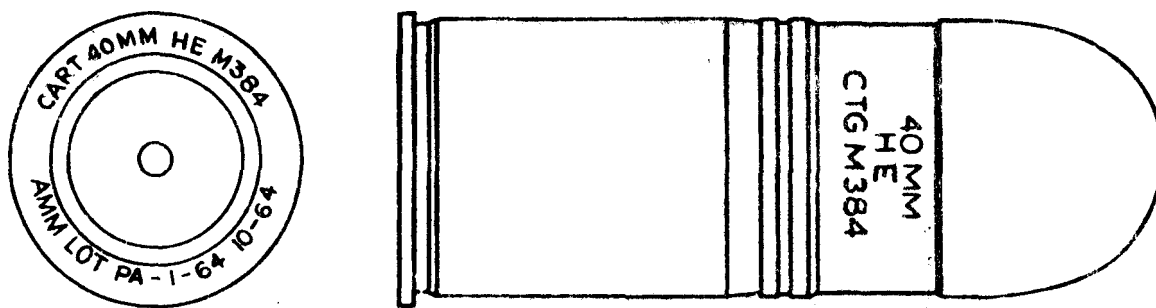


Figure 3-12A. Cartridge M384-Cutaway View



ORD L1174R

Figure 3-12B. Typical 40MM Cartridge External View

1-41. Identification:

- a. Weight, 0.75 pounds.
- b. 4.5 inches long.
- c. Loaded with lamp A5.
- d. Uses the M533 point-detonating fuze.

1-42. Hazards: Lead cup assembly (RDX) (M533 Fuze)

1-43. Function:

- a. Setback pulls pin from rotor.
- b. Centrifugal lock engages star wheel.
- c. When sufficient spin is attained, three bracket weights pivot outward releasing a push pin.
- d. Firing pin spring pulls firing pin from rotor slot.
- e. Centrifugal lock releases and arming begins.
- f. Arming is delayed until projectile is 18 to 36 meters from launches by use of an escapement assembly.
- g. Upon graze or impact fuze detonates the cartridge.

M406, 40MM HIGH EXPLOSIVE, ANTI-PERSONNEL, GROUND BURST
CARTRIDGE WITH M551 PD FUZE

1-44. Type: M406, 40MM high explosive, anti-personnel, groundburst cartridge with M551 PD fuze (reference figure 3-13A, 3-13B, 3-13C and 3-13D)

1-45. Identification:

- a. Weight, 0.5 pounds
- b. Four (4) inches long
- c. Loaded with lamp B
- d. Uses the M551 point-detonating fuze

1-46. Hazards:

- a. Detonator (M551 Fuze)
- b. Lead in (M551 Fuze)

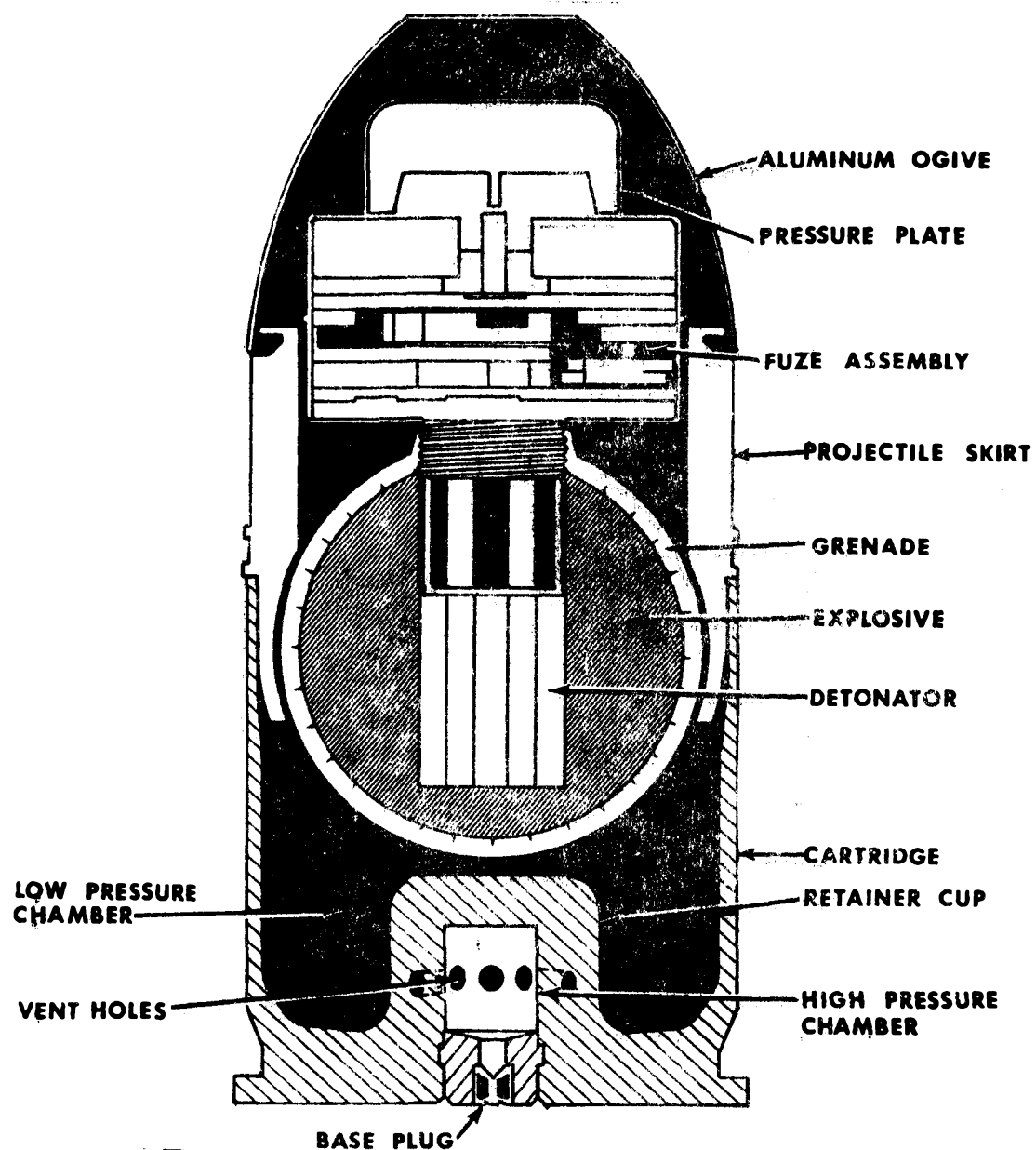


Figure 3-13A. Cross Section of 40-MM Grenade Cartridge

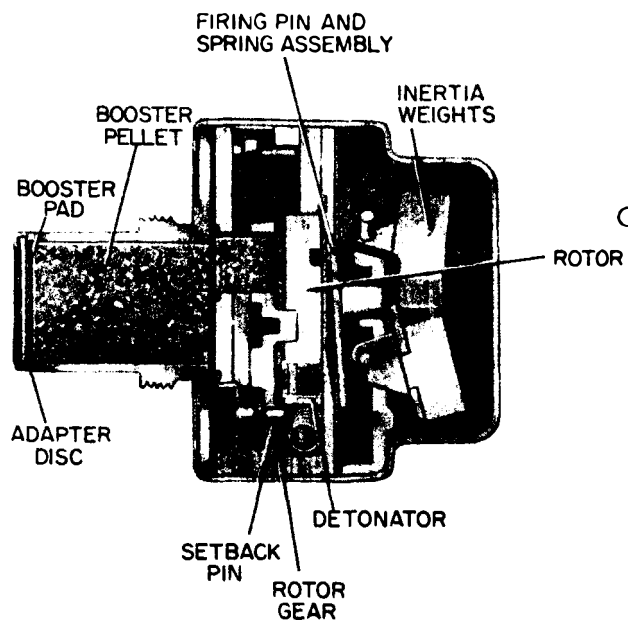


Figure 3-13B. PD Fuze M551,
Cutaway View Showing Unarmed Condition

Figure 3-13C.
Typical 40MM Projectile (Fired)



Data	M381	M382	M384	M385	M406	M407A1	XM576	XM583	XM585	XM574E2	XM428E1	XM657 XM651E1
Weight of complete round (lb).	0.5	0.5	0.75	0.75	0.5	0.5	0.5	0.5	0.5	0.75	0.75	0.63
Length of complete round (in.).	4	4	4.5	4.5	4	4	2.5	5	5	4.5	4.5	4.5
Explosive Charge	Comp B	None	Comp A5	None	Comp B	None	None	Pyrotechnic	Pyrotechnic	WP Filler w/RDX Booster	50/50 red phosphorus and magnesium	CS pyrotechnic mixture
Fuze Model	M552	M552	M533	None	M551	M551	None	None	None	M533	None	XM581E1
Fuze Type	PD	PD	PD	None	PD	PD	None	None	None	PD	None	PD
Arming Delay	3	3	18-36		14-27	14-27		5 Seconds	5 Seconds	18-36		30
Distance (meters).												

Figure 3-13D. Cartridge Characteristics

c. Booster (M551 Fuze)

d. M406 cartridge

1-47. Function:

a. Setback unlocks the rotor.

b. Rotation causes the firing pin to retract from the rotor.

c. Rotor lines the fuze up explosively.

d. Projectile completes arming in 14 meters from the launcher.

e. Upon graze or impact the inertia weights pivot inward, driving the firing pin into the detonator.

XM 574E2, 40MM, WP ROUND WITH THE M533 PD FUZE

1-48. Type: XM 574E2, 40MM, WP round with the M533 PD fuze (reference figure 3-14).

1-49. Identification:

a. Weight, 0.75 pounds.

b. 4.5 inches long.

c. Loaded with WP and RDX Booster

d. Uses M533 point-detonating fuze

1-50. Hazards:

a. WP

b. RDX Booster

c. RDX Lead cup in fuze

1-51. Function:

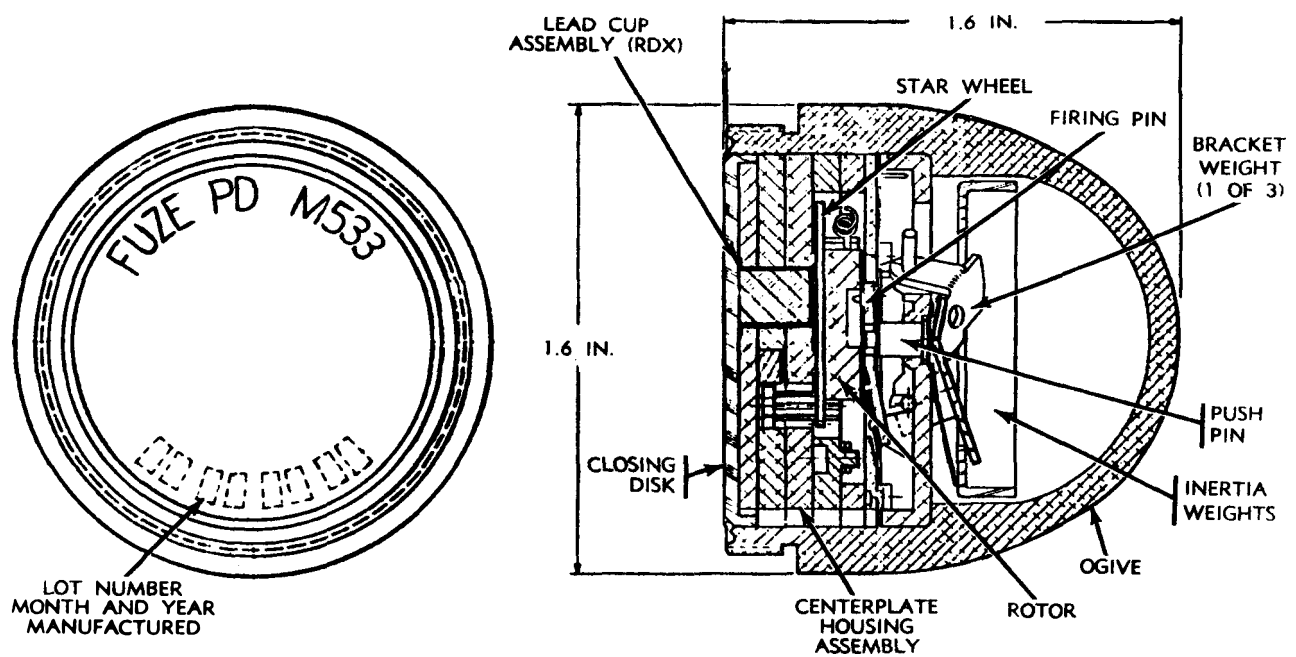
a. Setback pulls pin from the rotor

b. Centrifugal lock engages the star wheel

c. When sufficient spin is attained, three bracket weights pivot outward releasing a push pin

d. Firing pin spring pulls the firing pin from rotor slot

e. The centrifugal lock releases and arming begins



ORD L1257A

Figure 3-14. PD Fuze M533, Cross Section View Showing Unarmed Condition

f. The arming is delayed until projectile is 18 to 36 meters from launcher by use of an escapement assembly.

g. Upon graze or impact the fuze detonates the RDX booster pellet, which disperses the WP charge.

XM576, 40MM CARTRIDGE (BUCKSHOT)

1-52. Type: XM576, 40MM cartridge (Buckshot) (reference figure 3-15)

1-53. Identification:

- a. Weight, 0.5 pounds
- b. 2.5 inches long
- c. Pellet cup assembly on nose

1-54. Hazards: Cartridge

1-55. Functioning:

- a. Setback causes pellet cup assembly to move rearward disengaging the snap on cap from the pellet cup.
- b. Upon reaching the muzzle, the sabot carrier and the pellet cup separate from the lead pellets, thus allowing free flight of the pellets to the target.

XM651, 40MM, CS PYROTECHNIC ROUND FUZED WITH THE XM581E1 FUZE

1-56. Type: XM651, 40MM, CS pyrotechnic round fuzed with the XM581E1 fuze (reference figure 3-16A and 3-16B).

1-57. Identification:

- a. Weight, 0.63 pounds
- b. 4.5 inches long
- c. Loaded with CS mixture
- d. Uses XM581E1 point-detonating fuze

1-58. Hazards:

- a. Detonator (XM581E1 Fuze)
- b. Percussion primer (XM581E1 Fuze)
- c. CS mixture (cartridge)
- d. First Fire mixture (cartridge)

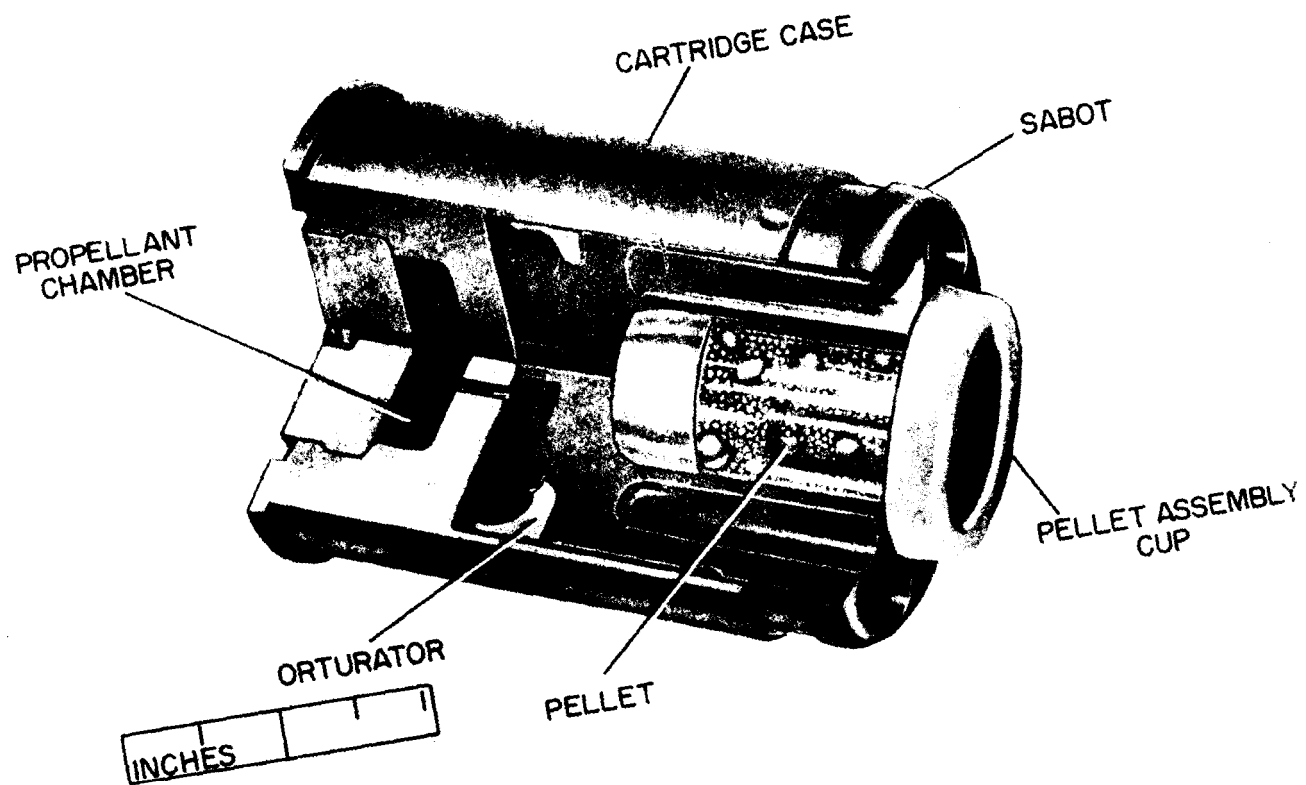
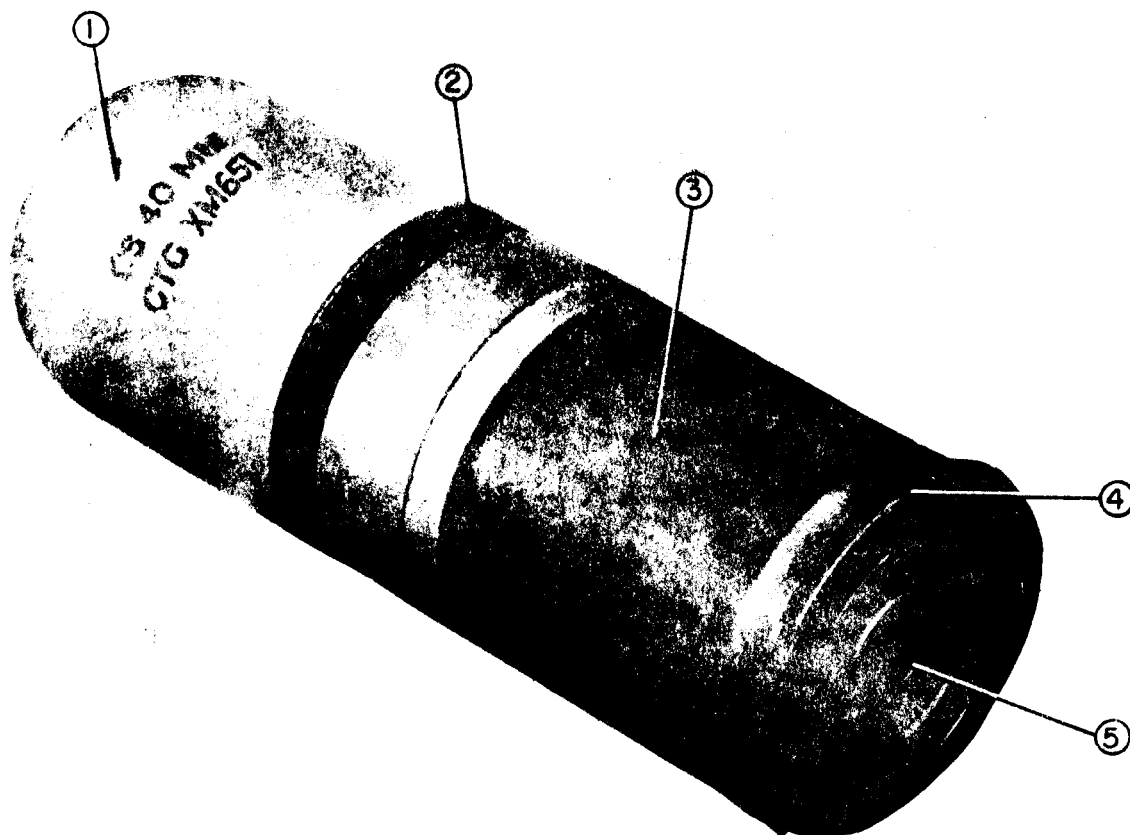


Figure 3-15. Cartridge XM576 - Cutaway View



1 Ogive
2 Red band
3 Cartridge case

4 Identification
notch
5 Percussion primer

Figure 3-16A. CS Cartridge XM651

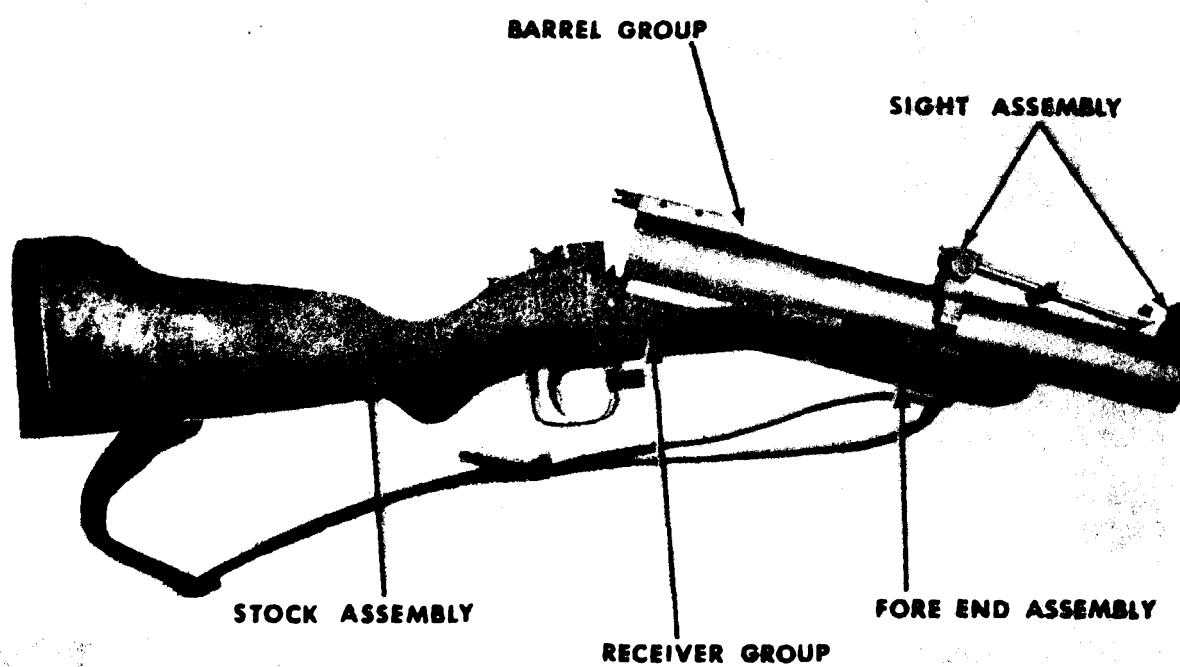


Figure 3-16B. Grenade Launcher, 40-MM

1-59. Function:

- a. Setback frees the rotor
- b. Centrifugal force releases the escapement mechanism to delay the arming until projectile is 30 meters from the launcher.
- c. Rotor moves into armed position
- d. Detonator lines up with firing pin
- e. Firing pin strikes detonator on impact
- f. Detonator ignites first fire mixture, and CS pyrotechnic mixture blows out plug releasing the CS to atmosphere for about 25 seconds.

M28 RIFLE GRENADE (HEAT) WITH PIBD FUZE ("ENERGA")

1-60. Type: M28 Rifle Grenade (HEAT) with PIBD fuze ("ENERGA") reference figure 3-17A and 3-17B)

1-61. Identification:

- a. Fin stabilized (6 each)
- b. 15.5 inches long, 2.95 inches in diameter
- c. Weight, 1.5 pounds
- d. Grenade is painted olive drab or black with markings in yellow
- e. Striker head has a serrated tip

1-62. Hazardous Components:

- a. Initiating detonator (in point initiating device).
- b. Two stage base detonator
- c. Booster, 93/7 mix of RDX/TNT
- d. Main charge, 80/20 mix of RDX/TNT

1-63. Functioning:

- a. Setback sleeve moves rearward when launched.
- b. Safety balls released
- c. Grenade decelerates releasing the detonator carrier

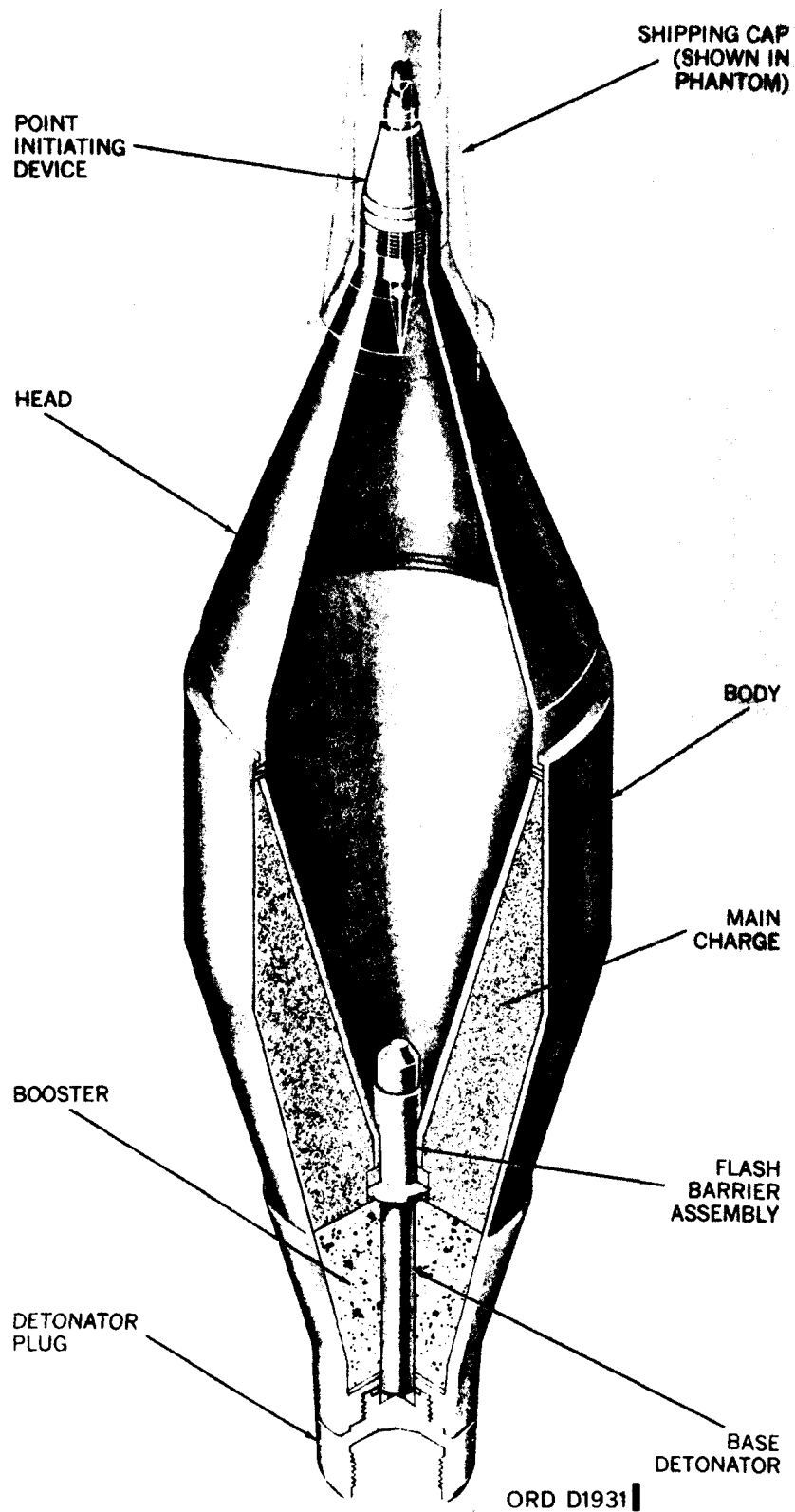
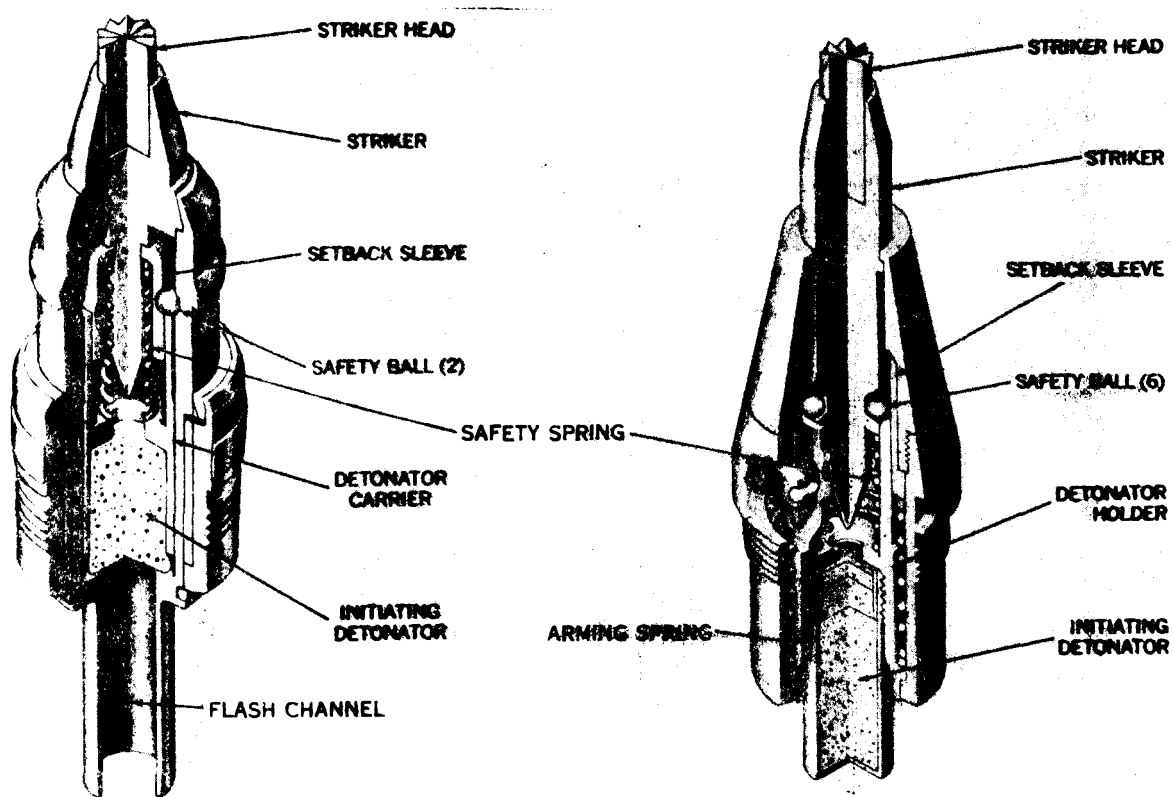


Figure 3-17A. Grenade Body and Head Assembly with PIBD Fuze
Cutaway View



INERTIA TYPE

DRIVEN-STRIKER TYPE

ORD D1932

Figure 3-17B. Point-Initiating Devices - Cutaway View

d. On impact, the initiating detonator overcomes the inertia spring and impinges on the striker. Flame is spit rearward to initiate the base detonator functioning the main charge.

66MM "HEAT" ROCKET M72 WITH PIBD FUZE M412

1-64. Type: 66MM "HEAT" Rocket M72 with PIBD Fuze M412 (reference figures 3-18A, 3-18B and 3-18C)

1-65. Identification:

- a. This round is commonly referred to as the "LAW".
- b. Fin stabilized, (6) (six each)
- c. Bottle-shaped configuration
- d. Warhead painted olive drab or black with yellow letters

1-66. Hazards:

- a. Rocket motor, ignitor
- b. .67 pound of HMX/TNT
- c. Electric detonator in base element
- d. Stab type primer
- e. Teteryl booster

1-67. Functioning:

- a. Flash from primer ignitor which in turn ignites the rocket motor
- b. Fuze safety plunger unlocks
- c. Set back unlocks the rotor to armed position
- d. Impact fires the round

3.5 INCH HEAT ROCKET WITH M404 SERIES FUZE

1-68. Type: 3.5 inch HEAT Rocket with M404 Series fuze

1-69. Identification:

- a. Shrouded fins on tail (6 each)
- b. Approximately 24 inches long and 3.5 inches in diameter
- c. Fuze located aft of warhead

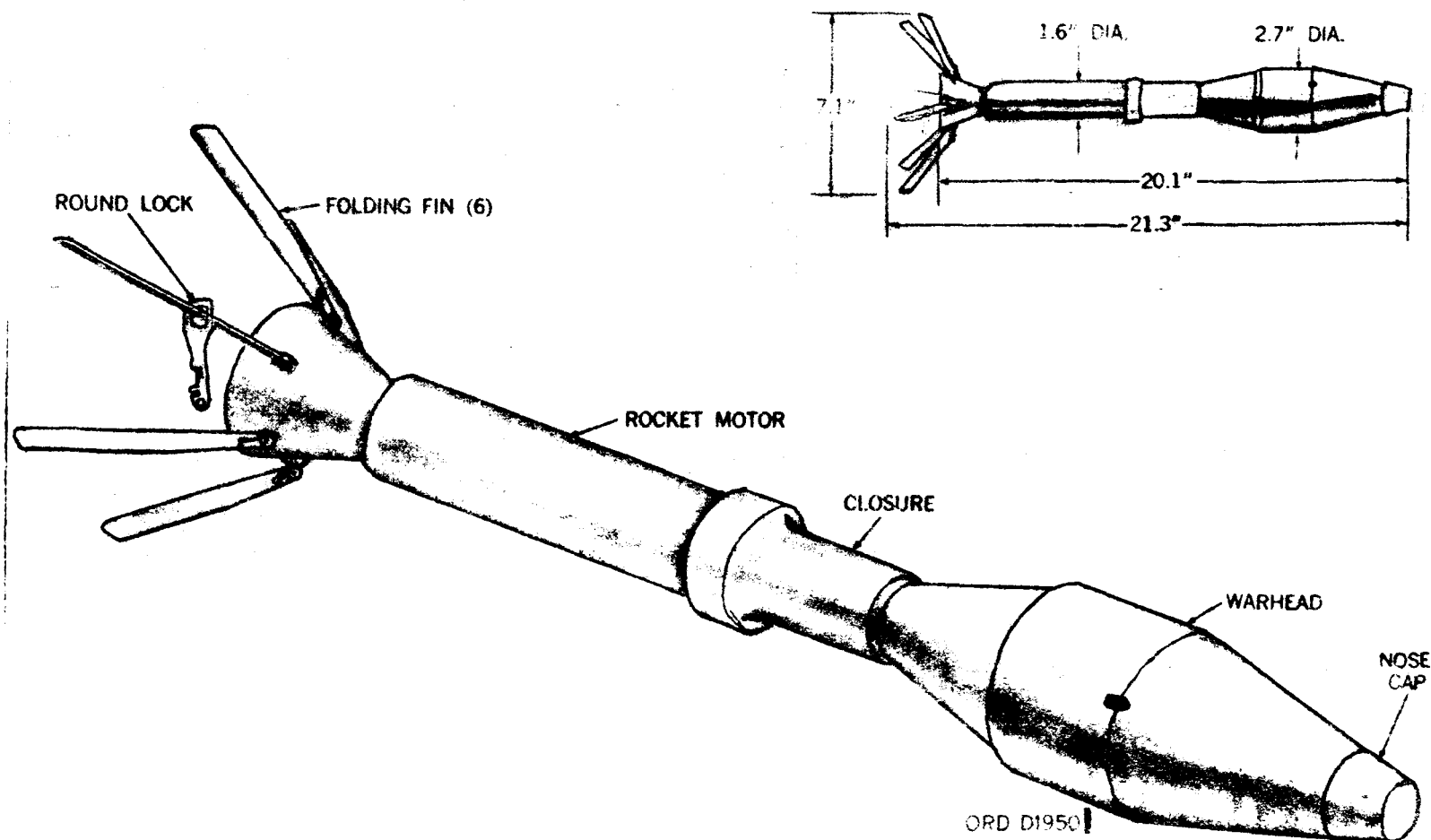
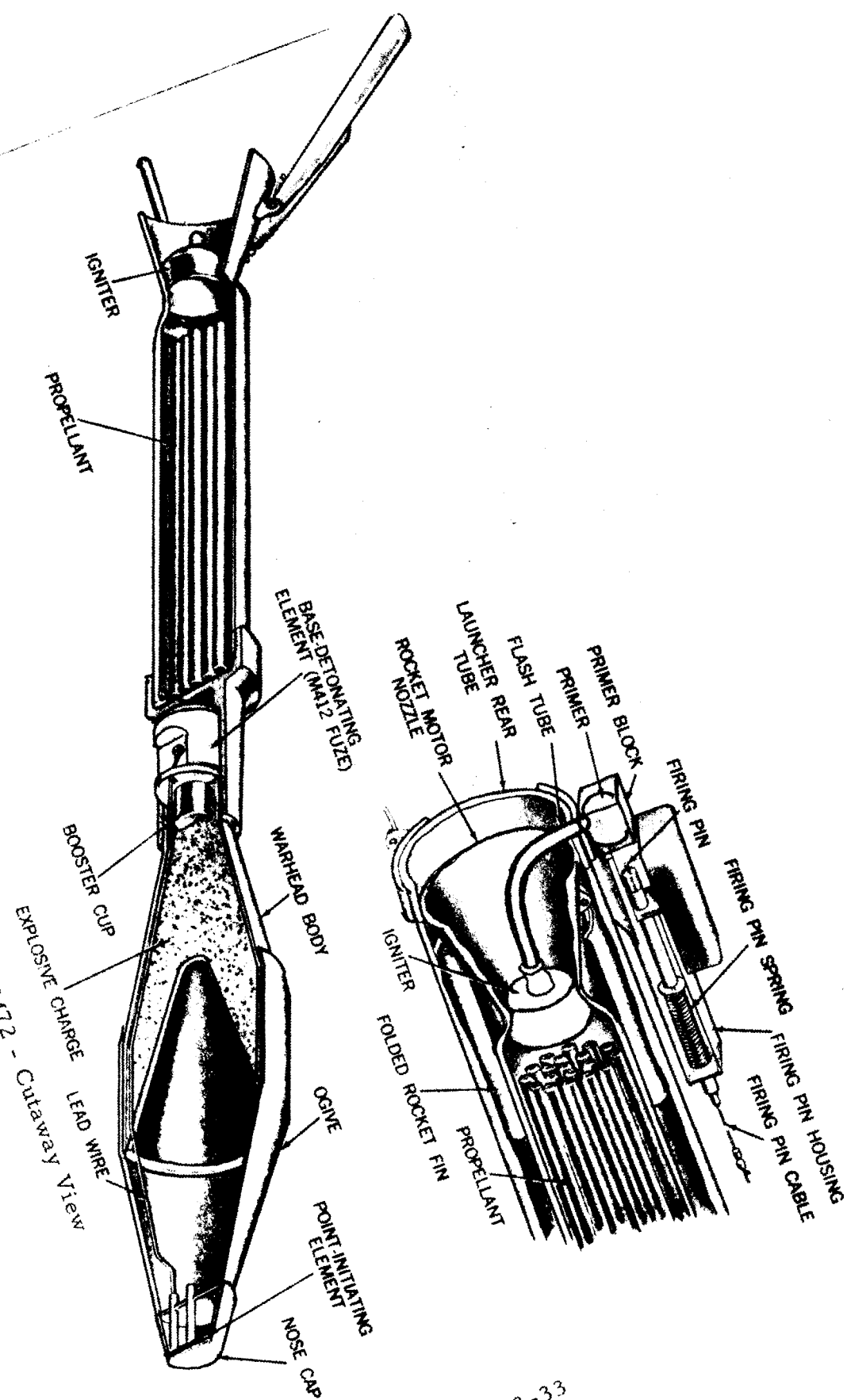
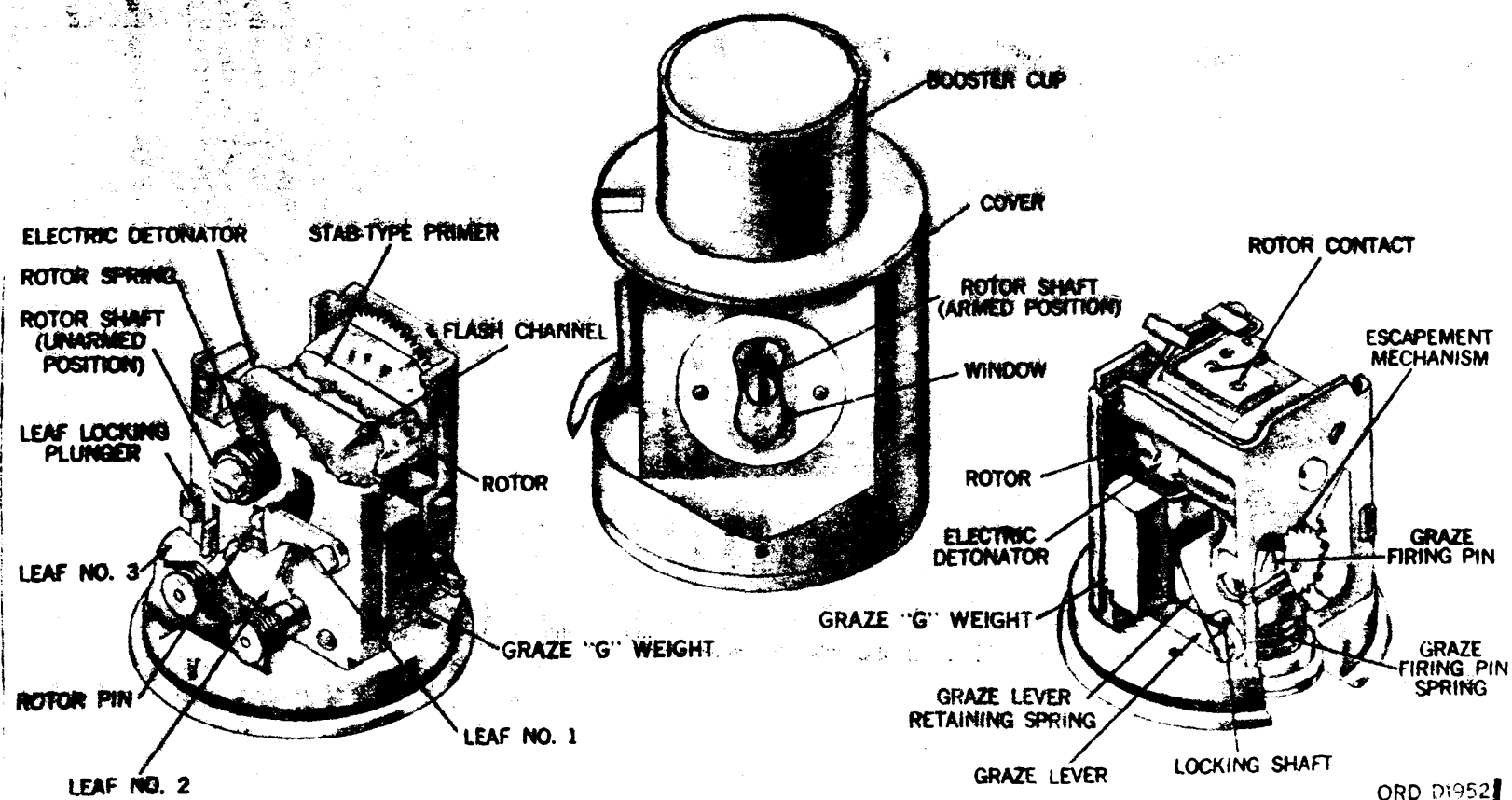


Figure 3-18A. 66MM HEAT Rocket M72.

Figure 3-18B.

ORD D1951
66MM HEAT Rocket M72 - Cutaway View





ORD D19521

Figure 3-18C. PIBD Fuze M412

1-70. Hazardous Components:

- a. Detonator (fuze)
- b. Booster (fuze)
- c. Warhead

1-71. Functioning:

- a. Safety band removed prior to flight
- b. Setback sleeve compresses the setback spring, clears the arming pin path, and is locked in this position by a spring loaded detent.
- c. Rocket leaves launcher and arming pin is ejected from fuze
- d. Any angle of impact will function the fuze.

PART 2

PROJECTILE FUZES

OBJECTIVE:

To learn the identification, hazards, function and render safe/disposal of U. S. projected munitions fuzes employed in South East Asia.

INTRODUCTION

The U. S. and Allied forces are using heavy gun and howitzer projectiles in South East Asia. With this in mind EOD personnel must become familiar with and knowledgeable of the identification, operation and hazards of the various fuzes compatible with these projectiles. Having this information, the RSP and disposal procedures can be performed safely and quickly.

AIR BURST FUZES

2-1. Type: Proximity Fuzes (general). These fuzes are setback and centrifugal armed, wet cell energizer, influence (proximity) fired. (Reference figures 3-19, 3-20 and 3-21)

2-2. Identification:

- a. Plastic ogive.
- b. Fuze designation and loading information are stamped on the metal fuze base.

2-3. Hazards:

- a. Electric primer.
- b. Impact detonating element.

2-4. Basic Operation:

- a. Setback breaks the ampoule containing the electrolyte and centrifugal force distributes it into the the cells of the battery.
- b. Centrifugal force lines the fuze up explosively.
- c. The fuze transmits and receives as it approaches the target. A proper reflected signal causes the fuze to function.
- d. If the VT element of the fuze fails the impact detonating element causes the fuze to function

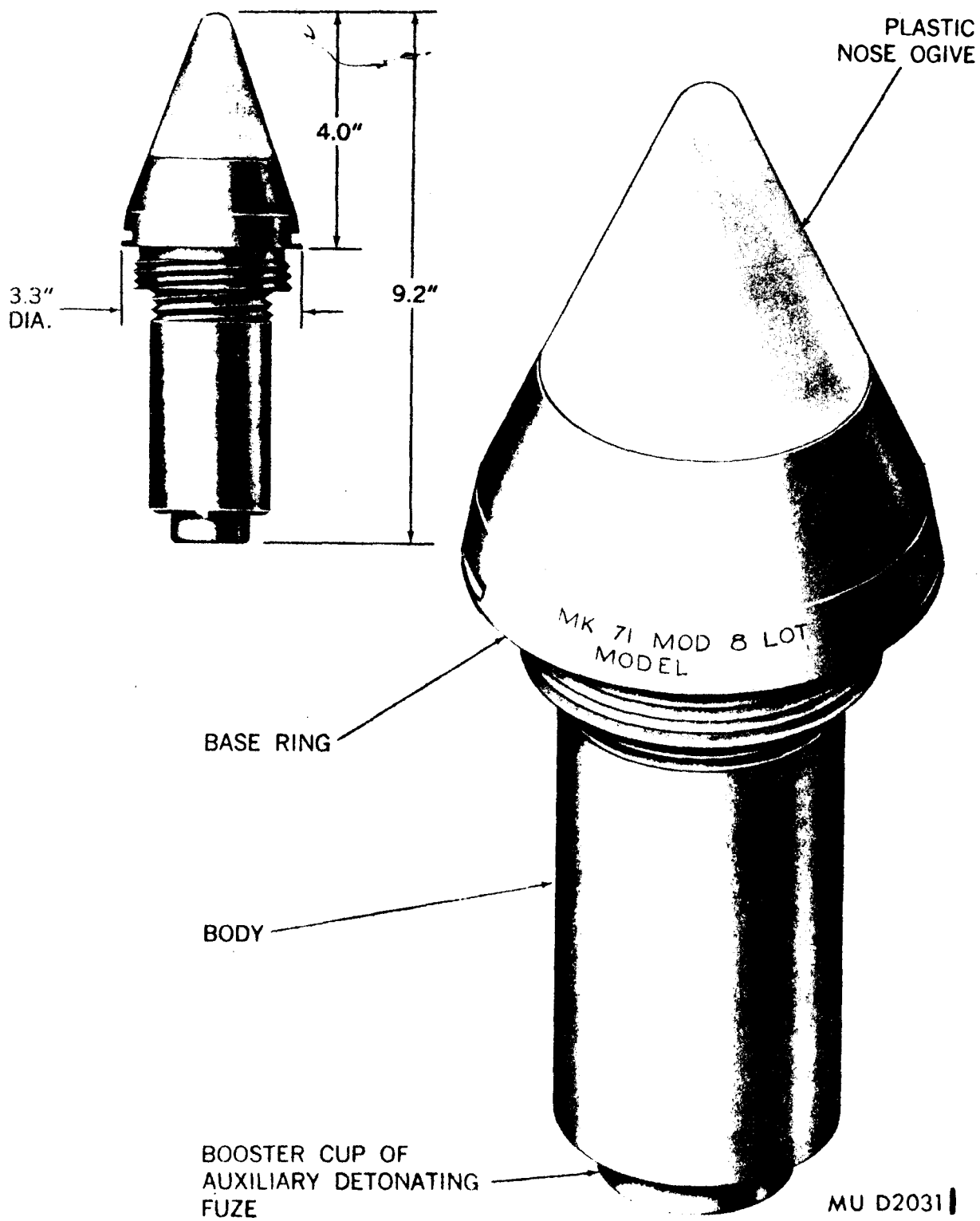
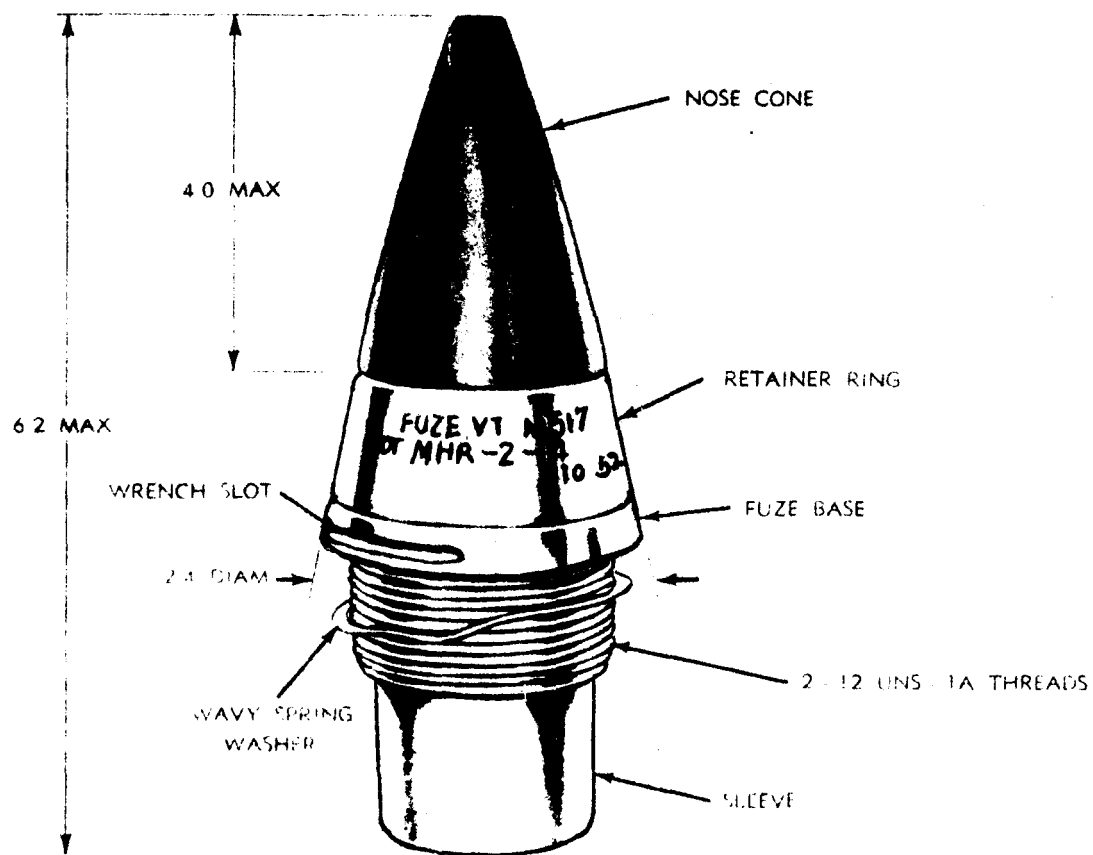


Figure 3-19. General Appearance and Dimensional Characteristics of Proximity Fuze



MU D2035

Figure 3-21. A Representative Type Projectile VT Fuze

AIR BURST FUZES

2-5. Fuze, Mechanical Time Superquick (MTSQ), M500, M500A1, M501, M501A1, M502, M502A1, M506, M518, M520, M548 and M564 (reference figures 3-22, 3-23, 3-24 and 3-25A and 3-25B).

2-6. Identification:

a. Fuze designation, loading data, and time graduation scale is stamped on the body of all fuzes except the M548 and M564, which have a vernier scale stamped on the body.

b. All are unpainted except for the M548 and M564 which are painted black and all stampings are painted white.

2-7. Hazards:

- a. Primer
- b. Detonator
- c. Booster

2-8. Basic Operation:

a. Setback and centrifugal forces cause the clockwork to unlock and the time to run off.

b. On expiration of the time setting the clockwork releases the striker, firing the fuze.

c. The Superquick ("SQ") assembly will fire the fuze if impact occurs before completion of the time interval for which the fuze was set, or if the fuze was set at "S".

BASE DETONATING FUZES

2-9. Type: PIBD "LUCKY" M509A1 and M530 Series. Setback armed and instantaneous firing (reference figure 3-26).

2-10. Identification:

- a. Only by the using projectile or cartridge.
- b. Will always be used in HEAT rounds.

2-11. Hazards:

- a. Electric detonator
- b. Lead charge of tetryl
- c. Booster pellet of tetryl
- d. M530 Series contains a primer T92 in the graze sensitive assembly

2-12. Use:

- a. 90MM HEAT round

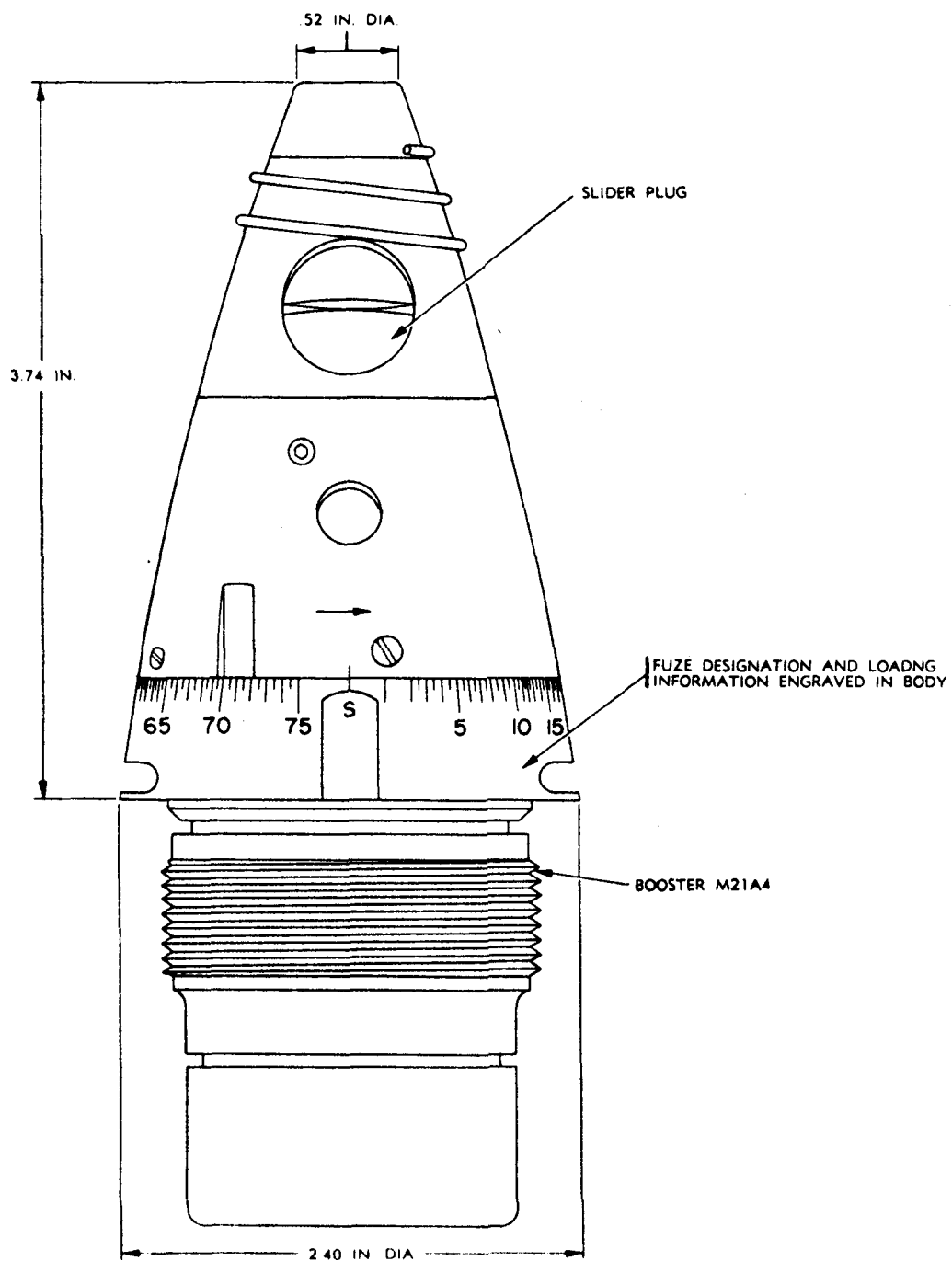
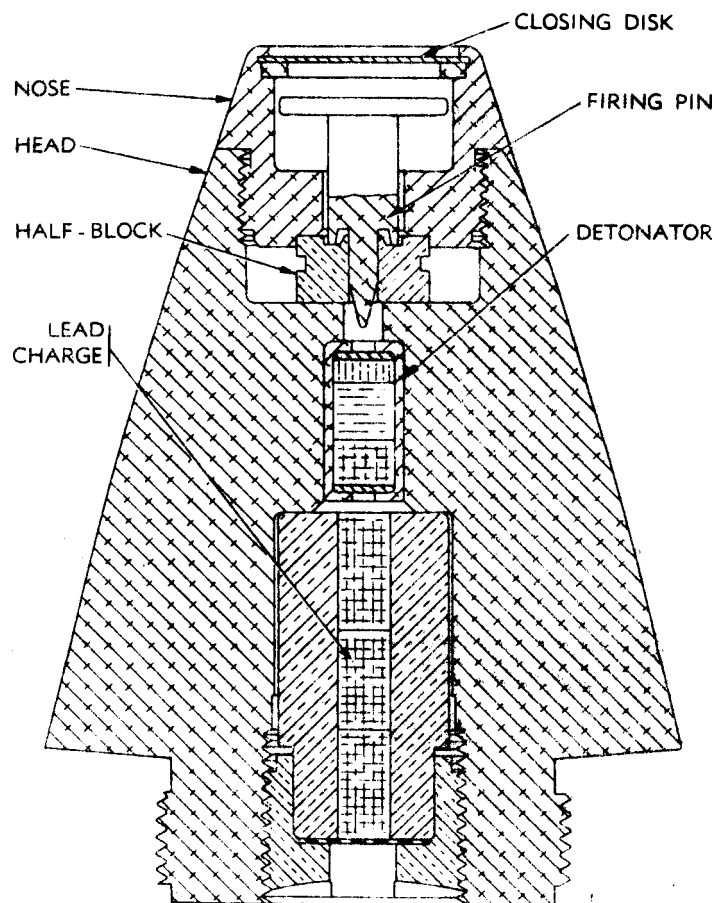


Figure 3-22. External Characteristics of Fuze M500A1



Fuzes M502, M502A1, M506, M518, M518A1, Cutaway View of Point Detonator Assembly Showing Unarmed Condition

Figure 3-23.

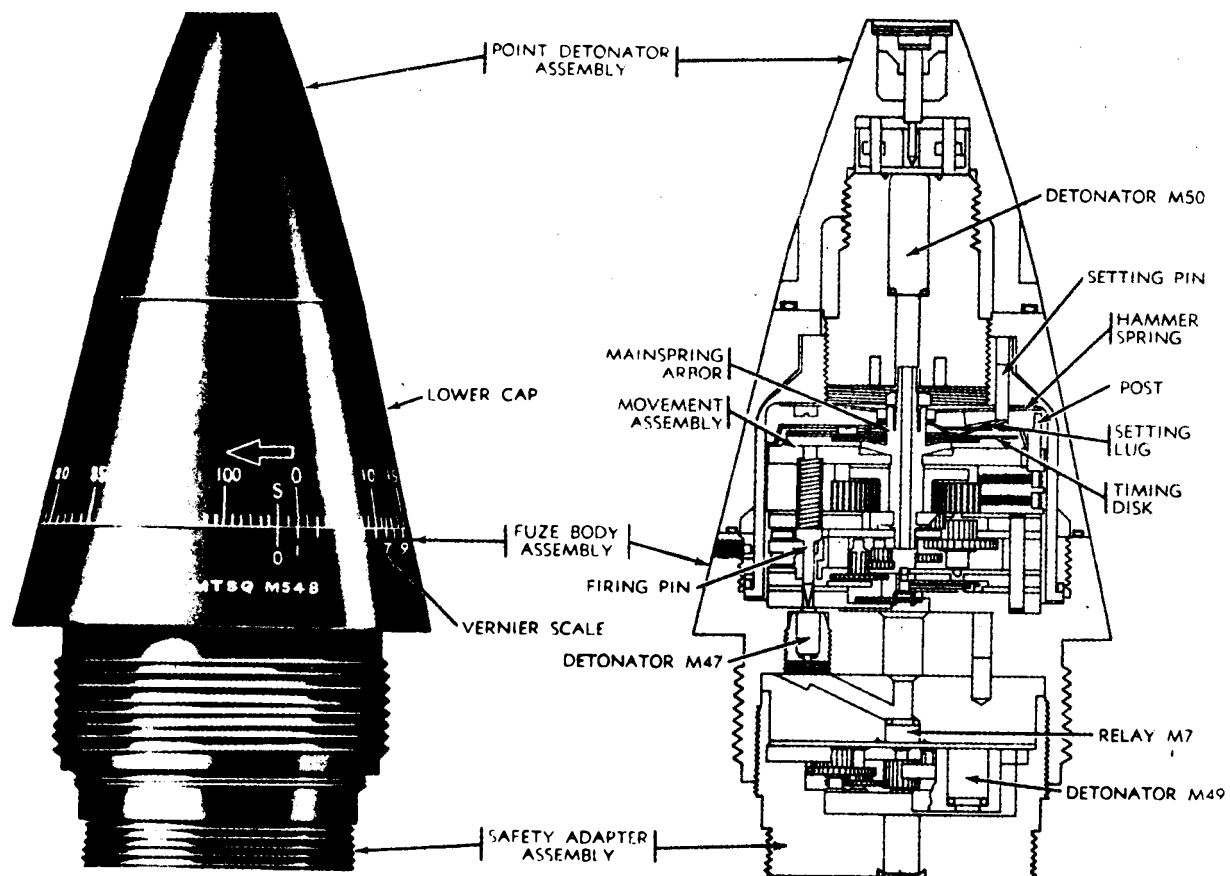


Figure 3-24. Fuze M548 - External and Cutaway Views

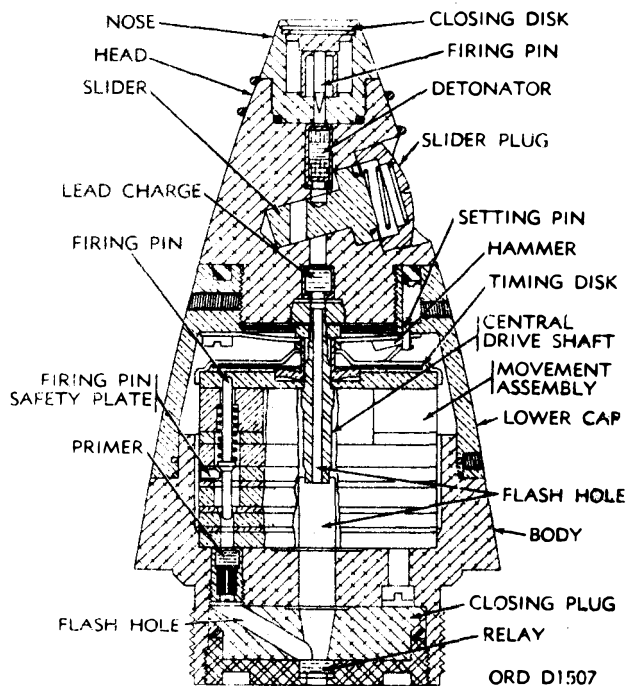


Figure 3-25A. Fuze M500H1, Cutaway View of Unarmed Condition

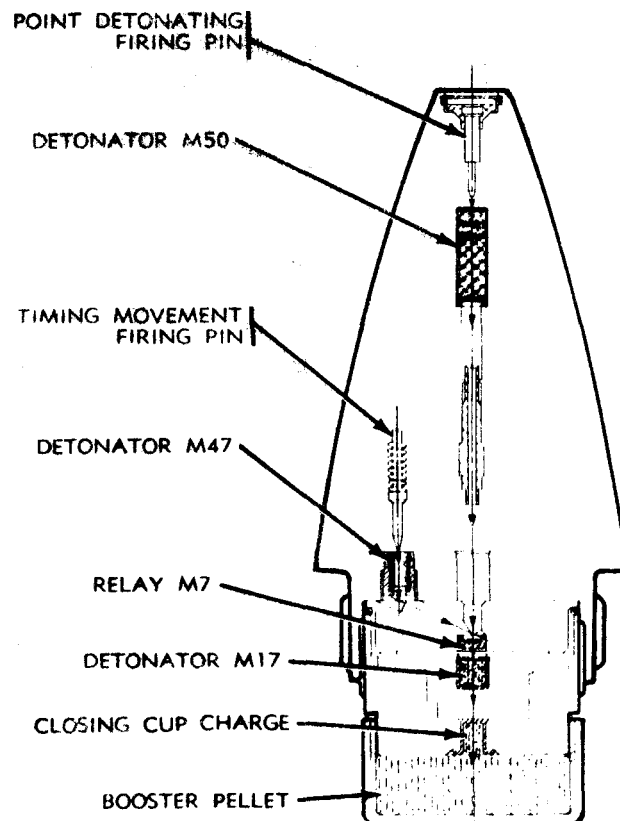


Figure 3-25B. Fuze M564 - Explosive Train

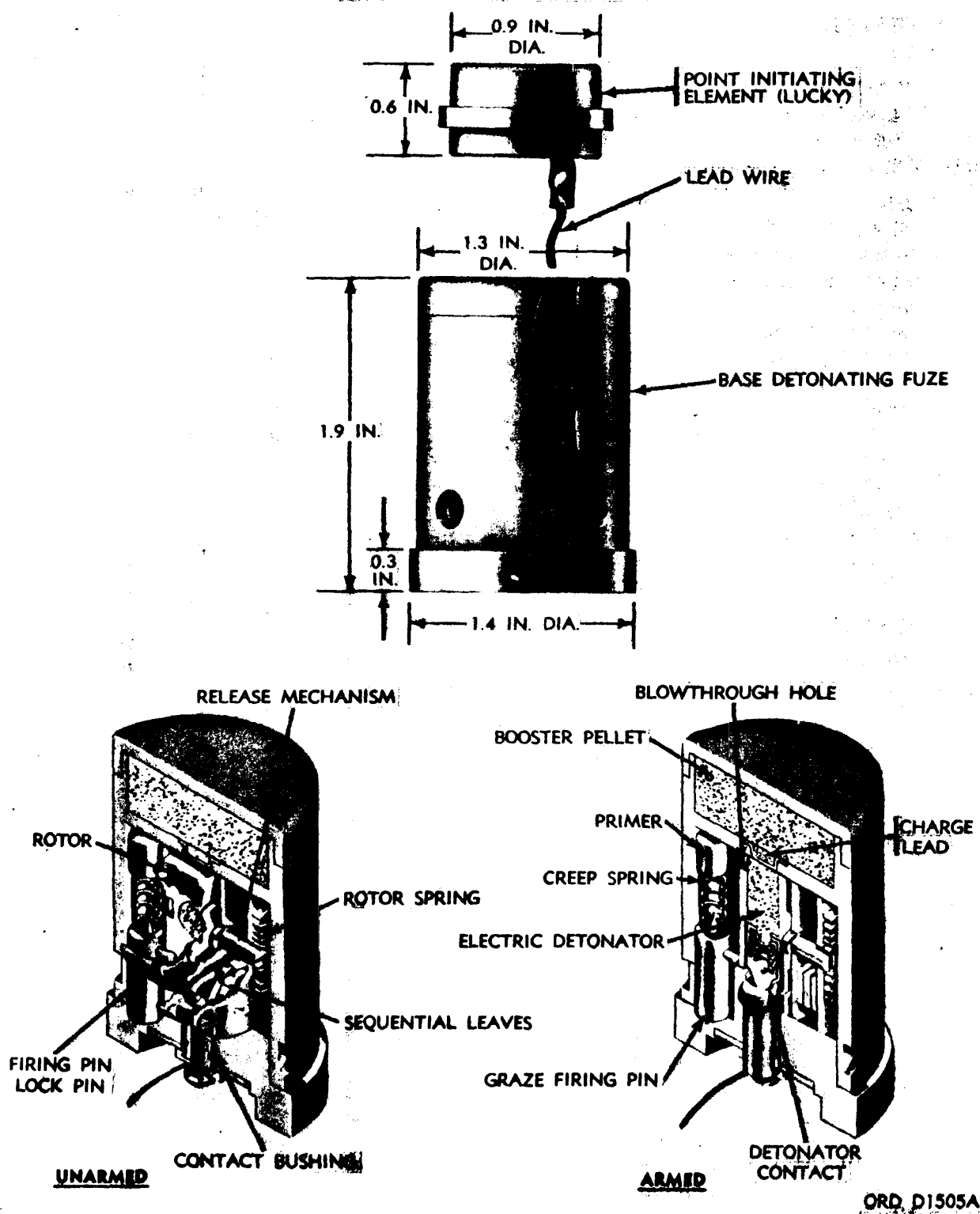


Figure 3-26. Characteristics of Fuze M530

- b. 105MM HEAT round
- c. 106MM HEAT round
- d. 120MM HEAT round

2-13. Basic Operation:

- a. Prior to firing, the rotor is out of line and the electric detonator is shorted.
- b. Setback cause the rotor to lineup completing a circuit between the "Lucky" crystal and detonator, arming the fuze.
- c. Rotor movement also arms the graze sensitive feature.
- d. On impact the "Lucky" crystal is stressed functioning the electric detonator in the base.
- e. If the fuze does not fire electrically the graze sensitive firing pin will function the fuze.

POINT DETONATING FUZES

2-14. Type: M48 Series, M51 Series and M557 fuzes are all centrifugally armed, impact fired (reference figures 3-27, 3-28, 3-29, 3-30, 3-31).

2-15. Identification:

- a. Unpainted steel bodies
- b. Stamped with fuze designations
- c. Wrench slots

2-16. Hazards:

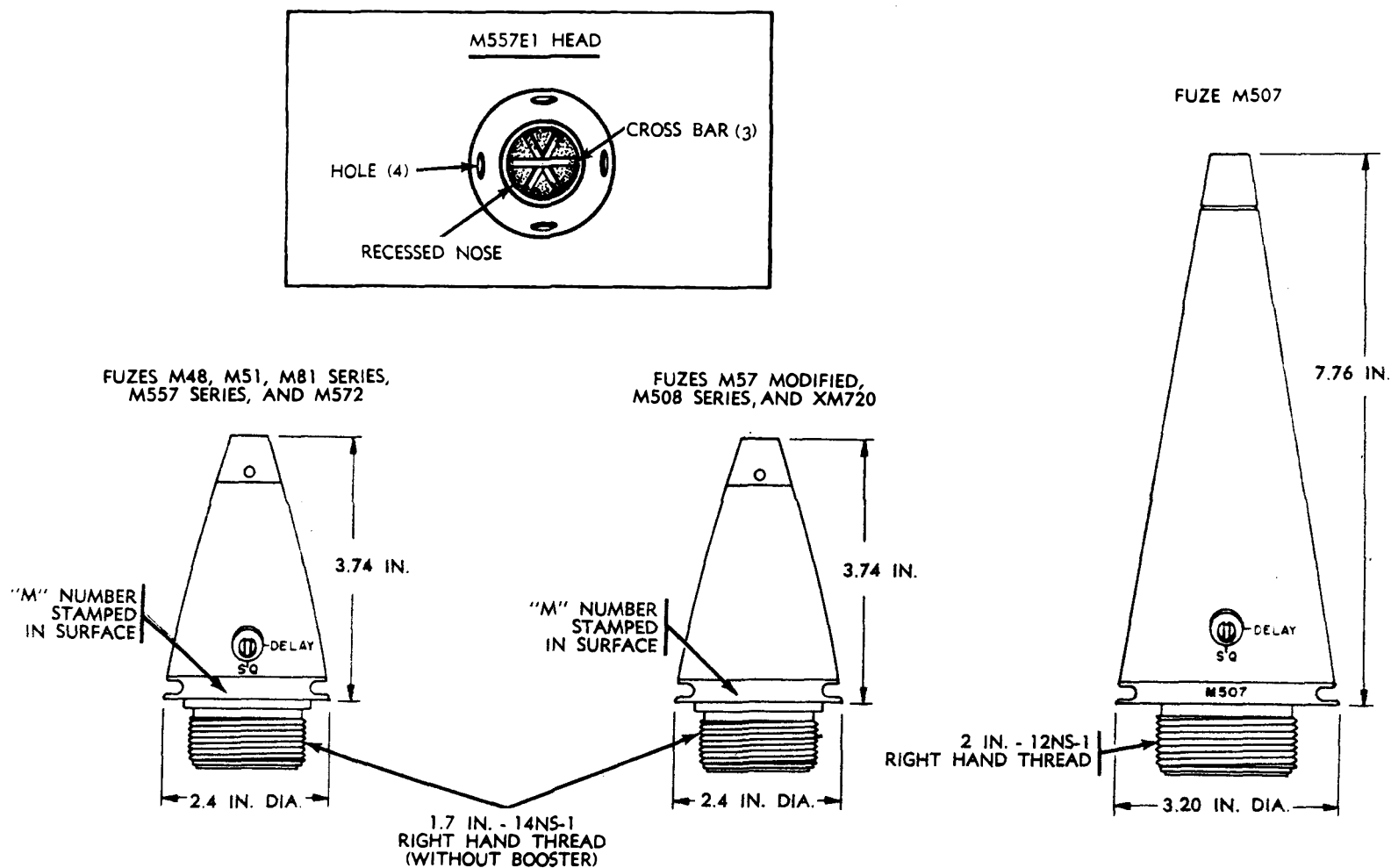
- a. Detonators -- Lead azide and tetryl
- b. Booster -- tetryl

2-17. Use:

- a. M48 Series -- 75 and 90MM projectiles
- b. M51 Series -- 105 and 155MM projectiles
- c. M557 -- 152MM projectiles

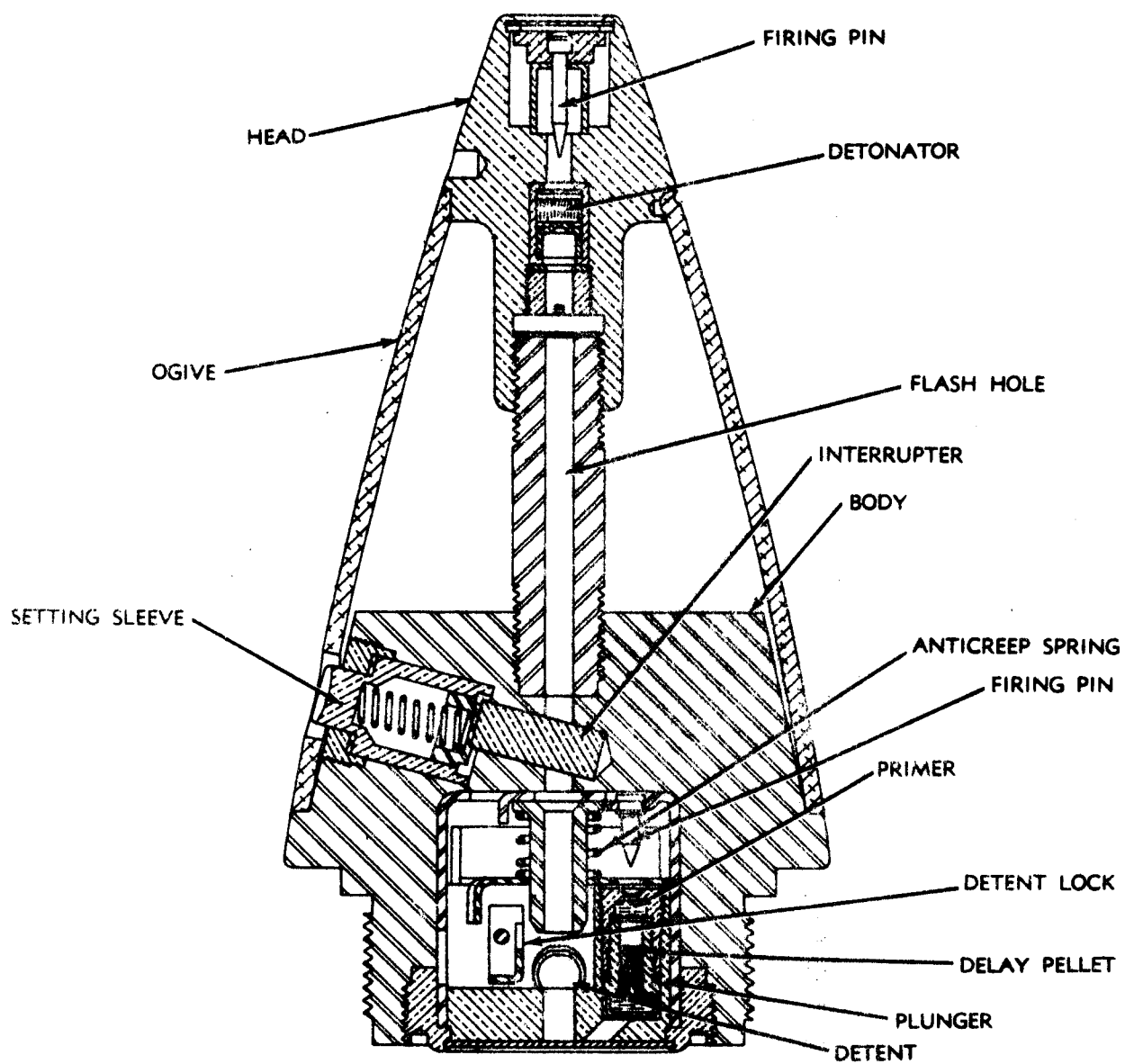
2-18. Basic Operation:

- a. Prior to firing the fuze is set for Superquick or Delay.
- b. Setback must decrease before the fuze starts to arm.
- c. Centrifugal force lines the fuze up explosively.
- d. The fuze functions on impact.



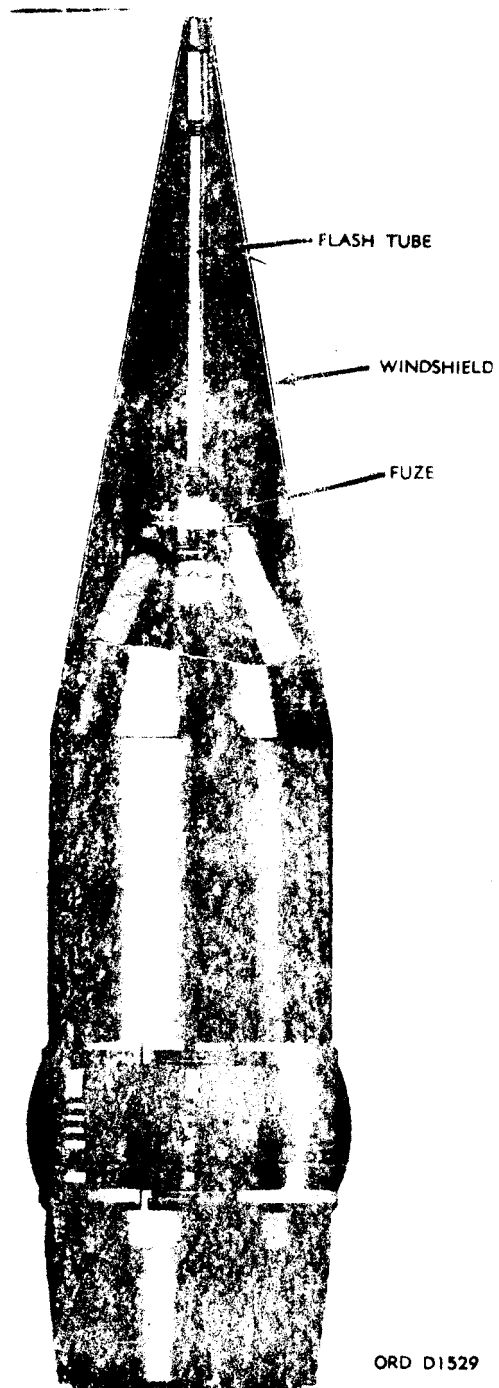
External Characteristics of Fuzes M48 Series, M51 Series (other than Mod 3), M57 Modified, M81 Series, M507, M508 Series, M557 Series, M572 and XM720

Figure 3-27.



Fuze M51A5, Cutaway View Showing Unarmed Condition

Figure 3-28.



ORD D1529

Figure 3-29. Characteristic of Fuze M51 Series Mod 3

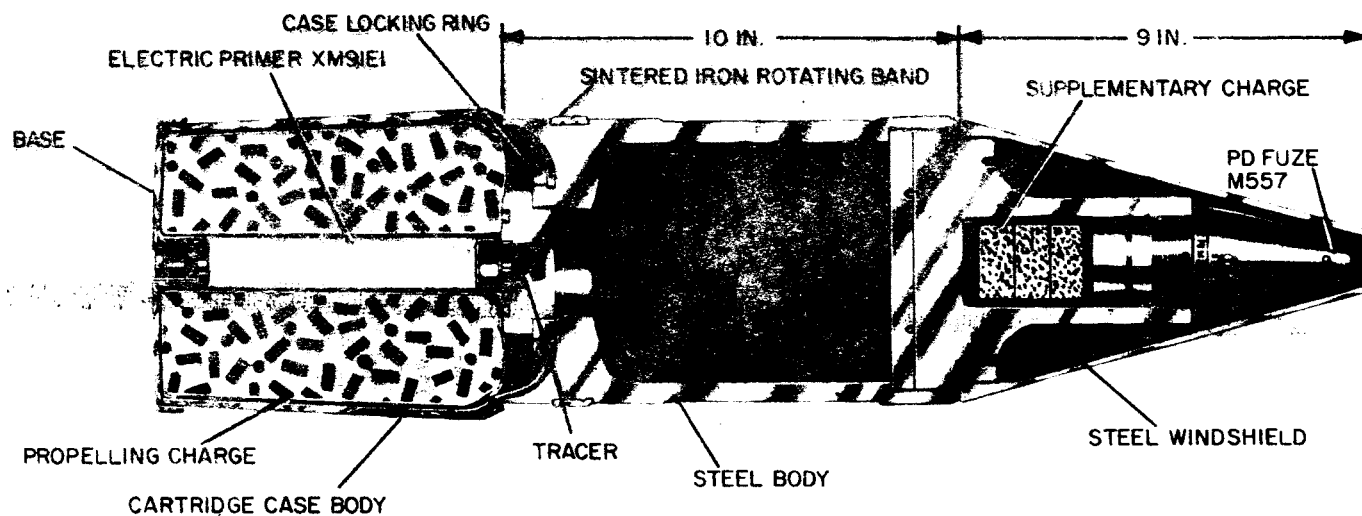
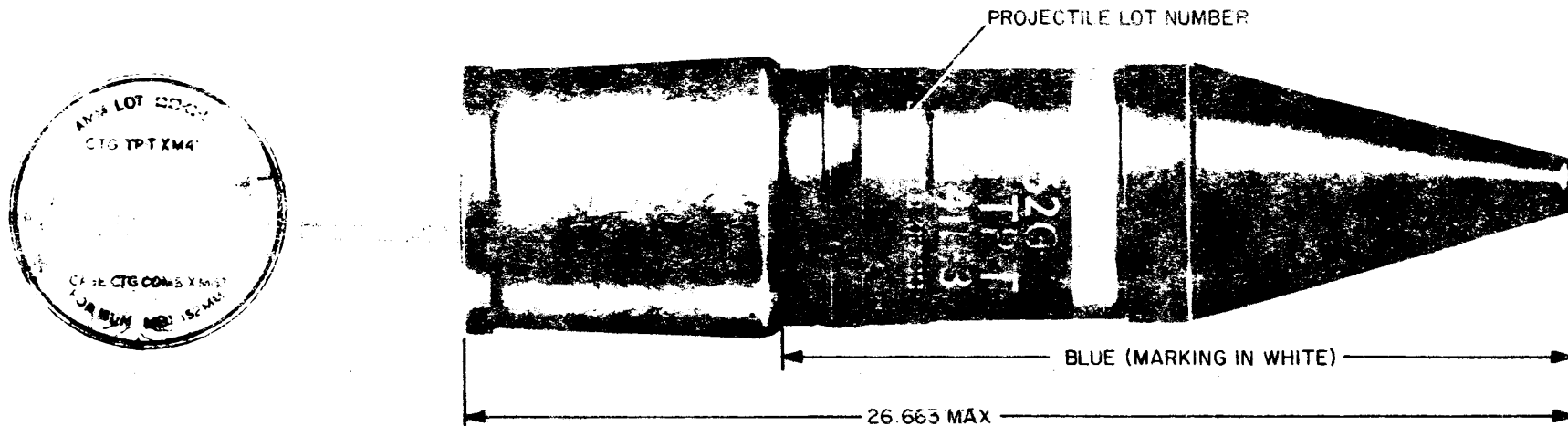
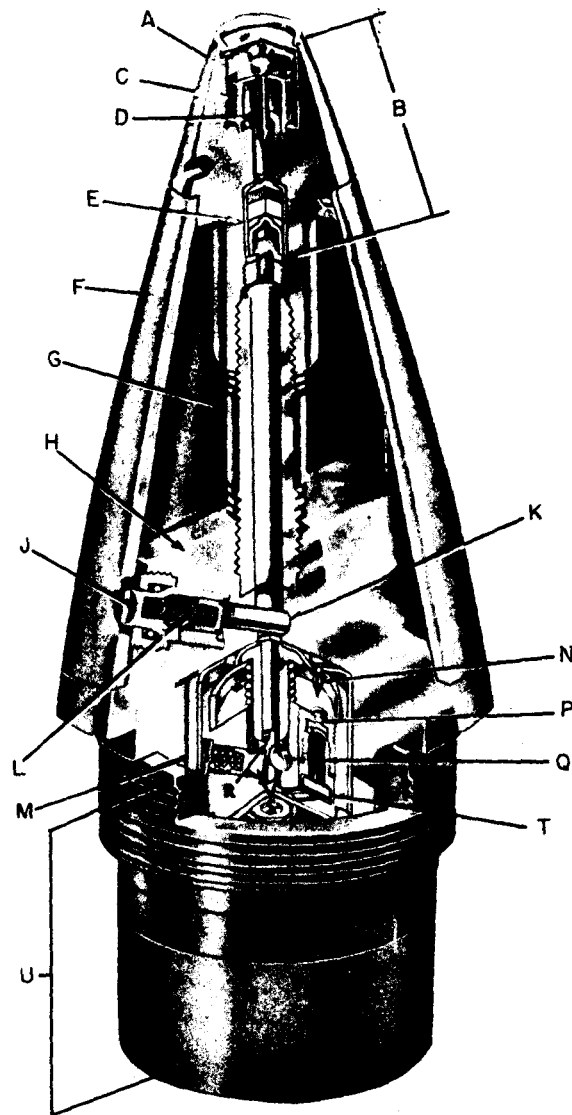


Figure 3-30. 152-MM TP-T Round



- A—Head
- B—Superquick element
- C—Firing pin support
- D—Firing pin (SQ)
- E—Detonator M24
- F—Ogive or windshield
- G—Flash tube
- H—Body
- J—Setting sleeve
- K—Interrupter
- L—Interrupter spring
- M—Delay plunger assembly
- N—Firing pin (delay)
- P—Primer M54
- Q—Delay charge
- R—Plunger pin lock
- S—Plunger pins
- T—Relay M7
- U—Booster M125A1

Figure 3-31. Fuze Cutaway View M557

Dept Aerospace Munitions Tng
Lowry Air Force Base, Colorado

Student Text 3AZR46470-1
1 February 1970

CHAPTER 4

PART ONE - DISPENSERS

PART TWO - PAYLOADS

POINT DETONATING FUZES

2-19. Type: M525 and M526 Series fuzes which require Setback for arming and are impact fired (reference figures 3-32 and 3-33)

2-20. Identification:

- a. Unpainted metal or plastic body
- b. Stamped with fuze designations.
- c. Slider plug.
- d. Spanner wrench hole
- e. Bore riding pin
- f. Protruding striker

2-21. Hazards:

- a. Black powder delay charge
- b. Lead azide relay
- c. Booster -- tetryl

2-22. Use:

- a. 60MM Mortar
- b. 81MM Mortar

2-23. Basic Operation:

- a. Bore riding pin jumps out when the round leaves the tube.
- b. Delay Arming mechanism starts on setback and firing pin is withdrawn from the slider. The slider spring forces the slider into the armed position.
- c. Upon impact the firing pin is driven into the detonator.

POINT DETONATING FUZES

2-24. Type: The M524 Series fuzes require setback and/or centrifugal force for arming (reference figures 3-34, 3-35A and 3-35B).

2-25. Identification:

- a. Unpainted metal or plastic body.
- b. Stamped with fuze designation
- c. Wrench slots

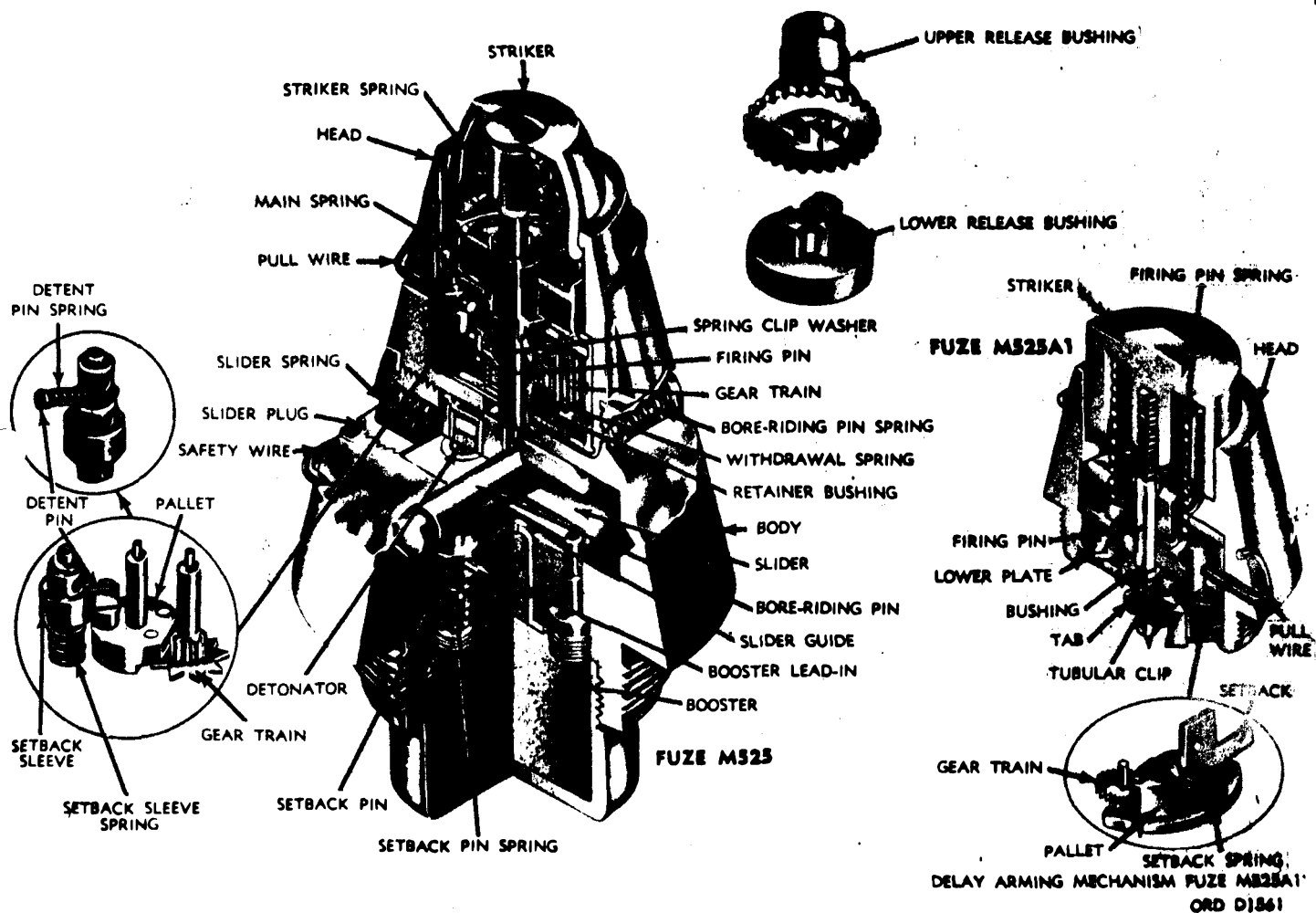


Figure 3-32. Fuze 525 Series, Cutaway View Showing Unarmed Condition

DIMENSIONS SHOWN ARE APPROXIMATE
AND APPLY ALSO TO FUZE M526A1

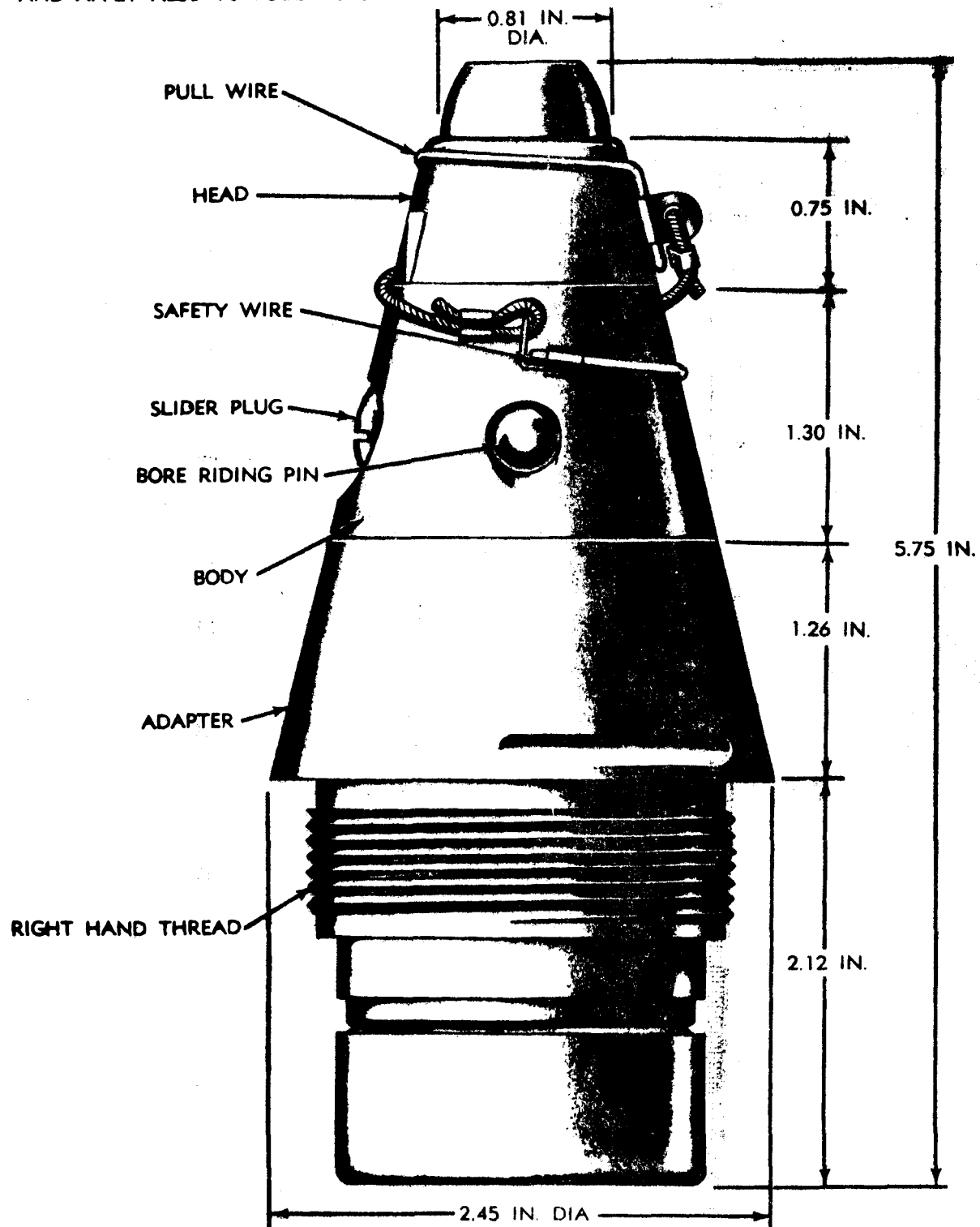


Figure 3-33. External Characteristics of Fuze M526 Series

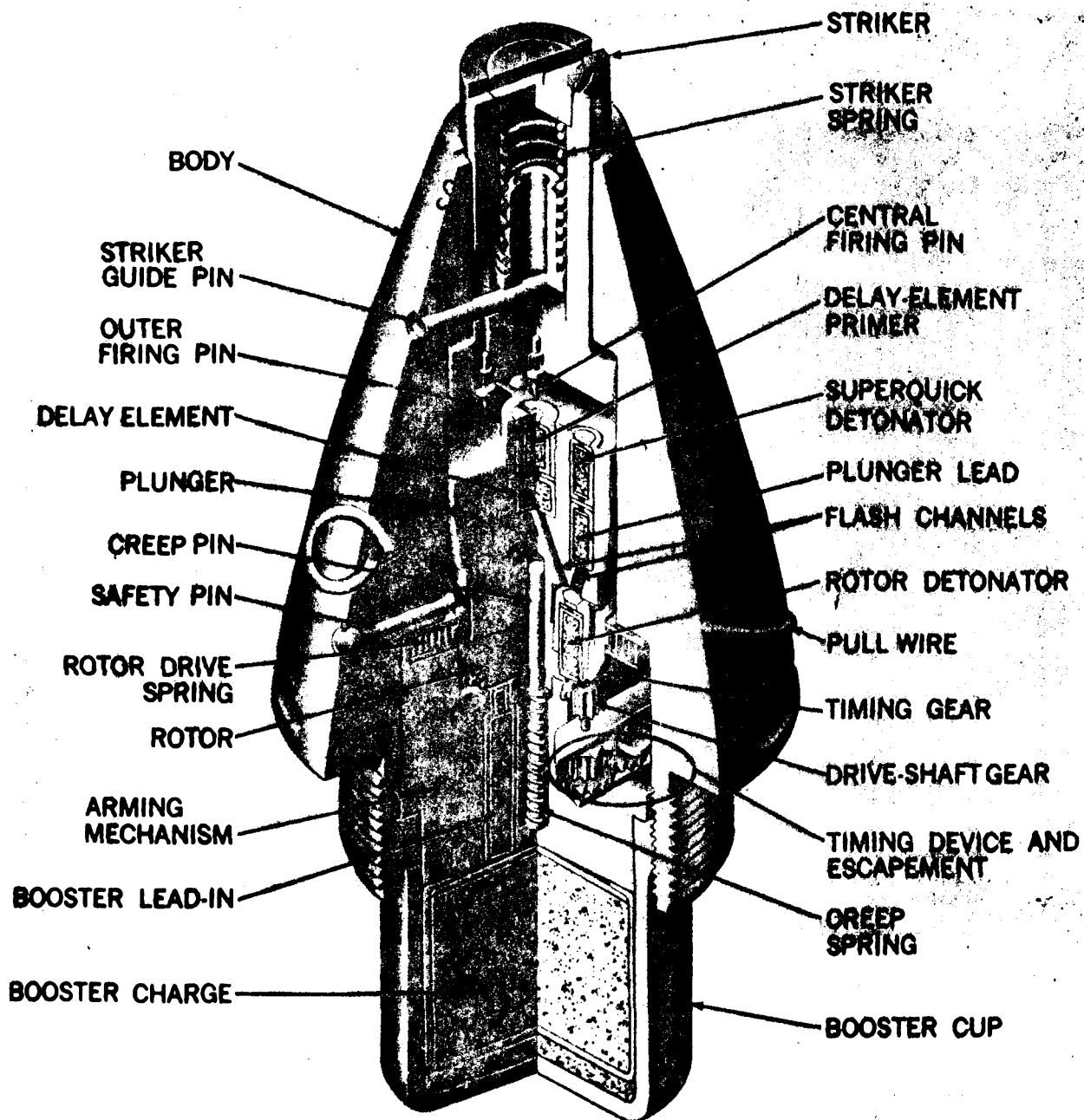


Figure 3-34. Fuze M524, Cutaway View Showing Unarmed Condition

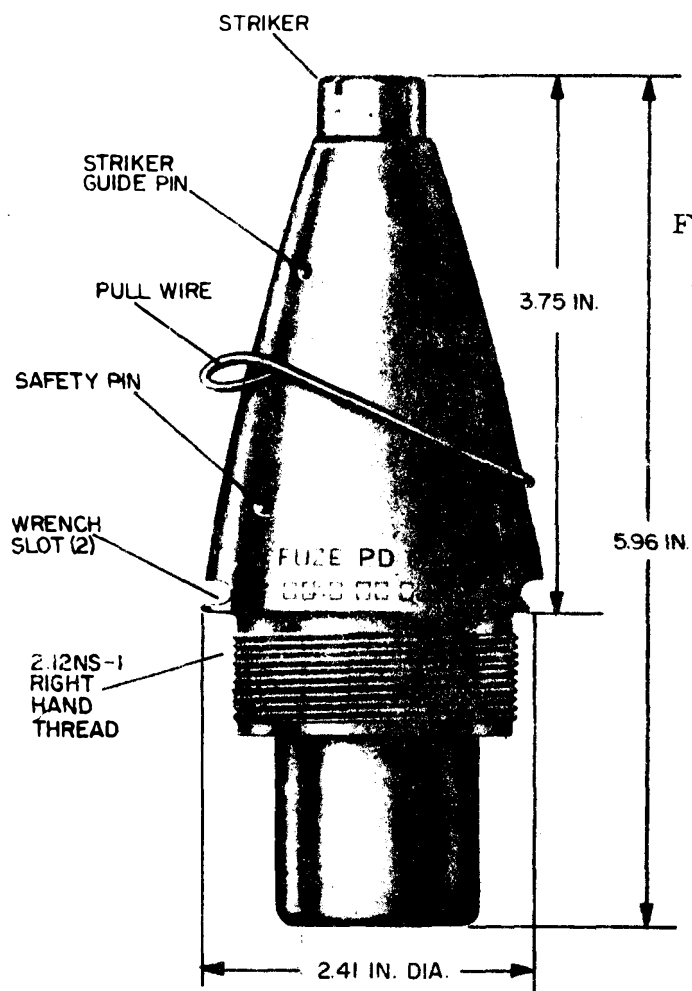


Figure 3-35A. External Characteristics of Fuze M524 Series except M524A5

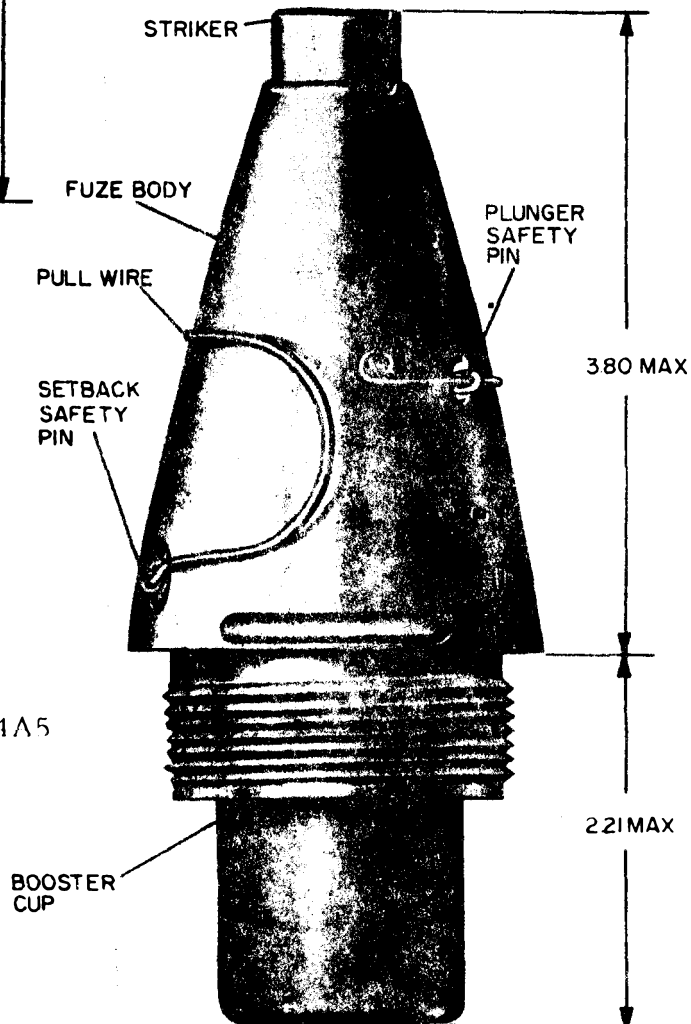


Figure 3-35B.

External Characteristics of Fuze M524A5

- d. Protruding striker.

2-26. Hazards:

- a. Detonator - Lead azide and ROX
- b. Booster - Tetryl

2-27. Use:

- a. ~~60MM Mortar~~
- b. 81MM Mortar

2-28. Basic Operation:

- a. Setback allows plunger to rotate.
- b. Flash channels are now aligned with booster lead-in.
- c. Impact functions the fuze.

NOTE

If the striker is not driven rearward by impact, the plunger moves forward against the creep spring and causes the superquick detonator to impinge on the firing pin.

Dept Aerospace Munitions Tng
Lowry Air Force Base, Colorado

Student Text 3AZR46470-1
1 February 1970

CHAPTER 4

PART ONE - DISPENSERS

PART TWO - PAYLOADS

PART ONE

DISPENSERS

OBJECTIVE

To learn the identification, function, safety precautions, hazardous components, RSP and/or disposal procedures for munition dispensers.

INTRODUCTION

There are approximately 12 dispensers being used by the Air Force in SEA. As an EOD man, you must be able to recognize them and know the procedures used to minimize the hazards that each presents.

Empty dispensers are designated as SUUs--SUU 7, SUU 10, SUU 13, etc. The bomb-lets carried in these dispensers are designated as BLUs and there are many of them. When a given BLU is placed in a SUU, the designator for the loaded unit becomes CBU.

This text describes the various dispensers and lists the bomblets carried by each. Therefore, all units except the XM-47 and CBU-19 will be referred to as SUUs.

The following dispensers are covered in this text:

SUU-7	4-1	SUU-24	4-8	SUU-38	4-17
SUU-10	4-1	SUU-25	4-8	SUU-41	4-17
SUU-13	4-3	SUU-30	4-11	XM-47	4-26
SUU-14	4-3	SUU-36	4-11 + 4-12	CBU-19	4-29
		SUU-7A/A and SUU-10/A		CBU-MK20, mod 1	4-29

1-1. **GENERAL DESCRIPTION:** Externally carried 19 tube dispenser used with jet type aircraft. Used to deliver various anti-personnel munitions (reference figures 4-1A, 4-1B and 4-1C).

1-2. Identification:

- Cylindrical body with a tail cone.
- Hemispherical nose, with an opening in the center.
- 19 tubes.
- O.D. or white in color.

Disposal
6 m 37

1-3. Hazards:

- Heavy coil spring in each tube.
- 19 explosive detents.

1-4. Payloads:

- BLU-3/B's or 4/B's.
- BLU-7/B's and/or 7A/B's.
- BLU-17/B's.

1-5. Dispersal Operation:

- Aircraft power fires explosive detents.
- Spring tension starts dispersal of payload.
- Ram air assists in dispersal.

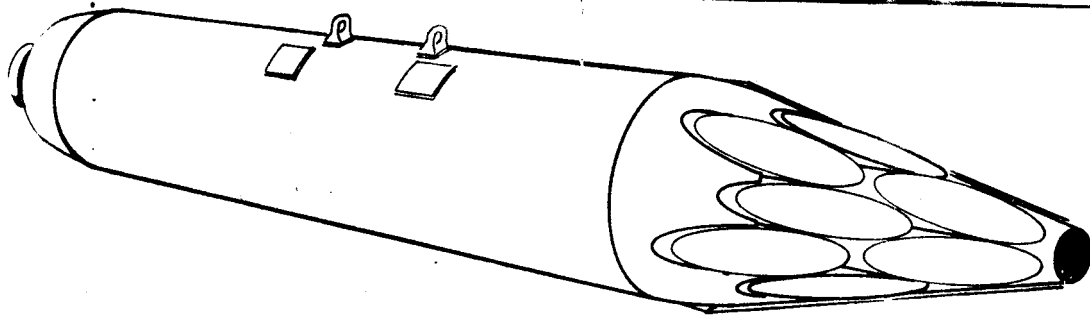


Figure 4-1A. SUU-7A/A or SUU-10/A

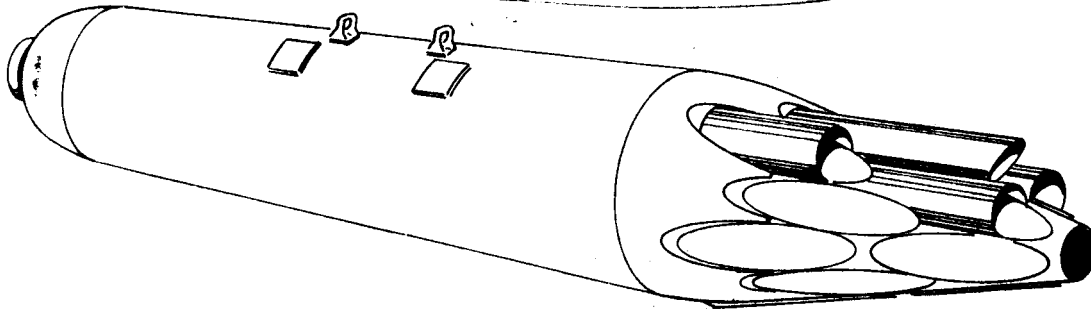


Figure 4-1B. SUU 7A/A or SUU-10/A with Extensions

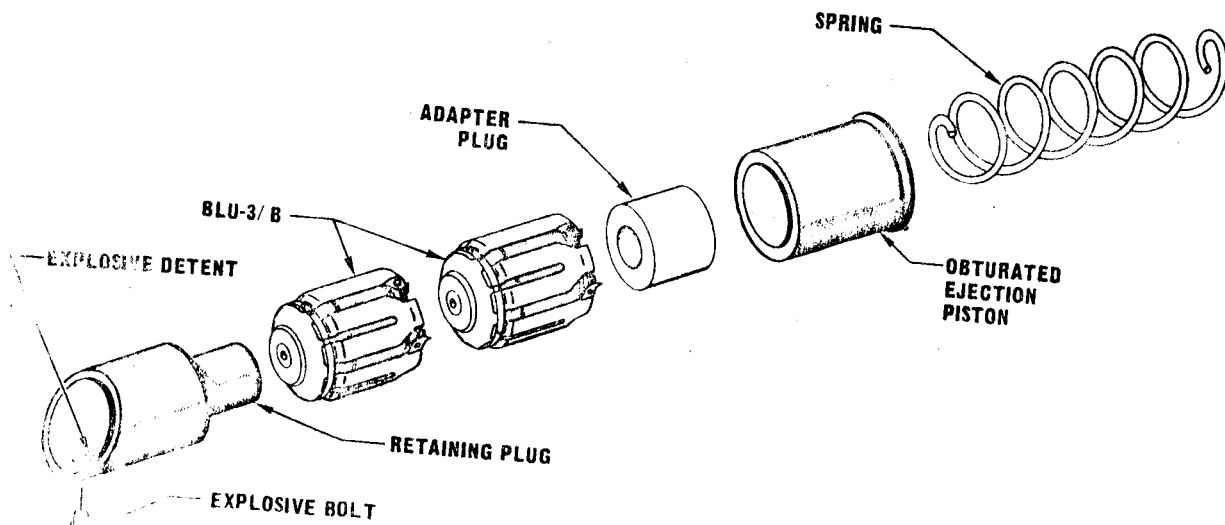


Figure 4-1C. Tube Contents-SUU-7A/A in CBU-2A Configuration

SUU-13/A

1-6. GENERAL DESCRIPTION: Externally carried dispenser, used to deliver various anti-personnel munitions (reference figures 4-2a, 4-2b and 4-3).

1-7. Identification:

- a. Rectangular, with flat sides and open bottom.
- b. Pointed aerodynamic nose and flat back.
- c. 40 tube assemblies.
- d. O.D. or camouflaged color.

Dispersal
Down head

1-8. Hazards:

- a. Payloads.
- b. 40 ejection cartridges.

1-9. Payloads:

- a. BLU-18/B.
- b. BLU-39/B.
- c. BLU-43/B, 44/B, 44A/B.
- d. BLU-49/B, 60/B. (X1)

1-10. Dispersal Operation:

- a. Aircraft power fires ejection cartridges.
- b. Expanding gas forces payload downward.
- c. Delay fires burster and breaks cannister open.
- d. Munitions disperse and arm.

SUU-14/A

1-11. GENERAL DESCRIPTION: Externally carried 6 tube dispenser used with prop-driven aircraft. Used to deliver various anti-personnel munitions (reference figures 4-4a, 4-4b, and 4-5).

1-12. Identification:

- a. Triangular cross section configuration.
- b. Six tubes.
- c. Strong back assembly in center.

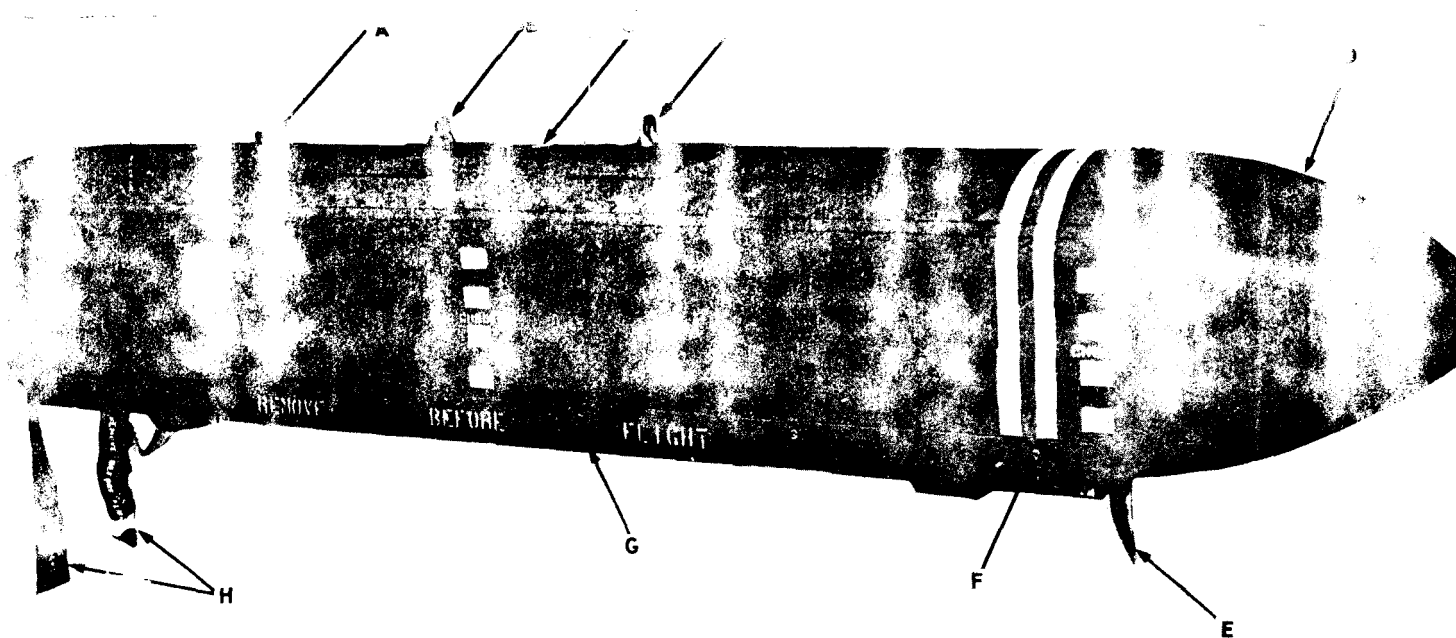
Disposal
4 m 37

1-13. Hazards:

- a. Each tube contains one ejection cartridge.
- b. Tubes contain the payload.

1-14. Payloads:

- a. BLU-3/B bomblets - 114.
- b. BLU-17/B WP Grenade - 72.
- c. BLU-24/B, 66/B Jungle bomblets - 132.



A - Electrical connector cover
 B - Suspension lug (2)
 C - Machine thread plug
 D - Forward fairing
 E - Pallet strap handle (2)

F - Pallet fastener stud (12)
 G - Pallet
 H - Remove before flight
 safety flag (2)

Figure 4-2A. SUU-13/A Side View

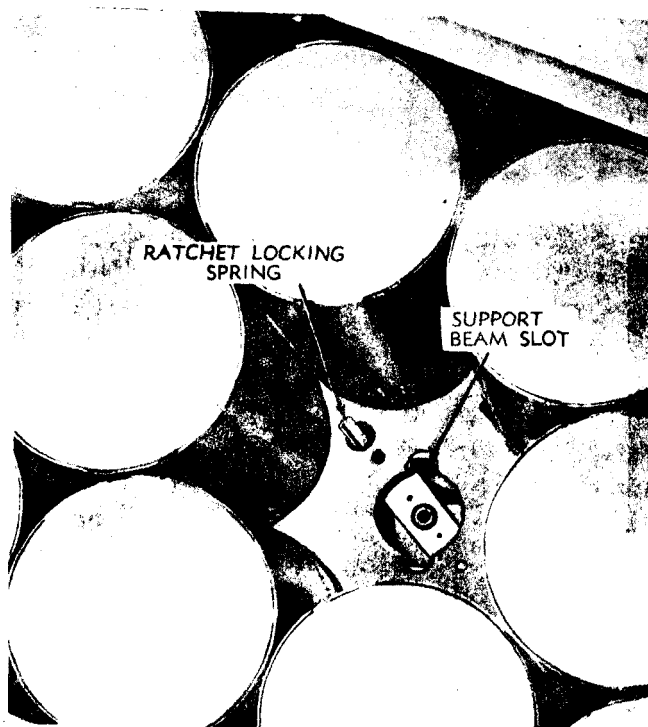


Figure 4-2B. SUU 13/A Bottom View

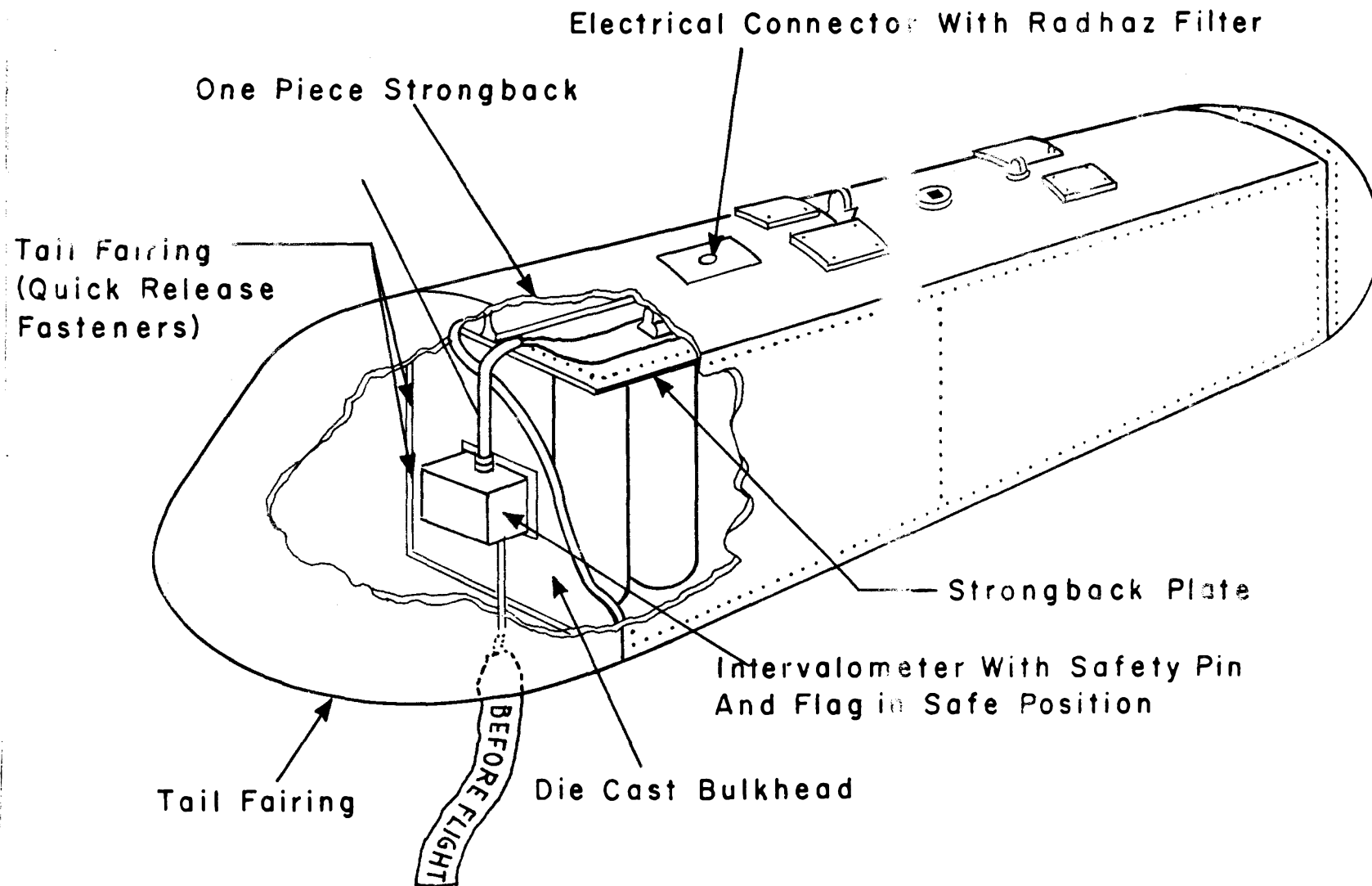


Figure 4-3. SUU 13/A Dispenser

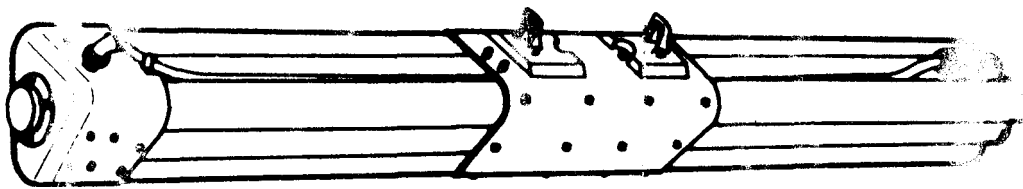


Figure 4-4A. SUU 14/A

- | | |
|---------------------------------|------------------------------|
| 1. ACCESS COVER | 17. PISTON ORIFICE SEAL |
| 2. ACCESS COVER GASKET | 18. BOMB (SEE NOTE) |
| 3. ELECTRICAL JUMPER PLUG | 19. END PLUG |
| 4. SAFETY PIN ASSEMBLY | 20. SAFETY PLATE (SEE TABLE) |
| 5. NOSE FAIRING ASSEMBLY | 21. TUBE |
| 6. MAIN WIRING HARNESS | 22. SUSPENSION LUG |
| 7. ELECTRICAL HARNESS ASSEMBLY | 23. LUG ADAPTER |
| 8. SAFETY SWITCH ASSEMBLY | 24. SKIN ASSEMBLY |
| 9. RADHAZ FILTER ASSEMBLY | 25. SCREW |
| 10. ROTARY SELECTOR ASSEMBLY | 26. FLAT WASHER |
| 11. BREECH BLOCK ASSEMBLY | 27. CABLE CLAMP |
| 12. EJECTION CARTRIDGE ASSEMBLY | 28. SELF-LOCKING NUT |
| 13. BULKHEAD ASSEMBLY | |
| 14. BREECH ASSEMBLY | |
| 15. SAFETY ROD (SEE TABLE) | |
| 16. PISTON AND SPRING ASSEMBLY | |

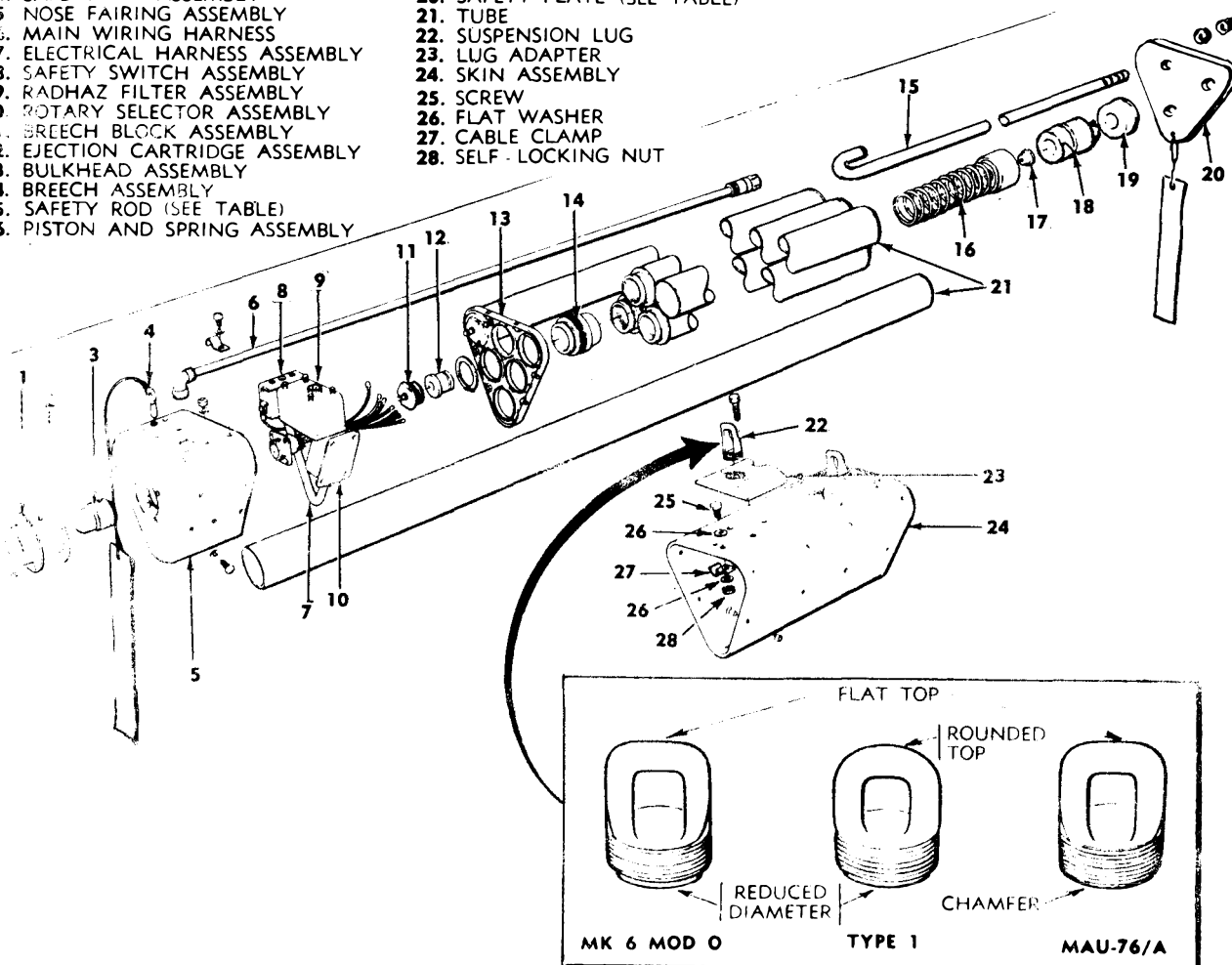


Figure 4-4B. SUU 14/A (Exploded View)

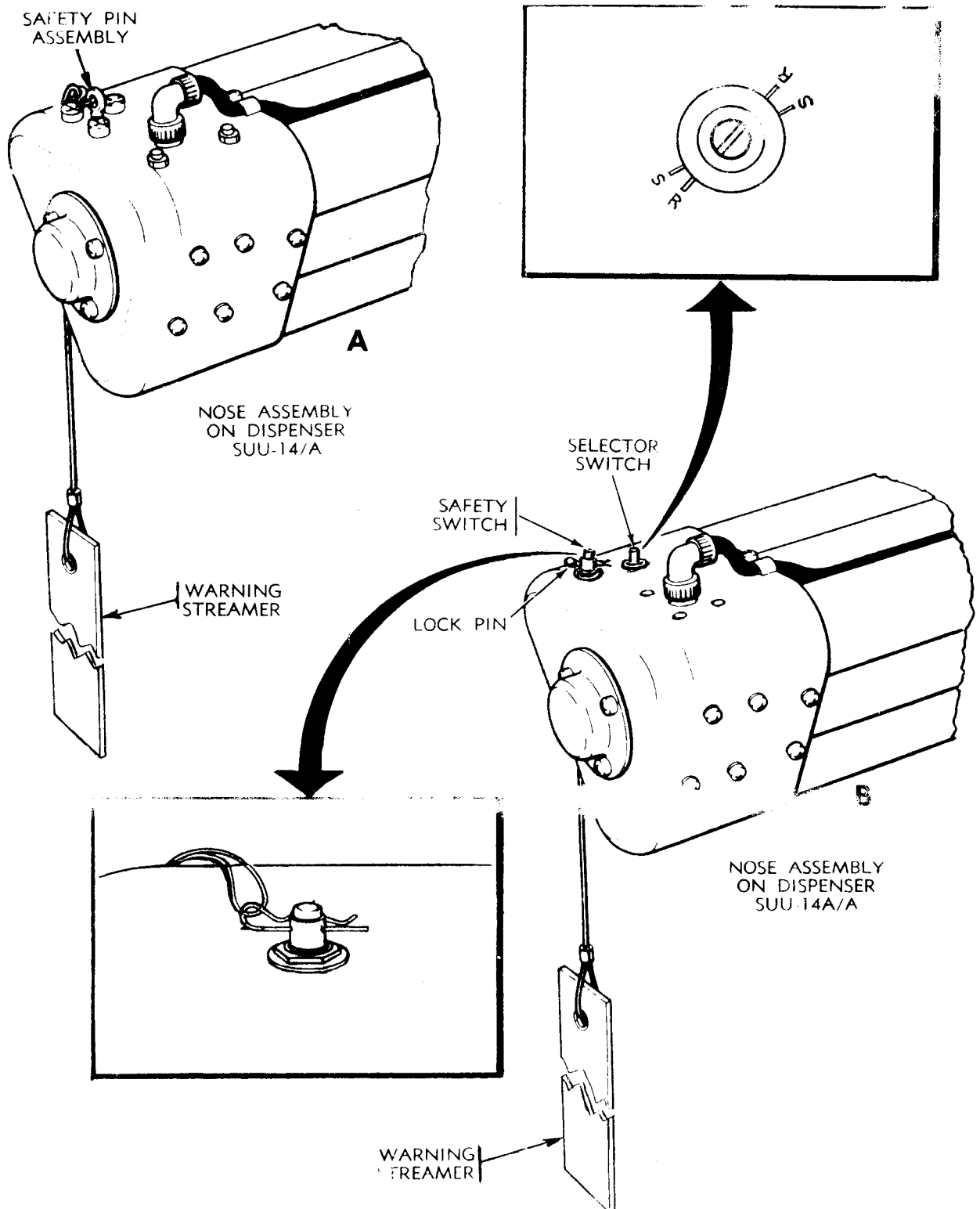


Figure 4-5. Safety Features of the SUU-14/A

1-15. Dispersal Operation:

- a. Safety pin is removed prior to flight.
- b. Aircraft power fires ejection cartridges.
- c. Gas pressure from cartridges over comes the payload retaining rivets and forces the payload from the tubes.
- d. Tubes may be fired singly or in ripple.

SUU-24/A

1-16. GENERAL DESCRIPTION: Internally carried 24 bay dispenser used with the B-52 aircraft. Used to deliver anti-personnel munitions (reference figures 4-6a, 4-6b, 4-6c, and 4-6d).

1-17. Identification:

Disposal

- a. Large rectangular shaped dispenser.
- b. 24 double walled cells.
- c. Normally painted blue.
- d. Contains 72 cubed shape ADU's.

1-18. Hazards:

1-19. Payloads:

- a. BLU-3/B's
- b. BLU-26/B, 36/B, 59/B may be mixed.

1-20. Dispersal Operation:

- a. Aircraft power operates release solenoids on selected cells.
- b. ADU's drop from cell.
- c. ADU timers start running.
- d. Expiration of timers open ADUs.
- e. Munitions released.

SUU-25/A, 25B/A

1-21. GENERAL DESCRIPTION: A four tube dispenser capable of releasing 8 MK 24 fuses. Used on fighter type aircraft (reference figure 4-7).

1-22. Identification:

- a. Modified 5" Zuni Rocket Launcher.
- b. Round body.
- c. 4 tubes.

Disposal
Detonate
OR
Burn

1-23. Hazard:

- a. SUU-25/A.
 - (1) 2 Explosive detents in each tube.
 - (2) Payload, each tube.

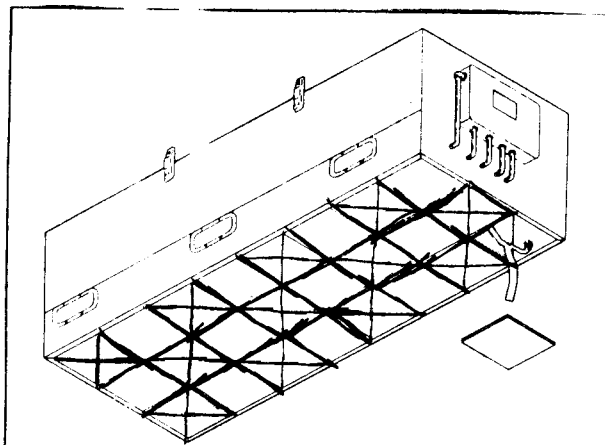


Figure 4-6A Dispenser, SU-24/A

Figure 4-6B.
Adapter Cluster Bomb, ADU-253/B

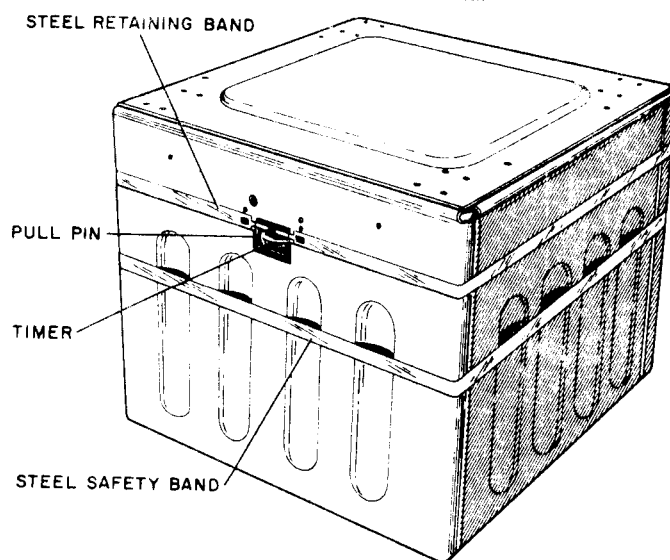
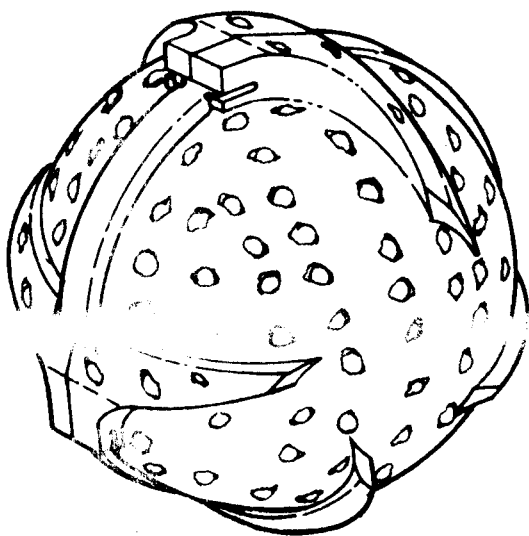
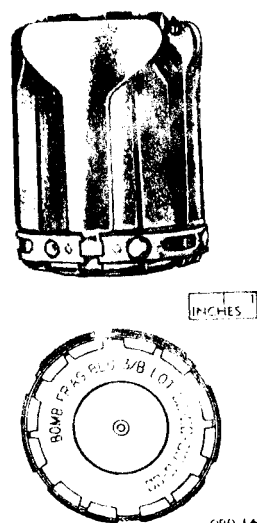


Figure 4-6C.
Fragmentation Bomb, BLU-26/A

Figure 4-6D. Fragmentation Bomb, BLU-3/B



ITEM	I. D.	HAZARDS	Pay load	Dispersal
Suu - 7	19 Tubes	19 Detonants (Explosive)	BLU - 4	Sprng Ram Air
Suu - 10	19 Tubes	19 Detonants (Explosive)	BLU - 4	Sprng Ram Air
Suu - 14	6 Tubes	6 Explosive Cartridges	BLU 3, 4, 16, 17, 24, 66	Gas Pressure
Suu - 30	Metal Cluster	Fuze. 907 - Fmu 56 - Fmu 26	BLU 26, 36, 59	Clam Shells
M - 129	Fiber Glass	Det Cord	Leglets	Clam
Xm 47	4 Tubes	4 Explosive Devices	Gravel Mines	Gas Pressure
GBU - 19	Clean Shastic	Exp. Bolts, Black Powder	Tear Gas	Exp. Bolt Shrapnel Spring
Suu - 258/A	4 Tubes	4 Eyecore Cartridges	Mk 24 Fuses	Cartridges (Gas Pressure)
Suu - 13	40 Tubes down	40 Exp Cartridges - Pay load	BLU 18, 37, 43, 44, 49, 60	Exp Grets Down
Suu - 38	10 Bags	50 Grets	BLU 42, 54	CRts
Suu - 36	10 Bags	10 Grets	BLU 45	CRts
Suu - 41	10 Bags	10 Grets	COU 4, 5, 10, 14	CRts
Suu - 24	24 Bags		BLU 3, 26, 36, 59	Down load

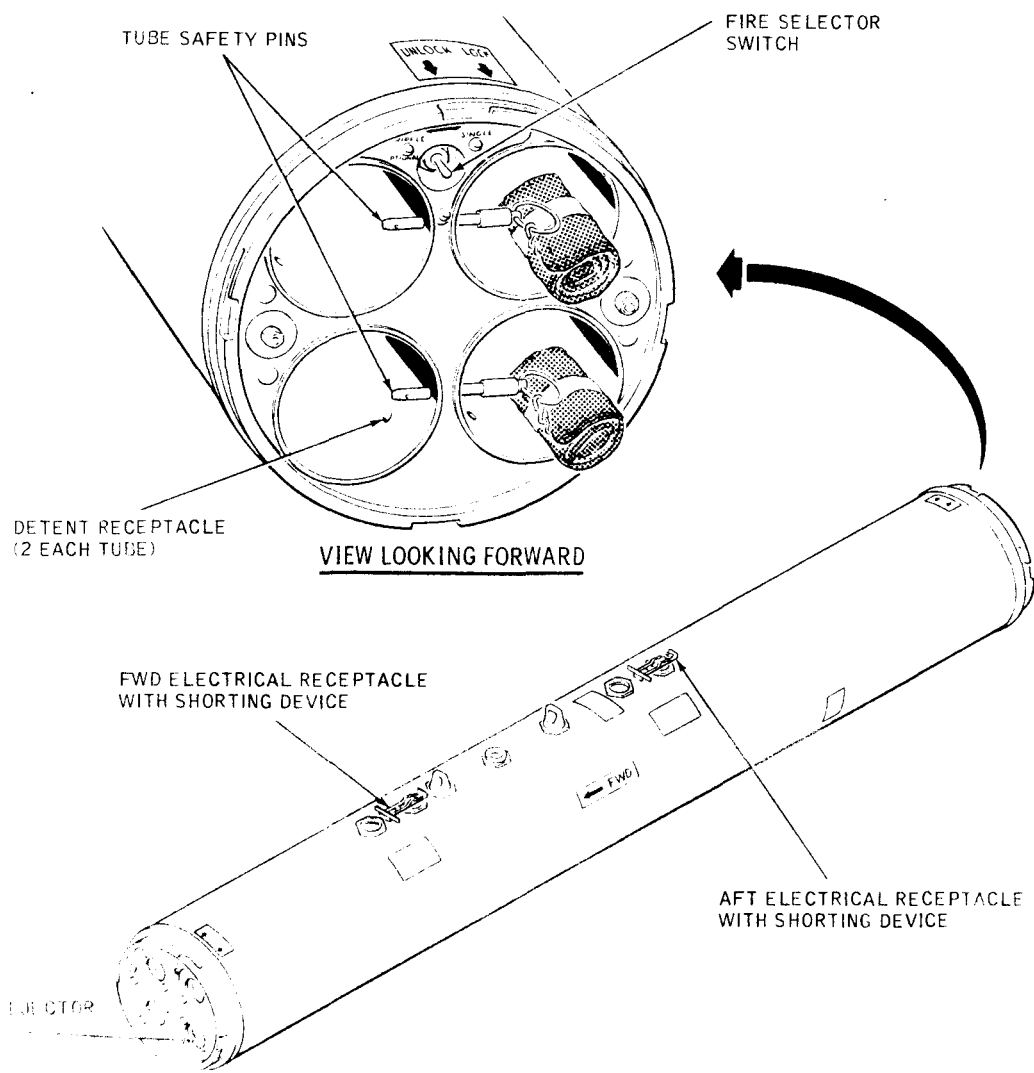


Figure 4-7. Flare Dispenser SUU-25

b. SUU-25B/A

(1) 1 Ejection Cartridge in each tube.

(2) Payload, each tube.

1-24. Payloads: MK 24 Flares (2 per tube).

1-25. Operation:

a. SUU-25/A

(1) Aircraft Power fires detents.

(2) Spring forces flares out of tube.

b. SUU-25B/A

(1) Aircraft Power fire ejection cartridges.

(2) Gas Pressure forces flares out of tube.

SUU-30/B

1-26. GENERAL DESCRIPTION: Externally carried, bomb shaped, clam shell opening dispenser. Used to deliver anti-personnel munitions (reference figures 4-8a, 4-8b, 4-8c, and 4-9).

1-27. Identification:

a. Smooth bomb shaped body, steel construction.

b. Upper and lower halves held together at nose.

c. Four attachable fins.

d. Normally O.D. in color.

e. Use airburst type fuzes.

1-28. Hazards:

a. Nose fuze.

b. Payload.

1-29. Payloads: (Amounts can vary)

a. BLU-26/B - approx 670.

b. BLU - 36/B, 59/B - approx 670.

c. Not limited to the above.

1-30. Dispersal Operation:

a. M907E1, FMU 26A/B, 26B/B, or FMU 56/B opens cluster. (Clam Shell)

b. Removal of nose cap allows halves to separate.

c. Munitions disperse and arm.

SUU-36/A

1-31. GENERAL DESCRIPTION: Externally carried, 10 bay, downward ejection dispenser (reference figures 4-10, 4-11, and 4-12).

Disposal
4 M37

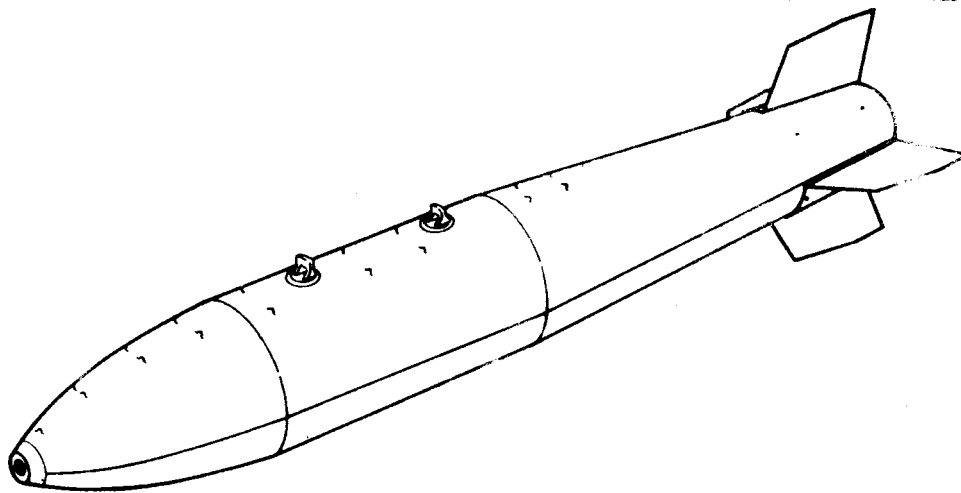


Figure 4-8A. SUU 30/A

MUNITION RELEASED FROM AIRCRAFT
(ARMING WIRE WITHDRAWN)

FUZE FUNCTION
(BOOSTER IGNITION)

CASE SEPARATION

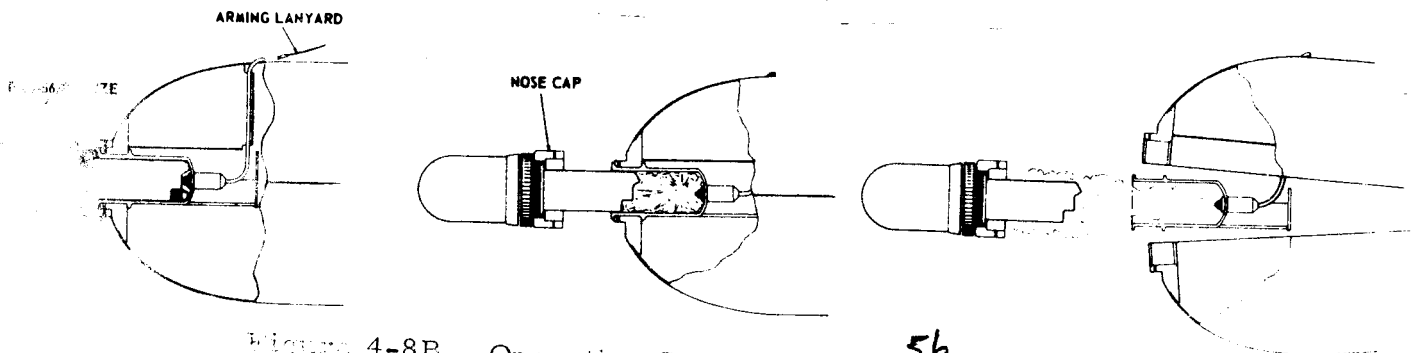


Figure 4-8B. Operation Sequence (FMU-56⁵⁶ Installation)

ARMING WIRE
FUZE

NOSE CAP

BREECH CAP

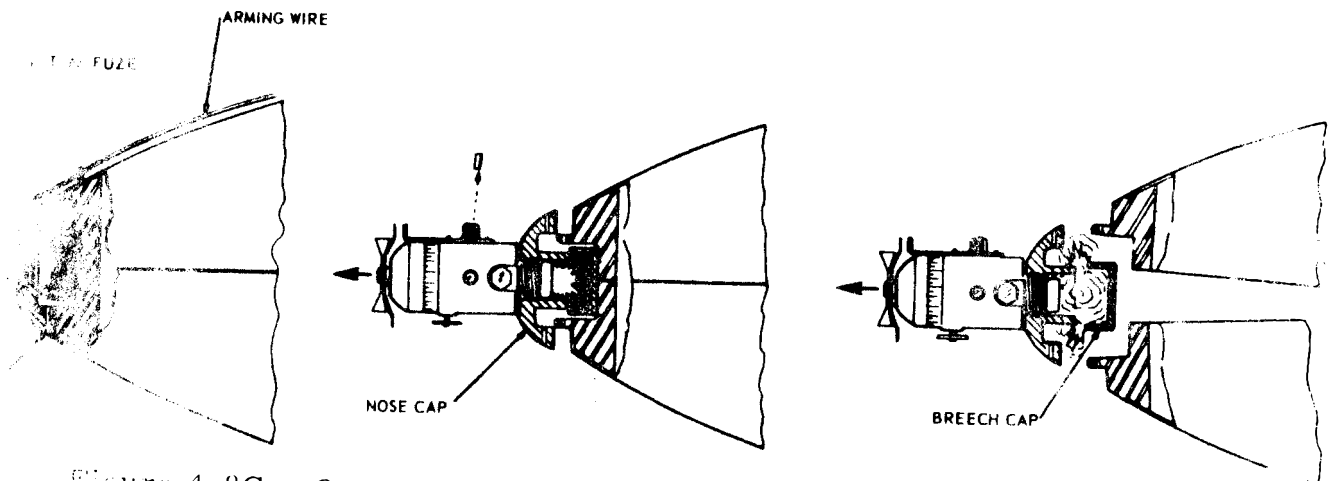


Figure 4-8C. Operational Sequence (M907 Installation)

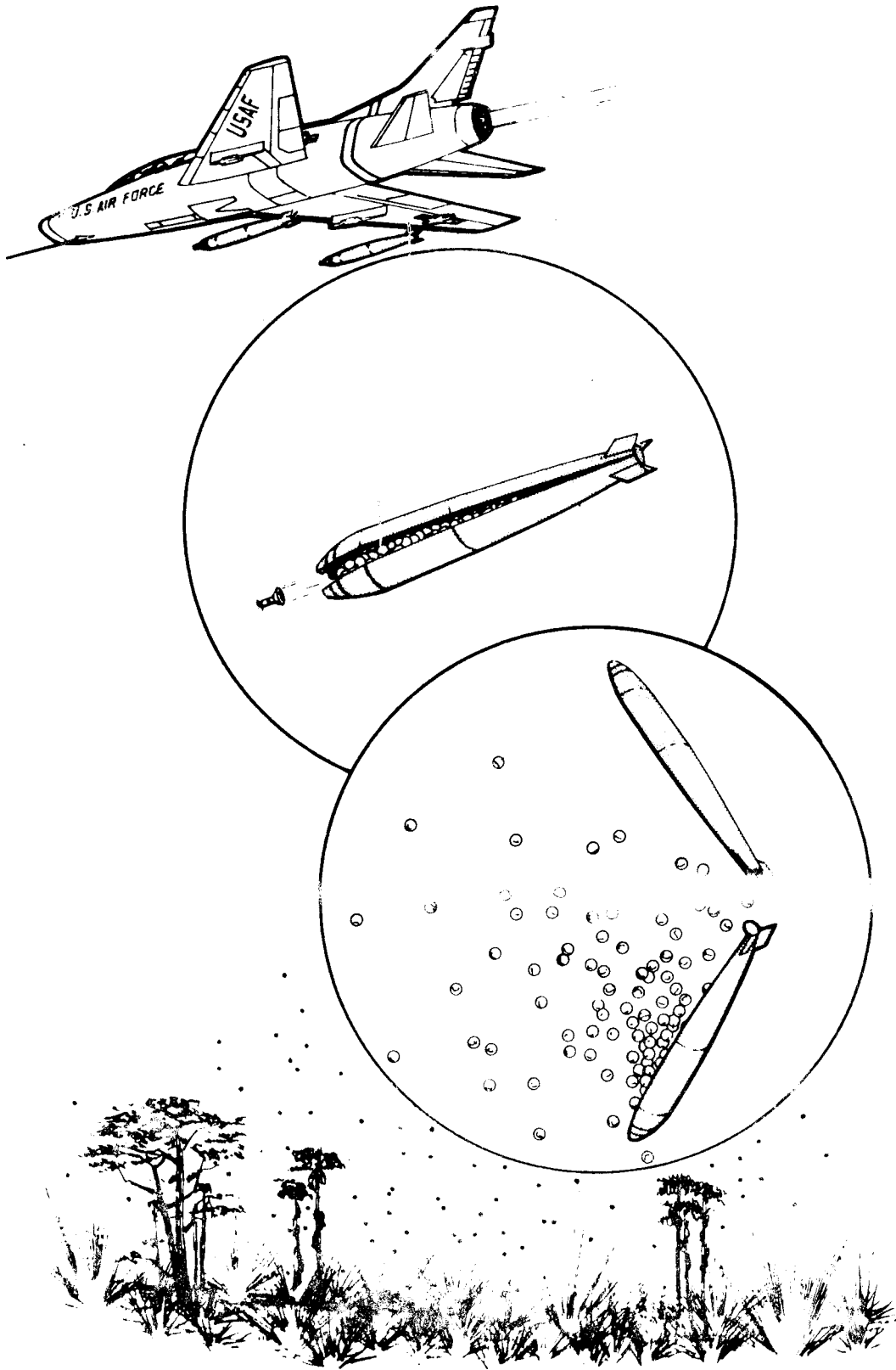


Figure 4-9. Sequence of Operation

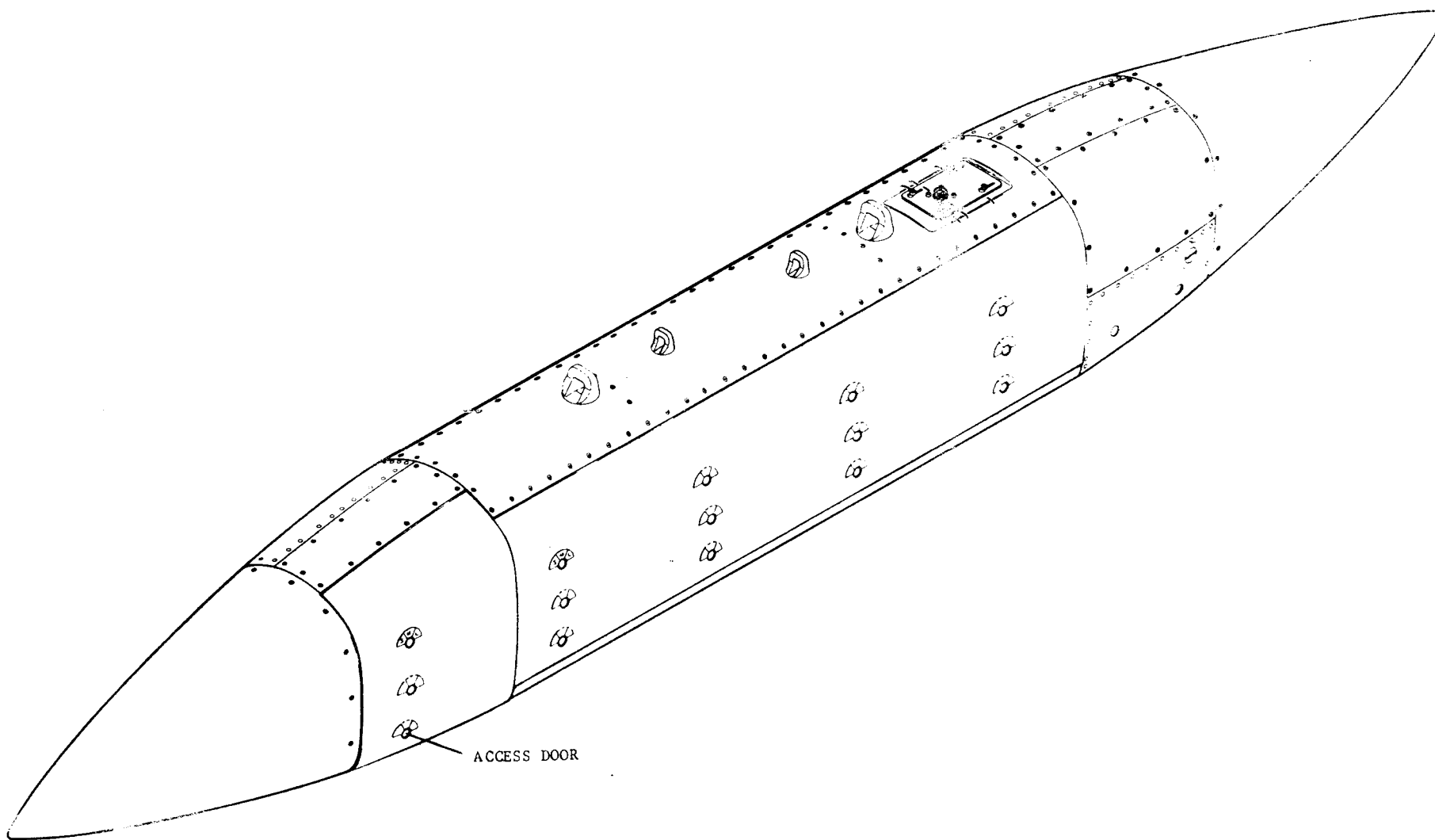


Figure 4-10. SUU 36, A

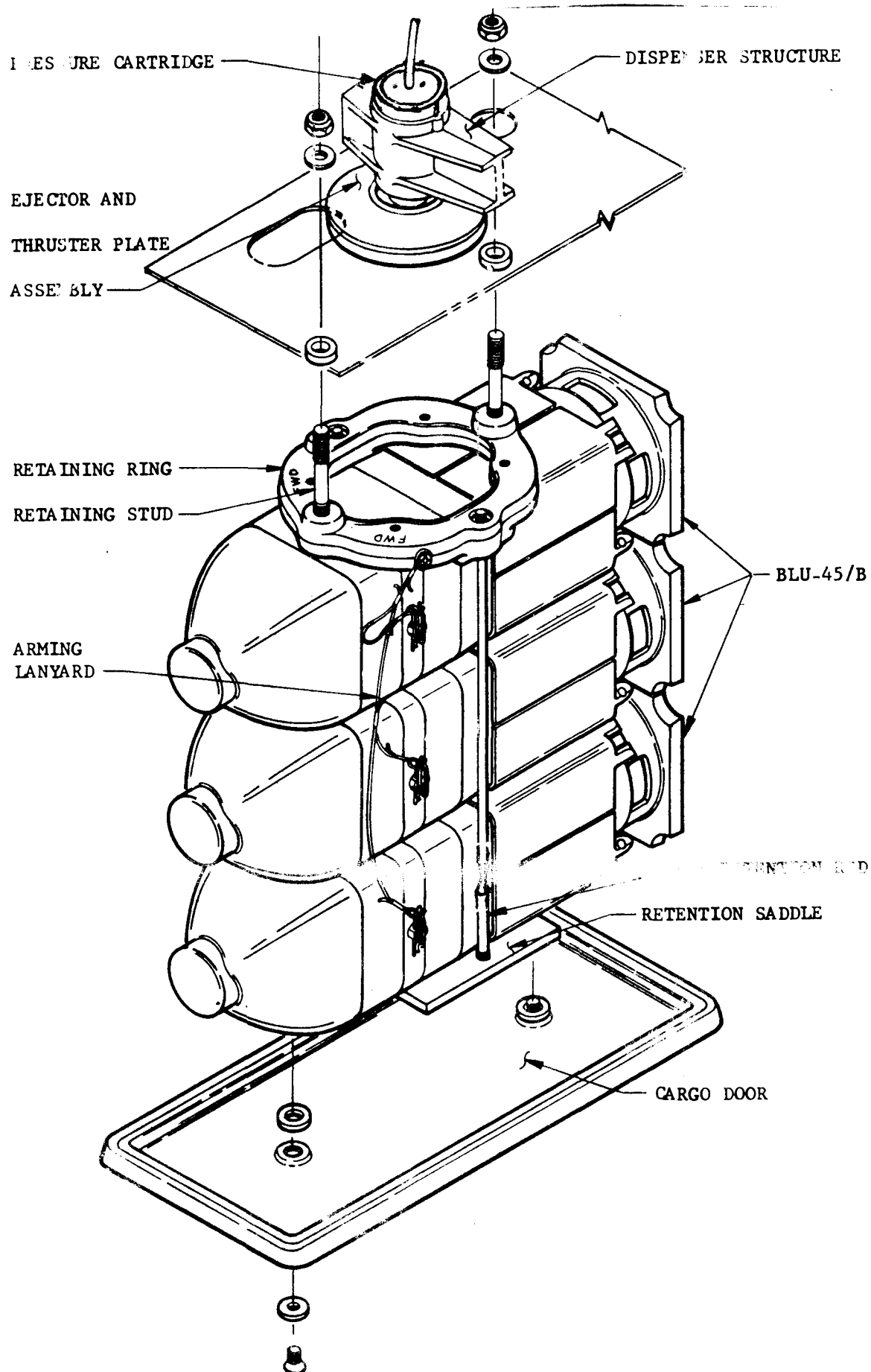


Figure 4-11. FANU 339/B with BLU-45/B

4-16

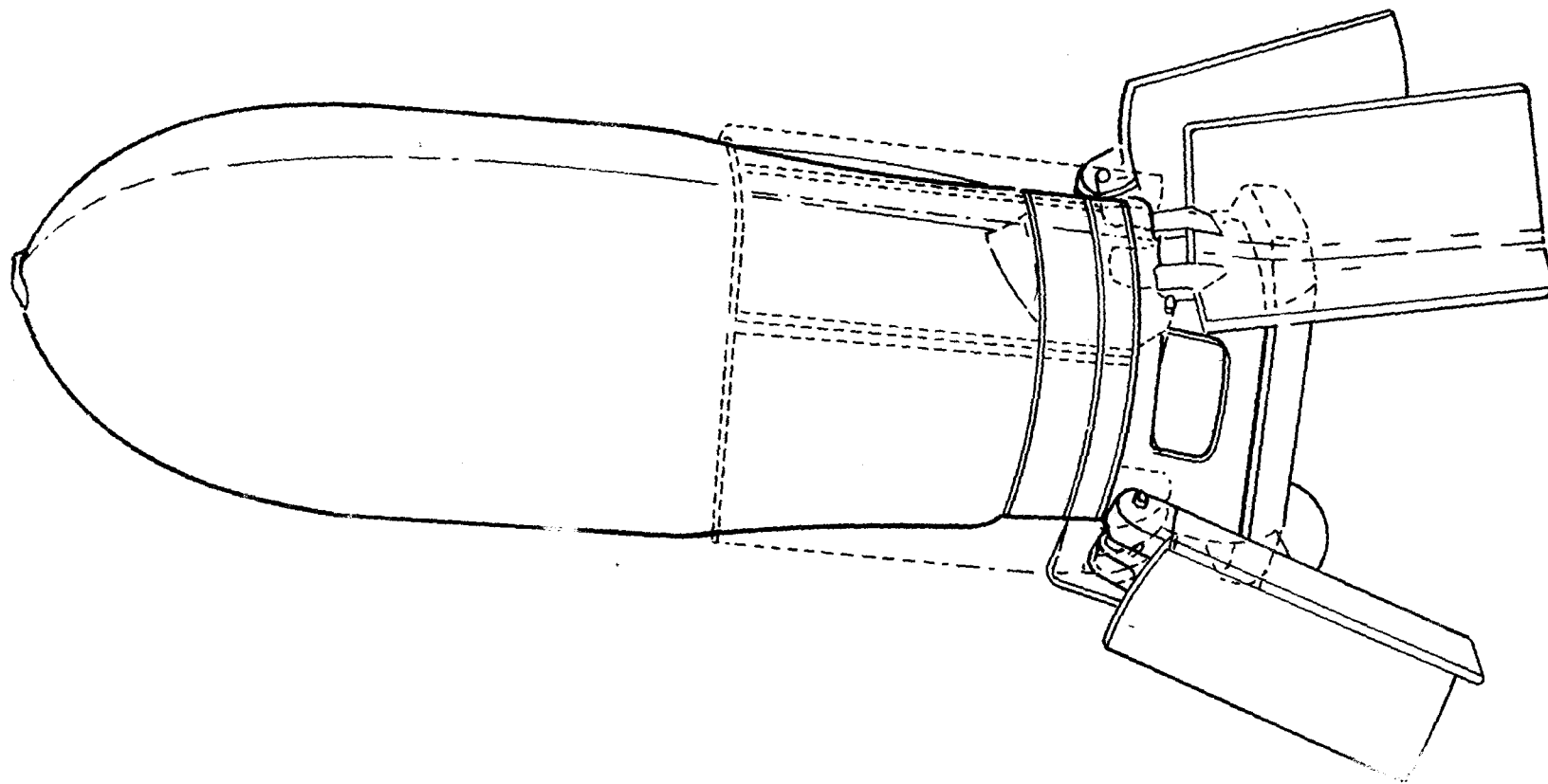


Figure 4-12. ATLM configuration with Fins in open and closed positions

1-32. Identification:

- a. Rectangular shape with aluminum skin.
- b. Rounded top.
- c. Aerodynamic fairings at each end.
- d. 10 cargo bays - BCL.
- e. 30 selector switches, 15 on each side.
- f. O. D. in color.

1-33. Hazards: Ten pressure cartridges, one per bay.

1-34. Payload: 3 BLU-45/Bs per bay.

1-35. Operation:

- a. Aircraft power fires cartridges.
- b. Gas expands and extends ejection pistons.
- c. Munitions are ejected from dispenser.

SUU-38/A

1-36. GENERAL DESCRIPTION: Externally carried, 10 bay, downward ejection dispenser (reference figures 4-13, 4-14, and 4-15).

1-37. Identification:

- a. Rectangular shape with aluminum skin.
- b. Rounded top.
- c. Aerodynamic fairings at each end.
- d. 10 cargo bays - BCL.
- e. O.D. in color.

Disposal
4 m 37

1-38. Hazards: 30 pressure cartridges, 3 installed in each bay

1-39. Payloads:

- a. BLU-42/B.
- b. BLU-42A/B.
- c. BLU-54/B.

NOTE: These BLUs are clustered in a KMU-338 adapter.

1-40. Operation:

- a. Aircraft power fires cartridges.
- b. Gas expands and extends ejection piston.
- c. KMU-338 adapter is ejected from dispenser.
- d. Delay detonator in the KMU adapter disperses the BLUs.

SUU-41B/A

1-41. GENERAL DESCRIPTION: Externally carried, 10 bay, downward ejection dispenser (reference figures 4-16, 4-17, 4-18, 4-19, 4-20, 4-21A, and 4-21B)

Disposal
6 m 37

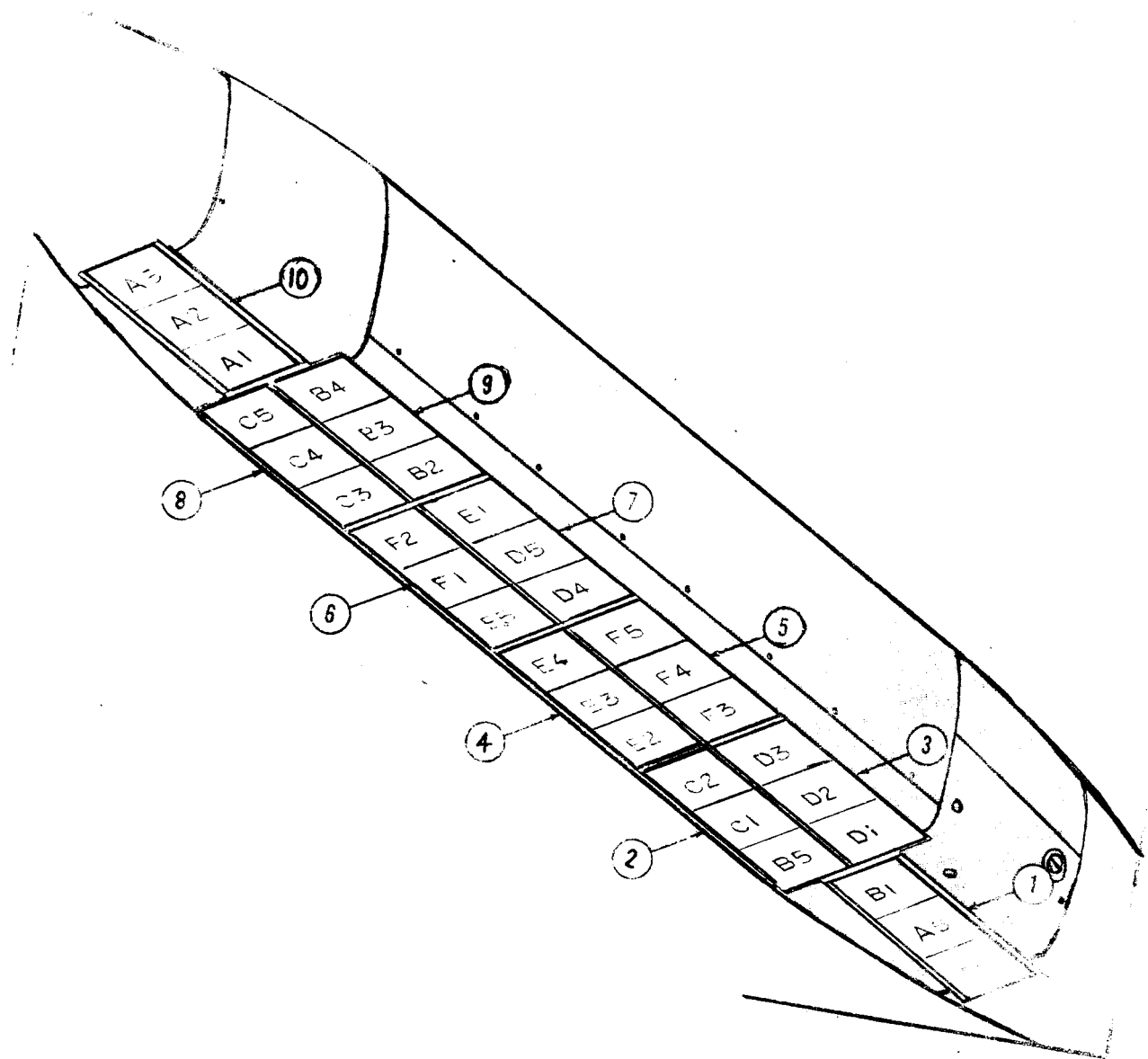


Figure 4-1. SUU-38/A Bottom View

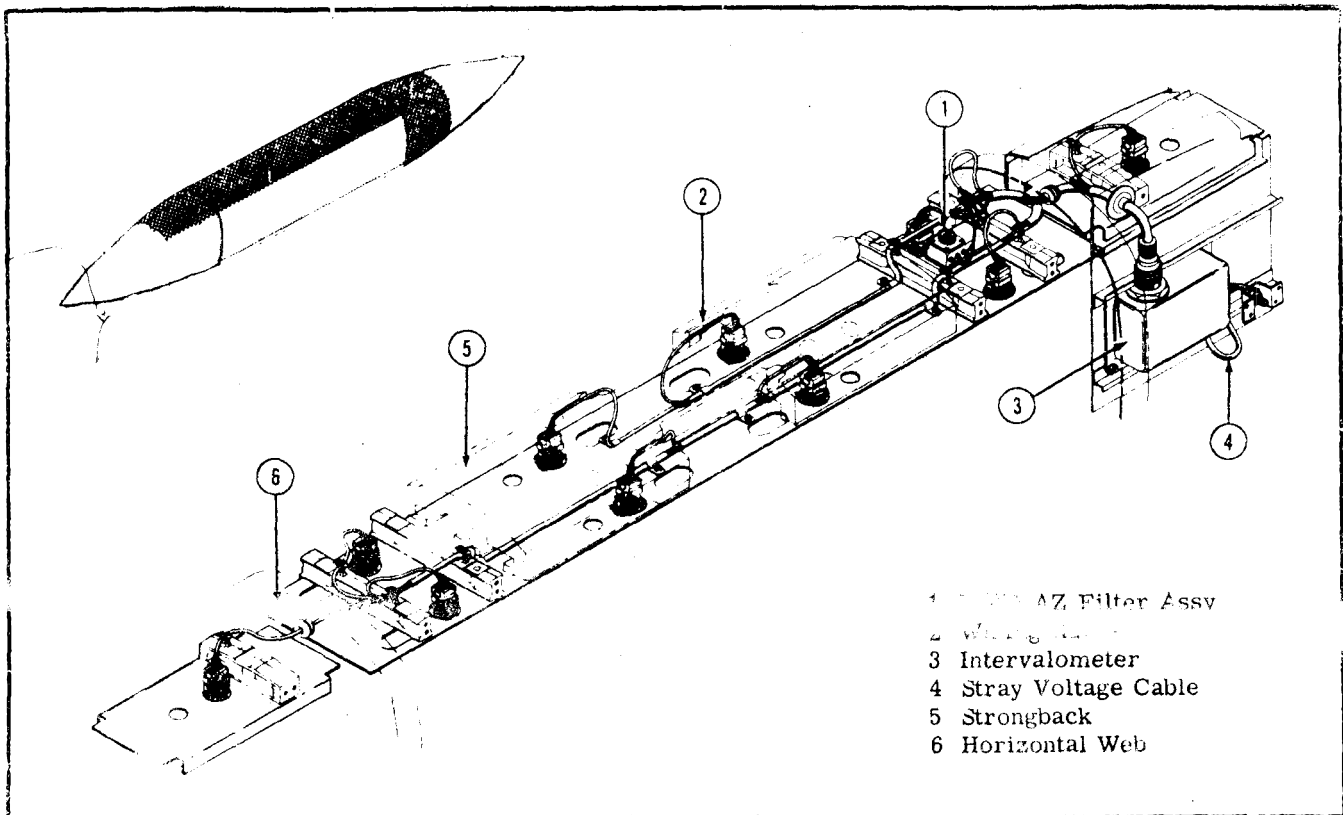


Figure 4-14. SUU-38A Electrical Detonator Assembly

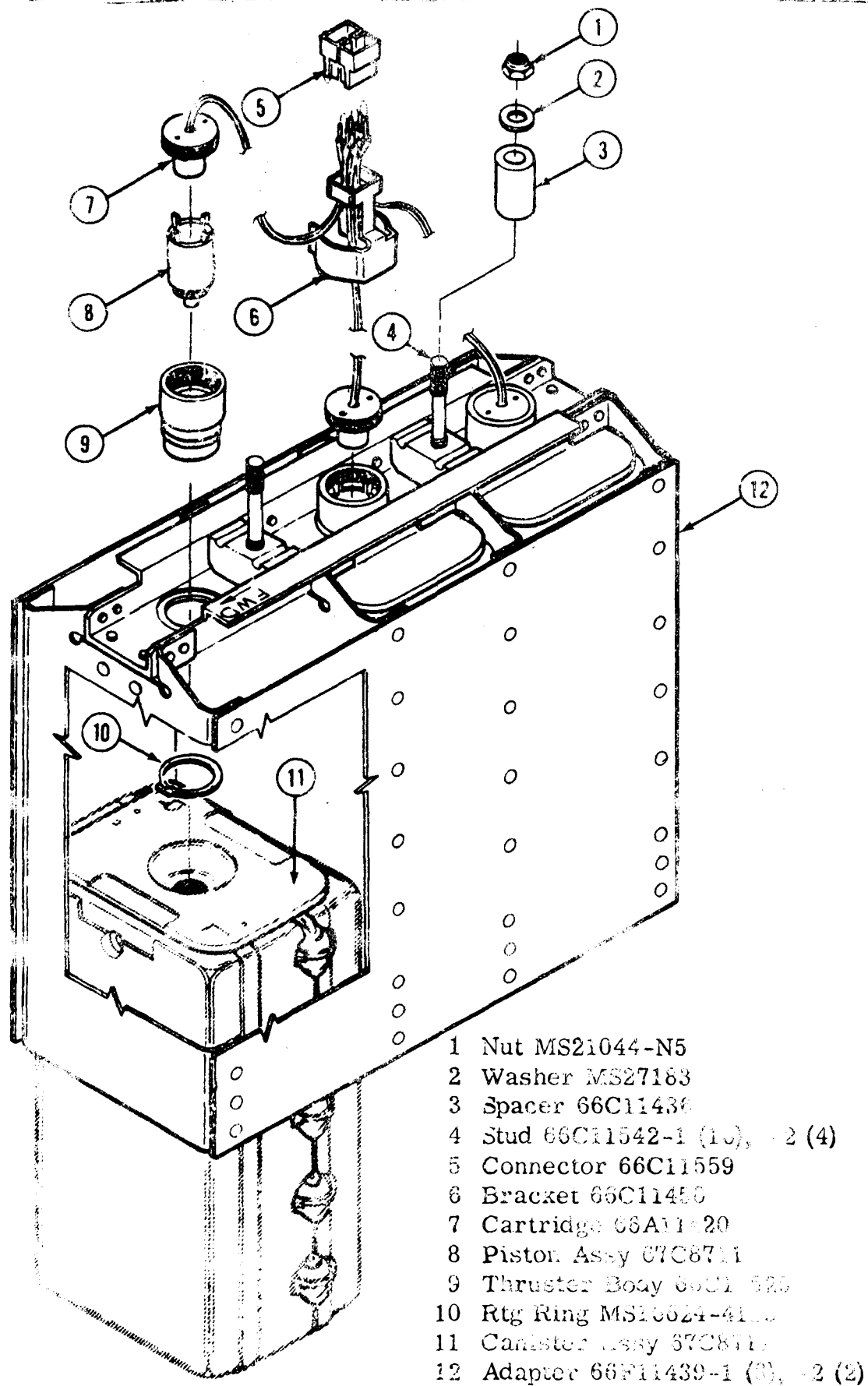


Figure 4-15. KMU-338/B Adapter Kit with Canister Assembly

Figure 4-16. SUU-41B/A Bottom View

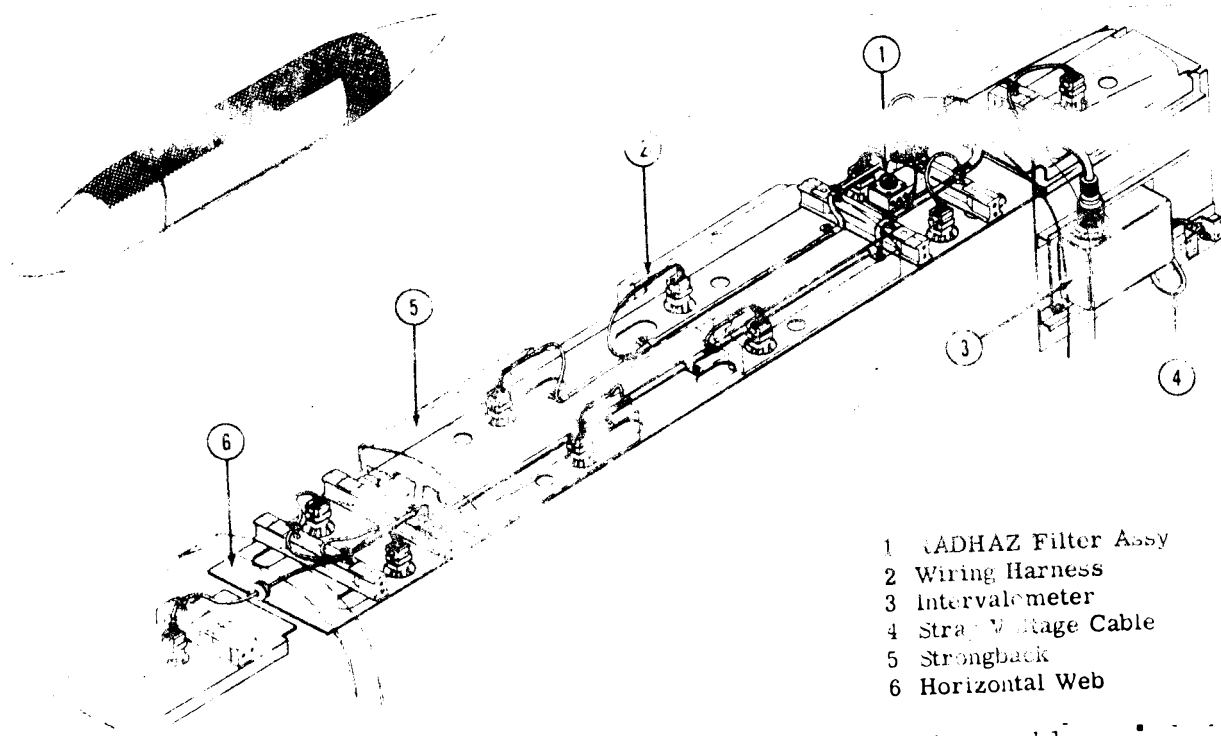


Figure 4-17. SUU-41B/A Electrical Detonator Assembly

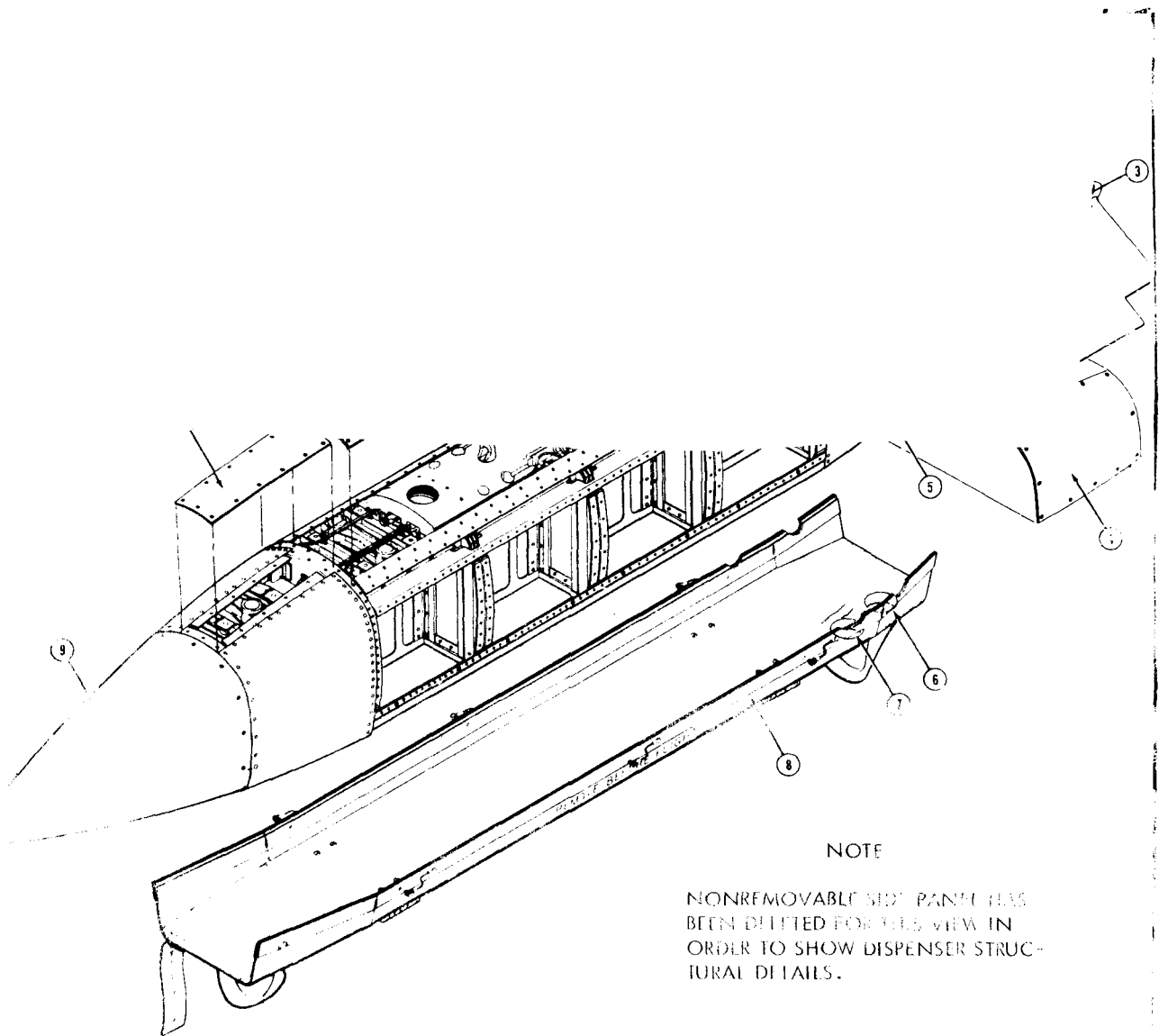


Figure 4-18. SUU-41 B/A Exploded View

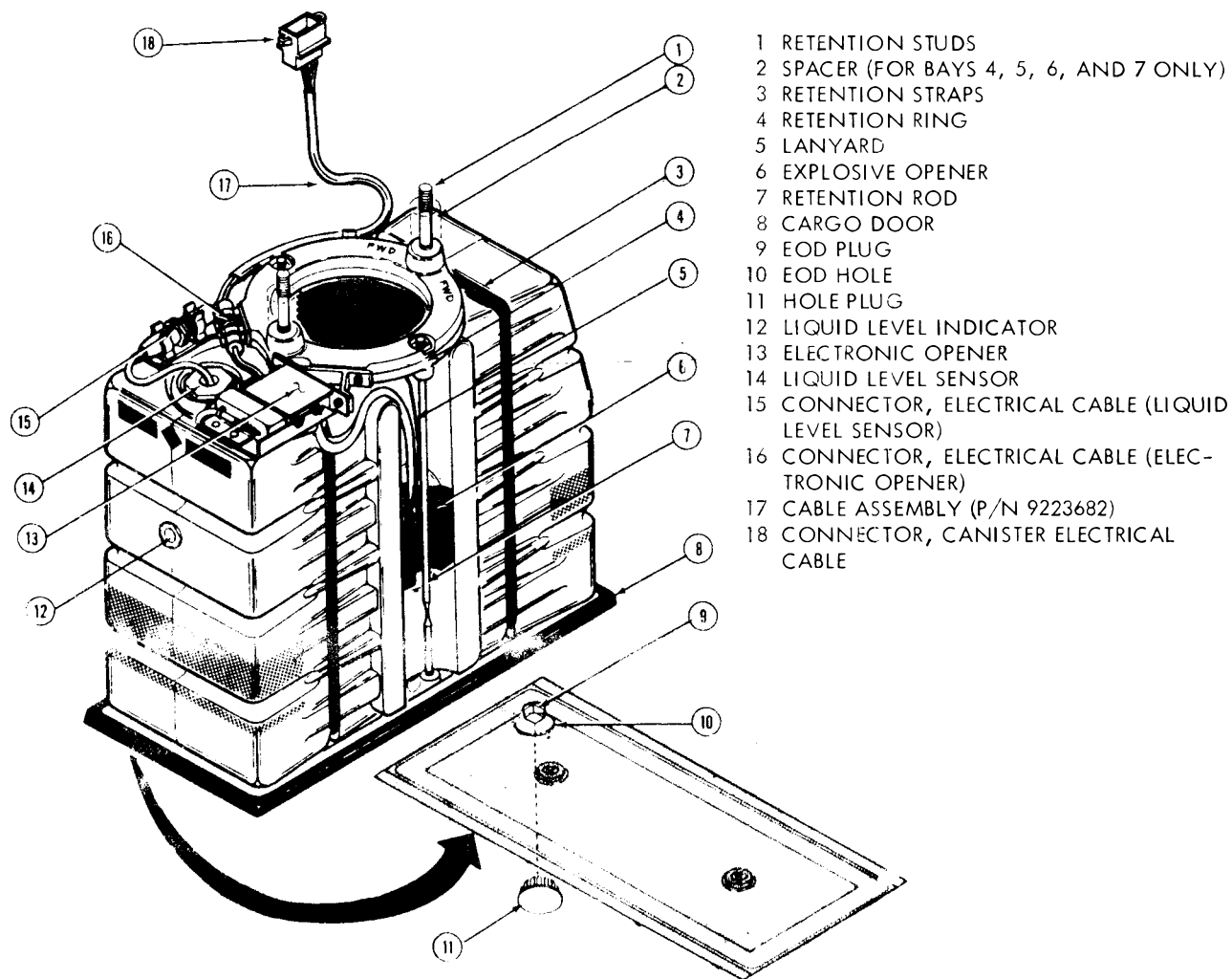


Figure 4-19. Canister Assembly, CDU-4/B, CDU-5/B, CDU-10B and CDU-14B

1 TEN-LIGHT TEST SET SHORTING PLUG

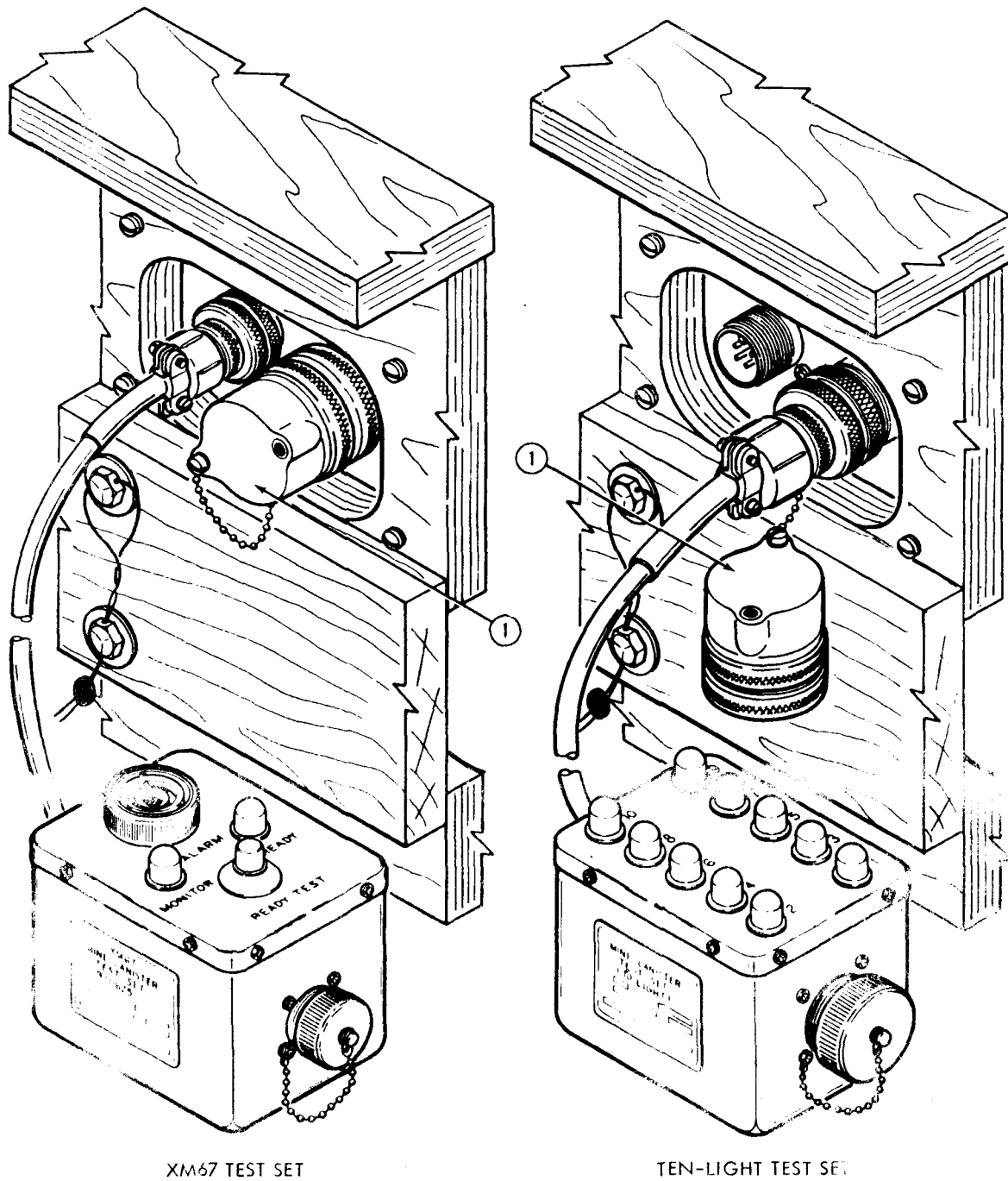


Figure 4-20. Electrical Continuity Check of the Mine Canister Set

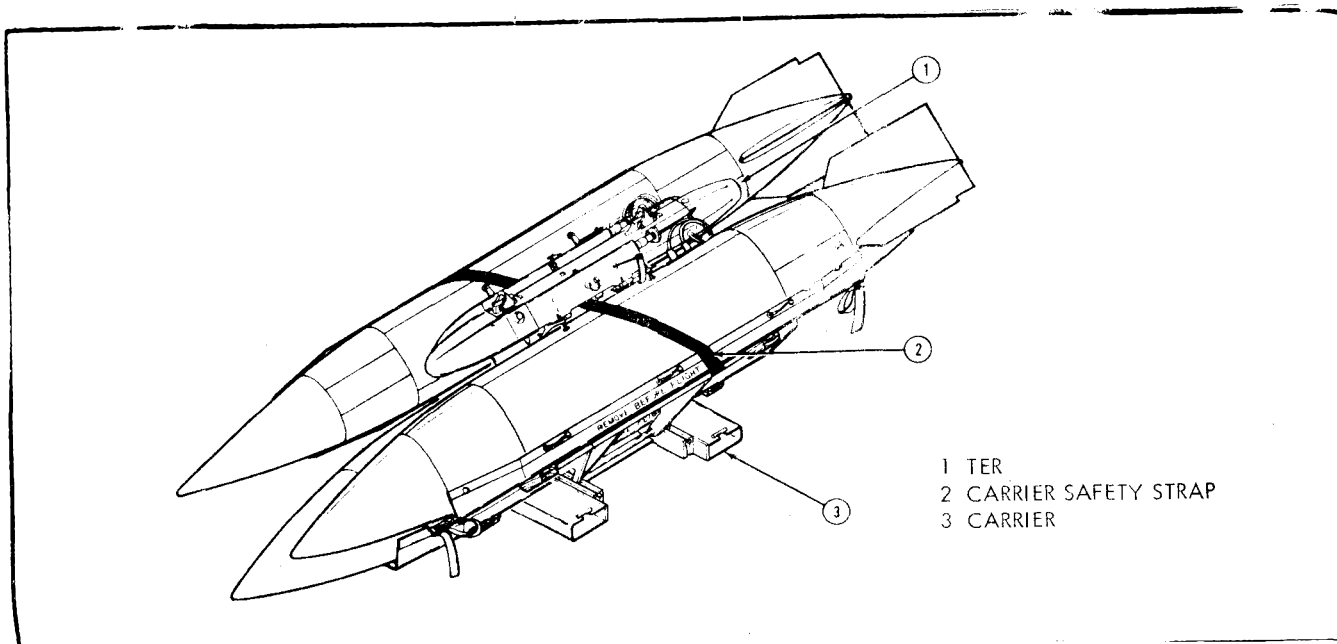


Figure 4-21A. SUU-41 B/A Loaded on a TER Rack

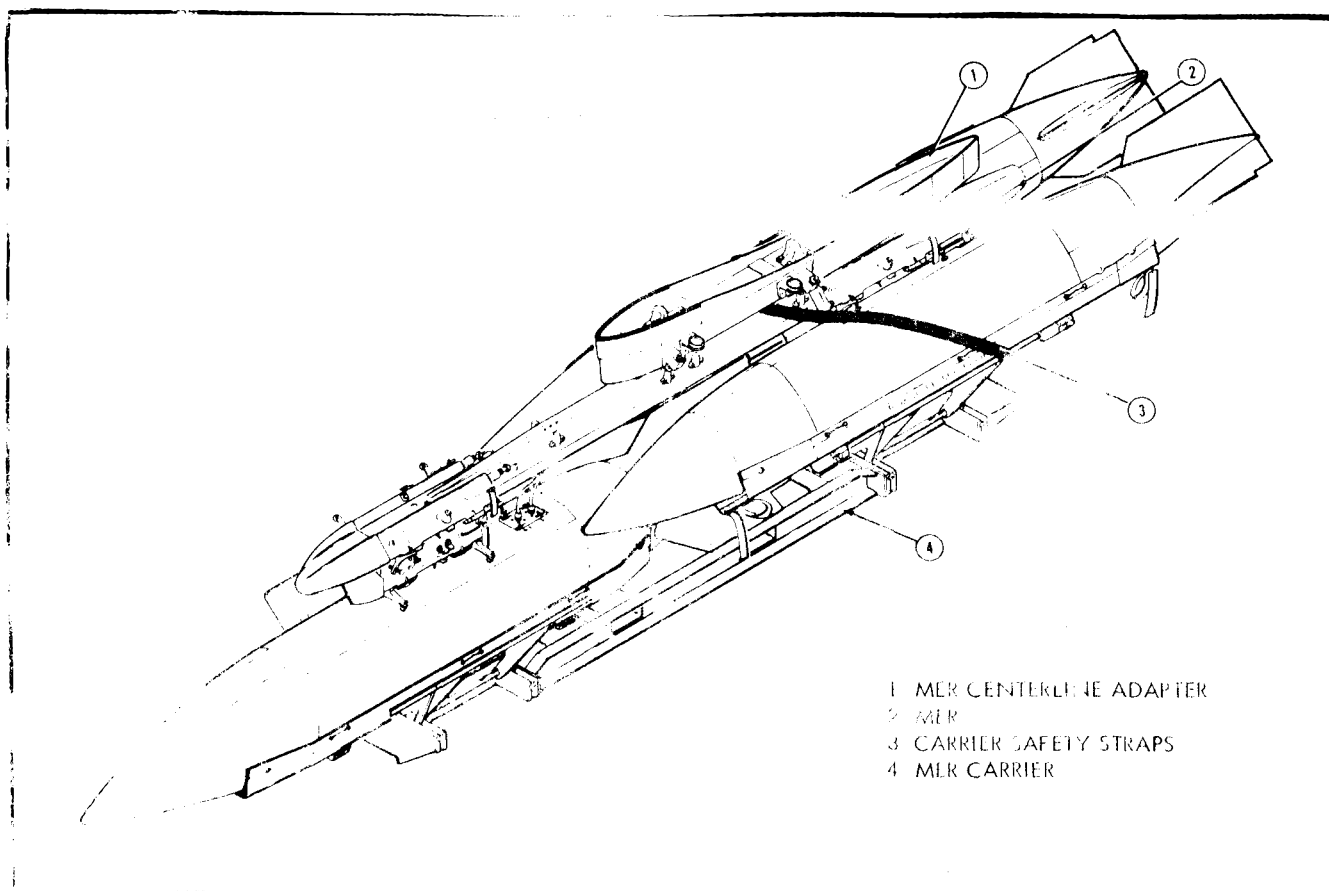


Figure 4-21B. SUU-41 B/A Loaded on a MER Rack

1-42. Identification:

- a. Rectangular shape with aluminum skin.
- b. Rounded top.
- c. Aerodynamic fairings at each end.
- d. 10 cargo bays - BCL.
- e. O.D. in color.

1-43. Hazards: Ten pressure cartridges, one per bay.

1-44. Payloads:

- a. CDU-4/B - XM47E1 Mines.
- b. CDU-5/B - XM40E5 Mines.
- c. CDU-10/B - XM40E5 and XM44 Mines.
- d. CDU-14/B - XM65 Mines.

1-45. Operation:

- a. Aircraft power fires cartridges.
- b. Gas expands and extends ejection pistons.
- c. Munitions are ejected from dispenser.

XM47 Dispenser

1-46. GENERAL DESCRIPTION: Mine Dispersing Subsystem, XM47 (reference figures 4-22 and 4-23)

1-47. Identification:

- a. 4 double walled dispenser tubes.
- b. Pressure gage on forward end of each tube.
- c. Intervalometer on forward end.
- d. Pressure connector forward end of each tube.
- e. O.D. in color.

Dispersal
Detonate

1-48. Hazards:

- a. Linear shape in each tube.
- b. Electric detonator in each tube. (4 ea)

1-49. Payload: Anti-personnel mines. GRAUCH MINES

1-50. Dispersal Operations: The payload is contained in the inner tube with a piston at the forward end. The outer tube is pressurized. Dry nitrogen at 50psi.

- a. ^{GAS PRESSURE} Aircraft power functions cannister opener.
- b. A cable is pulled, breaking a fracture valve.
- c. The orifice opens and dry nitrogen exerts pressure on the piston.
- d. The piston forces the payload rearward.

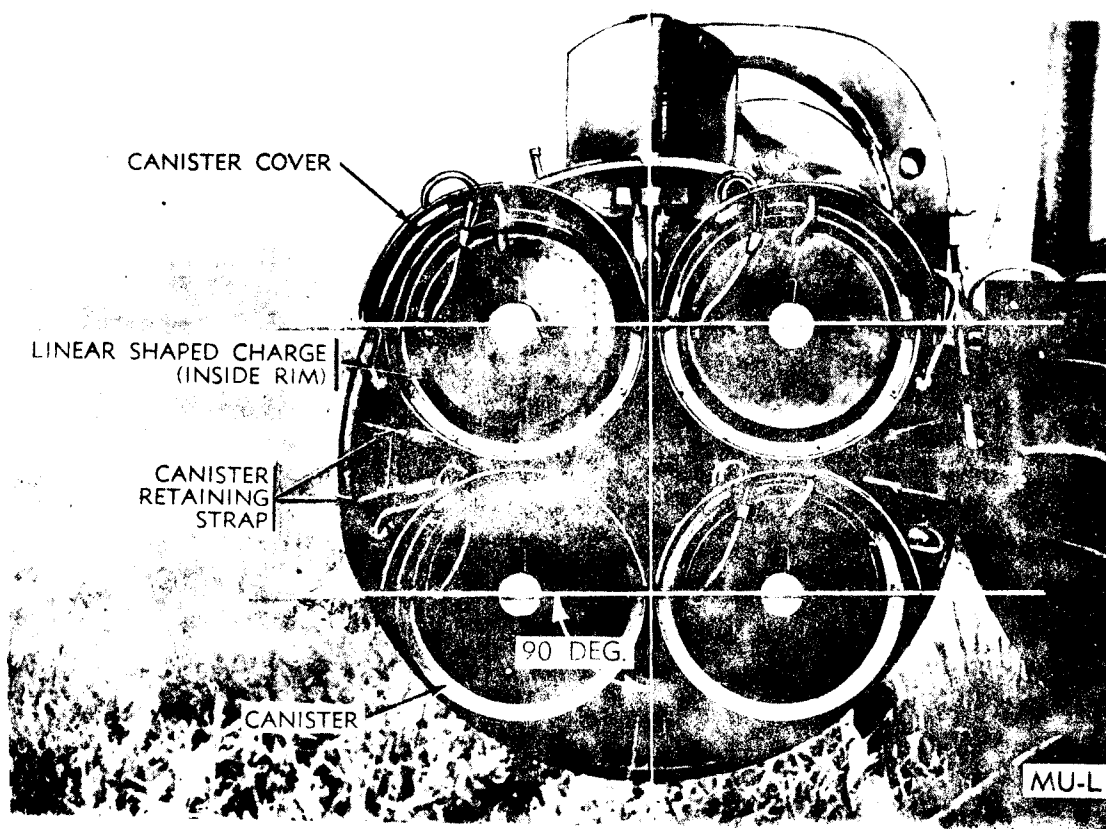
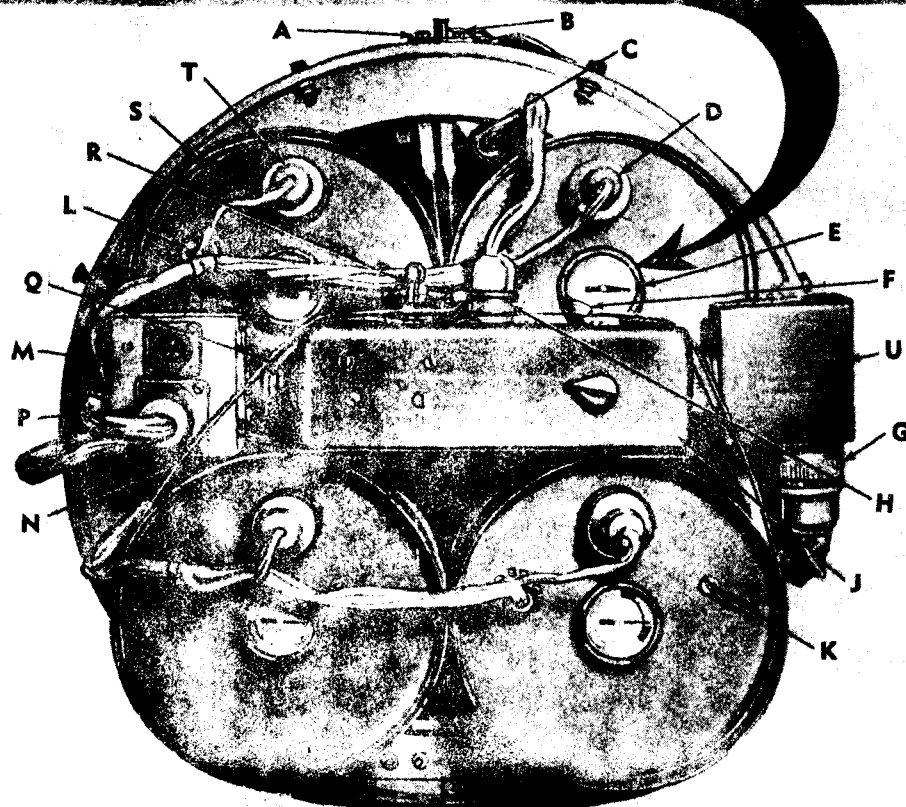
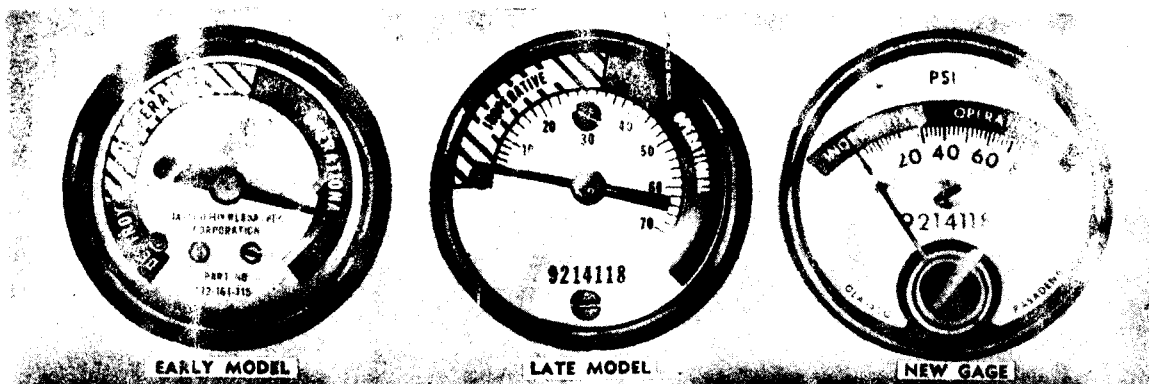


Figure 4-22. AFT End of Dispenser Showing Positioning of Canisters



- | | |
|---|---|
| A - MACHINE BOLT | K - VENT SCREW |
| B - SAFETY PIN (WITH RED FLAG) | L - BREAKWIRE CONNECTOR |
| C - MINE CANISTER TIE-DOWN STRAP | M - MONITOR ADAPTER |
| D - PRESSURE CONNECTOR | N - HOSE CLAMP |
| E - VISUAL PRESSURE GAGE | P - PRESSURE SWITCH AND
BREAK-WIRE CONNECTOR |
| F - QUICK-RELEASE LATCH | Q - RUBBER PAD |
| G - SQUIB CONNECTOR | R - INTERVALOMETER SWITCH |
| H - FIRING CIRCUIT AND PRESSURE
MONITORING CONNECTOR | S - MINE CANISTER |
| J - INTERVALOMETER | T - PRESSURE SWITCH |
| | U - FUSE ADAPTER |

Figure 4-23. Forward View of Subsystems XM42, XM4261, XM47 and XM54

CBU-19/A

1-51. GENERAL DESCRIPTION: A strong back with two E158 clusters attached. Externally carried on slow speed aircraft or helicopters (reference figure 4-24)

1-52. Identification:

- a. Aluminum strong back.
- b. 14" suspension lugs.
- c. 16 plastic modules (clusters).

Disposal
Burn

1-53. Hazards:

- a. Explosive bolt assembly.
- b. 2 Detonators
- c. Pyrotechnic delays. Black powder

1-54. Payload: BLU-39/B, 528 each. Tear gas CS

1-55. Dispersal Operation:

- a. The electric detonators fire upon release.
- b. Separation charge shears the bolt from the forward end of the tie rod.
- c. Spring-loaded end clamps move outward releasing the hinged flanges on each side.
- d. Clusters fall free of the strong back.
- e. The cocked detonators are released and impinged on the firing pins.
- f. The delay leads ignite.
- g. Ignition mixture in each junction block is ignited in turn.
- h. The cannisters are ignited and ejected.

DISPENSER AND BOMB, CBU-MK20, MOD 2

1-56. GENERAL DESCRIPTION: This dispenser and bomb is an air launched conventional free-fall weapon. The weapon is delivered as a unit with fuze, and all necessary components installed. It consists of a bomb dispenser, MK7, Mod 2, and a load of anti-tank bombs, MK118, Mod 0 (reference figures 4-25, 4-26A, 4-26B).

1-57. Identification: The bomb dispenser, MK7, Mod 2 consists of the following:

- a. Argo Section.
- b. Nose Fairing.
- c. Tail Section (4 movable fins)
- d. Mechanical Time Fuze (MK339)
- e. Fuze Arming and Fin Release Wires.

1-58. Hazards:

- a. Fuze, MK339.
- b. Linear Shaped Charge.
- c. Spring Loaded Tail Fins.

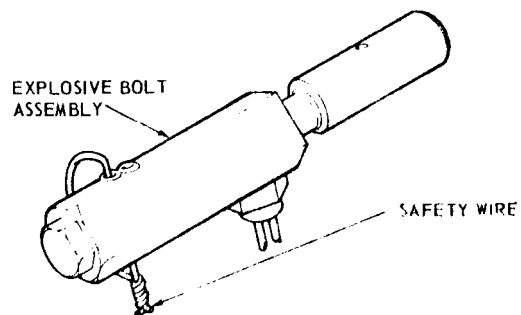
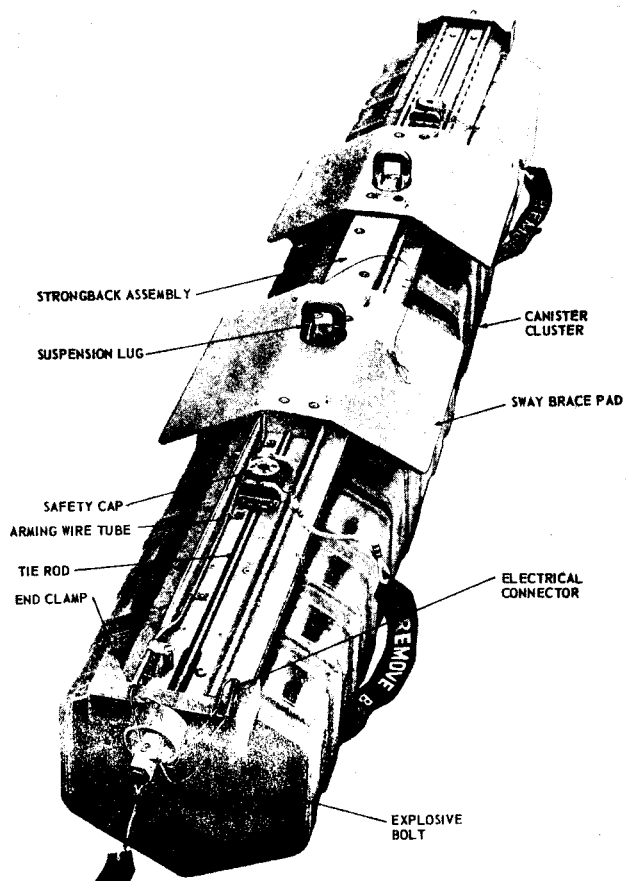
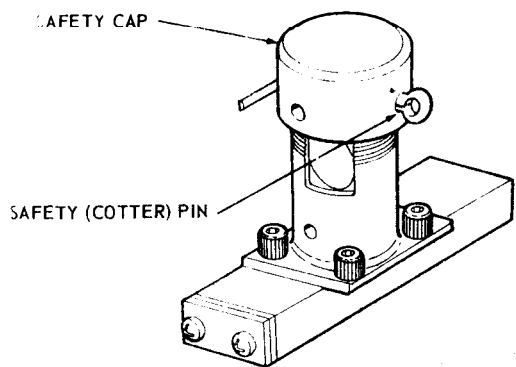


Figure 4-24. CBU-19/A Canister Pyrotechnic Mixture Cluster

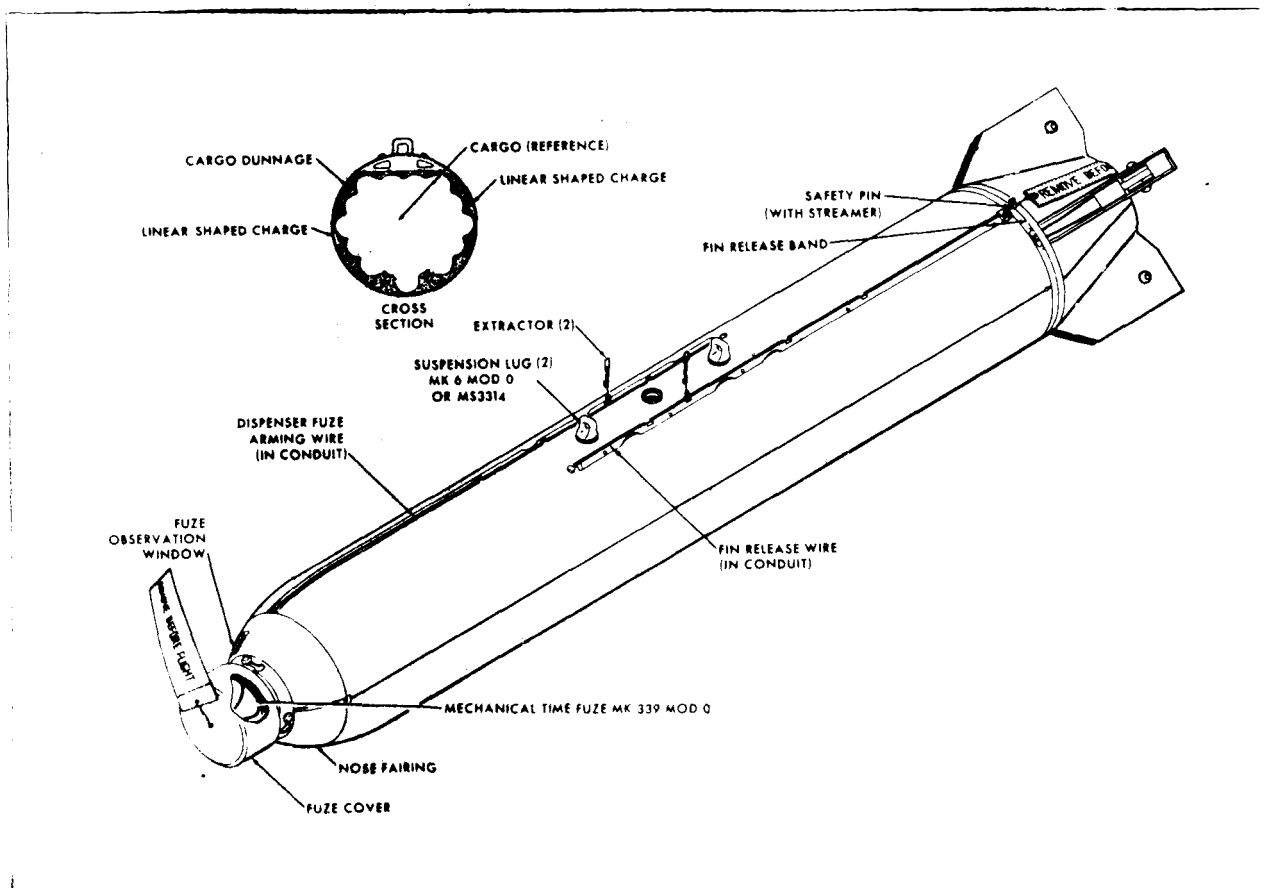


Figure 4-25. Bomb Dispenser, MK7, Mod 2

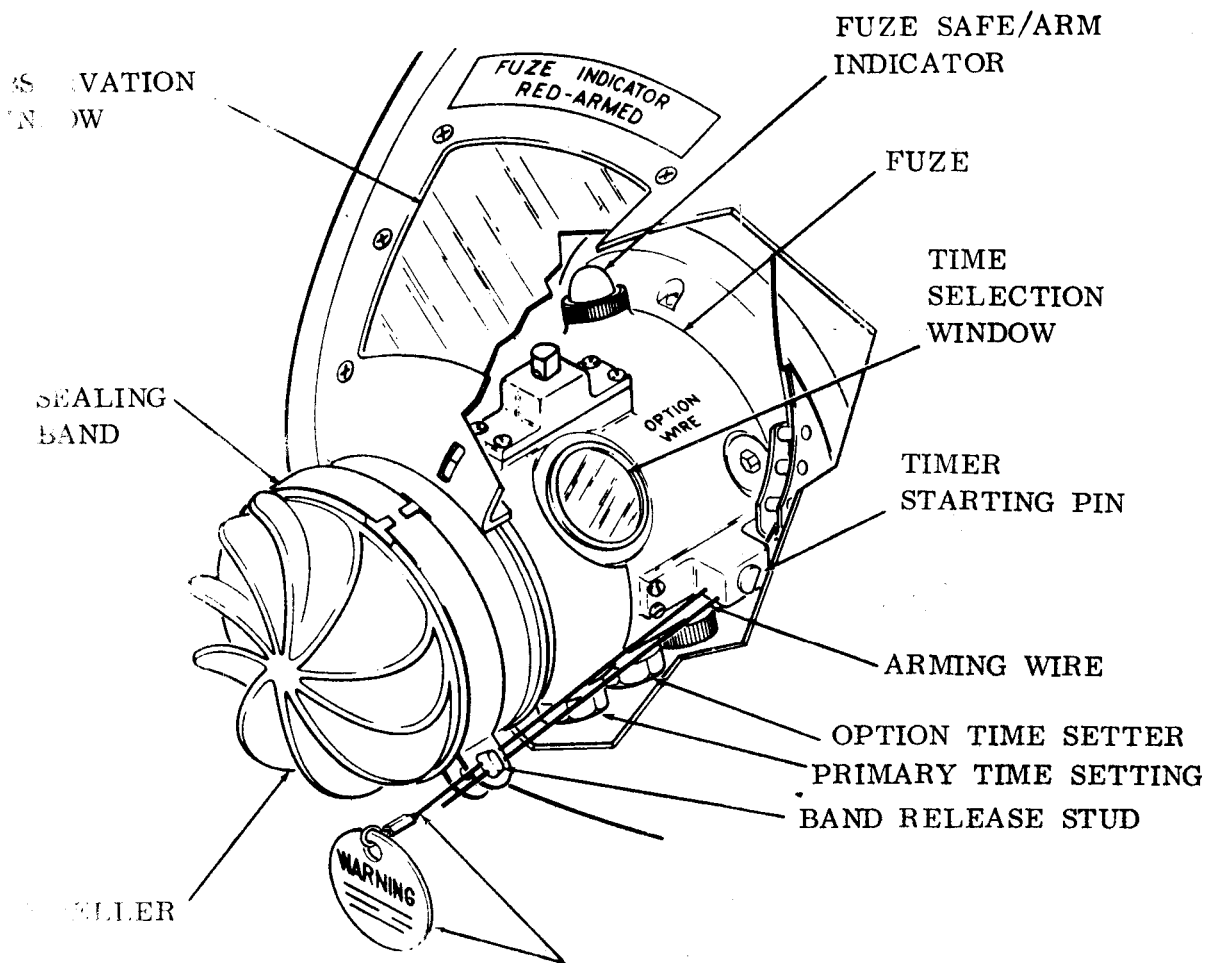


Figure 4-26A. Fuze, MK 339

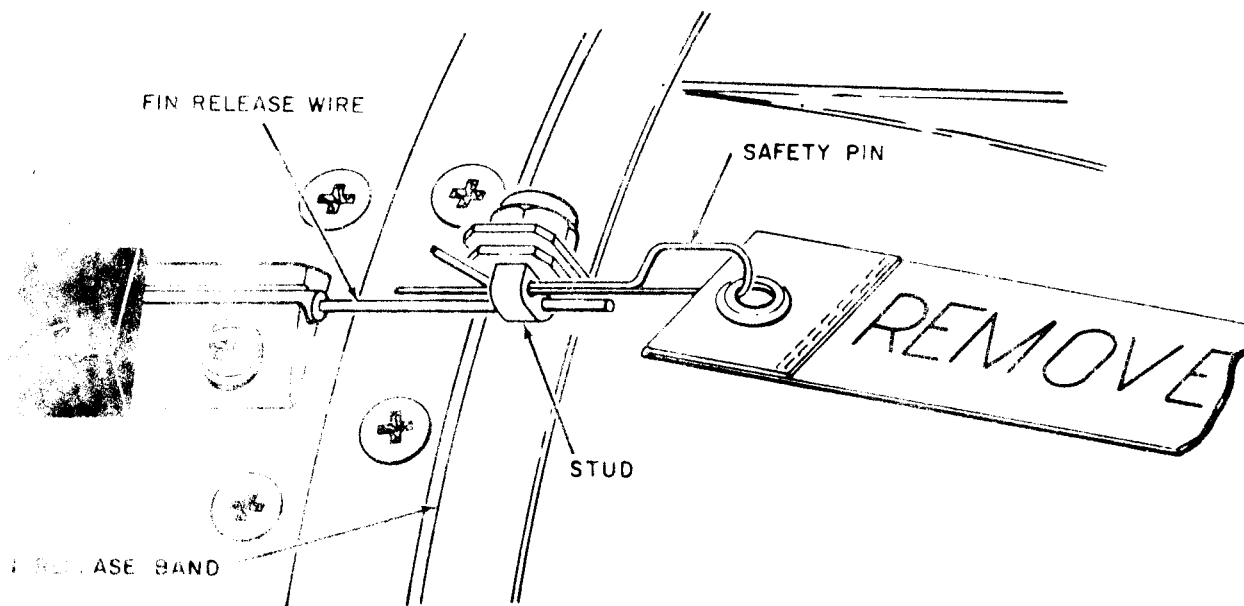


Figure 4-26B. Fin Release Wire and Safety Pin Arrangement

1-59. Payload: Consists of 247 Anti-tank Bombs, MK118, Mod 2 (reference figure 4-27)

1-60. Dispersal Operation:

a. A centerline (ø) release, the fin release wire allows the fin to snap open. The fuze arming wire allows the fuze timer to start and actuates the fuze arming cycle.

b. The fuze functions and imitates a linear shaped charge.

c. The linear shaped charge cuts the dispenser in half from front to back.

d. Dispenser opens allowing the anti-tank bombs to free-fall to the target.

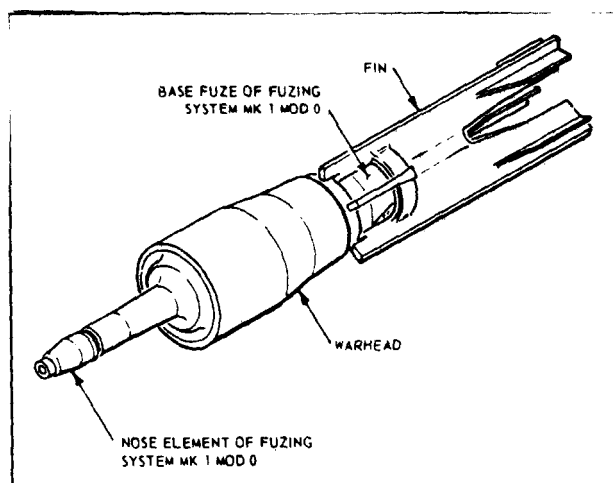


Figure 4-27. Antitank Bomb, MK 118, Mod 0

PART TWO

PAYLOADS

OBJECTIVE

To learn identification, functioning, hazards/precautions, rendering safe and/or disposal procedures for dispenser payloads.

INTRODUCTION

The number and type of dispensed munitions in the AF Arsenal today requires that EOD personnel be completely familiar with all types of these air munitions. Although the payloads are small, each one is lethal. The large quantities carried compound the hazards associated with accidents/incidents involving these munitions. Every type of fuzing that is employed in large munitions, e.g., airburst, impact, delay, and anti-disturbance is used with dispensed munitions. EOD personnel must be able to recognize the munition, know the basic operation and be aware of the hazards involved due to the type fuzing employed.

DISPENSED MUNITIONS

2-1. Type: BLU-3/B Anti-Personnel and Material, High-explosive Bomb (reference figure 4-28a, 4-28b, and 4-28c).

2-2. Identification:

- a. Approximately 2.5 inches in diameter by 6.8 inches long (vanes extended).
- b. The body is aluminum embedded with steel fragmentation balls.
- c. 6 drag vanes.
- d. Yellow with gold end cap.
- e. End cap crimped to body.

2-3. Hazards:

- a. Main charge 0.4 pounds of RDX or Cyclotal.
- b. Booster.
- c. Detonator.

2-4. Operation:

- a. Release: Wind tab removal allows vanes to open.
- b. Vane Opening arms fuze.
- c. Impact of end cap drives firing pin into detonator.

BLU-17/B

2.5 Type: BLU-17/B Anti-Personnel W P Bomb (reference figures 4-29a and 4-29b)

2-6. Identification:

- a. Similar in appearance to M15 Grenade.
- b. Body painted Green with Red markings.
- c. Grenade type fuze.
- d. Spoon handle held down by wind tab.

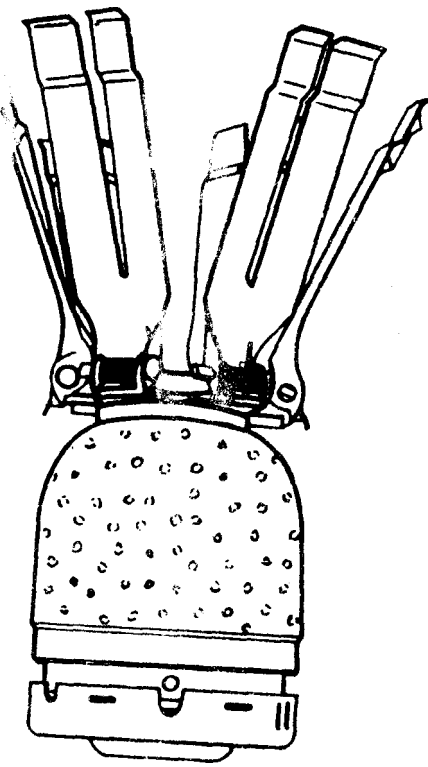


Figure 4-28A. BLU 3/B

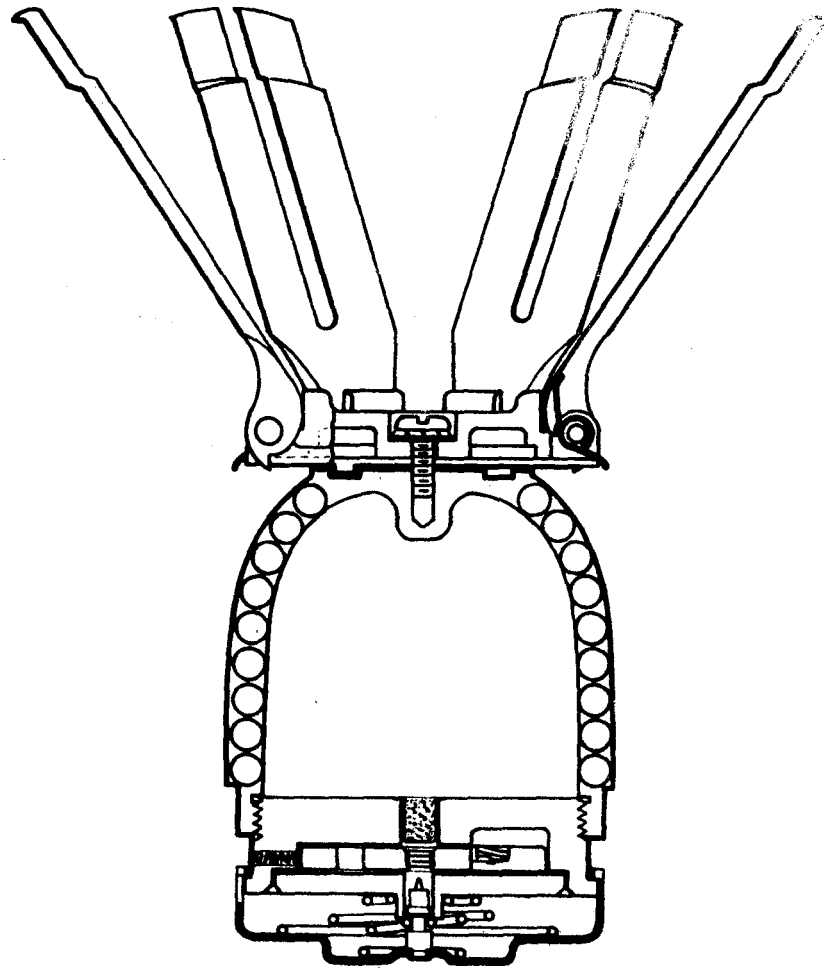


Figure 4-28B. BLU 3/B Cutaway View

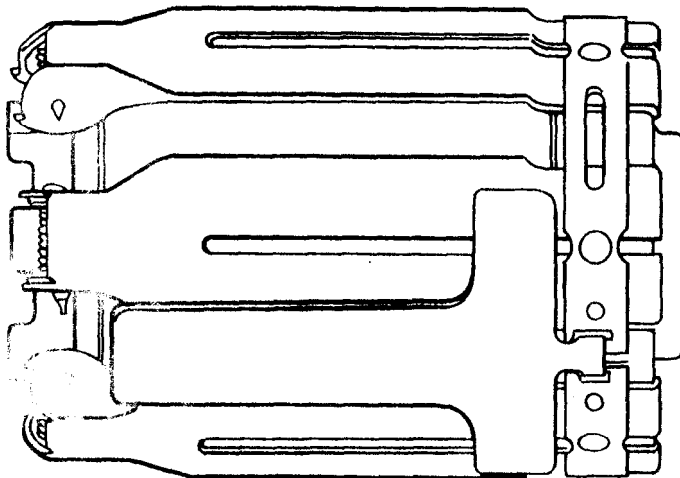


Figure 4-28C. BLU 3/B Safe Condition

2-7. Hazards:

- a. Cocked Striker, Grenade fuze.
- b. W P
- c. Explosive Burster.

2-8. Operation:

- a. Release: Wind Tab removal allows spoon handle to be released.
- b. Fuze functions like Grenade fuze.
- c. Burster detonates and spreads W P

BLU-24/B, BLU-66/B

2-9. Type: BLU-24/B, BLU-66/B, Anti-personnel Bomblets (reference figures 4-30, 4-31a, 4-31b, and 4-31c)

2-10. Identification:

- a. Plastic shrouded canted fins for stabilization.
- b. Round steel warhead.
- c. The BLU-66/B uses a 2.1" diameter spoiler disc between the bomb body and fin assembly.

2-11. Hazards:

- a. Main charge: H-6 or Cyclotol.
- b. Stab type primer and RDX lead-in.

2-12. Operation:

- a. Gas pressure ejects bombs from dispenser.
- b. Bombs spin by air passing through canted vanes.
- c. At approximately 3,500 RPM's inertia weights move out.
- d. Firing pin retracts from detonator slider.
- e. Detonator slider rotates into armed alignment.
- f. As bombs strikes foliage or other obstructions, spin rate decreases.
- g. Reduction in spin releases the firing pin and impact forces firing pin into primer.

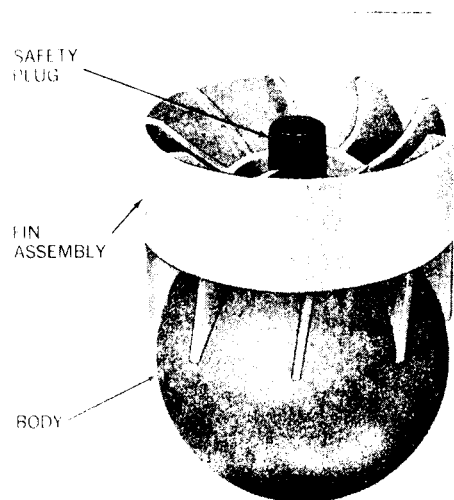
NOTE: Spoiler disc on BLU-66/B allows deeper penetration into foliage prior to functioning.

BLU-7/B and BLU-7A/B

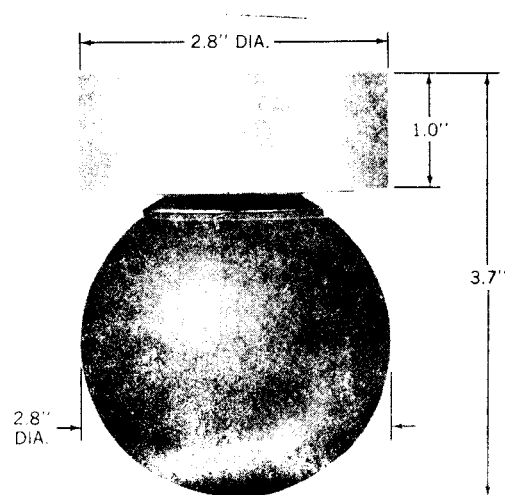
2-13. Type: BLU-7/B and BLU-7A/B, Parachute Armed and Stabilized Shape Charged, Impact Inertia Fired Bomb (Used against tanks, vehicles and aircraft) (reference figures 4-32 and 4-33).

2-14. Identification:

- a. Plastic parachute protectors.
- b. Cylindrical body with truncated cone.
- c. Tail contains the fuze with parachute lines attached.



Fragmentation Bomblet BLU-24/B
(Early Model) Fragment Bomblet



Fragmentation Bomblet BLU 24/B
(late model) and BLU 66/B

Figure 4-30.

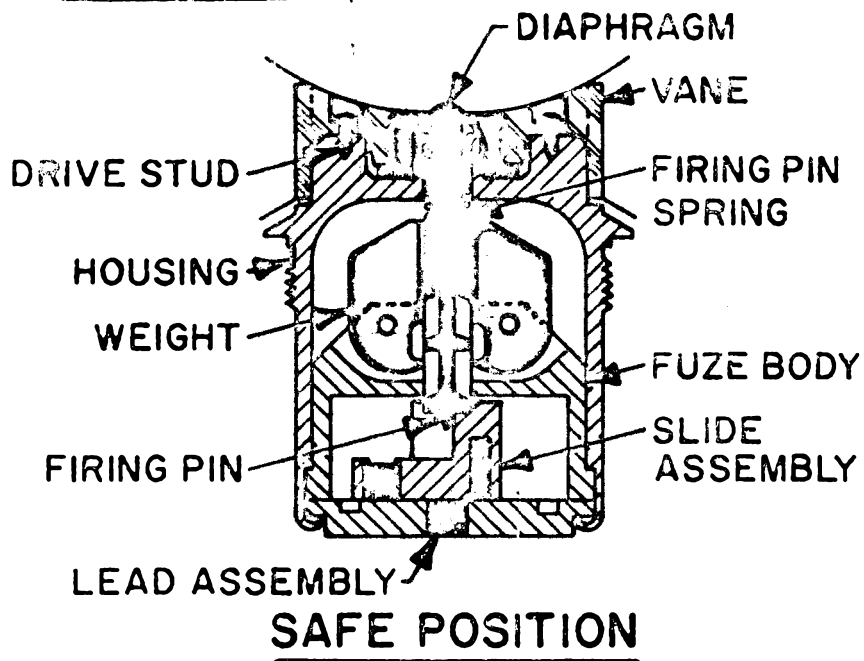


Figure 4-31A. Bomblet, BLU 24/B - BLU 66/B
Fuze in the Safe Position

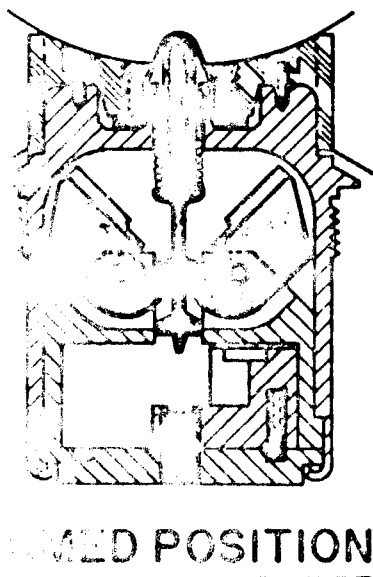


Figure 4-31B. Fuze, Armed Position

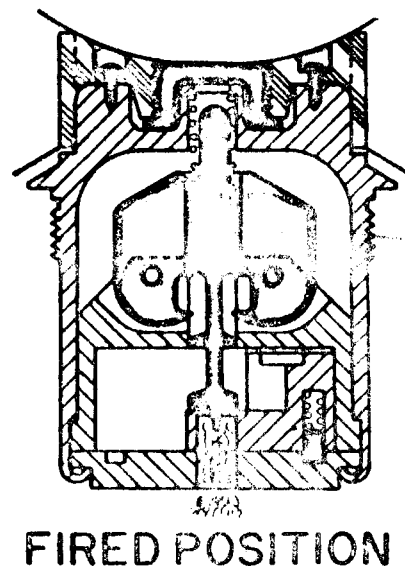


Figure 4-31C. Fuze, Fired Position

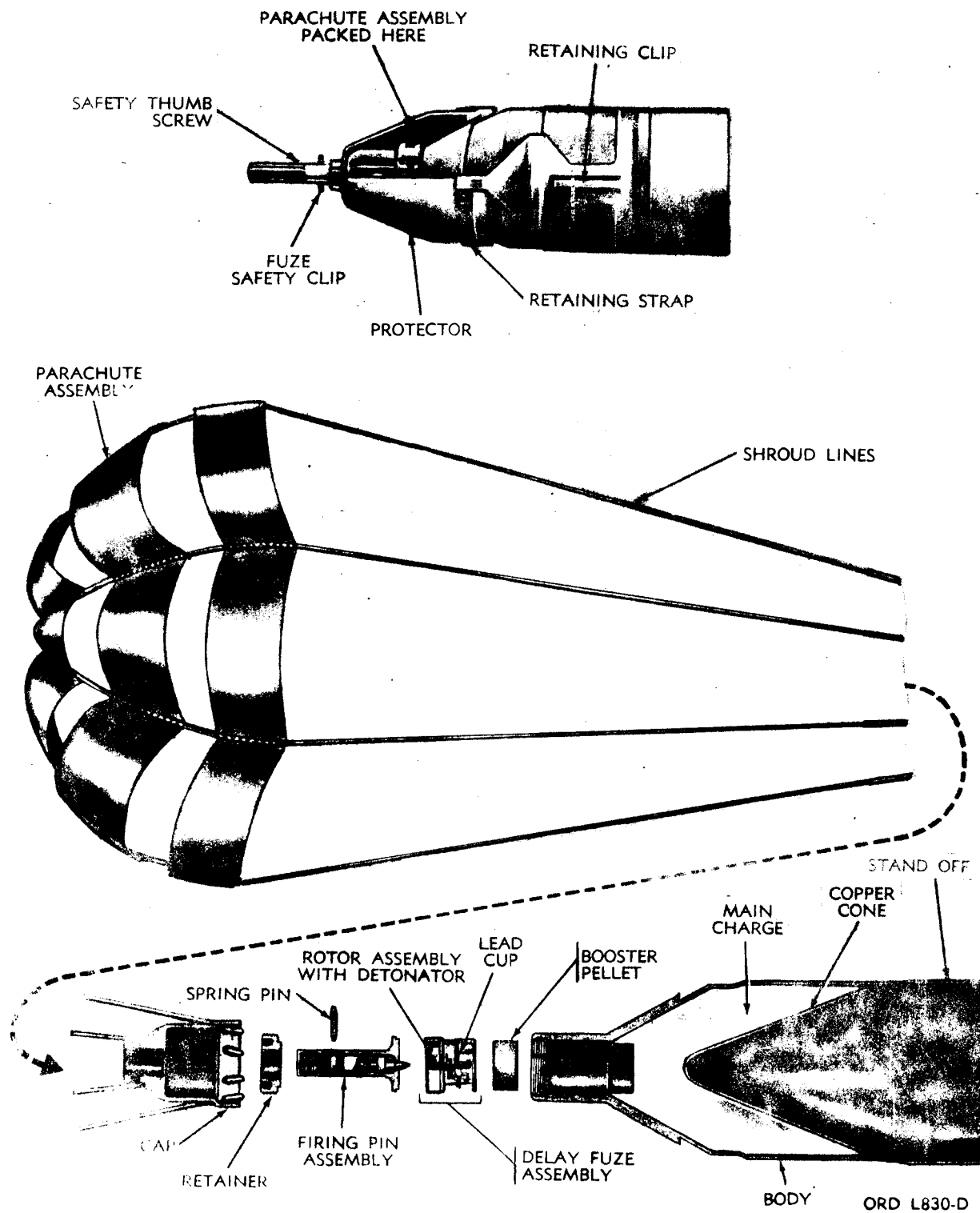


Figure 4-32. Bomb BLU-7/B

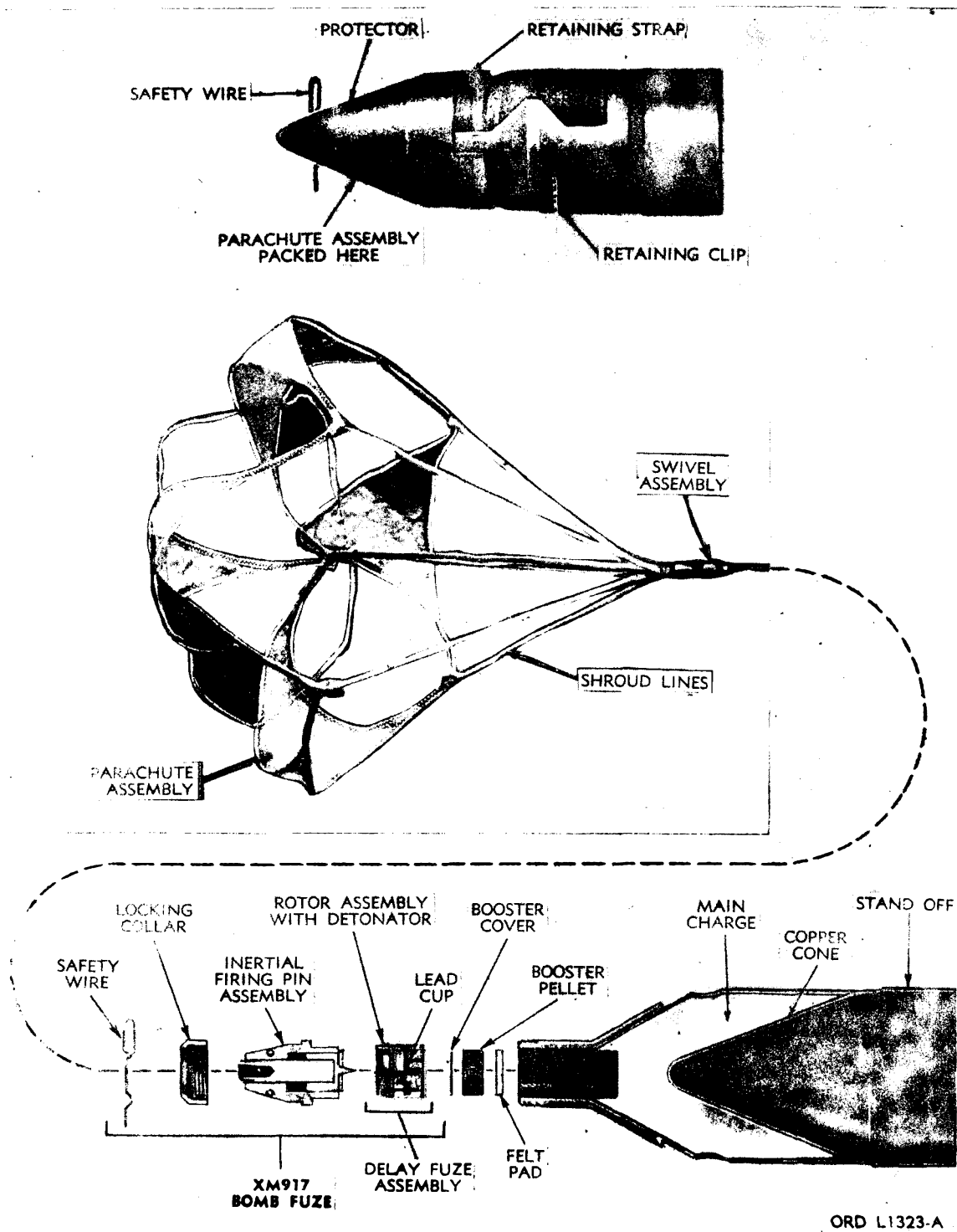


Figure 4-33. Bomb BLU 7A/B

- d. Wind tabs secure parachute.
- e. BLU-7/B has a safety clip hole TCL whereas the BLU-7A/B has a pin hole TCL.

2-15. Hazards:

- a. Main charge: composition B.
- b. Booster - RDX.
- c. Detonator rotor.

2-16. Operation:

- a. BLU-7/B.
 - (1) Ejection wind tab removed parachute deploys.
 - (2) Firing pin pulled back by parachute.
 - (3) Detonator rotor aligns, 0.8 to 1.3 second delay.
 - (4) Impact driver firint pin into stab detonator.
- b. BLU-7A/B
 - (1) Ejection-retainer clip removed-parachute deploys.
 - (2) Inertial firing pin pulled back.
 - (3) Detonator rotor aligns, 0.8 to 1.3 second delay.
 - (4) Impact-Inertia overcomes creep spring and drives firing pin into stab detonator.

BLU-26/B

2-17. Type: BLU-26/B Anti-personnel and Material, High-explosive, Centrifically Armed, Impact Fired Bomb (reference figures 4-34a, 4-34b, and 4-34c).

2-18. Identification:

- a. Aluminum case embedded with steel balls.
- b. 2.375 inches in diameter.
- c. Fluting cast externally on case.
- d. Identical in appearance to BLU-36B and 591B.
- e. Can use either M-219 or M-219E1 fuming.
- f. Clamp ring around center.

2-19. Hazards:

- a. Detonator - .015 grams primer and .-19 grams RDX.
- b. Booster - 1.45 grams RDX.
- c. Main Charge - 81 grams cyclatol.

2-20. Operation:

- a. M-219 Fuze: (Indent) has a dimple in the center of its case.
 - (1) Release: Bomb spins to approximately 2400 rpm and arms.
 - (2) Hammer weight moves out.
 - (3) Rotor weights retracts allowing detonator to line up.
 - (4) Impact (any angle) causes hammer weights to drive firing pin into detonator.

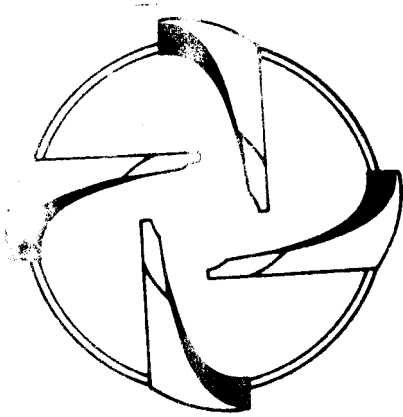


Figure 4-34A. Fragmentation
Bomblet BLU 26/B

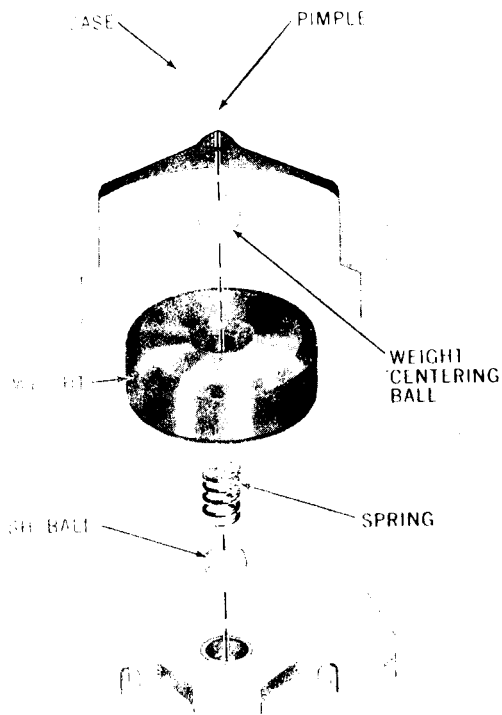


Figure 4-34B. Fuze M-219E1

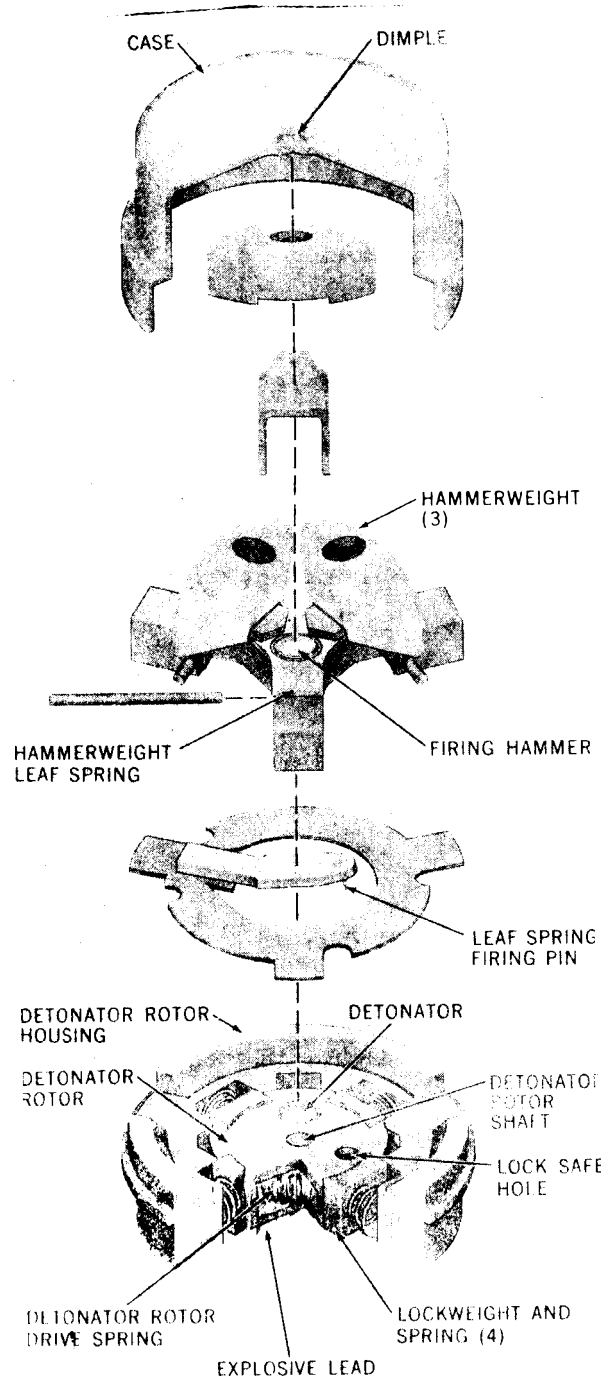


Figure 4-34C. Fuze M-219

b. M-219E1 Fuze: (Indent) Has a pimple in the center of its case. Functions basically same as M-219 fuze except the hammer weights are replaced with an inertia weight and push ball that cams the firing pin into the detonator upon impact.

BLU-36/B, 59/B

2-21. Type: BLU-36/B, 59/B, Fragmentation, High-explosive. Centrifically Armed, Time-delay Fired Bombs (reference figures 4-35a, 4-35b).

2-22. Identification:

- a. Aluminum Case embedded with steel balls.
- b. 2.375 inches in diameter.
- c. Fluting cast externally on case.
- d. Clamping ring around center.
- e. Both identical in appearance to BLU-26/B.
- f. BLU-36/B use XM-218 fuze, BLU-59/B use XM-224 fuze.

2-23. Hazards:

- a. Detonator - .015 grams Primer and .019 grams RDX.
- b. Booster - 1.45 grams RDX.
- c. Main Charge - 81 grams Cyclotol.

2-24. Operation:

- a. BLU-36/B-XM-218 (Fuse has Blue sticker on Booster end.).
 - (1) Release: Bomb spins to approximately 2400 rpm.
 - (2) Rotor weights retract allowing detonator to line up.
 - (3) Delay Rotor lever is released allowing spring-driven delay rotor to turn, forcing sacked fluid in front of it.
 - (4) When the delay rotor reaches the end of its travel, a lock ball is allowed to withdraw from a cocked firing pin.
 - (5) Time delay is from 0 to 120 minutes.
- b. BLU-59/B - XM-224 (Fuze has red sticker on booster end).
 - (1) Operation is identical to XM-218.
 - (2) Time delay is from 0 to 30 minutes.

CDU-4/B, 5/B, 10/B, 14/B

2-25. Type: CDU-4/B, 5/B, 10/B, 14/B, Anti-personnel Mine Canisters. The Canisters contain anti-personnel mines packaged in liquid freon (reference figures 4-36a, 4-36b, and 4-36c).

2-26. Identification:

- a. Brown plastic molded case with 20% glass fiber fill.
- b. Liquid level indicator on aft face of canister.
- c. Painted diamond on aft face of canister.
- d. Explosive opener on center portion of canister.
- e. Opener switch on top aft portion of canister.

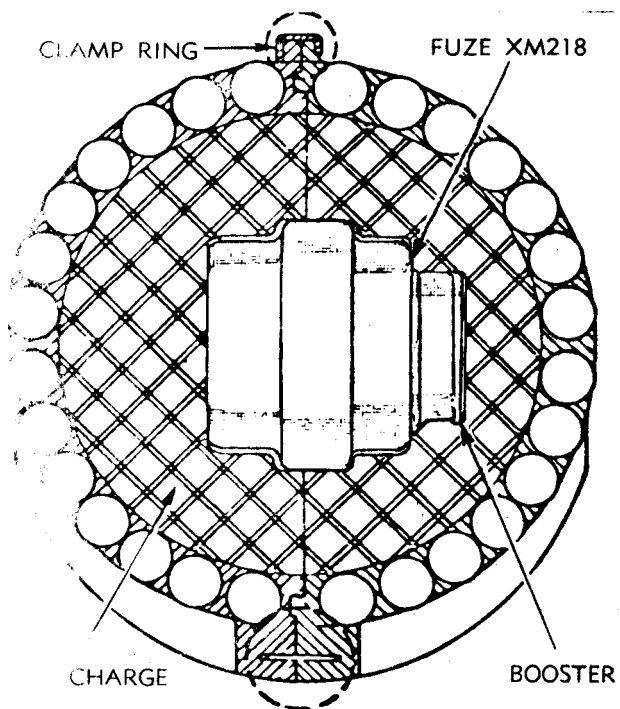


Figure 4-35A

Bomblet BLU 36/B,
Top/B Cutaway View

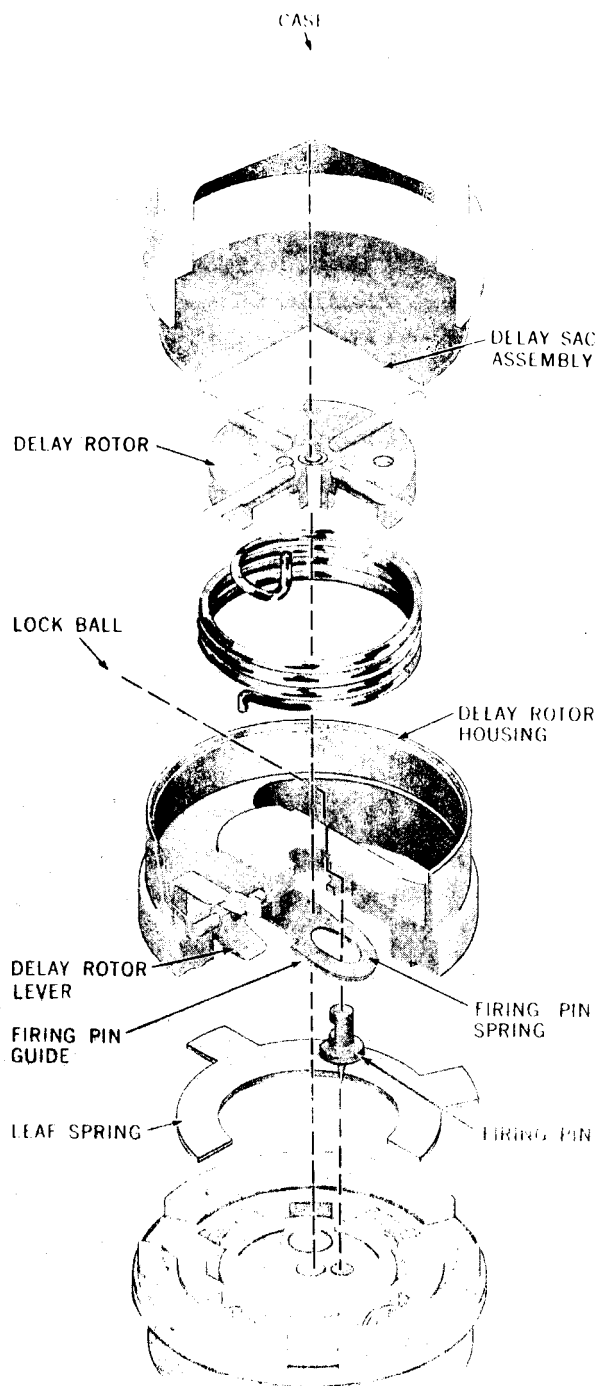
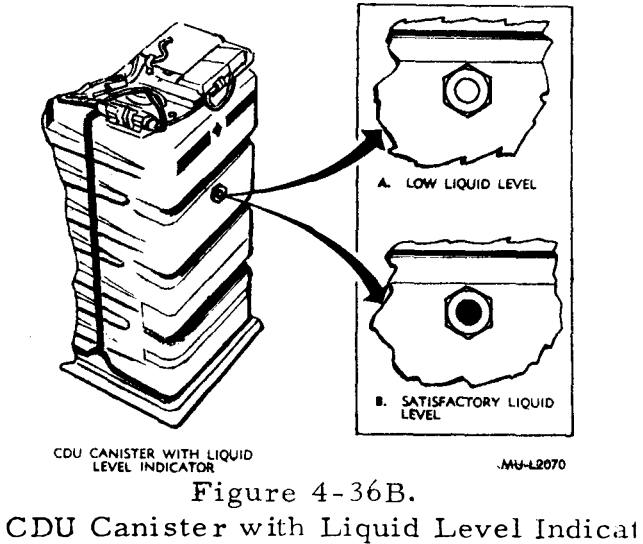


Figure 4-35B. Fuze XM 218 and Fuze XM 214

DIAMOND	CDU-	MUNITION
BLACK	4	XM41
WHITE	5	XM40E5
GREY	10	XM40E5 XM44
GOLD	14	XM65

Figure 4-36A. Identification Color Code for CDU's



osive Opener

Plug

-EOD Hole

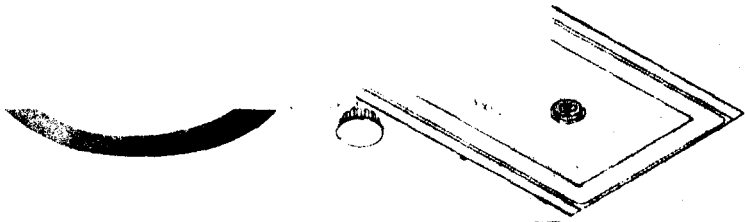


Figure 4-36C. Mine Canister, CDU4

- f. Yellow stripe around center.
- g. Color of diamond identifies what type CDU.

2-27. Hazards:

- a. Explosive opener on each canister.
- b. CDU-4/B--XM41E1 mine - 3.35lb explosive each canister.
- c. CDU-5/B--XM40E5 mine - 0.78lb explosive each canister.
- d. CDU-10/B--XM40E5/XM-44 mine - 0.62lb explosive each canister.
- e. CDU-14/B--xm65 mine - 3.35lb explosive each canister.

2-28. Operation:

- a. Pressure cart in dispenser ejects CDU.
- b. Movement of the CDU closes two switches.
- c. Two capacitors are charged, one for detonation pulse and the other for time delay.
- d. As the CDU leaves the SUU, a _____ the detonator.
- e. At the end of the preset time _____ er which shatters the CDU and disperses the _____
- f. All CDU's function identically

BLU

2-29. Type: BLU-39/B Burning Type, and 4-37b).

2-30. Identification:

- a. Unpainted with a red band ar
- b. Primarily constructed of alu
- c. Weighs approximately 2 ounce

Hazards:

- a. Dispenser tube contains:
 - (1) Electric primer.
 - (2) M5 propellant ejection
- b. Module contains:
 - (1) Pyrotechnic delay.
 - (2) 1.4 grain detonator charge
 - (3) 7.56-inch length of Du
 - (4) Black powder expulsi
- c. BLU-39/B contains:
 - (1) Compacted CS pyromix _____ 1.3 ounces.
 - (2) Black powder fuse igniter.
 - (3) 1 inch length of safety fuze.
 - (4) Main igniter mixture.

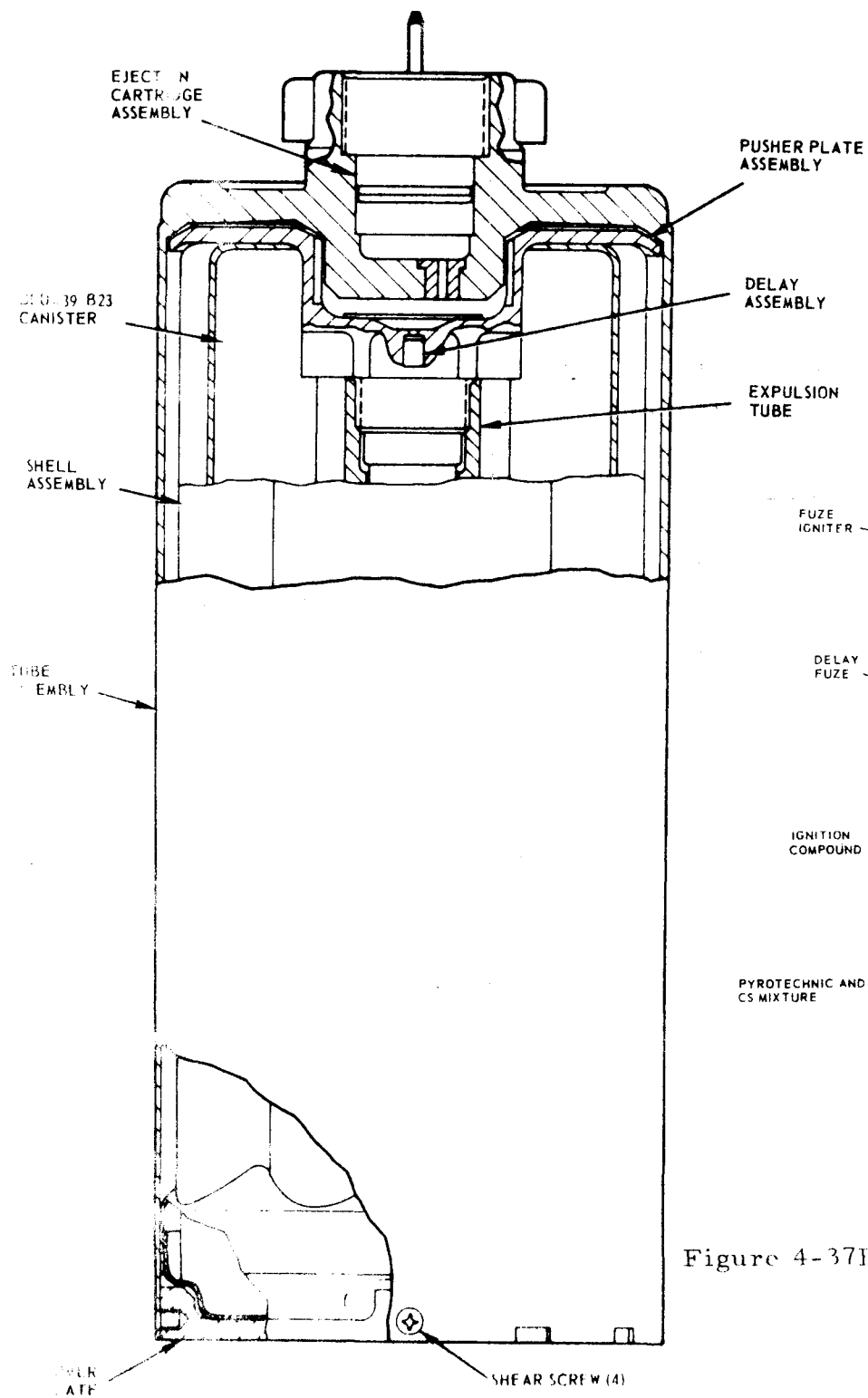


Figure 4-37A. BLU 39/B23 CS Canister Cluster

PUSHER PLATE ASSEMBLY

DELAY ASSEMBLY

EXPULSION TUBE

FUZE IGNITER

DELAY FUZE

IGNITION COMPOUND

PYROTECHNIC AND CS MIXTURE

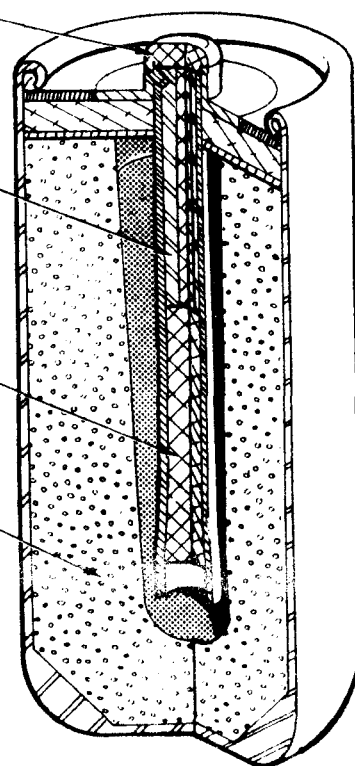


Figure 4-37B. BLU 39/B23 CS Canister

2-32. Operation:

- a. Match head of each bomb ignited by a flash of the expelling ejection charge.
- b. Safety fuze of each bomb ignited by match head.
- c. Safety fuse ignites the ignition mixture which ignites the CS Pyro mix filler.
- d. The off-center hole in the BLU-39/B expels the bomb in an erratic path along the ground for a distance of 200 yards from the point of impact spreading the agent over a wide area.

BLU-43/B, BLU-44/B and BLU-44A/B

2-33. Type: BLU-43/B, BLU-44/B and BLU-44A/B Anti-personnel mines (reference figure 4-38)

2-34. Identification:

- a. Plastic housing.
- b. May be O.D., Tan, Brown or camouflaged.
- c. Irregular shaped.
- d. A thin wing attached to one side.

2-35. Hazards:

- a. 9 grams binary charge - (2 liquids, a fuel and a sensitizer).
- b. Detonator.
- c. Shaped Charge Booster.
- d. Explosive rod and delay to open canister.
- e. Ejection cartridge for canister.

2-36. Operation: (reference TO 11-132)

- a. Dispersed when the mine cluster explosive rod is actuated.
- b. Arming is automatic when mines are expelled from the mine cluster.
- c. Mines will detonate when pressure is applied.
- d. Mines will be rendered inert after a predetermined length of time.

2-37. Miscellaneous Information: Information pertaining to the M118, Mod 0 dispersed munition and material depicted in figures 4-39A through 4-41 will be presented by you instructor.

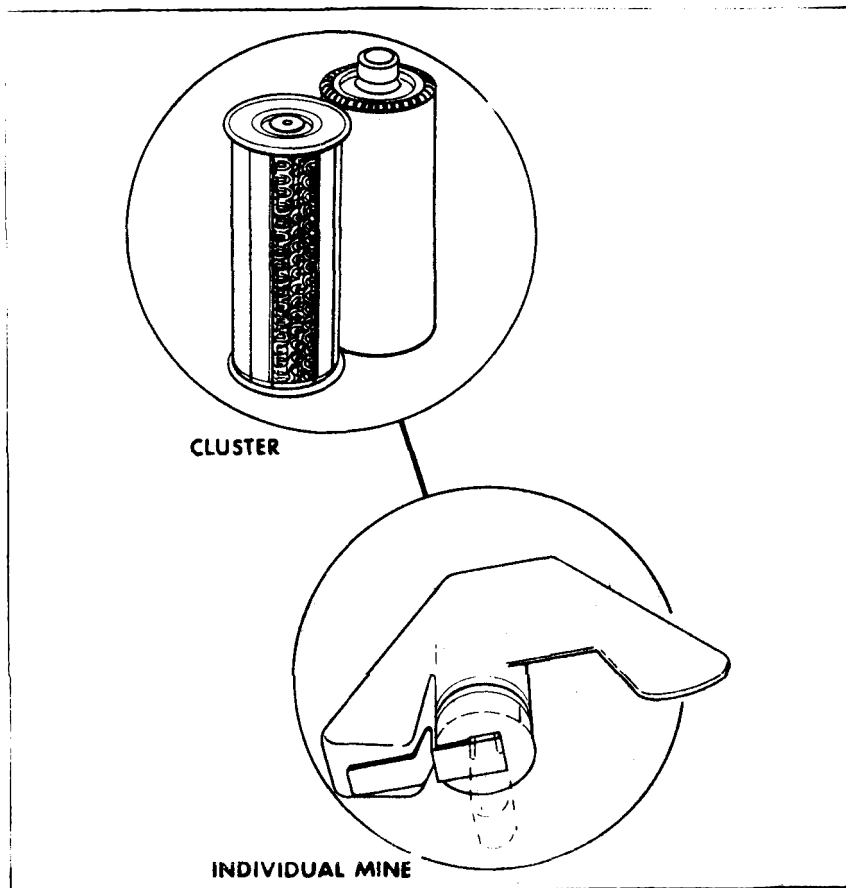


Figure 4-38. Mine Cluster, Tube, and Antipersonnel Mine, BLU 43/B and BLU 44/B

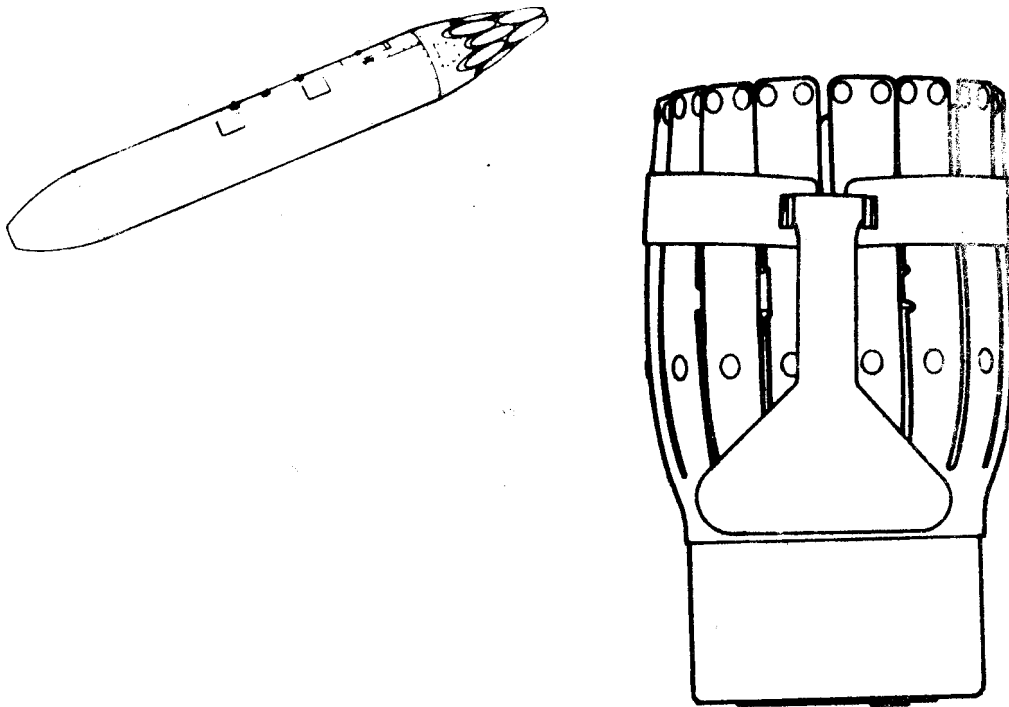


Figure 4-39A. Fragmentation Bomblet BLU 4/B

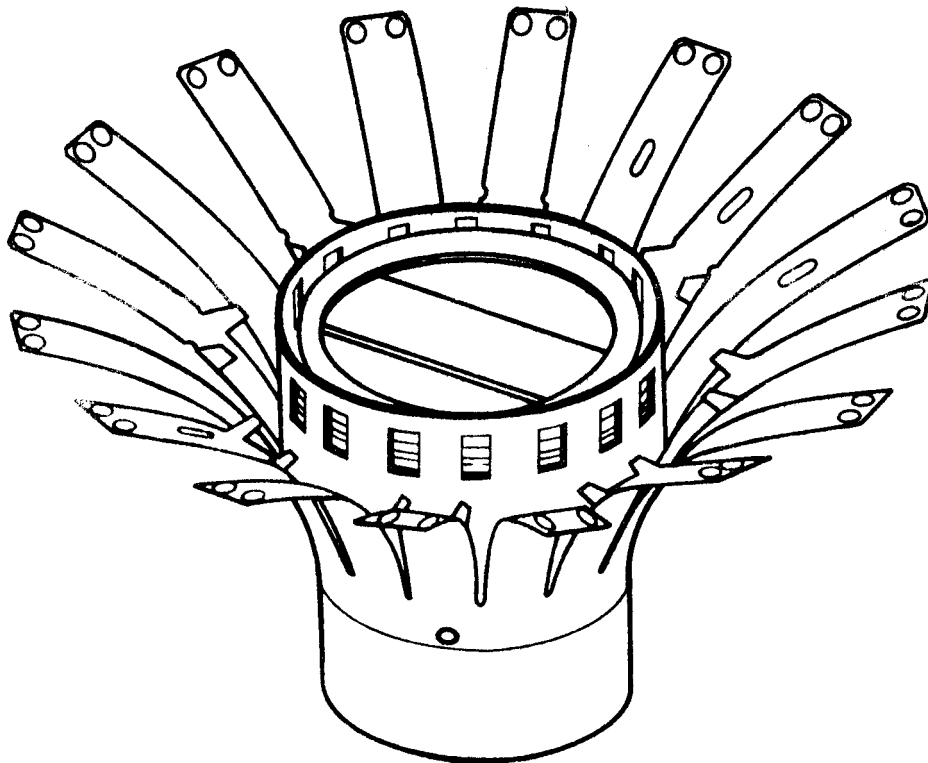


Figure 4-39B. Fragmentation Bomblet BLU 4/B with Vanes Extended

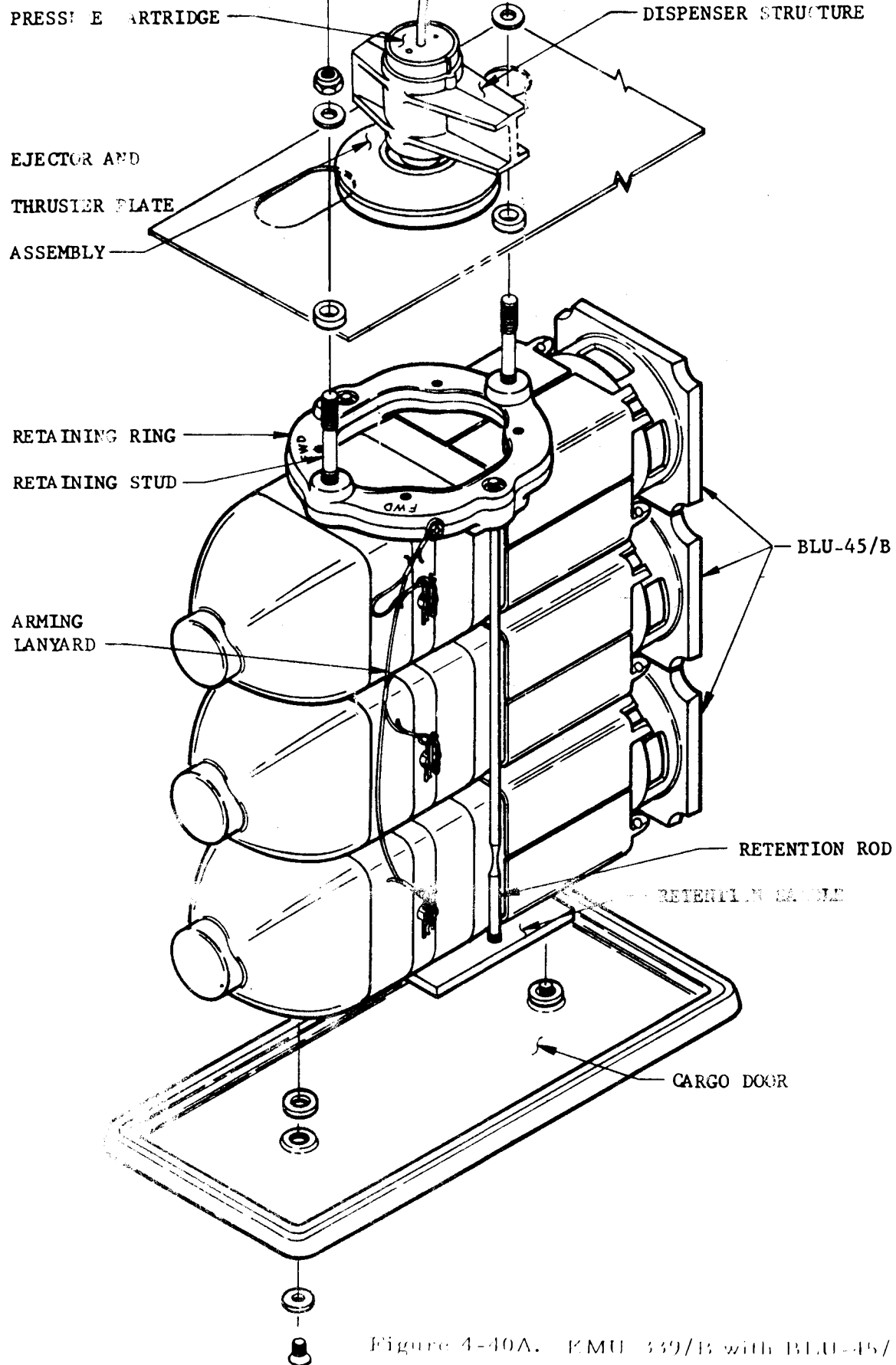


Figure 4-40A. PMU 339/B with BLU-45/B

NOTE

SELF-DESTRUCT SETTING SWITCH HAS
CLICK STOPS FOR S - M - L SETTINGS.

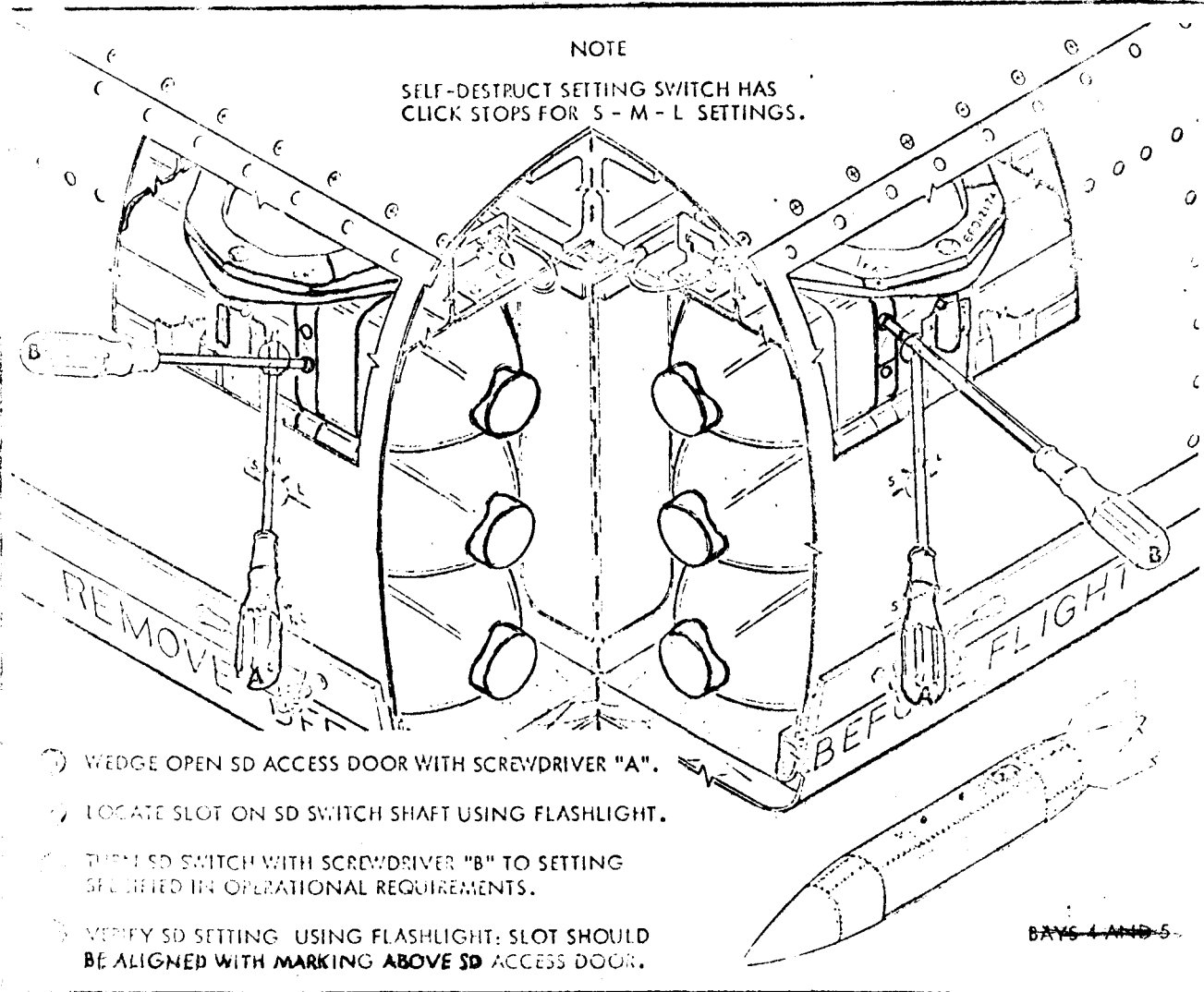


Figure 4-40B. Procedures for Setting the Self-Destruct Feature

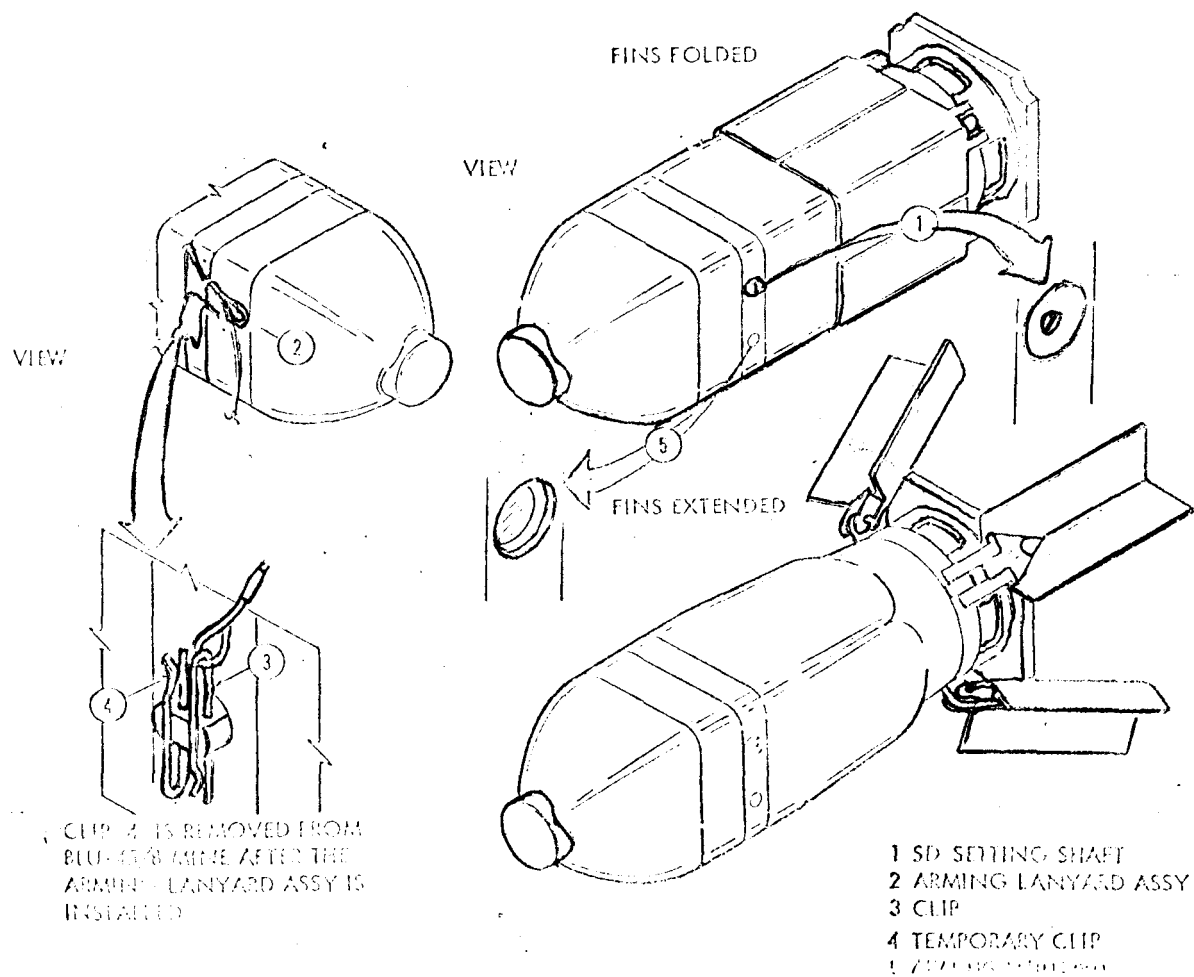


Figure 4-40C. BLU 45/B Antivehicle Land Mine

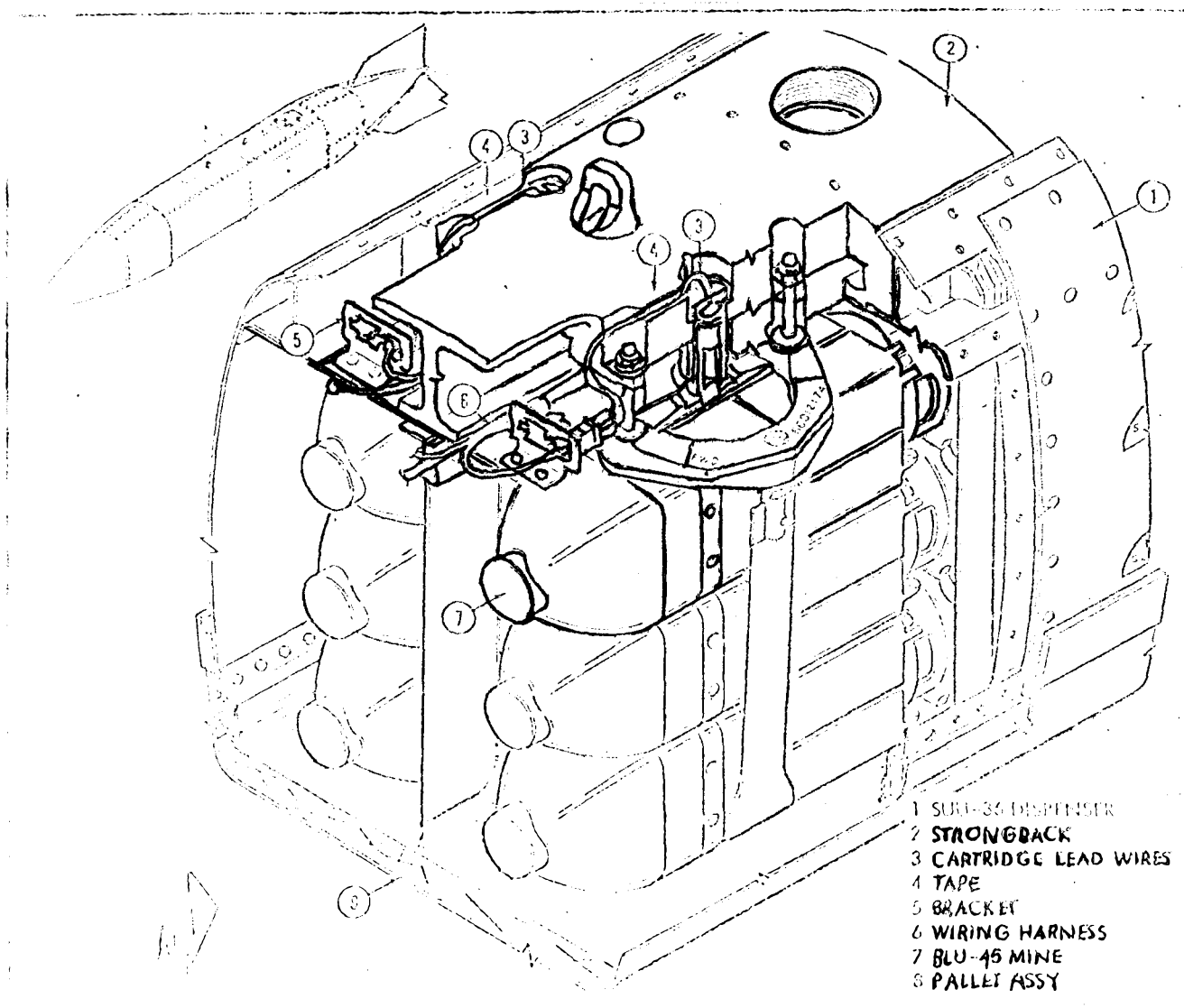


Figure 4-40D. KMU 339/B Mine-Dispenser Adapter Kit

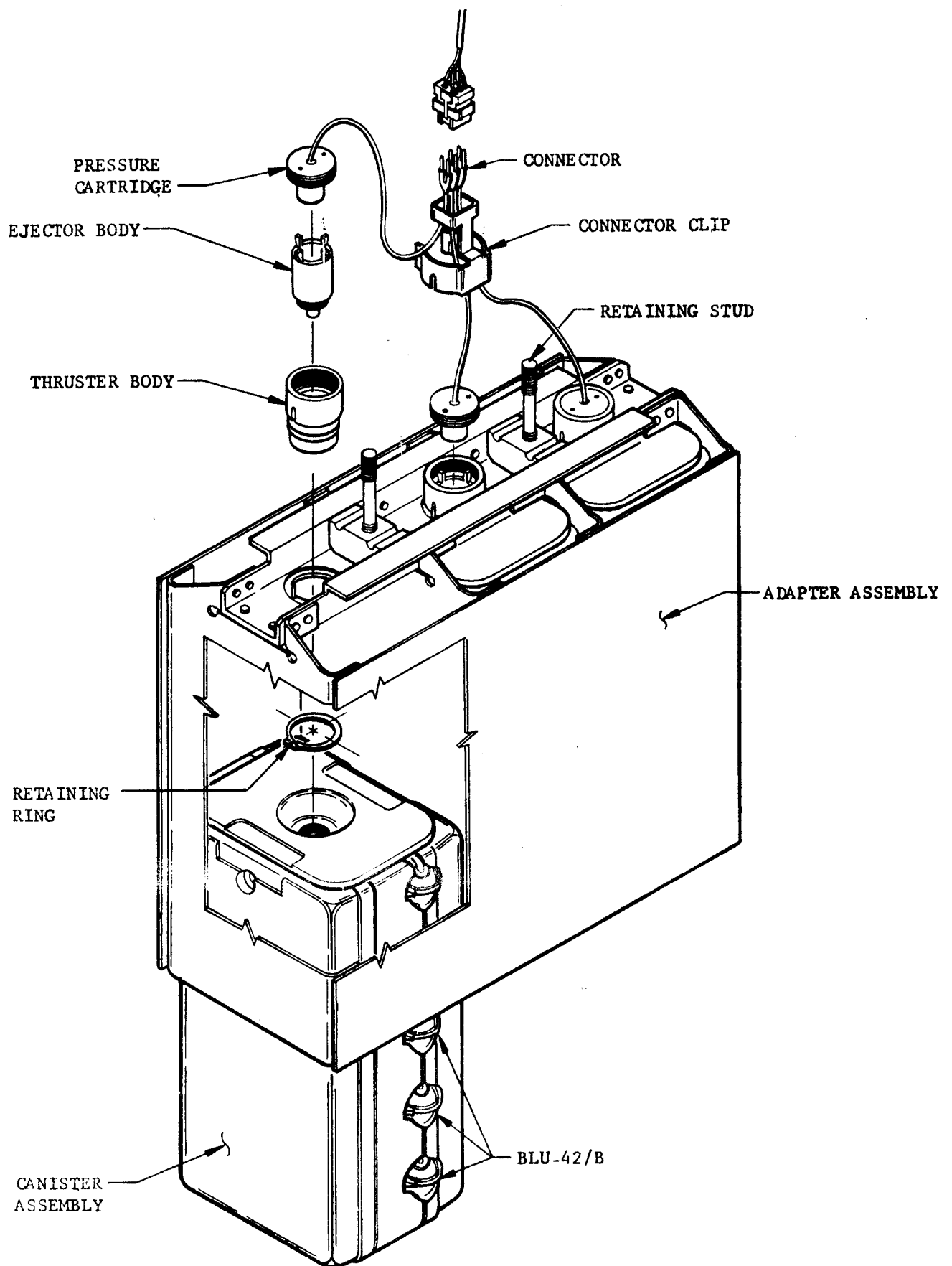


Figure 4-41. KMU 338/B with BLU 42/B

43. The mandatory safe waiting time for BLU-36/Bs and BLU-59/Bs is 3 hours and if possible wait 4 hours.
44. Manually handling of armed BLU-26/Bs, BLU-36/Bs, and BLU-59/Bs will be done as Last Resort.
45. There is no I.D. R.S.P. for BLU-26s, 36s, and 59s.
46. The CDU-4, 10, and 14 are basically the same, differing only in the Payload.
47. Liquid freon is used in the CDU-4, 10, and 14 to keep mines inert.
48. What is the purpose of the lanyard on the CDU-4s, 10s, and 14s?
Remove ground from Explosive opening Charge.
49. A Hydraulic pressure activated fuze is used in the BLU-43/B and BLU-44/B mines.
50. The main difference between the BLU-43/B and BLU-44/B is 43 has desensitiser 44 has Self Destruct (Sterilization Time).
51. Sterilization does not effect the Detonator and Booster in the BLU-43/B and BLU-44/B.
52. In the mine canisters there are two hazards aside from the BLU-43 and BLU-44s, they are Explosive Rod Explosive CART.
53. The BLU-45/B is a Anti-Tank Anti Vehicle Land mine.
54. The filler for the BLU-39/B23 is CS.
55. The hazards of the BLU-39/B23 are Black powder Expulsion Charge
Pyrotechnic delay
1.4 grain detonator charge
7.56" length of duct Pyrocone

EVALUATION QUESTIONS

1. When working on a SUU-7 that has received impact what possibility must be considered? Armed Bomblets in Tubes.
2. Other than payload, what is the hazard of a SUU-7 or SUU-10? 19 Explosive Detents/Spring.
3. BLU-42/Bs, BLU-42A/Bs, and BLU-54/Bs are dispensed by means of a 30 Explosive Cartridges.
4. The fuze used to function the SUU-30 has a (Propelling) GAS PRODUCING booster. 56/26/907
5. How many tubes are in a SUU-7 or SUU-10 dispenser? 19 Tubes.
6. Are all tubes in the SUU-7 always loaded in every configuration? NO.
7. The payload of a SUU-7 or SUU-10 is dispensed by RAM AIR + Spring Pressure.
8. What is the payload of the SUU-7 and SUU-10? Blu 3, 4, 16, 17, 24, 66 / 7.
9. The SUU-14 has 6 tubes.
10. The SUU-14 dispenses its payload by means of GAS Pressure.
11. The payload of the SUU-14 is Blu 3, 4, 16, 17, 24, 66.
12. List four payloads that can be carried in a SUU-13: Blu 39, Blu 43, Blu 18, and Blu 49/60.
13. The SUU-13 dispenses its payload by means of Explosive Cartridges.
14. The individual SUU-13 dispenser container is removed by Draw Rod or Screw Driven AND (Boxing) Turn 1/4 to 1/2.
15. The SUU-30 dispenser differs from all other dispensers because CLAM Shell opening AND Conventional Fuzed.
16. List the payloads found in the series of SUU-30 dispensers: Blu 26, 36, 59's.
17. The SUU-30 looks like the 750 16 GP.
18. The SUU-24 dispenser is designed to be carried B-52 Internally.
19. The ADU's carried in the SUU-24 contain Blu 3, 26, 36, 59 Anything.
20. The ADU's carried in the SUU-24 are opened by Mechanical Timers.
21. How many flares can be carried in the SUU-25? 8.

22. Care must be taken while downloading a SUU-25, not to Pull lanyard ON Second MK 24 (Tied lanyard To lanyard).
23. What is the payload of the CBU-19/A? (CS) Blu 39.
24. What are the hazards of the CBU-19/A aside from the payload? Explosive Bolts, 2 Detonators, Black powder Wafers.
25. Give three safety precautions you would observe while working on an impacted CBU-19/A CS (chemical Preact), Explosive Bolt, and Black powder.
26. The munitions carried in the SUU-38 are Blu 42, 54.
27. In the SUU-38 ejection of the payload is initiated by A/C power to that 30 GAS CARTRIDGES.
28. The SUU-14A/A is an externally carried dispenser designed to dispense Blu 24/B (1320).
29. What are the hazards of the SUU-41 other than payload? 10 GAS CARTRIDGES.
30. Give the ID features of the SUU-36/A. Small access holes in side for setting Blu 45.
31. The payload of the SUU-36/A is Blu-45's.
32. The mines in the XM-47 are ejected by Nitrogen Pressure.
33. BLU-3/Bs are to be considered armed when out of Tube when 100% Fins are up.
34. The ID features of the BLU-3/B are 6 Fins, End Cap,.
35. BLU-17/Bs contain WP.
36. If the cocked striker of the BLU-17/B functions while handling you should Throw 35 YARDS.
37. What is the difference between the BLU-24/B and the BLU-66/B? None.
38. There is no external means of determining the condition of a BLU-24/B or BLU-66/B when out of Dispenser.
39. The fuze in the BLU-24/Bs and BLU-66/Bs function by Spin Delay & Impact.
40. The fuzes in the BLU-7/B and BLU-7A/B are armed by Parachute Retraction.
41. The fuzes in the BLU-7/B and BLU-7A/B by function are impact.
42. By type BLU-26/Bs, BLU-36/Bs and BLU-59/Bs are Anti-Personnel.

Department of Aerospace Munitions Training
Lowry Technical Training Center

Student Text 3AZR46470-1
1 February 1970

CHAPTER 5
LAUNCHED MUNITIONS

PART ONE - AIRCRAFT ROCKETS
PART TWO - MISSILES (INCLUDING GUIDED WEAPONS)

PART ONE
AIRCRAFT ROCKETS

OBJECTIVE

To present identification, basic operation, hazardous components, and rendering safe procedures of Air Force rockets.

INTRODUCTION

Rockets have been used by military forces for many centuries. By the fifteenth century, several types of rockets had been developed. Dr. Robert H. Goddard, the "Father of American Rocketry," was primarily responsible for developments in the field of rockets in the early twentieth century. He was first with the idea of multiple staging, and in World War I he successfully demonstrated a one-man antitank rocket which was fired from a tube. This was the forerunner of the World War II "bazooka" and the current U.S. Army "Redeye."

The Air Force has more than a passing interest in rockets. At least three interceptor-type aircraft have had rockets as their prime source of armament. With one notable exception, the Genie, the trend is towards guided missiles rather than rockets for air-to-air combat. Though they still can be used in air-to-air combat, rockets are now used primarily for tactical or air-to-ground attack.

Today, the Air Force stockpiles five types of aircraft rockets. Four of these rockets are for combat use, and one is used as a target for air-to-air missiles. Rockets are employed against personnel, shipping, tanks, armored fortifications, and equipment of all types, as well as in air-to-air combat. High explosive, anti-tank, flechette, and white phosphorous are several types of warheads which are adapted to aircraft rockets.

2. 75" ROCKETS

1-1. Type: 2.75" Folding Fin Aircraft Rocket (FFAR) (reference figure 5-1a, 5-1b, 5-2, 5-3, 5-4, 5-5, 5-6a, 5-6b, 5-7, 5-8, 5-9a, 5-9b, and 5-10).

1-2. Description: The 2.75" FFAR, called the "Mighty Mouse," is the smallest rocket in our inventory. It is 2.75 inches in diameter and, depending on the type warhead installed, is about 4 feet long and weighs approximately 20 pounds. The rocket was designed to provide air-to-air armament for interceptor aircraft and air-to-ground armament for tactical aircraft. It is equipped with four fins that fold within the diameter of the rocket motor for firing from tubular type launchers. High explosive, antitank, flechette, and smoke (WP) warheads are used with the 2.75" rocket (reference figures 5-2 through 5-10).

1-3. Warheads and Fuzes:

- a. MK 1, HE W/H (HBX-1), W/M176 Fuze.
- b. MK 5, Head W/H (Comp B), W/M181 Fuze.
- c. M151, HE W/H (Comp B), W/M427 Fuze.
- d. M156, Smoke W/H (WP), W/M423 Fuze.
- e. M152/153, Smoke W/H (WP), W/427 Fuze.
- f. M30, 3.5" Smoke W/H (WP), W/M404A1 Fuze.
- g. WDU4/A, Flechette W/H, W/M113A Fuze.

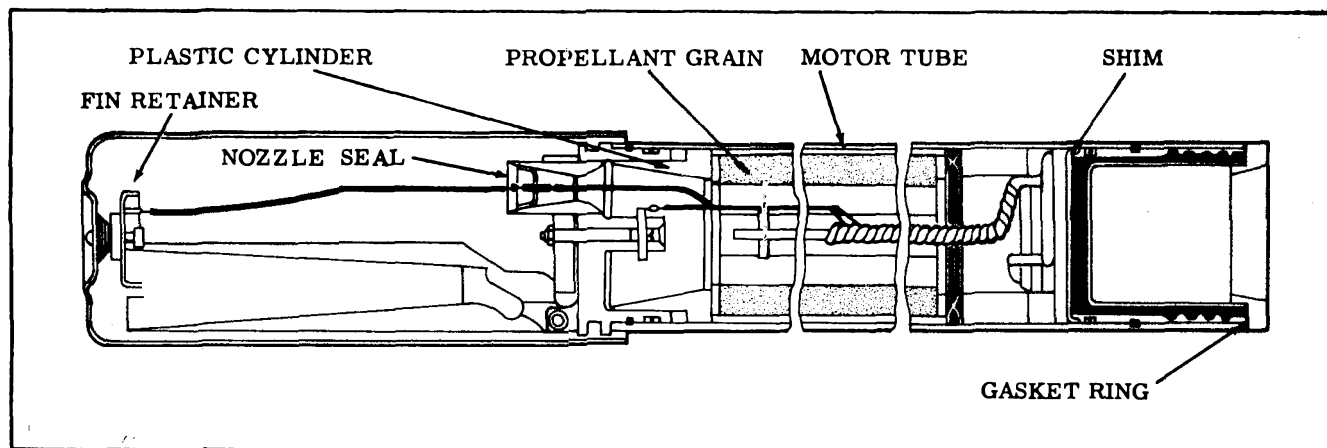


Figure 5-1A. 2.75 Inch Rocket Motor (FFAR), Cutaway View

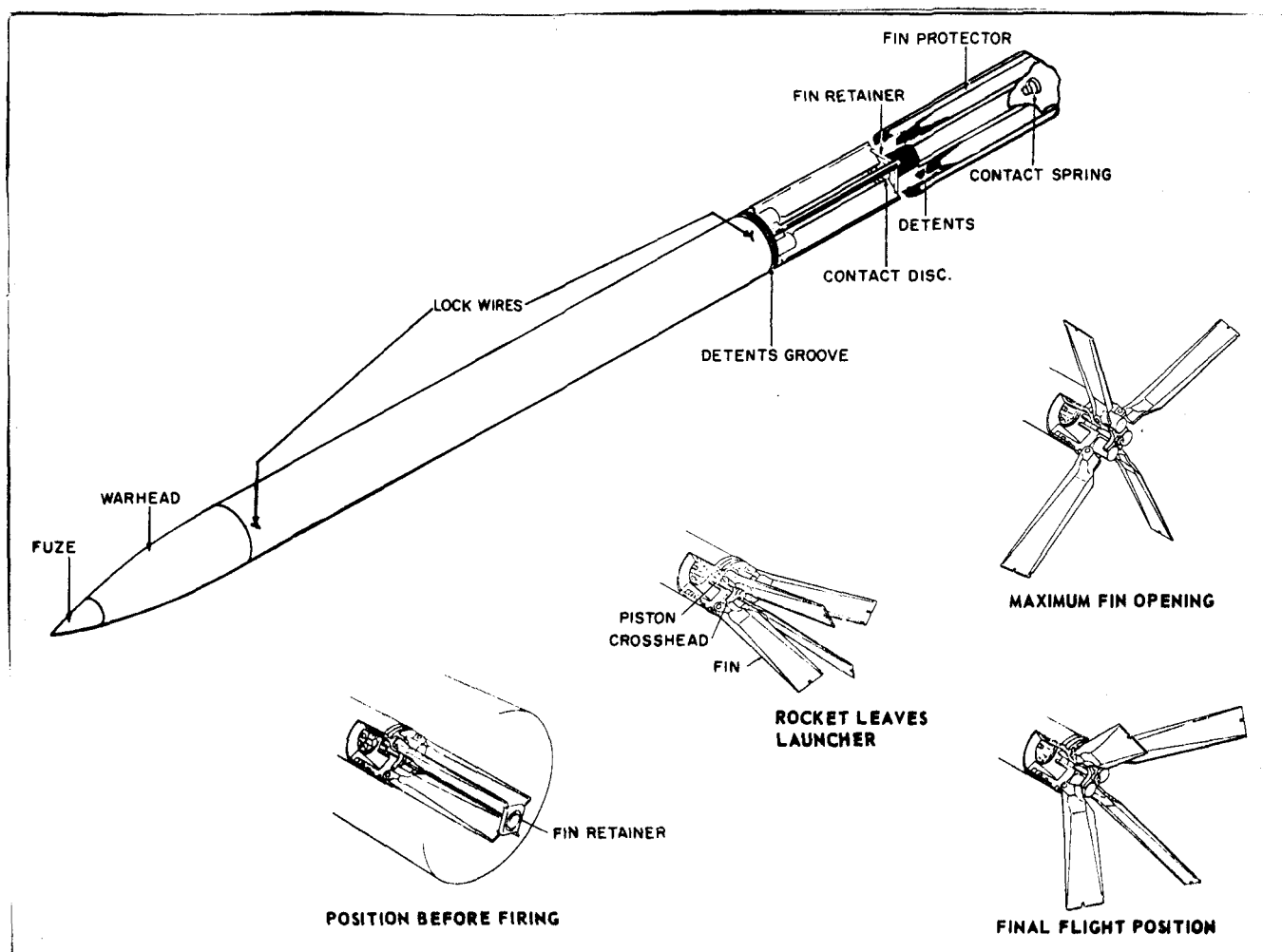
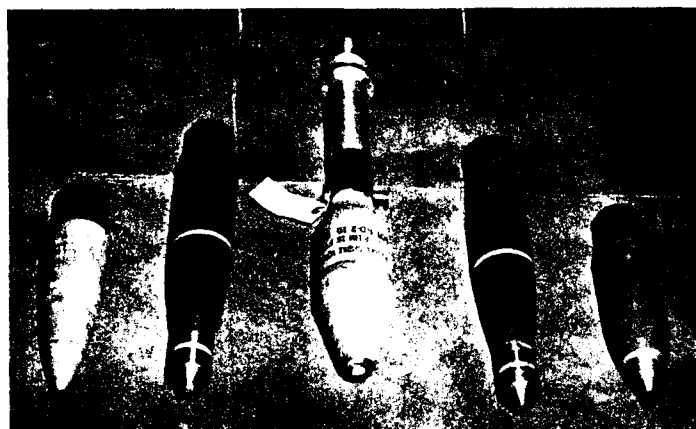


Figure 5-1B. 2.75 Inch Folding Fin Aircraft Rocket (FFAR)



MK1 M151 3.5 WP
W/ADAPTER M156 MK5



WDU4/A

Figure 5-2. 2.75 Inch Warheads

HIGH EXPLOSIVE WARHEADS

Mk 1 HE Warhead. The Mk 1 HE warhead consists of a steel case threaded internally at the forward end for attaching the fuze to the warhead, and threaded externally at the aft end for attachment to the motor. Warheads are shipped complete with fuze. It is filled with 1.4 pounds of HBX-1. It uses the Mk 176, point-initiating, point-detonating, impact delay fuze. When assembled to the motor it is classified as air-to-air, service, blast effect

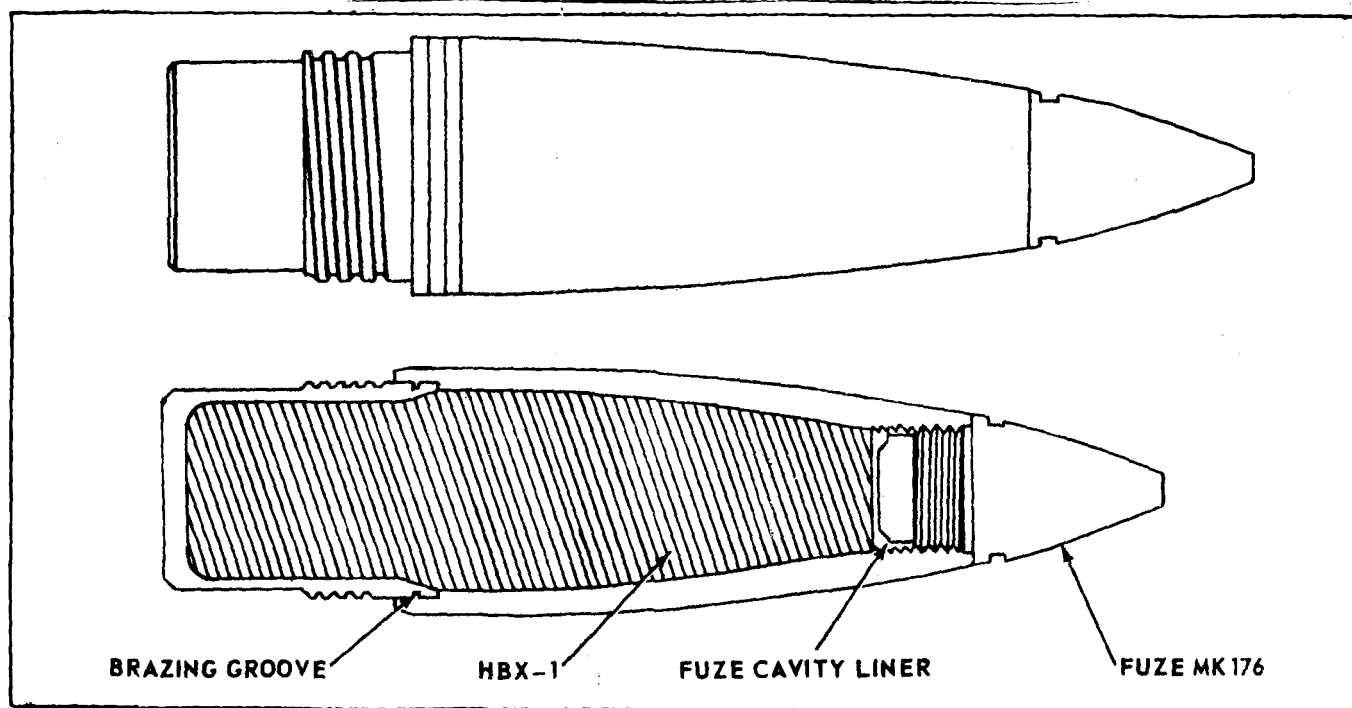


Figure 5-3. 2.75 Inch Rocket Warhead MK1 Mod 4 (HE)

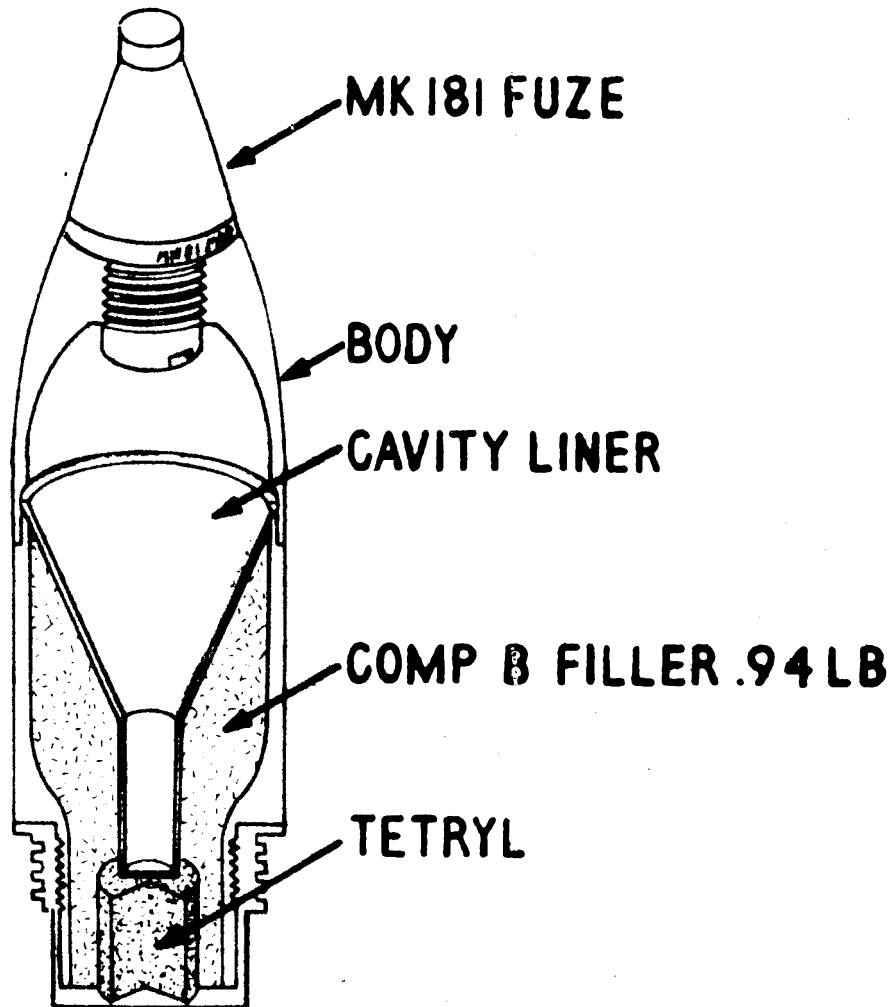


Figure 5-4. 2.75 Inch Rocket Warhead MK5 (HEAT)

Mk 5 Warhead. The Mk 5 HEAT (High Explosive Anti-Tank) warhead is designed for armor-piercing, using the Monroe effect. It has approximately the same configuration as the Mk 1, but can be readily identified by the flat nose on the fuze which is designed to prevent ricochet. It is filled with .89 pounds of Composition B. It uses the Mk 181 fuze which is point-initiating and base-detonating. When assembled it is classified as air-to-ground, service, armor-piercing

M151 HE Warhead. The M151 warhead has a pearlite malleable iron case designed for fragmentation. The body length and fuze configuration readily identify the head. Warheads are shipped unassembled from the fuze. It is filled with 2.3 pounds of Composition B. When assembled to the motor it is classified as air-to-ground, service, ground fragmentation. It uses the M427, graze sensitive, super-quick fuze

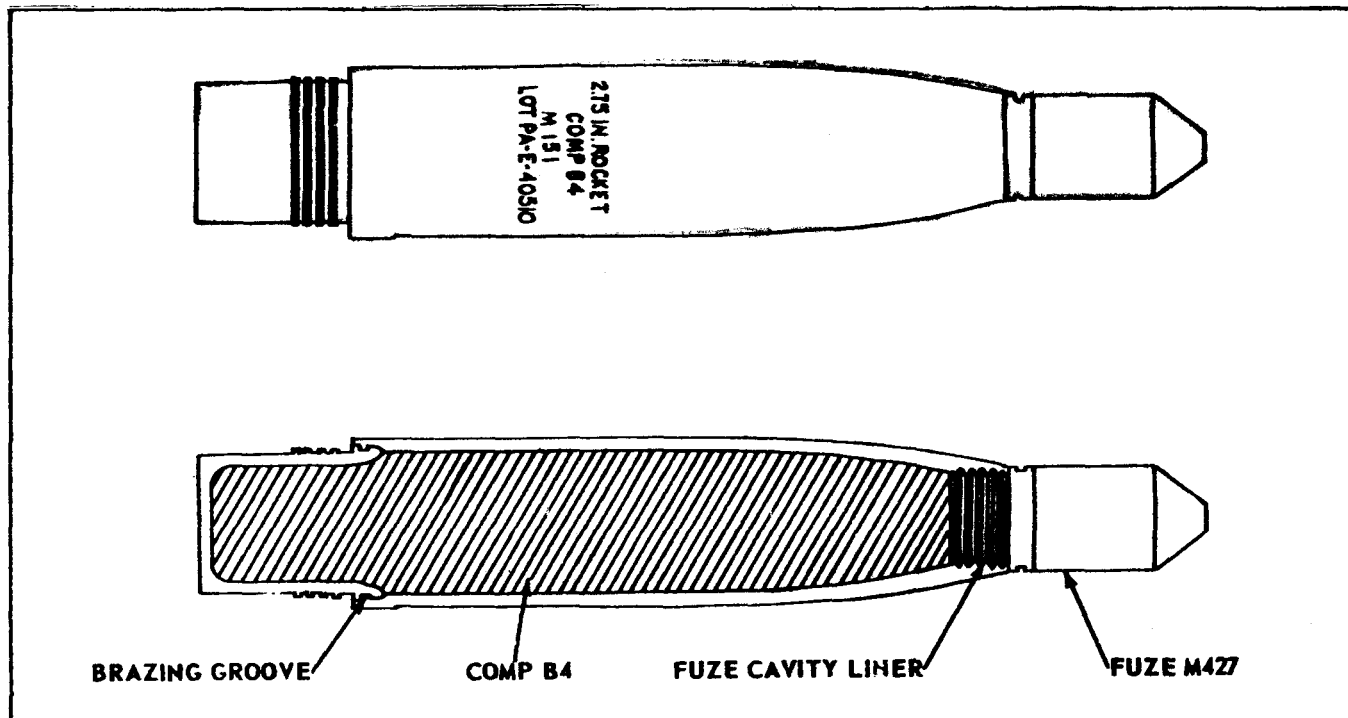


Figure 5-5. 2.75 Inch Rocket Warhead M151 (HE)

M156 (E13) Smoke, WP, Warhead (HE). This warhead is used for target marking and target identification. This head is similar to the Mk 1, but it contains an adapter and the M127E1 fuze which makes it approximately 12 inches in total length. The head is filled with a core of Comp B surrounded by WP. The HE disperses the WP upon detonation and also fragments the outer case.

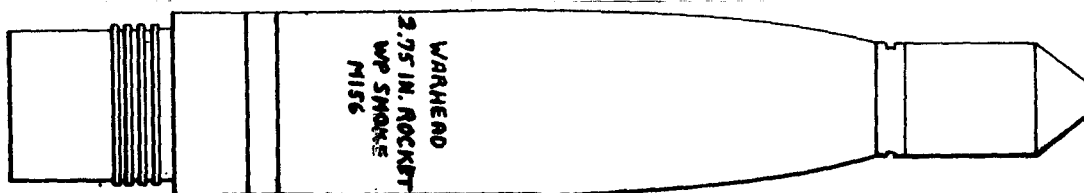


Figure 5-6A. 2.75 FFAR, M156, Smoke (WP)

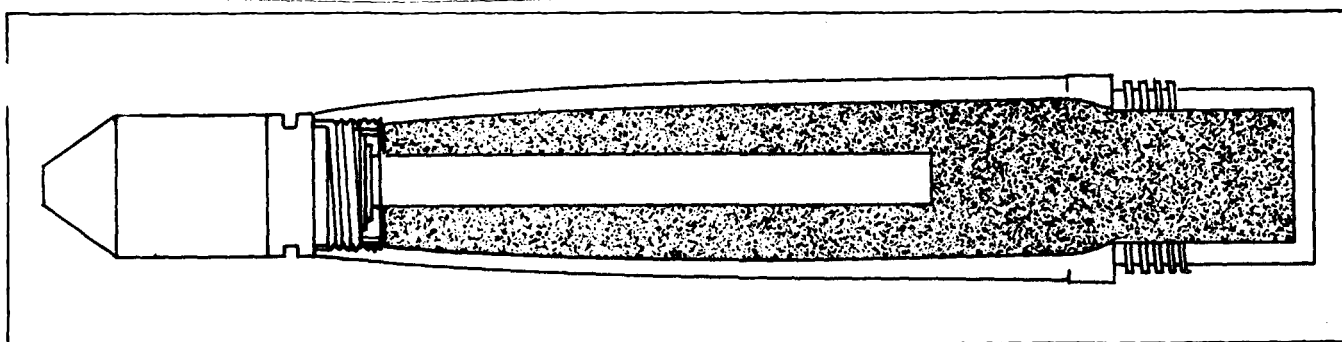


Figure 5-6B. 2.75 Inch Rocket Smoke (WP) Warhead, M156 Cutaway View

XM152 and XM 153 Target Marker Warheads. The XM152 and the XM153, red and yellow smoke warheads are used for target identification. The head has a core of smoke pellets with a sleeve of salt in layers. This is surrounded by a high explosive (Baratol) to disperse and ignite the smoke pellets and to cause fragmentation of the outer case. When assembled to the motor it is classified as air-to-ground, service, smoke. It uses the M427E1 fuze with a tetryl pellet at the rear to detonate the baratol,

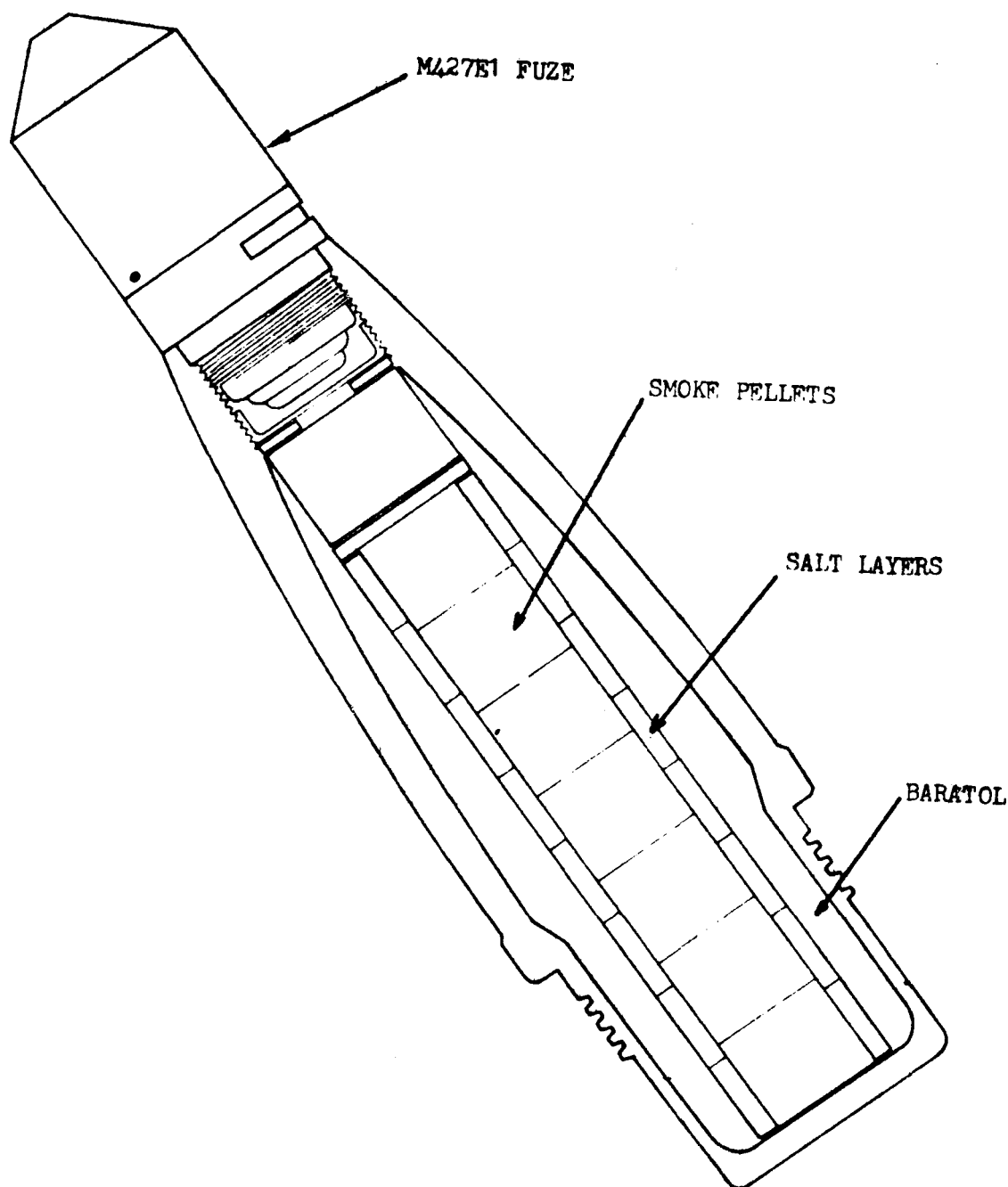


Figure 5.7. 2.75 Inch Rocket Colored Smoke Warhead XM152 and XM153 (Target Marker)

CHEMICAL WARHEADS

M30, 3.5" Smoke, WP, Warhead. The 3.5" WP smoke warhead provides the 2.75" rocket with a spotting capability. It is internally threaded at the aft end to attach the fuze. It is filled with 2.3 pounds of WP. The warhead uses a modified M404A1 base-detonating fuze. The fuze is externally threaded for attachment to the warhead and internally threaded for attachment to the aluminum alloy adapter, which must be used for attachment to the motor. When assembled to the motor it is classified as air-to-ground, service, smoke

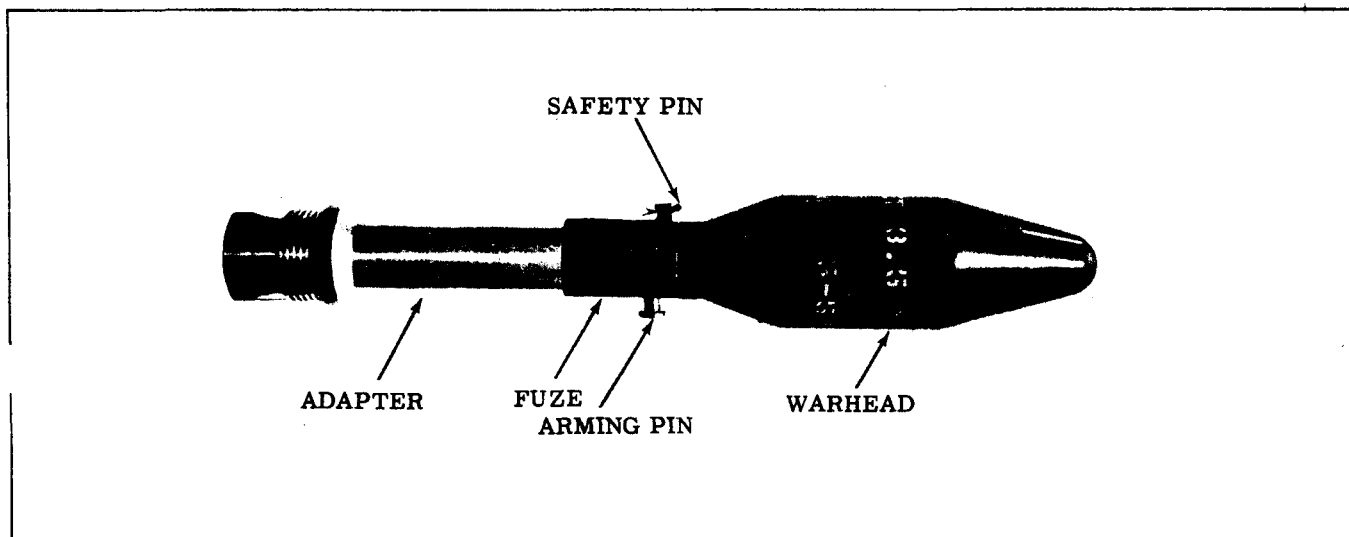


Figure 5-8. 3.5 Inch Smoke WP Warhead, Fuze, and Adapter, for 2.75 Inch Aircraft Rocket

Figure 5-9A. 2.75 Inch Rocket Flechetts Warhead WDU-4A/A

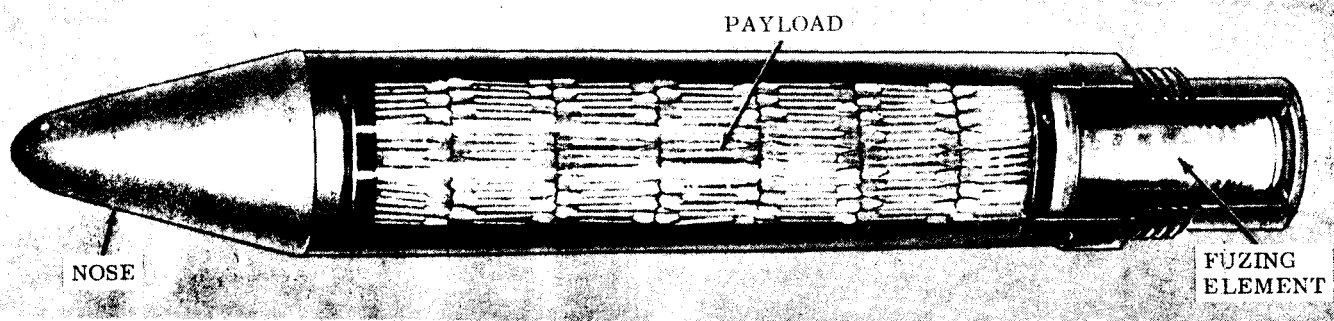


Figure 5-9B. 2.75 Inch Rocket Flechetts Warhead, WDU-4A/A, Cutaway View

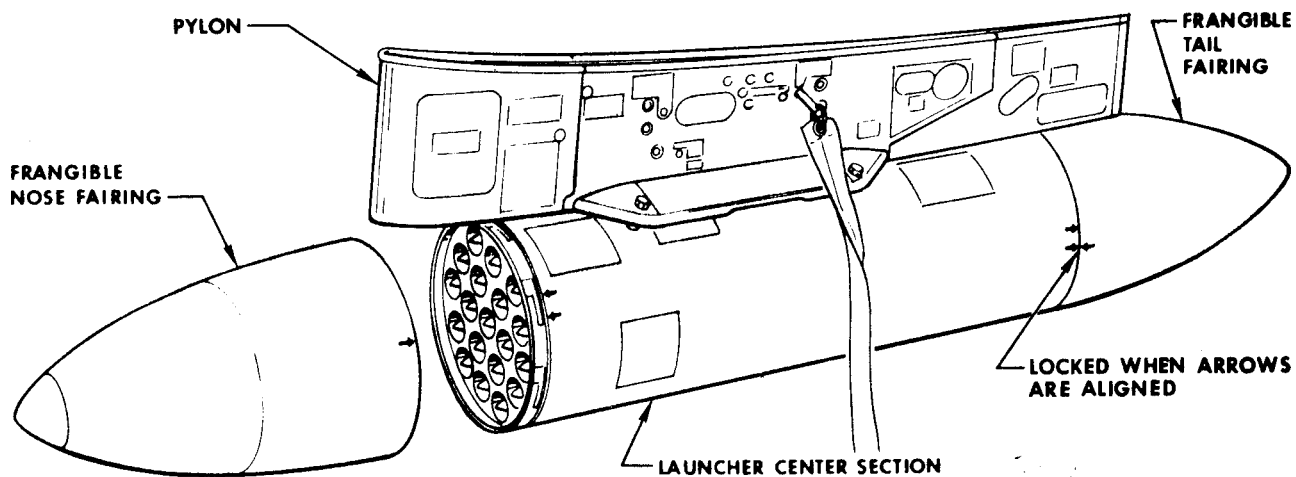


Figure 5-10. LAU 3/A Rocket Launcher

1-4. Hazardous Components:

- a. Rocket motor
- b. Igniter
- c. Fuzes w/boosters
- d. Warheads (WP or HE)

1-5. Operation:

- a. Aircraft power ignites rocket motor.
- b. Requires sustained acceleration to arm fuzes.
- c. Fuzes arm 140' to 250' from launcher.
- d. Motor burns out at approximately 1.69 seconds.
- e. Effective range is approximately 5 miles.

2.75" ROCKET FUZES

1-6. Type: MK 176, Point-initiated, Impact Delay Operated Fuze (used with MK 1, HE Warhead) (reference figures 5-11a, 5-11b, and 5-11c).

1-7. Description:

- a. Cone-shaped steel body.
- b. Wrench slots at the base.
- c. Booster cup on the bottom.

1-8. Hazardous Components:

- a. Primer
- b. Delay element
- c. Detonator
- d. Booster

1-9. Operation: Unarmed- out of line det-rotor.

- a. Aircraft power ignites rocket motor.
- b. Acceleration of 27 Gs for 0.6 second.
- c. Setback weight moves into position.
- d. Rotor rotates into armed position.
- e. Straight impact (70° angle) fires fuze. (1)

M181

1-10. Type: M181, Point-initiated, Setback Armed, Air Column Fired Fuze (used with the MK 5, HEAT Warhead for use against heavy vehicles and armour) (reference figures 5c, 5-12a, 5-12b, and 5-12c).

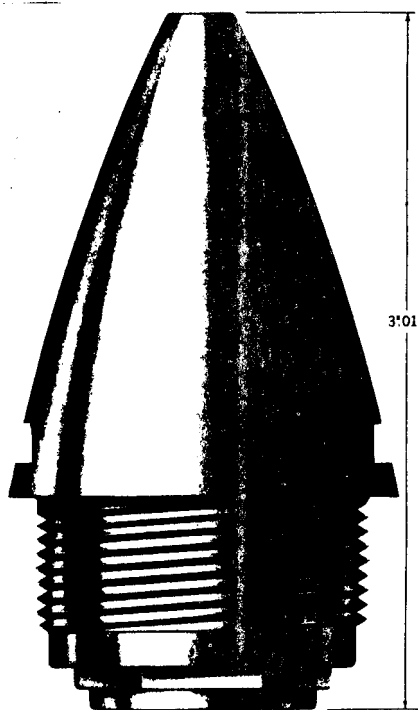


Figure 5-11A. Nose Fuze MK 176 Mod 1

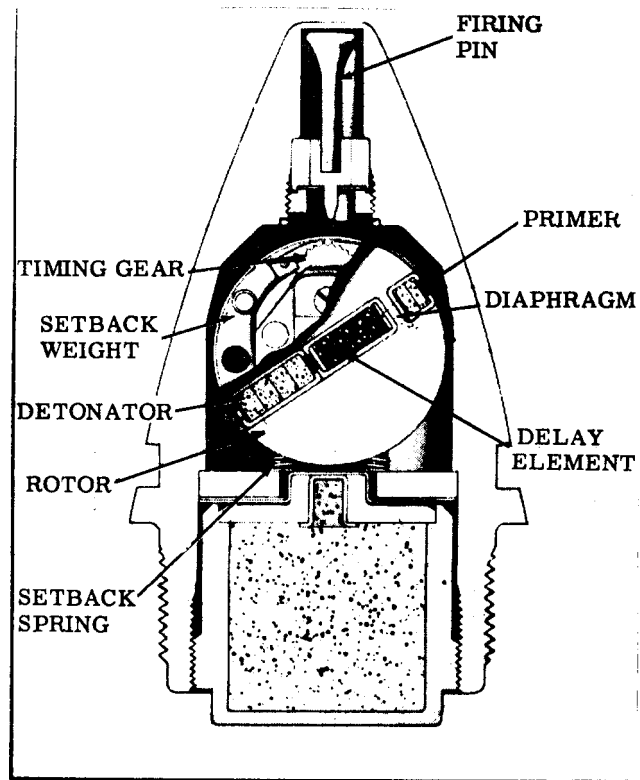


Figure 5-11B. Rocket Warhead Fuze, MK 176 Mod 1, Cutaway View

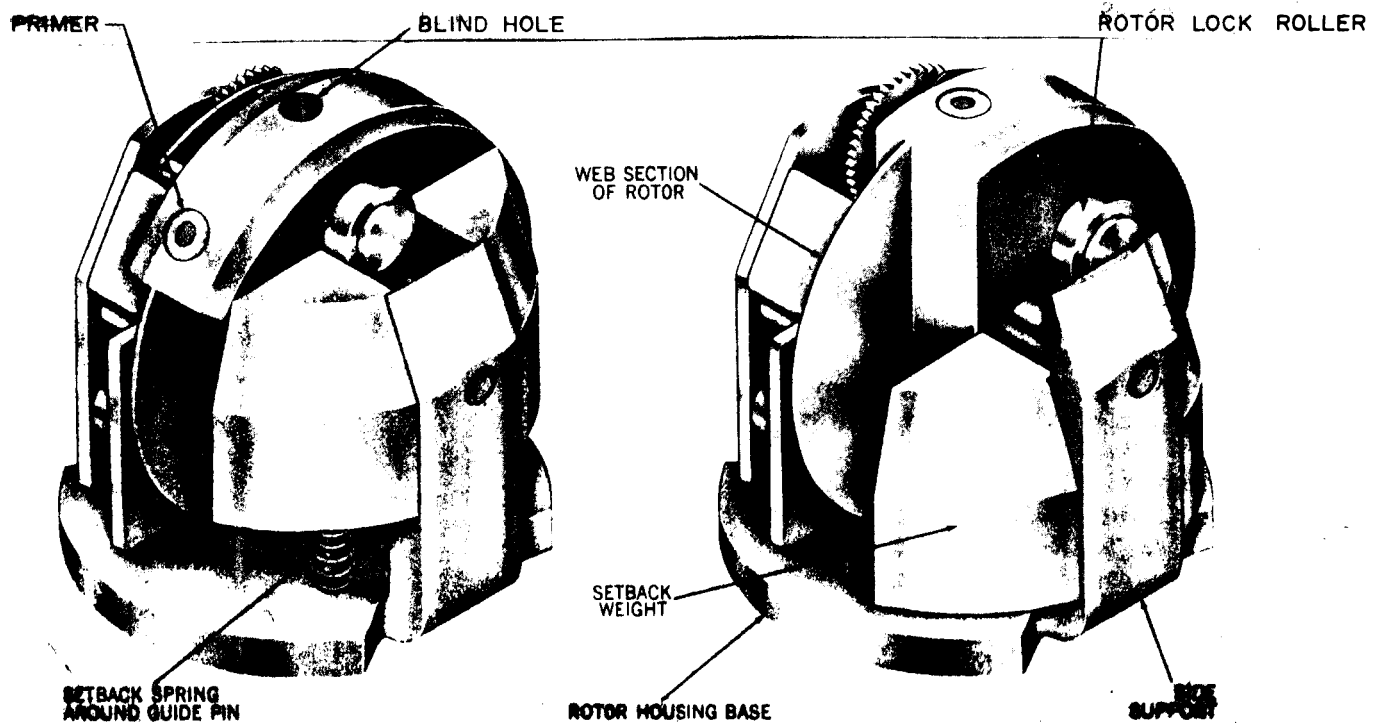


Figure 5-11C. Typical Acceleration-Arming Mechanism

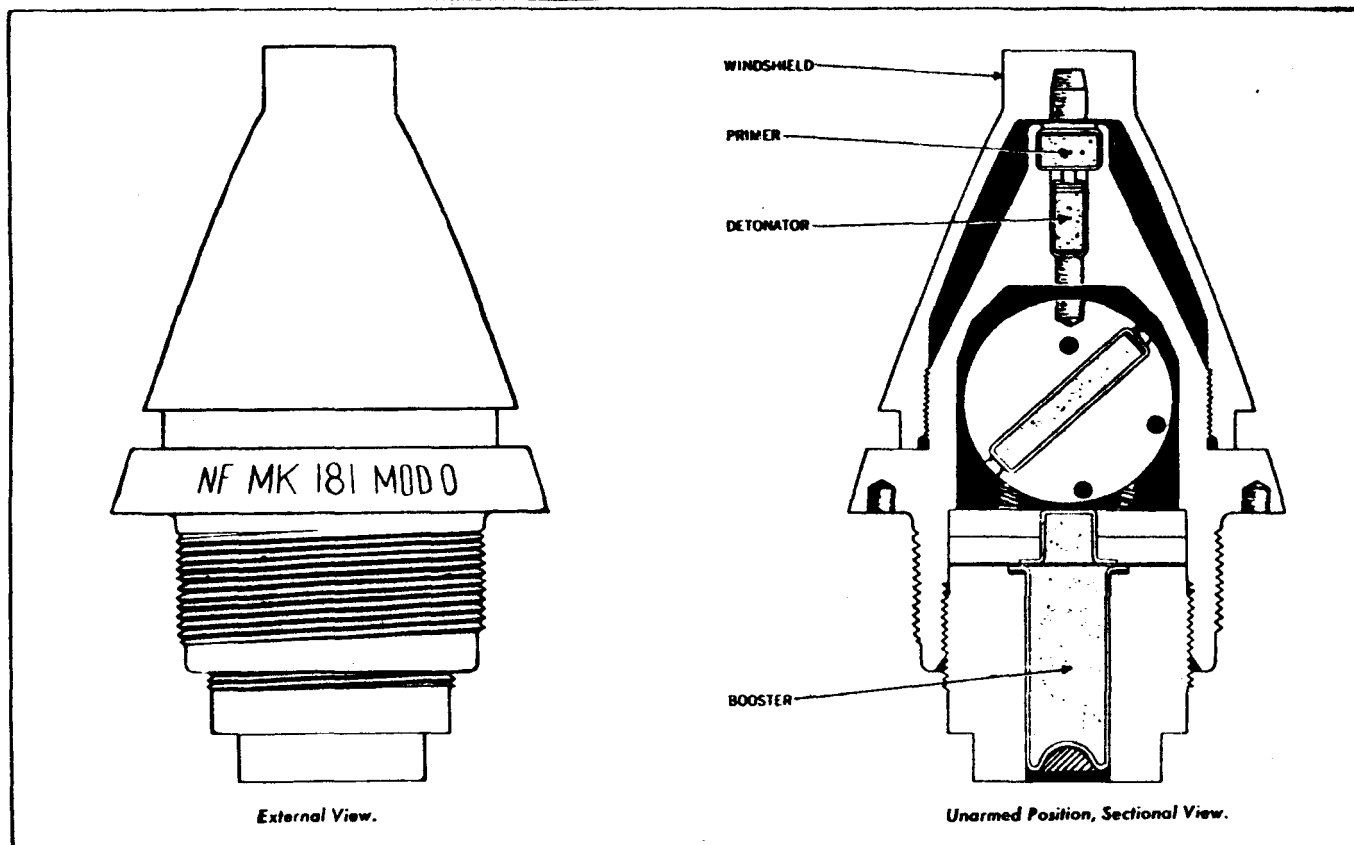


Figure 5-12A. Nose Fuze MK 181 Mod 0

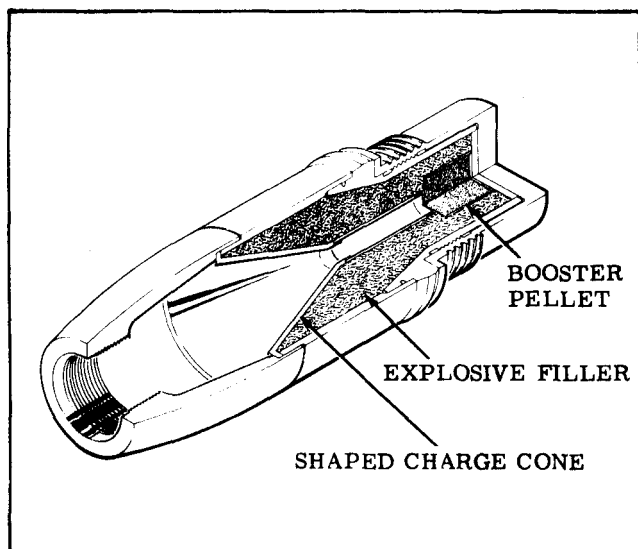


Figure 5-12B. 2.75 Inch Rocket High Explosive Antitank Warhead, MK5, Cutaway View

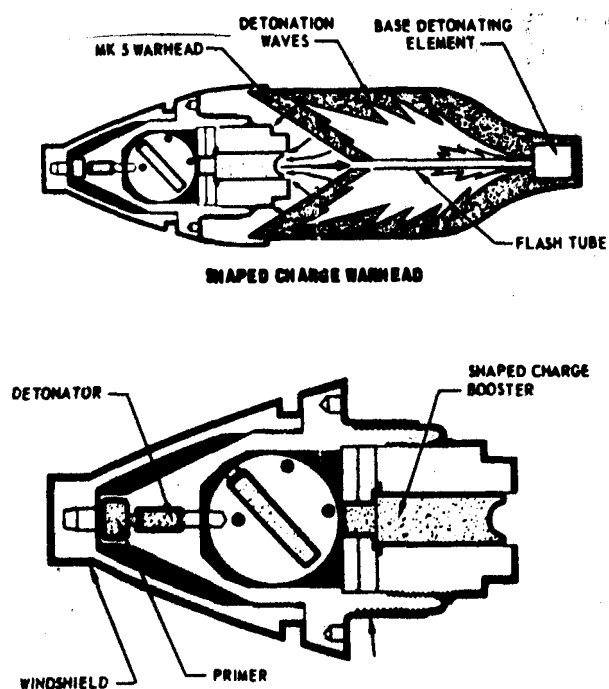


Figure 5-12C. HEAT Warhead and Fuze

1-11. Description:

- a. Cone-shaped metal body.
- b. Point of fuze flattened for anti-ricochet action.
- c. Two wrench slots at the base.
- d. Booster cup on bottom.
- e. Nomenclature stamped on base.

1-12. Hazardous Components:

- a. Primer
- b. Detonator
- c. Relay
- d. Booster

1-13. Operation: (Fuze does not require a firing pin.)

- a. Aircraft power ignites rocket motor.
- b. Acceleration moves setback weight into position.
- c. Rotor rotates to armed position.
- d. Impact functions air column primer.
- e. Detonator and relay function booster.
- f. Booster flashes back and functions base detonating element.
- g. Base detonator functions shape charge.

M423 and M427

1-14. Type: M423 and M427, Point-initiated, Setback Armed, Super-quick Graze-sensitive Fuzes (designed to give maximum fragmentation of the warhead or spread of its filler). These fuzes are commonly called "Rice Paddy" fuzes. They are used with the M151, 156, 152, 153 warheads. (reference figure 5-13).

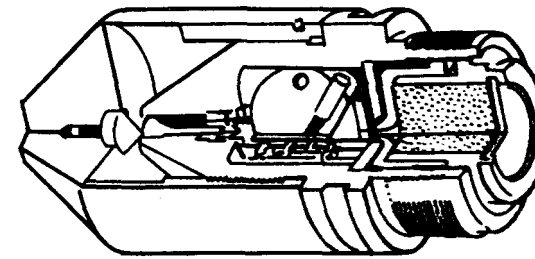
1-15. Description:

- a. Cylindrical shaped body.
- b. Conical nose.
- c. Aluminum body.
- d. Two wrench slots at the base.
- e. Booster cup on bottom.

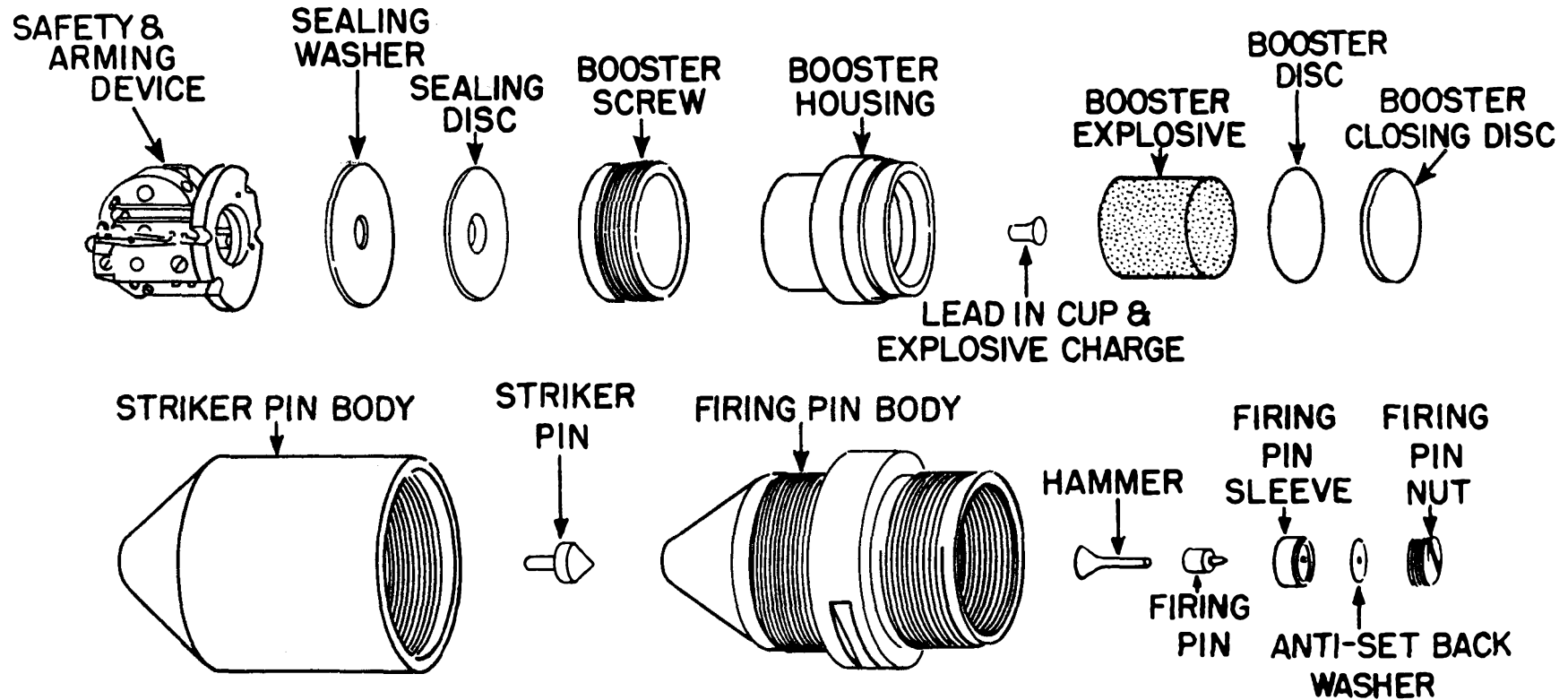
1-16. Hazardous Components:

- a. Primer
- b. Detonator

0 1 2 3 4 INCHES



ASSEMBLY



5-15

Figure 5-13. XM427 Rocket Fuze

- c. Lead-in
- d. Booster

1-17. Operation: (M423 and M427 differ only in arming time.)

- a. Aircraft power ignites rocket motor.
- b. Acceleration moves setback weight into position.
- c. Rotor rotates to armed position.
- d. Direct or graze impact functions primer.
- e. Superquick action functions booster.

M113/A

1-18. Type: M113/A, Acceleration Actuated Arming, Deceleration-actuated, Spring Loaded Firing, Base Fuze, For Nose Ejection (used with the WDU 4/A flechette warhead) (reference figure 5-14).

1-19. Description:

- a. Completely inclosed in base of warhead.
- b. No external identification features.

1-20. Hazardous Components:

- a. Spring-loaded firing mechanism.
- b. Primer.
- c. Ejection charge (M9).

1-21. Operation:

- a. Aircraft power ignites rocket motor.
- b. Acceleration of 286's for 1.8 seconds.
- c. Sleeve and setback weight move in position.
- d. Rotor rotates into armed position.
- e. Rocket burnout moves setback sleeve forward.
- f. Lock balls release spring-loaded firing pin.
- g. Primer and ejection charge function.
- h. Gas pressure overcome retaining pins.
- i. Flechette payload expelled through the nose.

SPECIAL PURPOSE FUZES

1-22. Two more fuzes will be presented in the classroom by the instructor. These fuzes are:

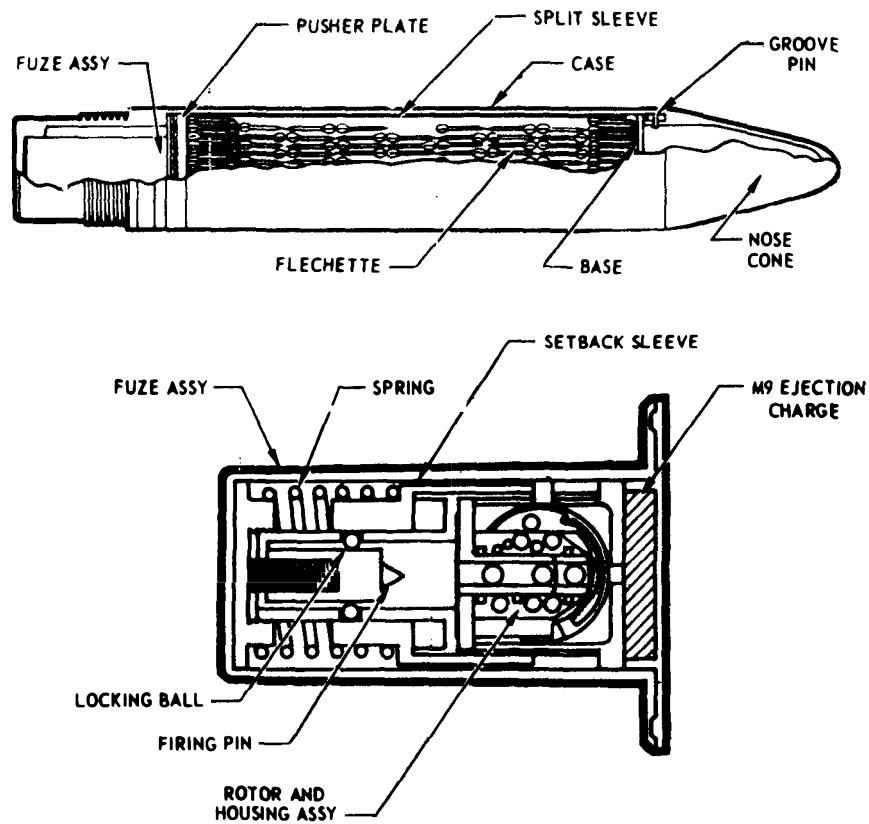


Figure 5-14. WDU 4/A Flechette Warhead

a. XM429 Proximity Fuze (used with the 2.75" Rocket) (reference figures 5-15A, 5-15B, 5-16, and table 1). The XM429 Proximity Fuze will not be discussed because of classification.

b. M404A1 Fuze. This fuze is a base-detonating type. It consists of a body which contains the functioning parts, a detonator and booster pellet. It is externally threaded at the forward end and internally threaded at the aft end, and it serves as a coupling between the 3.5" smoke warhead and the adapter. It is armed by setback when fired and functions with non-delay action on impact. The fuze is rapid in action and is sensitive to low graze angles. It has been modified by cutting a 1/16-inch slot through the fuze wall which allows a longer arming pin to protrude through the fuze. The arming pin is secured and made safe by a cotter pin inserted through the safety pin hole (reference figure 5-16).

1-23. Table 1 is a complete round chart for a quick reference to the information that has been covered to this point in this text.

5.0" ROCKETS

1-24. Type: 5.0-inch Folding Fin Aircraft Rocket (ZUNI) (reference figures 5-17a, 5-17b, 5-17c, 5-18a, 5-18b).

1-25. Description: The 5.0-inch FFAR, commonly called the "ZUNI" Rocket, is a supersonic, unguided rocket designed for air-to-air and air-to-ground attack. The MK16 rocket motor consists of an aluminum alloy motor tube, a nozzle and four folding fins. The rocket is fired from the LAU-10/A, 4 tube launcher. Electrical contact is made on the forward end of the rocket motor.

1-26. Warheads and Fuzes:

a. MK 24, HE W/H, (9.5 pounds, Comp B).

(1) MK 191, base detonating fuze. Factory equipped, cannot be removed in the field.

(2) MK 188, point detonating nose fuze.

b. MK 32, HEAT W/H, (15 pounds, Comp B).

(1) MK 188, point detonating nose fuze.

(2) MK 2061, VT fuze.

1-27. Hazardous Components:

a. Rocket motor.

b. Igniter with two igniter squibs.

c. Fuzes with boosters.

d. Warheads (HE).

1-28. Operation:

a. Aircraft power ignites rocket motor.

b. Blast from nozzle extends folded fins.

c. Acceleration arms fuzes.

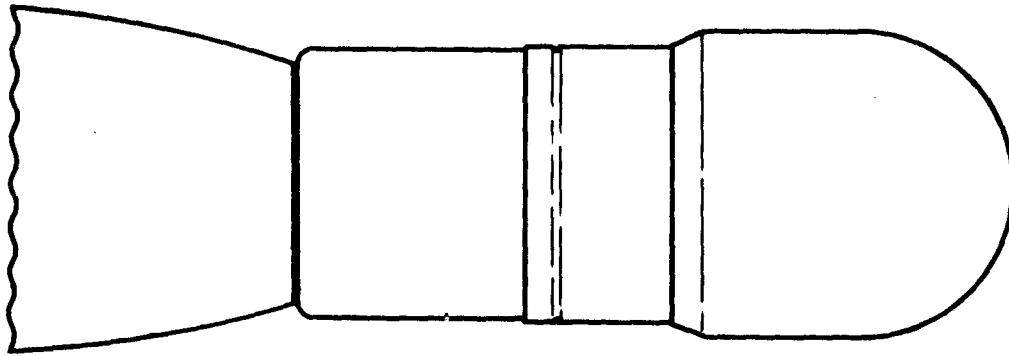


Figure 5-15A. Proximity Fuze XM429

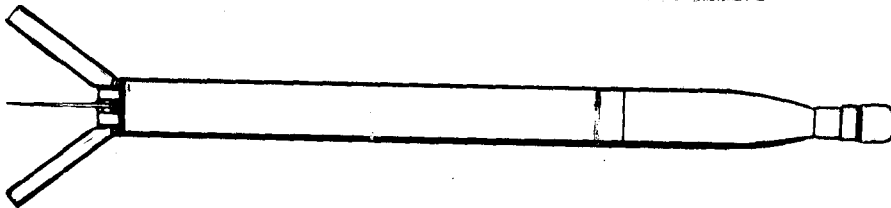


Figure 5-15B. 2.75 Inch Rocket with XM429 Proximity Fuze

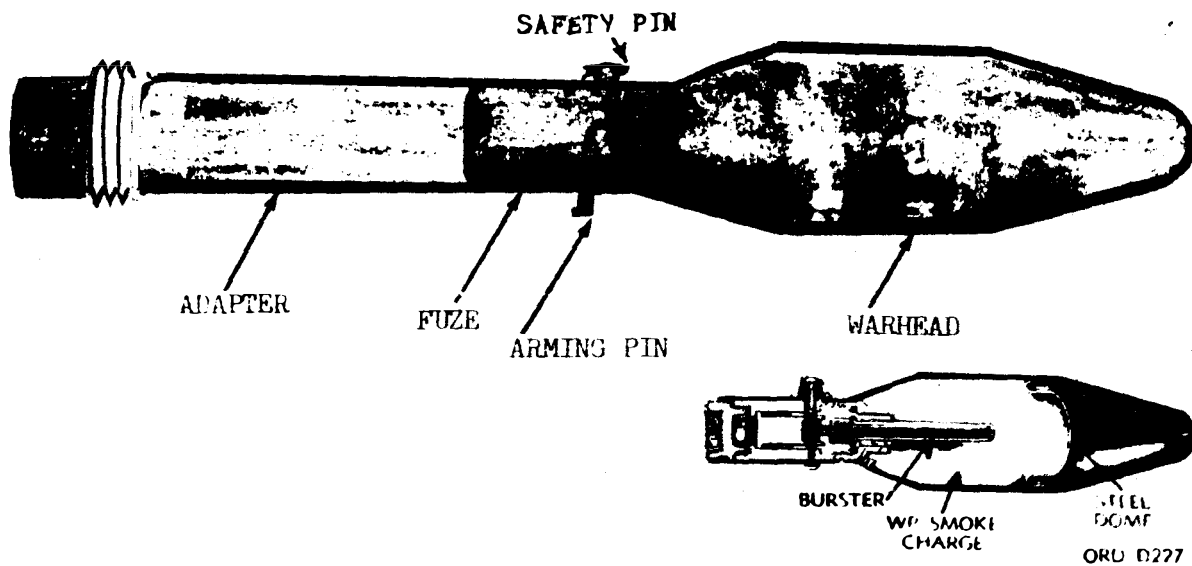


Figure 5-16. 3.5 Inch Smoke WP Warhead and Adapter

Table 1. Warhead Complete Rounds

Warhead	Fuze	Use	Purpose	Filler in Head	Old Color Code on Head	New Color Code on Head
MK 1	MK 176	Air-to-air	Service (HE)	HBX-1	OD/white markings	Yellow/black markings
MK 5	MK 181	Air-to-ground	Service (HEAT)	Comp B	OD/white markings	Black/yellow markings
M151	M427	Air-to-ground	Service (HE)	Comp B4	OD/white markings	Yellow/black markings
M156	M427	Air-to-ground	Service Smoke & Frag	WP & Baratol	*	*
3.5" WP, M30	M404A1	Air-to-ground	Service (Smoke WP)	WP	Grey/light green band, WP in light red; markings in black	Light green/WP in light red
MK 1	Dummy	Air-to-ground or air-to-air	Practice	Inert	Blue/white markings	Blue/black
XM152, XM153	M427	Air-to-ground	Service (Smoke WP), (HE)	WP & HE	*	*
WDU-4A	M113A	Air-to-ground	Service (Special)	Expelling charge; flechettes	May or may not be color coded	

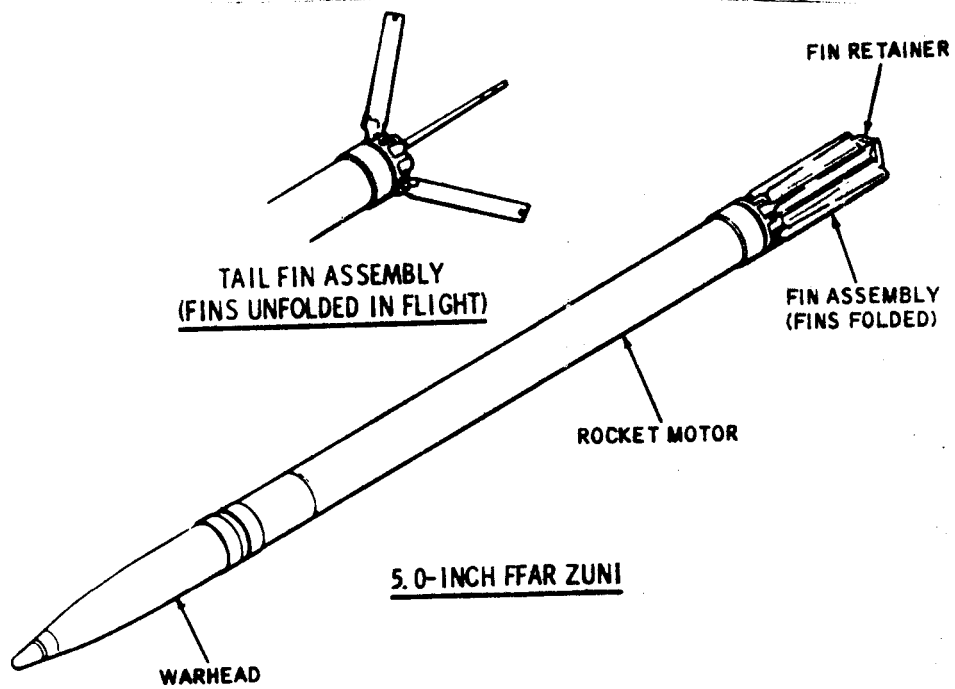


Figure 5-17A. 5 Inch Folding Fin Aircraft Rocket (ZUNI)

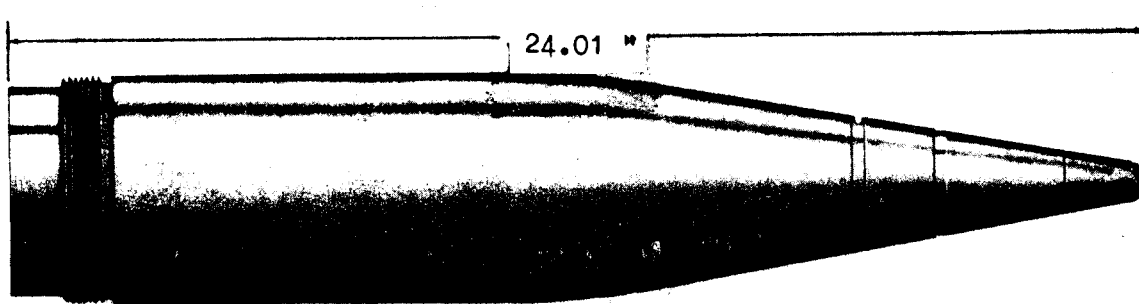


Figure 5-17B. 5 Inch ZUNI, MK24 Mod 0, ATAP

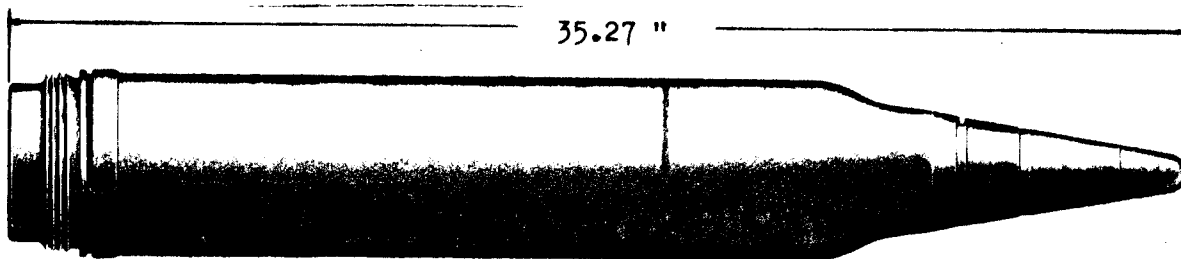


Figure 5-17C. 5.0 ZUNI, Mk 32 Mod 0, ATAP

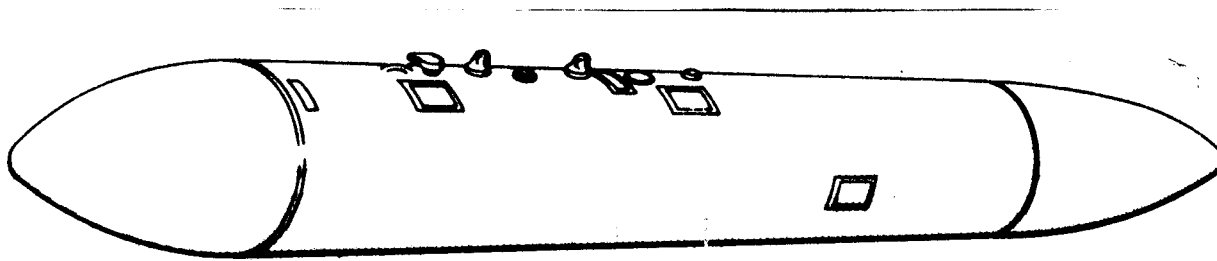


Figure 5-18A. LAU 10/A Launcher, Assembled with Fairings

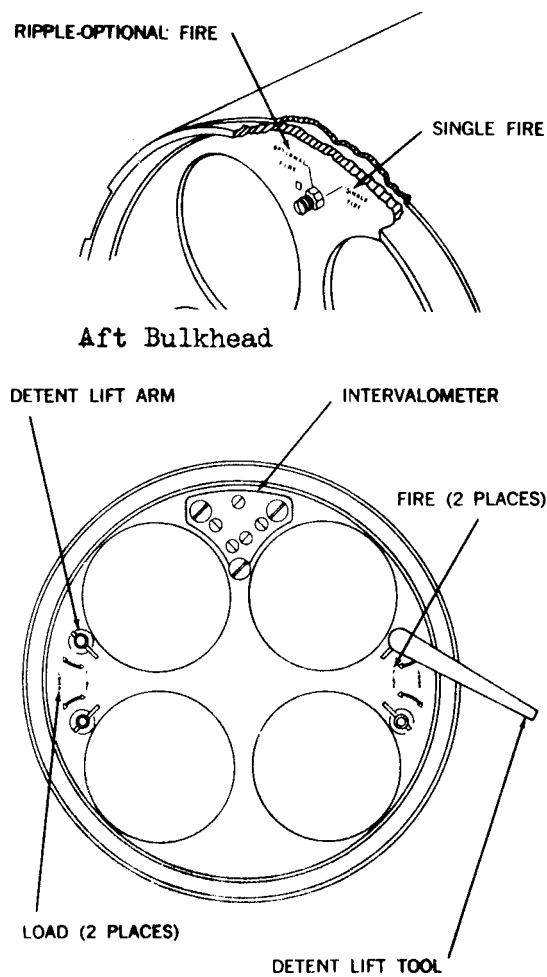


Figure 5-18B. LAU 10/A Launcher, Forward and Aft Bulkheads

1-29. Type: 5.0-inch High Velocity Aircraft Rocket (HVAR) (reference figures 5-19a, 5-19b, and 5-19c).

1-30. Description: The 5.0-inch fin stabilized aircraft rocket is Navy designed and currently being used in Viet-Nam only on the A1E aircraft with the Aero-14 launcher. The rocket motor consists of a steel tube, nozzle assembly, and four fixed (removable) fins.

1-31. Warheads and Fuzes: Several warheads can be used with this rocket; however, the one being used at this time is the MK 25 Mod 1, HEAD W/H, with MK 149 Fuze.

1-32. Hazardous Components:

- a. Rocket motor
- b. Igniter
- c. Fuze with booster and warhead

1-33. Operation:

- a. Aircraft power ignites motor (cannon plug attached to the base of the rocket motor).
- b. Rocket leaves launcher.
- c. Fuze arms by acceleration.
- d. Impact or time fired.

5.0" ROCKET FUZES

1-34. Type: MK 188, Point Detonating, Setback Armed Fuse (used with the MK 32 and MK 24 warheads) (reference figures 5-20a and 5-20b).

1-35. Description:

- a. Flat nose
- b. Steel body
- c. Two wrench slots
- d. Booster cup on bottom
- e. Nomenclature stamped on base.

1-36. Hazardous Components:

- a. Primer. Held in unbalanced rotor.
- b. Detonator. Held in unbalanced rotor.
- c. Booster.

1-37. Operation:

- a. Aircraft power fires rocket motor.
- b. Acceleration moves setback weight into position.

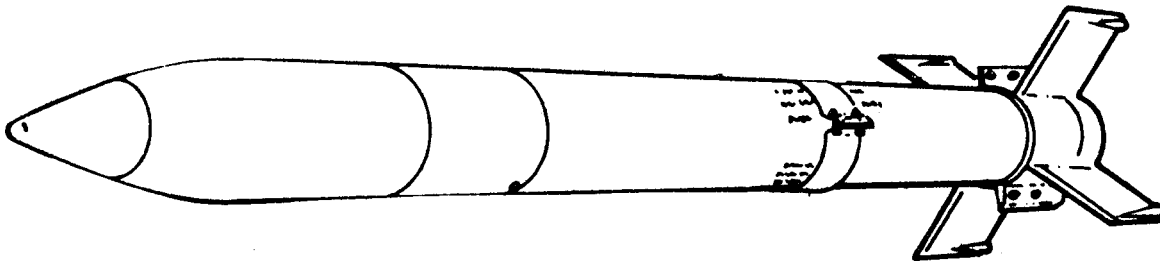


Figure 5-19A. 5.0 Inch High Velocity Aircraft Rocket (HVAR)

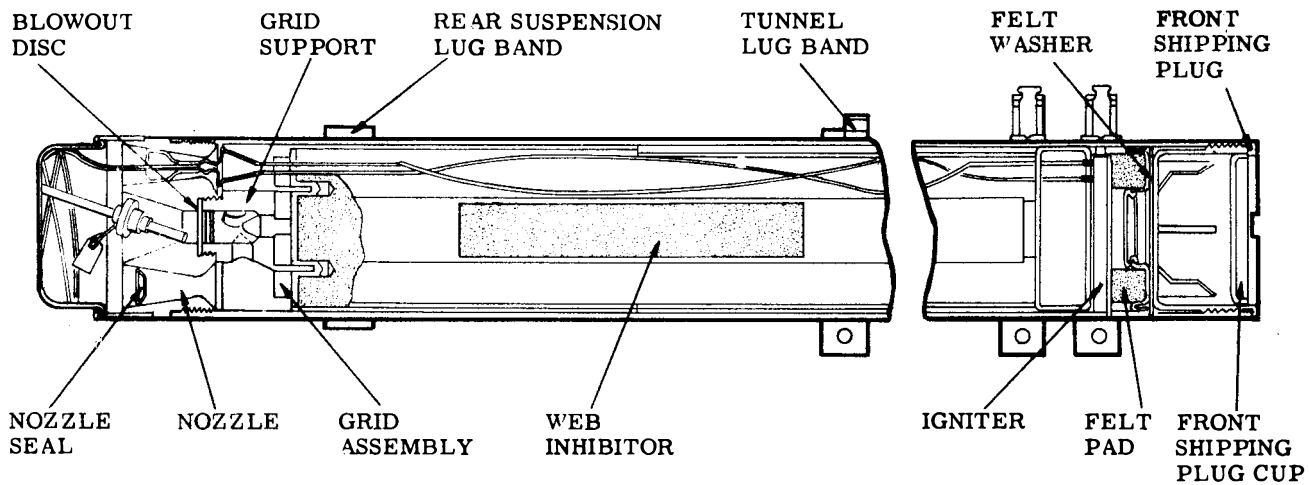


Figure 5-19B. 5.0 Inch Rocket Motor, MK 10 Mod 7, Cutaway View

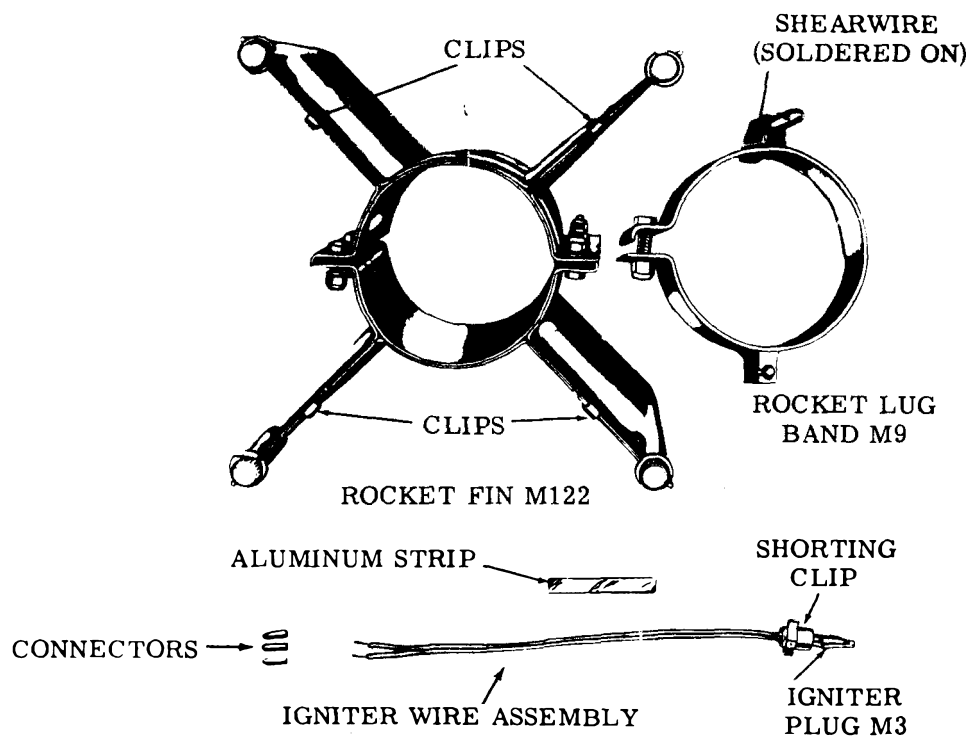


Figure 5-19C. Fin Assembly Kit, M34

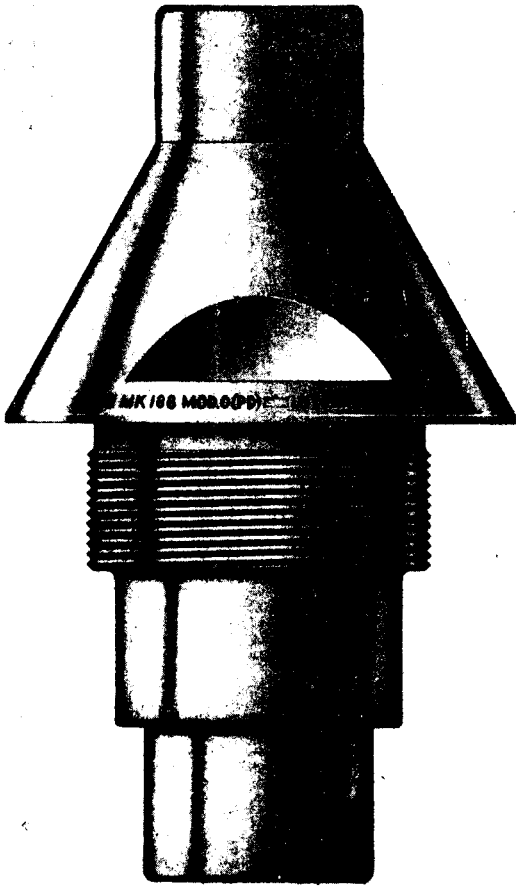
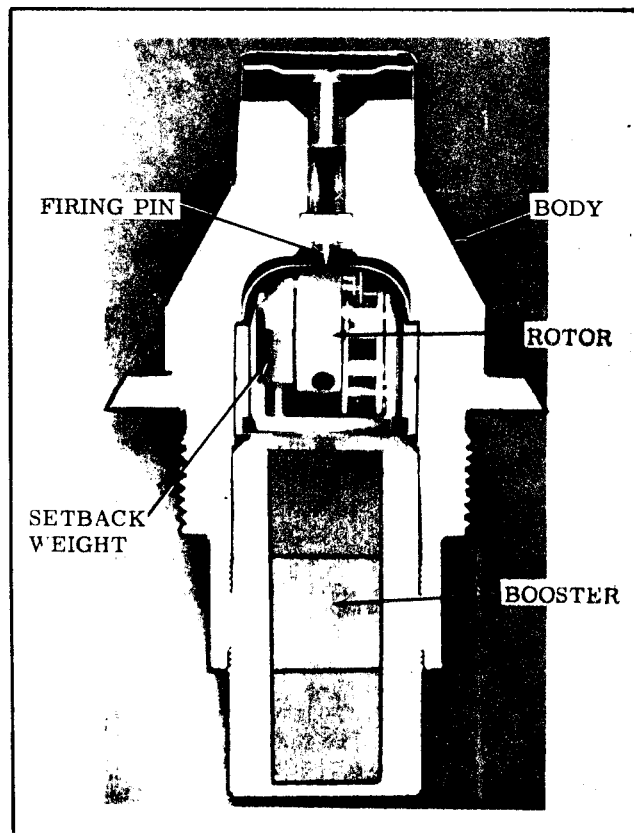


Figure 5-20A. Nose Fuze MK 188 Mod 0

Figure 5-20B. Rocket Nose Fuze,
MK 188, Cutaway View



- c. Rotor rotates to armed position.
- d. Explosive train aligned.
- e. Impact drives firing pin into primer to initiate detonation.

1-38. Type: MK 149 Mod 1, Air-arming (vane), Impact Detonating Fuze (used with MK 25 Mod 1 W/H). The fuze incorporates an out-of-line detonator (reference figures 5-21a and 5-21b).

1-39. Description:

- a. Arming cap on nose.
- b. Small arming vanes under cap.
- c. Steel body.
- d. Two wrench slots.
- e. Fuze uses arming wire.

1-40. Hazardous Components:

- a. Detonator rotor
- b. Lead-in
- c. Booster

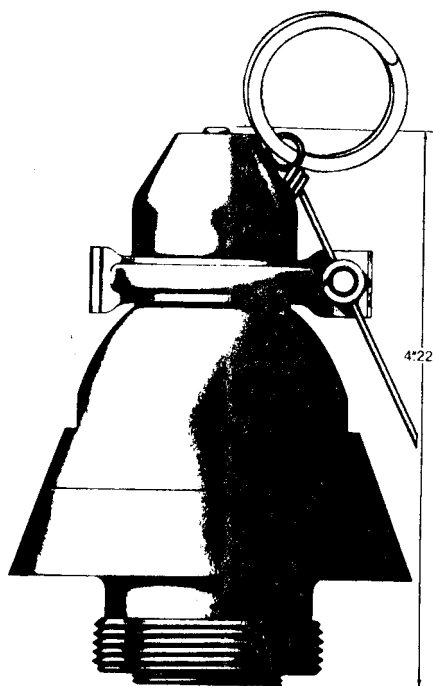
1-41. Operation:

- a. Aircraft power fires rocket motor.
- b. Arming wire withdrawn from fuze.
- c. Cap spring projects cap from fuze.
- d. Vanes rotate and withdraw firing pin from det rotor.
- e. Rocket motor burns out.
- f. Detonator aligns with firing pin.
- g. Impact drives firing pin against detonator.
- h. Detonator function lead-in and booster.

SPECIAL PURPOSE FUZES

1-42. Two more fuzes will be discussed in the classroom. The instructor will cover required information at that time. These fuzes are:

a. MK 191, Base Detonating Fuze. It is an electro-mechanical, acceleration arming impact fuze. This fuze is shipped already installed in the MK 24 warhead only. The fuze contains two arming mechanisms that are the same as those used in the 2.75" rocket fuzes. The forward mechanism contains the out-of-line detonator, and the rear mechanism is inert and is used to electrically arm the fuze. Both of the arming mechanisms must experience sufficient G forces to completely arm the fuze. After proper acceleration, the fuze is explosively and electrically armed (short is removed by the rear arming mechanism). Upon impact with the target, inertia forces cause a magnet to move over a coil inducing sufficient current to fire the detonator.



EXTERNAL

Figure 5-21A. Rocket Nose Fuze MK 149 Mod 1

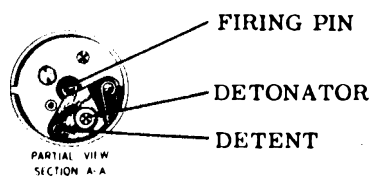
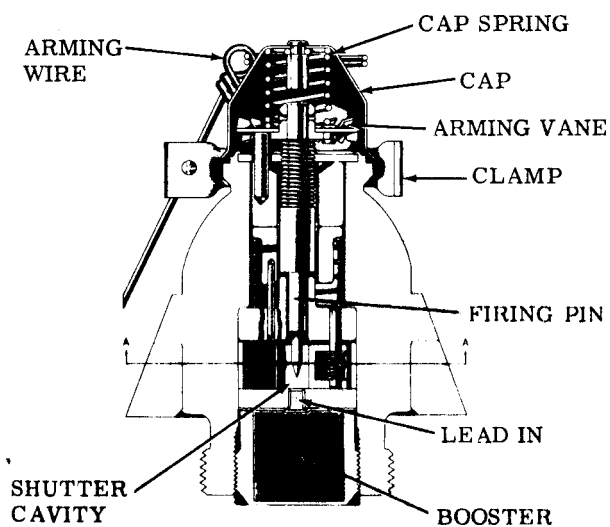


Figure 5-21B. Rocket Nose Fuze, MK149 Mod 1, Cutaway View

b. MK 2061, VT Fuze (reference figures 5-22a, 5-22b, and 5-22c). Designed for use with the 5.0-inch ZUNI rockets and the MK 24 and MK32 warheads. It is especially effective against aircraft. In air-to-air firing, the MK 2061 functions within 40 feet of the target. A near miss, when used with the MK 32 warhead, will kill a heavy bomber.

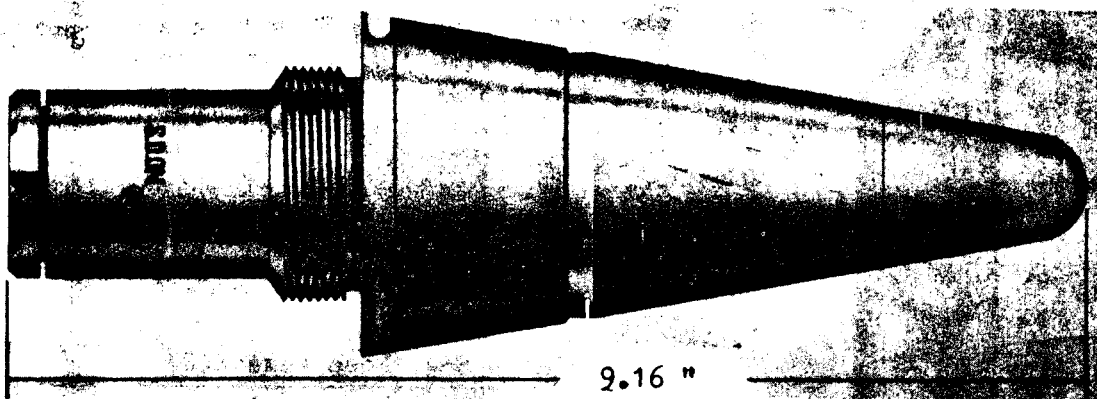


Figure 5-22A. Nose Fuze MK2061, VT.



Figure 5-22B. 5.0 Inch Rocket Head MK24 Mod 0

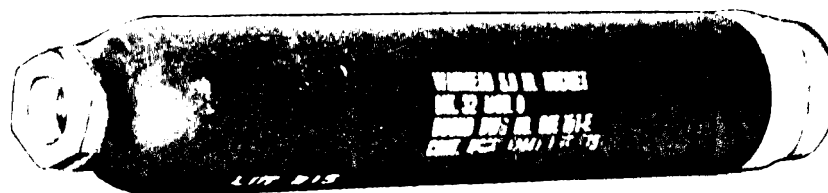


Figure 5-22C. 5.0 Inch Rocket Head MK32 Mod 0

PART TWO

MISSILES (INCLUDING GUIDED WEAPONS)

OBJECTIVES

Upon completion of this instructional unit, you will be able to identify the following missiles to include hazardous component identification and associated safety and rendering safe procedures.

- AIM-4 (Falcon)
- AIM-7 (Sparrow)
- AIM-9 (Sidewinder)
- AGM-12C (Bullpup)
- AGM-45 (Shrike)
- AGM-62 (Walleye)
- AGM-78 (Standard Arm)
- KMV-253 (Guided Bomb)
- KMU-351 (Guided Bomb)

INTRODUCTION

The term guided missile refers to an unmanned vehicle moving above the earth's surface or under water, the trajectory or flight path of which is capable of being altered by a mechanism within the vehicle. The missile usually carries a lethal or useful military warhead.

MISSILE GUIDANCE SYSTEMS

General. As previously mentioned, the difference between a missile and a rocket is that the missile is guided while rockets are free flight. Many different types of guidance systems have been designed in the past few years. However, only those guidance systems used on the missiles to be discussed will be covered. A brief description of these systems and some advantages and disadvantages of each follows.

2-1. Command: In this system, the signals for course correction are received from an external source. The missile "guidance package" usually consists of a receiver, which receives directions from an external source, and causes the control system to execute these commands. A common example of a command type of guidance system is a radio controlled model airplane.

a. Advantages.

(1) The control system for the missile is not destroyed each time the missile is fired.

(2) Reliable and simple.

b. Disadvantages.

(1) Usually, only one missile at a time may be employed in the grid.

(2) Accuracy decreases with range.

(3) Very susceptible to ECM.

2-2. Passive Radar Homing: This type of guidance is very effective against ground targets which emit radar signals. The system picks up a signal directly from the ground station, locks-on, and flies a path directly to the source of the radar transmission.

a. Advantages.

- (1) Accuracy increases as the missile approaches the target.
- (2) Forces enemy to shut down a radar site or risk losing it.

b. Disadvantages. Unless a memory circuit has been built in, the missile becomes unguided if the target ceases transmission.

2-3. Active Radar Homing (ARAH): This type of guidance system has its own transmitter and receiver. The guidance unit is locked-on to the target prior to launch and remains so until impact. The radar transmitter transmits a signal, and the receiver picks up a reflection of this signal and converts it into voltage to make course corrections. An ARAH system is most effective against high-speed, airborne targets.

a. Advantages.

- (1) Launching aircraft can "launch and leave."
- (2) Very accurate.

b. Disadvantages.

- (1) Susceptible to ECM.
- (2) Complex system.
- (3) Relatively expensive.

2-4. Semi-Active Radar Homing (SARAH): This system is basically the same as ARAH except that it does not have its own radar transmitter. The radar transmitter for this system is at the launching point which may be either aircraft or ground. The missile has a receiving unit which picks up a signal which is reflected from the target by the transmitter at the launching point. When the launch platform is an aircraft, the aircraft must maintain a course which will allow its radar to continually illuminate the target throughout the guidance phase.

a. Advantages.

- (1) Accuracy.
- (2) Small size.

b. Disadvantages.

- (1) Launching aircraft must stay locked-on until detonation.
- (2) Susceptible to ECM.

2-5. Passive Infrared (IR): This type of guidance unit, sometimes referred to as heat seeking, homes in on the infrared emanating from the heated surfaces of enemy airborne targets. After launch, the guidance unit needs no direction from any external source as it computes and corrects for launching errors and target maneuvers. The infrared radiation is detected and translated into voltage changes to provide error signals for target interception.

a. Advantages.

- (1) High degree of accuracy.
- (2) Launch and leave system.
- (3) Relatively inexpensive.

b. Disadvantages.

(1) Limited range.

(2) Unsophisticated systems can be led astray by locking on to the sun, flares, etc.

2-6. TV Guidance: With this system, the pilot is able to launch a highly accurate weapon from points outside the range of enemy anti-aircraft weapons. The guidance system is basically a television camera and various other components which transmit closed circuit television signals to a display circuit in the aircraft and to a computer in the missile. With this system, the pilot merely aligns the target on a display screen and fires the missile. The guidance system then keeps the missile on target until impact.

a. Advantages.

(1) Extremely accurate.

(2) Relatively long range.

(3) Relatively inexpensive.

b. Disadvantages.

(1) Cannot be used at night against a dark target.

(2) Used only against stationary or slow moving ground targets.

2-7. Laser Guidance: In this system, the guidance and control unit is made up of a laser illumination detector, a computer, a guidance control, and a wing canard assembly. The laser illumination detector picks up reflected laser energy (usually provided by a second aircraft) from the target and transmits this energy to the computer. The computer performs the electronic processes which develop the command signals and converts them into drive signals which operate wing steering solenoids.

The laser guided bomb is used in the same manner and against the same type targets as conventional unguided bombs. When dropped, the weapon flies an unguided (ballistic) path towards the target just as does the conventional bomb. The ballistic flight continues until reflected energy from the illuminated target is strong enough to activate the guidance system. When activated, the guidance unit senses this energy and translates it into steering commands for the canards. Since the weapon was originally dropped on a ballistic path to the target, the guidance system has to make only final course-type corrections. If the guidance system malfunctions, the weapon should still impact close enough to the target to cause considerable damage.

The laser guided bomb has no electrical connections with the aircraft; therefore, no monitoring or controlling of the bomb is possible from the cockpit. A thermal battery supplies the electrical power to the guidance section, and a gas grain generator supplies pneumatic power to operate the canards. An arming wire is threaded to a thermal battery firing device which activates the battery upon release. An M-905 tail fuze and an FMU-26/B or A/B fuze, installed through the adapter fairing into the nose well, are used to detonate the bomb upon impact.

SPECIFIC MISSILES

AIM-4A and 4D. These are commonly called Falcons. They are air-to-air guided missiles, the AIM-4A using semi-active radar and the AIM-4D using passive infrared homing guidance. Both missiles are capable of high altitude operation and can be launched from aircraft flying at speeds up to mach 1.5 (reference figures 5-23 and 5-24).

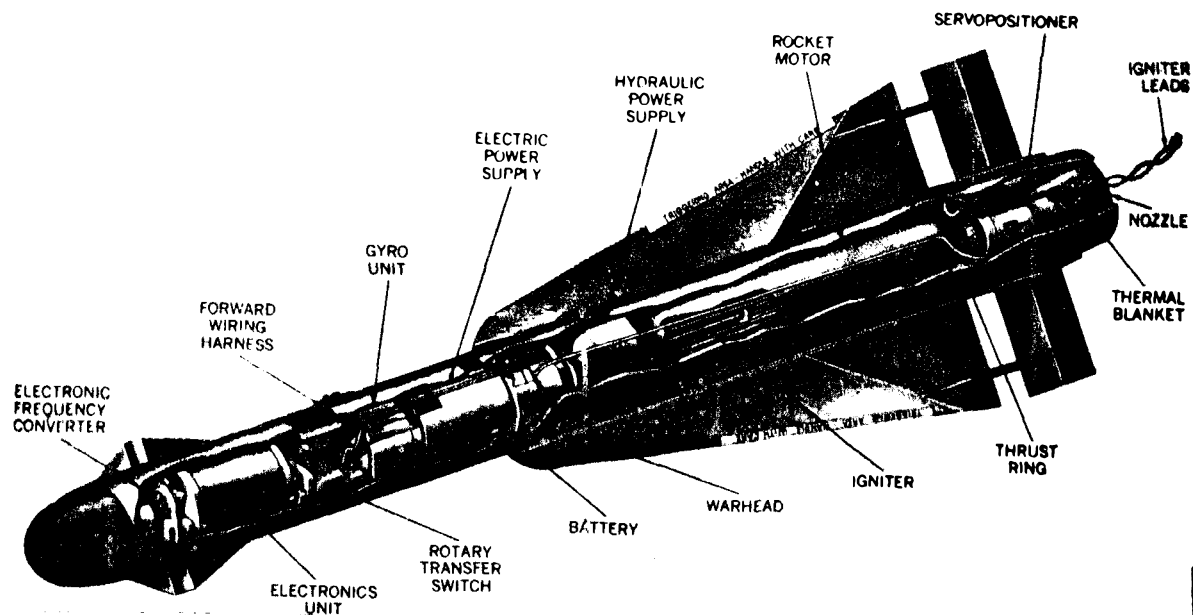


Figure 5-23. Partial Cutaway View of the AIM-4A, showing the general arrangement of components within the fuselage.

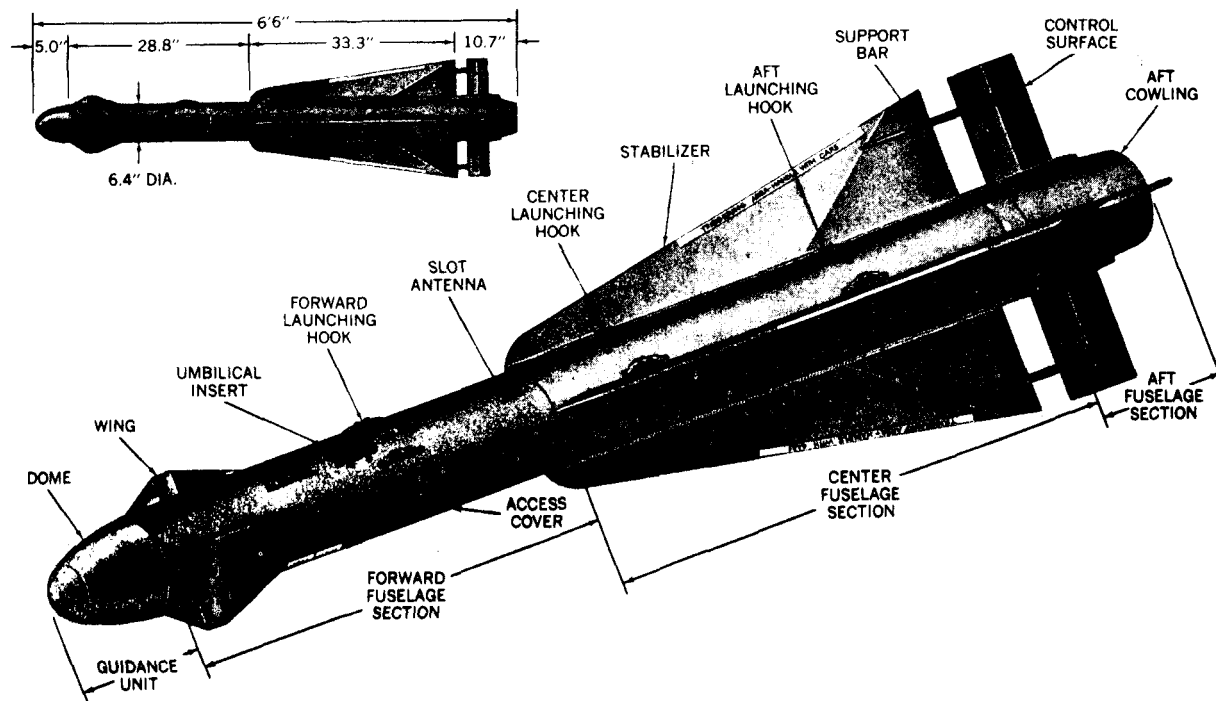


Figure 5-24. Dimensional characteristics and external appearance of the AIM-4D.

2-8. Identification:

- a. Weight: approximately 130 pounds.
- b. Length: 6' 6", diameter 6.4".
- c. Four small wings equally spaced on the forward fuselage section.
- d. Four large stabilizers with attached fins on the center and aft fuselage section.
- e. AIM-4A: Dark brown radome.
- f. AIM-4D: Transparent radome with cooling assembly outlets on the forward fuselage section.
- g. Orange in color.

2-9. Hazardous Components of the Guidance System:

- a. Hydraulic reservoir.
 - (1) Forward part of center fuselage.
 - (2) Squib-activated.
 - (3) Provides power for control surfaces.
- b. Wet cell battery.
 - (1) Aft part of center fuselage.
 - (2) Squib activated.
 - (3) Provides missile electrical power.
- c. Argon reservoir: AIM-4D.
 - (1) Forward part of center fuselage.
 - (2) Squib activated.
 - (3) Provides coolant for guidance unit.

2-10. Hazardous Components of the Warhead System:

- a. Warhead (reference figure 5-25).
 - (1) Blast type, 2.5 pounds HBX.
 - (2) Forward part of center fuselage section at the junction.
- b. Fuze: Inside recess in warhead.
 - (1) Operates on contact when metallic strips in leading edge of stabilizers are broken.
 - (2) Self-destruct operates when clockwork runs down (25 seconds after launch).

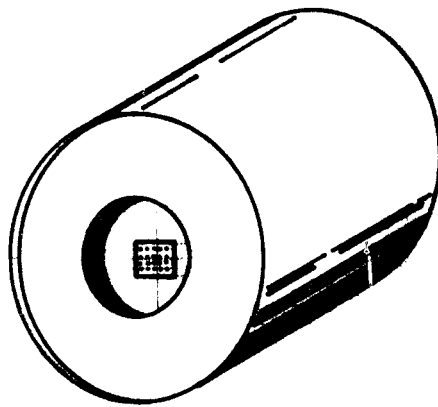


Figure 5-25. AIM-4 Warhead

2-11. Hazardous Components of the Propulsion System:

- a. Rocket motor (reference figure 5-26).
 - (1) Solid propellant.
 - (2) Thirty one pounds, aft fuselage section.
- b. Igniter (reference figure 5-26).
 - (1) Removable, flash powder type.
 - (2) Two squib activation.
 - (3) Access, aft section of motor.

AIM-4F and 4G. These are often referred to as Super-Falcons. They are air-to-air guided missiles with the AIM-4F using semi-active homing and the AIM-4G using passive infrared homing guidance. Both missiles are capable of high altitude operation and can be launched from aircraft flying at speeds up to mach 1.5 (reference figure 5-27).

2-12. Identification:

- a. Weight: approximately 148 pounds.
- b. Length: 6'10", diameter 6.6".
- c. Super-Falcons do not have wings on forward fuselage.
- d. Four lengthened stabilizers, extending onto forward fuselage with attached movable control surfaces.
- e. Modified sleeve over forward fuselage.
- f. Viewing port at sleeve junction on aft part of forward fuselage.
- g. AIM-4G: Blueish glass colored dome with two exhaust ports at the fuselage and guidance junction.
- h. AIM-4F: White fiberglass dome (may or may not have an arrow-shaped metal probe) (reference figure 5-28).
- i. Orange in color except for sealing sleeve which is white.

2-13. Hazardous Components of the Guidance System:

- a. Hot gas generator: Forward of missile motor, provides hydraulic and electrical power.
- b. Argon reservoir: Behind the radome, provides coolant for the guidance system.

2-14. Hazardous Components of the Warhead System:

- a. Warhead: Blast type, 7.1 pounds HE. Rear section of forward fuselage (reference figure 5-29).
- b. Fuze: Aft of warhead, operates by contact or clockwork (SD) (reference figure 5-29).

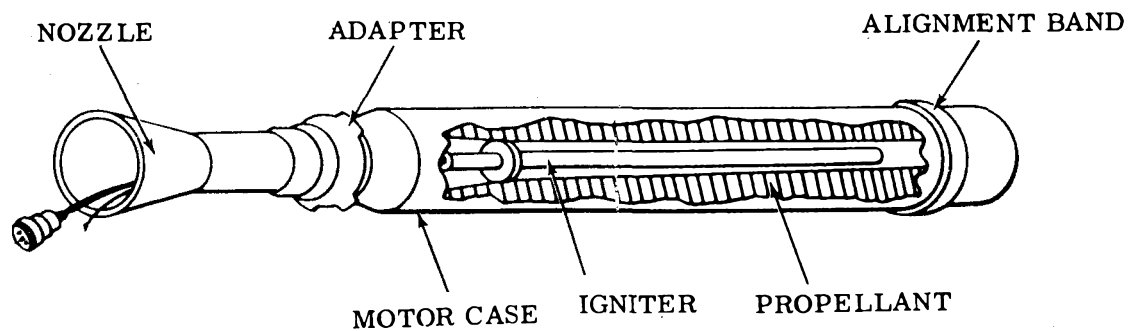


Figure 5-26. AIM-4 Rocket Motor and Igniter

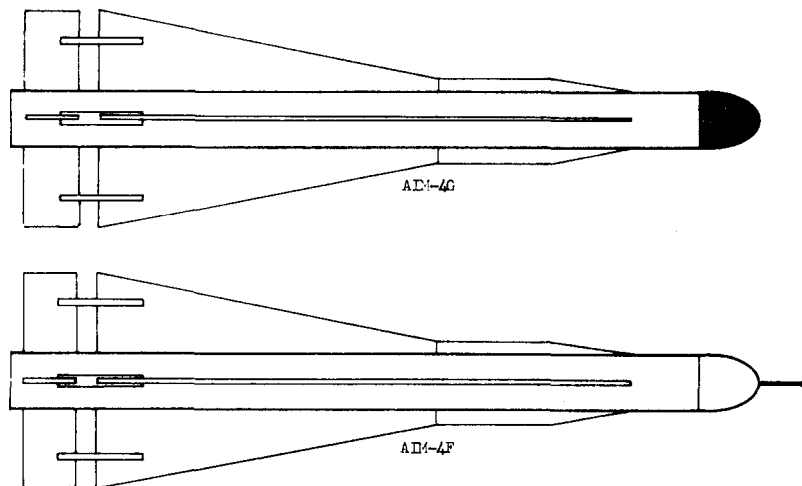


Figure 5-27. AIM-4G and AIM-4F

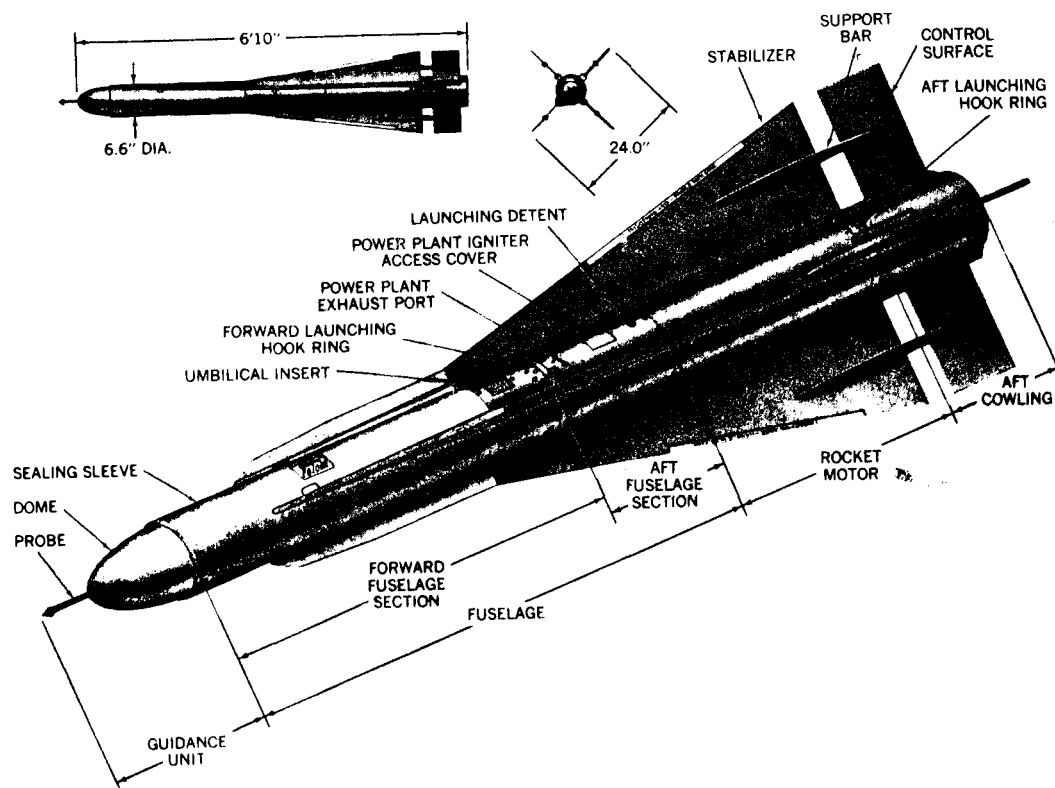


Figure 5-28. Dimensional characteristics and external appearance of the AIM-4F

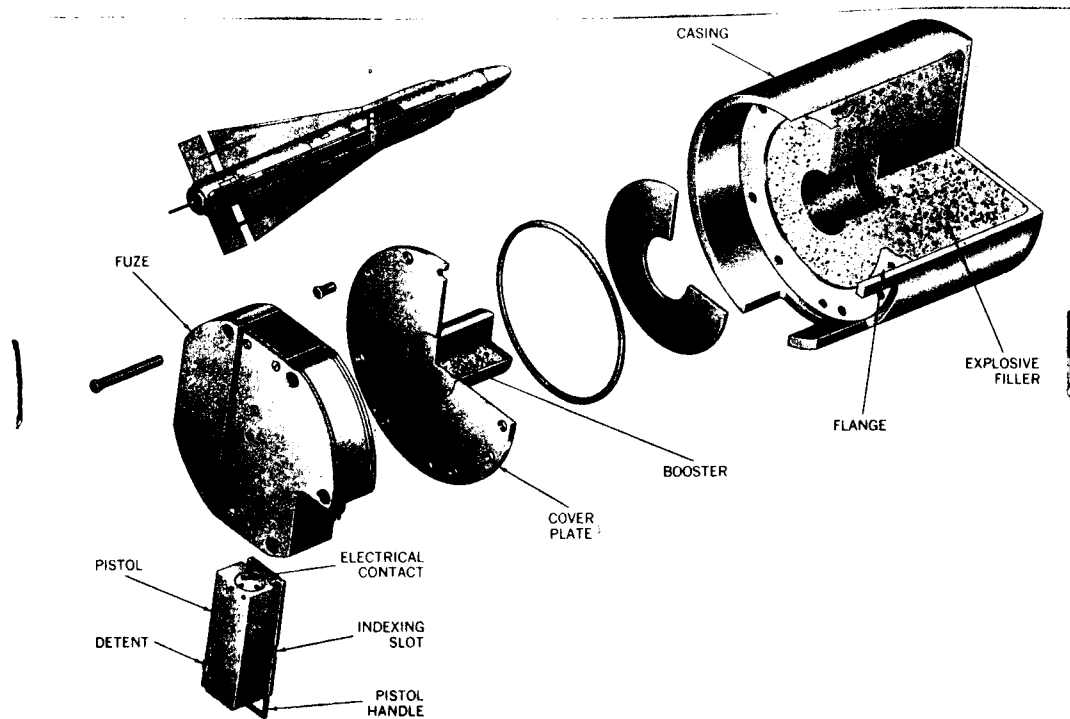


Figure 5-29. Warhead and Fuze for AIM-4F and AIM-4G

c. Pistol: Mates to fuze and is removable. Contains a detonator which detonates warhead. Window show red "A" indicates armed; green "S" indicates safe (reference figure 5-29).

2-15. Hazardous Components of the Propulsion System:

a. Rocket Motor: Aft fuselage, solid propellant, 2-stage weighing approximately 26 pounds.

b. Igniter: Permanently installed, with quick release at aft end.

AIM-7D and E (Sparrow). The AIM-7 is an air-to-air boostglide weapon employing semi-active radar homing guidance. The missile body consists of three major sections connected by no-lead interrupted threads. These sections are the guidance section, warhead section, and propulsion section. The warhead fires on proximity to the target or on contact with the target. The missiles are launched from F4 aircraft (reference figures 5-30 and 5-31).

2-16. Identification:

a. Weight: Approximately 400 pounds.

b. Length: 12', diameter 8".

c. Color: White, except for the unpainted radome.

d. Two-inch yellow band on the warhead with type of HE in black.

e. Four movable fins mid-section for guidance and four painted tail fins (removable).

2-17. Hazardous Components of the Guidance System:

a. Gas powered unit: (GPU-Hot Gas Generator) located in the target seeker section, provides hydraulic power for target seeker.

b. Electrical power unit: (EPU-Hot Gas Generator) located in the auto-pilot section, provides missile electrical power.

c. Hydraulic accumulator: Located in the wing control section, provides power to operate wings.

2-18. Hazardous Components of the Warhead System:

a. Warheads: Approximately 69 pounds (reference figure 5-32).

(1) MK 18 Mod 0: Approximately 14.5 pounds HE.

(2) MK 38 Mod 0: Approximately 20 pounds HE.

b. Safety and Arming Device (S&A) (reference figure 5-33): Detonates warhead by proximity or impact crystals in the triggering device and is located in the forward part of warhead.

(1) Booster-tetryl.

(2) Two electric detonators and two explosive leads.

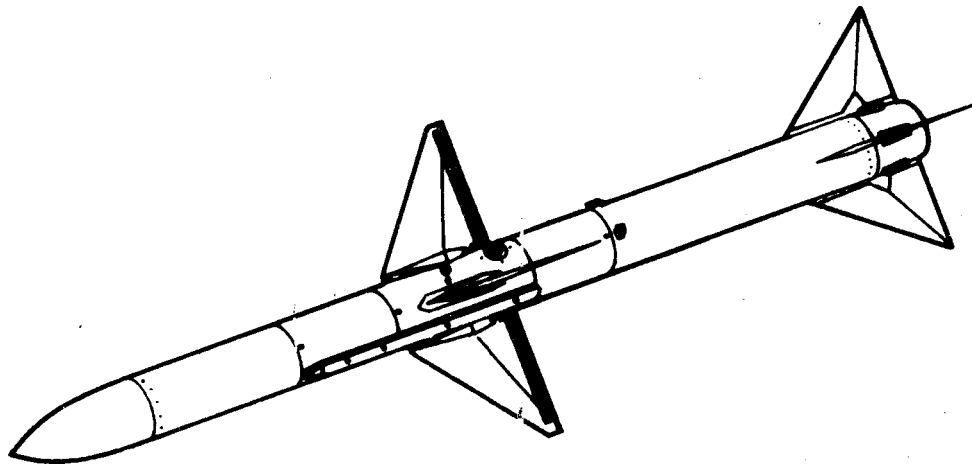


Figure 5-30. External Configuration of AIM-7

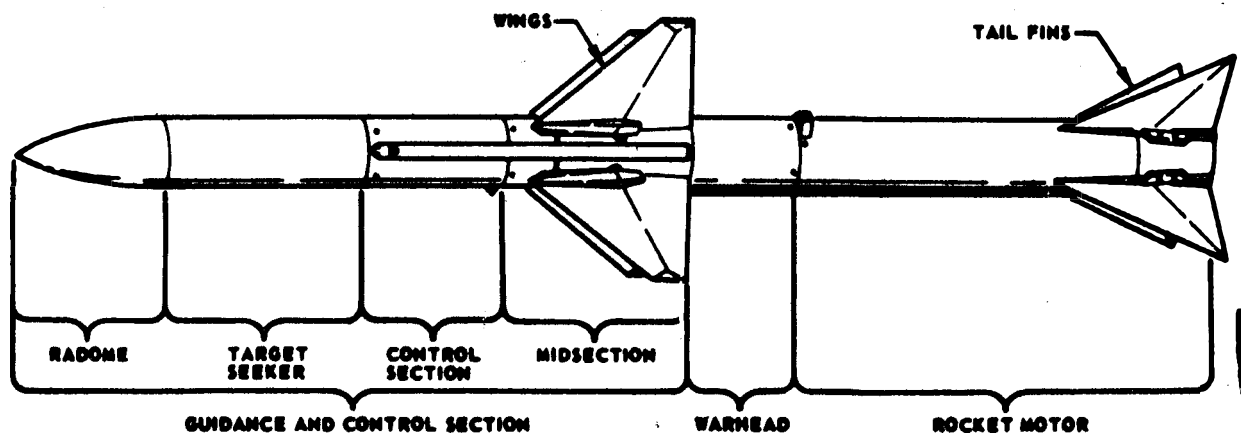


Figure 5-31. AIM-7D/E Missile Sections.

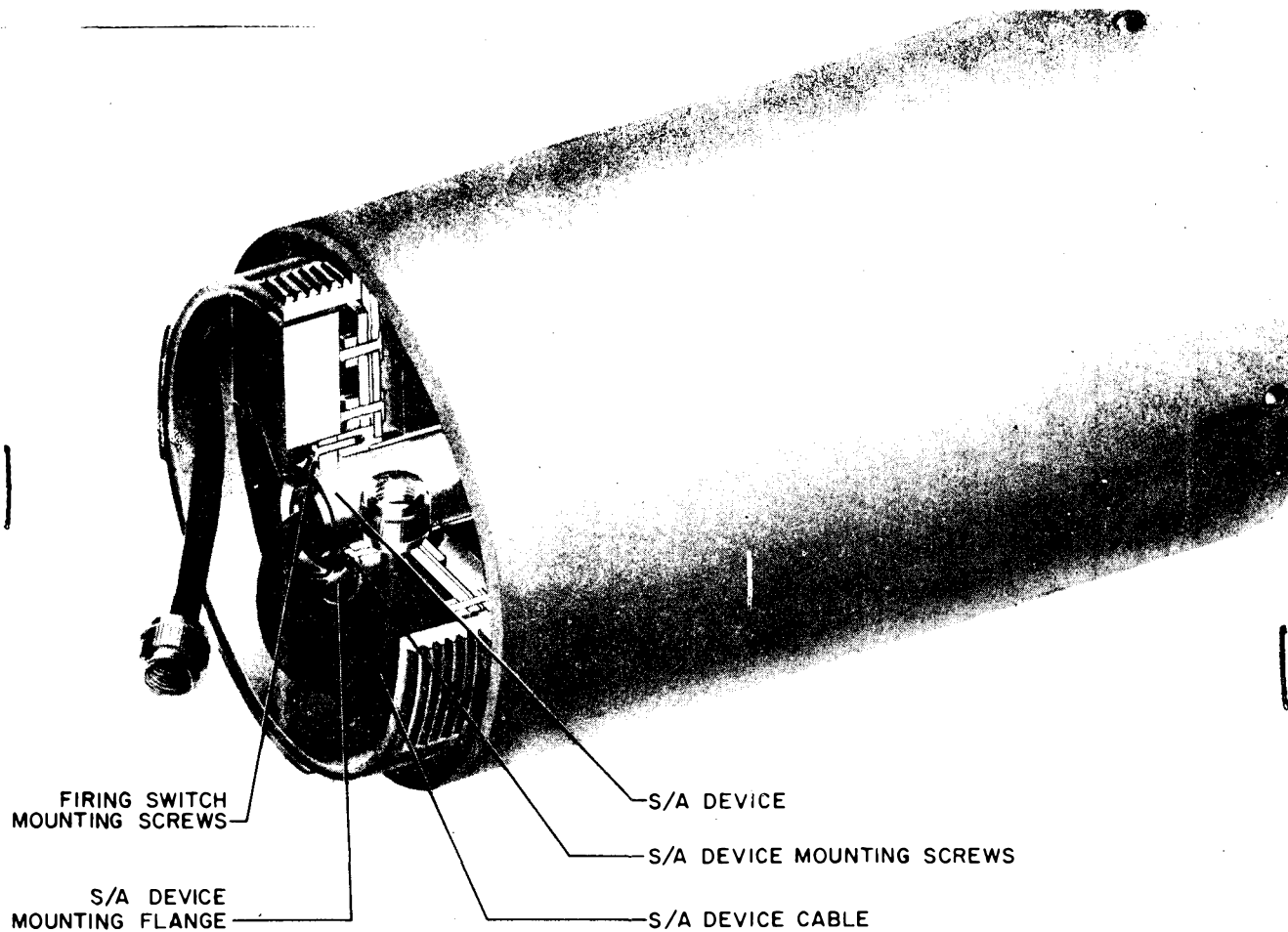


Figure 5-32. Warhead, MK18 Mod 0 and MK38 Mod 0

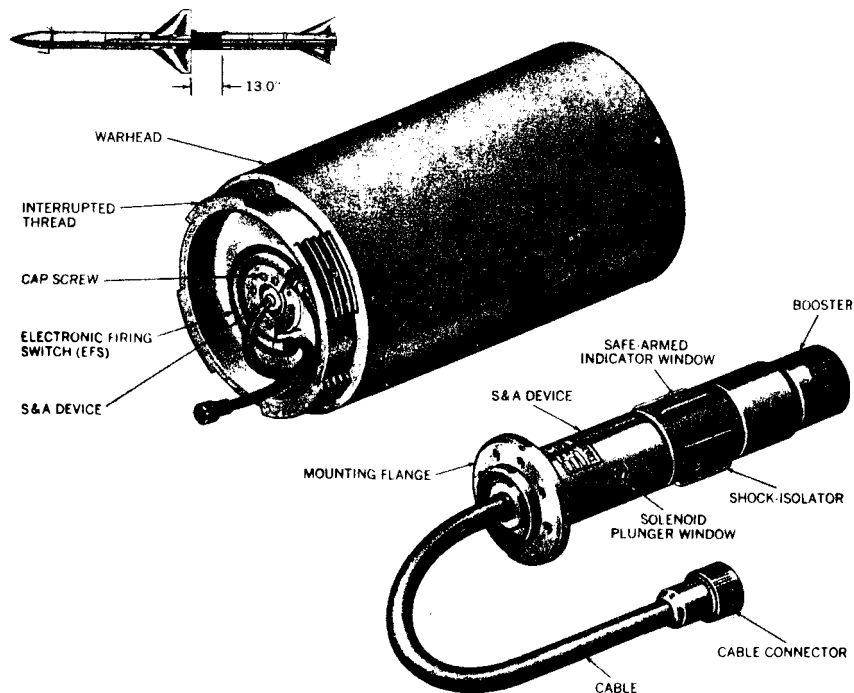


Figure 5-33. Typical warhead, EFS, and S and A device (U).

2-19. Hazardous Components of the Propulsion System:

a. Rocket Motors.

(1) AIM-7D: Approximately 70 pounds solid propellant with MK 6 rocket motor.

(2) AIM-7E: Approximately 90 pounds solid propellant MK 38 and MK 52 rocket motors (reference figure 5-34).

b. Igniters.

(1) MK 258: Used with the AIM-7D and the MK 6 motor. It is safed by an electrical save/arm switch which is packed separately and must be attached to the forward end of the motor prior to igniter installation. The arm/safe switch safes the igniter by interrupting the igniter firing circuit (reference figure 5-35).

(2) MK 265: Used with the AIM-7E and the MK 38 rocket motor. The rotor assembly can be rotated 90° relative to the body to provide a positive mechanical safing capability by moving the initiating charges out of line with the primary charges. The MK 265 is shipped installed in the MK 38 motor. An arming key or actuator is used to move the igniter from safe to armed and back (reference figures 5-36 and 5-37).

AIM-9B (Sidewinder). The AIM-9B is a supersonic, air-to-air guided missile designed to be launched from an externally mounted rail-type launcher. It uses an infrared guidance system which detects and homes in on the infrared radiation given off from an aircraft (reference figures 5-38 and 5-39).

2-20. Identification:

a. Weight: Approximately 158 pounds.

b. Length: 9', diameter 5".

c. Color: White, with transparent nose section.

d. Four fixed fins and four rollerons, aft on the rocket motor for stabilization

e. Four movable fins, forward on the Guidance and Control (G&C) section for guidance.

f. Umbilical cable on the G&C section.

g. Two electrical contacts on the forward suspension lugs.

2-21. Hazardous Components of the Guidance System:

a. Gas Generator: Located in the G&C section. Electrically ignited solid grain propellant. Provides electrical power and pneumatic power for operating the control surfaces (reference figure 5-40).

b. Mercury Thallium: Used as a lubricant in the guidance system.

2-22. Hazardous Components of the Warhead System (W/H):

a. Warhead (W/H): A 25-pound fragmentation type, located aft of the G&C unit. (reference figure 5-41).

b. Contact Fuze: Detonates W/H on contact. Located aft of the G&C unit with a booster that extends into the center of the W/H (reference figure 5-42).

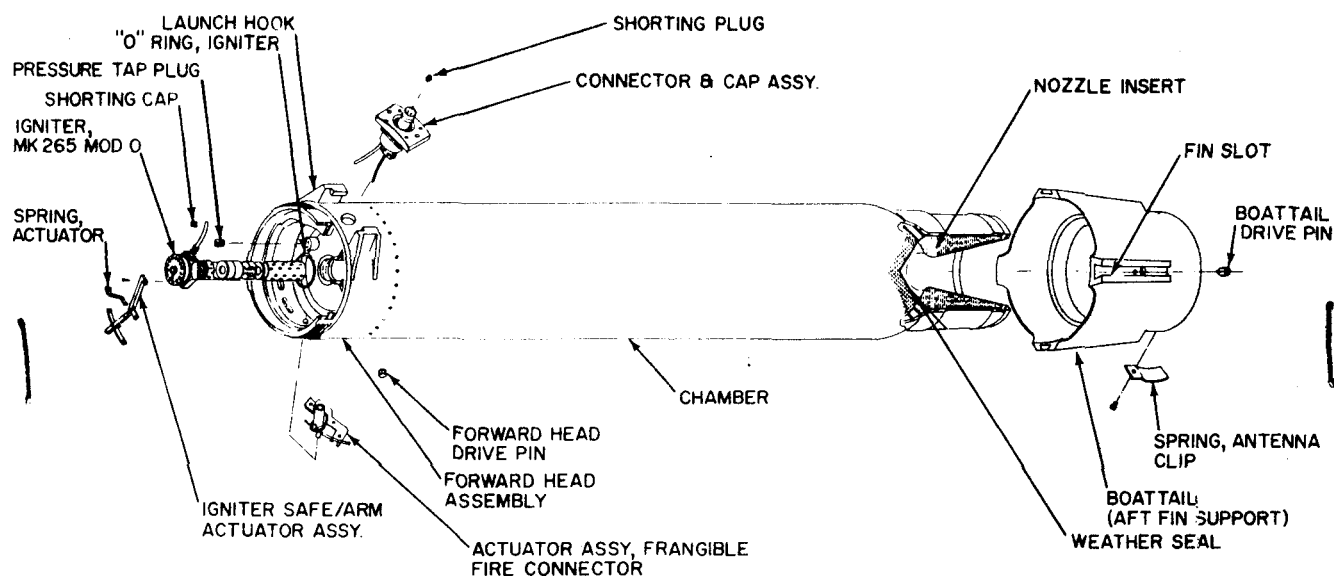


Figure 5-34. Rocket Motor, MK38 All Mods, Cutaway View

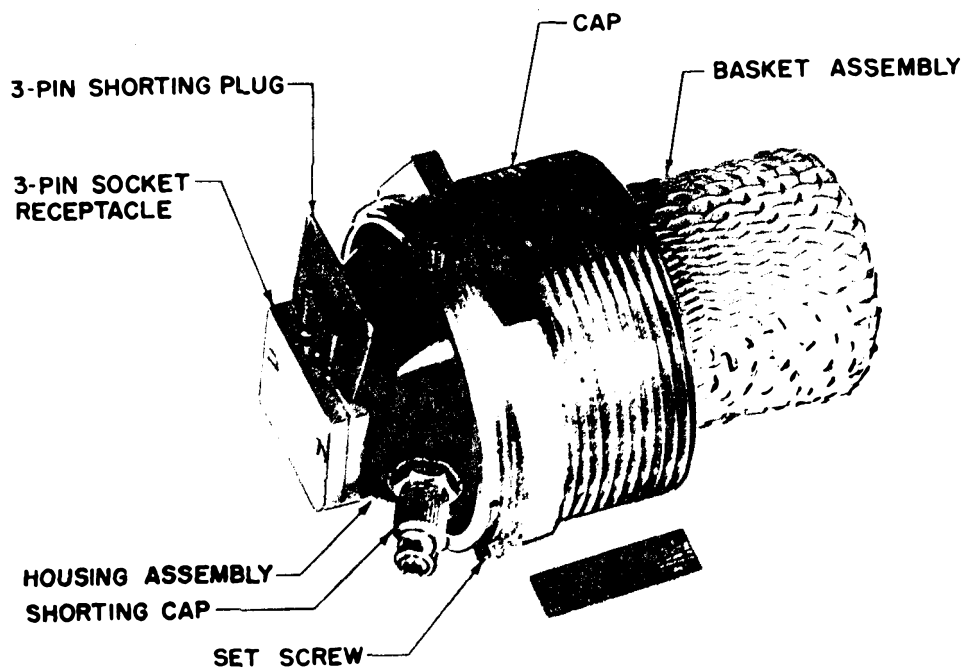


Figure 5-35. Igniter, MK 258 Mod 0

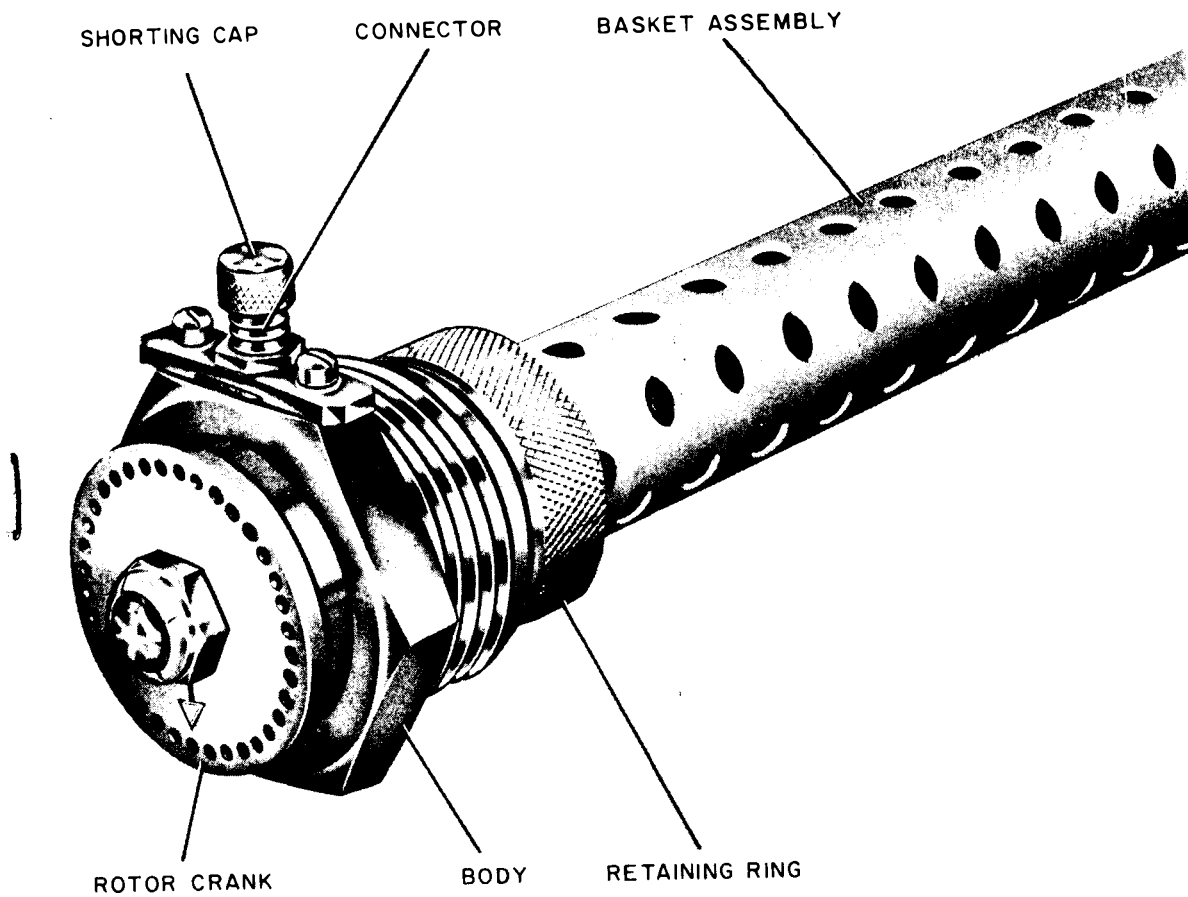


Figure 5-36. Igniter, MK 265 Mod 0

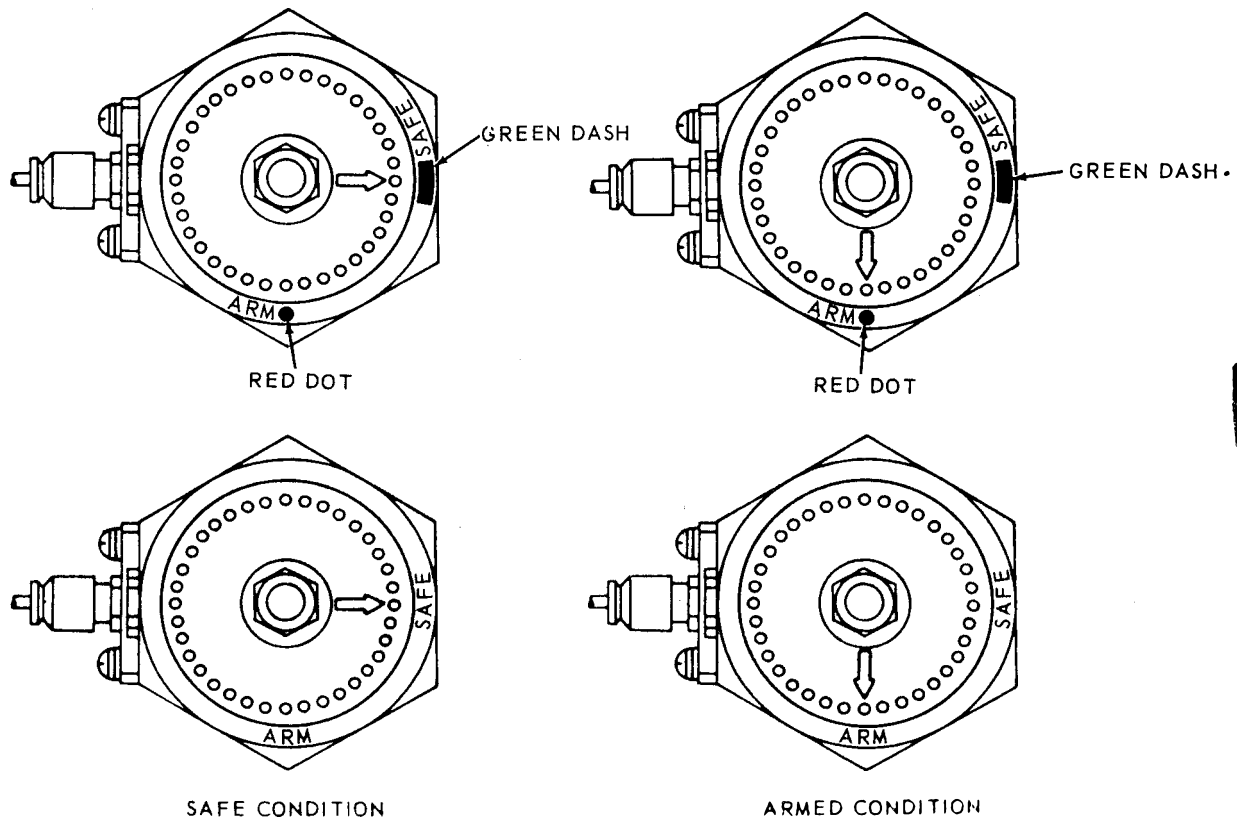


Figure 5-37. Mk 265 Igniter SAFE/ARM Indications

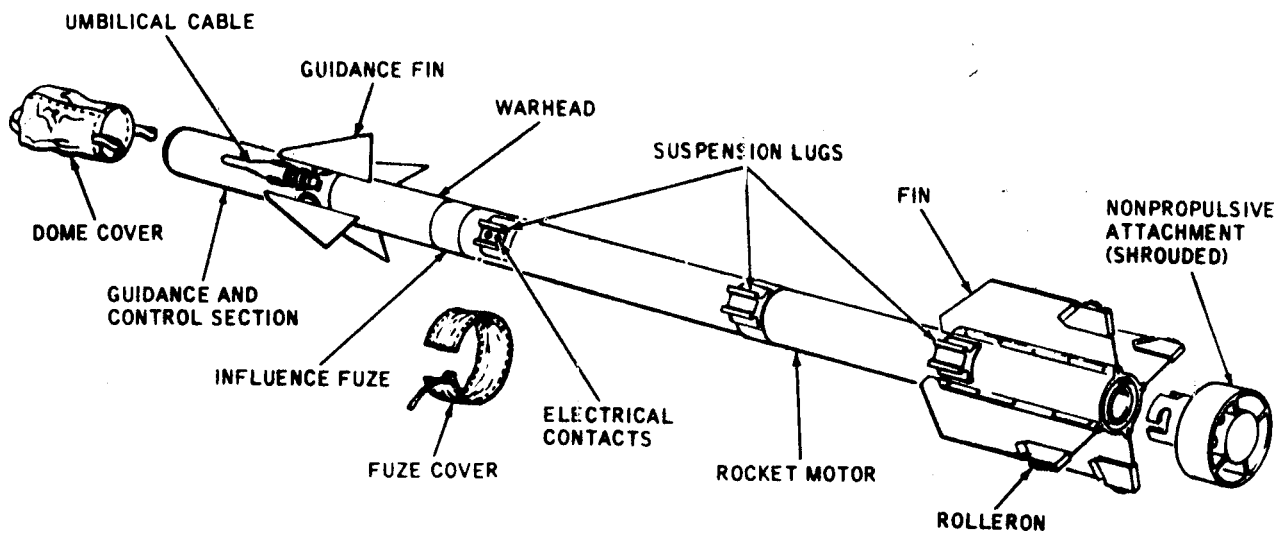


Figure 5-38. External Configuration AIM-9B Missile

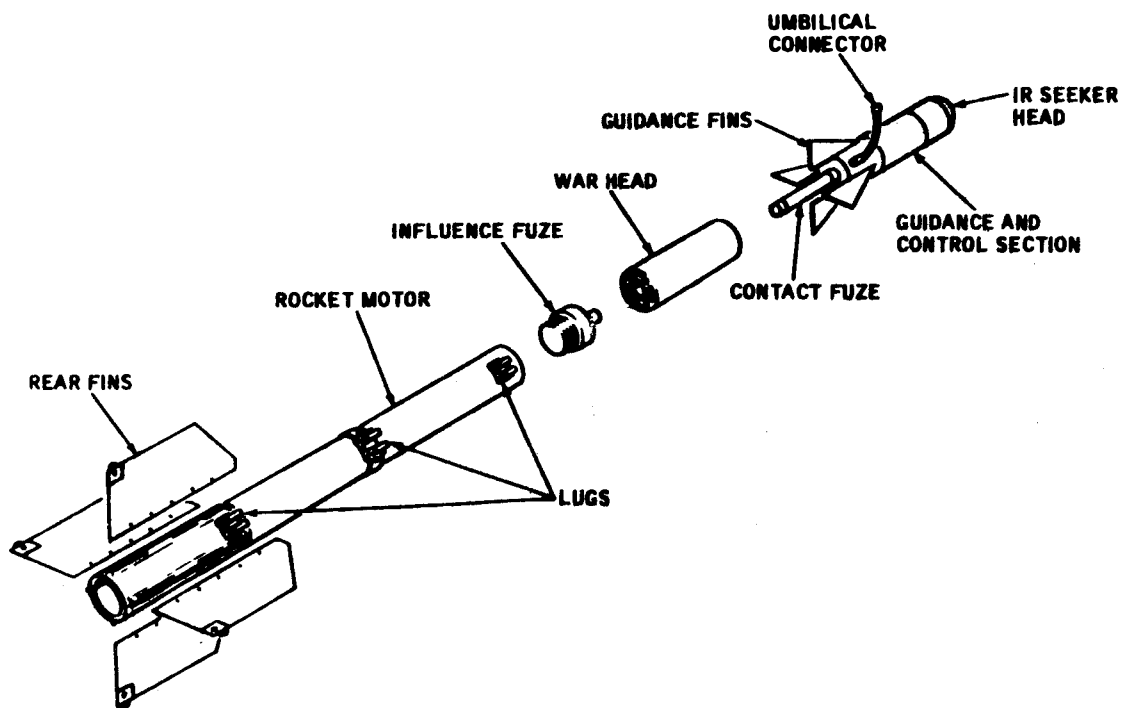


Figure 5-39. AIM-9B Missile Sections

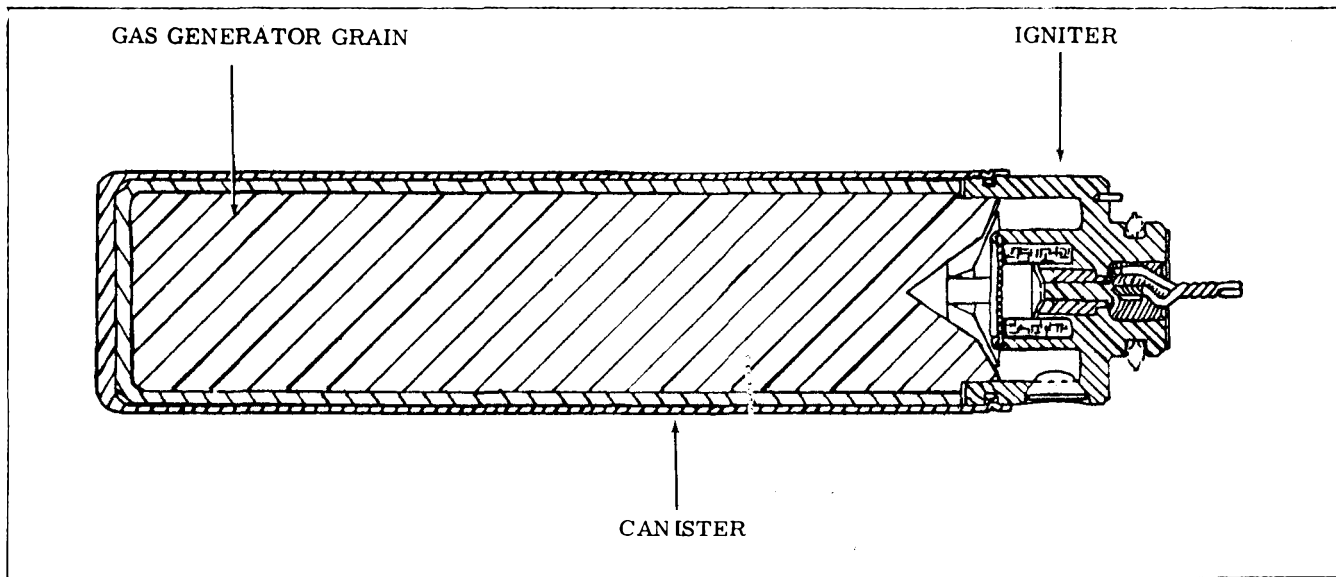


Figure 5-40. Gas Generator

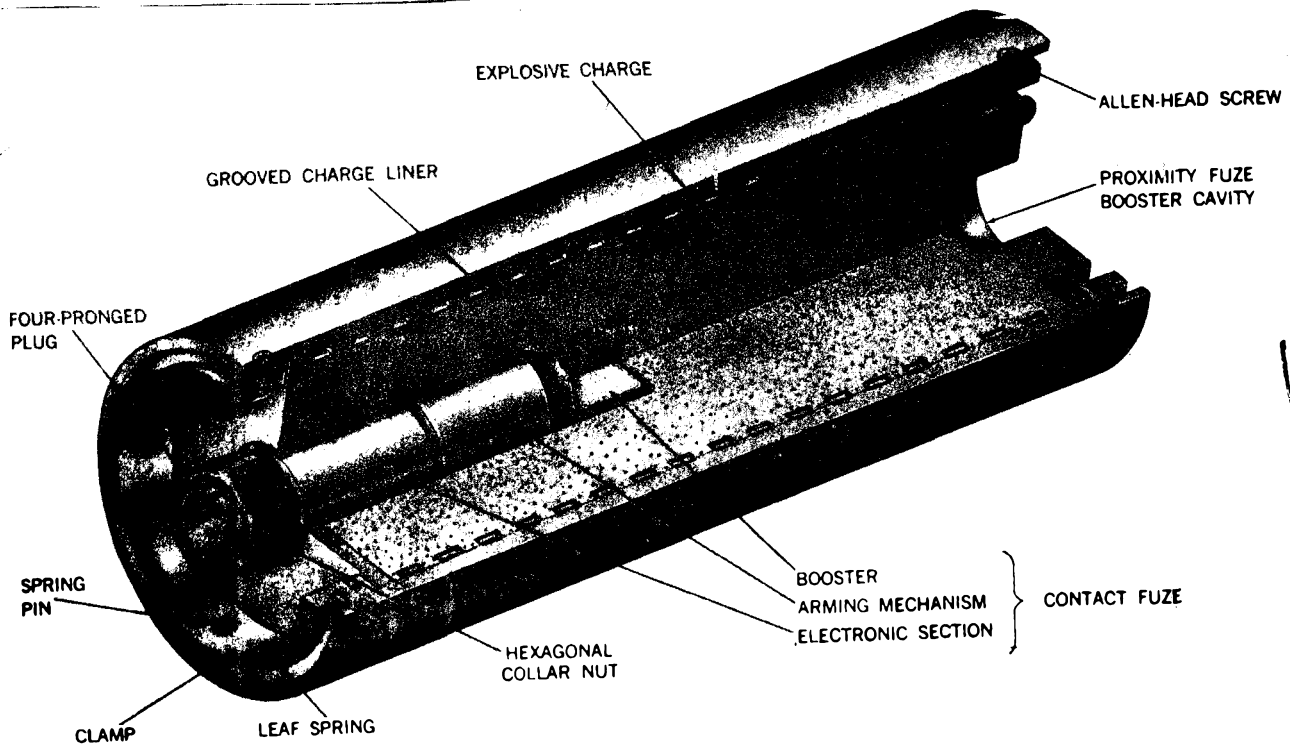


Figure 5-41. Cutaway view of warhead with contact fuze in place

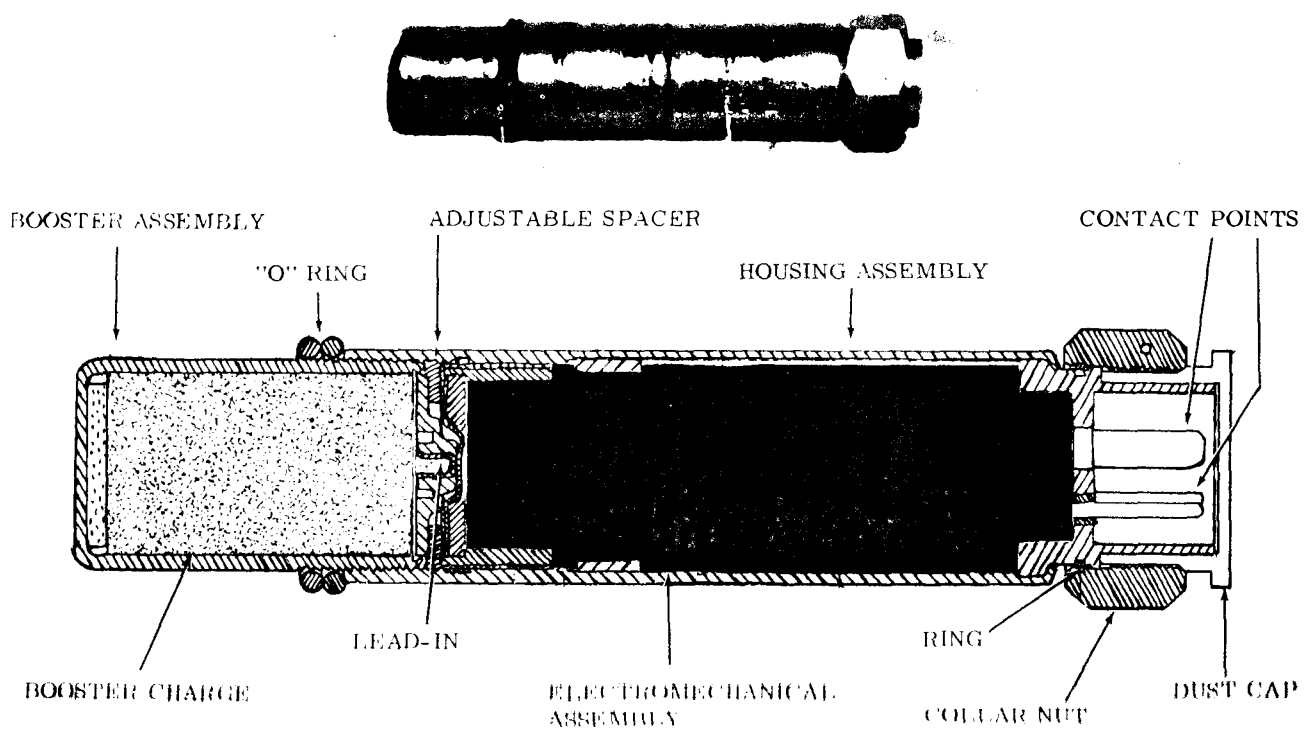


Figure 5-42. Contact Fuze

c. Influence Fuze: Detonates W/H when missile is within its range. Loss of power will destroy the W/H 30 seconds after launch. Located between the W/H and the rocket motor. Initiated by the forward contact button on the forward motor hangar (reference figure 5-43).

2-23. Hazardous Components of the Propulsion System:

a. Rocket Motor: A solid propellant motor weighing approximately 43 pounds (reference figure 5-44).

b. Igniter: Permanently installed in the forward section of the rocket motor. Ignited by the rear contact button on the forward motor hangar.

2-24. Non-Propulsion Attachment: This device is placed on the missile to prevent it from going propulsive in the event of accidental firing or stray voltage. It is utilized when aircraft are on alert status (reference figure 5-45).

2-25. Shorting Clip: This device prevents accidental firing of the missile due to stray voltage during down-loading or during storage (reference figure 5-46).

AIM-9C and D (Sidewinder). Air intercept guided missiles employing semi-active radar or passive infrared guidance, commonly called Irah and Sarah missiles (reference figure 5-47).

2-26. Identification:

a. Weight: AIM-9C approximately 192 pounds, and AIM-9D approximately 180 pounds.

b. Length: Approximately 9', diameter 5".

c. Four fixed fins with rollerons aft on motor.

d. Four movable fins on G&C unit.

e. Irah: Transparent nose dome.

f. Sarah: Radome type nose section.

2-27. Hazardous Components of the Guidance System:

a. Hot Gas Generator: Solid propellant for electrical power and power for control fins. Located in the G&C section.

b. Mercury Thallium: Used to lubricate guidance system.

2-28. Hazardous Components of the Warhead System:

a. Warhead: Fragmentation type, weighing approximately 25 pounds.

b. Safe and Arming Device (S&A): The S&A detonates the W/H upon a signal from the proximity fuze device or from contact. The missile will self-destruct after burn out of the gas generator.

2-29. Hazardous Components of the Propulsion System:

a. Rocket Motor: A solid propellant case bonded motor weighing approximately 60 pounds.

b. Igniter: Permanently installed for rocket motor ignition.

Figure 5-43. Influence Fuze

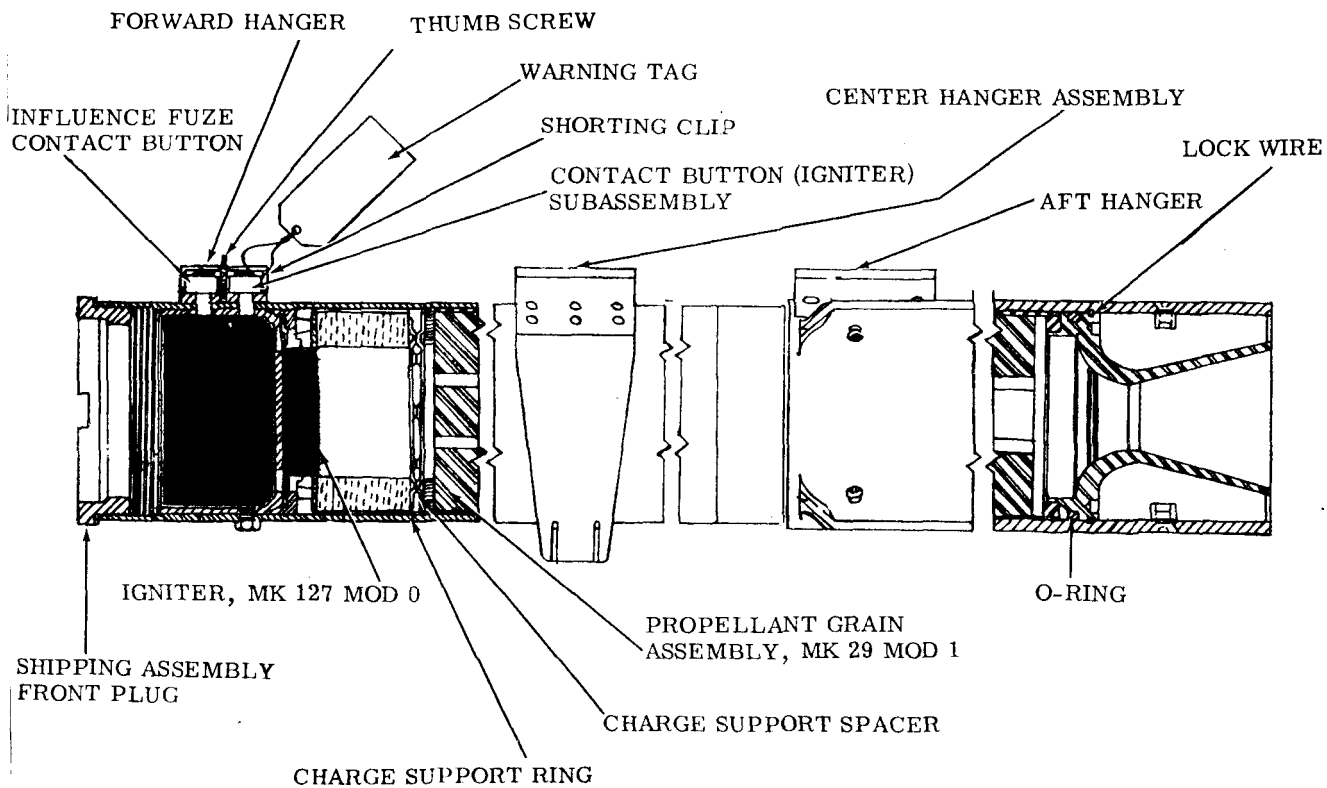
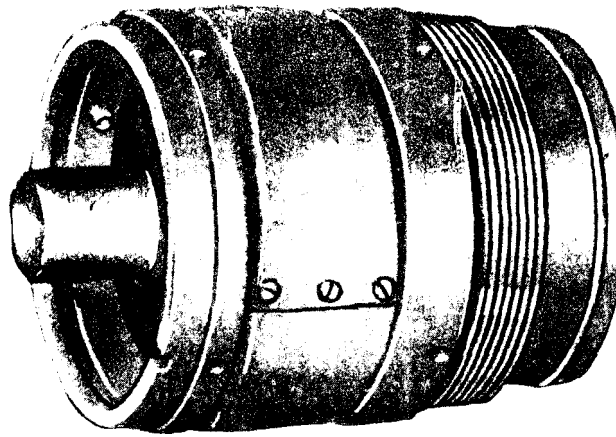


Figure 5-44. Rocket Motor, MK 17 Mod 1, Cutaway View

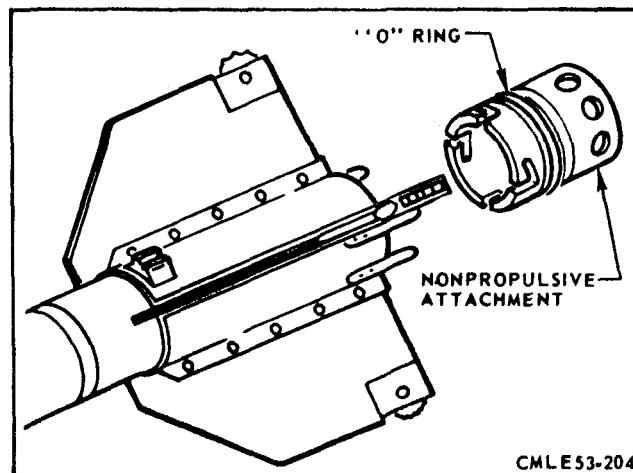


Figure 5-45. Non-propulsion Attachment for AIM-9B

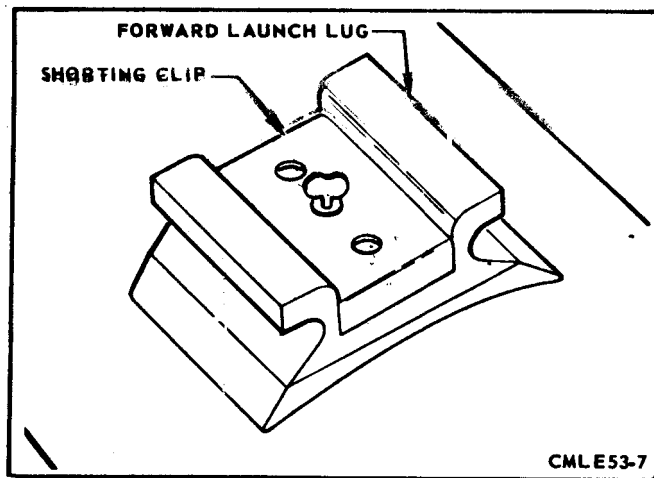


Figure 5-46. Shorting Clip for AIM-9B

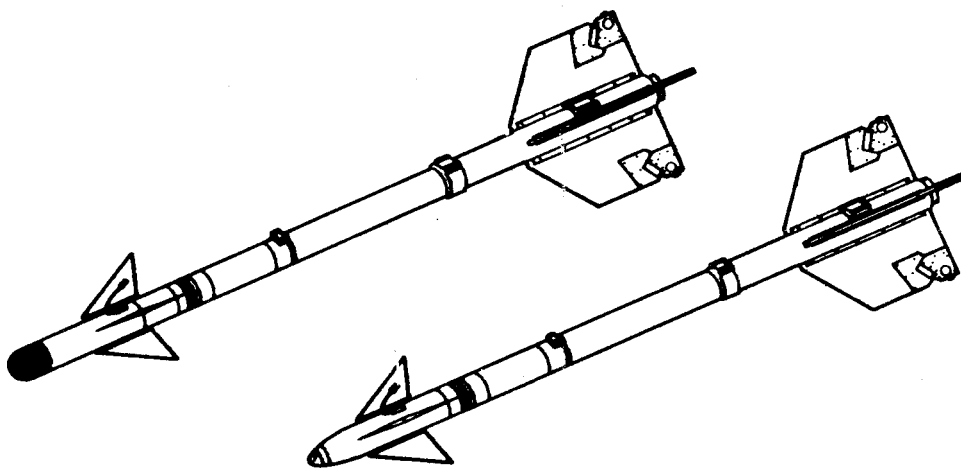


Figure 5-47. AIM-9C and AIM-9D

AGM-12C (Bullpup). An air-to-ground missile employing radio command guidance. It is designed to be used against targets requiring deep penetration. It is a pilot controlled missile, using a single-stage, liquid-fueled, rocket motor (reference figure 5-48).

2-30. Identification:

- a. Three section body (reference figures 5-49, 5-50, 5-51, and 5-52).
- b. Weight: Approximately 1800 pounds.
- c. Length: Approximately 13.5', diameter 12" at the nose section and 18" at the body section.
- d. Four attachable fins on the motor section.
- e. Four movable fins on the nose section.
- f. Color: White.

2-31. Hazardous Components of the Guidance System:

- a. Air Bottle: Squib activated containing 3000 psi to operate control fins, located in forward body section.
- b. Thermal Battery: Squib activated to provide electrical power, located in forward body section.
- c. Tracking Flares: Used for visually tracking missile.

2-32. Hazardous Components of the Warhead System:

- a. Warhead: 1000-pound warhead similar in appearance to a 1000-pound SAP bomb.
- b. Impact Fuze: Detonates on signal from fuze triggering rods. The triggering rods are in the forward body section.

2-33. Hazardous Components of the Warhead System:

- a. Thermal Battery: Squib activated to provide electrical power to ignite motor igniter. Located in forward part of the aft body section.
- b. Igniter: Initiates igniter booster. Located in forward part of aft body section.
- c. Igniter Booster: Ignites solid propellant grain. Located in forward part of motor section.
- d. Solid Propellant Grain: Pressurizes fuel and oxidizer tanks, forcing fuel into the thrust chambers. Located in the forward part of motor section.
- e. Inhibited Red Fuming Nitric Acid (IRFNA): Missile oxidizer.
- f. Mixed Amine Fuel (MAF-1): Missile fuel.

AGM-45A (Shrike). An air-to-ground missile employing passive homing guidance. There are four models of the AGM-45A. All models can use the same control section, gas generator, fuze, booster, rocket motor, and igniter. Three types of warheads are available for the Shrike missile: the MK 52 Mod 0, the MK 68 Mod 0, and the MK 69 Mod 0. This missile is used to acquire home on and destroy radar transmitters directing ground anti-aircraft or surface-to-air guided missiles (reference figure 5-53).

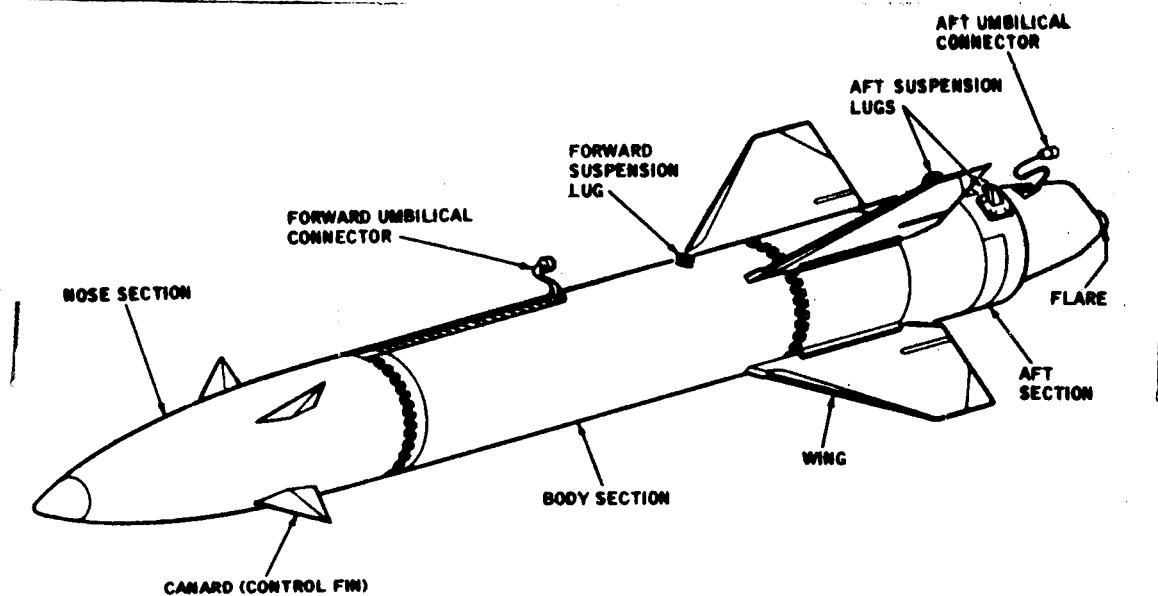


Figure 5-48. External Configuration AGM-12C Missile

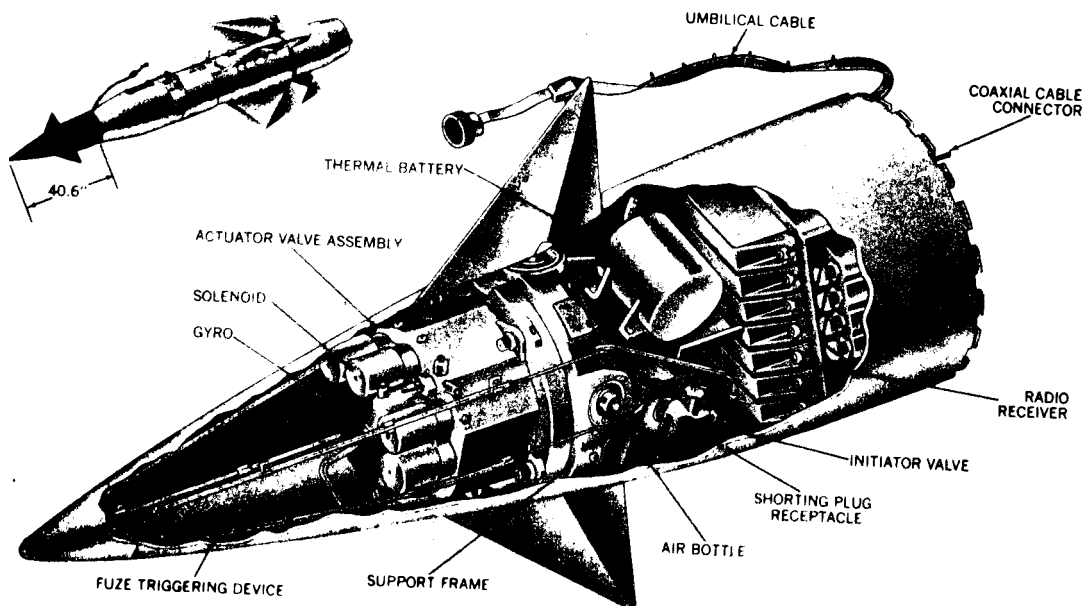


Figure 5-49. Forward Body Section

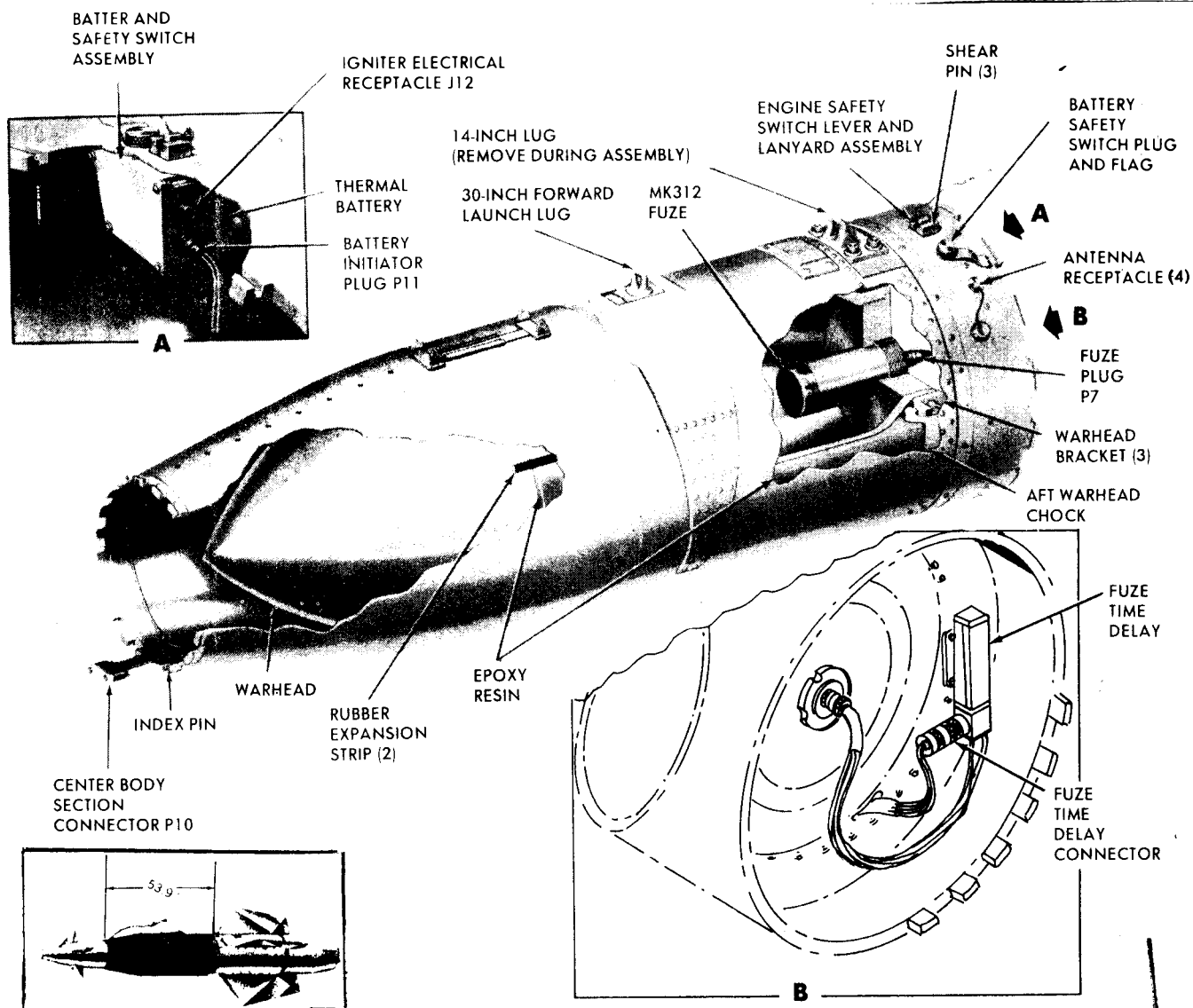


Figure 5-50. Center Body Section

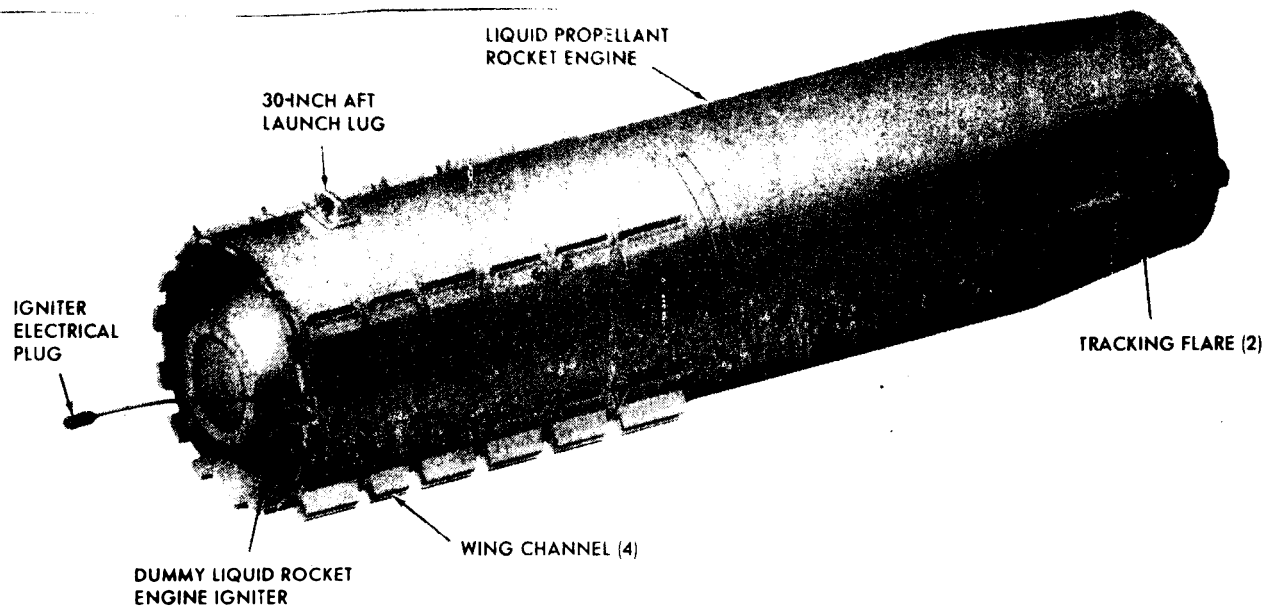


Figure 5-51. Aft Body Section

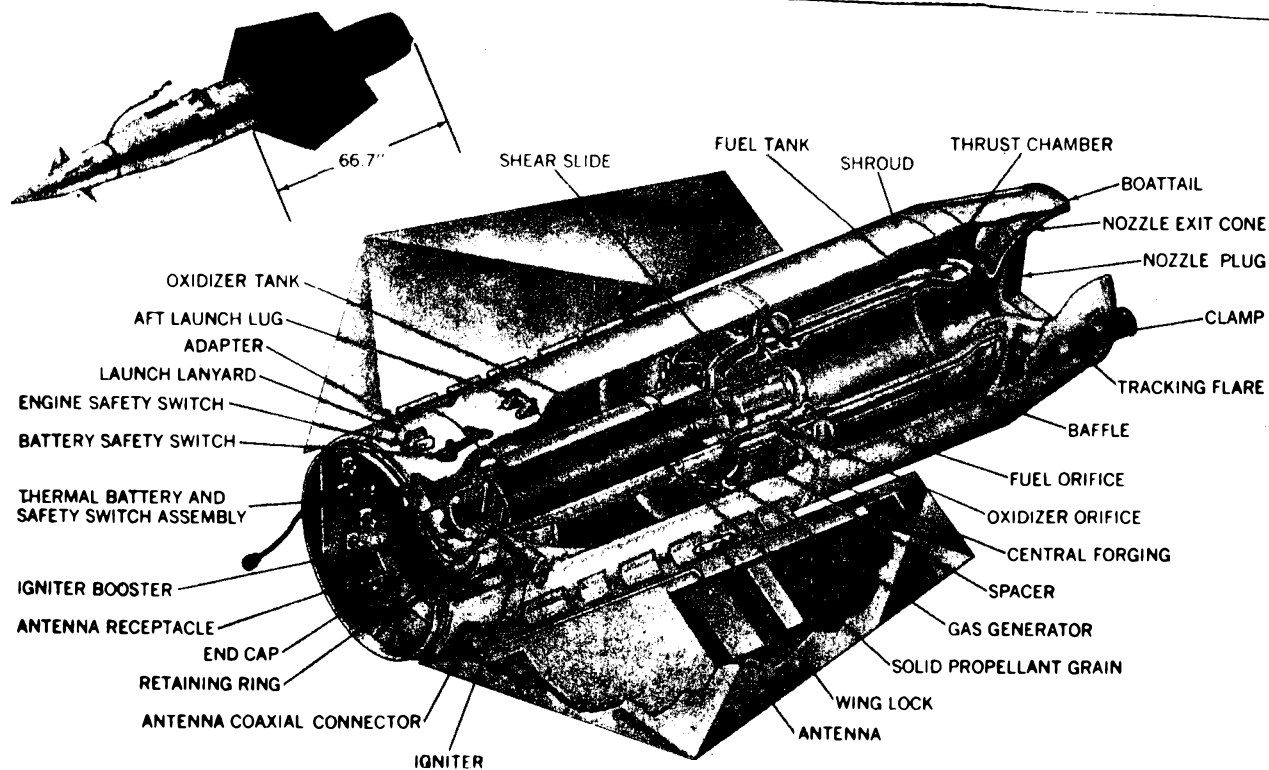


Figure 5-52. Aft Body Section Showing Components of Rocket Engine

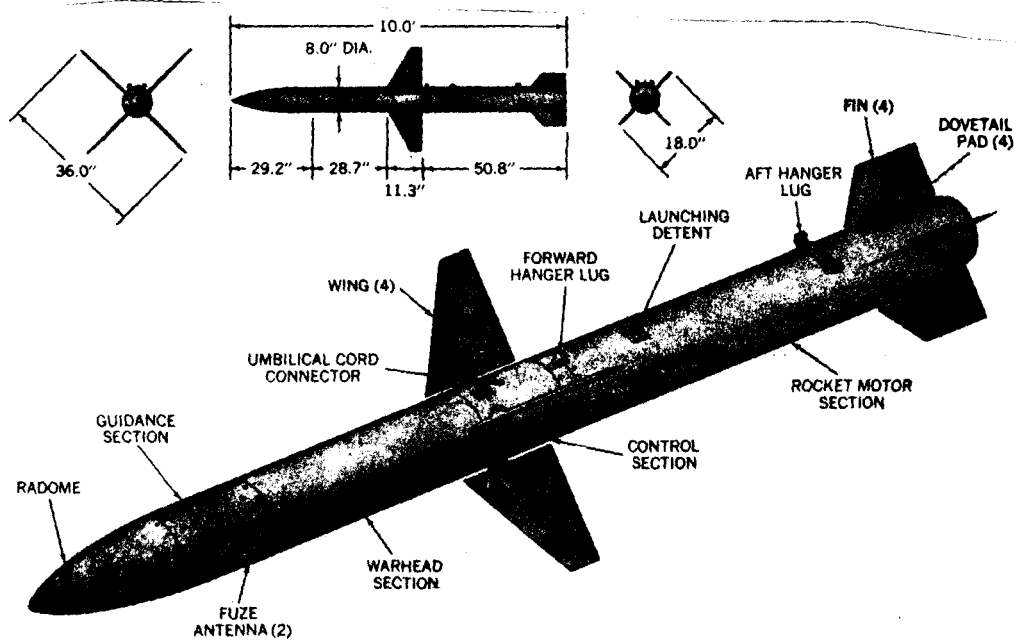


Figure 5-53. AGM-45A Strike Missile

2-34. Identification:

- a. Four-section body (reference figure 5-54).
- b. Weight: Approximately 392 pounds.
- c. Length: Approximately 10 ~~ft~~ diameter 8".
- d. Four movable fins on the control section.
- e. Four stabilization fins on the tail section.

2-35. Hazardous Components of the Guidance System:

- a. Gas Generator: Squib activated and used to provide servo power to operate control fins. Location: control section.
- b. Thermal Batteries: Squib activated and used to provide missile electrical power. Location: control section.
- c. Pyrotechnic Switch Packs: Used to complete circuits in the guidance system. Location: control section.

2-36. Hazardous Components of the Warhead System:

- a. MK 52 Mod 0 W/H: Contains steel cubes and HMX (HE 53 pounds).
- b. MK 68 Mod 0 W/H: Basically the same except the MK 68 has a shaped charge in the forward-end head closure.
- c. MK 69 Mod 0 W/H: White phosphorous (WP) in place of explosives and steel cubes. It also contains a shape charge in the forward-end closure (58 pounds WP, 2 pounds HMX).
- d. MK 330 Mod 0 Fuze: Installed in the base of the W/H and used to detonate the W/H.
- e. MK 44 Mod 0 Booster: Attached to the forward end of the MK 330 fuze. Contains CH-6 explosive.

2-37. Hazardous Components of the Propulsion System:

- a. MK 39 Rocket Motor: Contains approximately ⁹⁵91 pounds of propellant (reference figure 5-55).
- b. MK 53 Rocket Motor: Contains approximately 89 pounds of propellant (reference figure 5-56).
- c. MK 265 Igniter: Consists of the igniter body, rotor crank, perforated plastic basket, and ignition elements. The rotor assembly can be rotated 90° relative to the body to provide a positive mechanical safing capability. Used with the MK 39 motor (reference figures 5-57 and 5-58).
- d. MK 274 Igniter: Consists of the igniter chamber assembly, igniter adapter, safe/arm rod, dual delay squib initiator, and retaining ring. The initiator is mechanically isolated from the main charge by an igniter adapter containing a control piston. The igniter includes a safe/arm rod which can be rotated and locked by means of a spring-loaded safe/arm lock assembly. Used with the MK 53 motor (reference figures 5-59 and 5-60).

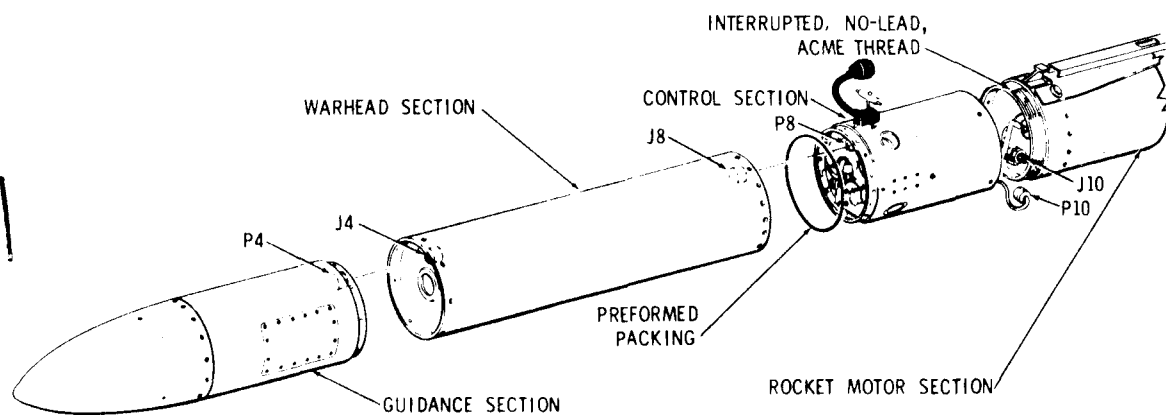


Figure 5-54. AGM-45A Missile Sections

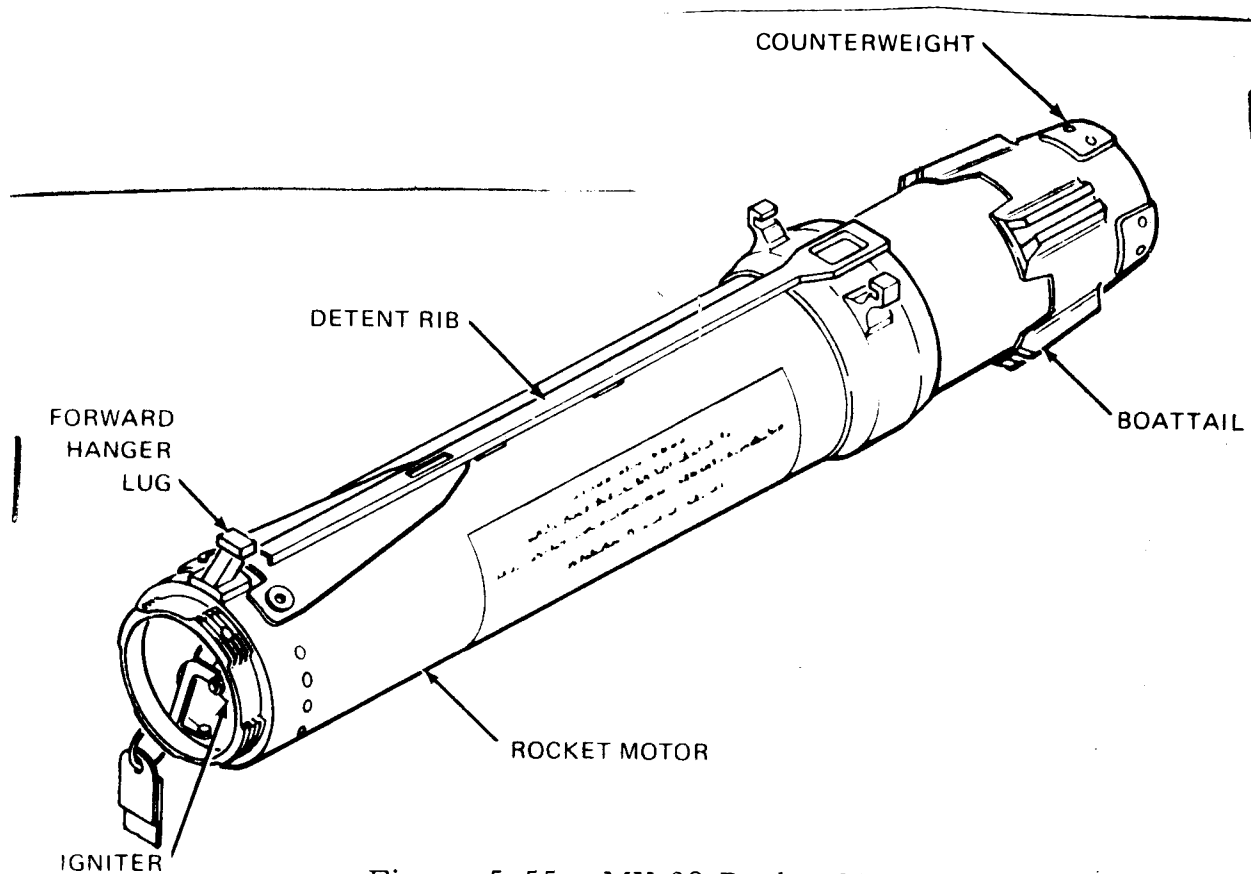


Figure 5-55. MK 39 Rocket Motor

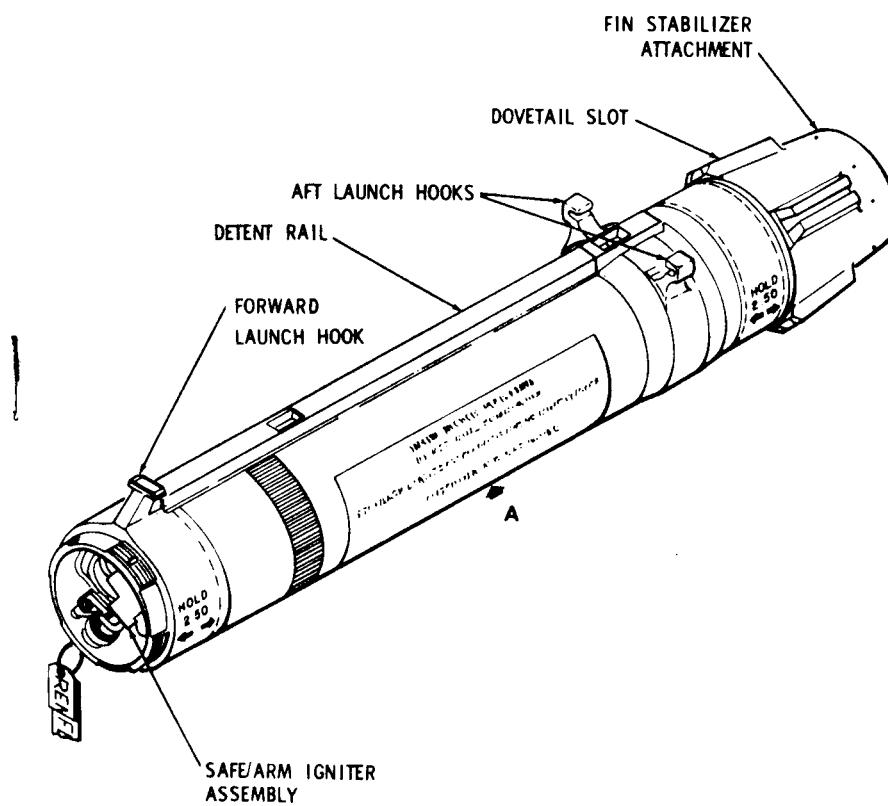


Figure 5-56. MK 53 Rocket Motor

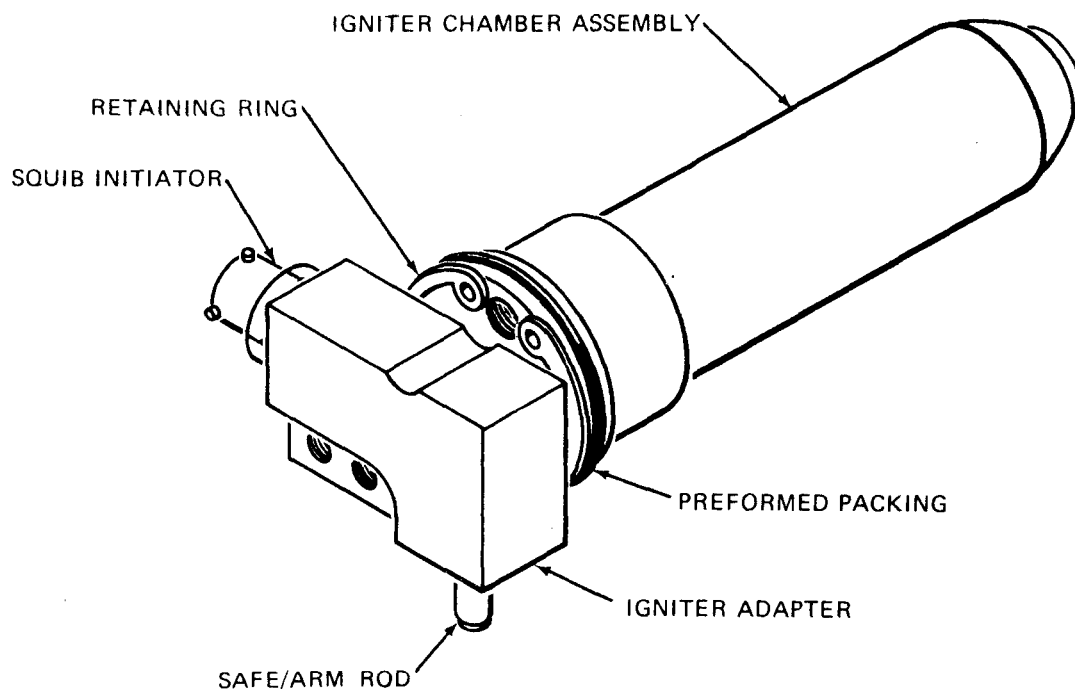


Figure 5-59. MK 274 Igniter

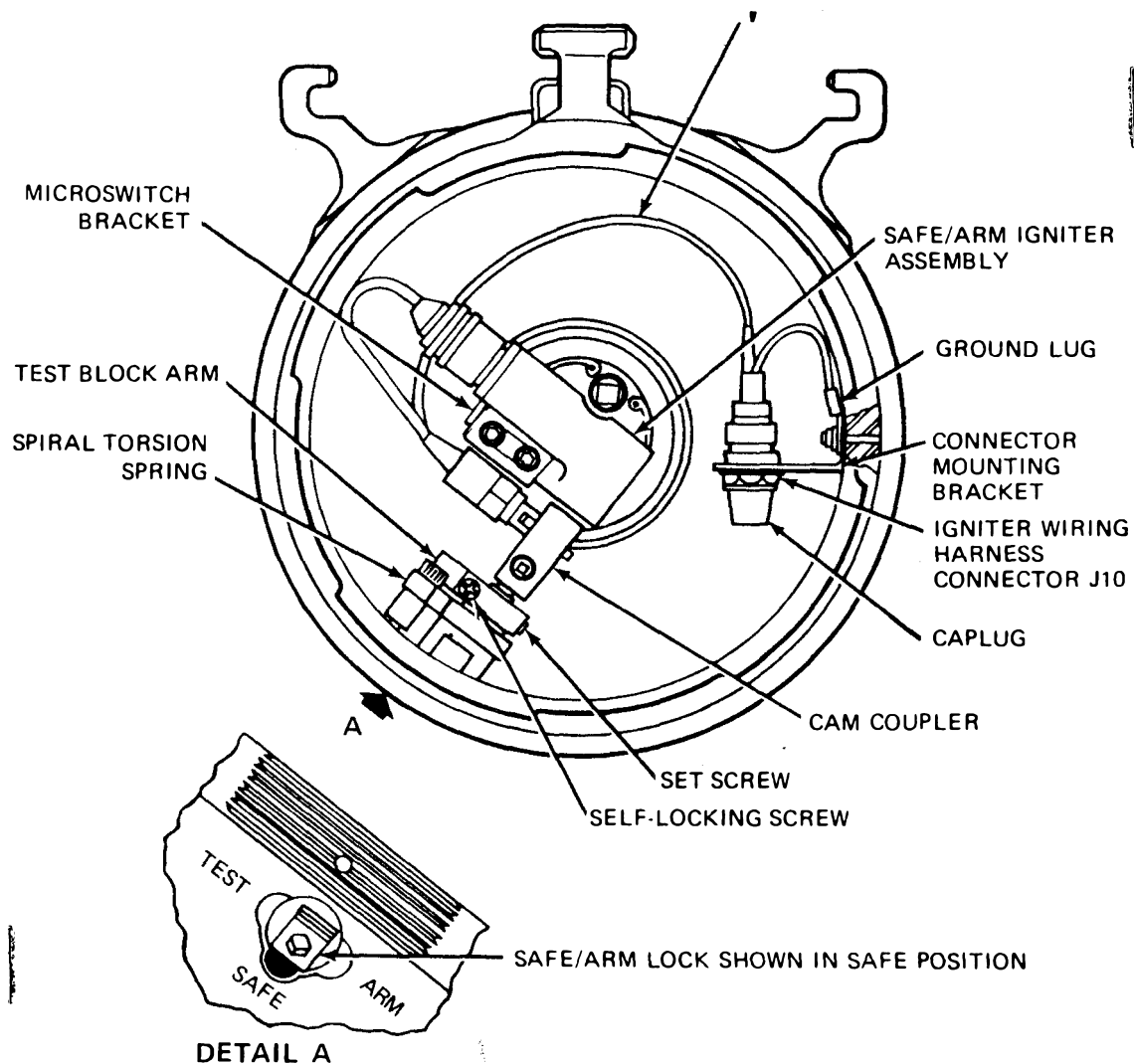


Figure 5-60. MK 274 Safe/Arm Actuator

AGM-78A, called the Standard Arm Missile and nicknamed the Super Shrike. It is a supersonic, air-launched, guided missile, employed against surface targets which radiate electromagnetic energy. The missile employs a passive homing guidance system (reference figure 5-61).

2-38. Identification:

- a. Four-section body (reference figure 5-62).
- b. Weight: Approximately 1375 pounds.
- c. Length: Approximately 15', diameter 13.5".
- d. Four movable control surfaces on the tail.
- e. Color: White.

2-39. Hazardous Components of the Guidance System:

- a. Nitrogen Bottles: Two each, squib activated. One in each gyro assembly (3000 psi), located in the autopilot-battery section.
- b. ELX Battery: Squib activated battery. The squib forces electrolyte into the battery.

2-40. Hazardous Components of the Warhead System (reference figure 5-63):

- a. Warhead: Ordnance section, high velocity fragmentation.
- b. Safety and Arming Device (S&A): Two detonators.
- c. Detonating Cord: Under dorsal fin number 2, initiates explosive in marker package (reference figure 5-62).
- d. Visual Marker: Located in lower half of spacer. Contains red or white phosphorous (reference figure 5-62)

2-41. Hazardous Components of the Propulsion System:

- a. Dual Thrust Rocket Motor: Two integrated solid propellant fuel grains, one for providing boost thrust and one for providing sustaining thrust.
- b. Igniter: Contains an ignition squib. The arming lever in the forward lower launching shoe can be rotated to the arm or safe position by an arming device installed on the launching shoe.

MK 1 Mod 0 (Walleye). The MK 1 Mod 0 glide bomb, or Walleye, is a highly accurate, relatively long-range, unpropelled, TV guided bomb. Essentially, the Walleye consists of a conventional HE bomb, a television guidance unit, and a control section. Because it is highly accurate, it is considered inexpensive when compared to the cost of the total number of conventional, unguided bombs usually needed to destroy a specific target (reference figure 5-64).

2-42. Identification:

- a. Three-section body.
- b. Weight: Approximately 1100 pounds.
- c. Length: Approximately 11 1/2', diameter 15".

- d. Guidance window on the nose section.
- e. RAT blade on the tail section.
- f. Four wings on the W/H section.
- g. Four fins on the control section.
- h. Color: White.

2-43. Guidance System (reference figure 5-65):

- a. Forward Compartment: Contains a gimbal-mounted, gyro-stabilized, television camera and two caging assemblies which drive the gimbal assembly.
- b. Rear Compartment: Contains the guidance power supply and an electronics assembly which contains the electronic video tracking circuits.

2-44. Warhead System (reference figure 5-66): Contains a linear shaped charge warhead and its fuzing and arming circuits.

2-45. Control System (reference figure 5-67): The control section consists of a forward and a rear compartment. The forward compartment contains an electrical package and a hydraulic servo system. The electrical package receives signals from the guidance section, then translates and transfers them to the hydraulic servos to position the control fins. The rear compartment contains a ram air turbine (RAT) and an alternator. The RAT blade, powered by the airstream, drives the alternator to produce electrical power and also drives a hydraulic pump that provides the hydraulic pressure for the servo system.

KMU-351/B GUIDED BOMB

2-46. Description (reference figure 5-68): The KMU-351/B guided bomb utilizes the MK 84, low drag, 2000-pound general purpose bomb, equipped with the KMU-351/B guidance kit. The kit provides for the addition of fixed fins to the tail and a guidance and control unit to the nose of the bomb. The G&C unit is made up of a laser illumination detector, a computer, a guidance control, and a wing canard assembly.

2-47. Hazardous Components of the Guidance System:

- a. Gas Generator: Supplies power to function canards.
- b. Thermal Battery: Supplies electrical power to the guidance section.

2-48. Hazardous Components of the Warhead System:

- a. MK 84, low drag bomb.
- b. FMU-26/B or FMU-26 A/B Fuze.

2-49. Propulsion System: None.

KMU-253/B GUIDED BOMB

2-50. Description: The KMU-253/B guided bomb consists of a MK 84, 2000-pound, low drag general purpose bomb with attachable control and guidance system. The bomb will normally be fuzed with two electronically timed, multi-purpose fuzes (FMU-26/B's). Planned for use with the F4D aircraft.

2-51. Hazardous Components of the Guidance System:

- a. Gas Generator: Provides power for control fins.

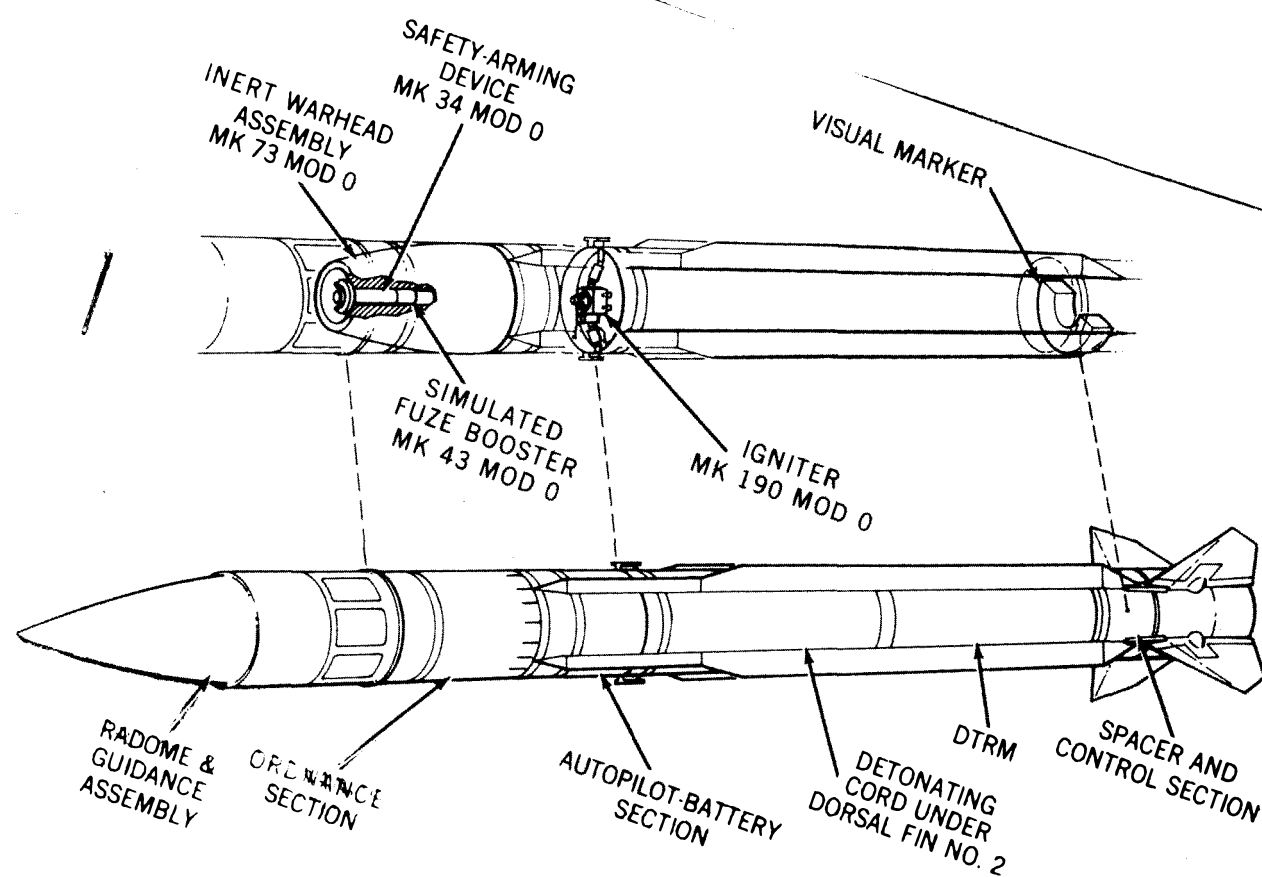


Figure 5-61. AGM-78A Missile

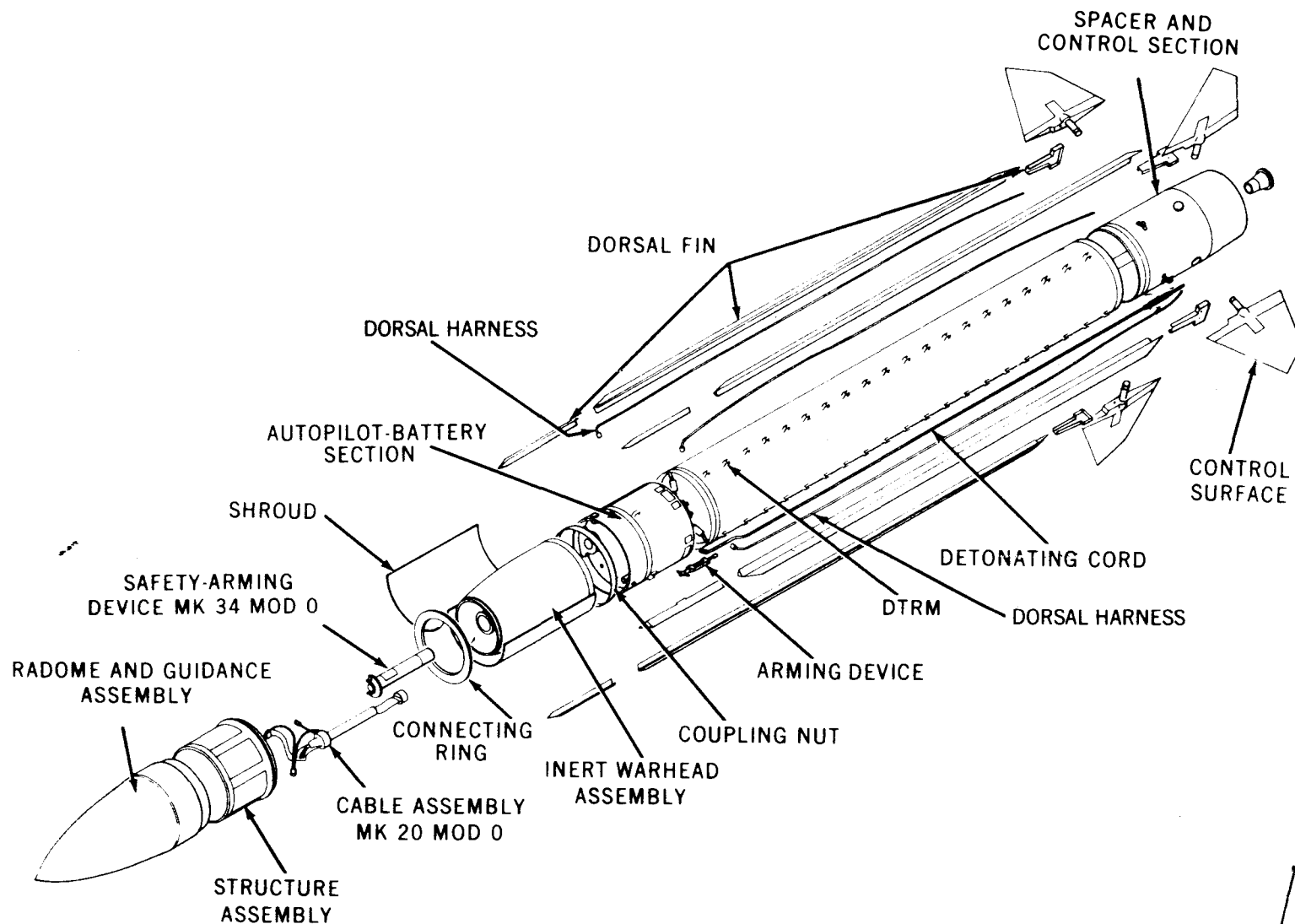


Figure 5-62. AGM-78A Missile Sections

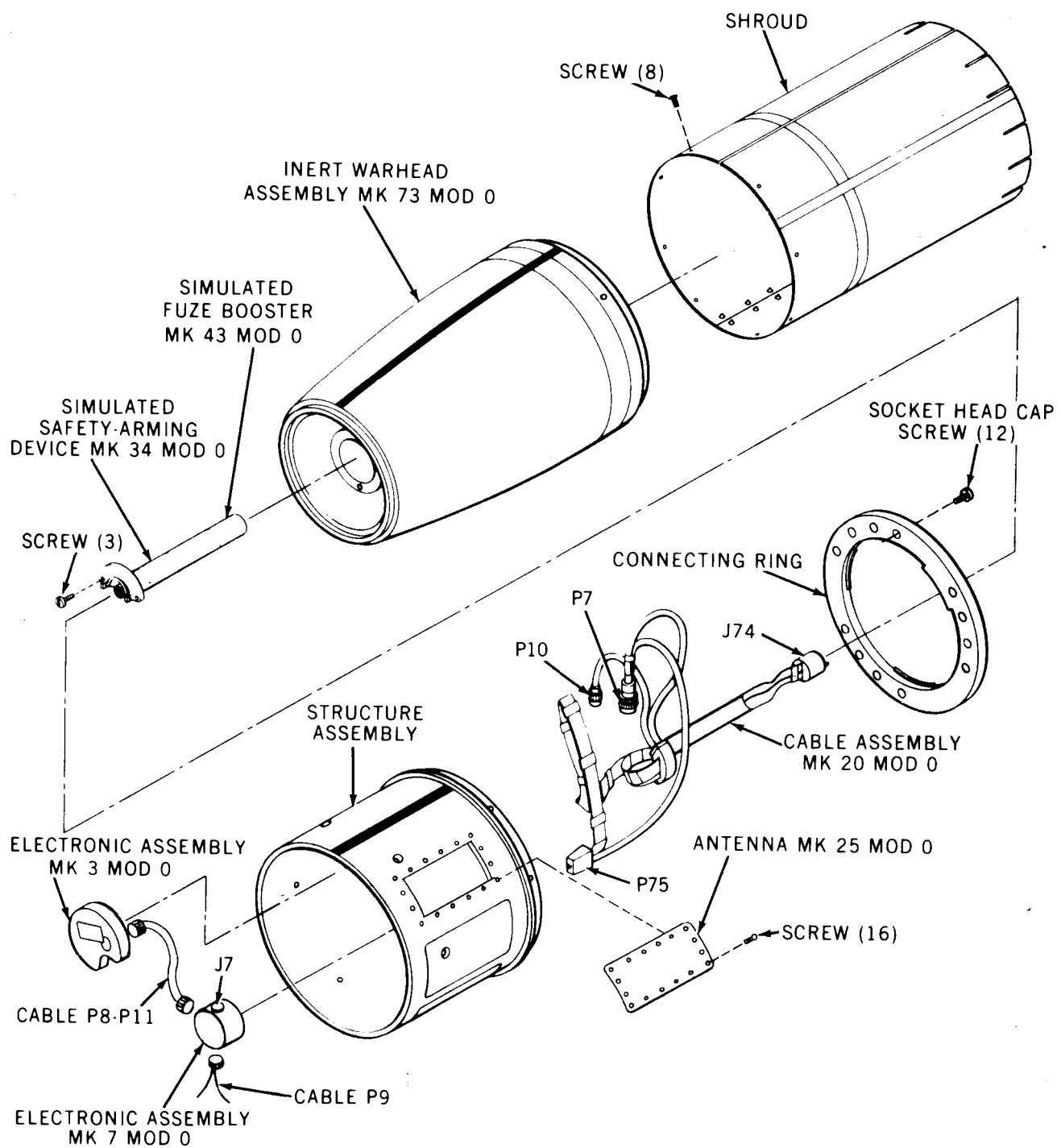


Figure 5-63. Simulated Warhead Components

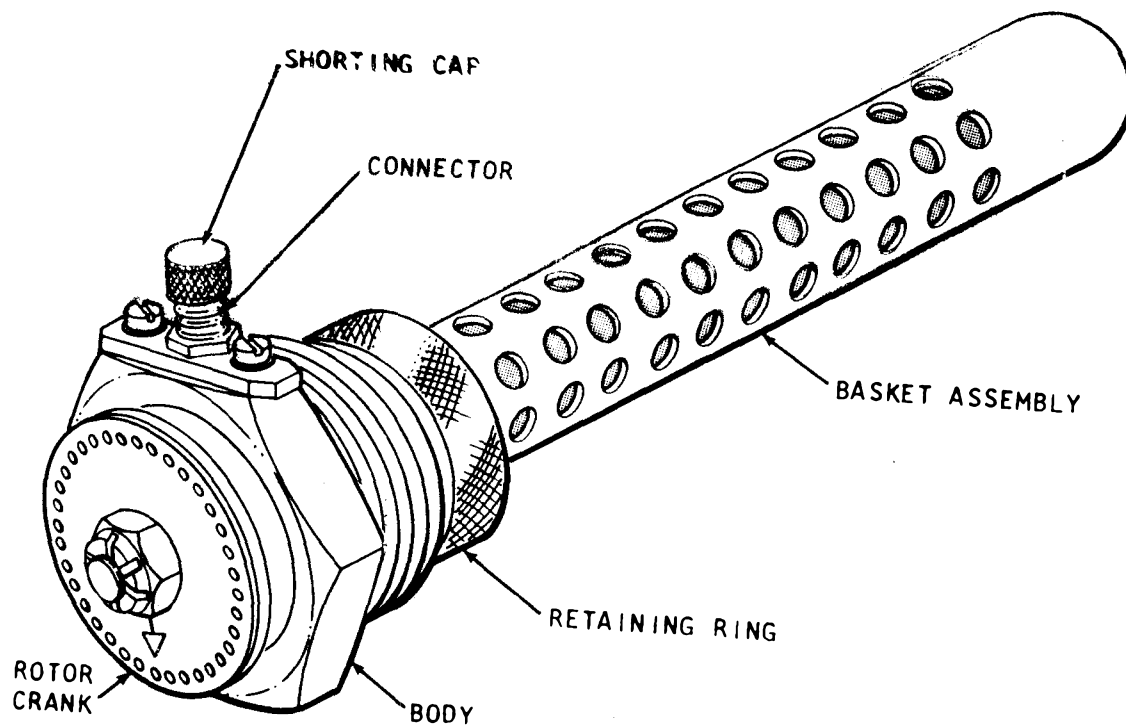


Figure 5-57. MK 265 Igniter

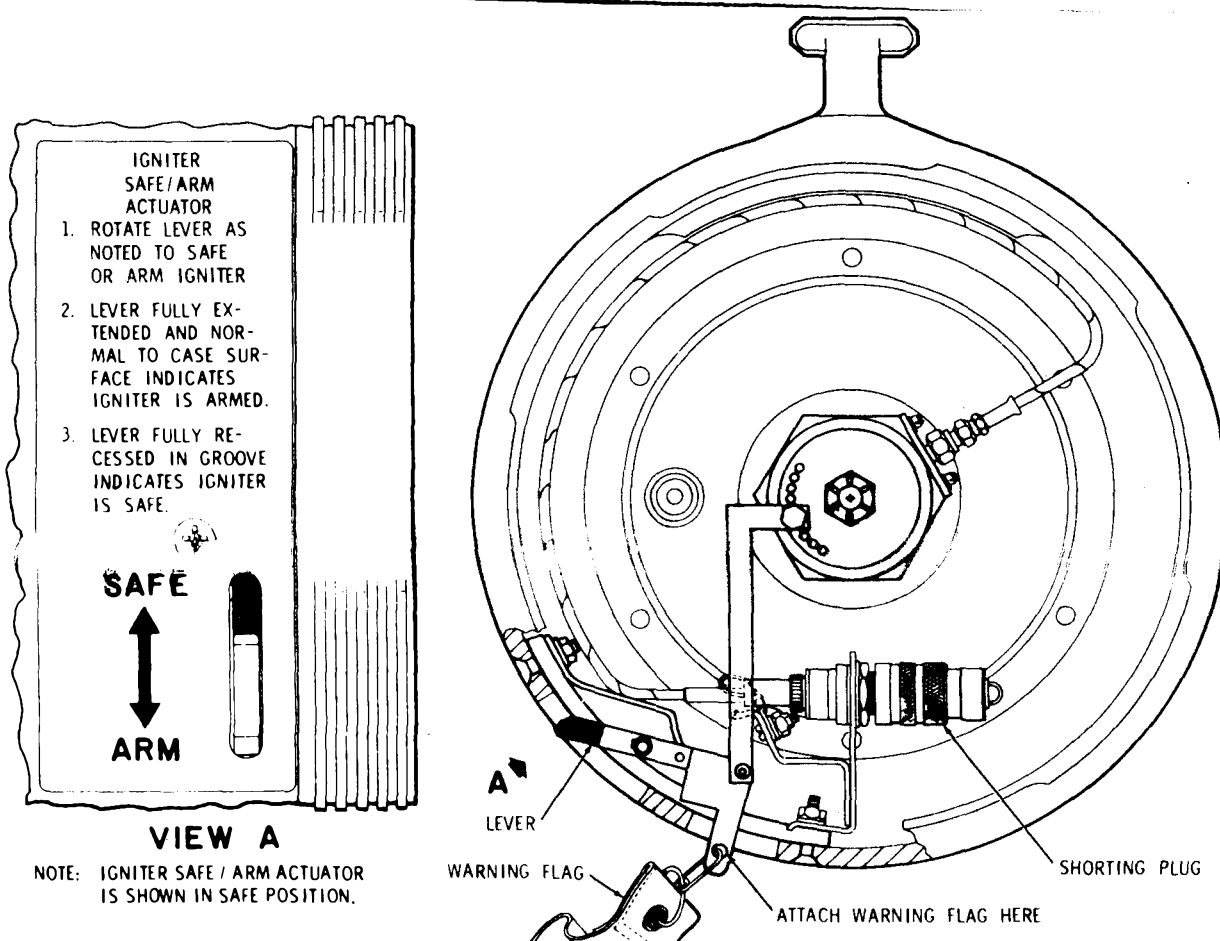
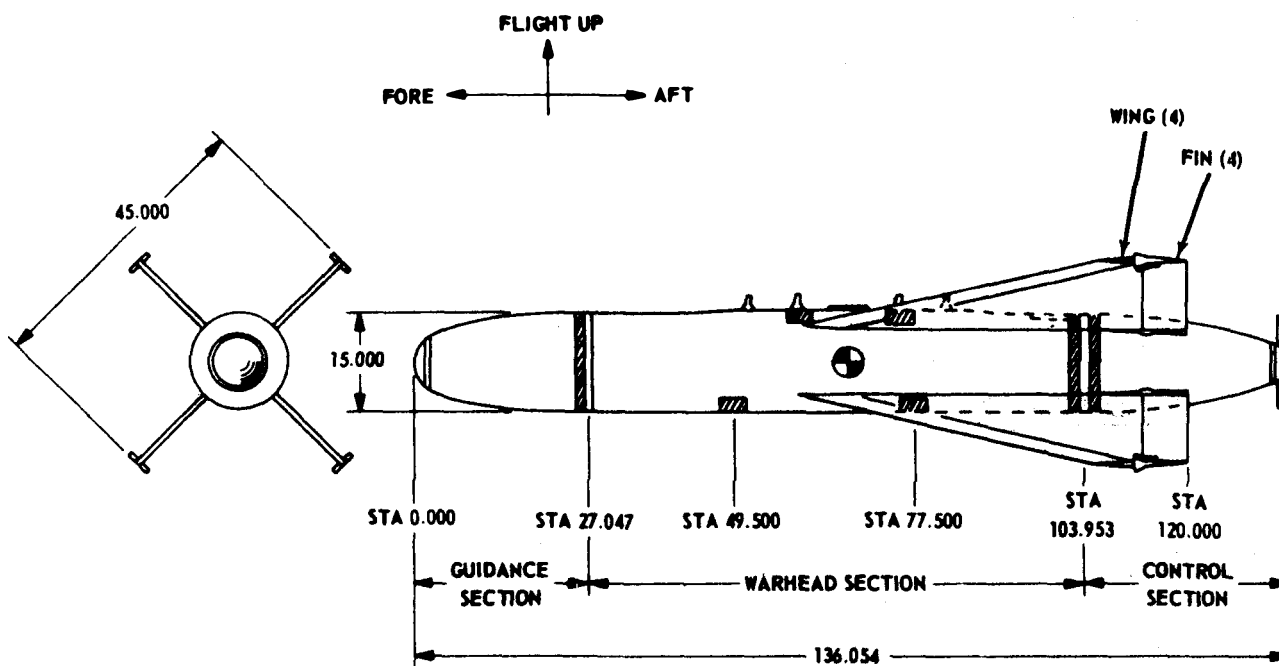


Figure 5-58. MK 265 Safe/Arm Actuator



NOTES

1. ALL DIMENSIONS SHOWN ARE IN INCHES.
2. HARD POINTS ARE SHOWN BY SHADED AREAS.
3. STATION INDICATES DISTANCE IN INCHES FROM FRONT OF WEAPON.

Figure 5-64. AGM-62 Guided Weapon

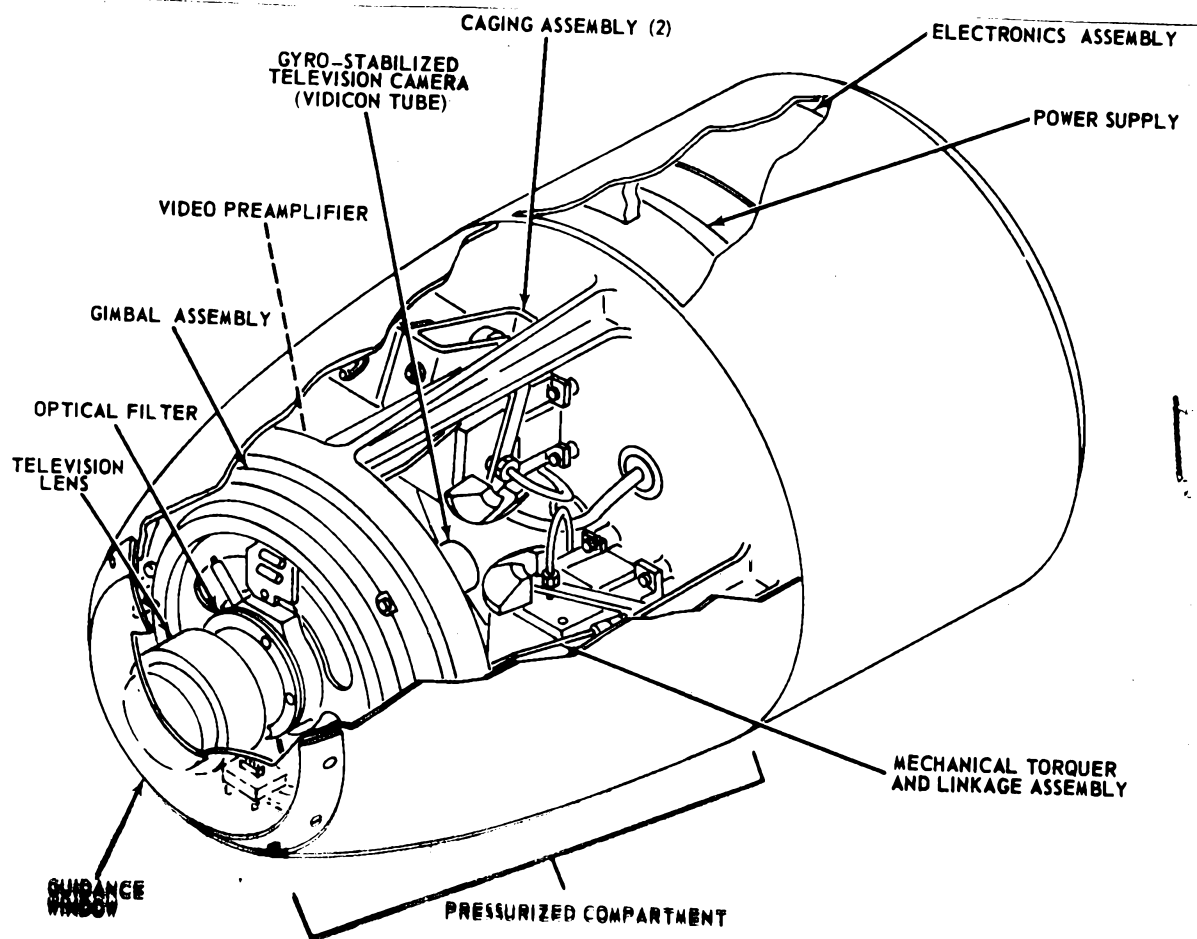


Figure 5-65. Guidance Section

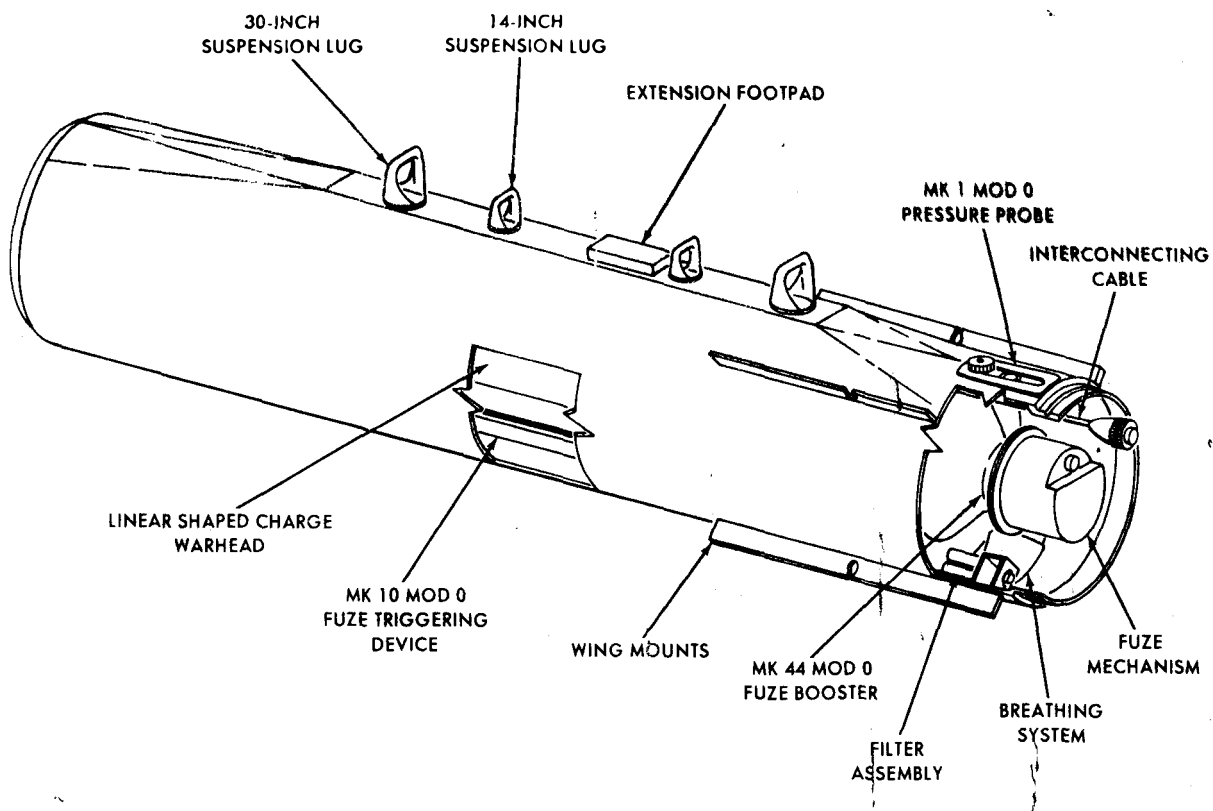


Figure 5-66. Warhead Section

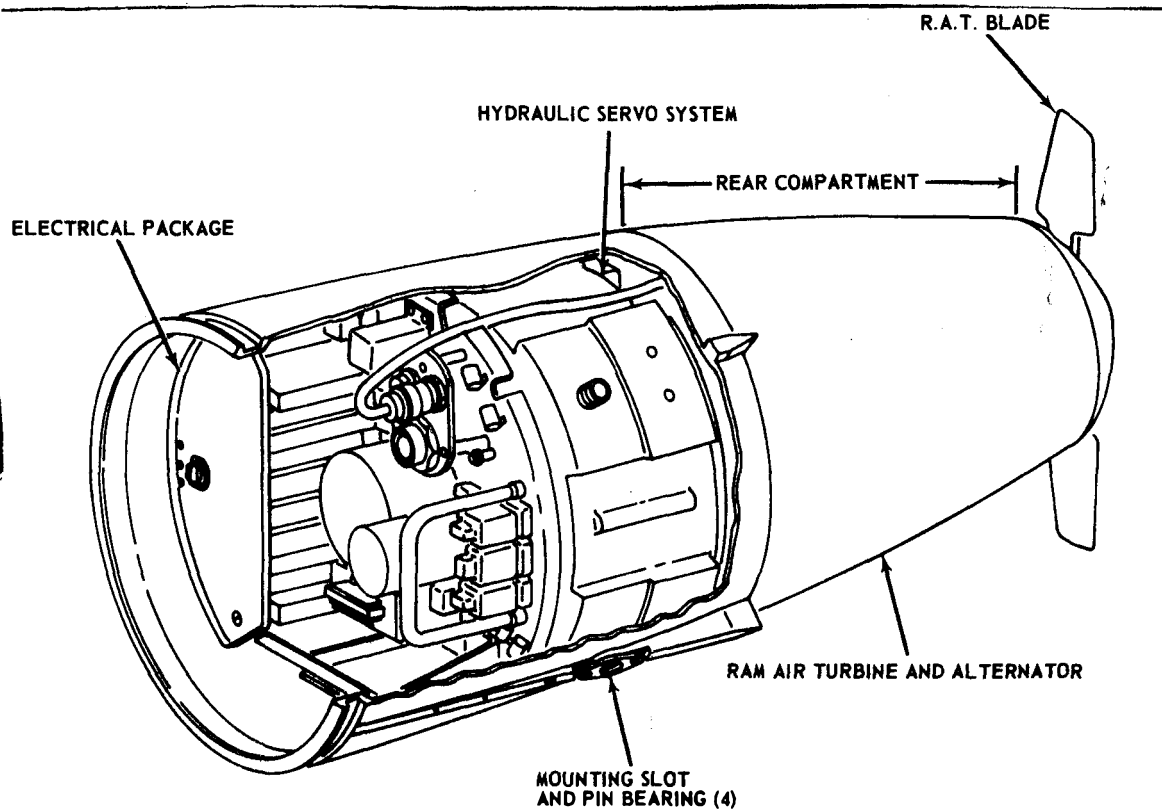
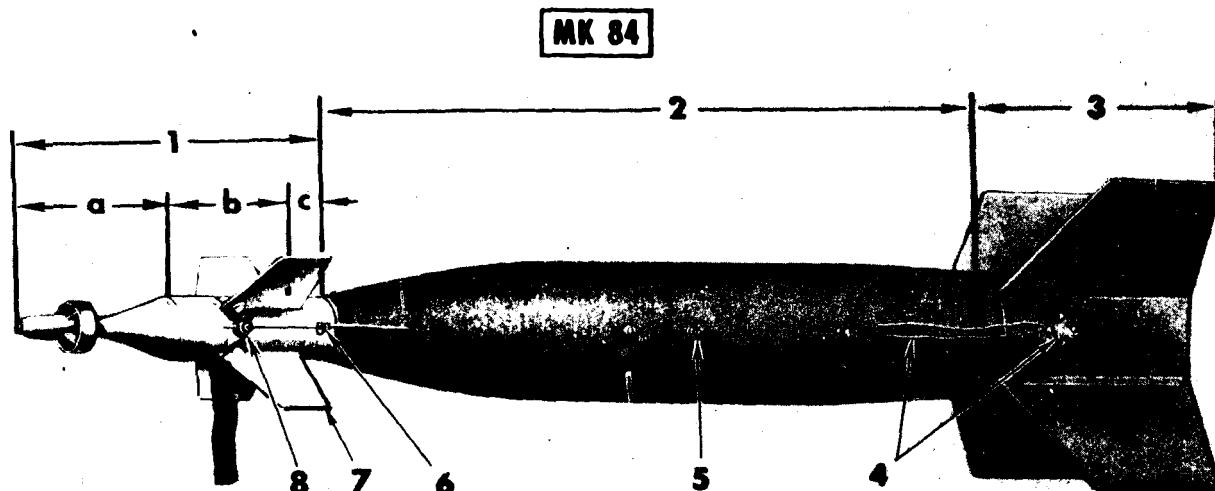


Figure 5-67. Control Section



- 1 KMU-351/B:
 - a. Laser Illumination Detector.
 - b. Bomb Guidance Computer and Control Section.
 - c. FMU-26/B, or FMU-26A/B Fuze and Forward Firing Assy.
- 2 MK-84 BOMB.
- 3 KMU-351/B WING ASSEMBLY.
- 4 ATU-35/B DRIVE ASSEMBLY (M-905 TAIL FUZE).
- 5 BATTERY INITIATOR LANYARD ACCESS.
- 6 BATTERY ARMING WIRE , and STEEL CLIP.
- 7 CANARDS .
- 8 THERMAL BATTERY FIRING DEVICE SAFETY PIN.

Figure 5-68. KMU-351/B Guided Bomb

b. Squib Activated Batteries: Two each located in the control section, used to power the guidance and control sections.

2-52. Hazardous Components of the Warhead System:

- a. 2000-pound, low drag bomb.
- b. FMU-26/B fuze, nose and tail.

2-53. Propulsion System: None.

CHAPTER 6

PLACED ENEMY MUNITIONS

PART ONE - LAUNCHED ENEMY MUNITIONS

PART TWO - GRENADES

PART THREE - MINES AND BOOBYTRAPS

Needed by Lowry

102 mm Rocket

Fin & prop charge for PG.-7

Chemical Pencils

NNC 82 Fuze

Slides of Base

PART ONE

LAUNCHED ENEMY MUNITIONS

OBJECTIVES

To teach the identification, operation, hazards, precautions, EOD procedures and disposal of launched enemy munitions and fuzes.

INTRODUCTION

This text will cover launched enemy munitions and the fuzes that are used in conjunction with these munitions. Only a representative sample of munitions and fuzes that have been encountered in SEA will be covered in this text. These fuzes are some of the more hazardous type.

102MM, HE, MODEL 488 ROCKET

1-1. Type: 102MM, HE, spin-stabilized, model 488 rocket, with chicom point detonating impact fuze type 100-3 (reference figure 6-1).

1-2. Identification:

- a. The 102MM rocket is approximately 28.3 inches long and 4 inches in diameter.
- b. The 102MM rocket has 8 canted nozzels and a warhead which contains approximately 3 lbs of TNT.
- c. The 100-3 PD fuze has a body made of either aluminum or phenolic plastic. The 100-3 is entirely waterproof. The only safety device in the 100-3 is the shear wire and the fact that the primer is held stationary by the locking plate and locking plate spring.

1-3. Operation: The shipping cap (1) is removed prior to firing. The closing cup (2) and the primer housing (4) are held immovable by the shear pin (3). These, in turn, block the firing pin (6) and firing pin disc (5) in position. The primer (9) is held in its position at the bottom of the primer housing (4) by a locking plate (8) which rides in slots cut through the primer housing (4). The plate is held stationary by its lugs riding in the recesses cut into the inner fuze cavity bulkhead. The locking plate spring (7) assists in maintaining the locking plate (8) and primer (9) in the lower end of the primer housing (4) if the shear pin (3) is sheared by set-back. Upon impact, the shear pin (3) is sheared and the primer housing (4) is moved rearward by the closing cup into the inner fuze cavity. The firing pin (6) and firing pin disc (5) are also forced rearward by the closing cup (2). The primer (9) moves forward by inertia, sliding the locking plate (8) ahead of it. The locking plate (8) moves in the slots cut in the primer housing (4), compressing the locking plate spring (7). The primer and firing pin (6) make contact, initiating the primer (9), which functions the detonator and booster (11).

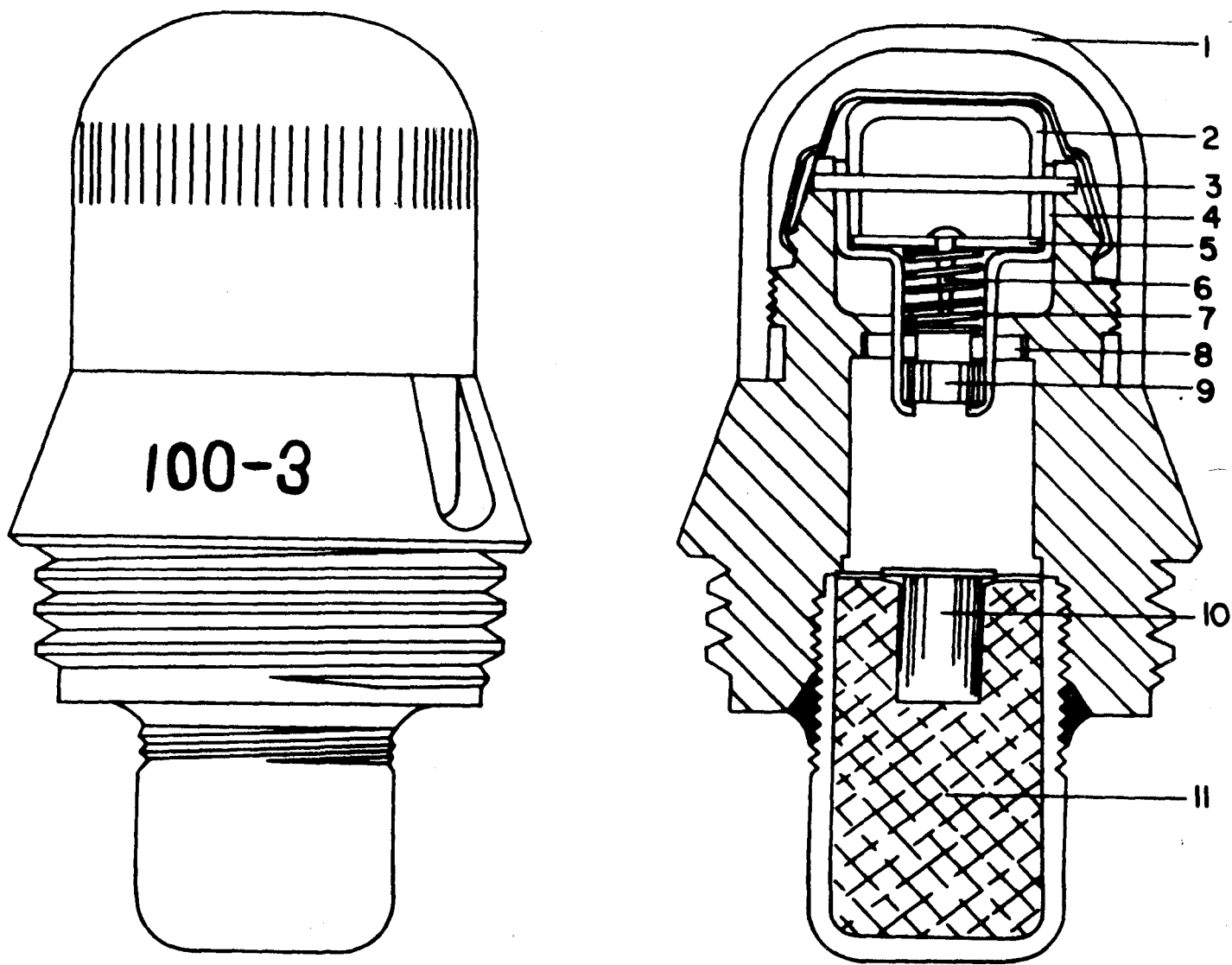


Figure 6-1. Chicom, Point-Detonating Impact Fuze:
Type 100-3

107MM, HE, TYPE I

1-4. Type: The 107MM, spin-stabilized rocket, HE filled with a chicom point-detonating impact fuze, type I (reference figure 6-2).

1-5. Identification:

- a. The 107MM rocket has 6 canted nozzles and two baurrelets.
- b. It is constructed of heavy steel and weighs 41 lbs, is 33 inches long, and 4 1/2 inches in diameter.
- c. The type I fuze is a modified version of the Soviet V-25 fuze.
- d. The type I is longer than the V-25, has an external selector, a nose shipping cap and a two piece construction.

1-6. Operation: Upon firing, setback causes the firing pin (2) to seat firmly upon the centrifugal detents (4) locking them in place. The detent locking cup (6) is also setback compressing its spring. As acceleration ceases and centrifugal forces increase, the centrifugal detents (4) under the firing pin (2) move outward against their springs (5). The detent blocking cup spring forces the detent blocking cup (6) upward until it rests against the shoulder of the firing pin. In this position it blocks any return of the detents (4). Simultaneously, centrifugal force causes the sliding detent to move outward along its track opening the flash channel. The fuze is now armed. With the selector set on superquick, the flash channel is open from the upper detonator (8) to the lower detonator (14) in the booster cup. Upon impact, the firing pin is driven into the upper detonator (8) or upon impact at flat angles, the graze weights (10) move laterally and cam the detonator carrier (9) upward so that the detonator (8) is impaled on the firing pin (2). The detonator flashes down into the lower detonator (14) which initiates the booster.

If the selector (13) is set on delay, the delay elements (20) are ignited upon functioning of the upper detonator (8). However, the selector blocks the flash channel on the delay setting so that the flash from the upper detonator cannot reach the lower detonator (14). When the delays (20) burn through after approximately 0.025 seconds, they flash into the lower detonator (14) causing the booster to detonate.

140MM, HE, MODEL V-25

1-7. Type: The 140MM, ~~spin~~-stabilized rocket, HE filled with a Soviet, point-detonating impact fuze, model V-25 (reference figure 6-3).

1-8. Identification:

- a. The 140MM rocket has 10 canted nozzles.
- b. It is constructed of heavy steel and weighs 87 lbs, is 42 3/4 inches long, and 5 1/2 inches in diameter.
- c. The V-25 fuze looks like the type I, only shorter.

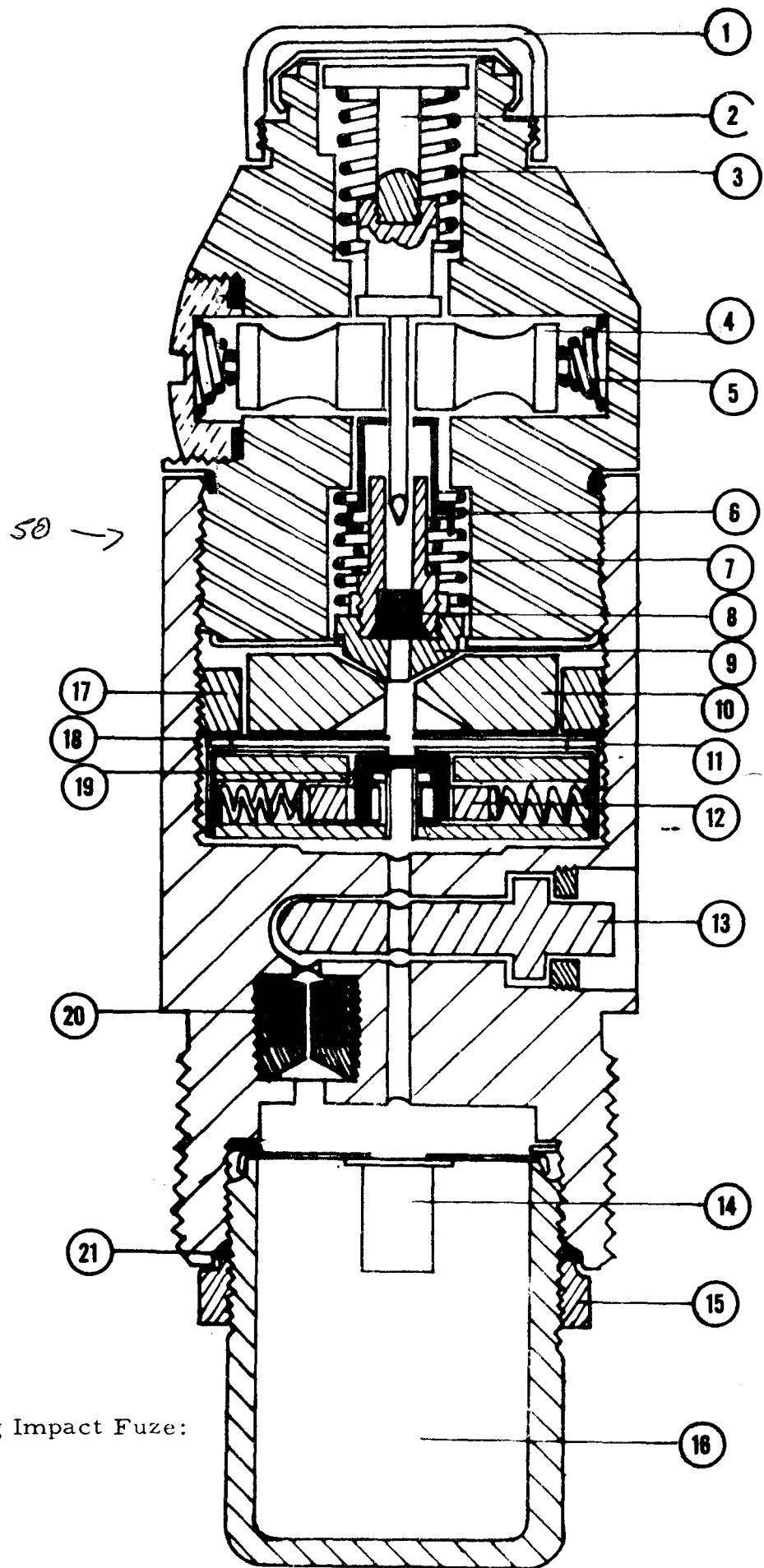


Figure 6-2.

Chicom Point-Detonating Impact Fuze:
Type I (Rocket)

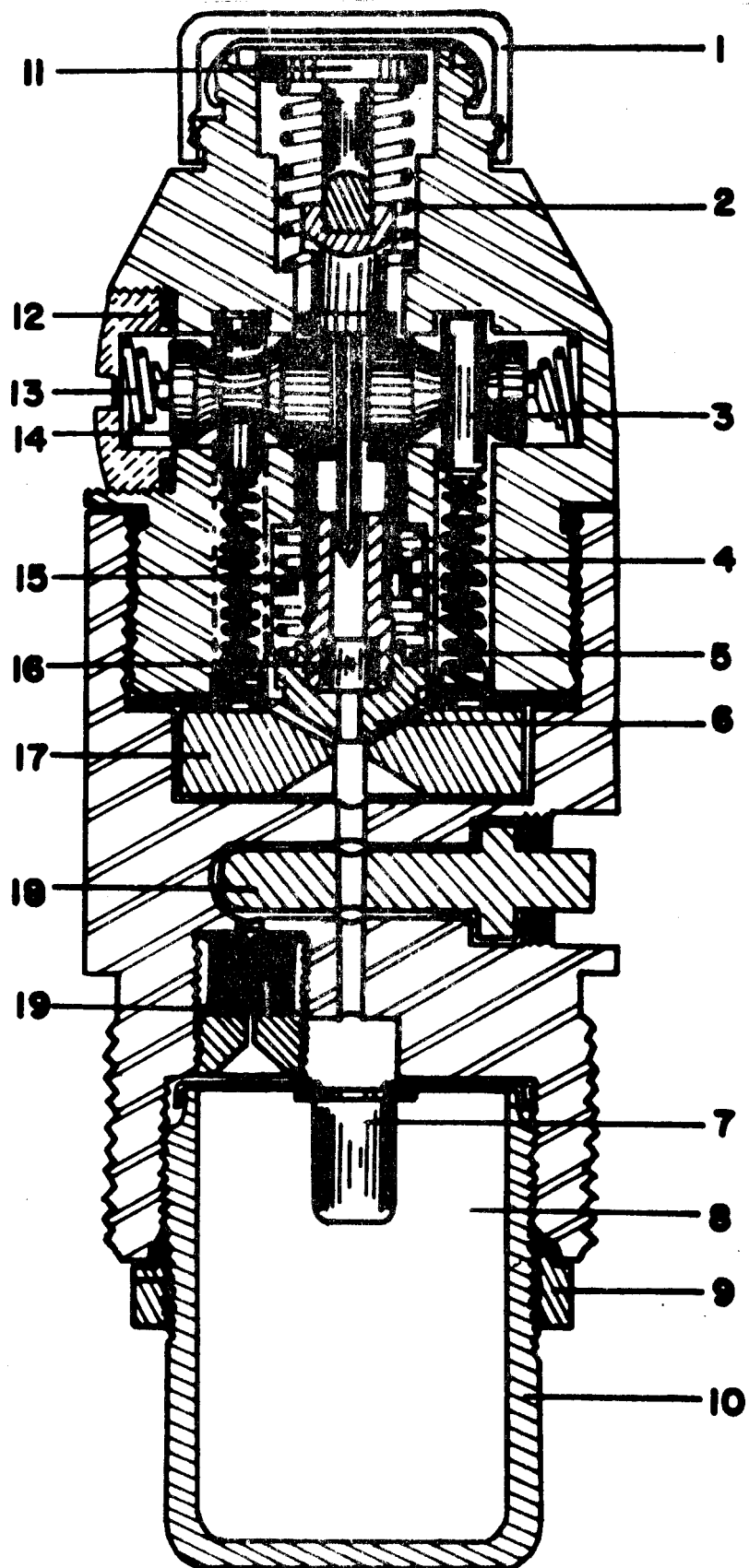


Figure 6-3. Soviet Point-Detonating Impact Fuze:
Model V-25.

- d. The V-25 fuze has an external selector, a nose shipping cap.

The V-25 fuze is of piece construction.

1-9. Operation: When the rocket is fired, setback causes the two setback detents (3) to move downward against their springs, unlocking their centrifugal weights (14) which move outward against their springs (13) by centrifugal force. As the centrifugal detents (14) move outward the positive block is removed from the firing pin (11). The striker is prevented from firing the detonator by the striker spring (2). When setback ceases, the centrifugal detent blocking cup (15) rises under the influence of its spring to prevent the centrifugal detents from returning to their original positions and blocking the striker. The fuze is now armed and will function upon impact or grazing action. Upon impact, the striker assembly (11) is driven rearward. Simultaneously, the graze weights (17) slide laterally camming the detonator carrier (6) forward. The firing pin pierces the detonator, initiating the explosive train. If the fuze strikes a target at a low angle, the striker assembly (11) may not be driven rearward. The graze weights (17) move laterally camming the detonator carrier (6) upward. The detonator carrier overcomes the resistance of the carrier spring (5) and impales itself on the detonator, initiating the explosive train.

122MM ROCKET, MODEL DKZ-B

1-10. Type: The 122MM rocket, fin stabilized, with a Soviet, point-detonating impact fuze, model DKZ-B (reference figure 6-4 and 5).

1-11. Identification:

- a. The 122MM rocket has four folding fins and 7 nozzles.

b. It is constructed of heavy steel and is approximately 75.4 inches long, 4.8 inches in diameter and weighs 101.85 lbs.

c. The DKZ-B fuze consists of a nose cap and membrane crimped to the aluminum windshield, plastic bonded steel body, and booster delay selector.

1-12. Operation: When the DKZ-66 rocket is fired, setback causes the setback sleeve (22) to move rearward while being retarded by the Zig-Zag slot governor and the sleeve spring (4). When the setback sleeve reaches the bottom of its travel, two levers (5) are cammed inward, releasing the lock ball (6) which releases the spring loaded arming primer (8). The arming primer (8) propelled by its spring (7) impinges on the fired firing pin (10). The primer (8) flashes and flame travels through the three flash holes in the firing pin housing (10). This ignites the flash pellet (11) whose flame ignites the relay pellet (12). The relay pellet ignites the delay arming pellet (13). Simultaneously, setback and sustained acceleration cause the weight (30) to move to the rear and remain there partially unlocking the detonator rotor (25). When delay arming pellet (13) burns out, the locking detent (14) is cammed into the pellet cavity by the rotating rotor (25) powered by the rotor spring (35). The fuze is now armed. Upon impact, the nose cap membrane (1) is crushed so that the firing pin plunger (3) is forced downward driving the firing pin (9) downward against its spring into the detonator (26). If the spindal is set for instantaneous action, the straight through flash channel (32) permits flame from the detonator (26) to flash directly into the relay detonator (19) functioning the warhead. If the spindal is set for short delay, the flash channel is blocked and the delay pellets are ignited. When they burn through,

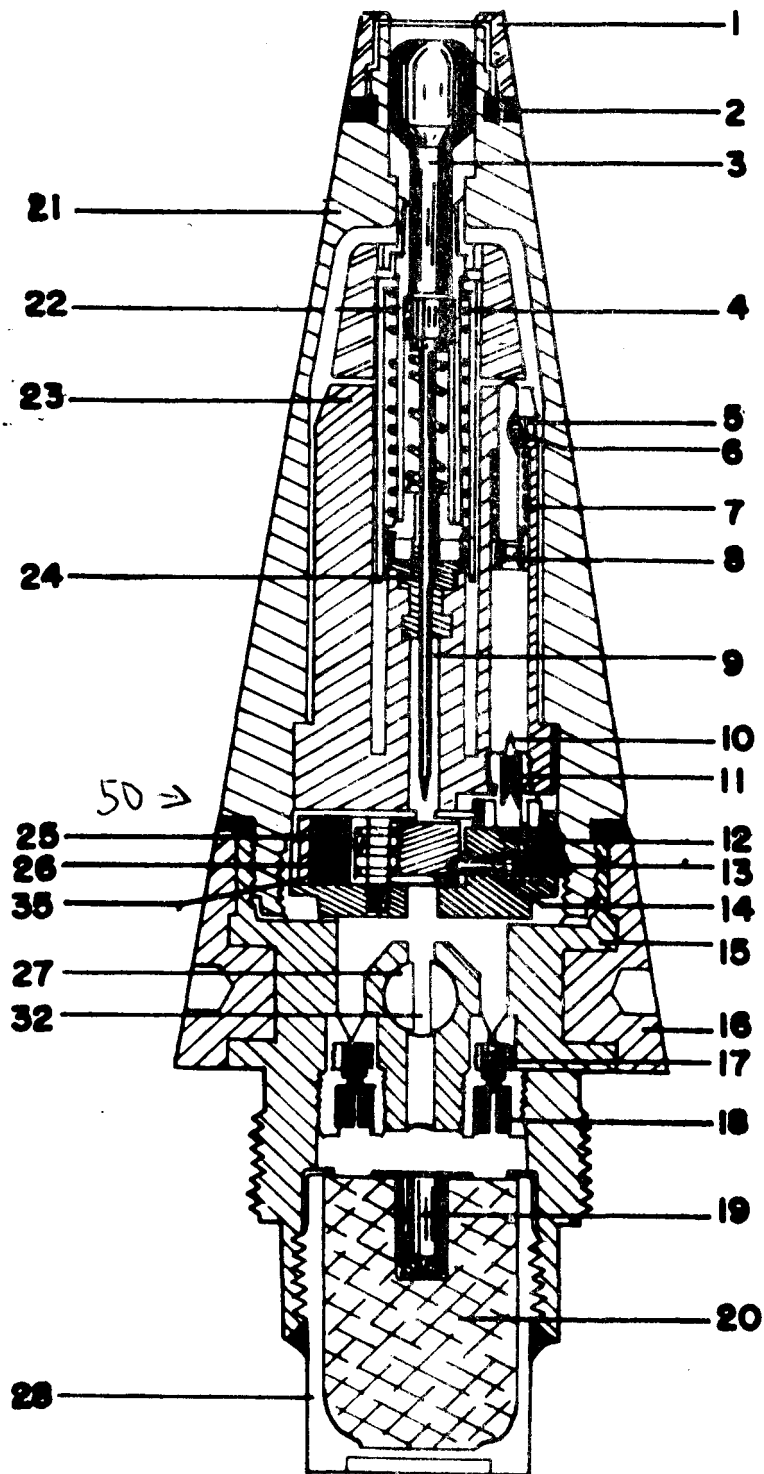


Figure 6-4. Soviet Point-Detonating Impact Fuze DKZ-B

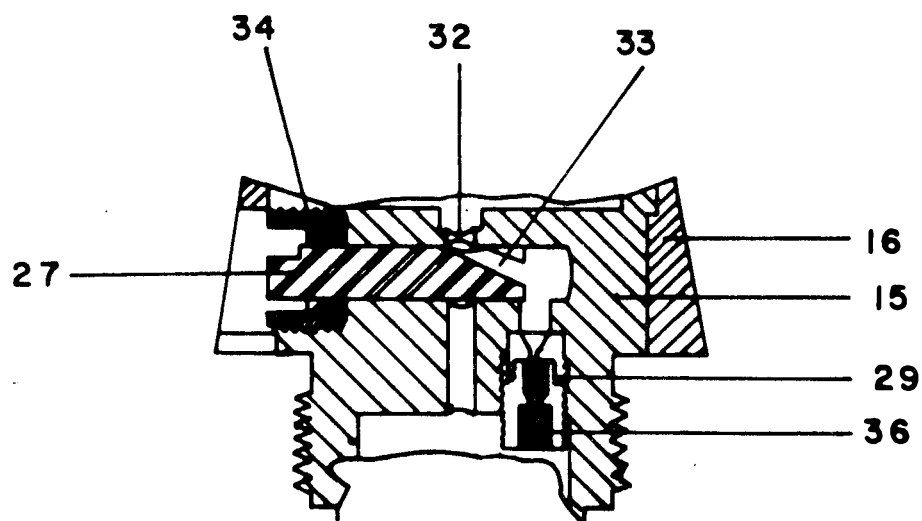
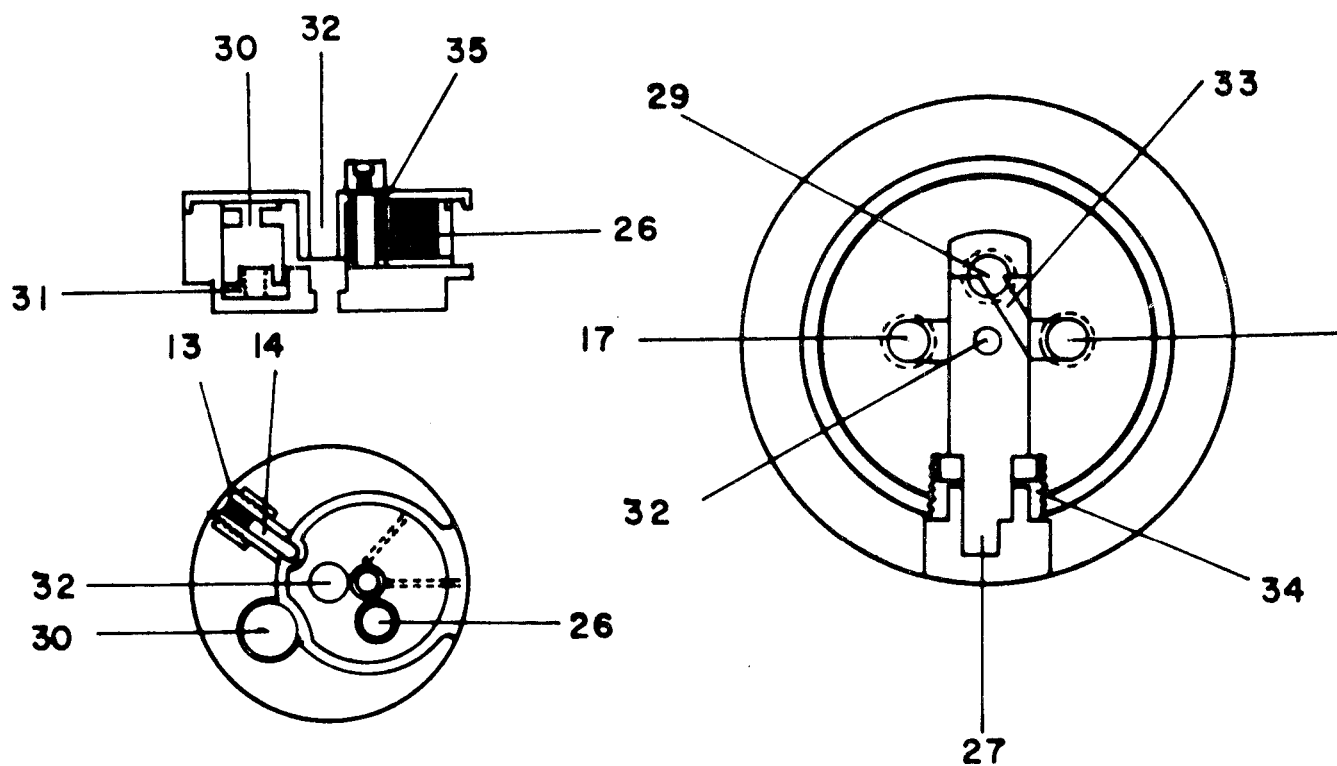


Figure 6-5. Soviet Point-Detonating Impact Fuze:
Model DKZ-B Component

the flash pellets flash into the detonator producing warhead functioning. If the spindal is set on long delay, the flash channel (33) transmits flame from the detonator to the long delay pellet (29). When the pellet burns out, the burn out flame completes fuze functioning.

75MM, HE FILLED, TYPE I

1-13. Type: The 75 MM, HE filled, recoilless rifle round with a Chicom point-detonating impact fuze, type I (reference figures 6-6 and 6-7).

1-14. Identification:

- a. The 75MM recoilless rifle round has a one piece steel body.
- b. The cartridge case contains vent hobs.
- c. The Chicom type I fuze is a setback and centrifugal force armed fuze, with pyrotechnic delay arming and a graze sensitive feature.

1-15. Operation: Prior to firing, the fuze cap may be removed for instantaneous action or left on for non-delay action. Upon firing, the detent locking collar (8) moves down compressing its spring, removing frictional resistance from the centrifugal detents. Simultaneously, the set-back firing pin (27) moves downward against the spring (28), firing the primer (29). The resulting flame passes through the flash channels (26) in the firing pin (27) and passes through the channel (30) igniting the delay arming pellet (19). Centrifugal force causes the detent (7) to move outward against its spring (6), partly unlocking the firing pin (20). As the pellet (19) is consumed, centrifugal force causes the delay arming detent to move into the evacuated cavity. This produces delay arming of the firing pin (20) and the graze firing assembly (21). As acceleration diminishes, the locking collar spring forces the collar (8) forward, preventing the centrifugal detents from extending upon spin decay. The fuze is now armed. In flight, the anti-creep spring prevents the graze firing assembly (21) from moving forward prematurely, firing the fuze. Upon impact, the firing pin (20) is driven downward into the primer (9) which flashes through the channel into the detonator (15) initiating the booster (16). On graze impacts, inertia causes the graze firing mechanism (21) to move forward until the locking balls (10) are forced out of their recesses into the annular groove. The compressed primer carrier spring (11) propells the primer carrier (22) forward, impaling the primer (9) on the sharp pointed firing pin (20), initiating functioning. Dud Type 1 and Type 3 fuzes are rare due to the combined impact and graze action functioning.

75MM RECOILLESS RIFLE ROUND, TYPE 53 MOD 2

1-16. Type: The 75MM recoilless rifle round with a chicom, point-detonating impact fuze, type 53 MOD 2 (reference figures 6-8 and 6-9).

WR

1-17. Identification:

- a. The 75MM recoilless rifle round has a one piece steel body.
- b. The cartridge case contains vent hobs.
- c. The chicom type 53 MOD 2 fuze is a setback and centrifugal force armed fuze.

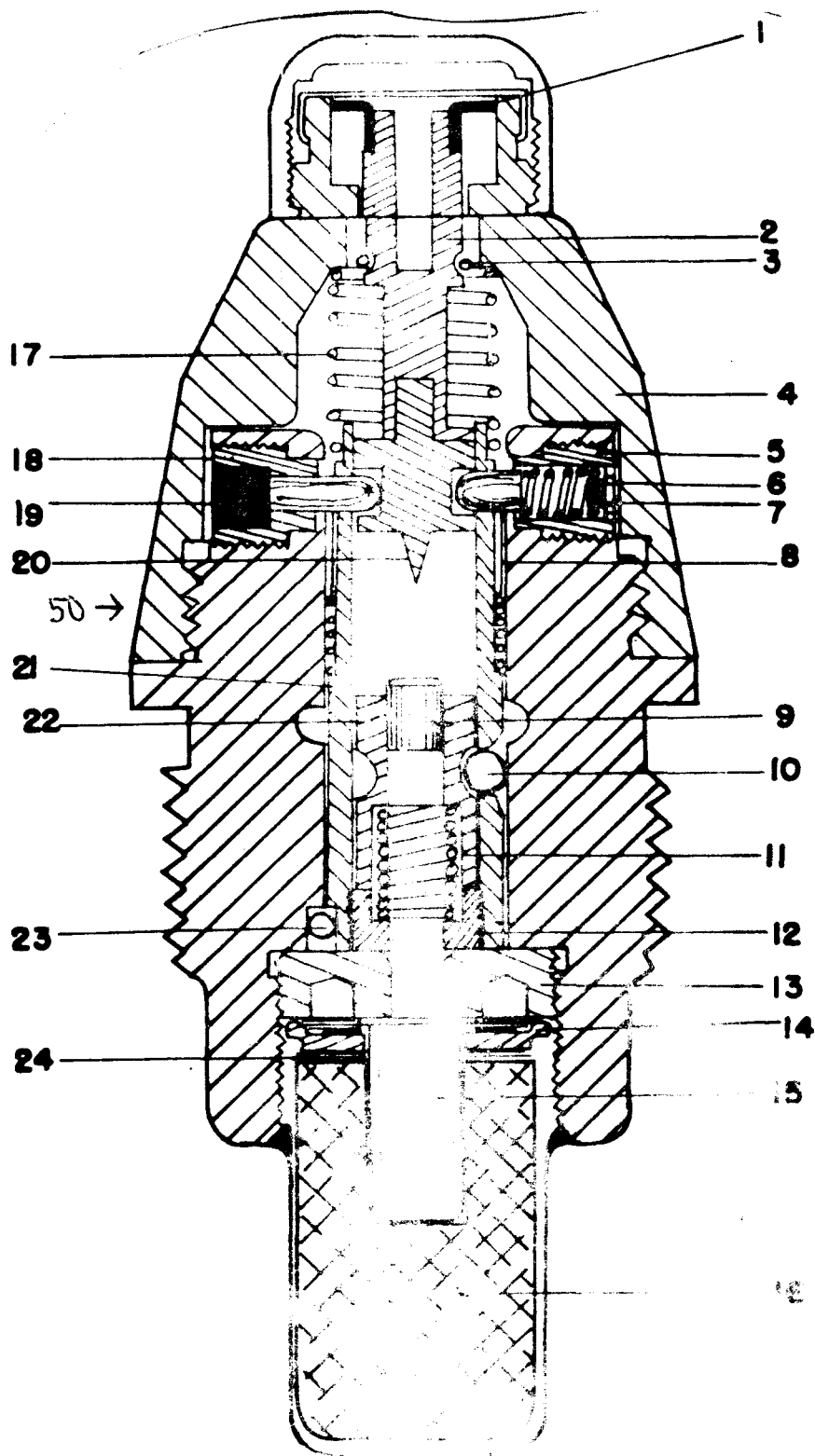


Figure 6-6. Cnic (1) (2) (3) (4) (5) (6) (7) (8) (9) (10) (11) (12) (13) (14) (15) (16) (17) (18) (19) (20) (21) (22) (23) (24) Type 1 (2) (3) (4) (5) (6) (7) (8) (9) (10) (11) (12) (13) (14) (15) (16) (17) (18) (19) (20) (21) (22) (23) (24)

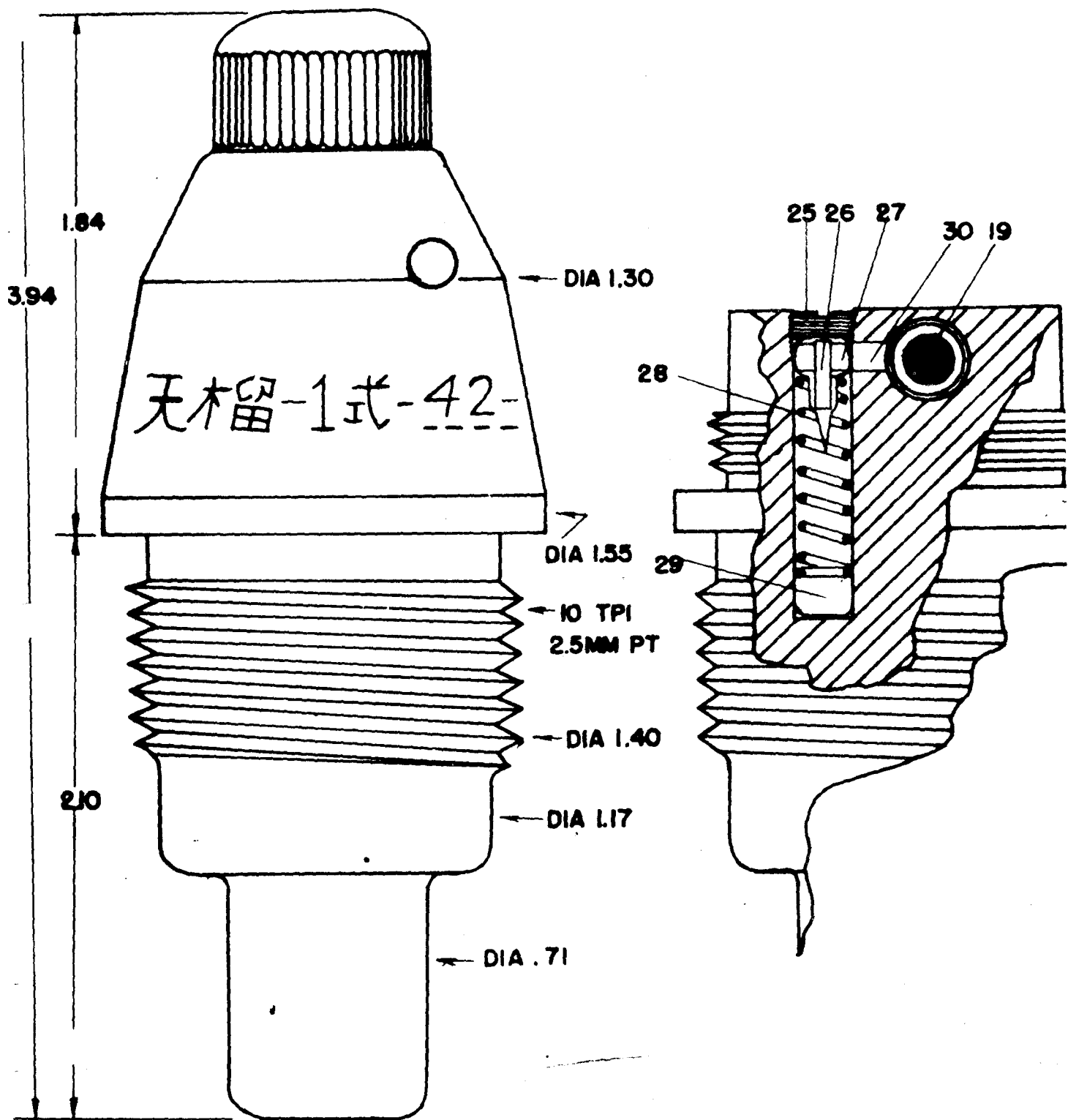


Figure 6-7. Chicom Point-Detonating Impact Fuze:
Type I (Artillery)

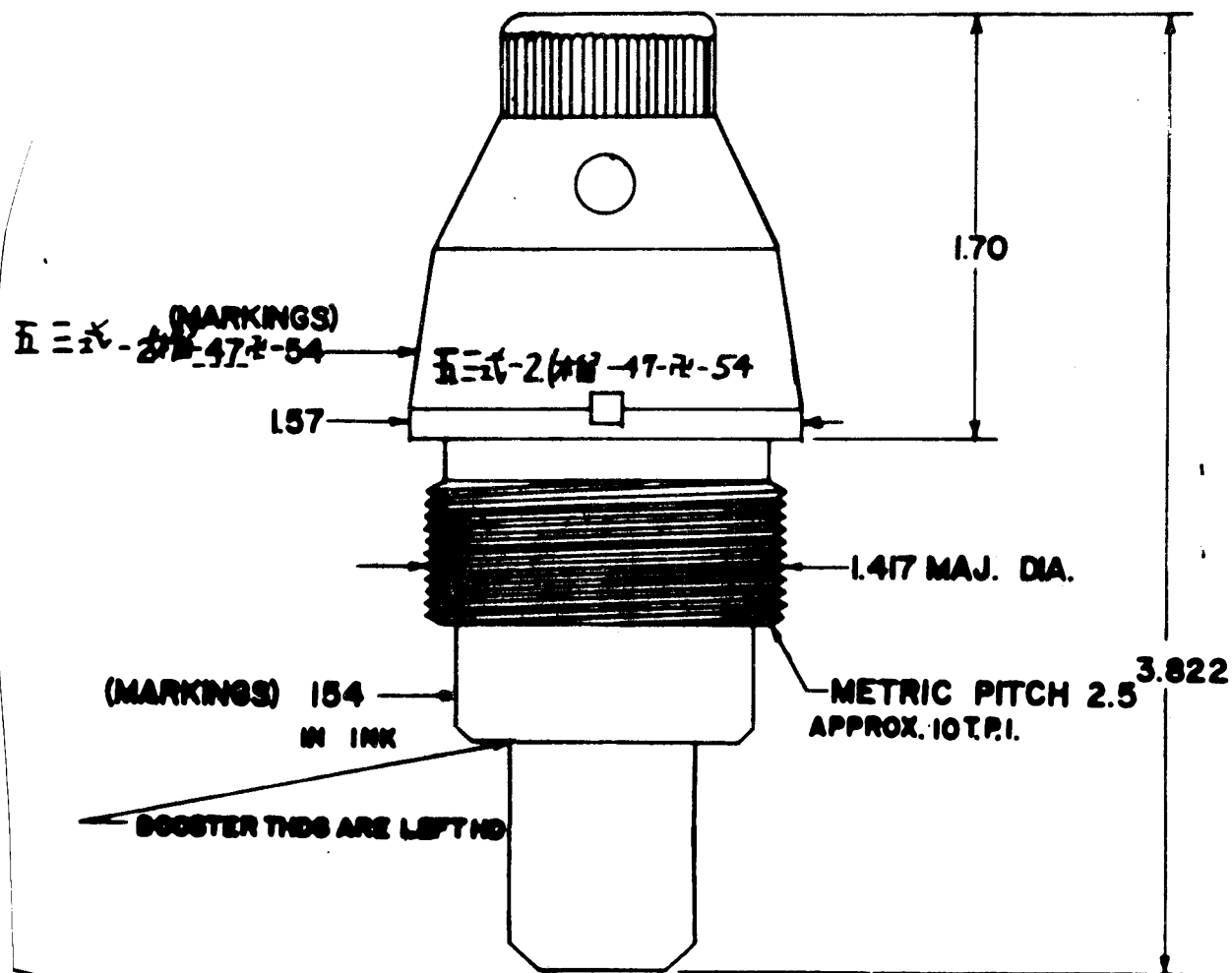


Figure 6-8. Chicom Point-Detonating Impact Fuze, Type 53 Mod 2

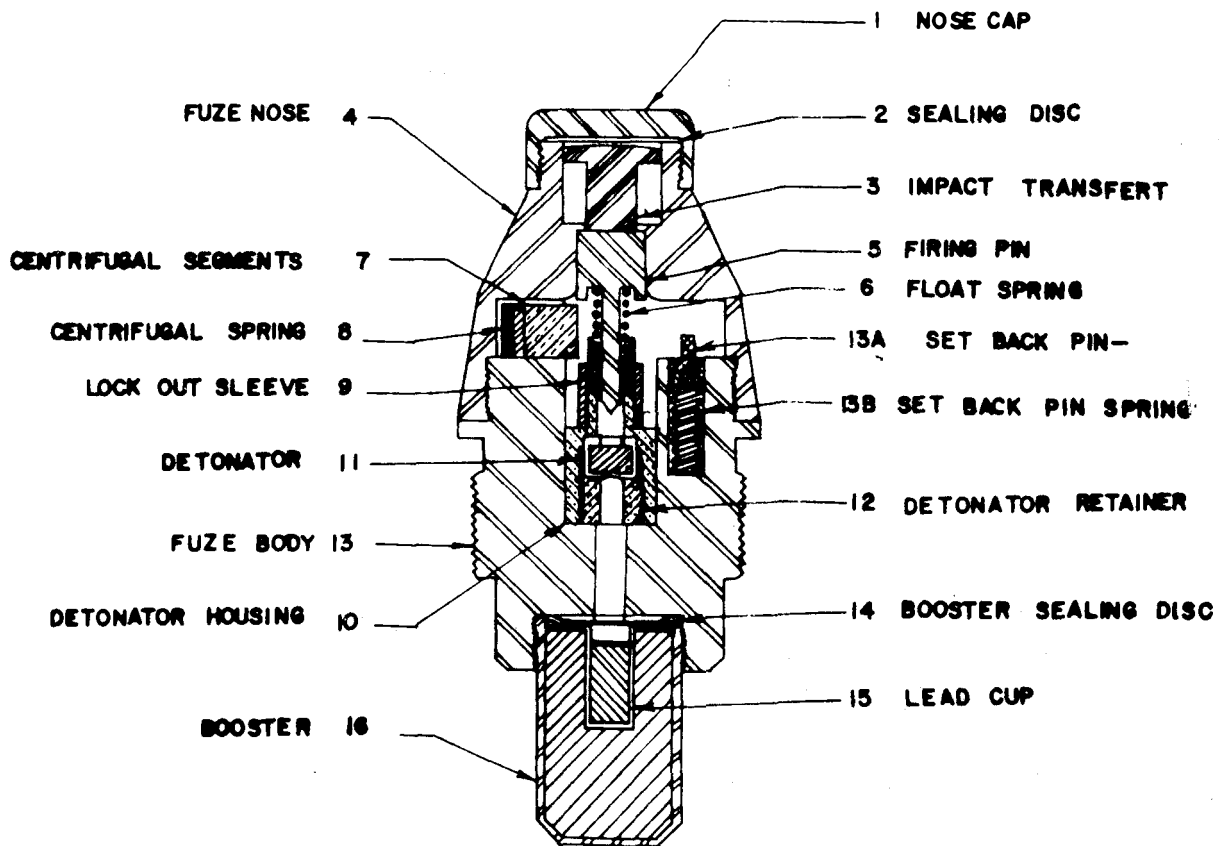


Figure 6-9. Chicom Point-Detonating Impact Fuze,
Type 53, Mod 2

1-18. Operation: Upon firing, setback causes the setback pin (13a) to move downward and remain in this position throughout sustained acceleration. When centrifugal force overcomes the friction produced by setback, the key detent (7) permits the remaining detents to pivot outward in sequence. When all base pivoted from beneath the firing pin (5) the fuze is armed. Creep action causes the lockout sleeve (9) to move forward and prevents the centrifugal spring from forcing the detents (7) to return to their original positions upon spin delay. With the detents (7) locked out by the sleeve (9) the firing pin (5) is separated from the detonator (11) by the anticreep spring (6).

Upon impact the firing pin (5) is driven downward by the impact plunger (3) piercing the detonator (11). The detonator (11) flashes through flash channel initiating the lead cup (15) and boosters (16). If the projectile impacts at a flat angle, or the nose cap (1) was left in position, the detonator housing (10) slides forward in its cavity impaling the detonator (11) on the primer, initiating fuze action. This twin movement of the firing pin and detonator is characteristic of the new Soviet/ChiCom fuze series and results in excellent fuze confidence.

75MM RECOILLESS RIFLE ROUND (HEAT), TYPE TS-2

1-19. Type: The 75MM recoilless rifle round (HEAT) with the chicom point-detonating impact fuze type TS-2 (reference figures 6-10 and 6-11).

1-20. Identification:

- a. The 75MM recoilless rifle round (HEAT) has a two piece steel body with two spanner wrench holes in the nose section.
- b. The cartridge case contains vent holes.
- c. The chicom type TS-2 fuze is a setback armed, nondelay, impact fuze.

1-21. Operation: Upon firing, setback forces the Zig-Zag sleeve (15) to the rear, releasing the sleeve retaining ball (14) which falls into the fuze body cavity. As setback decreases the sleeve spring (4) which is compressed by the sleeve, expands, moving the sleeve (15) forward beneath the head of the firing pin assembly (13) and releasing the four firing pin locking balls (6), allowing them to drop into the fuze body cavity (5). The fuze is now armed. The firing pin is held separated from the primer detonator (9) by the firing pin spring (17). Upon impact, the plunger (2) is driven against the head of the firing pin assembly (13) which pierces the primer detonator (9) causing it to detonate and, in turn, detonate the booster.

If the fuze impacts at a flat angle so that the plunger (2) is not depressed, the graze sensitive plunger moves laterally, overcoming the retaining disc (11) and forcing the primer-detonator assembly (9) forward onto the firing pin (9) achieving detonation.

B-50 ROCKET, HEAT, B-50

1-22. Type: The B-50 rocket, HEAT, with a North Vietnamese base-detonating impact fuze, B-50. The rocket is often referred to as a grenade. (reference figure 6-12).

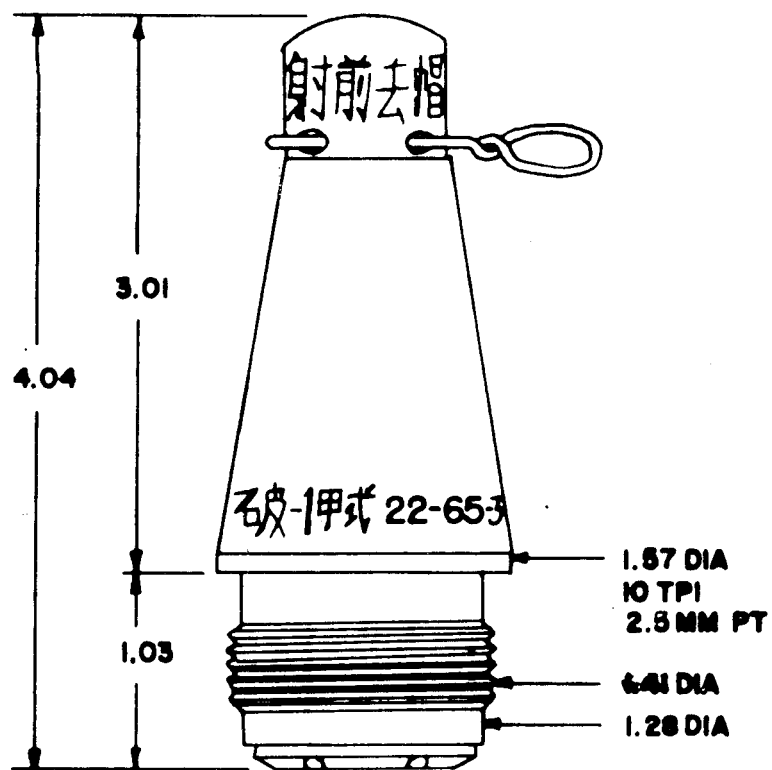


Figure 6-10. Chicom Point-Detonating Impact Fuze:
Type TS-2

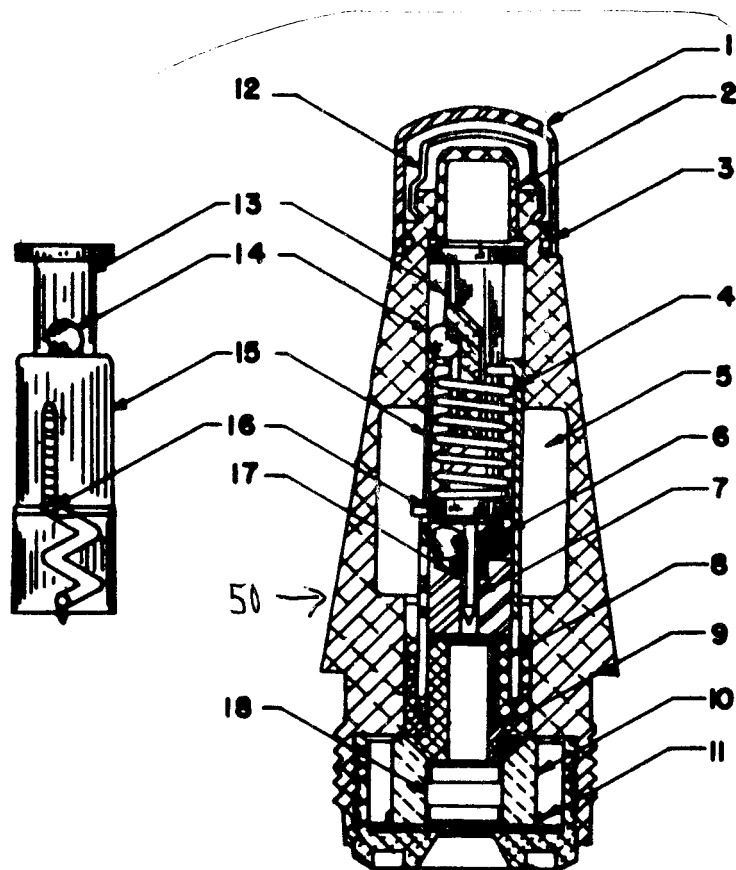


Figure 6-11. Chicom Point-Detonating Impact Fuze,
Type TS-2

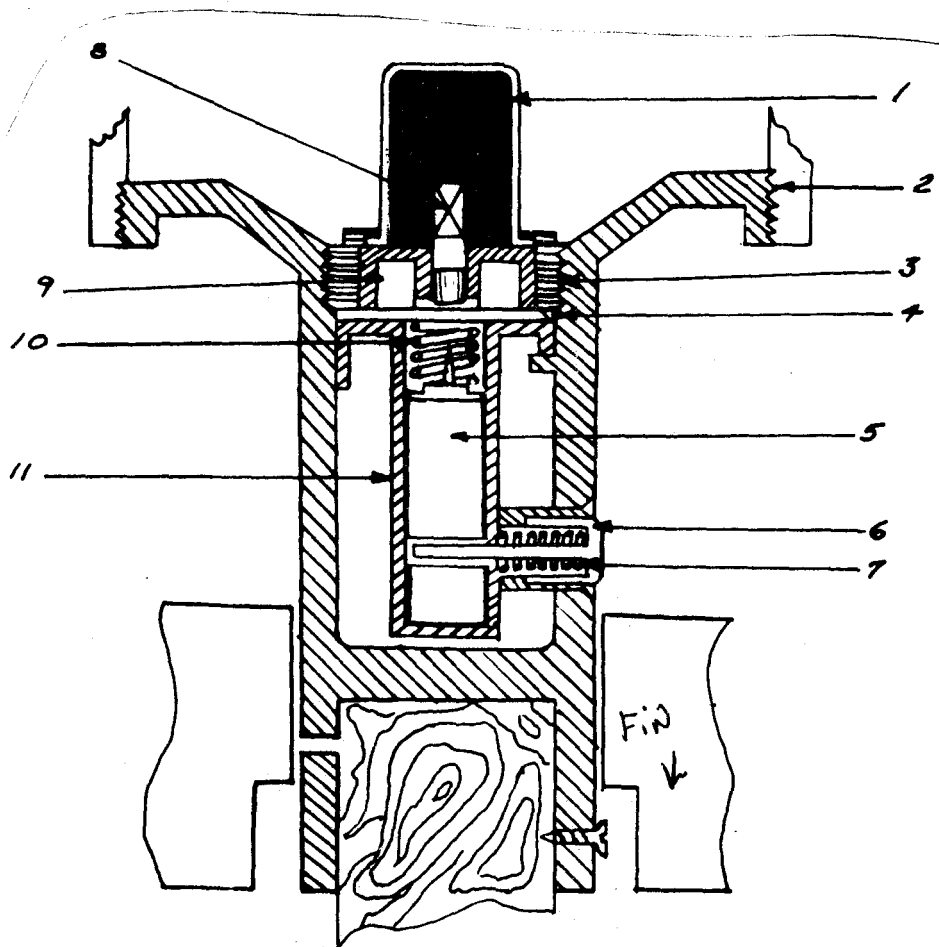


Figure 6-12. North Vietnamese Base Detonating Impact Fuze, B-50.

1-23. Identification:

- a. The B-50 rocket is OD in color and has the appearance of a HEAT round.
- b. The B-50 rocket is approximately 41 inches long, 100MM in diameter at the warhead and 50MM in diameter at the motor.
- c. The B-50 rocket has a wooden boom that attaches the warhead to the motor.
- d. The wooden boom holds the fuze and sliding stabilizer fins.
- e. The fuze, B-50, is jump-out-pins operated and impact fired.
- f. The fuze, B-50, is completely hidden in the wooden boom and the warhead body.

Range 100 meters

1-24. Operation:

Upon firing the B-50 grenade inertia causes the fin assembly to shear a pin and move to the rear of the wooden boom. This uncovers the jump-out pin (6) which is expelled from the fuze housing (2), by the jump-out pin spring (7). This frees the firing pin (5) which is held away from the primer detonator (8) only by the anti-creep spring (10). The fuze is now armed. When the grenade impacts the inertia firing pin (5) moves forward and presses the stab-sensitive primer-detonator (8). This initiates the booster (1) and the shaped charge warhead of the B-50 grenade.

PG-2 HEAT GRENADE (DK-2)

1-25. Type: The PG-2 HEAT grenade, with the DK-2 Soviet, base-detonating impact fuze (reference figure 6-13).

1-26. Identification:

penetrates 6 to 7" Steel

- a. The PG-2 has a HEAT round appearance and is OD in color.
- b. It has a crimped ogive and is approximately 19.9 inches long.
- c. The PG-2 has wrap-around fins and a screw on type propelling charge.
- d. The DK-2 fuze has a small round metal body with a plastic cover.
- e. The DK-2 is an always-acting type fuze, enclosed in the base of the PG-2, and it is removeable.

1-27. Operation: Upon firing, setback causes the Zig-Zag arming sleeve (4) to compress the setback spring (6) as it moves rearward. The end of the transverse plunger (5) rides through the large Zig-Zag slot to the forward end of the sleeve. This allows the small end of the plunger to move to the right, forced by the plunger spring (10), and into the small slot. The setback spring (6) then forces the sleeve forward. The Zig-Zag slot causes the sleeve to move forward by a reciprocating action. This action produces sufficient arming delay until the grenade has traveled a safe distance from the launcher. Upon impact, the striker assembly (9) moves forward overcoming the anti-creep spring (3) and the sharp pointed firing pin pierces the primer detonator. This initiates the detonator and booster. If the round impacts at a low angle, the steel

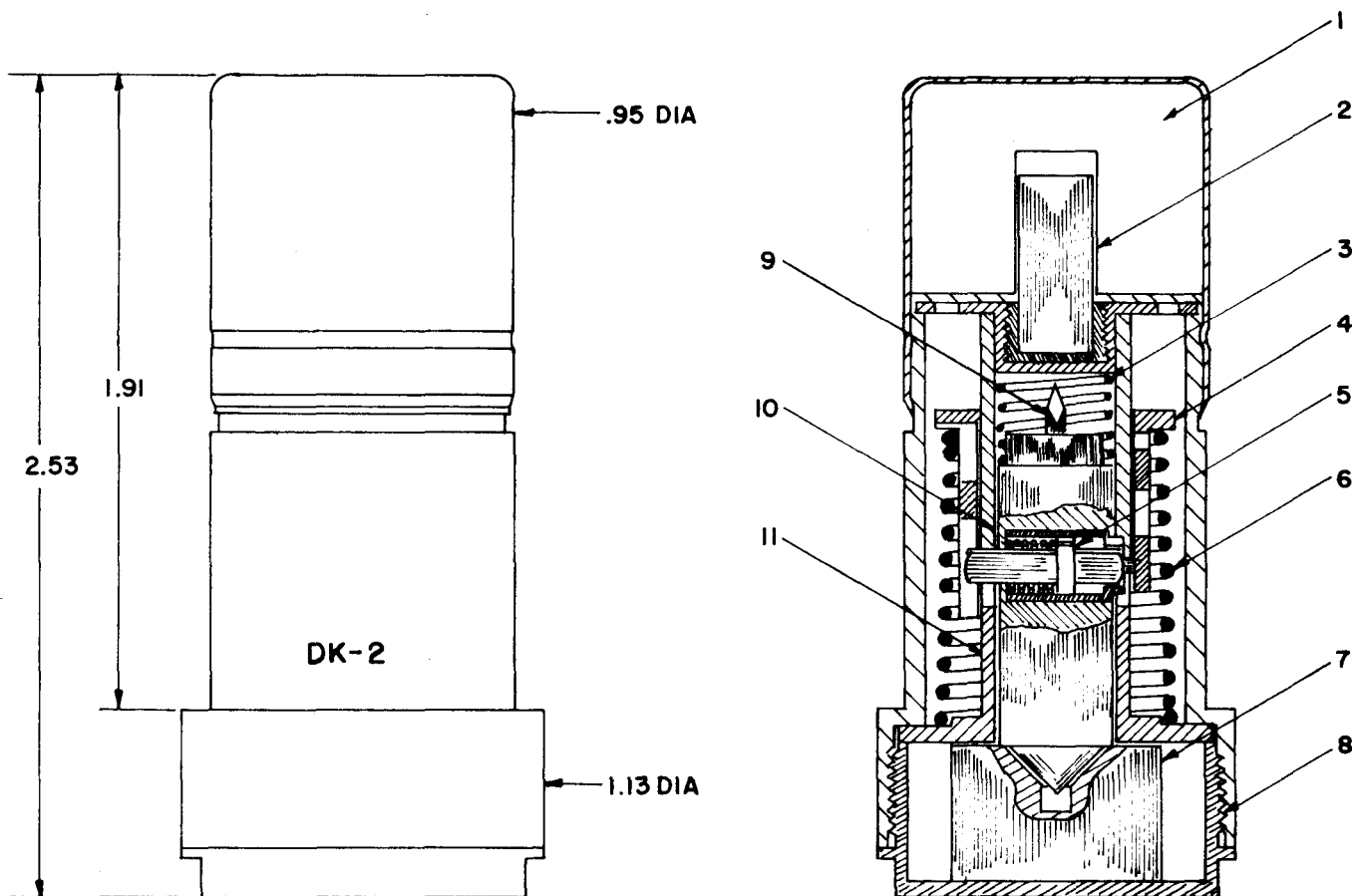


Figure 6-13. Soviet Base-Detonating Impact Fuze:
Model DK-2

hammer (7) placed below the striker assembly (9) moves laterally in its cavity camming the firing pin assembly into the primer detonator.

PG-2 HEAT GRENADE (DK-4)

1-28. Type: The PG-2 HEAT grenade with the DK-4 Soviet, base-detonating impact fuze which incorporates a self-destruct feature (reference figure 6-14)

1-29. Identification:

- a. The PG-2 has a HEAT round appearance and is OD in color.
- b. It has a crimped ogive and is approximately 19.9 inches long.
- c. The PG-2 has wrap-around fins and a screw-on type propelling charge.
- d. The DK-4 fuze has a small, round, metal body approximately 2.5 inches long, and 1 inch in diameter.
- e. The DK-4 is an always-acting type fuze, enclosed in the base of the PG-2 and it is removeable.

1-30. Operation: Upon firing, setback causes the weighted primer (21) to move rearward against its spring (22). If setback is of sufficient magnitude the primer (21) is impaled upon the fixed firing pin (23). The resulting flash travels through the flash channel (13) and ignites the self-destruct ignitor (14) starting the self-destruct delay element (15) burning. Flame also passes into the large cut (24) and ignites the pyrotechnic arming delay pellet (25). Simultaneously, the setback sleeve (10) moves rearward, compressing its spring (16). When the mouth of the sleeve (10) clears the lock pin (12), the pin is forced outward by its spring locking the sleeve (10) to the rear. At this time the pyrotechnic delay pellet (25) burns out permitting the pin (11) to be forced into the evacuated cavity by its spring. The fuze is now armed. The housing (9) acting as an inertia weight is restrained only by the anti-creep spring (11).

Upon impact, the housing (9) moves forward permitting the firing pin (8) to pierce the stab-sensitive detonator (3) which initiates the booster and main charge. In the event the grenade misses the target the self-destruct element (15) burns through igniting the propelling charge (19). Forces from the charge (19) expand against the cap (18) forcing the housing (9) forward in the same manner as inertia forces will normally produce functioning.

PG-7, HEAT ROCKET, MODEL VP-7

1-31. The PG-7, HEAT rocket, with the Soviet, piezo-electric, point-initiating, base-detonating, impact fuze, model VP-7 (reference, figures 6-15 and 6-16).

1-32. Identification:

penetrate 15" steel

- a. The PG-7 has a HEAT round appearance and is OD in color.
- b. The PG-7 has tractor type ventures located near the forward end of the motor where it mates to the warhead.

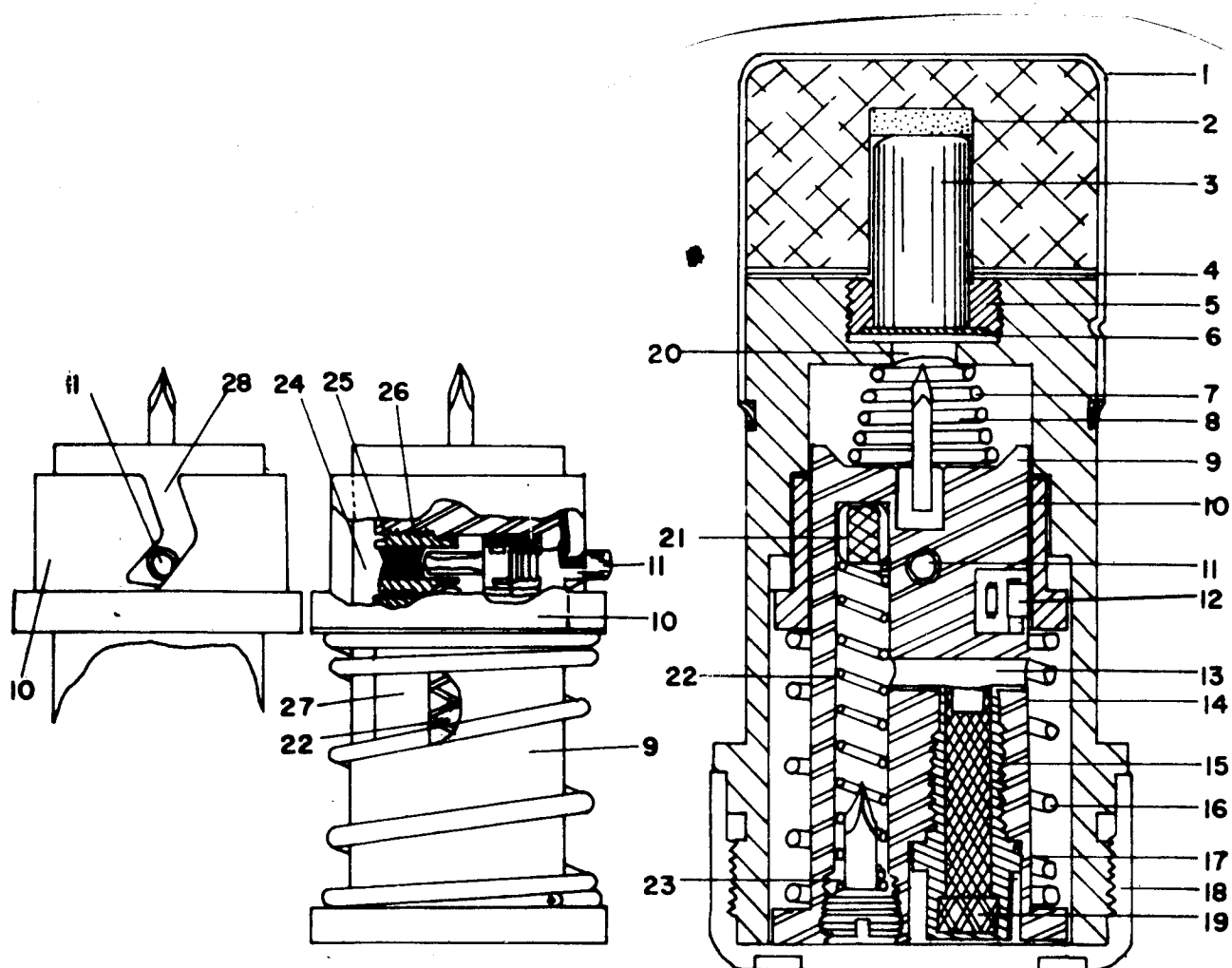


Figure 6-14. Soviet Base Detonating Impact Fuze, DK-4

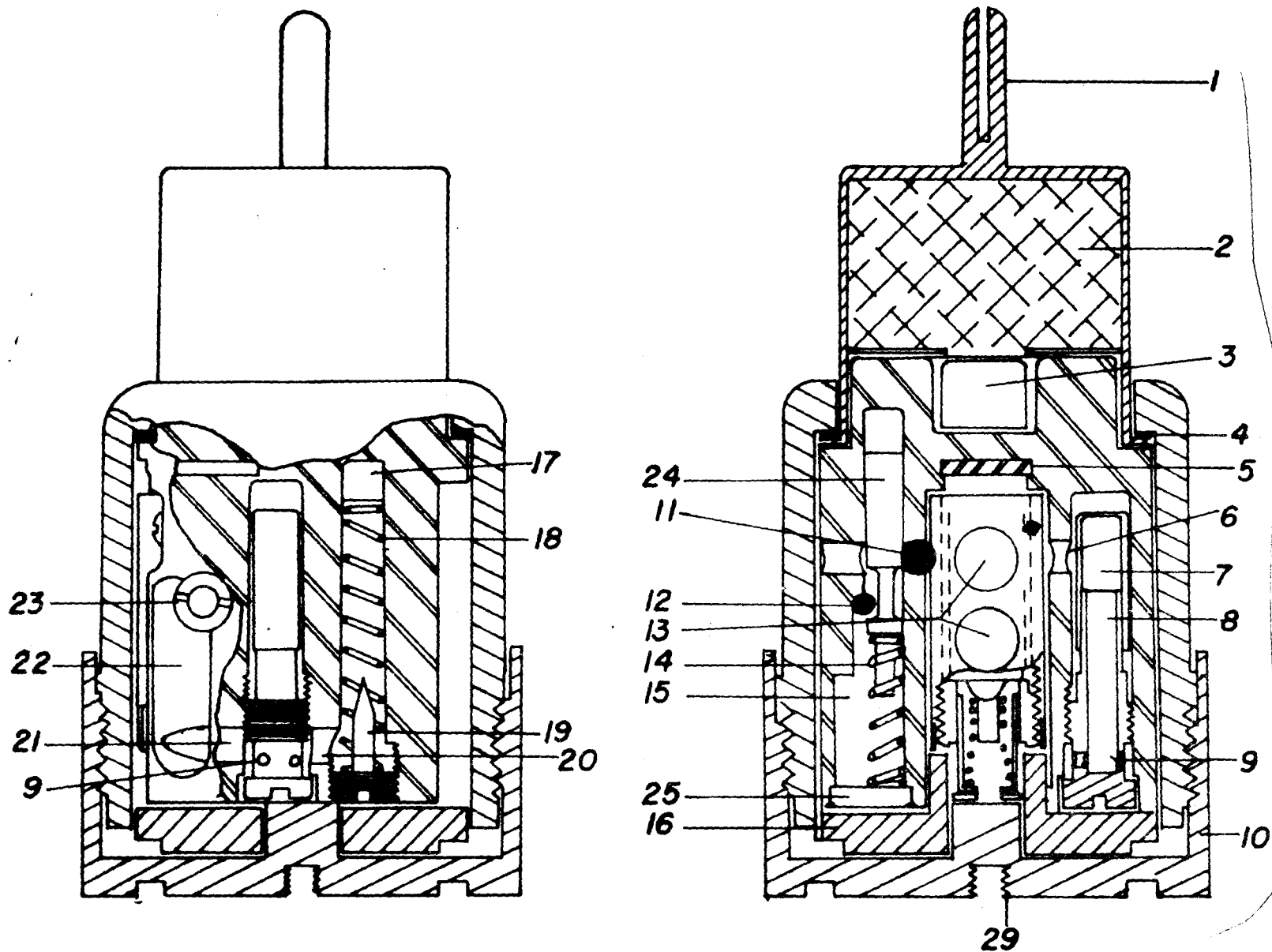
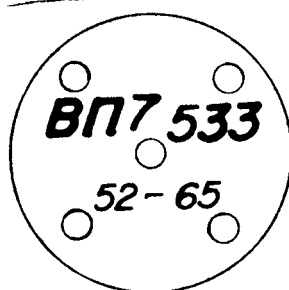
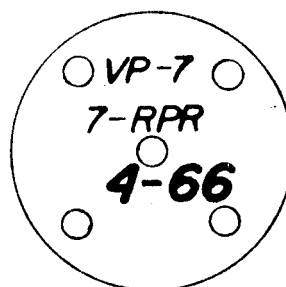


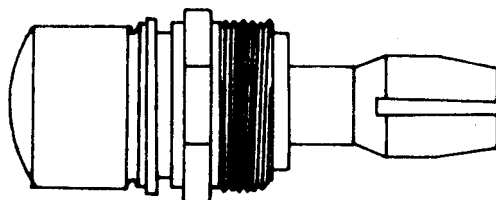
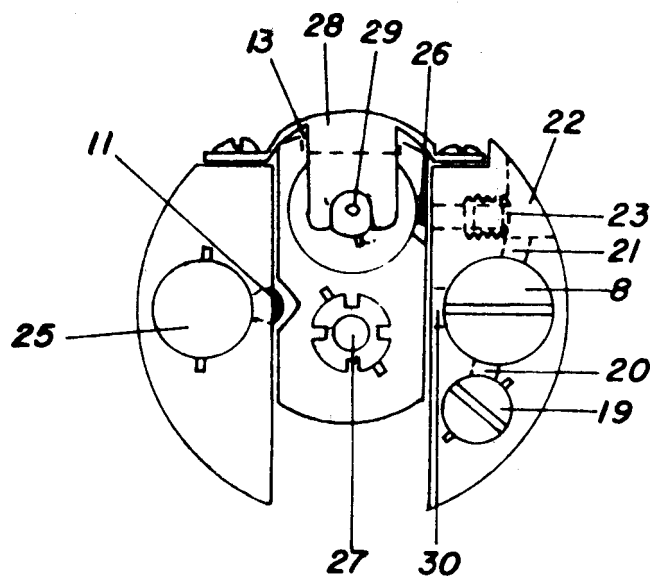
Figure 6-15. Soviet Piezo-Electric Point Initiating,
Base-Detonating, Impact Fuze VP-7



SOVIET



RUMANIAN



PIEZO ELECTRIC NOSE ELEMENT

Figure 6-16. Soviet Piezo-Electric Initiating, Base-Detonating, Impact Fuze VP-7.

- c. A propelling charge which is attachable to the motor is also used.
- d. The VP-7 fuze is completely enclosed in the base of the warhead.
- e. The PG-7 incorporates twin piezo-electric crystals which are located in the nose of the round.

1-33. Operation: Upon firing setback causes the weighted flash primer (17) to move rearward compressing its spring (18) and impales itself on the fixed firing pin (19). The resulting flame travels up the flash channel (20), ignites the self-destruct delay element (8) through the holes (9) in the delay housing and continues on up the flash channel (21) where the flame spreads in the groove (22) and ignites the arming delay pellet (23) that begins to burn.

Simultaneously the setback pin (24) moves rearward against its spring (14) depositing the ball (12) in the fuze cavity (15). The slight rotation of the rocket plus the cam surface on the slider causes the slide lock ball (11) to move inward, unlocking one side of the slider. As the arming delay pellet (23) is consumed the slider moves downward under action of the twin compressed springs (13), camming the lock pin (26) into the evacuated pellet cavity (23). When completely unlocked the slide moves downward, aligning the electric detonator (29) with the booster lead (3) and further aligning the self-destruct blast cavity (6) with the hole in the slide leading to the detonator (29). With the downward movement of the slider the shorting pin (27) is disconnected from the stud on the closing cap and the electric detonator contact (29) moves with the stud. The fuze is now mechanically and electrically armed.

Upon impact with a target the twin piezo-electric crystals in the nose element are stressed. This generates a pulse of current that travels through the inner and outer cones of the ogive, through the pin (1), through the fuze housing, onto the bridge wire of the electric detonator. The detonator is initiated, which functions the explosive train.

If the rocket does not impact with a target. The self-destruct delay (8) burns into the self-destruct detonator (7) which flashes through the channel (6) to detonate the electric detonator, initiating the rocket explosive train in the normal manner.

82MM, HE FRAG MORTAR, MODEL NNC 82

1-34. Type: The 82MM, HE FRAG mortar, with the North Vietnamese, chemical long delay fuze, model NNC 82 (reference figure 6-17).

1-35. Identification:

- a. The round is OD or reddish in color with Chicom markings.
- b. It has a bulb-shape body with fins.
- c. The NNC 82 fuze has an aluminum body with a major break in the middle.
- d. The fuze has a removeable nose cap for an acetone ampule.

Range 3070 yards

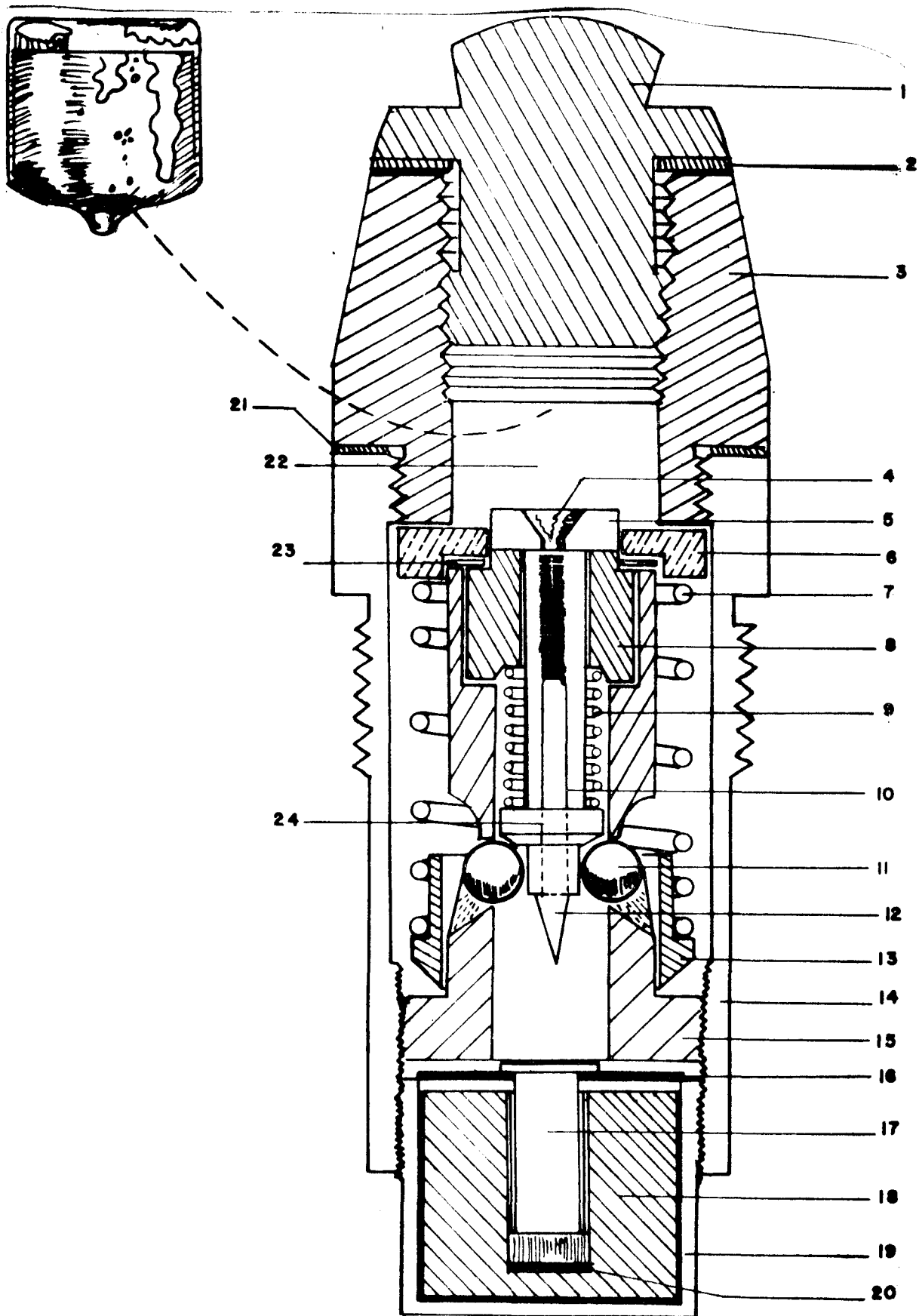


Figure 6-17. North Vietnamese Chemical Long Delay Fuze Model NNC 82

e. The NNC 82 fuze is approximately 4.5 inches long, 1.5 inches in diameter with the markings, NNC 82-2-67.

1-36. Operation: Prior to firing an ampule is installed in the fuze and crushed by tightening the nose plug (1). This releases acetone on the delay element (5) that retains the striker (10) in the cocked position. The striker is further held in the safe position prior to impact by the two locking balls (11) seated under the striker housing flange (24). Nose impact is the only force that arms the fuze. Upon firing, setback locks all moveable parts firmly together. No arming movement occurs. Upon impact, the impact arming collar (13) moves forward compressing the impact spring (7), simultaneously the locking balls (11) fly out of their recesses due to inertia. The balls move into the circumferential grooves in the firing mechanism housing (15) and are held in this groove when the impact arming collar (15) is forced rearward by the spring (11). The striker (12) is now unlocked and the fuze armed. As the acetone softens the plastic delay element (5) the striker spring (9) pulls the head of the striker (4) through the softened plastic and propells the sharp pointed striker (12) into the stab sensitive detonator (17) causing the detonator and booster to detonate.

It is apparent the fuze may have the fuze ampule crushed at any time prior to firing. Until impact, the fuze remains unarmed and safe. If the long delay period expires prior to firing, the fuze will detonate non-delay upon impact.

PART TWO

GRENADES

OBJECTIVES

To learn the identification, operation, hazards, and precautions of enemy grenades and EOD procedures for enemy grenades.

INTRODUCTION

The necessity for learning the objectives of this text should be obvious to all of us.

RKG-3

2-1. Type: RKG-3 anti-tank, parachute stabilized, shape charge hand grenade (reference figure 6-18A, 6-18B).

2-2. Identification: The grenade consists of:

- a. cylindrical sheet metal charge container, and
- b. A long cylindrical sheet metal handle which contains the stabilization parachute, a safety lever, and the grenade fuze.

2-3. Operation:

- a. This grenade is hand thrown and parachute stabilized.
- b. Once the grenade is thrown the safety lever is released, the parachute ejects, and the fuze is armed.
- c. Upon impact, inertia causes the firing pin to strike the primer, which in turn initiates the detonator to explode the main charge.

2-4. Hazards:

- a. The fuze has a very sensitive cocked striker.
- b. Shape charge precautions.

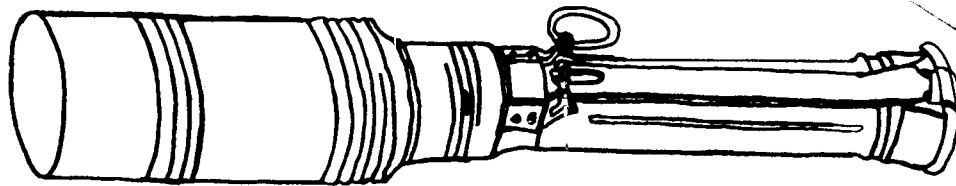


Figure 6-18A. Soviet RKG-3 HEAT Hand Grenade

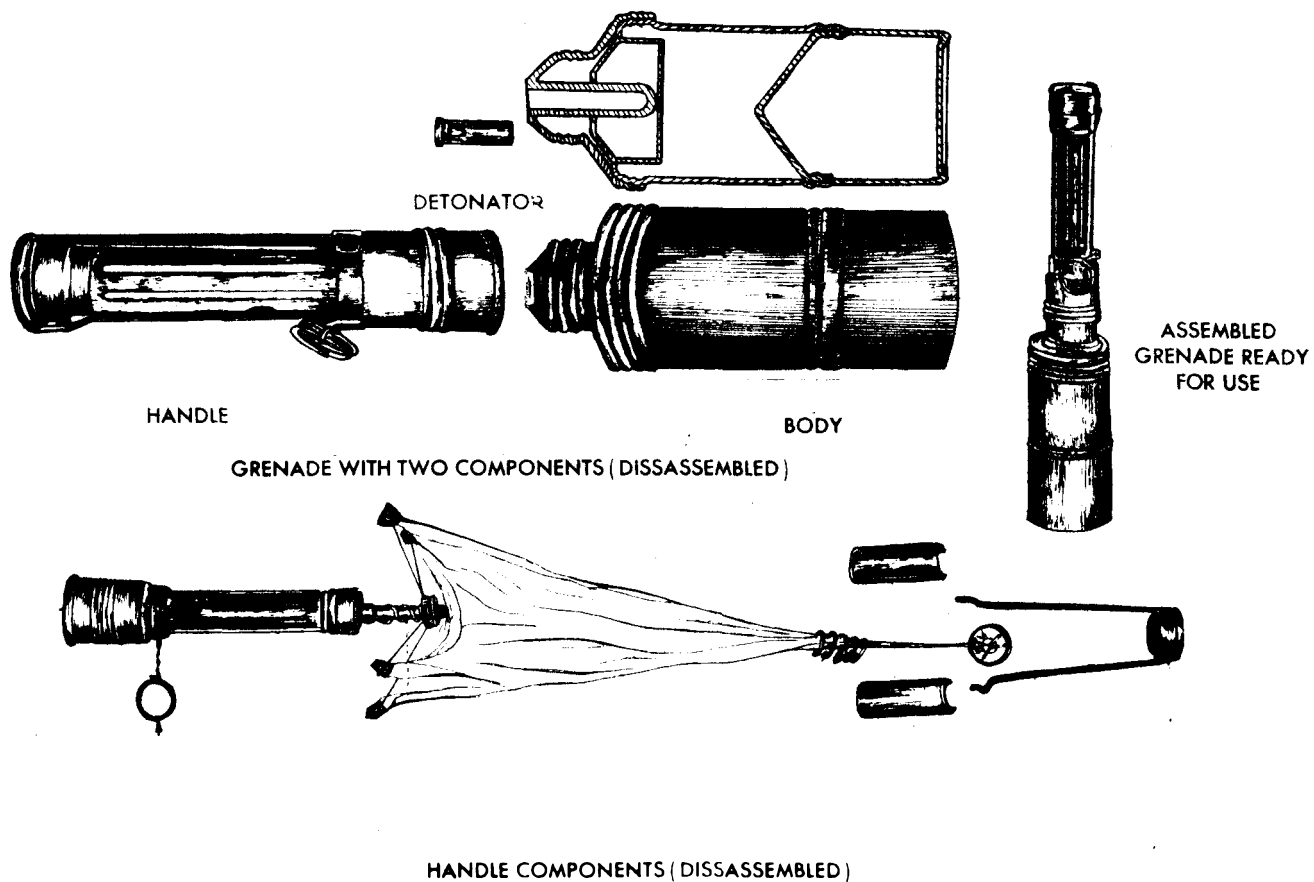


Figure 6-18B. Exploded View RKG-3 Grenade

BLAST GRENADES

2-5. Type: Blast Grenade (reference figure 6-19).

2-6. Identification:

- a. Cylindrical body.
- b. Body made of thin sheet metal.

2-7. Operation:

- a. When thrown, the safety lever will spring upward and leave the grenade body.
- b. The firing pin underspring tension is forced down and strikes the primer which ignites the time delay.
- c. The time delay, in turn, detonates the main charge of the grenade.

2-8. Hazards:

- a. Possible reverse action fuze.
- b. Possible instantaneous fuze.
- c. Check for booby traps.

FRAGMENTATION GRENADE

2-9. Type: Fragmentation Grenade (reference figure 6-20).

2-10. Identification:

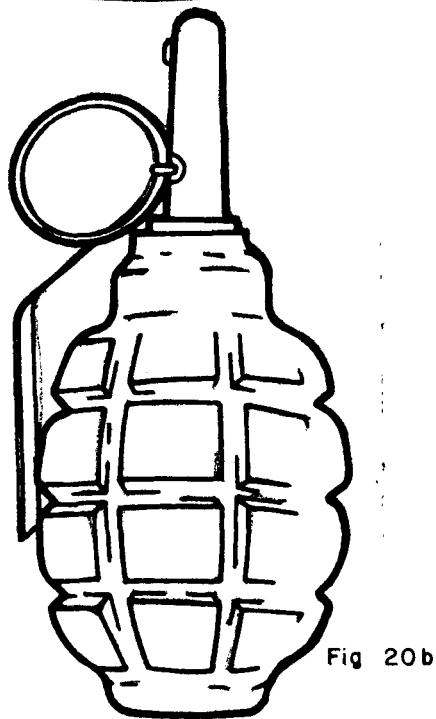
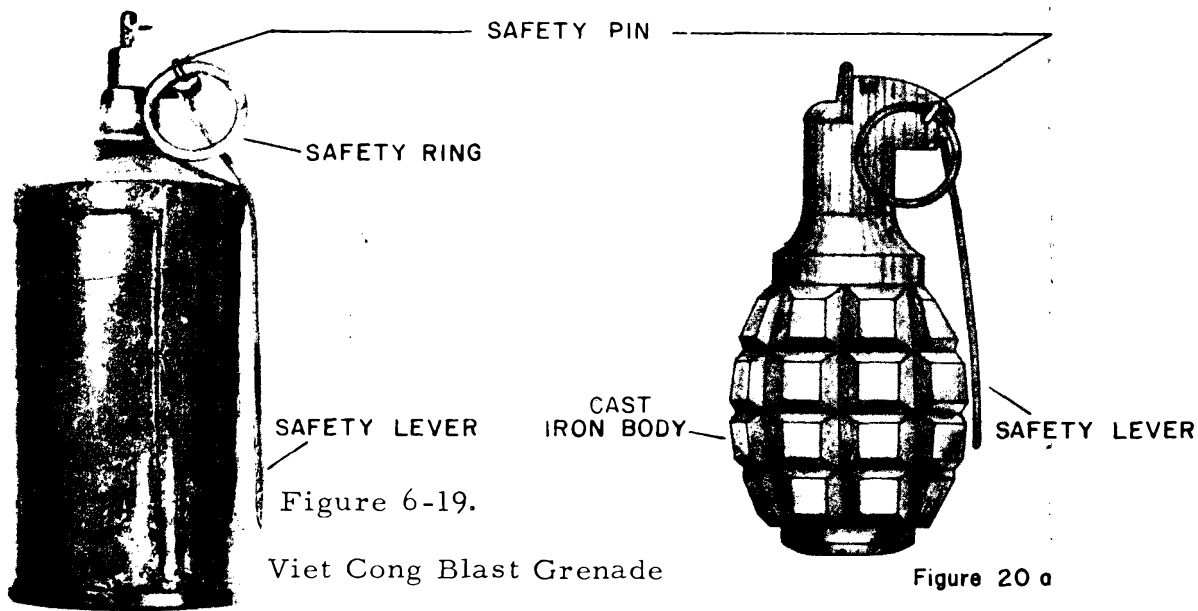
- a. Shape similar to the U.S. MK2.
- b. Serrated cast iron body.

2-11. Operation:

- a. When thrown, the safety lever will spring upward and leave the grenade body.
- b. The firing pin under spring tension is forced down and strikes the primer which ignites the time delay.
- c. The time delay, in turn, sets off the grenade.

2-12. Hazards:

- a. Reverse action fuze.
- b. Possible instantaneous fuze.
- c. Check for booby traps.



Chinese Communist type 1 defensive hand grenade.



Fig 20c

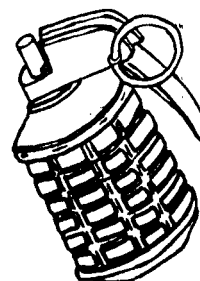


Fig 20d

Figure 6-20. Fragmentation Grenades

STICK GRENADES

2-13. Type: Stick Grenades (reference figure 6-21).

2-14. Identification:

- a. Cylindrical metal body.
- b. Long or short wooden handle
- c. May be a blast or fragmentation type grenade.

2-15. Operation:

- a. The card of a pull-friction fuze is located underneath the cap at the end of the throwing handle.
- b. A pull on this cord ignites a delay element.
- c. 2.5 to 6 seconds later the detonator explodes the main charge.

2-16. Hazards:

- a. Possible booby trapped fuze.
- b. Check for booby traps.
- c. Handle stick grenades only when necessary.

C S GRENADE

2-17. Type: C S Grenade (reference figure 6-22).

2-18. Identification:

- a. Body made of sheet metal.
- b. Similar to the blast type stick grenade.
- c. Possible plug for emission holes.
- d. Sometimes painted light green.

2-19. Operation:

- a. The card of a pull-friction fuze is located underneath the cap at the end of the throwing handle.
- b. A pull on this card ignites a delay element.
- c. The delay element ignites the C S compound.

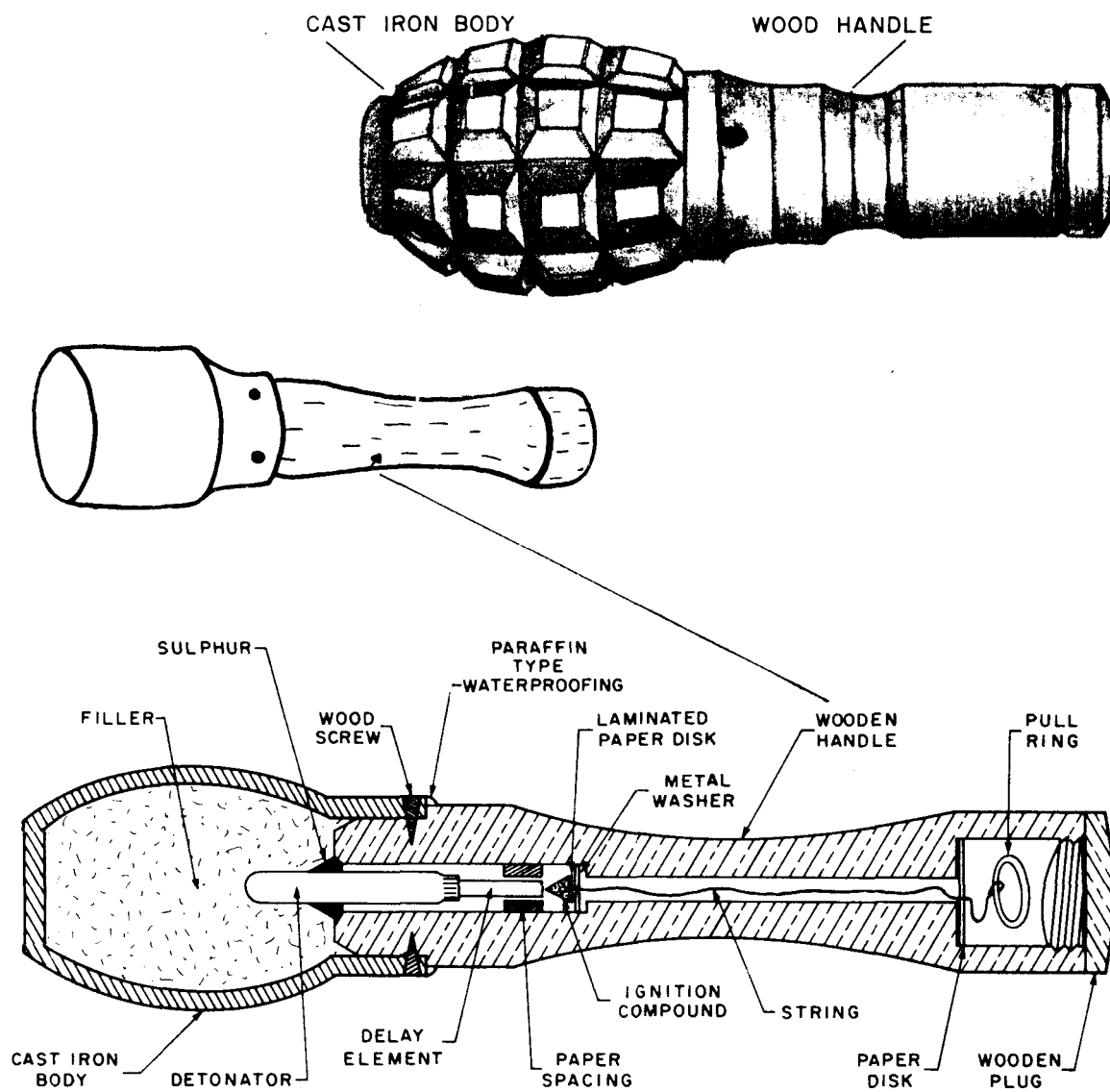


Figure 21 CHICOM Fragmentation Stick Grenade

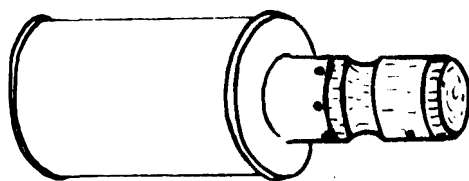


Figure 6-22. Viet Cong CS Grenades

2-20. Hazards:

- a. C S
- b. Possible booby trapped fuze.

FRENCH GRENADE

2-21. Type: French Grenade (reference figure 6-23).

2-22. Identification:

- a. Light brown in color.
- b. Mechanical firing head made of lead.
- c. Safety lever made of sheet metal.
- d. May be a blast or fragmentation type grenade.

2-23. Operation:

- a. When thrown, the safety lever is forced away from the grenade body by a spring loaded jump out pin. The safety lever is attached to the mechanical firing head and will remain with the grenade.
- b. The jump out pin releases a cocked striker which ignites the time delay.
- c. The time delay, in turn, detonates the main charge of the grenade.

2-24. Hazards:

- a. Possible hung cocked striker.
- b. Check for booby traps.

IMPROVISED GRENADES

2-25. Type: Improvised Grenades

2-26. Identification:

- a. These grenades will be of sizes and weights that can effectively be hand thrown and accept grenade type fuzing.
- b. Altered modified smaller ordnance that can be made to accept grenade type fuzing.
- c. The ability of the enemy to improvise grenades from small pieces of head pipe, bottles, tin cans or similar materials is unlimited.

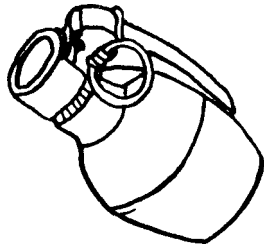


Figure 6-23. French Fragmentation Grenades

2-27. Operation:

- a. Same as other grenades
- b. Can be pull friction or cocked striker fuze

2-28. Hazards:

- a. Difficulty in identifying
- b. Check for booby traps
- c. Hung cocked striker
- d. Possible instantaneous fuze
- e. Possible reverse action fuze

SOVIET ANTI-TANK HAND GRENADE RPG-6

2-29. Type: Soviet Anti-Tank Hand Grenade RPG-6 (reference figure 6-24).

2-30. Identification:

- a. Sheet metal body
- b. Handle for throwing, which also contains stabilizing strips of cloth

2-31. Operation:

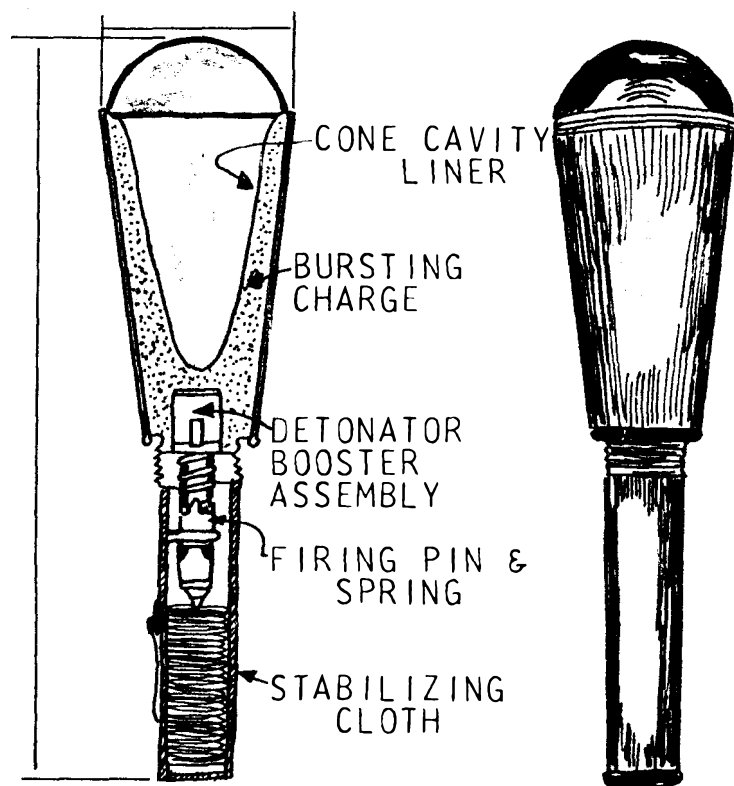
a. When thrown safety lever is ejected from handle, safety lever acts as pilot chute withdrawing stabilizing cloth strips.

b. Safety pin is free to pop out, arming the impact fuze.

c. Impact drives the firing pin into the detonator.

2-32. Hazards:

- a. Jet
- b. FRAG
- c. HE
- d. Possible booby traps



SOVIET ANTITANK HAND GRENADE, TYPE RPG-6

Figure 6-24. Soviet Antitank Hand Grenades, Type RPG-6

SOVIET ANTI-TANK GRENADE RPG-43

2-34. Type: Soviet Anti-Tank Grenade RPG-43 (reference figure 6-25).

2-35. Identification:

- a. Sheet metal container
- b. Wood Handle
- c. Collar or cone containing stabilizing strips of cloth

2-36. Operation:

- a. When thrown the collar and safety lever are forced off the grenade by a compressed spring.
- b. The safety pin is free to fall from the safety screw.
- c. Impact drives the detonator booster onto the fixed firing pin to initiate the explosive train.

2-37. Hazards:

- a. HE
- b. FRAG
- c. JET
- d. Possible booby traps

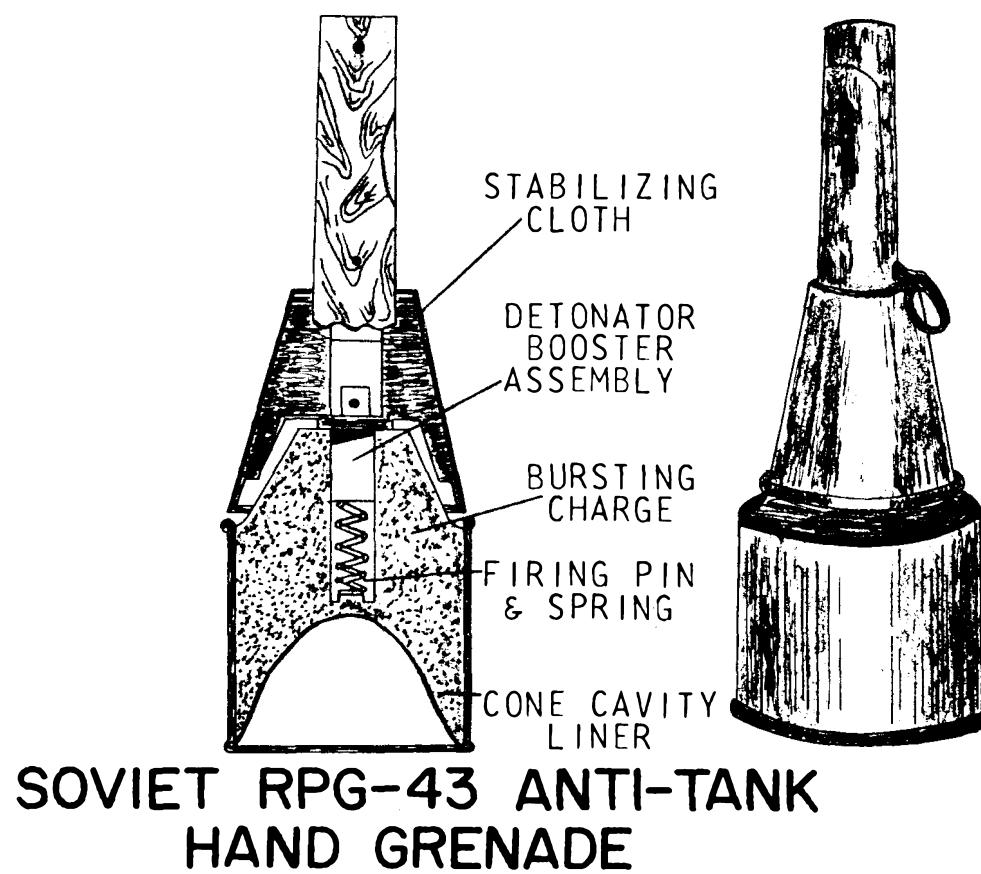


Figure 6-25. Soviet RPG-43 Antitank Hand Grenades

CHAPTER 7

US PLACED MUNITIONS

PART ONE - MINES

PART TWO - BOOBY TRAP PRIMING AND INITIATING DEVICES

PART ONE

MINES

OBJECTIVES:

To learn identification, function, safety precautions, hazards, and safing procedures for US Antipersonnel and Antitank mines. To learn the assembly, operation, and field techniques of the MD-M Mine Detector.

INTRODUCTION:

Mine warfare dates far back into military history. It originally consisted of tunneling under strong fortifications and blowing them up with explosive charges. Since modern weapons have much more destructive power and ability, this method is rarely used by modern armies. However, mine warfare, as employed by the Viet Cong in Viet Nam, has proven that no method of mine warfare is obsolete.

Mines may be laid in standard patterns or in random patterns. Mines have been removed and used against the forces which originally placed them. This is because the mines cannot discriminate between friend or foe. In addition to this, an armed mine never needs the rest or relief that an armed man does.

In this chapter we will cover representative samples of all known US mines employed in Viet Nam.

MINE, AP, (NM) M14

1-1. Type: Mine, AP, (NM) M14 (reference figure 7-1).

1-2. Identification: This particular mine

- a. is small and cylindrical in shape.
- b. has six ribs on the lower outside body.
- c. is blast type and contains one ounce of tetryl.
- d. has plastic construction and is OD in color.
- e. has integral fuzing and Belleville spring action.
- f. uses a shipping plug with a circular head and a detonator holder with hexagonal head.
- g. is identified by two letters, A and S, on top of fuze body.
- h. has a pressure plate slotted for U-shaped safety clip.

1-3. Hazards:

- a. Tetryl main charge
- b. Removable detonator

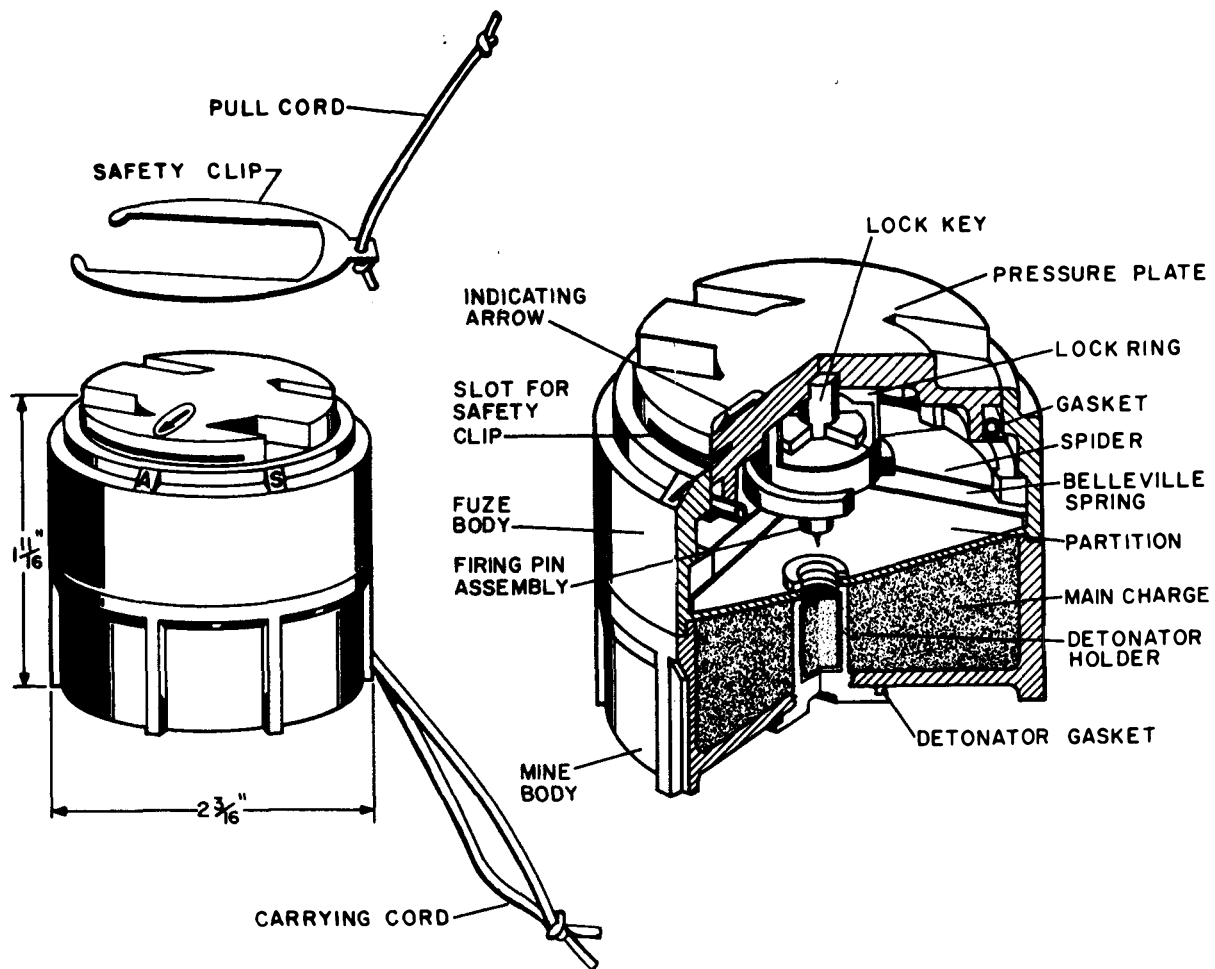


Figure 7-1. M14 antipersonnel mine.

1-4. Operation:

- a. The safety fork is removed and the pressure plate rotated to the "A" position.
- b. A force of 20 to 35 pounds will depress pressure plate.
- c. Pressure plate depresses lock key.
- d. Lock key forces Belleville spring to snap into reverse, driving firing pin into detonator.

MINE, AP, M18 OR 18A1

1-5. Type: Mine, AP, M18 or 18A1 (reference figure 7-2).

1-6. Identification:

- a. These mines are directional, fragmentation, control fired, electric/non-electric initiated antipersonnel mines.
- b. Mine case may be camouflaged with brown cotton flock or painted OD.
- c. Direction-of-fire arrow stenciled on the top of aiming sight (M18), direction-of-fire arrows stenciled on top at both ends of mine case (M18A1).
- d. Blasting cap wells at each end of mine case (M18), detonator wells on top of mine (M18A1).
- e. Three folding steel legs (M18), two pair of folding scissor-type (M18A1).

1-7. Hazards:

- a. Blasting caps, 2 each
- b. M18 contains 0.8 pounds of C-3
- c. M18A1 contains 1.5 pounds of C-4

1-8. Operation:

- a. The mine is primed by inserting blasting caps.
- b. The mine is emplaced and aimed at a target or potential target.
- c. Initiation of the blasting caps detonates the mine which propels cubical metal fragments outward in a fan-shaped pattern.

MINE, AP, M16A1

1-9. Type: Mine, AP, M16A1 (reference figures 7-2a and 7-2b).

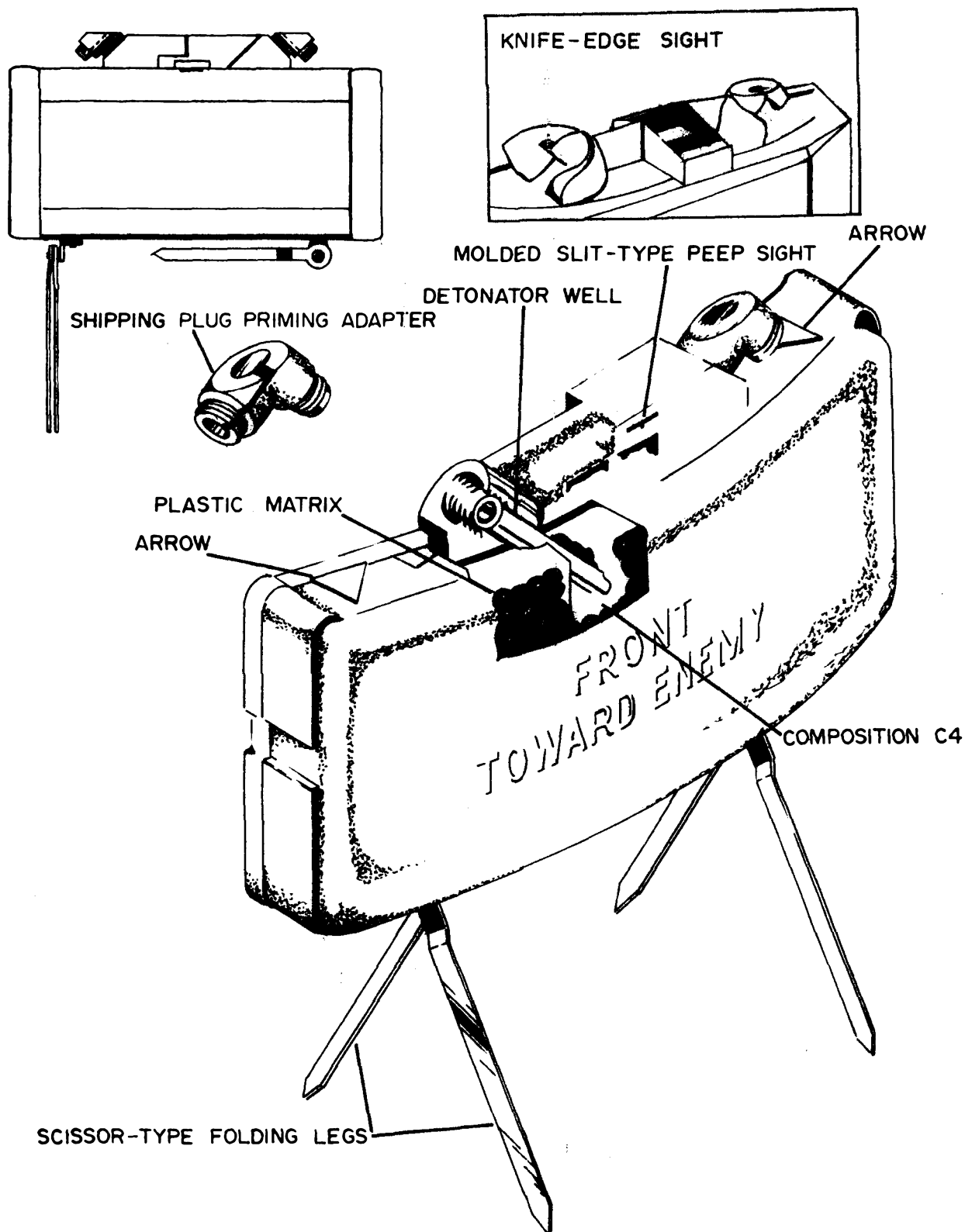


Figure 7-2. Antipersonnel Mine M18A1

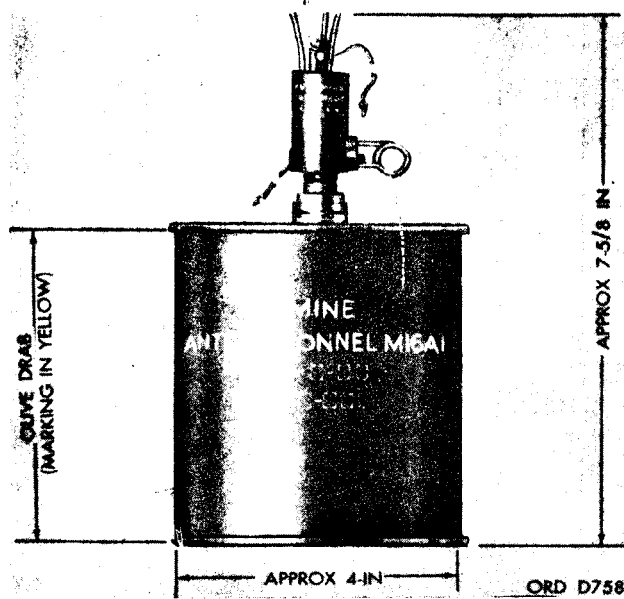


Figure 7-2a. Mine, Antipersonnel, M16A1 with Fuze Mine Combination, M605

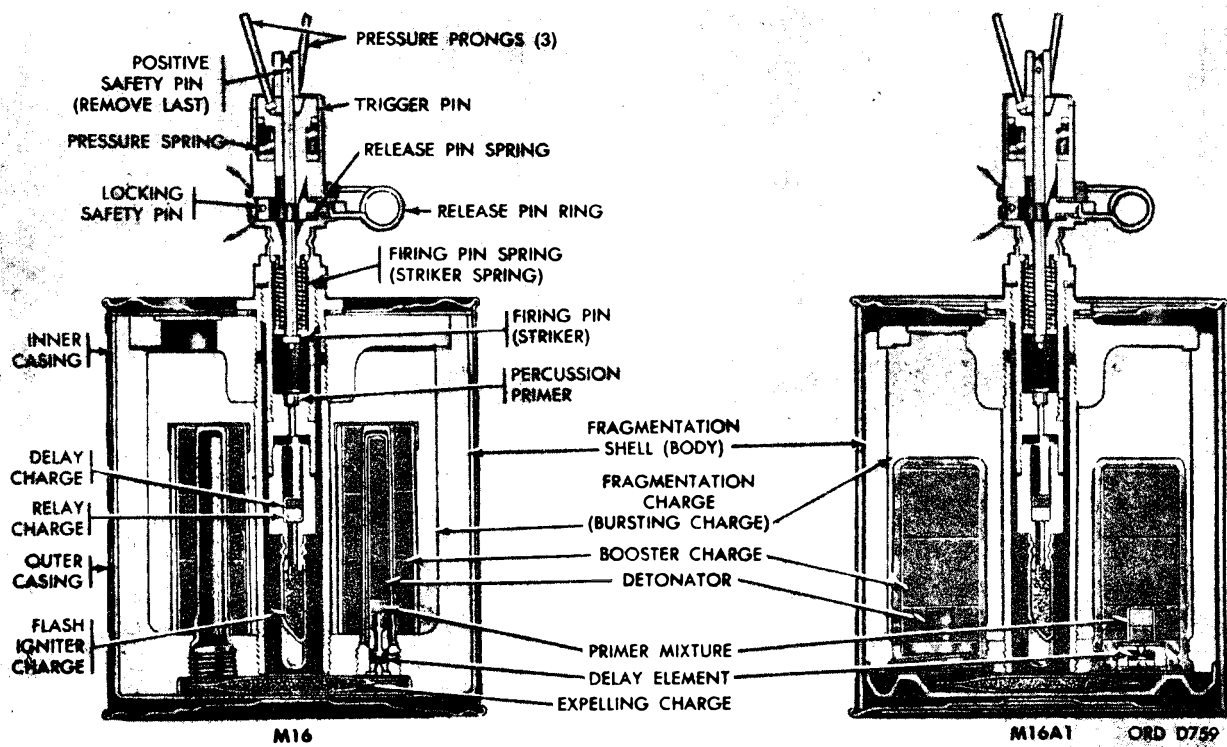


Figure 7-2b. M16/M16A1 Antipersonnel Mine

1-10. Identification:

- a. Mine body is painted OD.
- b. Mine body has the appearance of a 1-quart tin can.
- c. Mine case is made of sheet metal.
- d. The fuze mine weighs approximately 8 pounds.
- e. The M605 combination fuze has a 3-prong pressure head with a pressure or pull firing action.

1-11. Hazards:

- a. Percussion primer
- b. Delay and relay charge
- c. Flash igniter charge
- d. Expelling charge (black powder)
- e. Delay element
- f. Primer and detonator
- g. Booster
- h. Burster (1 pound of TNT)

1-12. Operation (Pressure):

- a. A pressure of 8 to 20 pounds on the pronged pressure head releases the firing pin.
- b. The firing pin detonates the primer which functions the delay charge, relay charge, ignition charge, and mine expelling charge.
- c. The mine expelling charge ejects the cast iron projectile and ignites two detonator delay charges.
- d. The projectile will detonate when approximately one meter above ground.
- e. Once initiated, the mine projectile will detonate even if restrained from ejection.

1-13. Operation (Pull):

- a. A pull of 3 to 10 pounds on a trip wire will release the firing pin.
- b. Functioning from this point is the same as for pressure.

MINE, ANTITANK M21

1-14. Type: Mine, Antitank M21 (reference figures 7-4 and 7-5).

1-15. Identification:

- a. The M21 is a cylindrical, metallic antitank mine.
- b. The mine case is made of sheet metal.
- c. The mine without fuze weighs approximately 17.5 pounds; the fuze weighs 0.5 pounds.
- d. The outer surface of the mine is painted OD, while the designation and other markings are in yellow on the top surface of the mine.
- e. Top cover of the mine is scored to facilitate fragmentation.
- f. The M607 fuze functions by horizontal tilt load applied to an extension rod, or by vertical pressure applied to pressure ring.
- g. The fuze is fitted with a 24-inch tilt rod.

1-16. Hazards:

- a. Stab-type detonator
- b. Delay assembly and booster
- c. Main charge of Comp B weighing 10.5 pounds

1-17. Operation:

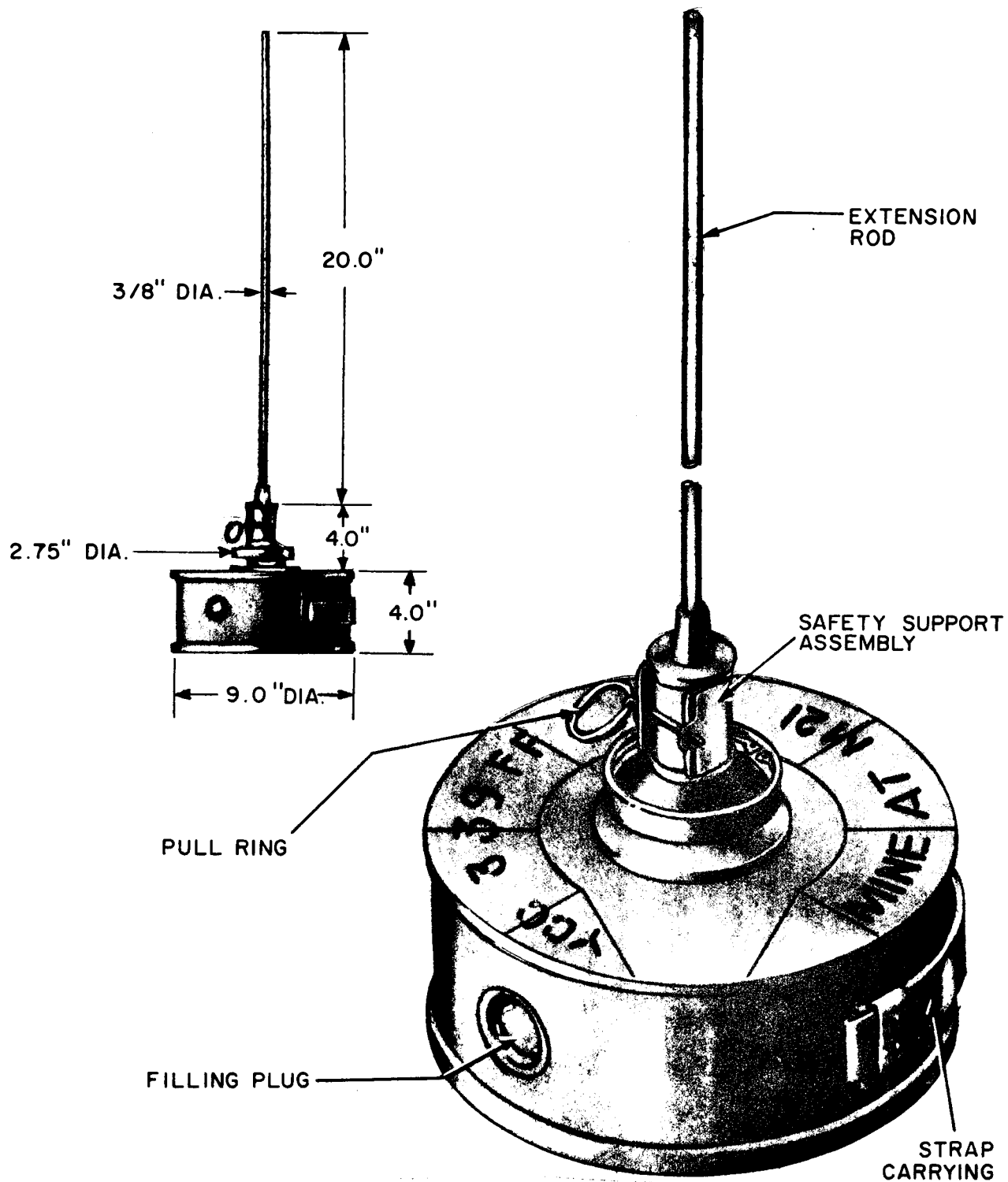
- a. A horizontal force of 3 to 6 pounds (7° tilt) on the tilt rod, or 290 to 390 pounds vertical pressure will cause the Belleville spring to deflect, driving the firing pin into the detonator.
- b. The expelling charge functions to remove the fuze and overburden of earth above the mine.
- c. Delay elements function 0.15 seconds, allowing target to position for "kill."
- d. The main charge functions, propelling the concave steel plate into the bottom of the target.

MINE, AP, PWP, POP-UP, XM54

1-18. Type: Mine, AP, PWP, Pop-up, XM54 (reference figures 7-6, 7-7, 7-8, and 7-9).

1-19. Identification:

- a. The XM54 mine is an aerial bursting antipersonnel-type munition. The AP capabilities are due to the PWP.



**External Configuration and Dimensional Characteristics
 of Mine M21 with Fuze M607**

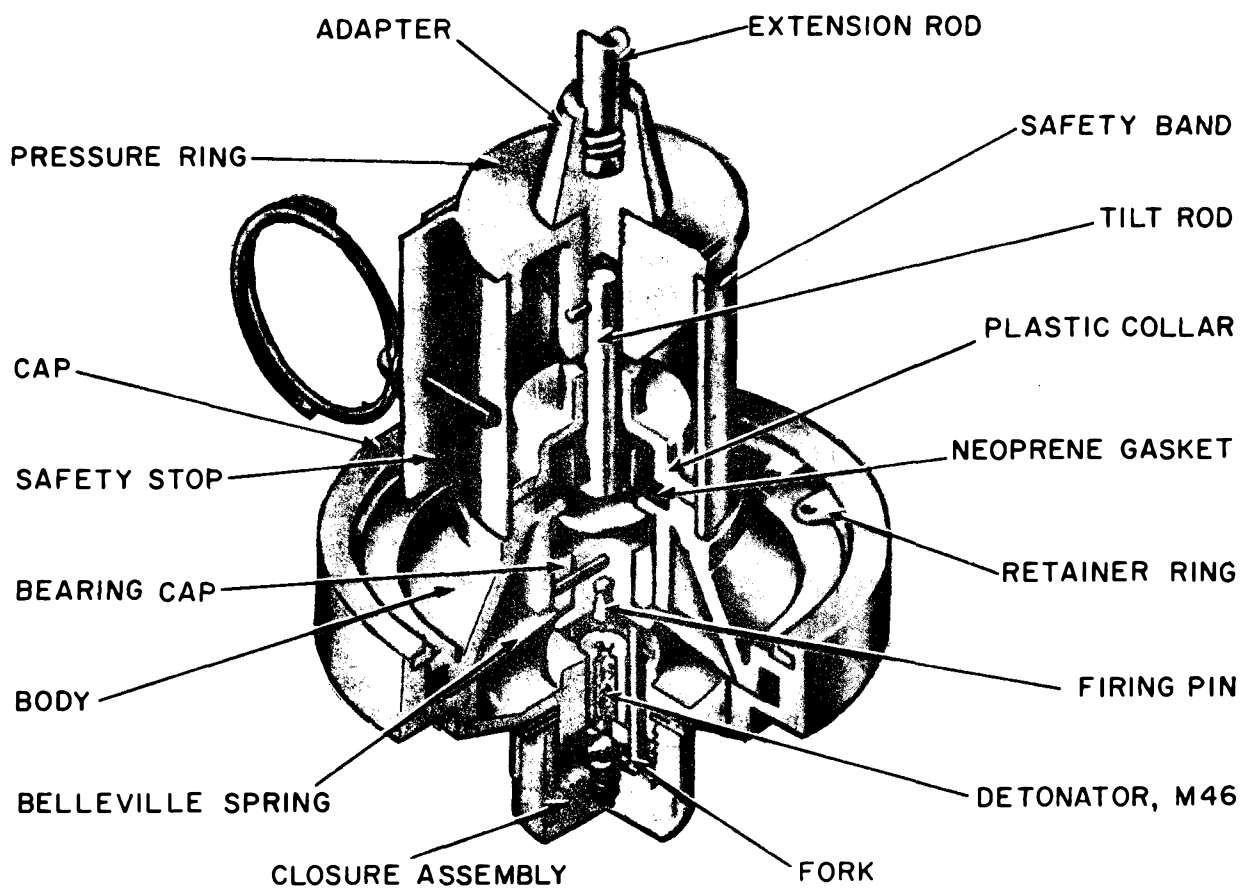


Figure 7-4.

Fuze M607 in Unarmed Condition—Cutaway View

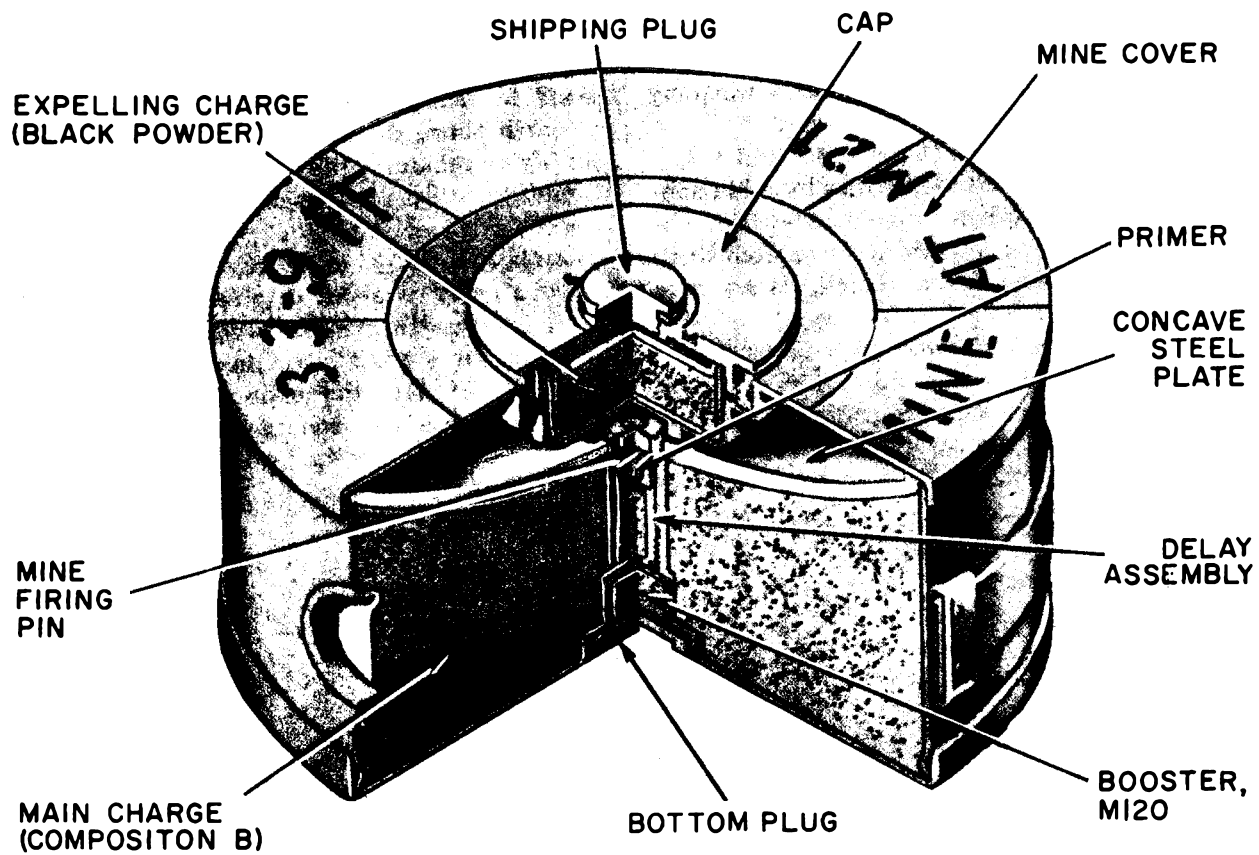


Figure 7-5. Mine antitank M21 cutaway view

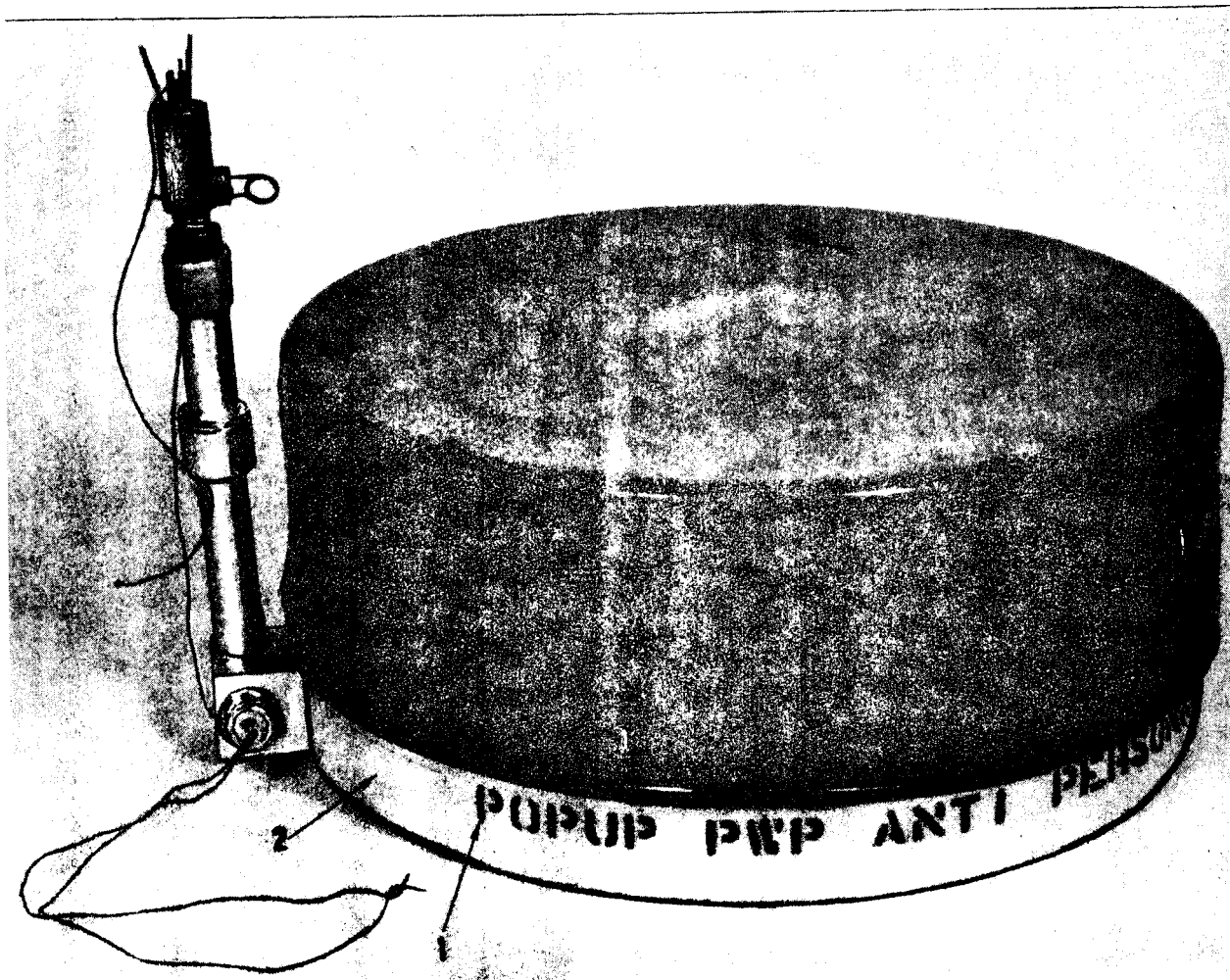
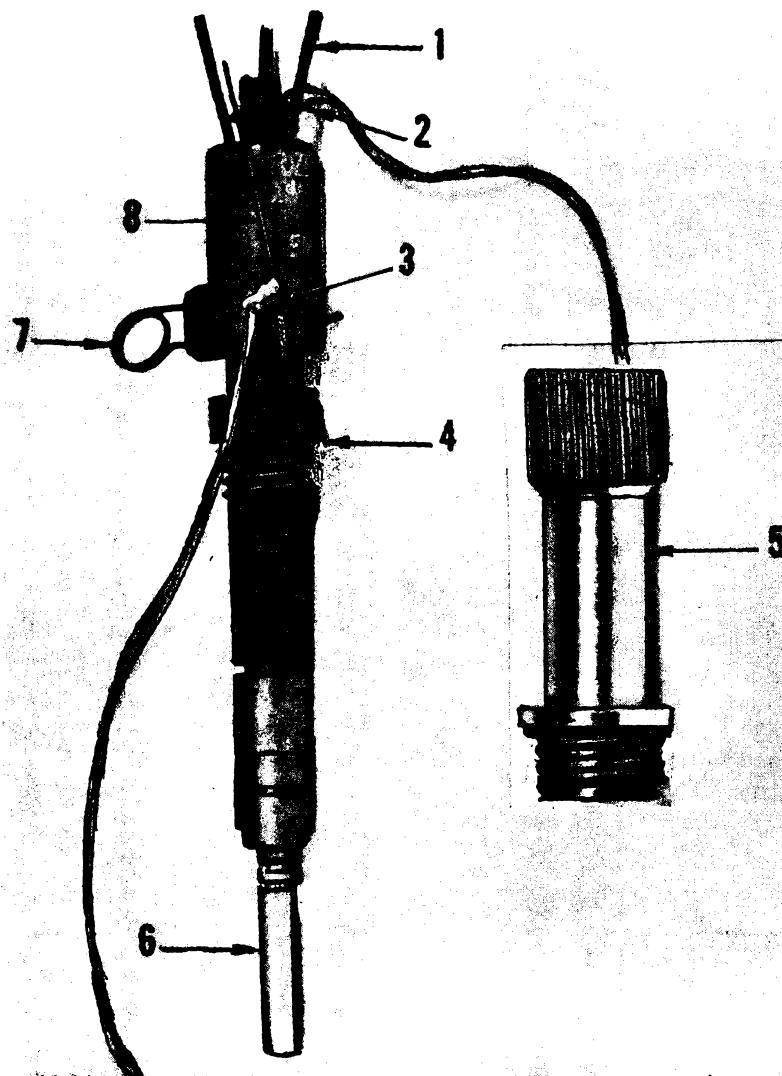
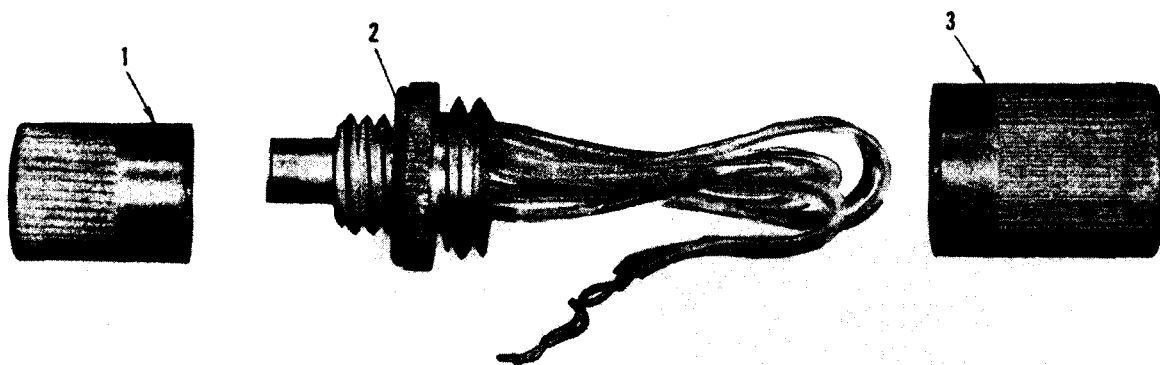


Figure 7-6. XM54 antipersonnel PWP pop-up mine.



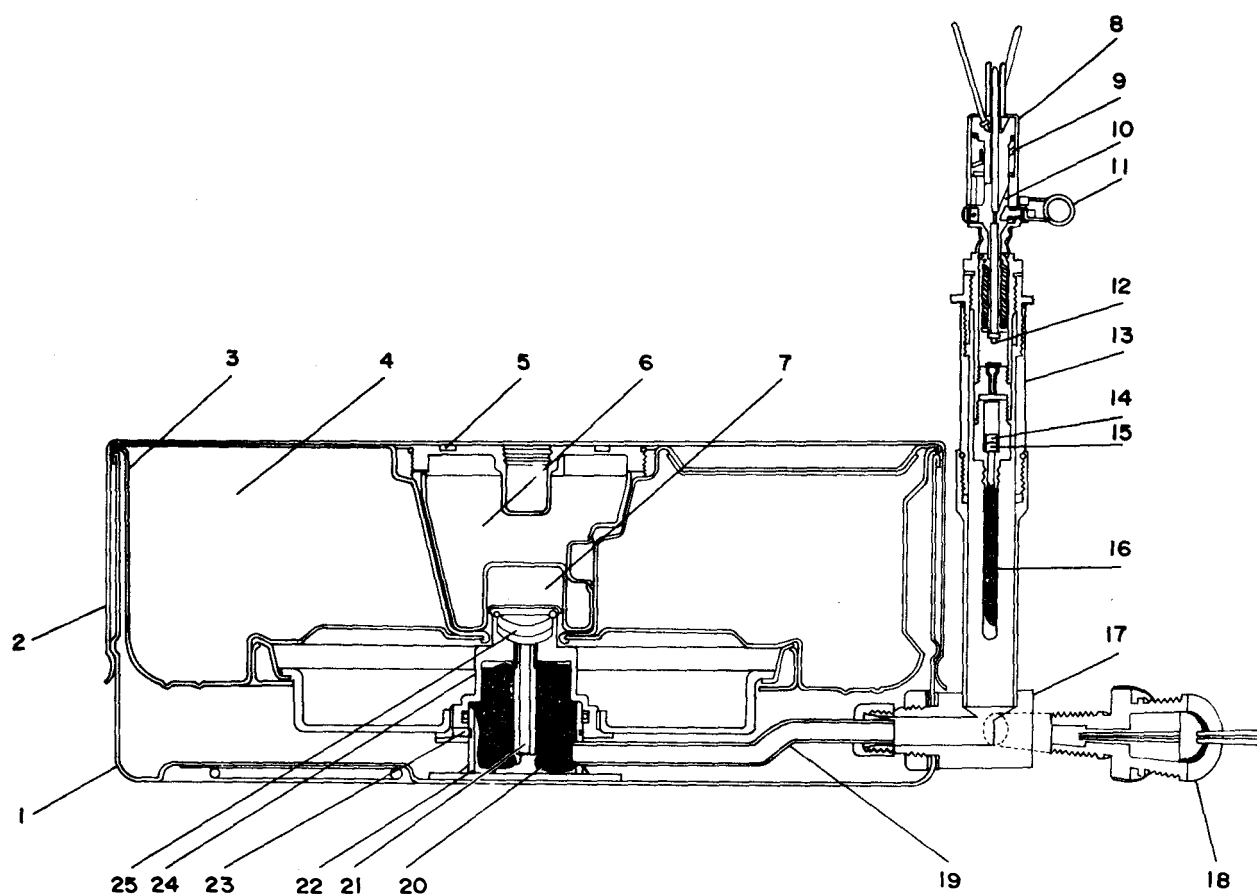
- | | |
|------------------------|-------------------------|
| 1. Prongs (3) | 5. Fuze extension |
| 2. Positive safety pin | 6. Flash igniter charge |
| 3. Release pin | 7. Release pin ring |
| 4. Rubber washer | 8. Interlocking pin |

Figure 7-7. M605 Combination Mine fuze



1. RF shield (front) 2. Squib
3. RF shield (rear)

Figure 7-8. M1A1 Squib Assembly.



- | | |
|-------------------------|------------------------------------|
| 1. XM44 projector case | 13. Fuze extension |
| 2. XM44 projector cover | 14. Delay charge |
| 3. XM55 mine | 15. Relay charge |
| 4. PWP | 16. Flash igniter charge |
| 5. Spanner wrench holes | 17. Fuze holder assembly |
| 6. M38 burster | 18. M1A1 squib assembly |
| 7. M120 booster | 19. Flash tube and igniter mixture |
| 8. M605 fuze | 20. Black powder propellant |
| 9. Pressure spring | 21. Delay detonator |
| 10. Trigger pin | 22. Chamber and tube assembly |
| 11. Release pin | 23. Shear screws |
| 12. Firing pin | 24. Propulsion chamber |
| 25. Explosive disks | |

Figure 7-9. XM54 Mine, cross section view

- b. Markings are in red, with one yellow band on the mine case periphery.
- c. The mine is 13-1/4 inches in diameter, 5-1/4 inches high, and weighs 30 pounds.
- d. The mine may be fired by a combination pressure/pull mechanical fuze or by electric command.

1-20. Hazards:

- a. Flash tube containing the igniter mixture
- b. Black powder propulsion charge
- c. Delay detonator and explosive discs
- d. Fuze assembly with flash igniter charge
- e. Booster and burster
- f. Squib assembly
- g. PWP

1-21. Operation:

- a. Pressure of 8 to 20 pounds or pull of 3 to 10 pounds will function the mechanical fuze.
- b. Delay, relay charges function the propelling charge and delay detonator in the mine.
- c. The mine detonates at approximately 10 feet above ground (effective range 82 feet radius).
- d. Command fire operation is the same except the mechanical fuze is bypassed.

MINE, AT, HE, HEAVY, M15

1-22. Type: Mine, AT, HE, Heavy, M15 (reference figure 7-10).

1-23. Identification:

- a. The mine is a high capacity type intended for use against heavy tanks.
- b. The mine is of heavy steel construction.
- c. It is approximately 4-7/8 inches high, 13-1/8 inches in diameter, and weighs 30 pounds.
- d. The primary fuze well is located in the top center of the mine.

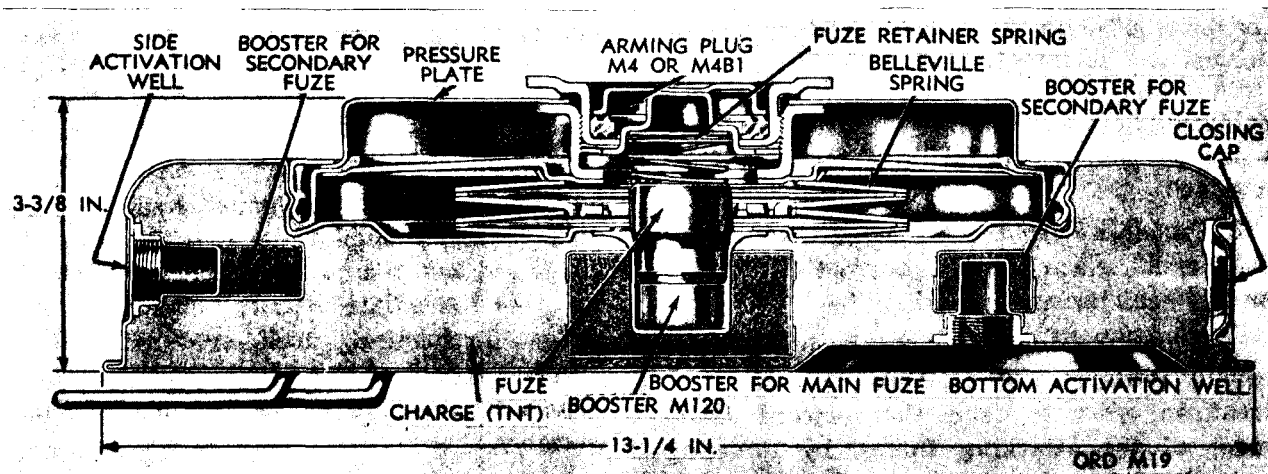


Figure 7-10. Antitank Mine (pressure type)

e. There are two secondary fuze wells for boobytrapping. One is located in the bottom, the other in the side.

f. The mine is painted OD with markings in yellow.

1-24. Hazards:

- a. HE, 22 pounds of Comp B or TNT
- b. Fuze, M603
- c. Booster

1-25. Operation:

- a. The mine is emplaced and the fuze is set to the armed position.
- b. A pressure of 565 $\pm$ 174 pounds on the pressure plate of mine causes the Belleville springs to snap to reverse driving the firing pin into the detonator.
- c. Detonation is instantaneous.

NOTE: It is possible that the mine could be detonated by a running soldier.

OPERATION OF THE MD-M DETECTING SET, MINE

1-26. General: The Aural Indication, Portable, Metallic Mine Detecting Set is a portable device capable of detecting the presence of metallic objects. It is specifically intended for detecting metallic antitank and antipersonnel mines that are buried or otherwise concealed from sight. The presence of a metallic object is indicated audibly by a 2500-cycle tone in the headset whenever a metallic object comes within a certain range of proximity. False responses that could be caused by operation over salt water or magnetic soil are prevented through the use of circuitry which cancels out the effects produced by these sources. Fully transistorized circuitry provides compactness and lightness to permit operation and portability by a single person.

1-27. The Equipment: The mine detecting set shown in figure 7-11 consists of the mine detector (1) and the following accessory items packed in a carrying case (2): a spare set of plug-in modules (3), a spare battery (4), phasing block (5), and the battery adapter (6).

1-28. The Mine Detector:

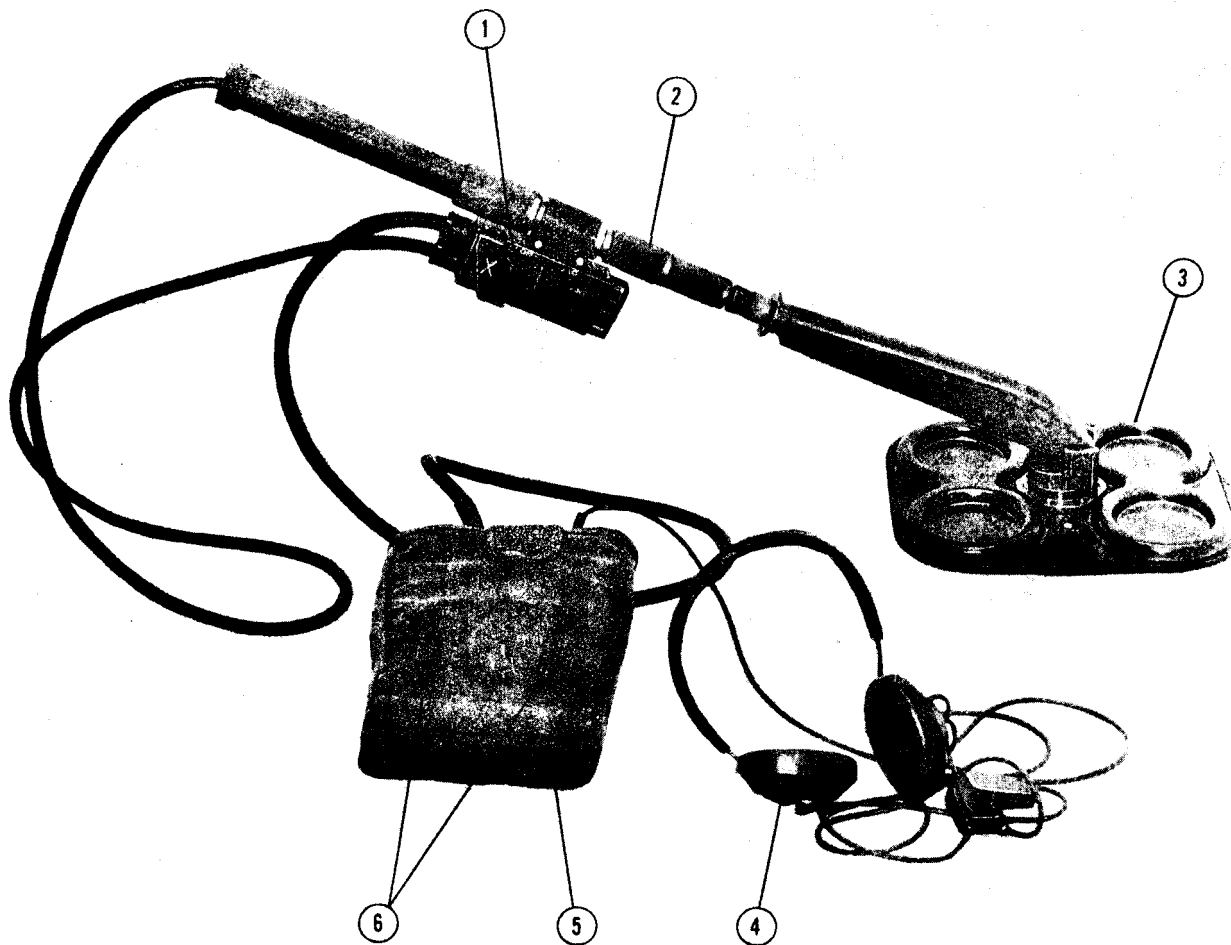
a. Basically, the mine detector (figure 7-12) can be thought of as a battery operated receiver/transmitter, the components of which have been placed in a configuration suitable for a specific purpose. A transmitter radiation coil and receiver pickup coils are positioned outside the receiver/transmitter chassis, and appear as elements in the head coil assembly. The control knobs are mounted on the control box assembly, which is positioned on the handle for convenience of operation. Electronic circuitry is in the form of sealed plug-in modules. Enclosures and junctions are fitted to provide waterproofing throughout.

b. The mine detector, as figure 7-12 shows, consists of the following components: the detecting head assembly (3), the long handle assembly (2), the control box



- | | | |
|------------------|------------------|-------------------------|
| 1. Mine Detector | 3. Spare Modules | 5. Phasing Block |
| 2. Case Assembly | 4. Batteries | 6. Battery Case Adapter |

Figure 7-11. Aural Indication, Portable, Metallic Mine Detecting Set, 10 Volt DC, Transistorized, with Case



- | | | |
|-------------------------|----------------------------|--|
| 1. Control Box Assembly | 3. Detecting Head Assembly | 5. Receiver/Transmitter and Bag Assemblies |
| 2. Long Handle Assembly | 4. Headset | 6. Keepers with Slides |

Figure 7-12. The Mine Detector Assembly

assembly (1), the receiver/transmitter and bag assemblies (5), and the headset assembly (4). These components are individually described in the following paragraphs.

1-29. Detecting Head Assembly: The detecting head assembly (figure 7-13a) is comprised of the head coil assembly, the cap assembly, and the short handle. These components are described in the following sections of this paragraph.

a. Head Coil Assembly (1 in figures 7-13a and 13b) consists of a transmitter coil, four receiver coils, and a balance coil assembly. The assembly is cast in a thermosetting plastic, thus permanently fixing the positions of the coils. The transmitter coil is positioned around the plastic capsule's outer perimeter, inside the bottom half section of the head coil assembly. The balance coil assembly consists of two windings on a common toroid core, mounted on a phenolic coil locator board. The assembly is positioned in a molded recess at the top of the plastic capsule, and covered by the cap assembly. The windings provide induction coupling between the transmitter and leads connecting to the receiver coils bridge circuit.

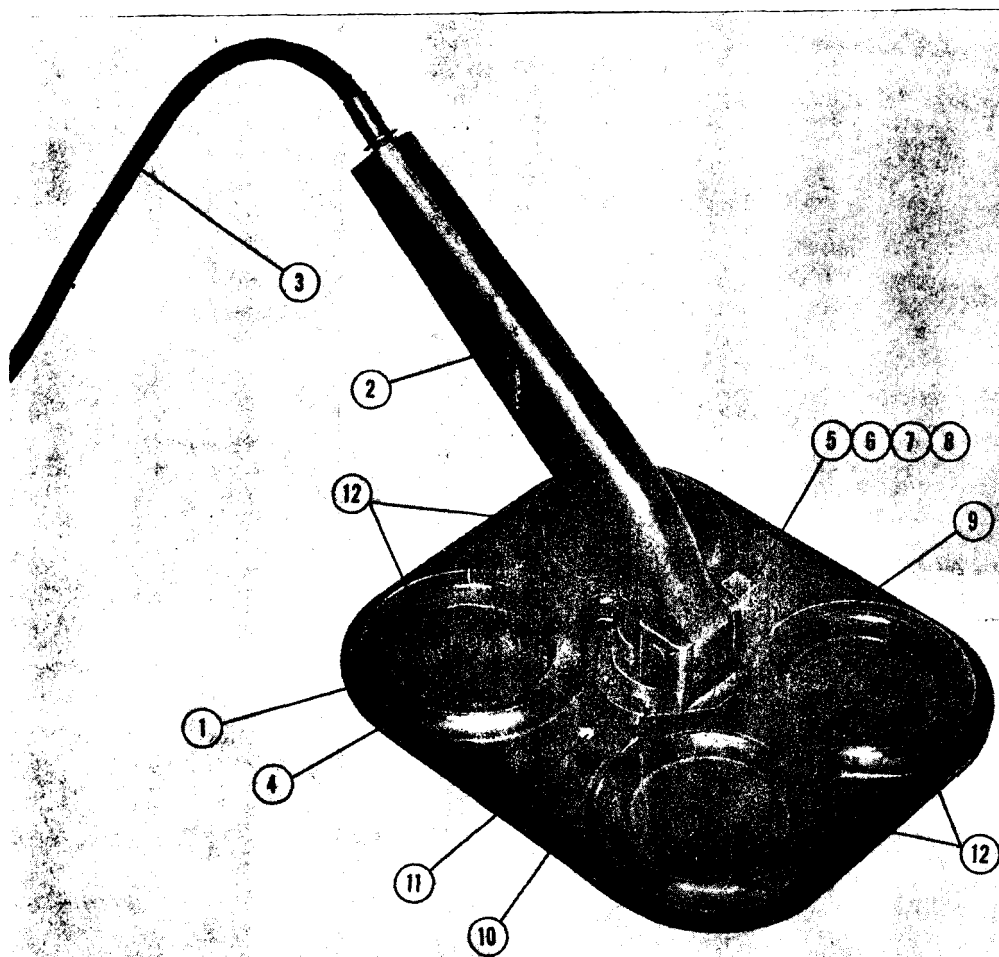
b. Cap Assembly and Short Handle: The cap assembly (9, figure 7-13a) provides for attachments of the short handle (2), and for passage into the head coil assembly of the control cable (3). The plastic cap assembly is attached to the head coil assembly with machine screws inserted upward from the bottom of the head coil capsule. The control cable emerges through a nylon bushing in the cap, with sealing provided by a hydrocarbon fuel resistant "O" ring packing. The short handle, cast of thermosetting plastic, is attached to the cap assembly with a plastic bolt (5), a plastic, slotted friction adjusting nut (6), and phenolic washer (7). Such attachment permits the short handle to be locked at any desired angle on the cap assembly. A nipple is molded in its opposite end to provide for long handle attachment with the quick disconnect coupling. The nipple is flanged to provide a grabbing surface for the coupling fingers. A keying slot in the flange positions the coupling to prevent handle and head assembly rotation.

1-30. Long Handle Assembly:

a. General: The long handle assembly (figure 7-14) consists of the long handle (1) and the quick disconnect coupling (2). The long handle, which is adjustable in length, adapts the equipment for use in circumstances where greater separation between operator and the detecting head is desired. The quick disconnect coupling permits instantaneous detachment of the long handle by the operator.

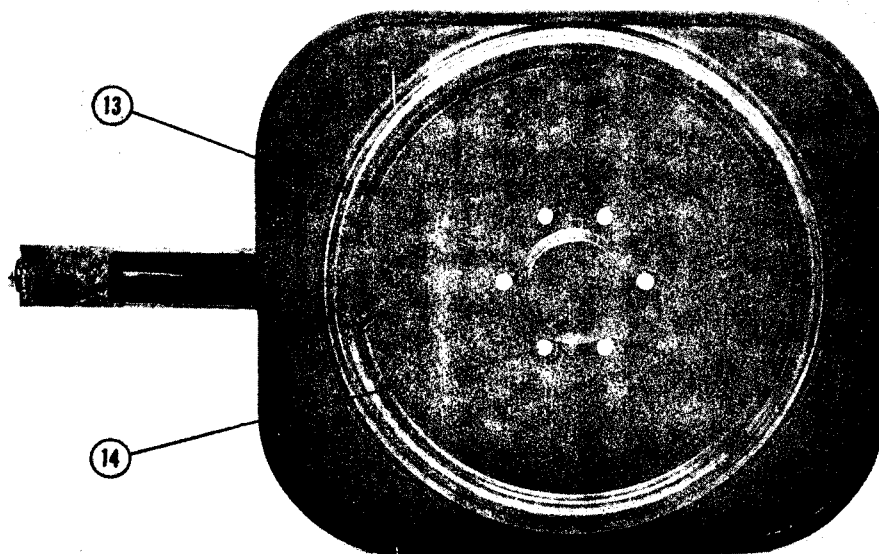
b. The Long Handle: The long handle consists of five telescoping sections of tubular aluminum, which may be extended from 18-1/2 inches when collapsed, to any length up to the fully extended range of 57 inches. To extend the handle to any desired length, proceed as follows. Grasp the large tubular section with one hand, and with the other hand turn the first knurled collet (3, figure 7-14) against the arrow to loosen. Extend the second tubular section to the desired length and tighten the first collet by turning in the direction of the arrow. Hold the control box assembly (4) with one hand and turn the second section in the direction of the arrow with the other hand until the second collet is loose. Extend the third section. Tighten the second collet by turning the second section against the arrow with one hand while holding the control box assembly with the other. For the remaining sections repeat the process used for extending the second section. Reverse the procedure to collapse the handle.

c. Quick Disconnect Coupling: The quick disconnect coupling attaches the long handle to the short handle. Attachment is accomplished in the following manner. Pull back the outer cover of the coupling, thus exposing the locking jaws and allowing



- | | | |
|--|---------------------------|------------------------------|
| 1. Head Coil Assembly | 5. Plastic Bolt | 9. Cap Assembly |
| 2. Short Handle | 6. Plastic Nut | 10. Threaded Inserts |
| 3. Control Cable | 7. Phenolic Washer (2) | 11. Phasing Dot |
| 4. Cable Fittings (Hidden):
Bushing, "O" Ring,
Strain Relief | 8. Sleeve Bearing Adapter | 12. Receiver Coil Placements |

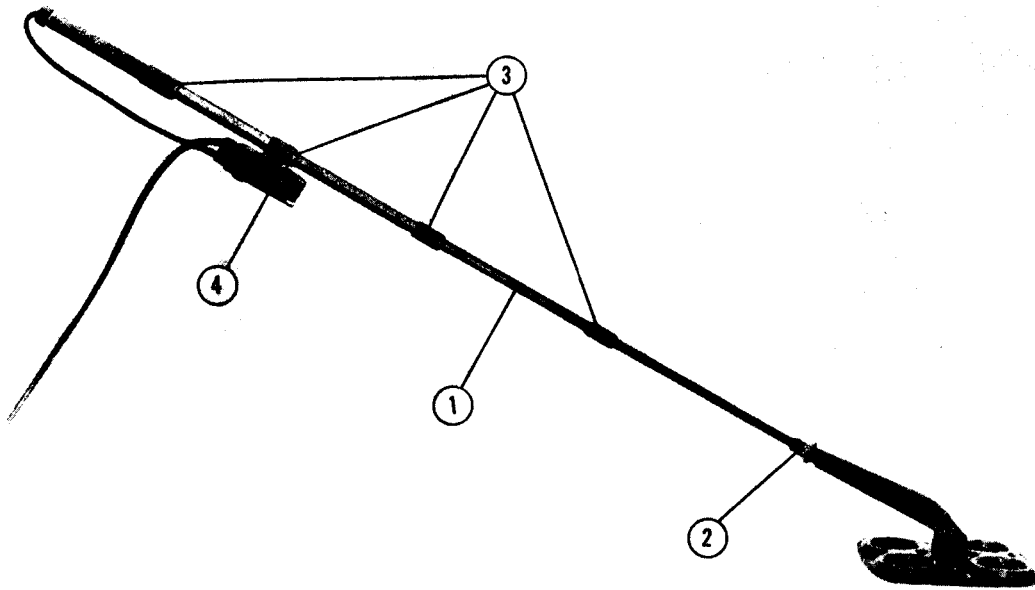
Figure 7-13A. Detecting Head Assembly (Sheet 1, Top View)



13. Transmitter Coil Placement

14. Screws (To Threaded Inserts)

Figure 7-13B. Detecting Head Assembly (Sheet 2, Bottom View)



- | | |
|------------------------------|-------------------------|
| 1. Long Handle | 3. Collets |
| 2. Quick Disconnect Coupling | 4. Control Box Assembly |

Figure 7-14. Long Handle Assembly

them to spread open. Couple the two sections so that the coupling fingers grab the flanged nipple, and allow the outer cover to slide forward. Align the keying pin so that the long handle fits flush against the short handle. To detach, reverse the procedure.

1-31. Control Box Assembly: The control box assembly (figure 7-15) contains the control elements of the detecting set. Three control knobs are mounted on the control box. They are a one-turn "X" potentiometer (1), a ten-turn "R" potentiometer (7), and a combination off-on and sensitivity selector switch (8). The control box assembly is held to the long handle by a clamp (5) and four screws with stabilization provided by a dowel pin. It is attached so as to permit operation from a prone position when necessary.

1-32. Receiver/Transmitter Assembly:

a. General: The receiver/transmitter assembly (figure 7-16) contains the major portion of the mine detector's electronic circuitry in the form of plug-in modules, and its 10.8 volt mercury battery power supply. It is designed to be carried inside a canvas bag carried by the operator. This assembly consists of the following components: four plug-in modules (13, 14, 15, and 16), the connector strip assembly (11), the battery tube (8), the receiver/transmitter chassis (12), the chassis header (6), the battery cap assembly (5), the chassis cover (2), the capacitor (10), and capacitor clamp (9).

b. The Modules: Four phases of circuitry comprise the detecting sets electronic detection and alarm system. These phases are each provided in the form of a potted module, identified by color coding and replaceable as an individual plug-in unit. The plug-in modules, referenced in terms of their function and color code, are as follows: the oscillator A4 (13), color code red; the variometer A2 (14), color code black; the input amplifier A1 (15), color code white; and the output amplifier A3 (16), color code yellow. The modules plug into receptacles provided by a connector strip assembly mounted inside the receiver/transmitter chassis.

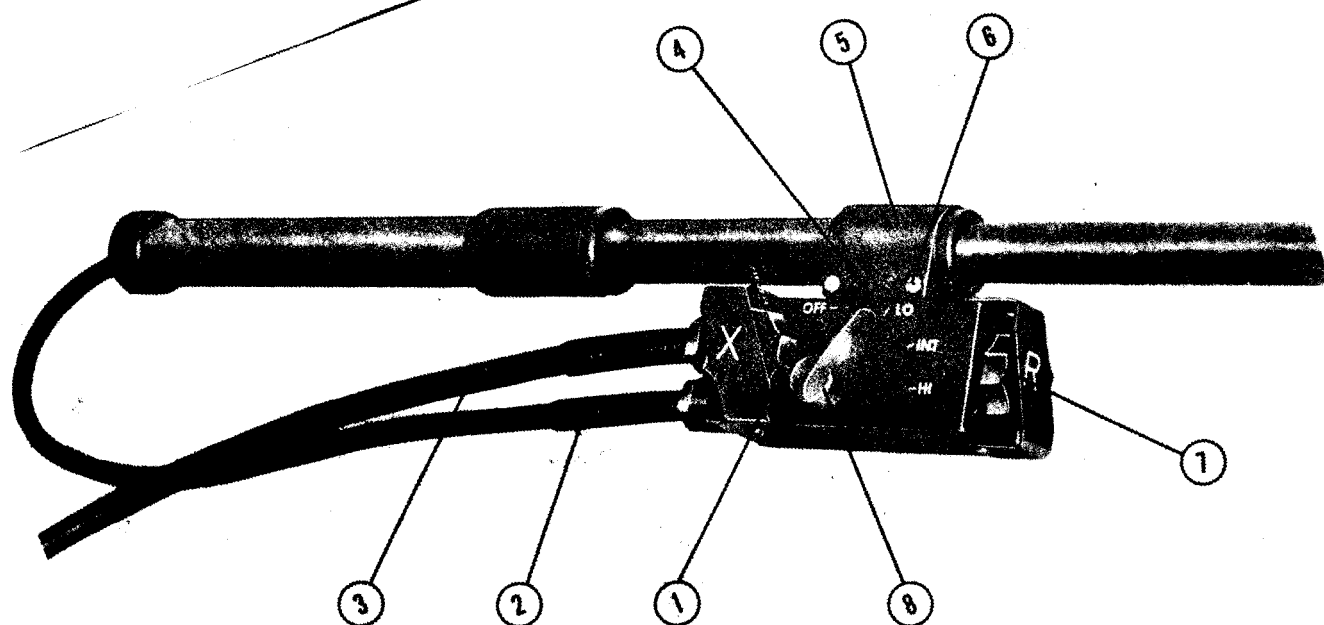
c. Connector Strip Assembly: The connector strip assembly (11) provides the wiring and connection elements whereby the modules are inserted into the detecting set circuitry. It consists of a receptacle connector for each of the four plug-in modules, lead wire terminals, and a printed circuit board. It is mounted inside the receiver/transmitter chassis with eight machine screws.

d. Battery Tube: The aluminum battery tube (8) accommodates a single 10.8 volt battery. It is supported on the receiver/transmitter chassis by the chassis header and a nylon support block. Its open end protrudes through to the surface of the chassis header, so as to make accessible for battery insertion.

e. The Receiver/Transmitter Chassis: The receiver/transmitter chassis (12), made of aluminum, is contoured to accommodate the plug-in modules in regularly spaced, shielded compartments. A leaf spring retainer, which fits over the modules, is welded inside of each compartment. Each leaf spring is painted the same color as the module it retains and serves as a guide to module installation. A nylon support block which retains the battery tube is riveted in position on the receiver/transmitter chassis.

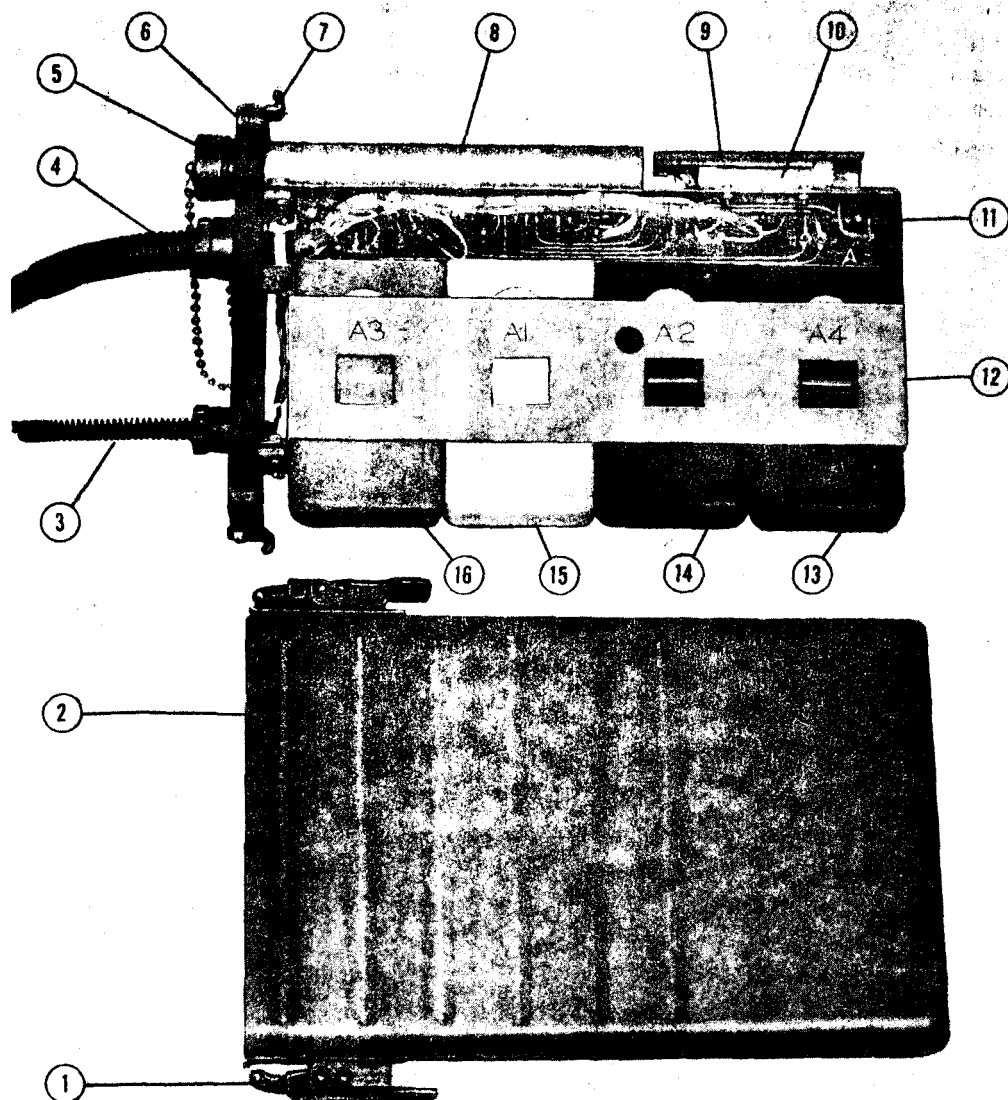
f. Chassis Header: The chassis header (6) contains fitted openings through which cable (3) goes to the headsets and cable (4) goes to the control box.

g. Battery Tube Cap Assembly: The battery tube cap assembly (5) consists of the cap with tension spring and a bead chain by which it is attached to the chassis header. An "O" ring packing provides a waterproof fitting when the cap has been turned finger tight.



1. "X" Control
 2. Control Cable
 3. Receiver/Transmitter Cable
 4. Dowel Pin (Beneath Clamp)
 5. Clamp
 6. Screw
 7. "R" Control
 8. ON-OFF, Sensitivity Selector Switch

Figure 7-15. Control Box Assembly



- | | |
|------------------------------|--------------------------------------|
| 1. Latch | 9. Clamp |
| 2. Chassis Cover | 10. Capacitor |
| 3. Cable (Headset) | 11. Connector Strip Assembly |
| 4. Cable (Control Box) | 12. Receiver/Transmitter Chassis |
| 5. Battery Tube Cap Assembly | 13. Oscillator Module (Red) |
| 6. Chassis Header | 14. Variometer Module (Black) |
| 7. Catch, Strike | 15. Input Amplifier Module (White) |
| 8. Battery Tube | 16. Output Amplifier Module (Yellow) |

Figure 7-16. Receiver/Transmitter Assembly

h. **Chassis Cover:** The chassis cover (2) is an aluminum housing for the entire receiver/transmitter assembly. Its open section is passed over the receiver/transmitter chassis and brought up against the chassis header, where it is drawn into snug contact by a spring loaded latch (1) which catches to a strike (7) mounted on the chassis header.

1-33. **Bag Assembly:** The bag assembly (5, figure 7-12) is a snug fitting canvas cover for the entire receiver/transmitter assembly. It is designed to permit the equipment to be suspended on a standard military pistol belt and worn on the person of the operator.

1-34. **Headset:** The headset (figure 7-17) consists of two headphones joined by a plastic-covered stainless steel headband, which is adjustable for proper fit. Rubber earcups fasten over the phones. The two wire cable connection to the receiver/transmitter assembly is equipped at its Y junction with a clothespin-type clip.

1-35. **Battery Adapter Assembly:**

a. **General:** The battery adapter (figure 7-18) is provided to permit the battery to be carried in the operator's pocket or under outer clothing in temperatures of 40° F and below. The battery case adapter assembly includes the following items: the battery case (5), the battery case adapter (4), the cable (3), and the receiver/transmitter adapter (2). When the 10.8-volt mercury battery is placed inside the battery adapter case, power is transferred by the cable to the receiver/transmitter adapter. In temperatures of 40° F and below, which might affect battery efficiency, the receiver/transmitter adapter is inserted into the chassis battery tube in place of the battery and the detecting set is powered by the adapter battery assembly which is carried inside the operator's clothing.

b. **Battery Case:** The battery case (5) is a tubular receptacle of aluminum base alloy in which the battery is housed. It is threaded inside its open end for attachment of the battery case adapter.

c. **Battery Case Adapter:** The battery case adapter (4) provides for entry of the cable into the battery case so as to make contact with the battery. A cable bushing is contained inside a coupling device which is threaded for attachment to the battery case. Sealing is provided by an "O" ring packing.

d. **Cable:** The twin-conductor cable (3) is four and one-half feet in length, contact to contact. It is supported at its entries to the battery case and receiver/transmitter adapters by helical cable springs. One conductor is grounded at both ends by mechanical attachment with a machine screw to the metallic structure. The other conductor is soldered to contacts, which are stress contained by springs, inside the battery case adapter and the receiver/transmitter adapter.

e. **Receiver/Transmitter Adapter:** The receiver/transmitter adapter (2) is a tubular, brass alloy device which, in its physical contour and the positioning of its electrical contacts, simulates characteristics of the battery which it physically displaces. It is inserted into the chassis battery tube and screwed into place. Its threaded section matches that of the battery tube cap. Cable entry is through a bushing, with sealing provided by "O" ring packings.

1-36. **Phasing Blocks:** The phasing block (1, figure 7-21) is a contoured block of acrylic resin. Magnetite has been imbedded into a section of the phasing block to serve as a target for checking variometer phasing of the mine detector.

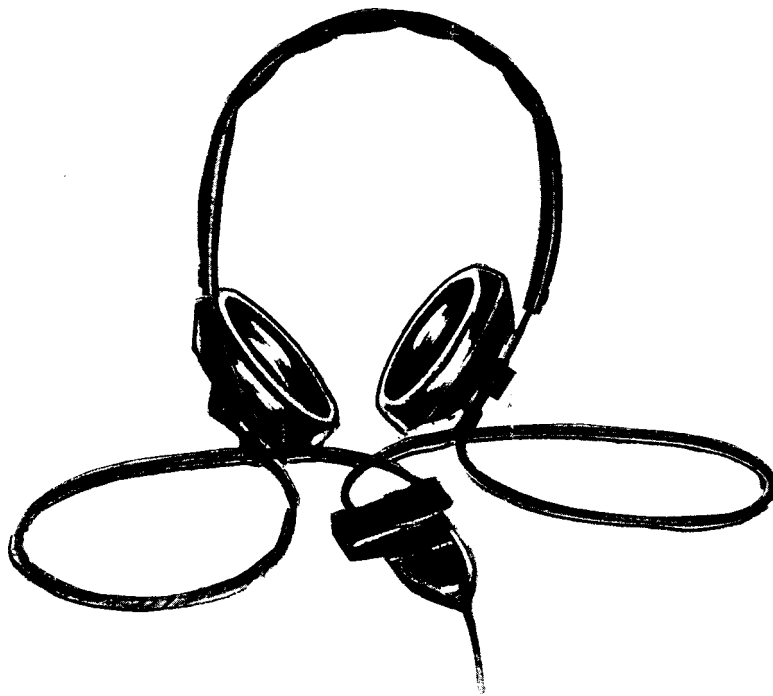
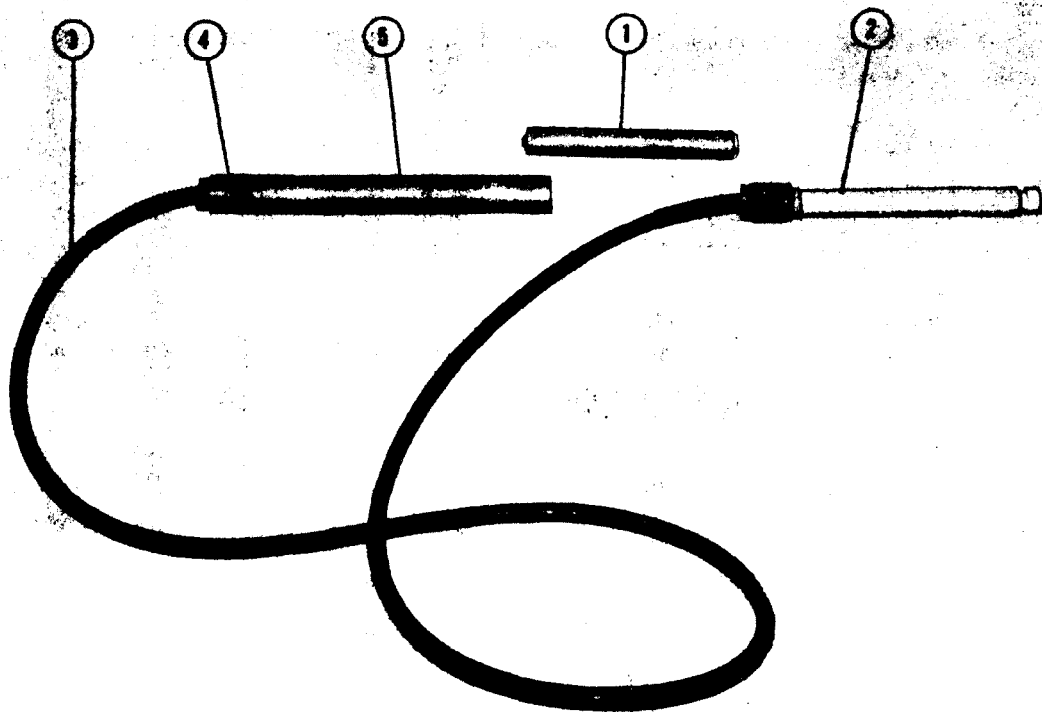


Figure 7-17. Headset



- | | | |
|---------------------------------|----------|-------------------------|
| 1. Battery | 3. Cable | 4. Battery Case Adapter |
| 2. Receiver/Transmitter Adapter | | 5. Battery Case |

Figure 7-18. Battery Adapter

1-37. Batteries: The battery (1, figure 7-18) is a 10.8-volt mercury type with a predicted span of 1000 milliampere-hours.

WARNING

When battery degradation has reduced power to 7.25 volts, an automatic alarm device will sound in the form of a buzzing noise in the headsets. When this occurs the battery should be replaced. NEVER throw a mercury battery into a FIRE as it may EXPLODE!

1-38. Functioning of the Detecting Set: Basically the detecting set consists of a mutual inductance bridge, with provisions for energizing the bridge coils and for amplifying its output into an audible signal. With the coils equally energized, the mutual inductance bridge is in a balanced state in which no output is produced. If its coils are unequally energized, the bridge circuit is in an unbalanced state and produces an output directly proportional to the degree of unbalance. An oscillator is caused to radiate so as to form a uniform magnetic field around the bridge circuit. By virtue of its uniformity, the field envelopes each bridge coil to an equal degree and thus energizes each equally. In this state the bridge is balanced and provides no output. This balanced state is upset in the presence of a metallic object. When a metallic object is brought within a certain range, it is influenced by the radiations and sets up a magnetic field of its own. This field interacts with and upsets the uniformity of that established around the bridge circuit. The non-uniform field about the bridge coils causes the bridge to become unbalanced and a bridge output is produced. The closer the metallic object, the greater is the imbalance and the stronger the output. To prevent responses from magnetic soil (magnetite) a variometer circuit is used. This circuit has the characteristics of a phase discriminator. It provides high degenerative feedback for in-phase magnetite signals which cancels out the imbalance produced by magnetic soil at the input bridge circuit. Thus, only signals caused by metallic objects, which are not in phase, will be heard in the headsets when operating over magnetite. Figure 7-19 illustrates the circuitry in block diagram form. The coils depicted are those contained in the head coil assembly; the circuit amplifier stages are the plug-in modules. The oscillator feeds current to the transmitter coil, which radiates and sets up a uniform magnetic field. The receiver coils, which have the configuration of a mutual inductance bridge, are evenly coupled into the field. A metallic object distorts the field pattern, causing the bridge to become unbalanced and produce an output. The output is amplified and appears as a 2500-cycle tone in the headsets. The variometer cancels out responses from magnetic soil.

1-39. Assembly and Operation of the Equipment:

a. General: To a large extent, the detecting set, as contained in the case (figure 7-20), is pre-assembled. The short handle is attached to the head coil assembly, as is the control box to the long handle. Also, certain items not necessary at initial assembly need not at this time be removed from the case; i. e., the four spare plug-in modules, the phasing block, and the battery adapter assembly. Remove the following items from the case: the receiver/transmitter assembly, the head coil assembly with short handle attached, the long handle assembly with control box attached, and one battery. Proceed to set up equipment as follows:

b. Battery Insertion and Removal:

(1) Battery Insertion. Unscrew the battery tube cap assembly (5, figure 7-16) on the receiver/transmitter assembly and insert the battery, negative end first. Reversal will result in non-operation with no damaging effects. Guard against slippage

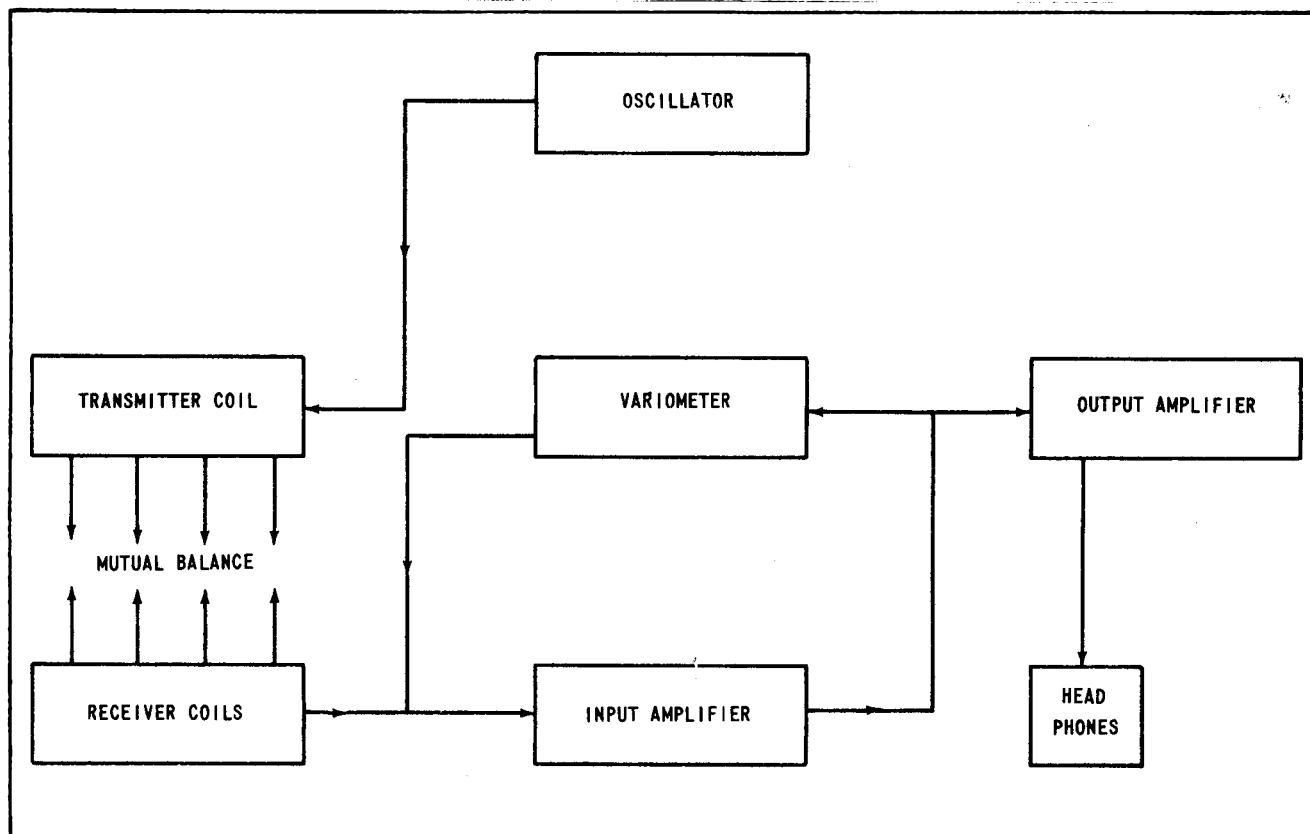
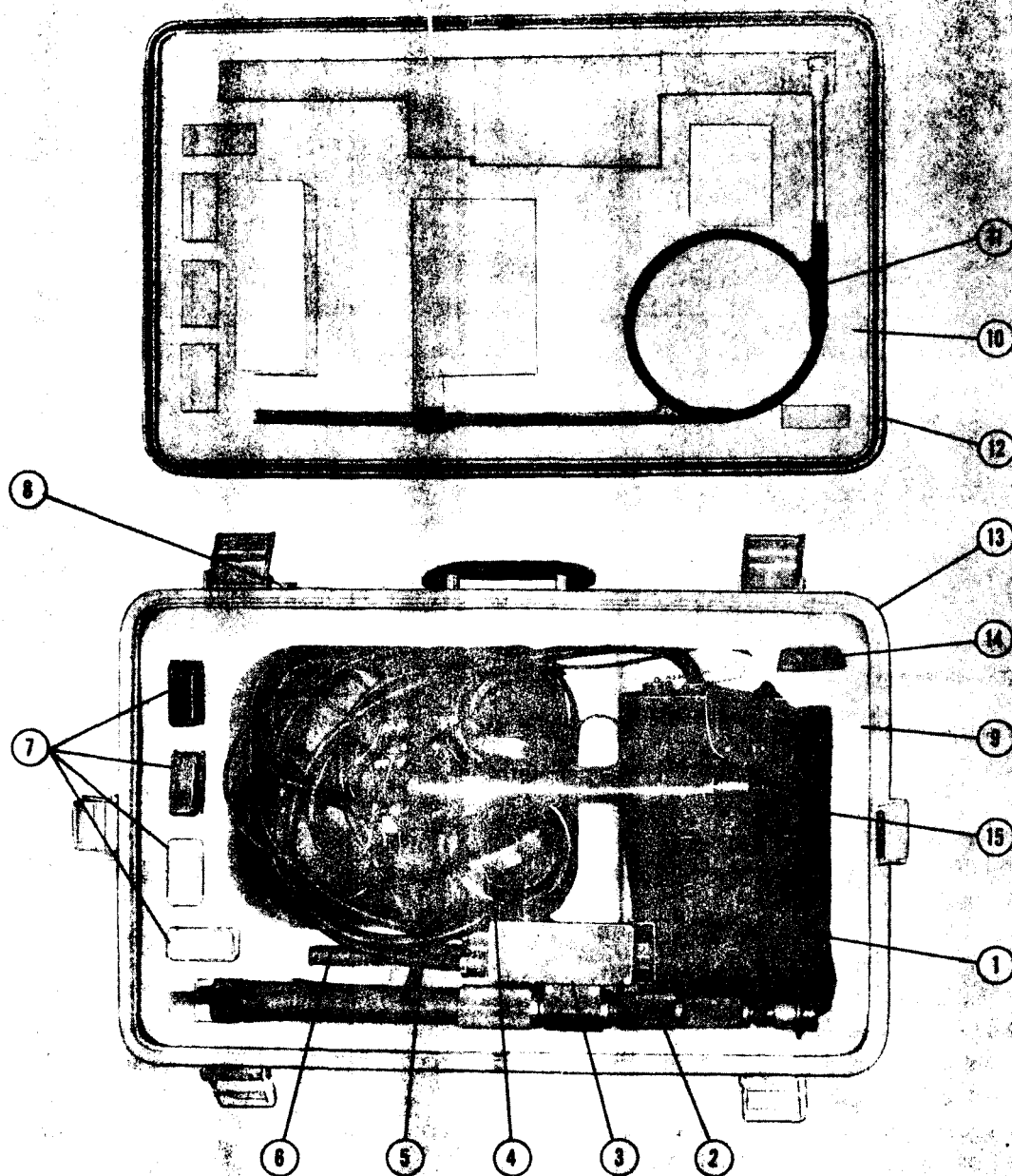


Figure 7-19. Block Diagram of Detecting Set Circuitry



- | | | |
|-------------------------------|------------------------------|-------------------------|
| 1. Receiver/Transmitter & Bag | 6. Batteries | 11. Battery Adapter |
| 2. Long Handle | 7. Spare Modules | 12. Case Top Section |
| 3. Control Box | 8. Air-Pressure Relief Valve | 13. Case Bottom Section |
| 4. Headset | 9. Bottom Insert | 14. Phasing Block |
| 5. Head Coil Assembly | 10. Top Insert | 15. Short Handle |

Figure 7-20. Case, Showing Positioning of Detecting Set Components

of the paper jacket on the mercury battery as this could prevent proper contact. Screw the battery tube cap assembly (5) back into position, taking care not to cross the threads. When finger tight the "O" ring packing provides a waterproof fit.

(2) Battery Removal. Battery replacement should be accomplished when the power provided has dropped to 7.25 volts. An automatic alarm device, which causes a rasping tone to appear in the headset, is a signal to the operator that the battery voltage has dropped to 7.25 volts or less.

c. Setting Up the Equipment (refer back to figure 7-12):

(1) Pull coupling back and slide long handle on short handle until coupling engages lock ring on end of short handle. Align keying pin so that long handle fits flush against short handle.

(2) To extend long handle, turn collet clockwise one-half turn and pull out on end section of long handle. Secure section by turning collet clockwise until snug. Repeat this procedure on remaining sections until handle is fully extended or at the desired length.

(3) To adjust detector head, loosen the friction nut by turning counter-clockwise.

(4) Place detector head on terrain and shift long handle to desired angle of operation.

(5) Tighten friction nut by turning clockwise until snug.

(6) To adjust headset, place headset on head. Slide adjusting band in or out until headset fits head.

(7) Attach receiver/transmitter assembly to belt. Wear in the conventional manner.

d. Starting the Equipment:

(1) Hold detector head five feet above terrain and at least five feet from metallic objects.

CAUTION: Voltage induced by metallic objects can seriously damage untuned circuits. The unit will not be started unless the detector head is at least five feet from metallic objects.

(2) Turn power selector switch to INT position.

(3) Align index mark on fine "X" control knob with related index mark on the control box.

(4) Align "R" control in a like manner.

(5) A 2500-cps tone should be heard in the headset. Adjust control knobs until a minimum null (signal) is obtained.

e. Variometer Phasing Check (figure 21):

NOTE: This operation is required to check the variometer circuit which prevents response from magnetic soil (magnetite).

(1) Depress the handle to the extreme end of its travel so that the bottom of the short handle is approximately parallel with the top of the detector head.

(2) Adjust set for minimum null.

(3) Place a battery against the side of the short handle at the quick disconnect end so that it is perpendicular to the short handle with either end flush with the bottom of the short handle. Note the signal response in the headset.

(4) Place the phasing block, first over the white dot on the detector head, and then on the side opposite the white dot. Note the signal rise in the headset. The signal response when the phasing block is placed on either side of the detector head should be the same, but less than the signal from the battery. A noticeable higher signal from the phasing block indicates incorrect variometer phasing, in which case report the set for organizational maintenance.

f. Sensitivity Check:

(1) Set the power selector switch to "HI" position and hold a coin (or other small metallic object) about two inches above the white dot on the detector head. A definite increase in signal strength should be heard in the headset.

(2) If the signal response is weak, replace the battery in the set and repeat step (1). If the signal response is still weak, replace the modules. If the signal is still weak, report the set for organizational maintenance.

NOTE: Do not allow rings, watches, or other metallic objects near the detector head while checking the set. These objects will generate a signal.

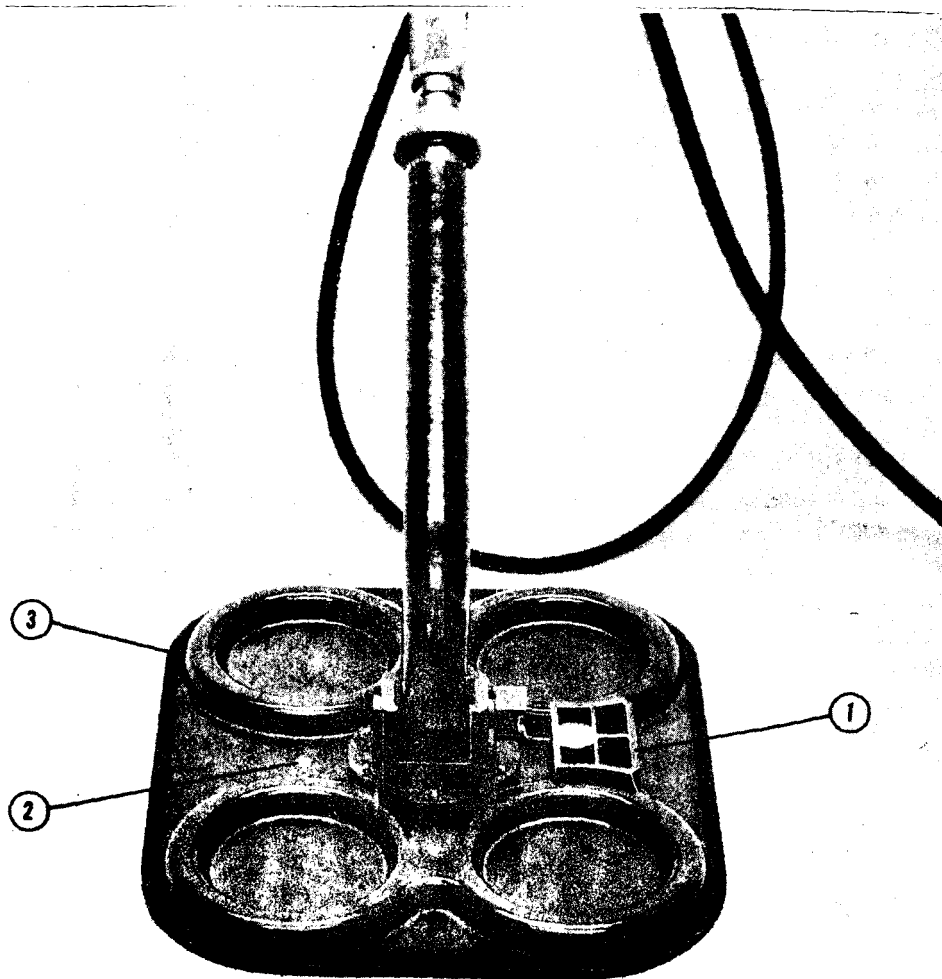
g. Stopping the Set: Turn selector switch to the "OFF" position.

1-40. Operation Under Various Conditions:

a. General: Instructions provided in this section pertain to operation, under various conditions, of a detecting set which has been assembled, checked, and adjusted as previously prescribed.

b. Starting Operation: Place the detecting set in operation by setting the power and sensitivity switch to the position best adapted to soil and terrain conditions. The following information is provided to assist the operator in determining which sensitivity switch setting should be used.

(1) HI Position. In this position, the sensitivity selector switch produces maximum sensitivity in the detecting set. It is effectively used when the soil is non-magnetic and the terrain is clear of surface metallic scrap or debris which could influence operation of the equipment.



1. Phasing Block 2. Phasing Dot 3. Head Coil Assembly

Figure 7-21. Phasing Block Placement for Phasing Test

(2) INT Position. This setting produces an intermediate sensitivity between that of "LO" and "HI." It gives best results for operation over magnetic soil. It is also used to modify the sensitivity so as to shut out interference from surface metallic objects.

(3) LO Position. This setting is useful for operation over terrain that is covered with metallic debris and scrap, where a high exclusion factor is desired in the equipment's responses. Responses to small metallic objects will be eliminated, but large objects, such as metallic mines, will yield adequate signals.

c. Using the Detector in the Standing Position. Grasp the handle in hands and make wide sweeping motions from left to right while slowly walking forward (study figure 7-22).

d. Using the Detector in the Prone Position. Assume the position (figure 7-23) and make wide sweeping motions while slowly crawling forward.

e. Buried Metallic Object Encountered. A noted increase in the headset signal is an indication that a buried metallic object is in this particular area. Proceed to locate the exact location as follows:

(1) When a sharp increase in signal is heard, move the detector head slowly from side to side. Increased signal will be heard as either side of the detector head is passed over the metallic object. A decrease will be heard as the center of the detector head moves over the buried object. If no decrease in signal is heard as the center of the detector head moves over the buried object, a saturation condition exists. If this occurs, raise the detector head 1 to 2 inches higher and repeat the sweeping motion. If necessary, raise the detector head until a definite change in volume is evident when the detector head moves over the buried object. When this occurs, the detector head is directly over the object.

WARNING

Always keep the detector head parallel to the ground during a search operation. Never allow the detector head to drop or rest on the ground during mine detecting operations in a suspected area.



Figure 7-22. Sweeping the Search Head from a Standing Position



Figure 7-23. Prone Position Operation of the Detecting Set

Chapter 8

AIRCRAFT EGRESS SYSTEMS

OBJECTIVES

To learn:

1. To identify cartridge-actuated devices used on aircraft egress systems.
2. The function of cartridge-actuated devices.
3. Safety precautions, EOD safing procedures, and EOD disposal procedures for these devices.
4. The quantity, type, and function of devices in the egress systems of the F-100, F-105, F-4, and A-1 series aircraft.

INTRODUCTION

All jet aircraft, and in some instances propeller-driven aircraft currently utilized in SEA, contain an egress system. It is imperative to know these systems thoroughly from an EOD viewpoint, not only for the safety of all personnel involved, but also for the immediate dearming of the system itself.

Some of the aircraft egress systems can be initiated externally (canopy removal) and some are limited to internal operation. It is the EOD man's responsibility to be completely knowledgeable of all aircraft egress systems for which he is responsible.

INFORMATION

CARTRIDGE-ACTUATED DEVICES

1 Initiators

Initiators are cylindrically-shaped items designed to provide the necessary ballistic gas pressure required to activate other items. They are manufactured in different types and use two methods of operation.

a. MECHANICALLY-ACTUATED INITIATORS. These initiators are actuated by pulling the mechanical linkage which in turn cocks and allows the firing pin to fire the explosive charge. The gas produced by the burning propellant flows through a tube and/or hose to initiate another item.

b. GAS-PRESSURE ACTUATED INITIATORS. These initiators are operated by gas pressure from another source. Pressure to the inlet port breaks the shear wire and forces the firing pin against the cartridge. The gas produced by the burning propellant flows through a tube and/or hose to another item.

Initiators may be either instantaneous or delayed in their action. Instantaneous initiators are used for any operation that requires immediate action. Delay initiators are used for any operation that requires a delay, such as seat ejection, seat lap belt release, etc.

CAUTION

Although initiators contain less than one ounce of explosive material, they are extremely hazardous and should be handled with caution.

2. Removers

Removers are used to remove the aircraft canopy by means of an explosive charge and like initiators, can be actuated by different methods.

a. COCKED FIRING PIN ACTUATION. A cocked firing pin, held in place by the M1 exactor, can be used to actuate the remover. Gas pressure to the inlet port of the exactor removes the pin from the firing head of the remover, allowing the cocked firing pin to fire the explosive charge.

CAUTION

Never remove the M1 exactor from an item to safe it. Removing the exactor will withdraw the pin releasing a cocked striker. Always remove the item and exactor as a unit.

b. GAS-OPERATED FIRING PIN ACTUATION. This type of remover is very similar to the gas-operated initiator because it has a firing pin held in place by a shear pin. Gas pressure applied to the inlet port forces the firing pin to break the shear wire and proceed downward to fire the explosive charge.

c. ELECTROMECHANICAL-BALLISTIC REMOVERS. These removers are designed to raise and lower certain aircraft canopies under normal conditions during ground operation and to jettison the canopy during an emergency escape while in flight or on the ground.

During normal ground operations the remover is functioned by electrical means; during emergency escape, it functions by the gas pressure supplied by an explosive cartridge.

3. Thrusters

Thrusters are used in the egress system for assorted purposes such as equipment stowage, hatch jettison, seat positioning, canopy unlock, etc. Gas-actuated thrusters function in the same manner as gas-actuated initiators. When gas pressure is supplied to the inlet port, the firing pin is propelled against the cartridge.

CAUTION

The explosive content of thrusters is comparatively small; however, their method of operation and their type of construction make them very hazardous to handle. Extreme caution should be exercised at all times when handling or removing them from aircraft.

4. Rotary Actuators

Rotary actuators are designed to forcefully separate the crew member from the seat after ejection. Gas pressure from an initiator causes the cartridge to fire; the resulting gas pressure exerts force on the bottom of the ball screw. Motion of the ball screw causes the ball nut to rotate and draw the webbing taut.

5. Catapults

Catapults are telescoping ejection items designed for emergency ejection of aircraft personnel. They can be used for either upward or downward ejection systems. Catapults operate by various methods in a manner very similar to initiators and removers.

a. MECHANICALLY-ACTUATED CATAPULTS. This device has a cocked firing pin which is held in place by a sear lever. Upon rotation of the lever an internal shear pin is broken, releasing the cocked firing pin which in turn fires the explosive charge.

b. GAS-OPERATED CATAPULTS. These devices operate exactly the same as the gas-operated removers (see "Removers").

c. MECHANICALLY-ACTUATED CATAPULT, NAMC (NAVY), TYPE I AND TYPE II. These devices function in a manner similar to that of the Air Force catapults. The pulling of the mechanical linkage cocks and releases the firing pin. The safety pin is removed by the canopy when it leaves the aircraft.

d. ROCKET CATAPULT. This device is a 2-stage ballistic item consisting of a cartridge-powered catapult and a solid propellant rocket motor. Gas pressure introduced into the inlet port shears the firing pin shear pin, forcing the firing pin against the primer and firing the cartridge. The catapult portion, actuated by gas pressure, pushes the ejection seat up the guide rails. The rocket motor is ignited by the catapult gases just prior to separation from the catapult tube.

CAUTION

Seat ejection catapults contain a larger amount of explosives than the other devices - often as much as 7 ounces. The very purpose of these items is to move heavy objects; therefore, anyone handling them should be thoroughly familiar with their construction and operation. They should be handled with the utmost care at all times.

e. ROCKET PACKS. This item is mounted under a seat and gives it a sustained push up and away from the aircraft. It is a mechanically initiated item and has many tubes of propellant and multiple venturies.

CAUTION

Due to the amount of propellant and its propulsive ability, the rocket pack is an extremely hazardous item.

f. DROGUE GUNS. These devices contain an explosive charge used to eject or propel a metal slug. The slug is usually used to deploy a parachute.

CAUTION

NEVER stand in front of or over a slug while working on a drogue gun.

SAFING PROCEDURES

Safing procedures covered in this portion of the study guide are general in nature and pertain only to individual items of the egress system. Safing procedures for the entire egress system will be discussed later in the portions of the study guide which pertain to individual aircraft.

1. Initiators

- a. Replace the safety pins if at all possible.

b. Disconnect or cut the hoses and replace the caps.

c. Due to the condition of certain initiators, it may be necessary to gag moving parts.

2. Removers

The safing procedures for removers are the same as those for initiators discussed above.

WARNING

Never remove the M1 exactor from the canopy remover.

3. Thrusters

1. Disconnect or cut the hoses and replace the protective caps.

4. Catapults

The safing procedures for catapults are identical to those of initiators and removers discussed above.

SAFETY PRECAUTIONS

Observe the following safety precautions when safing aircraft personnel egress systems.

1. Use quick disconnects whenever possible.

2. Insert maintenance safety pins whenever possible.

3. When cutting or disconnecting is required, cut as close as possible to the outlet ports of initiators, inlet and outlet ports of boosters, and inlet ports of removers and catapults.

4. Insure that the hose ends are taped or wired to a fixed object to prevent whipping action.

DISPOSAL

For disposal purposes, aircraft explosive items fall into the three following general categories: (1) items which must be disassembled to accomplish disposal, (2) items which are disposed of by detonation, and (3) items which are disposed of by burning. The most common means of disposal is by burning.

8 FA. Egress ITEMS

The F-100D aircraft uses a conventional egress system for the single seat. The escape system, illustrated in figures 8-1 and 8-2, can be initiated by raising the seat handgrips and pulling the canopy emergency jettison handle which is located on the right console. Later models of the F-100D have an external canopy jettison handle located on the left side of the aircraft.



8 FA. ITEMS

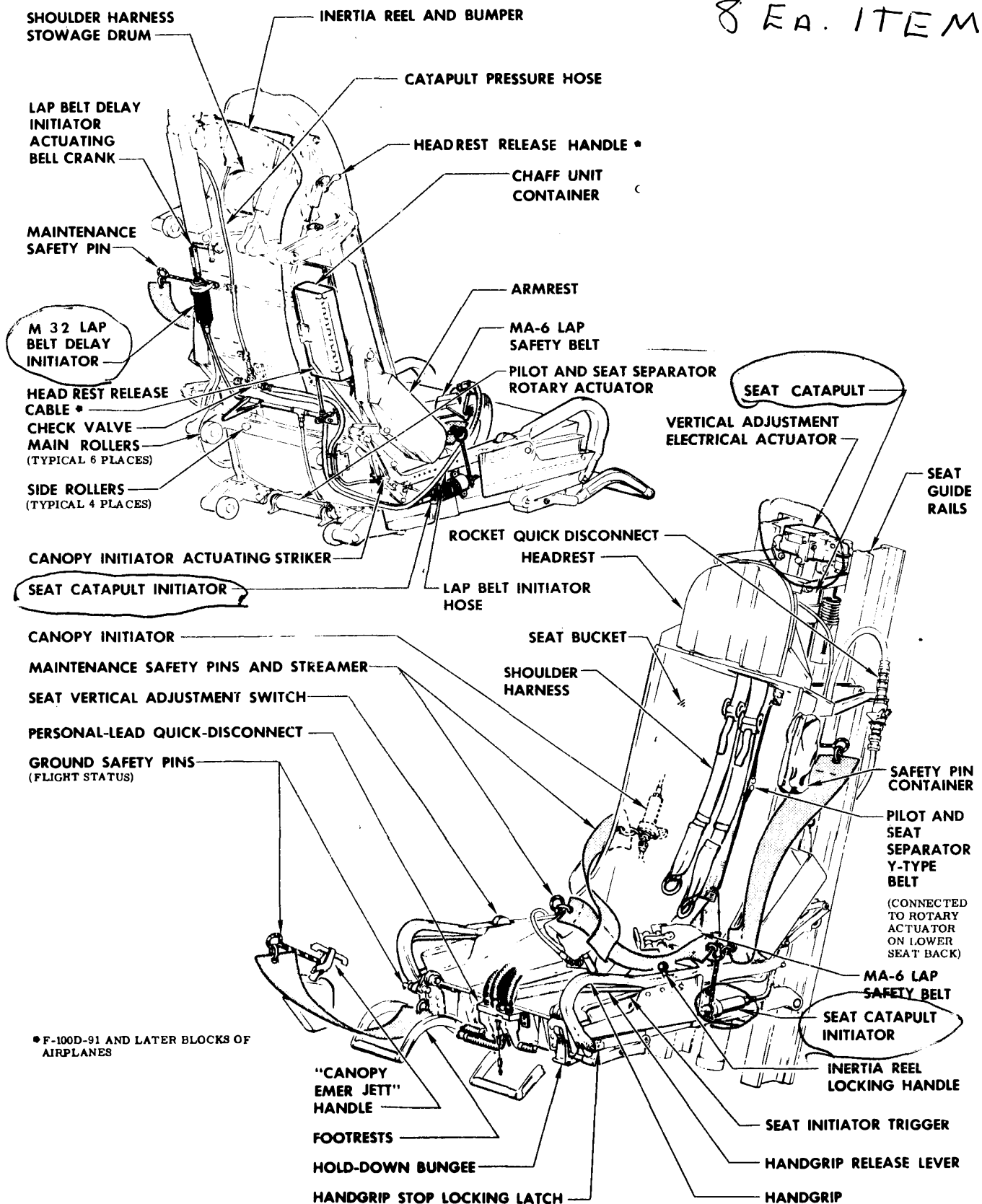


Figure 8-2. F-100D ejection seat system.

Operation

As shown in figure 8-3, raising the handgrips to the full up position fires a mechanical initiator. Gas pressure from this initiator actuates the piston in the exactor, which in turn fires the canopy remover.

Squeezing the trigger on either seat handle causes one or both of the mechanical initiators to fire; gas pressure then fires the catapult. As the seat moves up and out of the aircraft, the mechanical-delay initiator is fired, releasing the lap belt and shoulder harness. The mechanical-delay initiator also fires the explosive charge in the rotary actuator, resulting in separation of man and seat.

Normal activation does not fire every item in the system; for example:

(1) jettisoning the canopy normally from inside the aircraft will leave the external initiator in the live condition.

(2) external jettisoning of the canopy will leave the internal initiator in the live condition.

(3) squeezing the trigger on one side of the seat will leave the initiator on the other side of the seat unfired.

Before you attempt any action on the aircraft you should determine which method was used to activate the system.

Canopy Removal

Since the aircraft canopy must be removed before you can gain entrance to the cockpit, you should be familiar with the three means of canopy removal. These are illustrated in figure 1 and described below.

ELECTROMECHANICAL-NORMAL REMOVAL. The canopy can be removed by electro-mechanical-normal means by using the push-type switches located on either side of the aircraft below the windshield. The aircraft battery or an external power source must be available.

MANUAL (EMERGENCY RELEASE). The aircraft canopy can be manually released by using either of the two external emergency release handles, located on the right and left front of the canopy on C/D aircraft and on the right and left rear of the canopy on the F-100F aircraft.

PNEUMATIC JETTISON. Pneumatic jettison can be accomplished externally by using a mechanical initiator and a 6-foot lanyard with a handle.

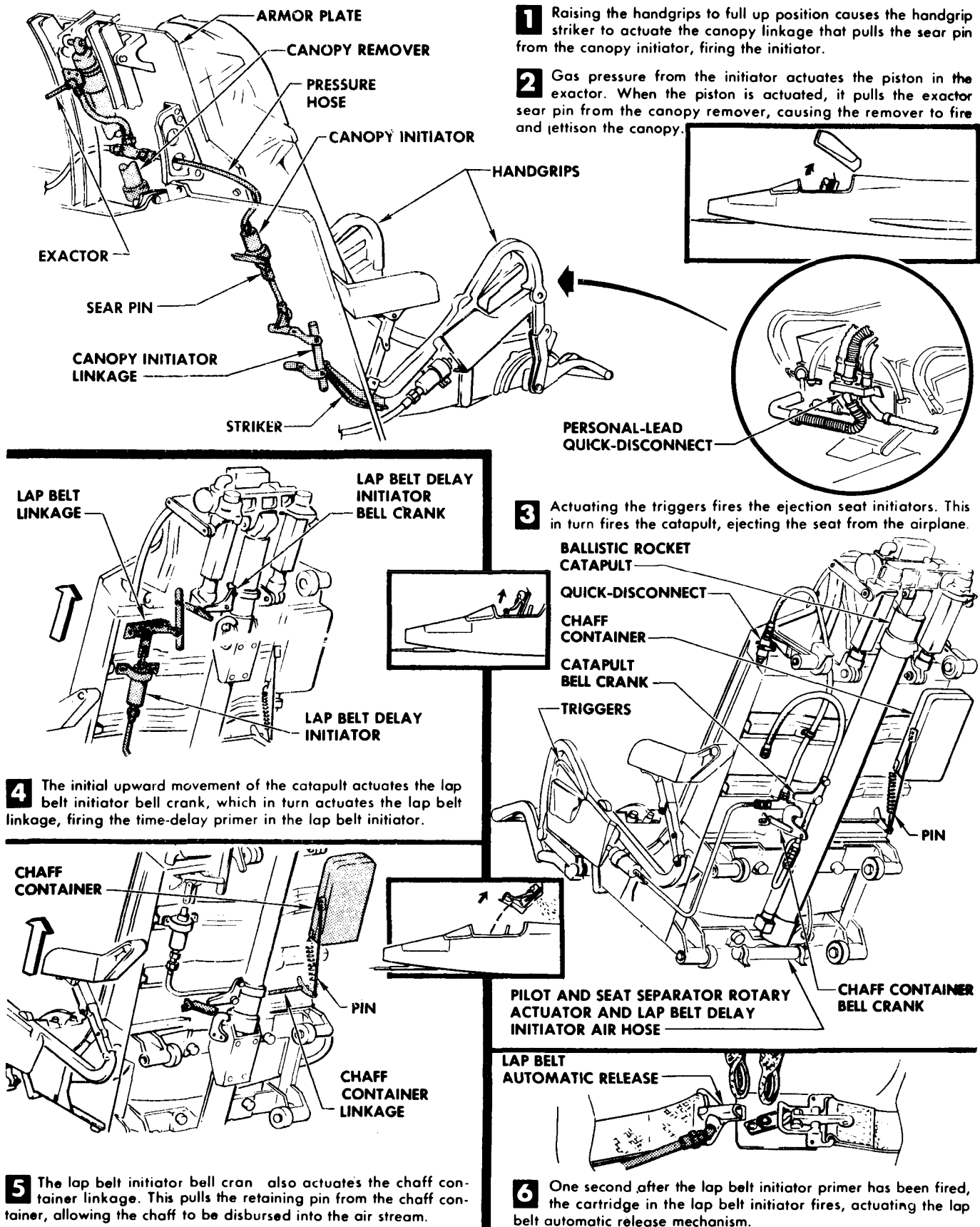


Figure 8-3. F-100D seat ejection sequence.

4 Pins
F-100F Aircraft

18 EA Egress ITEMS

The F-100F is essentially the same as the F-100D except that the following components have been added:

1. A mechanical initiator in each cockpit for firing the canopy remover.
2. Another seat fully equipped for ejection.
3. Four gas-actuated initiators - these initiators enable the man in the front seat to fire the rear seat catapult and provide a delay for the firing of the forward seat.

Safing Procedures for the F-100 Aircraft

Following is a checklist of safing procedures for the F100 aircraft. Because of the variable conditions in which the aircraft may be found, it may not be possible to safe the egress system in the exact order in which these procedures are listed. Refer to figure 2 and table 1 as you study the procedures. Table 1 is located at the back of this study guide.

1. If the canopy is present, gain access to the cockpit by using one of the three methods previously mentioned.
2. Disconnect the rocket catapult quick-disconnect.
3. Check the positions of the handgrips.

NOTE

The handgrips are interconnected and move simultaneously.

4. Install the ground safety pin(s) in the right handgrip(s) of the seat(s) and through the canopy emergency jettison handle(s) on the right console(s).

CAUTION

Insure that the handgrips are fully down and locked before inserting the ground safety pins.

5. Remove the components, insuring that maintenance safety pins are installed in each mechanical device and that plugs or protective caps are installed on gas-fired devices.

2 PINS

F-105D AIRCRAFT

12(1) EA Egress Items

The F-105D uses essentially the same system as the F-100, with a few exceptions. It incorporates a thruster for unlocking the canopy and an explosive actuator for removing the canopy. Unlike the F-100, the canopy jettison handle on the F-105D is located on the left console and has an initiator immediately below the handle. If the egress system is activated normally this initiator will be found in a live condition. The seat operation is basically the same as that of the F-100D, again with a few exceptions.

Operation

Raising the leg braces arms the ejection system. Squeezing the triggers fires the canopy/delay initiators. The canopy initiator actuates the thruster to unlock the canopy. Pressure from the thruster then goes on to actuate the canopy remover. The canopy is jettisoned. The delay initiator produces gas pressure to actuate the RAPEC and it ejects the seat. Seat travel fires another delay initiator which actuates the lap belt, the rotary actuator, the personnel force-deployed parachute, and the drogue gun to deploy the seat retardation parachute. Refer to figures 8-4, 8-5, and 8-6.

4 PINS F-105F AIRCRAFT 25(1) EA Egress Items

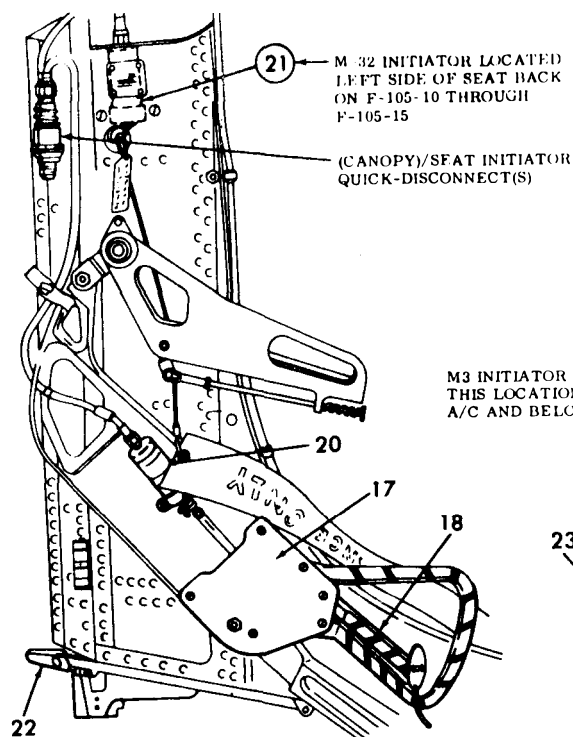
This aircraft is basically the same as the F-105D model but in addition to the duplication of devices for the extra seat, it uses a delay initiator which delays jettison of the rear canopy during ground jettison.

NOTE: On aircraft modified by T.O. 1F-105F-542, the aft seat contains an explosive powered inertia reel used to restrain the occupant on the ejection position when ejection is initiated from the forward cockpit.

Safing Procedures for the F-105 Aircraft

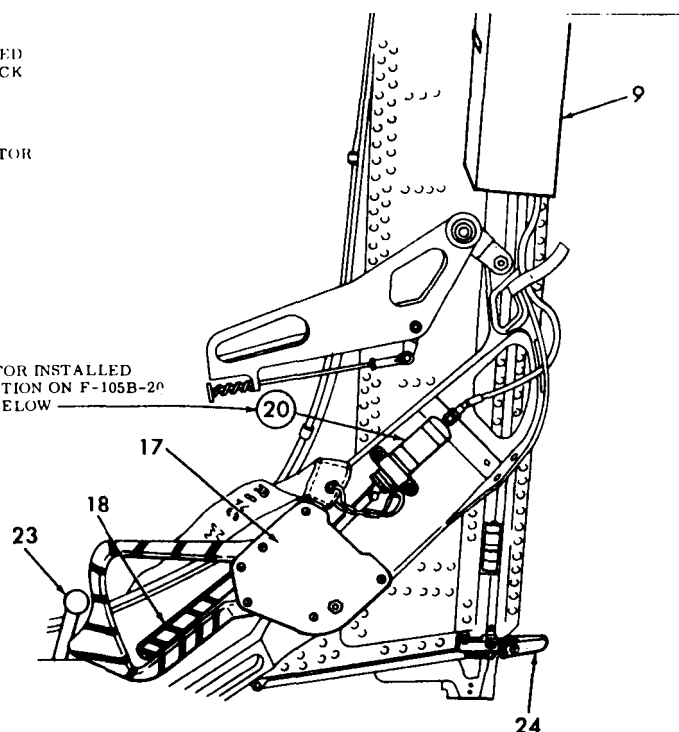
Following are the safing procedures for the F-105 aircraft (refer to figure 5 and table 2 as we discuss the safing procedures). Table 2 is located at the back of this study guide.

1. Insert the safety pin in the canopy ground emergency initiator.
2. Disconnect all pressure line quick-disconnect devices by pulling.
3. If the leg braces are down, install safety pins in the right-hand side of the ejection seat and through the auxiliary canopy jettison handle in the left console.
4. Install ground safety pins if applicable, and remove all components.

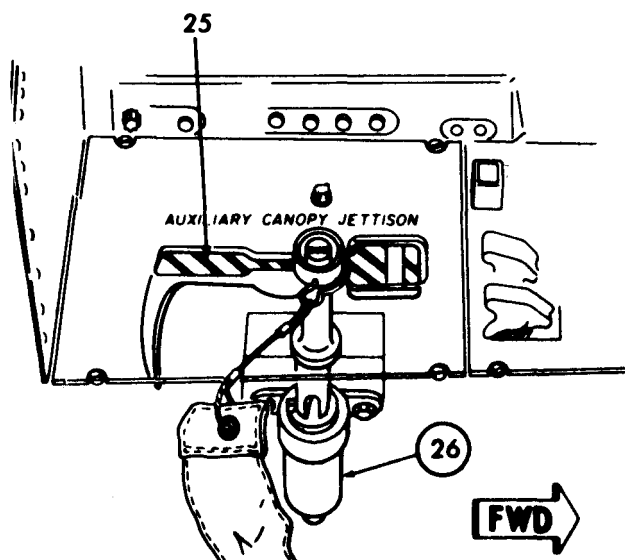


DETAIL A
SEAT (R.H. SIDE TYPICAL)

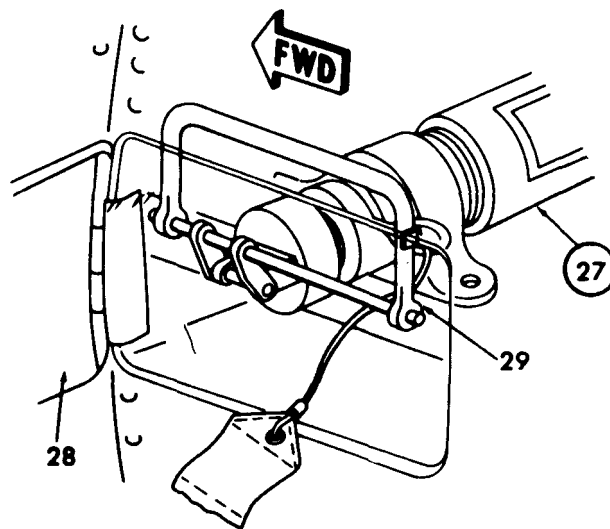
M3 INITIATOR INSTALLED THIS LOCATION ON F-105B-20 A/C AND BELOW



DETAIL B
SEAT (L.H. SIDE TYPICAL)



DETAIL C
AUXILIARY-CANOPY-JETTISON-INITIATOR
INSTALLATION-TYPICAL



DETAIL D
CANOPY-GROUND-EMERGENCY INITIATOR
(FF-77)

Figure 8-4. F-105 Emergency escape system details.

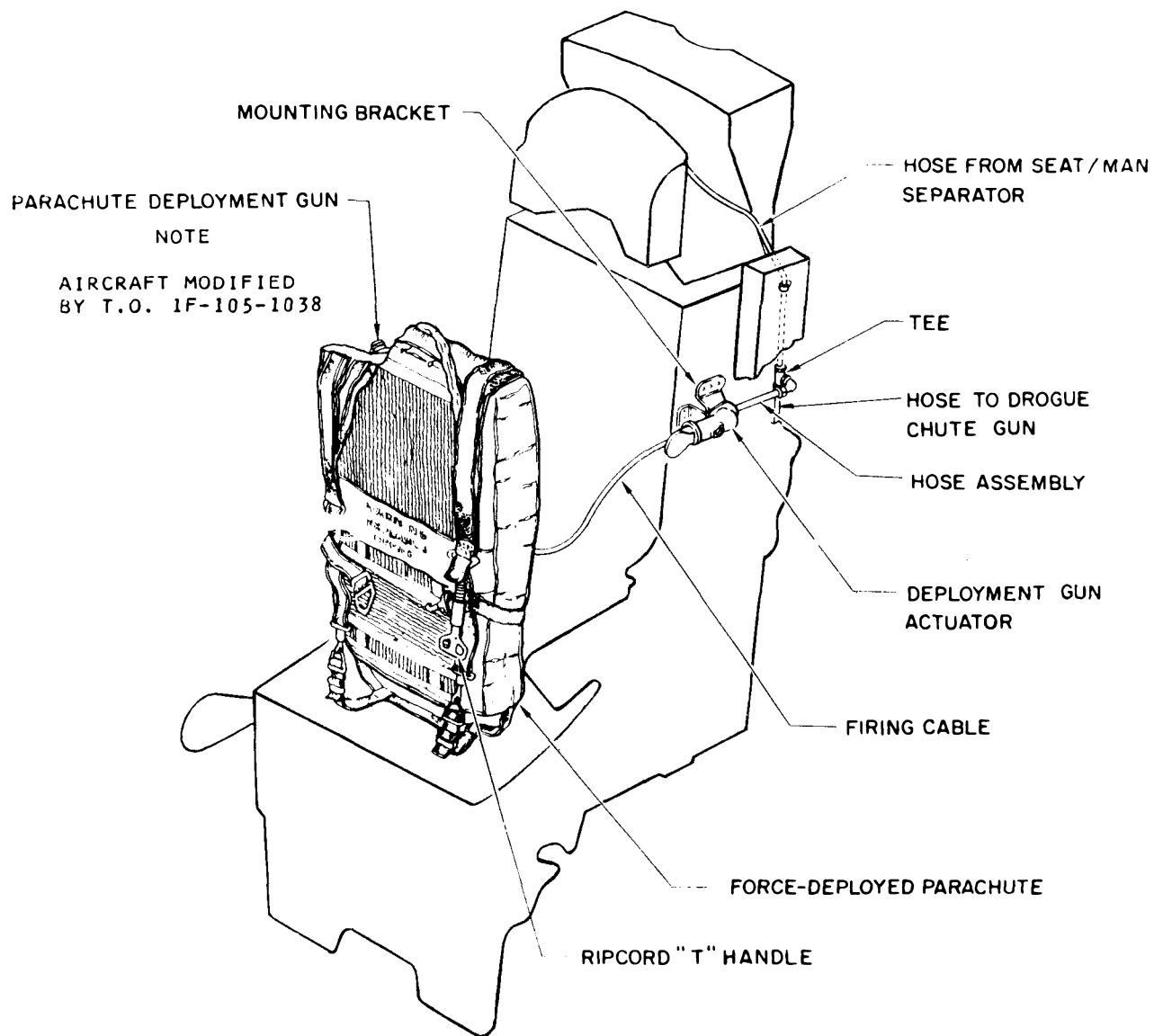
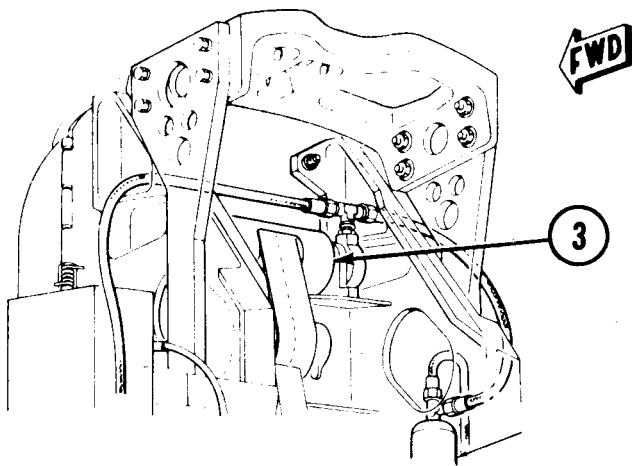


Figure 8-5. Personnel force-deployed parachute (gas initiated).



SEAT-MAN SEPARATOR
ACTUATOR INSTALLATION
(AIRCRAFT MODIFIED BY T.O. IF-105-1047)

LEGEND

- 1 DROGUE CHUTE
- 2 DROGUE CHUTE GUN
- 3 ROTARY ACTUATOR

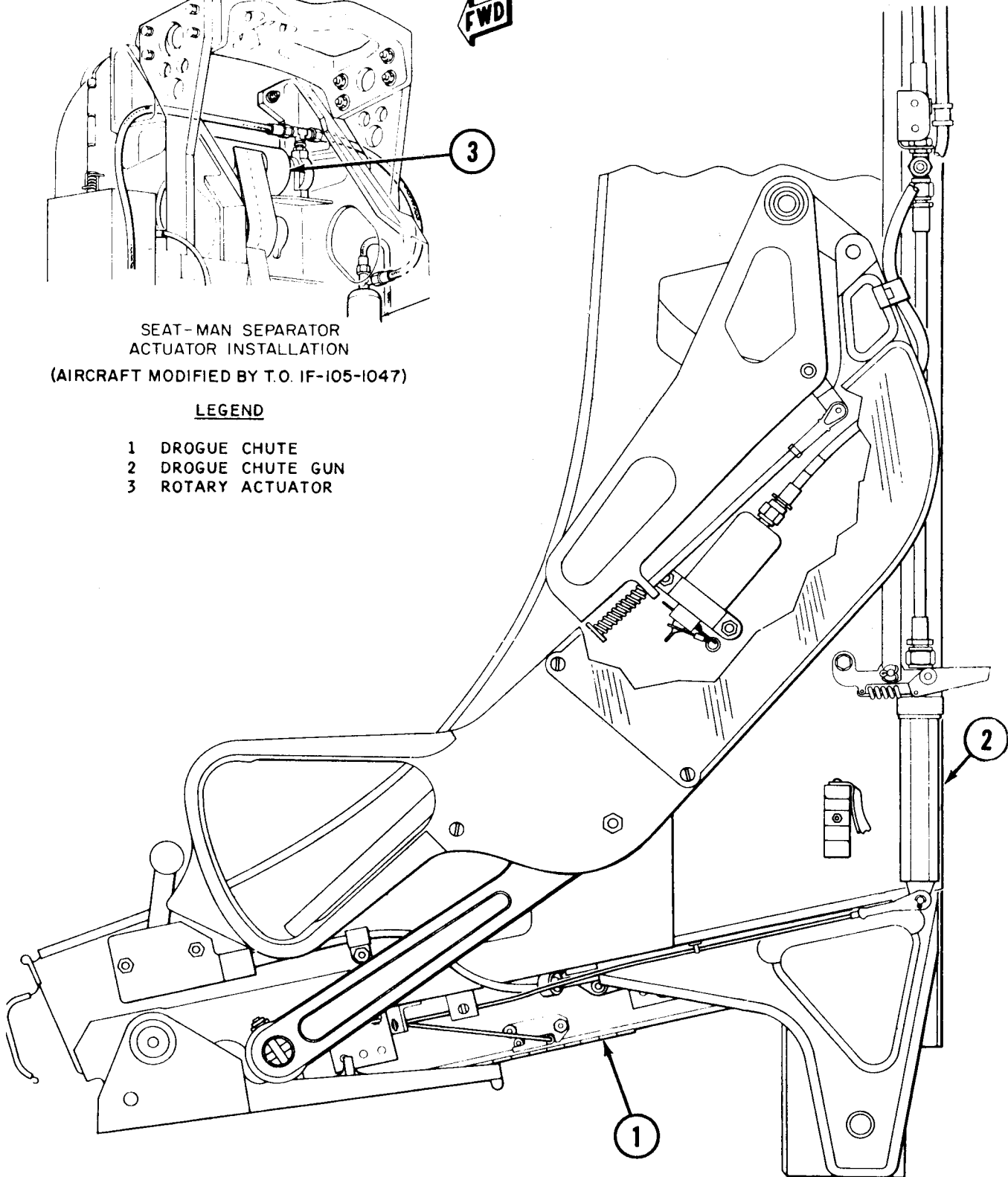


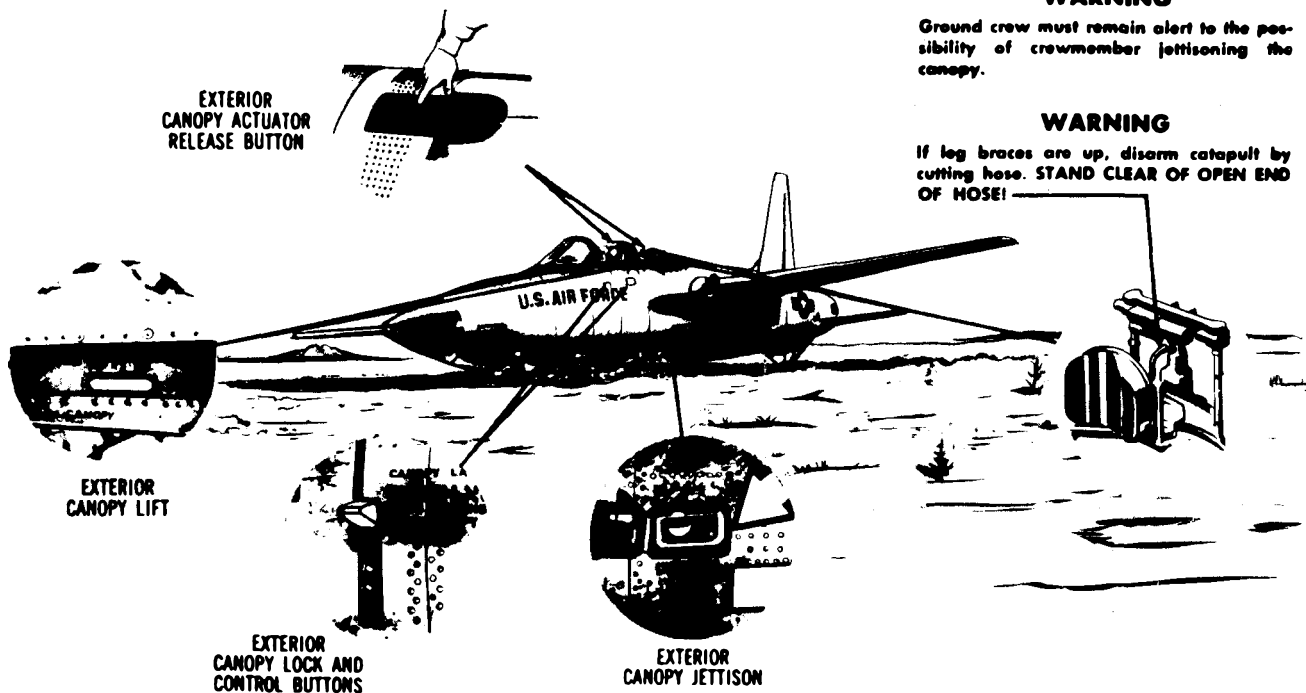
Figure 8-6. Drogue gun for seat retardation chute.

WARNING

Ground crew must remain alert to the possibility of crewmember jettisoning the canopy.

WARNING

If leg braces are up, disarm catapult by cutting hose. STAND CLEAR OF OPEN END OF HOSE!



NORMAL ENTRANCE

1. Exterior canopy lock lever — Raise.
2. Exterior canopy control button — Depress.

MANUAL ENTRANCE

1. Exterior canopy lock lever — Raise.
2. Exterior canopy actuator release button — Depress.
3. Raise canopy manually.

CAUTION: Hold canopy open as uplocks are not provided.

EMERGENCY ENTRANCE

IN THE EVENT NORMAL OR MANUAL ENTRANCE IS NOT POSSIBLE OR FEASIBLE

1. Push latch and open cover.
2. Exterior canopy jettison handle — Pull out 6 feet. Stand clear of canopy. **F** Both canopies will jettison.

IF CANOPY CANNOT BE JETTISONED — strike plastic along its edge attachment with the pointed end of a fireman's pike axe to produce a series of punctures outlining an escape hole. Strike punctures with broad edge of axe to open escape hole.

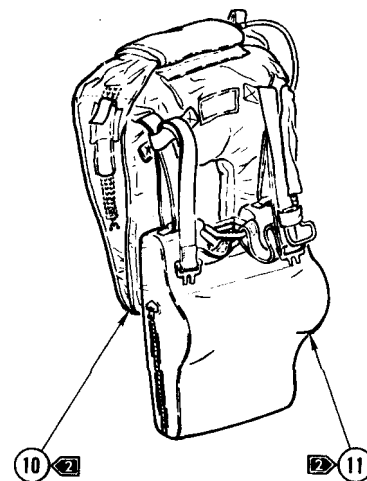
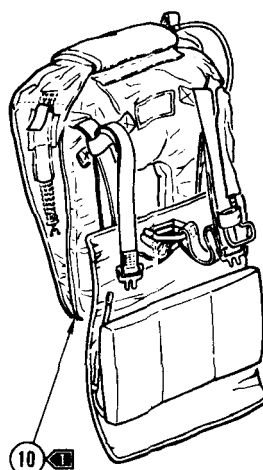
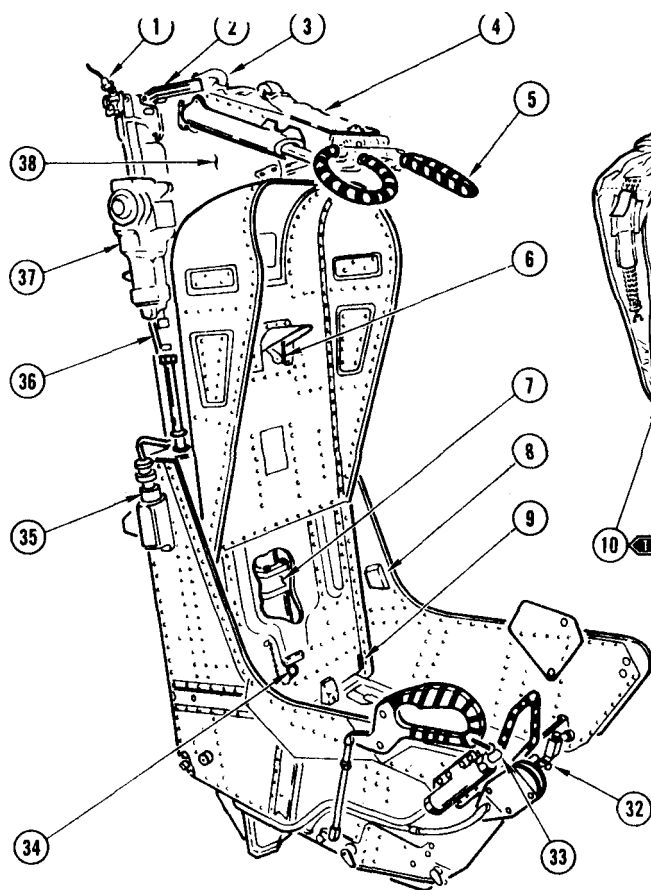
WHEN ACCESS TO COCKPITS IS GAINED

1. Make ejection seat safe (refer to paragraph 4-17).
2. Disconnect pilot's personal equipment leads.
3. Open seat safety belt (shoulder harness will release).
4. Pull emergency release handle on right side of survival kit to disconnect kit from parachute.

NOTE

Survival kit must be sitting FLAT in the seat pan or kit may be armed and life raft inflated when release handle is pulled.

Figure 8-7. F-105 emergency entrance.



NOTES

① F-4C-15 THRU F-4C-25 64-923, RF-4C-17 THRU RF-4C-25 65-863, AND F-4D-24 THRU F-4D-25 64-960 BEFORE INCORPORATION OF T.O. 1F-4-620.

② F-4C-25 64-924 AND SUBSEQUENT, RF-4C-25 64-864 AND SUBSEQUENT, AND F-4D 64-961 AND SUBSEQUENT. ALSO, F-4C-15 THRU F-4C-25 64-923, RF-4C-17 THRU RF-4C-25 65-863, AND F-4D-24 THRU F-4D-25 64-960 AFTER INCORPORATION OF T.O. 1F-4-620.

INDEX NO.	NOMENCLATURE	FNCE DESIGNATION	
		FWD COCKPIT	AFT COCKPIT
1	CANOPY INTERLOCK BLOCK	24-MP2M25C	24-MP3M26C
2	SCISSORS MECHANISM		
3	DROGUE SHACKLE		
4	DROGUE PARACHUTES	24-MP2M21	24-MP3M22
5	FACE CURTAIN HANDLE	24-MP2M37	24-MP3M38
6	SHOULDER HARNESS TAKE-UP MECHANISM	24-MP2M27	24-MP3M28
7	SEAT BUCKET POSITIONING ACTUATOR	24-AA2M19	24-AA3M20
8	STICKER CLIP		
9	LAP BELT LUG LOCK		
10	PERSONNEL PARACHUTE	24-AA2M49	24-AA3M50
11	LUMBAR PAD	24-MA2M53	24-MA3M54
12	RELEASE ASSEMBLY PERSONNEL PARACHUTE WITHDRAWAL LINE		
13	DROGUE WITHDRAWAL LINE		
14	TOP LATCH MECHANISM		
15	CATAPULT GUN FIRING MECHANISM	24-GP2M57	24-GP3M58
16	SEAT MOUNTED INITIATOR (REF)		
17	CATAPULT GUN	24-GP2M13	24-GP3M14
18	DROGUE GUN TRIP ROD	24-GP2M17B	24-GP3M18B
19	SEAT ACTUATOR QUICK DISCONNECT (SEAT BUCKET TO AIRCRAFT)		
20	MAIN BEAM ASSEMBLY	24-MP2M25	24-MP3M26
21	SEAT BUCKET GUIDE TRACK		
22	LAP BELT		
23	SEAT BUCKET	24-MP2M23	24-MP3M24
24	LEG RESTRAINT MANUAL RELEASE HANDLE	24-MP2M33A	24-MP3M34A
25	SHOULDER HARNESS SNUBBER RELEASE HANDLE	24-MP2M29A	24-MP3M30A
26	SECONDARY EJECTION HANDLE	24-MP2M41	24-MP3M42
27	SEAT HEIGHT ADJUSTMENT SWITCH	24-S206	24-S307
28	EMERGENCY HARNESS RELEASE HANDLE	24-MP2M31A	24-MP3M32A
29	GUILLotine GAS LINE		
30	DROGUE GUN	24-GP2M17	24-GP3M18
31	GUILLotine KNIFE BLADE ASSEMBLY	24-GP2M59	24-GP3M60
32	LEG RESTRAINT SNUBBER FINGER RING	24-MP2M63	24-MP3M64
33	GUILLotine FIRING MECHANISM	24-GP2M23A	24-GP3M24A
34	SEAT BUCKET QUICK RELEASE PIN (ACTUATOR PIN)		
35	SEAT ACTUATOR QUICK DISCONNECT (SEAT BUCKET TO ACTUATOR)		
36	TIME RELEASE MECHANISM TRIP ROD	24-AA2M15A	24-AA3M16A
37	TIME RELEASE MECHANISM	24-AA2M15	24-AA3M16
38	DROGUE CONTAINER		

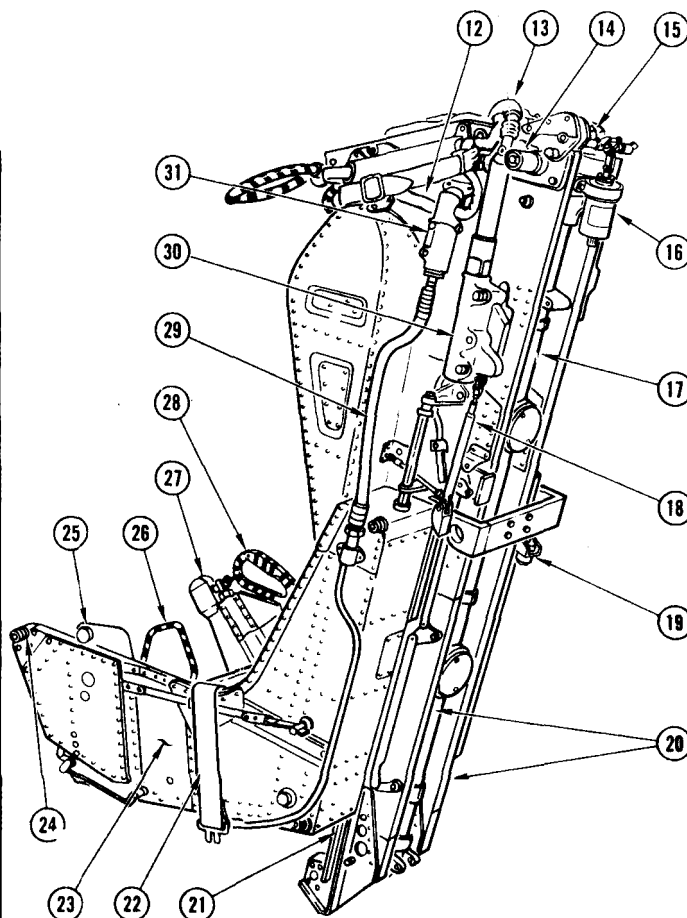


Figure 8-8. F-4C ejection seat.

5. If cable assembly of deployment gun is not connected to gun actuator on ejection seat, insure that the safety pin, streamer, and dust cap are engaged in the cable assembly. Refer to figure 5.

EMERGENCY ENTRANCE

Refer to figure 8-7 which shows the aircraft emergency entrance. This figure is self-explanatory. Study it carefully.

F-4C AIRCRAFT DOEA Egress Items

This aircraft utilizes the Martin-Baker MK H-5 ejection system. This system, although quite similar to other egress systems, has some distinctly different features. It is actuated much the same as other systems by use of a mechanical linkage to release a cocked firing pin; however, the catapult has one primary and two secondary explosive charges. This system also uses a drogue gun to open the primary parachute. The drogue gun, because of its design and explosive content, is extremely hazardous. Unlike the other devices, it fires a 15-ounce projectile out of the barrel like a rifle. The projectile, of course, represents a hazard to personnel and equipment. Refer to Figures 8-8 and 8-9 as you study the ejection sequence which follows.

1. Either the face curtain handle or the secondary ejection handle is pulled.

2. The mechanical initiator is fired; this subsequently jettisons the canopy. Also gas pressure from this initiator fires a gas generator that pulls the pilot to the ejection position.

3. Continued pull of the face curtain fires the ejection gun.

4. As the seat moves upward it reaches the end of a cable lanyard that fires the mechanically initiated rocket pack that sustains the seats upward motion. Refer to figure 8-9.

5. The drogue gun fires 1 second after ejection to deploy the controller drogue and stabilizer drogue.

6. The time release mechanism operates and releases restraint harness, leg restraint cords and eventually leads to deployment of the personnel parachute.

7. If the time release mechanism fails, release of the occupant from the seat is accomplished by the use of the emergency release handle which releases the restraint harness and fires the guillotine cartridge. The F-4 series aircraft have a system whereby either pilot can eject himself or both seats. This accomplished by a select valve in the aft cockpit (see figure 8-10) and by adding two each sequence actuators, initiators, and boosters.

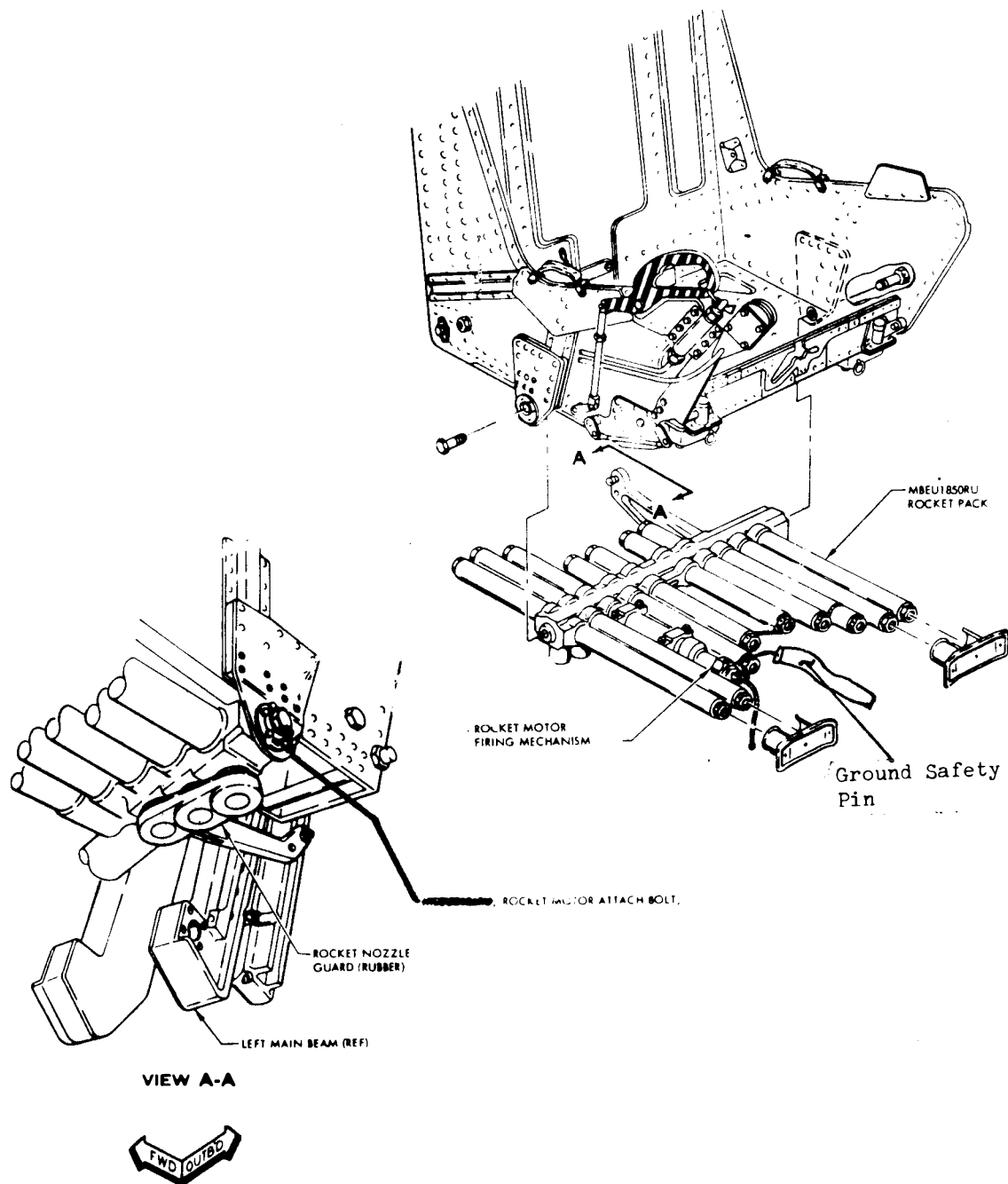


Figure 8-9. Ejection seat rocket pack installation (T.O. 13A5-32-501).

CAUTION

If the rear seat has ejected,
pulling or turning of the select
valve WILL fire the front seat.

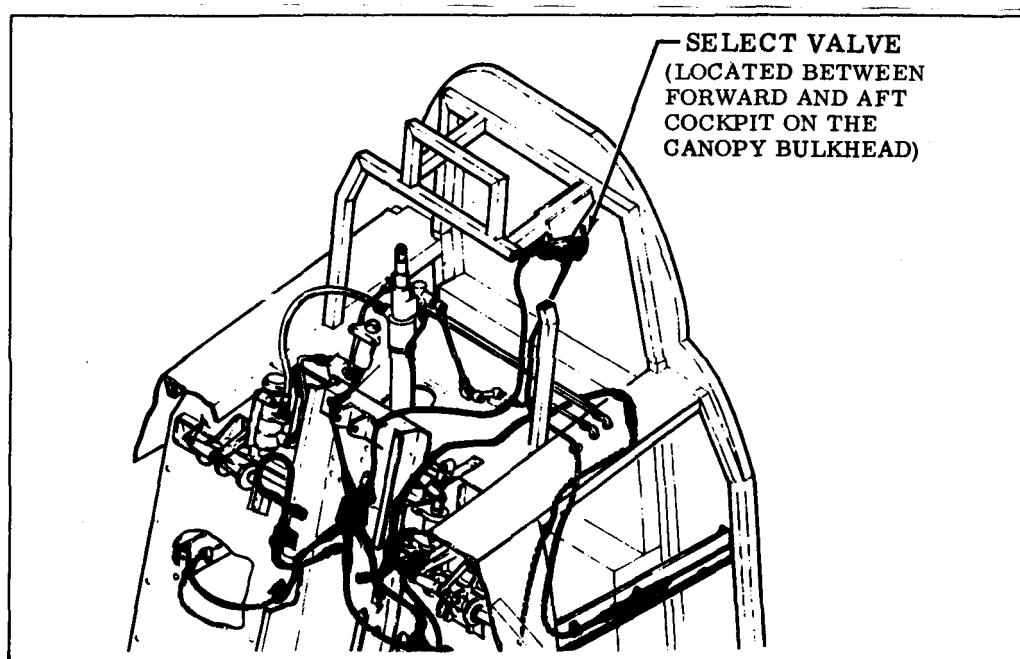


Figure 8-10. Pilot select valve.

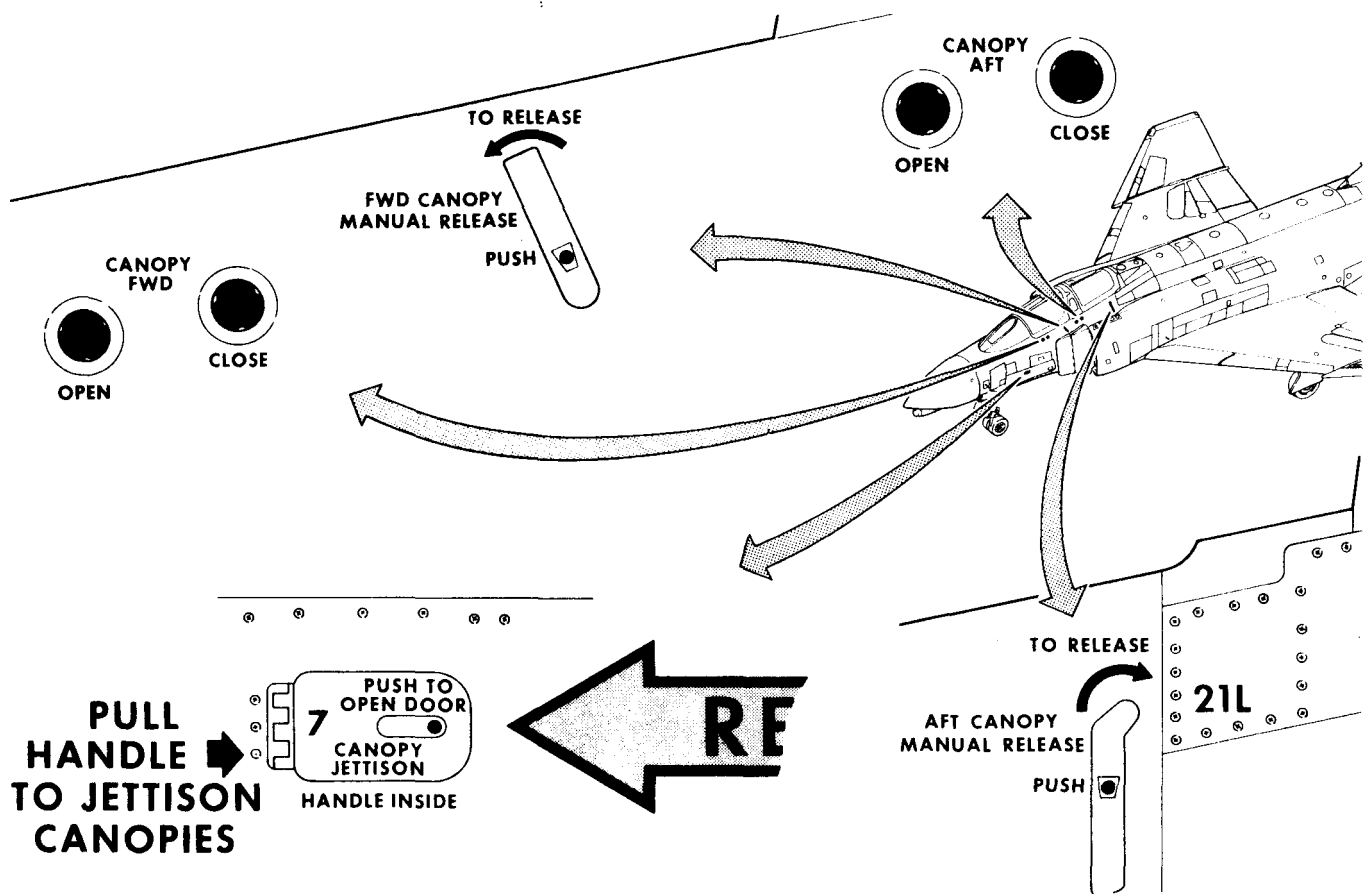


Figure 8-11. F-4C canopy operation.

Canopy Removal

The canopy on the F-4C aircraft may be opened several different ways. Since EOD personnel are concerned with entry into the cockpit, the external means of entry are as follows (refer to figure 8-11 as you read):

1. By pressing the forward/aft canopy open/close push buttons.
2. By use of the canopy external jettison handle.
3. By use of the forward/aft external manual unlock handles.

NOTE

Two mechanical initiators used for external canopy jettison for F-4 series aircraft are located inside each cockpit on the left-side of the rear canted bulkhead.

Safing Procedures for the F-4C Aircraft

Following are the safing procedures for the F-4C aircraft. However, due to the variable conditions in which the aircraft may be found, it may not be possible to safe the system in the exact order in which these procedures are listed. Refer to figure 8-12 as you study the procedures.

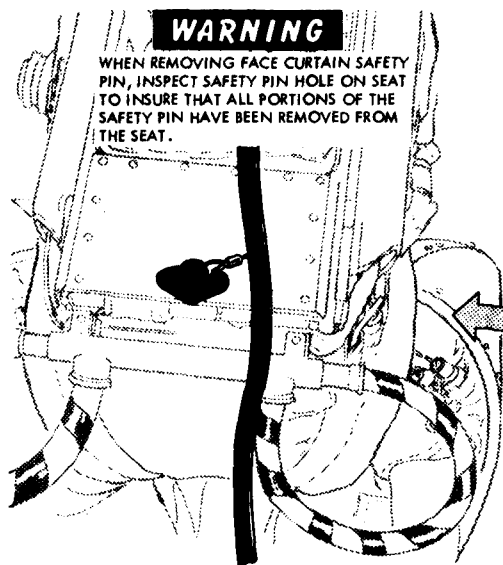
1. If the canopy is present, gain access to the cockpit by using one of the methods previously mentioned.
2. Replace the safety pin in the drogue gun and detach the trip rod.
3. Place safety pins in the face curtain, ejection gun, guillotine firing mechanism, initiators, and rocket pack.
4. Remove the components, insuring that maintenance safety pins are installed in each item. Figure 8-12 shows the safety pins installed and table 3 lists the total number of components. The table is located at the back of the SSG.

NOTE

If a safety pin cannot be used on the ejection gun, the firing head may be removed.

WARNING

WHEN REMOVING FACE CURTAIN SAFETY PIN, INSPECT SAFETY PIN HOLE ON SEAT TO INSURE THAT ALL PORTIONS OF THE SAFETY PIN HAVE BEEN REMOVED FROM THE SEAT.



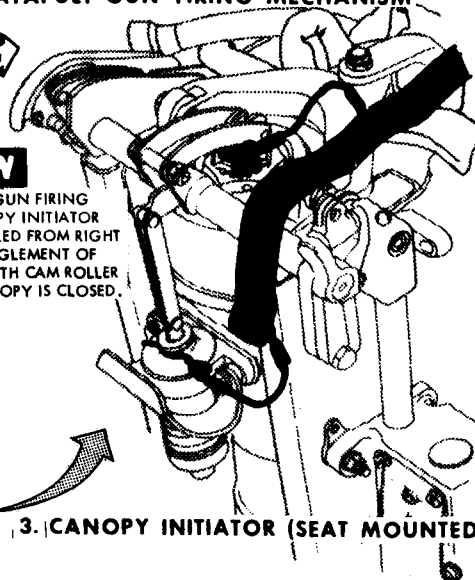
1. FACE CURTAIN

2. CATAPULT GUN FIRING MECHANISM



CAUTION

INSURE THAT CATAPULT GUN FIRING MECHANISM AND CANOPY INITIATOR SAFETY PINS ARE INSTALLED FROM RIGHT SIDE TO PREVENT ENTANGLEMENT OF SAFETY PIN ASSEMBLY WITH CAM ROLLER ON CANOPY WHEN CANOPY IS CLOSED.

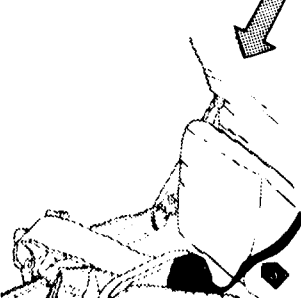


3. CANOPY INITIATOR (SEAT MOUNTED)

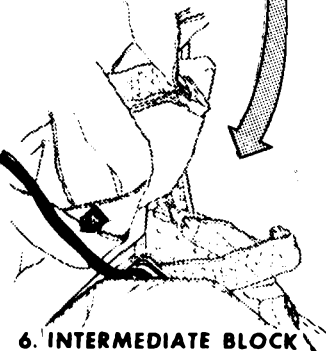


8. GUILLOTINE FIRING MECHANISM

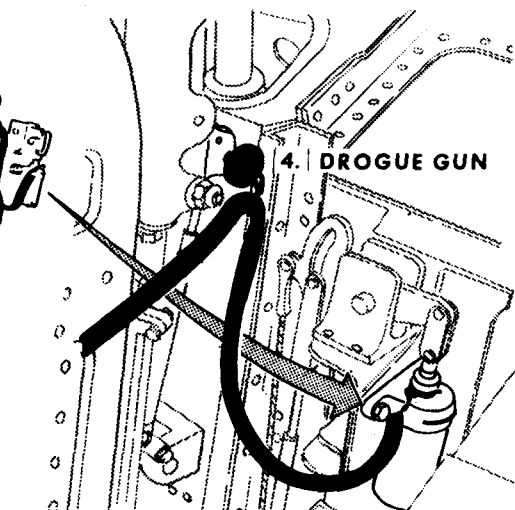
9. SECONDARY EJECTION HANDLE GUARD (ROTATE GUARD UP)



7. VENTILATING AIR EXHAUST HOSE DISCONNECT (21000-9 SURVIVAL KIT ONLY)



6. INTERMEDIATE BLOCK



5. CANOPY INITIATOR (COCKPIT MOUNTED)

Figure 8-12. F-4C Safety pin installation.

3 pins Per Seat A-1E AIRCRAFT

The A-1E aircraft uses a new concept in personnel ejection. Rather than actually ejecting a man and seat, the A-1E incorporates a rocket to extract only the man; the seat remains in the aircraft. This egress system is comprised of cartridge-actuated devices that have a different nomenclature than those with which most EOD personnel are familiar; therefore, they will be discussed in detail in this study guide. At the present time the A-1E is the only aircraft to incorporate the new system; however, in the near future it may be found in the A-26, T-28, and OV-10 aircraft. The A-1E escape system is illustrated in figure 8-13.

Extraction Rocket

The nozzles of this extraction rocket are on the front and the rocket pulls the man from the seat by employing a pendant line attached to each parachute riser. The rocket is internally launched from the aircraft by use of a launcher cartridge. The rocket itself is ignited when pull is exerted on the pendant line. When the rocket has expended 95 percent of its energy, a guillotine type of cutter is activated, thus severing the pendant line and allowing the rocket to carry itself away from the vicinity of the man.

Pendant Line

The pendant line is a ^{Perlon} nylon cord which connects the man to his extraction rocket and which is disconnected prior to parachute opening.

Messenger Cord

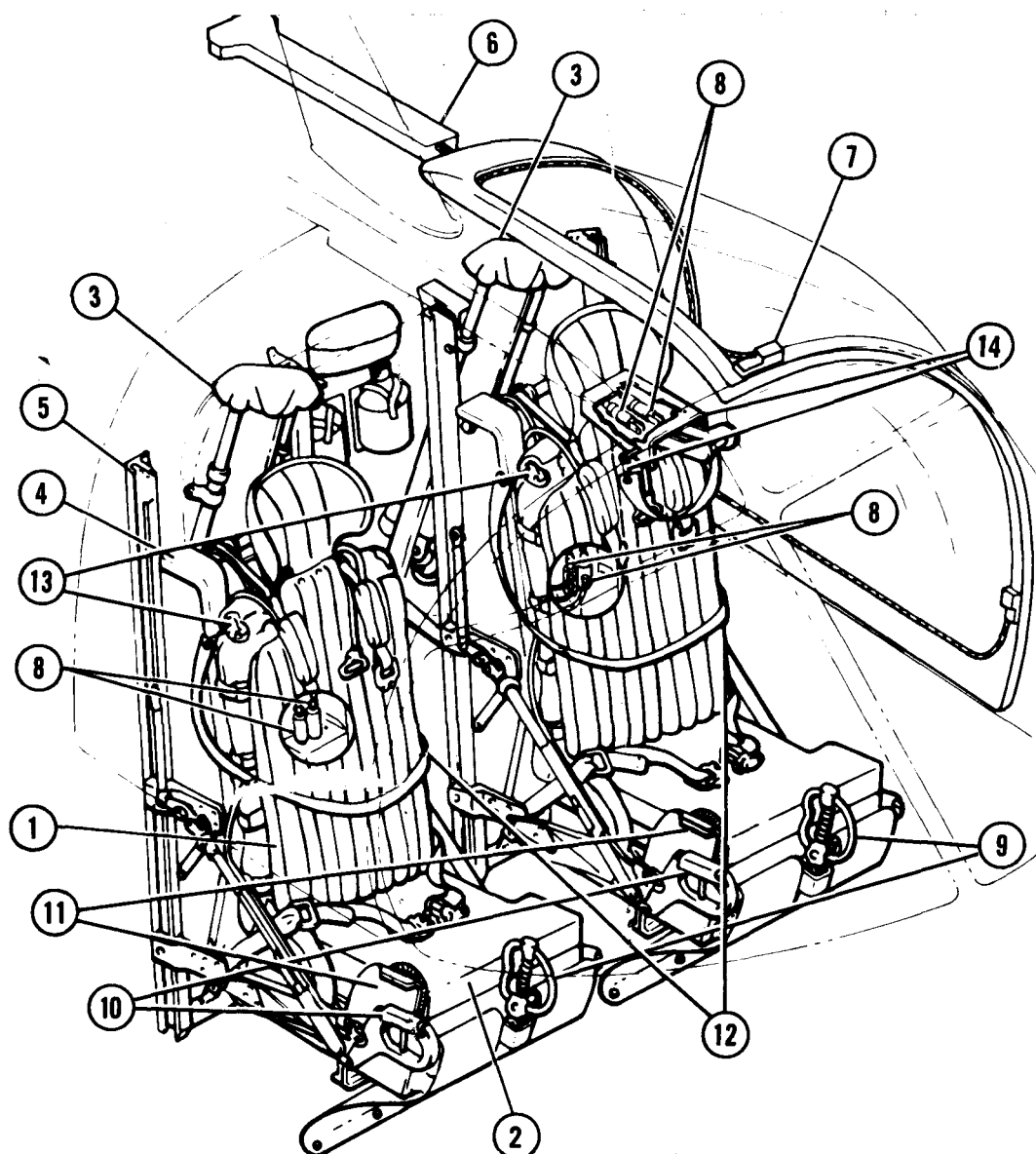
Messenger cord is a mild detonating fuze and a contained detonating fuze. The cord contains 2 grams per foot of PETN and is used to initiate cartridges for the rocket launcher, rocket erector, and canopy removal system. A lead styphnate booster is built into each end of the cord. The cord may be used within a nylon sheath (contained detonating fuze) or without the nylon sheath

Manifolds (Initiators)

Manifolds are nothing more than mechanical initiators. Unlike normal initiators, which produce gas pressure, the manifold initiators used in this system fire the detonating cord.

Pendant Disconnect Activator

The pendant disconnect activator is housed in the para-pack. It contains three cartridges; one of these is used to expel a 1-pound drogue slug for deployment of the parachute and two are used to provide pressure to operate the pendant disconnect.



LEGEND

- | | |
|--|--|
| 1 PARACHUTE PACK ASSEMBLY
(2 PLACES) | 8 MECHANICAL FIRING ASSEMBLY
AND BALLISTIC MANIFOLD |
| 2 SURVIVAL PACK (2 PLACES) | 9 PRIMARY EXTRACTION CONTROL
HANDLE |
| 3 EXTRACTION ROCKET AND
LAUNCHER ASSEMBLY | 10 SECONDARY ESCAPE HANDLE |
| 4 SEAT ASSEMBLY (2 PLACES) | 11 KIT RELEASE HANDLE |
| 5 SEAT RAIL ASSEMBLY (2 PLACES) | 12 PIN NO. 365136-11 |
| 6 TAKE-UP ASSEMBLY (2 PLACES) | 13 PIN NO. 365136-13 |
| 7 CANOPY CUTTER ASSEMBLY
(2 PLACES) | 14 PINS NO. 365136-5 (2) |

Figure 8-13. A-1E escape system.

Timer

The timer, which contains a cartridge, is contained within the parachute and is activated by the mechanical pull of a flexible lanyard. A barometric device is contained within the timer and blocks operation above 15,000 feet. Gas produced from the cartridge in the timer is used to fire the cartridges in the pendant disconnect. The timer is illustrated in figure 8-13 and table 4. Table 4 is located at the back of this SG.

Ejection Sequence

Following is the ejection sequence for the A-1E egress system. Refer to figure 8-13 as you study this sequence. The following sections are begun when the handle, located in the center of the seat is pulled.

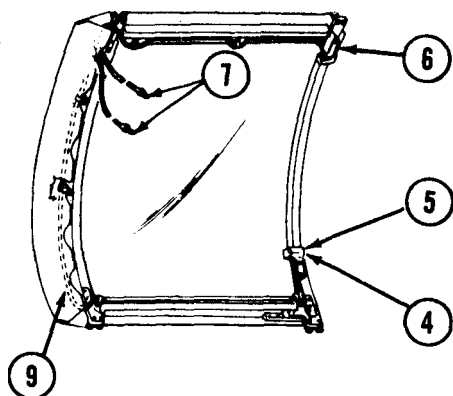
1. The inertia reel is locked.
2. The seat is allowed to fold downward after upward motion.
3. Two rail-mounted ballistic manifolds are initiated.
4. As shown in figure 8-14, the canopy removal system is initiated and the launcher cartridge is fired.
5. The extraction rocket is launched and ignites after full stretch of the pendant line.
6. The occupant is pulled from the seat through the canopy opening.
7. The parachute is deployed after the timer cartridge fires in the para-pack.

NOTE

A secondary escape handle is located on the right side of the seat pan. If a crew member decides to bail out rather than eject, the actuation of this handle allows separation from seat and rocket, allowing conventional procedures to be used.

Emergency Entrance

Entrance to the pilot's cockpit may be accomplished by turning the control knob to the open position and sliding the canopy to the rear (see figure 8-15).



- 1 CDF LINE
- 2 BALLISTIC MANIFOLD ASSEMBLY (2 PLACES)
- 3 COCKPIT SLIDING ENCLOSURE
- 4 CUTTER BLOCK
- 5 JUNCTION BLOCK (2 PLACES)
- 6 CUTTER BLOCK
- 7 CDF LINES (2)
- 8 TAKE-UP ASSEMBLY
- 9 MDF LINES

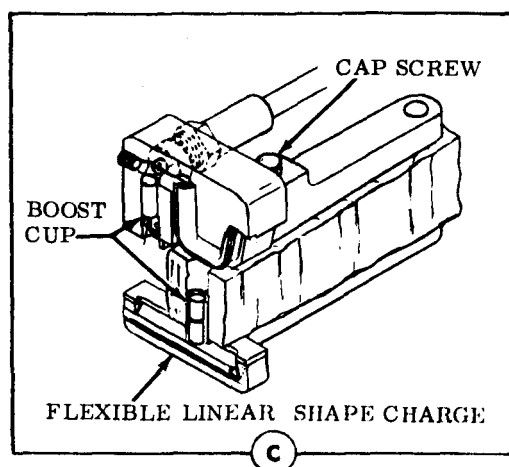
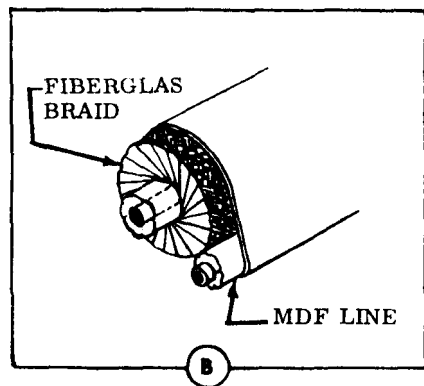
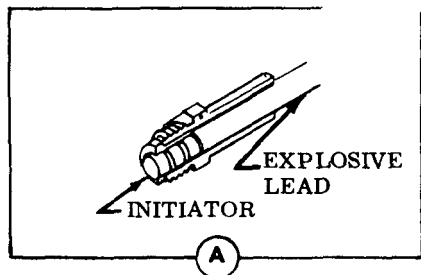
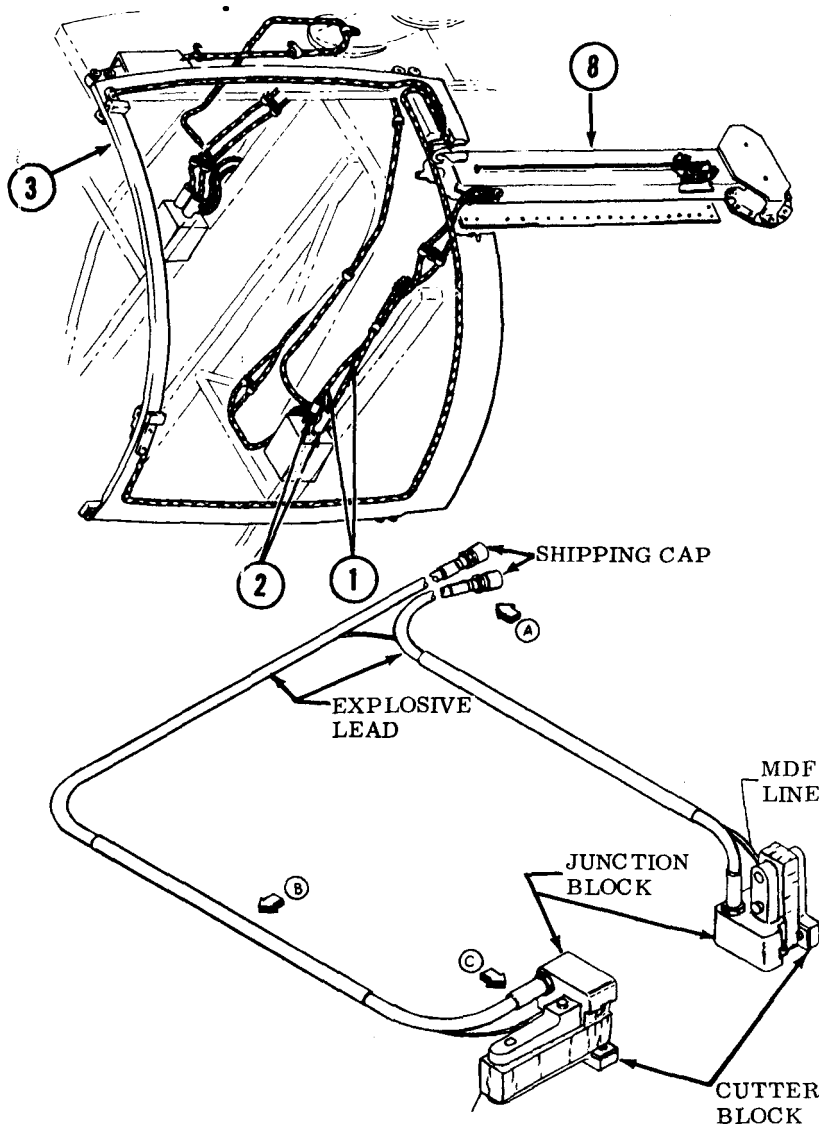


Figure 8-14. A-1E canopy cutter assembly.

Safing Procedures

Following is a list of safing procedures for the A-1E aircraft. Refer to figures 8-13 and 8-16 and table 4 as you read these procedures. Table 4 will be found at the back of this SG.

1. Install pins to safe bellcrank housing assemblies. (These are the mechanical firing devices on the seat rail assemblies.)
2. Install safing pins in the pendant disconnect activators in the parachute pack assemblies.
3. Install safing pins in the auxiliary control box assembly located on the upper-center cockpit structure.

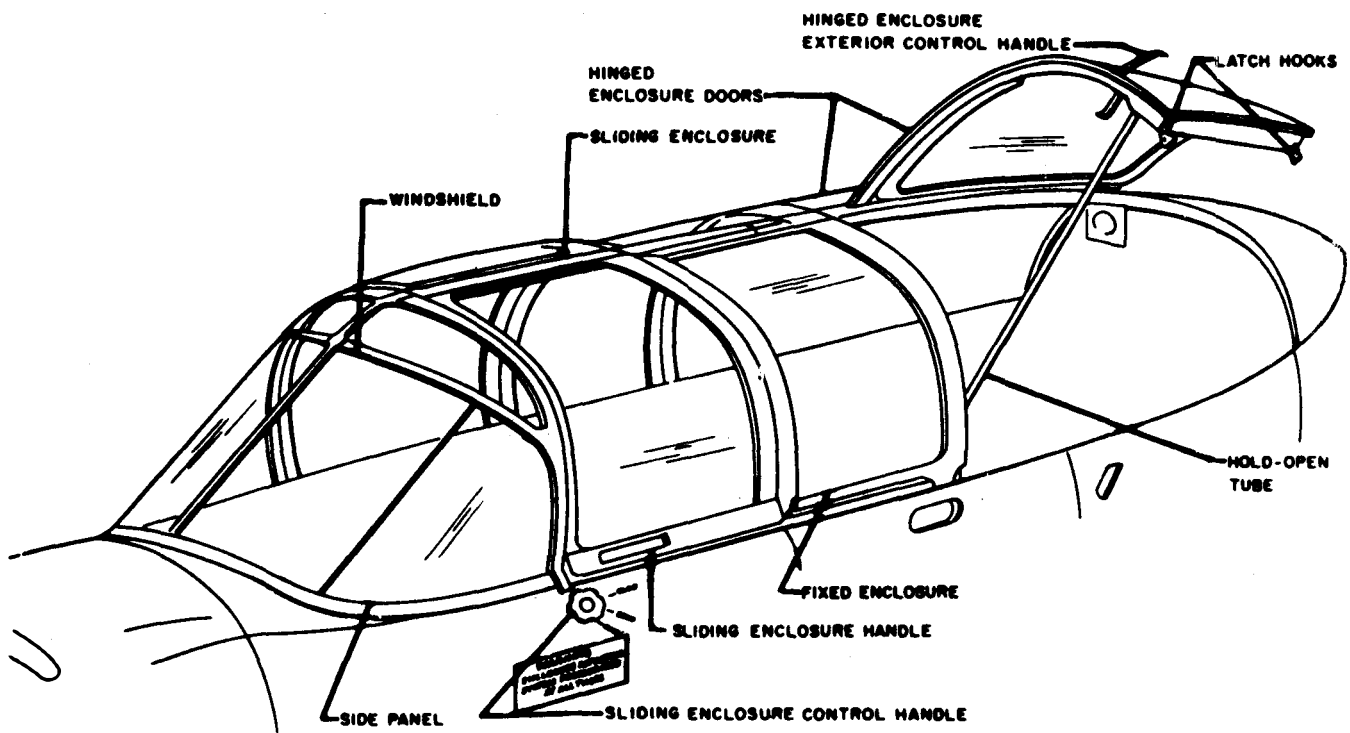


Figure 8-15. Cockpit enclosure.

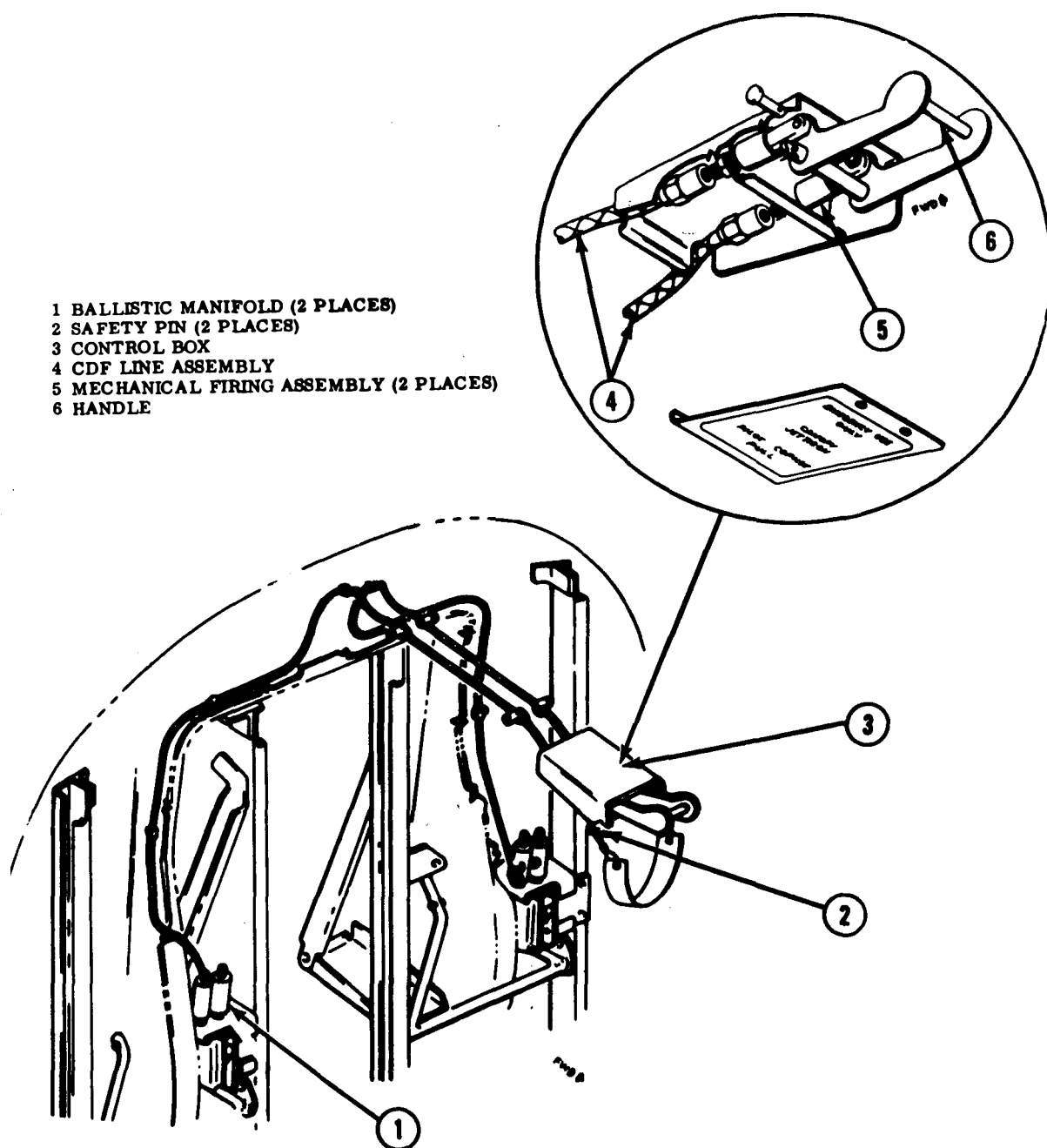


Figure 8-16. A-1E auxiliary canopy removal system.

Table 1. F-100 Egress System Components

ITEM	QTY	LOCATION	FUNCTION
F-100C Aircraft			
Initiator, M3A1	1	Under right console	Fires canopy remover
Remover, M1A3	1	Aft center of canopy	Jettisons canopy
Initiator, M3A1	2	Under each arm rest	Fires seat catapult
Catapult Rocket (2400-10) (M5 on earlier blocks)	1	Behind seat	Ejects seat
Initiator, M32	1	Behind seat at left shoulder	Releases lap belt and shoulder harness. Also fires pilot seat separator explosive-charged rotary actuator on aircraft modified by T.O. 1F-100-788.
Separator/Rotary Actuator (on aircraft modified by T.O. 1F-100-788)	1	Under seat	Separates pilot/seat
Quick-disconnect	1	Upper right side aft of seat	Safes seat system even when canopy is missing
Note: The F-100C has seven explosive egress items. For an emergency bailout, the pilot may pull either with triggers to actuate one or both catapult initiators. Therefore, it is possible to find an unfired initiator on a jettisoned seat.			
F-100D Aircraft			
Initiator, M3A1	1	Behind seat-right side	Fires canopy remover
Initiator, M3A1	1	Outside fuselage-left side (block 60 and later models)	Externally fires canopy remover
Remover, M1A3	1	Aft center of canopy	Jettisons canopy
Initiator, M3A1	2	Under each arm rest	Fires seat catapult
Catapult Rocket (2400-11) (M5 on earlier blocks)	1	Behind seat	Ejects seat
Initiator, M32	1	Behind seat just below left shoulder	Releases lap belt and shoulder harness. Also fires pilot/seat separator explosive-charged rotary actuator on aircraft modified by T.O. 1F-100-788.

Table 1. F-100 Egress System Components (Continued)

ITEM	QTY	LOCATION	FUNCTION
F-100D Aircraft (Continued)			
Separator/Rotary Actuator (on aircraft modified by T.O. 1F-100-788)	1	In seat bucket	Separates pilot/seat
Quick-disconnect	1	Upper left side of seat	Safes seat system even when canopy is missing
Note: The F-100D has seven explosive egress items on early models and eight on the F-100D-60 and later blocks. The additional explosive item is an M3A1 initiator for jettisoning the canopy externally. It is possible to find two unfired M3A1 initiators after an emergency bailout; the external canopy initiator and the remaining catapult initiator when only one trigger is pulled.			
F-100F Aircraft			
Initiator, M3A1	2	One behind right side of each seat	Fires canopy remover
Initiator, M3A1	1	Outside fuselage - left side	Externally fires canopy remover
Remover, M4	1	Center of canopy	Jettisons canopy
Initiator, M3A1 (front seat)	2	One under each arm rest	Fires M28/M72 (2 ea) initiators
Initiator, M28	2	Back of fwd seat - each side	Fires aft seat cata- pult
Initiator, M72		Back of fwd seat - each side	Fires fwd seat cata- pult 1/2 sec after rear seat catapult
Initiator, M3A1 (rear seat)	2	One under each arm rest	Fires aft seat cata- pult only
Catapult Rocket (2400-12) (M5 on earlier blocks)	1	Behind fwd seat	Ejects fwd seat
Catapult Rocket (2400-13) (M5 on earlier blocks)	1	Behind aft seat	Ejects aft seat
Initiator, M32	2	Behind each seat at left shoulder	Releases lap belt and shoulder harness. Also fires pilot/seat separator explosive- charged rotary actua- tor on aircraft modi- fied by T.O. 1F-100- 788.
Separator/Rotary Actuator (on aircraft modified by T.O. 1F-100-788)	2	One in each seat bucket	Separates pilot/seat
Quick-disconnect	2	Upper left side of each seat	Safes seat system even when canopy is missing
Note: The F-100F has eighteen explosive egress items. Either seat may be found with an unfired catapult initiator if the pilot utilizes only one handgrip trigger. Also, if the pilot in the forward seat initiates the egress system, the two catapult initiators and the canopy remover initiator on the aft seat, as well as the external canopy initiator, may be found in the unfired condition.			

Table 2. F-105 Egress System Components

ITEM	QUANTITY BY ACFT MODEL		LOCATION	FUNCTION
	B/D	F		
Initiator, M3 (on acft not modified by T.O. 1F-105-945)	1	2	Left leg brace (acft below F-105B-20) Right leg brace (acft above F-105B-20)	Fires canopy thruster by raising leg braces
Initiator, M3	1	2	Left console	Auxiliary canopy jettison
Initiator, M3	1	1	Left side of fuselage behind access door FF27 (B), FF77 (D/F)	External, ground canopy jettison
Initiator, delay, M31	-	1	Bulkhead behind aft pilot's seat	Delays jettison of aft canopy during ground jettison
Thruster, M9	1	2	Bulkhead behind pilot's seat rail	Unlocks canopy and fires canopy remover
Remover, M4	1	-	Rear canopy bulkhead	Jettisons canopy
Actuator/Remover	-	2	Rear canopy bulkhead	Opens/jettisons canopy
Initiator, M3	2	4	One in each leg brace	Fires catapult by squeezing trigger(s) on acft not modified by T.O. 1F-105-945. Fires thruster and M26 delay initiator on acft modified by T.O. 1F-105-945
Initiator, delay, M26 (on acft modified by T.O. 1F-105-945)	1	2	Right-hand, lower aft wall of cockpit	Fires catapult
Catapult, M3 (On acft not modified by T.O. 1F-105-945)	1	2	Back of seat	Ejects seat
Catapult, Rocket (On acft modified by T.O. 1F-105-945)	1	2	Back of seat	Ejects seat
Initiator, delay, M32	1	2	Left side of seat back (F-105-10 through F-105-15). Upper right side of seat back (F-105B-20 not modified by T.O. 1F-105-945)	Releases lap belt and shoulder harness. Fires rotary actuator
Separator/Rotary Actuator	1	2	Behind headrest(s)	Separates man/seat
Quick Disconnect(s) -Unmodified by T.O. 1F-105-945	1	2	Left side of seat on acft below F-105B-20. Right side of seat frame on acft above F-105B-20	Safes canopy/seat ejection systems
-Modified	2	4	Upper right side of seat frame	

Table 2. F-105 Egress System Components (Continued)

ITEM	QUANTITY BY ACFT MODEL		LOCATION	FUNCTION
	B/D	F		
Gun, Drogue Chute (on acft modified by T.O. 1F-105-1047)	1	2	Lower left hand aft corner of seat	Deploys Drogue Chute
Actuator, Deployment Gun (on acft modified by T.O. 1F-105-1038)	1	2	Left side of seat below chaff dispenser	Arms the parachute deployment gun
Reel, Inertia, Powered (on acft modified by T.O. 1F-105F-542)	-	1	On aft seat	When ejection is initiated from forward cockpit, aft cockpit occupant is retained in ejection position.

NOTE: If the pilot(s) squeeze(s) only one trigger, an M3 initiator will be found in an unfired condition in the right or left leg brace(s).

Table 2A. F-105 Egress System Explosive Component Recap

EXPLOSIVE ITEM	AIRCRAFT MODEL		
	B	D	F
Initiator, M3	4* or 5	4* or 5	7* or 9
Initiator, delay, M31	-	-	1
Thruster, M9	1	1	2
Remover, M4	1	1	-
Actuator/Remover	-	-	2
Initiator, delay, M26*	1	1	2
Catapult, M3	1	1	2
Catapult, Rocket*	1	1	2
Initiator, delay, M32	1	1	2
Rotary/Actuator	1	1	2
Gun, Drogue chute, RA061D0012-3	1	1	2
Reel, Inertia, Powered	-	-	1

*Aircraft modified by T.O. 1F-105-945

Table 3. Egress System - F-4C/D and RF-4C Explosive Items

ITEM	QTY	LOCATION	FUNCTION
Initiator, M3	2	1 on the back of each seat	Operates gas valve and directs air pressure to canopy actuator (1375 PSI)
Initiator, M3	2	1 behind each seat, on the fuselage, on left side of cockpit	Operates gas valve and directs air pressure to canopy actuator (1375 PSI)
Guillotine Firing Cartridge	2	1 on each forward right side of each seat bucket	Creates gas pressure through gas line to operate guillotine blade assembly, severing personnel parachute withdrawal line
Catapult Gun Cartridge	6	3 back of each seat within the catapult inner tube (1 primary, 2 auxiliary)	Gas pressure ejects seats from aircraft
Drogue Gun Cartridge	2	Within the drogue gun assembly, on the left vertical beam of the main beam assembly	Produces gas pressure to propel piston, pulling drogue parachutes from container
Cartridge MBEU/2250RU (T.O. 13A5-32-501)	2	Within rocket igniter assembly bottom of seat pan	Arms rocket motor
Initiator, 32-72317-3 (T.O. 1F-4-663)	1	Front cockpit, left side of canted bulkhead	Egress system booster initiator
Rocket Pack MBEU/1850RU (T.O. 13A5-32-501)	2	Bottom of seat pan	Assists in seat ejection
Initiator, 32-72317-3 (T.O. 1F-4-663)	1	Under left console rear cockpit	Egress system booster initiator
Initiator, 32-72317-11 (T.O. 1F-4-663)	1	Rear cockpit left side of canted bulkhead	Egress system booster initiator
Actuator, Sequence (T.O. 1F-4-663)	2	Cockpit seat rail assembly	Sequence seat ejection
Initiator, 32-72317-3 (T.O. 1F-4-663)	1	Rear cockpit under right console	Egress system booster initiator
Gas Generator (T.O. 13A5-32-501)	2	1 near inertia lock reel on each seat	Operates inertia lock reel

Table 4. A-1E Egress System Components

ITEM	QTY	LOCATION	FUNCTION
Canopy Cutter Assembly	1	Cockpit sliding enclosure	Cuts out canopy
CDF Lines	2	Canopy and take-up assembly	Connects junction blocks to ballistic manifold
MDF Lines	2	Canopy (interconnects junction blocks)	Cuts out canopy
Junction Block (shape charge booster)	2	Forward canopy frame	Cuts forward canopy frame
Cutter Block (shape charge)	2	Forward canopy frame	Cuts forward canopy frame
Auxiliary Canopy Removal Assembly	1	Upper center of forward cockpit structure	Cuts out canopy
CDF Lines (assembly booster and detonator)	2		Connect auxiliary system control box to MDF lines in canopy through the ballistic manifold
Bellcrank Housing	1	Left seat rail	Mechanical-Ballistic firing junction. Fires ballistic manifold
CDF Lines	2		
Ballistic Manifold	2	Left seat rail (side by side)	Initiates a signal through CDF lines to canopy removal systems and launcher cartridge
CDF Lines	5		
Launcher Assembly	1	Back of seat	Ignites and launches extraction rocket
CDF Lines	2		
Cartridge (0.5 sec. delay)	1		
Extraction Rocket	1	Back of seat (attached to crew members shoulder harness by a 10-foot pendant line)	Pulls crew member from aircraft
Parachute Pack Assembly	1	Seat back-rest	Air-drop survival
Timer w/time-delay cartridge	1		Transmits gas to pendant disconnect actuator
Pendant Disconnect Activator (3 cartridges)	1		Releases pendant disconnect assemblies from both shoulder straps. Deploys parachute

EVALUATION QUESTIONS

1. Initiators used in egress systems may be fired Mechanical or gas pressure.
2. T or F. The rotary actuator used in the F-100 egress system does not contain an explosive cartridge. False
3. Initiators are used to function other items in an egress system. These items are: Rotary Actuator, Truster, Catapult, _____, and _____.
4. T or F. When removing an exactor operated egress component, you should always remove the exactor from the item as soon as possible. False
5. The electro-mechanical ballistic remover can be used to remove the Canopy on the F-105 F aircraft.
6. T or F. The electro-mechanical ballistic remover contains one explosive cartridge fired by gas pressure from an initiator. True
7. When disposing of a RAPEC type seat catapult, care must be taken to prevent it from Propulsive or Air born.
8. A RAPEC catapult with no gas port in the top trunion would indicate that a RAPEC type catapult is installed.
9. The F-100D aircraft has a total of 8 egress items.
10. There are 5 initiators used in the F-100D aircraft.
11. There is an Initiator located at TCL of the F-105 fuselage.
12. The F-105D egress system contains 12 (1) explosive items.
13. The quantity of initiators that could be functioned to fire the electro-mechanical ballistic remover in the F-105D is 4.
14. There are a total of 25 (1) egress items associated with the F-105F.
15. In clearing an incident involving a F-105D aircraft, you should account for 6 (1) initiators.
16. The canopy remover system for the F-4C consists of an initiators and Air system.

17. There are 8 initiators used in the egress system on the F-4 aircraft.

18. There are a total of 20 egress items used in a F-4 aircraft.

19. T or (F) The Martin-Baker seat catapult is fired by gas pressure from the initiator which is located behind the head rest.

20. The guillotine cartridge is located Right Arm Rest on the F-4 aircraft.

21. T or (F) Installation of a safety pin in the mechanical shackle release system (Barostat) prevents the cartridge from firing to function the man-seat separation mechanism.

22. (T) or F. The egress system used in the A-1E aircraft uses MDF to remove the canopy.

23. T or (F) The rocket motor used in the A-1E aircraft is fired by gas pressure.

24. T or (F) To save the A-1E extraction rocket, you must install a ground safety pin in the right hand seat handle.

25. The drogue gun used in the A-1E aircraft is located Para Pak.

26. Match the following:

(1) Yankee system: A, C, F

(2) F-105 aircraft: E, H, I, J

(3) F-4 aircraft: D, B, A

(4) F-100 aircraft: G, H, I

- (A) No initiator in fuselage
- (B) Two firing methods for catapult
- (C) Lead styphnate
- (D) Rocket pack
- (E) Thruster
- (F) Shape charges
- (G) M1 exactor
- (H) Rotary actuator
- (I) Initiator TCL
- (J) RAPEC

Chapter 9

Aircraft Guns and Pods and Miscellaneous Hazards

OBJECTIVES: The purpose of this text is to supply knowledge to the EOD technician for identification, basic operation, clearing and safing of aircraft guns and pods. Also, to familiarize them with miscellaneous hazardous components that could be encountered on the F-100, F-105, F-4, and A-1 series aircraft.

INTRODUCTION: Aircraft guns and pods have always presented a problem to the EOD technicians who have had to walk around or work on them in an aircraft crash. Also, many instances have occurred where EOD personnel were the only people capable or available to safe the gunnery systems on a transient aircraft. These are just two of the reasons why they are discussed. Another problem to the EOD technician is the location of miscellaneous hazards that are not part of major systems. These hazards may be explosive or no-explosive. The F-100, F-105, F-4, and A-1 series aircraft are the only ones discussed because these are the workhorses in SEA and a good working knowledge of these aircraft will help in handling all type aircraft incidents. There is no specific or set pattern for disposal or destruction of aircraft guns and gun pods and possible approaches to disposal/destruction will be discussed for each system covered in the classroom.

M3 CALIBER .50 MACHINE GUN

1. Use of Gun

The M3 caliber .50 machine gun is a common aircraft and ground-mounted weapon which was used during World War II. It is now used in SEA on A-26 (8 guns), T-28 (2 guns), B-57 (8 guns), and in the tail turrets of B-52 (4 guns) aircraft. It can also be found on a tripod or in various vehicle-mounted configurations. See figure 1 for a typical application of the M3 caliber .50 machine gun.

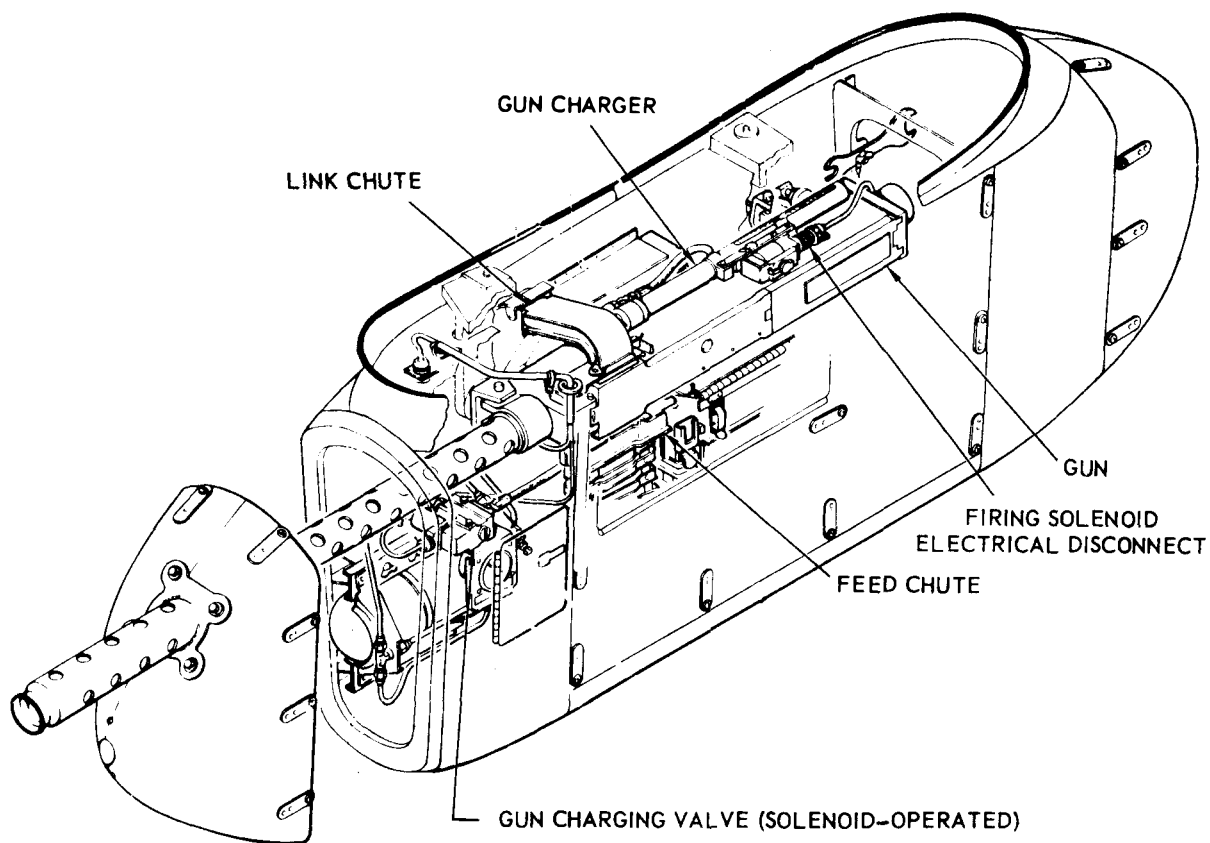


Figure 9-1. M3 Caliber .50 Machine Gun Mounted in a Gun Pod (T-28)

2. Ammunition

The M3 uses caliber .50 percussion primed ammunition.

3. Safety Precautions

The following safety precautions pertain to the M3 caliber .50 machinegun:

- o Never walk in front of the gun until you are sure it is safe and clear.
- o Disconnect electric leads only from solenoids and not from gun chargers.
- o Never put hands into the receiver assembly.
- o Do not disconnect or cut gun charger hoses until the system has been bled.

4. Safing Procedures

This procedure applies only to guns fired by an electric solenoid and is accomplished by disconnecting the electrical lead from the solenoid.

CAUTION

Disconnecting the electrical lead from gun chargers on some systems can cause the gun to fire. Refer to the applicable TO for additional information.

5. Clearing Procedures

To prevent accidental firing of the gun due to personnel error or by a round "cooking off" in the chamber, you must clear the gun by removing the round from the chamber and isolating the gun from its source of ammunition. To accomplish this on the M3 caliber .50 follow the steps below and use figure 9-2 as a reference.

a. Lift the cover (callout 7) and remove the ammo belt. (The belt may be fed to the gun from either side.)

b. Check position of the bolt.

1. If bolt is at the rear, remove round by pushing it down with a suitable tool. DO NOT USE FINGERS.

2. If bolt is forward, check the bolt face for the presence of a round; if no round is visible, the gun is clear.

3. If round is visible, remove it by one of the following methods:

(1) If manual charging handle is present, pull it rearward.

4. If operation is known, activate the gun charger.

5. The easiest method under most circumstances is:

WARNING

Do not attempt this procedure if the bolt is in the rear position.

(a) Depress the lock button and lift up on the backplate latch. Pull upward on the backplate and remove it (callout 1).

(b) Pry the driving spring out of the retaining hole and remove it (callout 2).

(c) Slide the bolt to the rear and remove the round (callout 4).

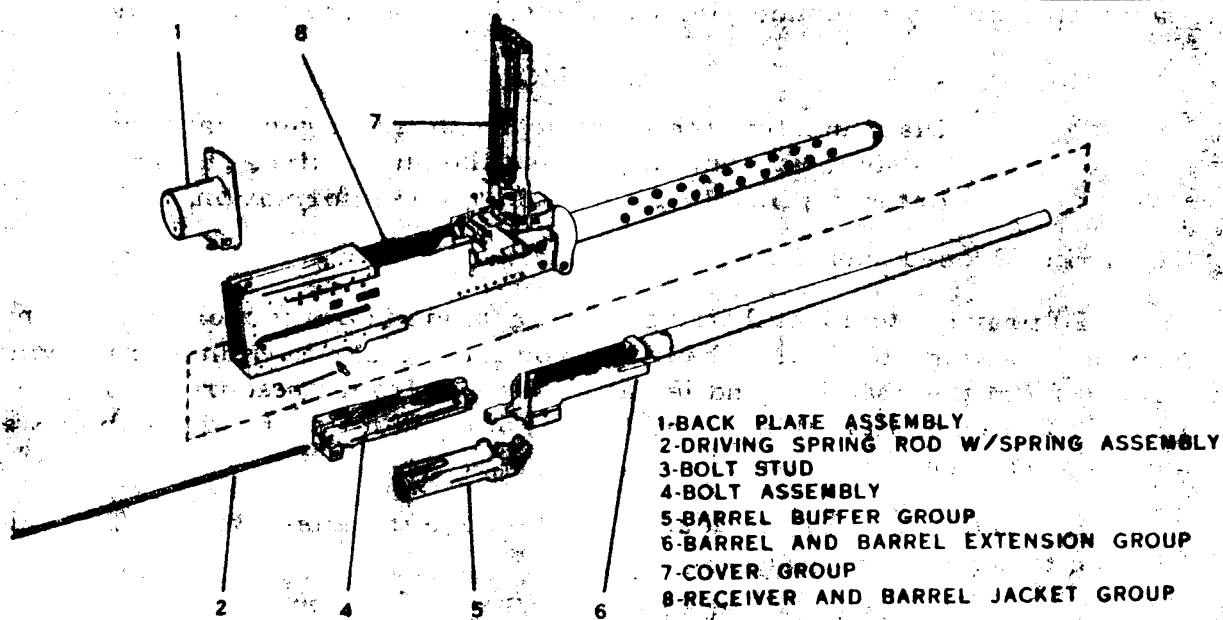


Figure 9-2. M3 Caliber .50 Machine Gun (exploded view)

M60 7.62-MM MACHINE GUN

1. Use of Gun

The M60 machine gun, like the M3 machine gun, is a versatile weapon. It can be used as a ground-, vehicle-, helicopter-, or aircraft-mounted weapon. It can be fired manually by using a trigger or electrically by using a solenoid. Figure 9-3 shows a typical application of the M60 machine gun.

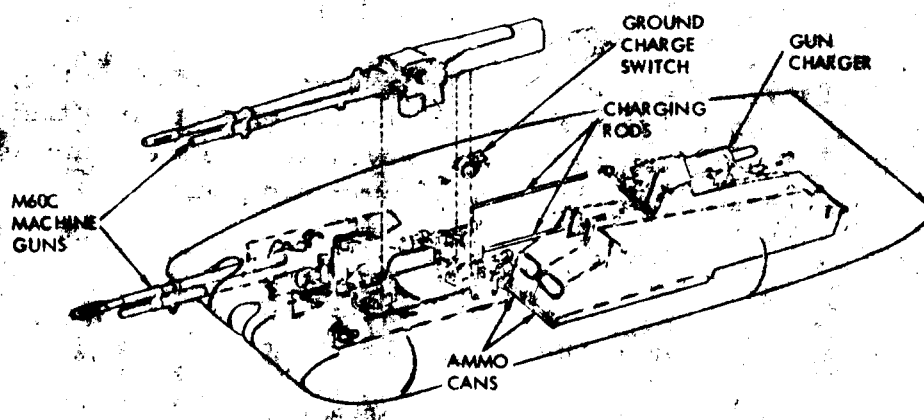


Figure 9-3. M60 Machine Guns Mounted in a Sponson (OV-10 Aircraft)

2. Ammunition

The M60 machine gun uses 7.62-mm percussion primed ammunition.

3. Safety Precautions

The following safety precautions apply to the M60 machine gun:

- a. Never walk in front of the gun until you are sure it is safe and clear.
- b. Never put hands into the receiver assembly.

4. Safing Procedures

Safing of the electrically fired M60 machine gun is accomplished by disconnecting the electrical lead from the firing solenoid.

5. Clearing Procedures

Clearing is accomplished on the M60 machine gun by performing the following steps:

- a. Unlatch and lift the cover assembly and remove the ammunition belt. (The belt may be fed to the gun from either side.)
- b. Pull the bolt to the rear using the cocking handle provided. This action should eject the round if one is present. If the round is not ejected, remove the round through the side port using a suitable tool. DO NOT USE FINGERS.

M3 AND M24 20-MM AUTOMATIC GUNS

1. Use of Guns

Both the M3 and the M24 automatic guns are used in Southeast Asia on the A-1 series aircraft--the M3 on the A-1E and the M24 on the A-1H and J (see figure 9-7). They could be interchanged, however, because they are identical in appearance and differ only in the method used to fire their ammunition. Safing and clearing procedures will also be the same for both types. Figure 9-4 shows the M3 20-mm automatic gun.

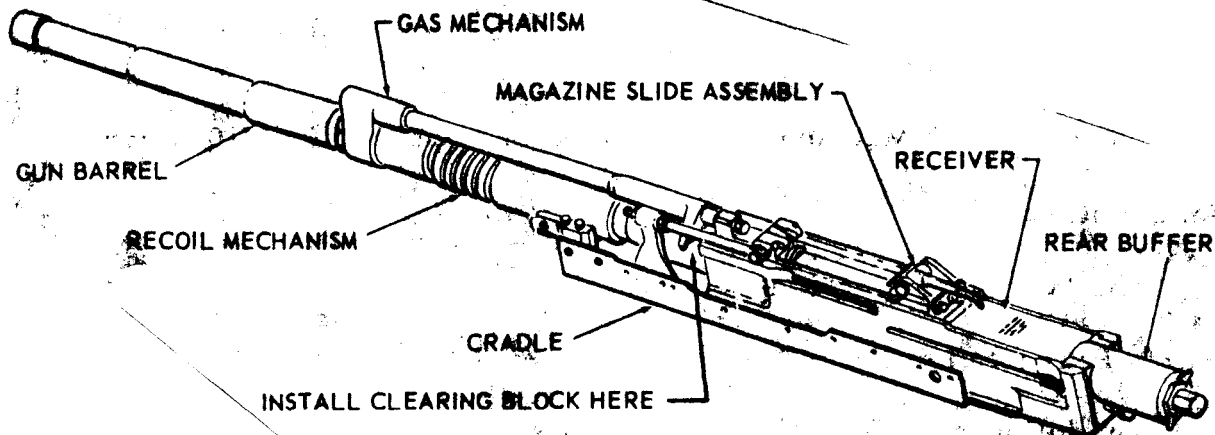


Figure 9-4. M3 20-mm Automatic Gun without Feeder Mechanism

2. Ammunition

The M3 20-mm automatic gun uses percussion-primed ammunition whereas the M24 automatic gun uses 20-mm electric-primed ammunition.

CAUTION

Some types of 20-mm ammunition currently used in the M3 20-mm automatic gun have a fuze that is "nonbore safe." This feature makes this ammunition more sensitive to rough handling.

3. Safety Precautions

The following safety precautions apply to the M3 and M24 20-mm automatic guns.

- o Never walk in front of the gun until you are sure it is safe and clear.
- o Never put your hands into the receiver or the feeder mechanism.
- o Do not cut or disconnect the hose to the gun charger until the system has been bled. This system is pressurized to 1500 psi.
- o Do not remove the trigger mechanism until the bolt has been blocked.

4. Safing Procedures

Safing of the M3 20-mm cannon is accomplished by disconnecting the electrical lead from the electric trigger mechanism located at the rear of the gun on the bottom.

5. Clearing Procedures

Clearing of the M3 20-mm cannon is accomplished by performing the following steps:

a. If the bolt is in the retracted position, install the gun-clearing block (see figure 9-5) or suitable substitute to prevent the bolt from moving forward to the battery position.

WARNING

The gun clearing block will allow the bolt to come forward to within 1/2 inch of battery position and prevent the gun from firing. Fingers will be crushed if they are in the receiver assembly and the bolt is accidentally released. Removal of the trigger mechanism will allow the bolt to come forward.

b. Remove the ammunition from the feeder mechanism by pushing in and turning the 5/8-inch hex nut on the end of the feeder toward the rear of the gun. Turn this nut in the direction opposite to that which feeds ammunition to the gun.

WARNING

The feeder mechanism is spring wound. If it is not completely de-torqued, it could cause severe injury to fingers or hands. KEEP YOUR HANDS OUT OF THE FEEDER.

c. Disconnect the ammunition and link chutes from the feeder mechanism.

d. Disconnect torque lever (from lower part of feeder) by pushing down and prying out with a large screwdriver.

e. Lift up on the feeder release handle, grasp feeder, and lift it out (see figure 9-6).

f. Check the breech for the presence of a round. If there is no round visible, the gun is clear.

g. If there is a round present and the bolt is to the rear, remove it by pushing it down and out the expended case chute.

h. If the bolt is forward, proceed as follows:

CAUTION

Do not stand behind the gun while performing these procedures.

1. Remove the large nut from the rear of the gun. (This will be under considerable spring tension.)
2. Remove the operating spring from the gun

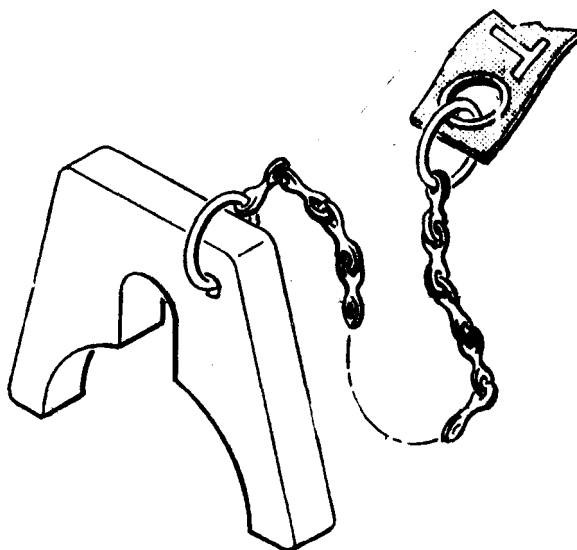
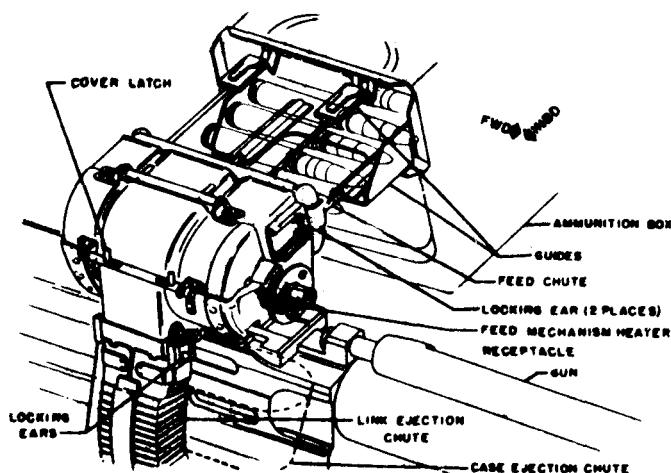
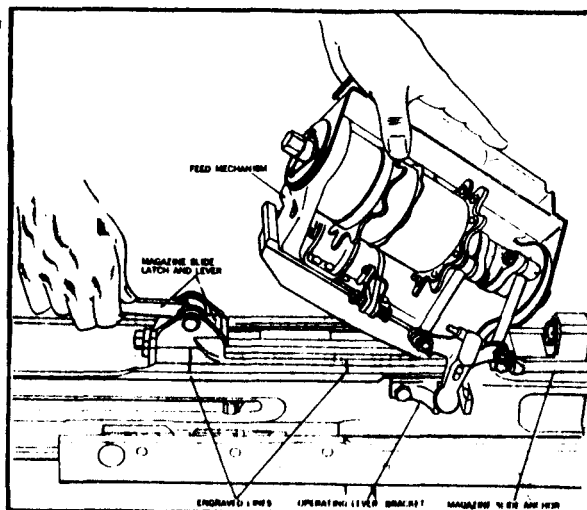


Figure 9-5. Gun Clearing Block

3. Pull out on the lock button and slide the backplate off the gun.
4. Using a suitable tool, unlock and force the bolt to the rear.
5. Remove the round from the face of the bolt.



FEED MECHANISM INSTALLATION



DETAIL-FEEDER REMOVAL

Figure 9-6. Feeder Installation and Removal

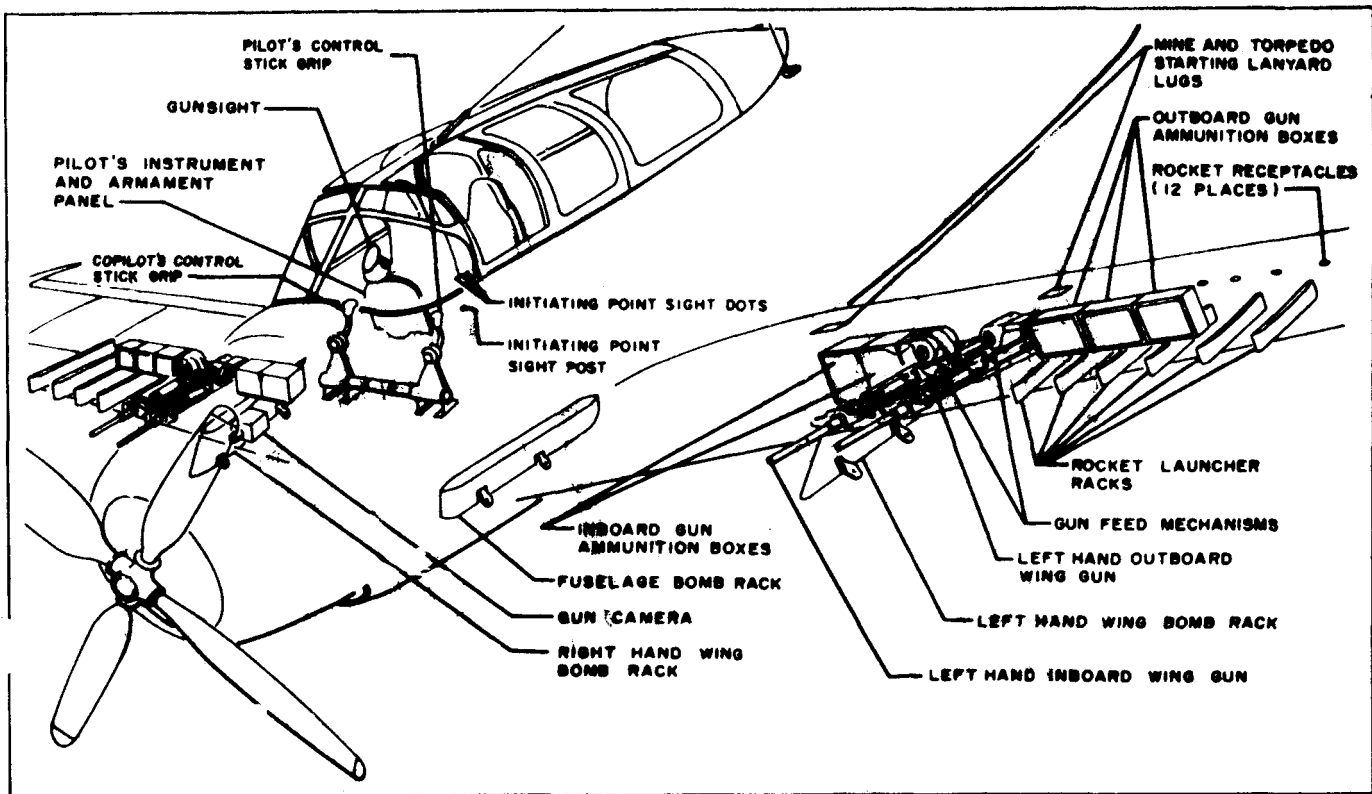


Figure 9-7. Typical M3 Installation in A-1E Aircraft

M39 20-MM AUTOMATIC GUN

1. Use of Gun

The M39 gun is an electrically fired, belt-fed gun, using the drum (revolver) principle of operation. The aircraft in SEA that use this gun are the F-100D (4 guns), F-100F (2 guns), F-5A (2 guns), and the B-57 (4guns). Figure 9-8 shows a typical application of the M39 automatic gun.

2. Ammunition

The M39 20-mm automatic gun uses 20-mm electric primed ammunition.

Safety Precautions

The following safety precautions pertain to the M39 gun:

- o Do not walk in front of the gun until you are sure it is safe and clear.
- o Before working on the gun, be sure it is not "over-centered."
- o Be sure you have control of the drum before removing the drum shaft.
- o Never use the manual charger unless absolutely necessary.

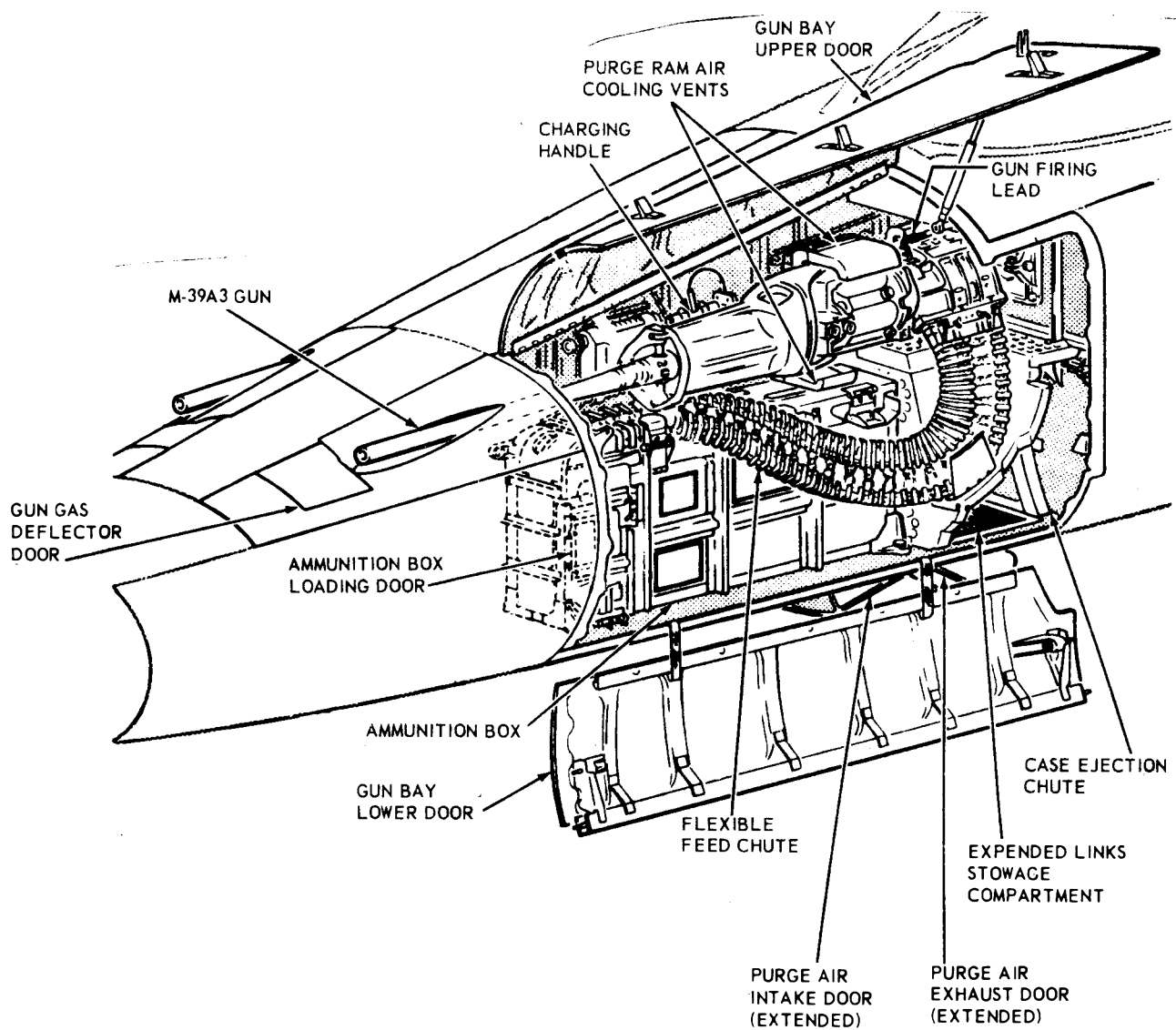


Figure 9-8. Typical Application of M39 automatic gun (F-5A)

2. Safing Procedures

Safing the M39 gun is accomplished by disconnecting the electrical lead located on either side of the drum cradle assembly, aft of the drum (refer to figure 9-9).

3. Clearing Procedures

To clear the M39 gun, proceed as follows: (refer to figures 9-9 and 9-10).

a. Remove the cartridge case ejection chute from the rear of the feeder (figure 9-10, callout 21).

b. Raise the two feeder lock plunger assemblies and remove the feeder (figure 9-10, callout 22).

NOTE

It is not recommended that the ammunition feed chute be disconnected from the feeder.

c. Unlock the barrel and drum latch plungers by depressing the lock ball and sliding the lock latch plunger outward (figure 9-10, callout 16).

d. Raise the drum shaft latch plunger (figure 9-10, callout 18).

WARNING

When installed in some aircraft, the gun is positioned in such a way that the drum will fall out when the shaft is removed. This drum is heavy and could contain live ammunition. Support the drum securely while removing the drum shaft.

e. Remove the drum shaft (figure 9-10, callout 12).

f. Remove the drum (figure 9-10, callout 20). The gun is now clear.

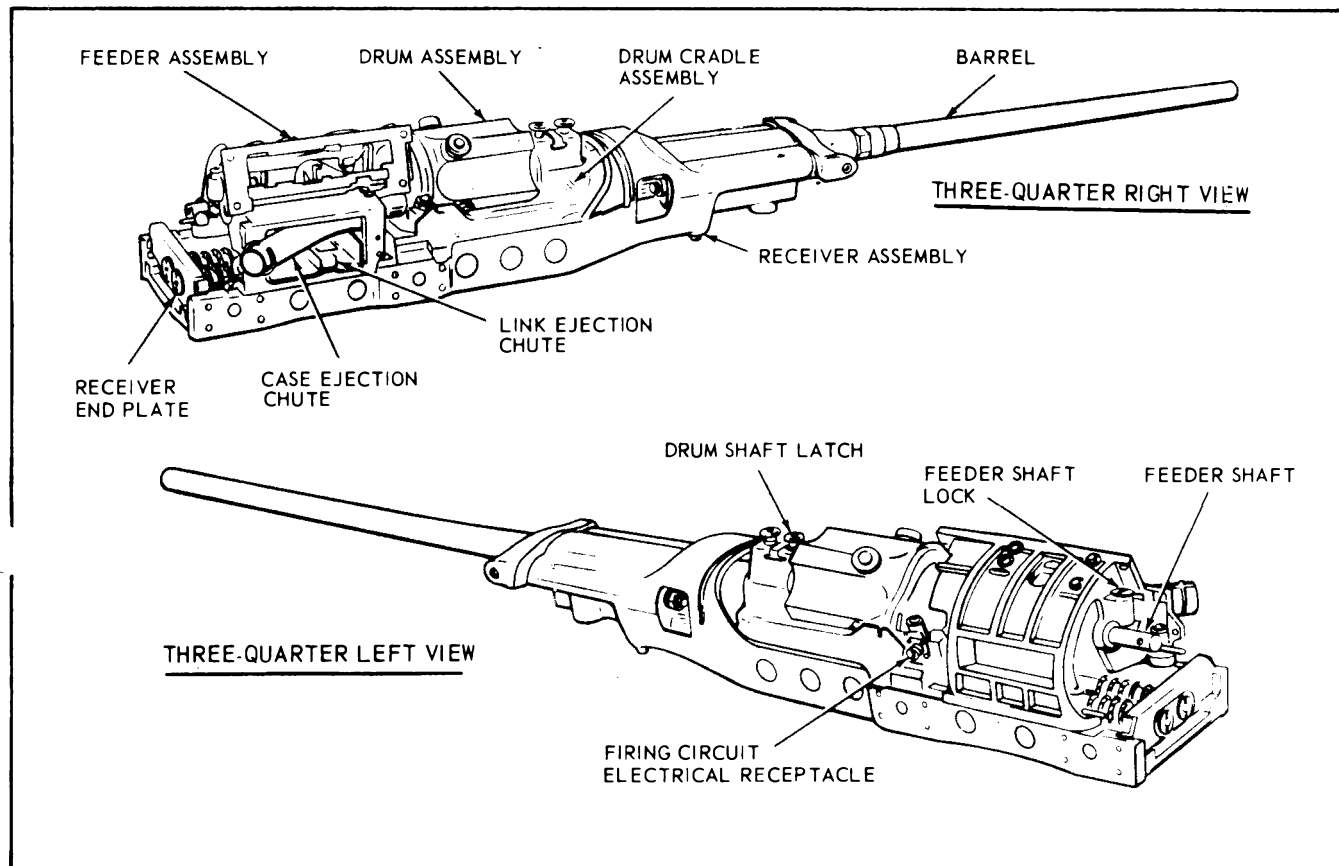


Figure 9-9. M39 20mm Automatic Gun

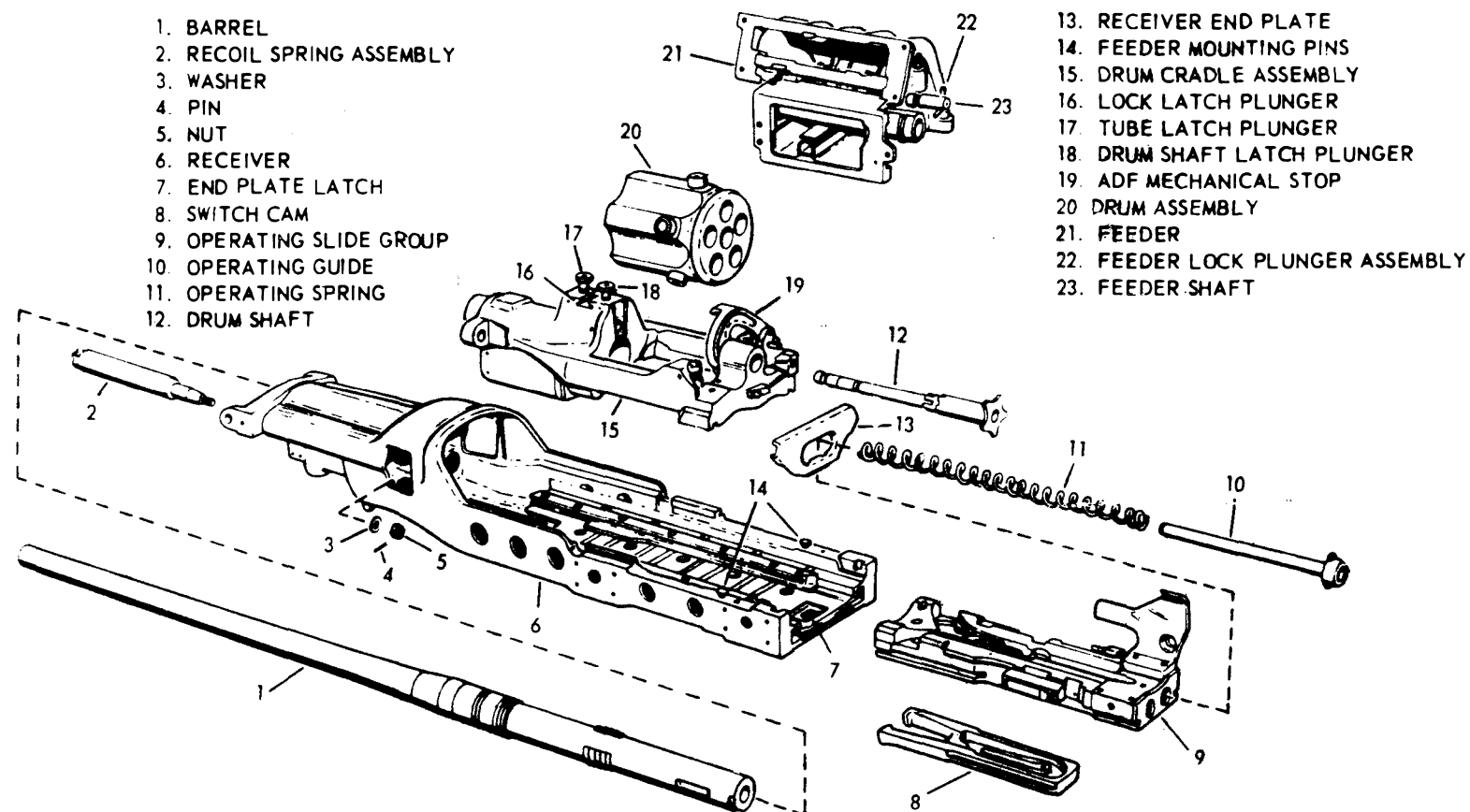


Figure 9-10. Major Components of the M39A2 20-mm Automatic Gun

M61 AND GAU-4 20-MM AUTOMATIC GUNS

1. The M61 and GAU-4 automatic guns are the latest concept in aircraft, rapid-fire automatic weapons. These guns employ the gatling principle of operation. The M61 is used in SEA on F-4E, F-105, C-130, and C-119 aircraft. and in the SUU-16 gun pod. The GAU-4 gun is used in the SUU-23 gun pod. The EOD procedures for both guns are identical.

2. Ammunition

Both the M61 and the GAU-4 guns use 20-mm electric-primed ammunition.

3. Safety Precautions

The following safety precautions pertain to the M61 and GAU-4 guns:

- o Never walk in front of the gun until you are sure it is safe and clear.
- o Be sure the clearing sector cam remains engaged at all times while working around the aircraft.
- o Never put hands into the barrels until you are sure what you are doing.

4. Safing Procedures

Safing of the M61 gun is accomplished by disconnecting the electrical lead on the top half of the receiver section (see figure 9-11).

5. Clearing Procedures

To clear the M61 gun, follow these steps:

- a. Push in and secure the clearing sector cam. This cam is located on the bottom of the receiver near the back plate of the gun (see figure 9-12)

WARNING

In most installations this gun is driven by an electric drive motor. Be sure that armament switches are OFF or electrical power to the motor is disconnected before putting hands into barrels.

- b. Rotate the barrels in a clockwise direction so that all six barrels make one complete revolution. This will track all bolts to the rear and, as long as the clearing sector cam is down, will prevent any rounds from the battery position.

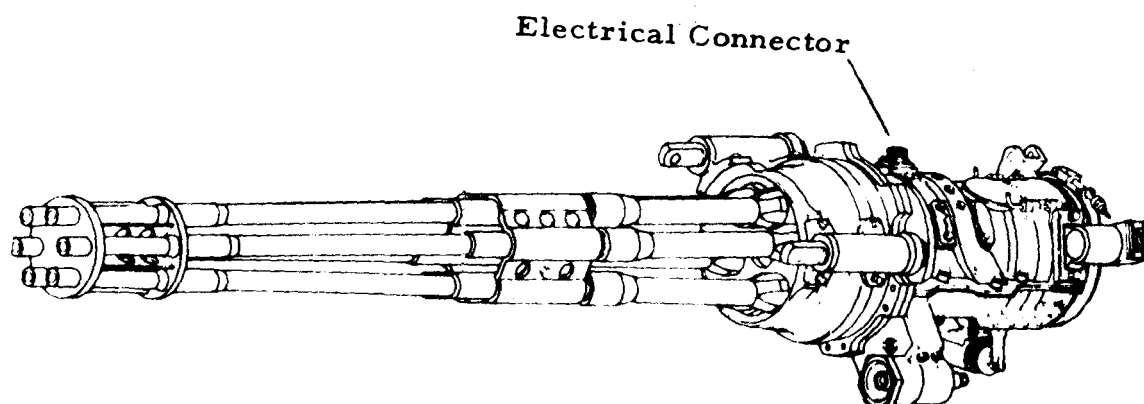


Figure 9-11. M61 20-mm Automatic Gun

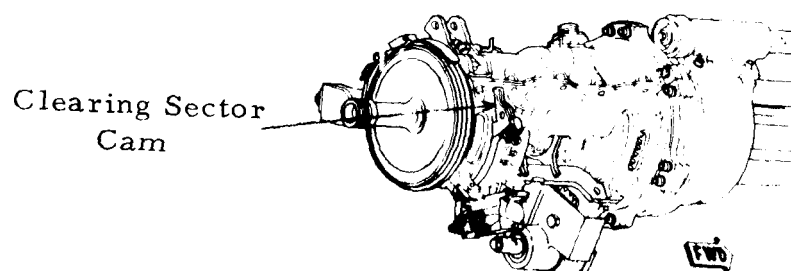


Figure 9-12. Right Side of M61 Showing Position of Clearing Sector Cam

SUU-16 AND SUU-23 GUN PODS

1. Use of Gun Pods

The SUU-16 and SUU-23 gun pods are currently being used in SEA on F-100 and F-4 series aircraft. The SUU-16 contains the M61 gun, while the SUU-23 contains the GAU-4 gun. Both pods carry approximately 1200 rounds of ammo contained in a drum. These pods can be loaded on any external station of an aircraft that has 30-inch suspension and the weight capacity. These pods weigh approximately 1750 pounds each (see figures 9-12 and 9-15).

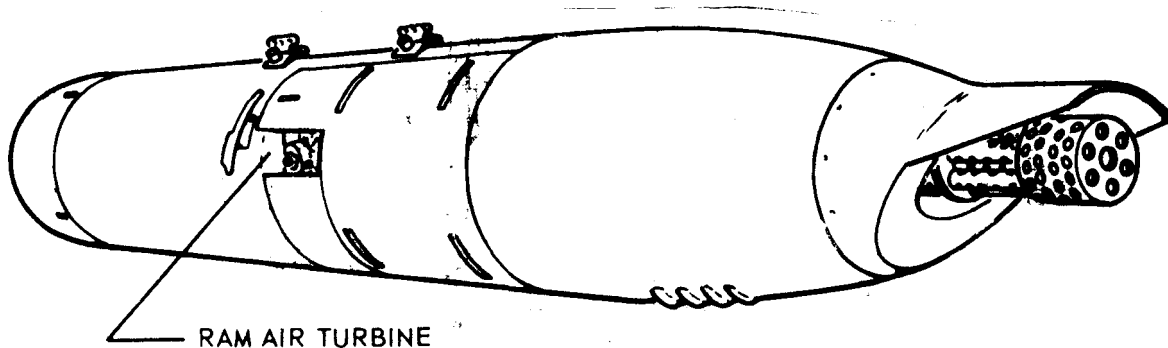


Figure 9-13. Location of Ram-air Turbine Door and the Side Cowling Latches on the SUU-16 Gun Pod

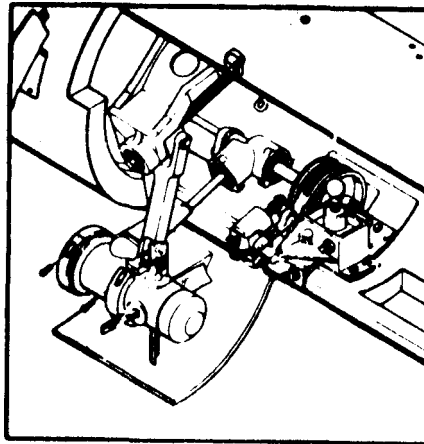


Figure 9-14. SUU-16 Gun Pod with RAT Door Extended

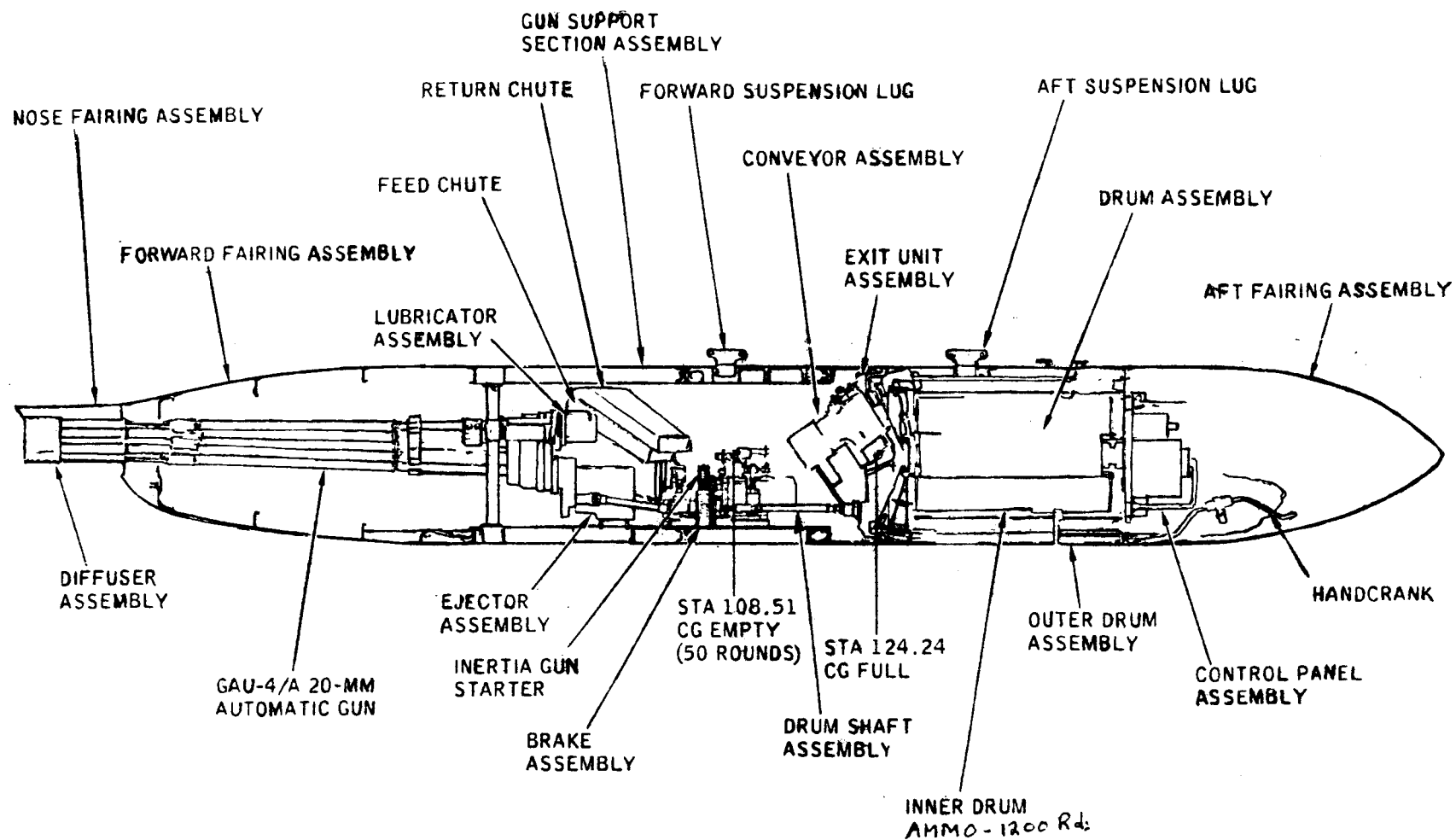


Figure 9-15. GAU-4 in SUU-23 Gun Pod

2. Ammunition

Both the SUU-16 and SUU-23 gun pods use 20-mm electric-primed ammunition.

3. Safety Precautions

The following safety precautions pertain to the SUU-16 and SUU-23 gun pods:

- o Observe all safety precautions listed for the M61 and GAU-4 guns.
- o Stay clear of the RAT (ram air turbine) door on the SUU-16 gun pod.
- o Use handling equipment for downloading the pod.

4. Safety Procedures

To safe the SUU-16 and the SUU-23 gun pods, use the following steps:

- a. Disconnect pod electrically from the aircraft if possible (aft of rear lug).
- b. Remove the side cowling by disengaging the five truck latches (see figure 9-13)

WARNING

The SUU-16 gun pod has a ram air turbine door directly aft of this cowling (figure 9-13). Stay clear of this door. Should it operate inadvertently, it will extend or retract in 1/10 of a second (see figure 9-14)

5. Clearing Procedures

To clear the gun in either the SUU-16 or SUU-23 gun pod, follow the clearing procedures for the M61 or GAU-4 gun as applicable.

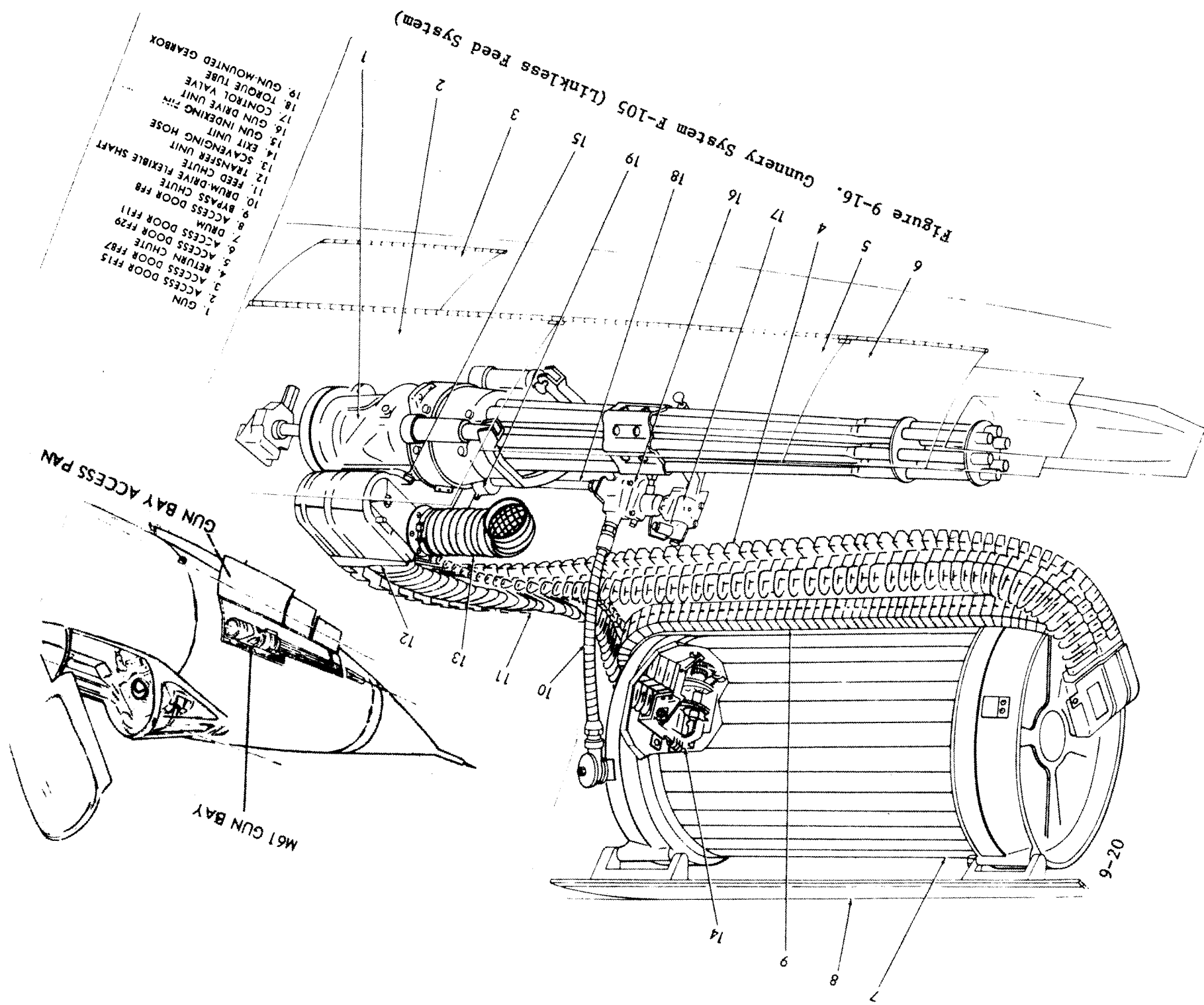
LINKLESS FEED SYSTEM

1. Use of Linkless Feed System

The linkless feed system is used only in the nose of F-105 series aircraft. It consists of an M61 gun and a 1028-round ammo drum (see figure 9-16).

2. Ammunition

The linkless feed system uses 20-mm electric-primed ammunition.



3. Safety Precautions

The following safety precautions apply when working on the linkless feed system:

- a. Follow all safety precautions listed for the M61 gun.
- b. Push the hydraulic de-clutch button BEFORE putting hands into barrels.

4. Safing Procedures

To safe the linkless feed system, open the louvered door on the left side of the aircraft below the windscreen and disconnect the electrical lead from the M61 (see figures 9-11 and 9-16).

5. Clearing Procedures

To clear the linkless feed system, use the following steps:

- a. Depress and secure (safety wire, tool, etc) the clearing sector cam down.
- b. Open the panel that covers the barrels.
- c. Turn the dzus fastener and open the small access cover located below the barrels.
- d. Push in the hydraulic de-clutch button and the barrels should rotate.
- e. If the barrels did not rotate, rotate them by hand while still pushing the button.

M61A1 GUN SYSTEM

1. Use of the M61A1 Gun System

The M61A1 gun system is used on the F-4E aircraft. It consists of an M61A1 gun and a 645 round drum (see figures 9-17 and 9-18).

2. Ammunition

The M61A1 gun system uses 20-mm electric-primed ammunition.

3. Safety precautions for the M61A1 gun system are the same as the safety precautions for the M61 gun.

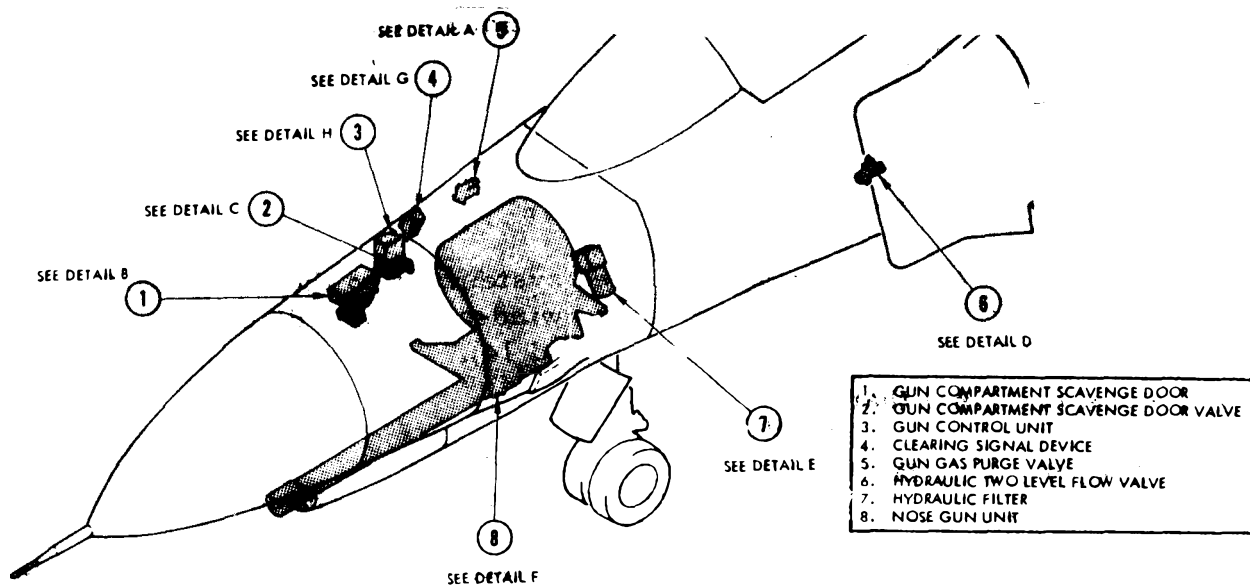


Figure 9-17. M61A1 Gun System
in F-4E Aircraft

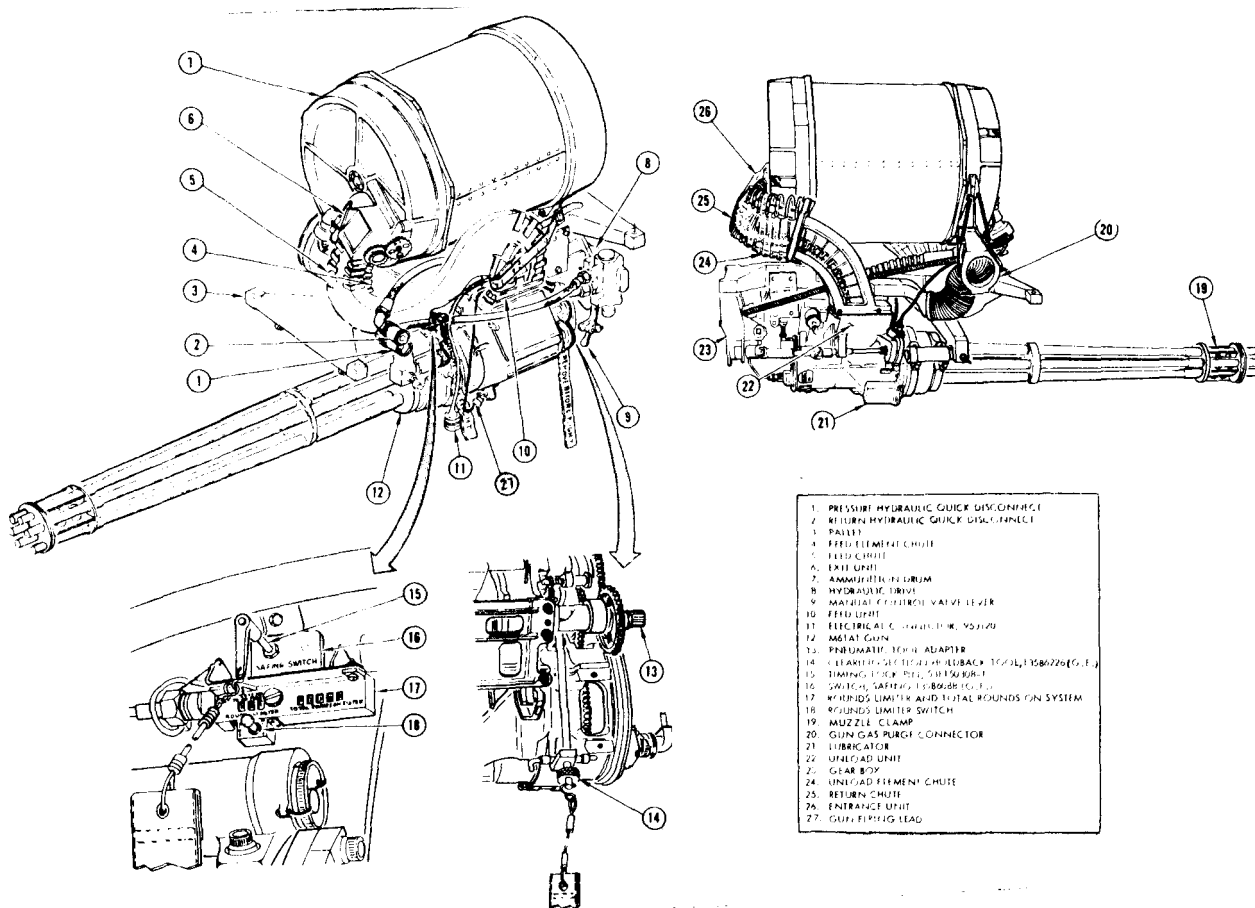


Figure 9-18. Internal Gun System, M61A1

4. Clearing Procedures

To clear the M61A1 system, follow the steps used for the M61 gun.

GAU-2 7.62-MM "MINI-GUN"

1. Use of the Gun

The GAU-2 is better known as the "Mini-Gun." It also has six barrels and operates on the gatling principle. It is currently used in SEA on helicopters, A-37 aircraft, the AC-47, AC-119A and C-130 gunships, and in the SUU-11 gun pod. Figure 9-19 show typical application of GAU-2 "mini-gun".

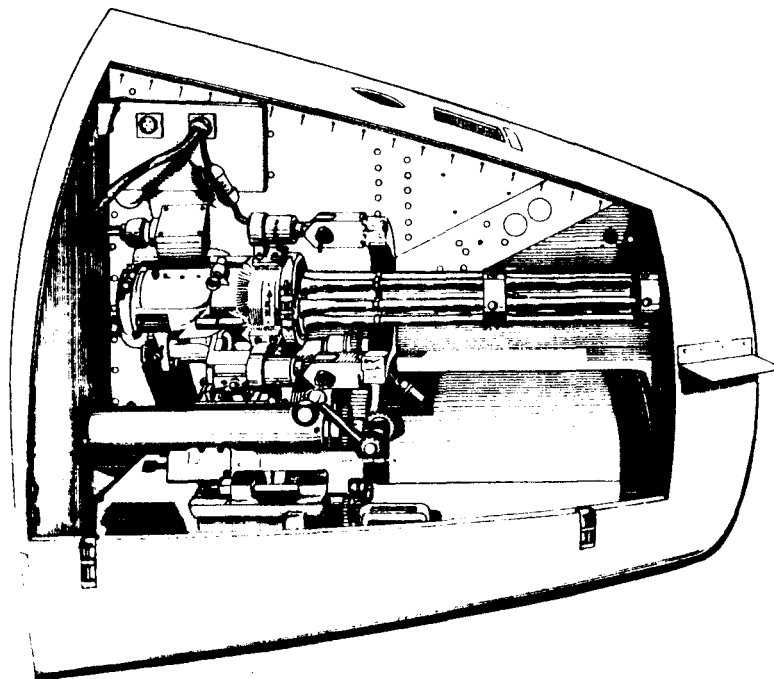


Figure 9-19. Typical Application of GAU-2 "Mini-Gun"
(A-37)

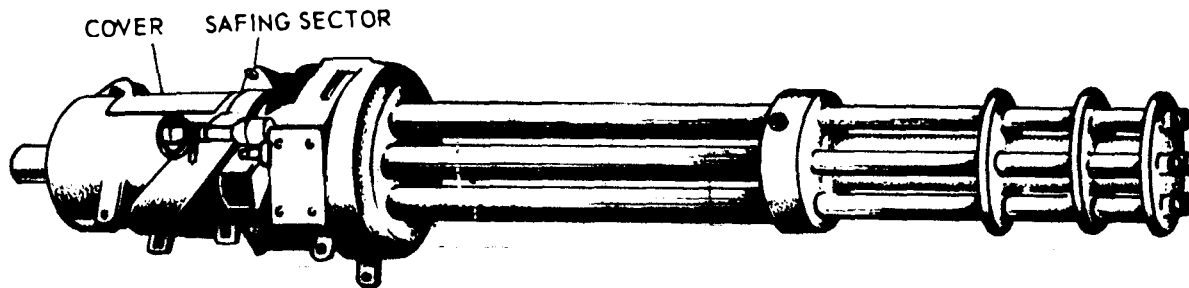


Figure 9-20. GAU-2 7.62-mm "Mini-Gun"

2. Ammunition

The GAU-2 gun uses 7.62-mm NATO percussion-primed ammunition.

3. Safety Precautions

When working on the GAU-2 gun, comply with the following safety precautions:

- o Never walk in front of the gun until you are sure it is safe and clear.
- o Never rotate the gun barrels until the gun is clear.
- o Keep hands away from barrels until the drive motor has been disconnected.

4. Safing Procedure

To safe the GAU-2 gun, use the following steps:

- a. Disconnect the electrical lead to the drive motor. If you are not sure which lead it is, disconnect them all.
- b. Remove two long and two short pins and remove the cover plate and safing sector (see figures 9-20 and 9-21)

WARNING

Rotating the barrels before the above step has been accomplished will cause the gun to fire.

5. Clearing Procedures

To clear the GAU-2 gun, rotate the barrels to remove all rounds from the gun.

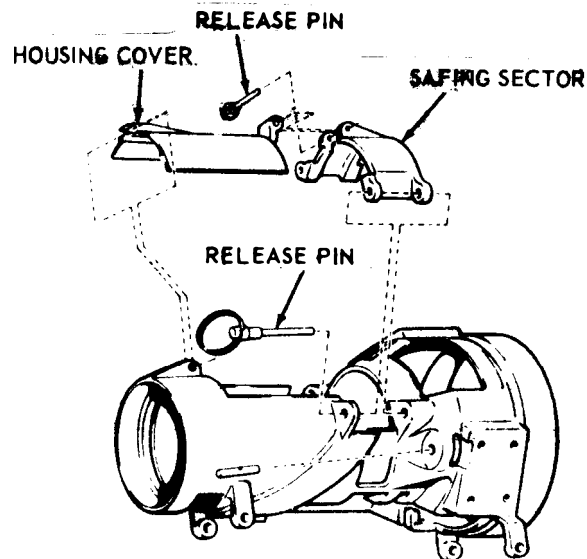


Figure 9-21. GAU-2 Gun Showing Cover and Safing Sector

SUU-11 GUN POD

1. Use of SUU-11 Gun Pod

The SUU-11 gun pod uses the GAU-2 "Mini-Gun" and can be loaded on any external bomb rack having a 14-inch suspension. The pod carries 1500 rounds in a drum. This pod also carries its own battery for electrical power.

Aircraft power is used only to keep the battery at full charge (see figure 9-22).

2. Ammunition

The SUU-11 gun pod uses 7.62-mm percussion-primed ammunition.

3. Safety Precautions

The following safety precautions are applicable to the SUU-11 gun pod:

- o Follow all safety precautions listed for the GAU-2 gun.
- o Handle the battery pack with care (wet acid hazard).
- o Remember this pod carries its own power supply.

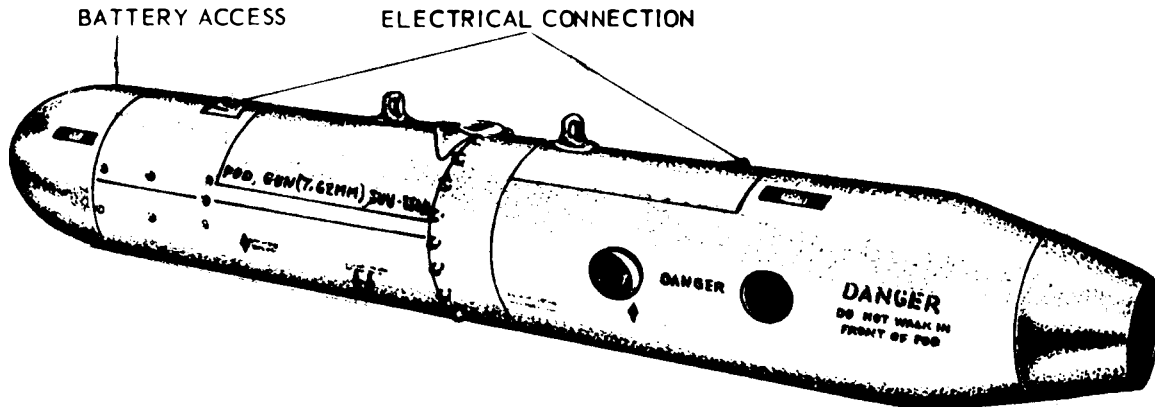


Figure 9-22. SUU-11A Gun Pod

4. Safing Procedures

To **safe** the SUU-11 gun pod, perform the following steps:

- a. Remove the rear fairing assembly and unlock and slide the battery to the rear. Doing this automatically disconnects the battery from the pod.
- b. Reach in the rear hole on the left side of the pod and disconnect the lead from the drive motor. This is disconnected by pulling, not by turning.

NOTE

The forward fairing may be removed to accomplish the next step.

- c. Remove the four pins and the cover and safing sector from the GAU-2 (see figure 9-21).

5. Clearing Procedures

To clear the SUU-11 gun pod, perform the same steps as for clearing the GAU-2 gun.

MISCELLANEOUS AIRCRAFT HAZARDS

1. General

a. **Battery Systems.** Aircraft batteries supply power to function most electro-explosive devices and should be disconnected if possible. Aircraft switches may perform the same function, but the condition of electrical wiring in an aircraft crash cannot be determined, so the switches may not perform the function. Disconnecting at the battery is a positive means of breaking power to the aircraft electrical systems. Most aircraft batteries have a quick disconnect at their terminals. Turning the wheel on this disconnect counterclockwise will disconnect it.

WARNING

Battery fumes are highly explosive. Keep open flames and spark producing devices away from batteries.

The batteries contain acid which may cause burns to the skin. If spilled on the body, wash affected areas thoroughly with water and then apply bicarbonate of soda, if available, until medical treatment can be obtained.

Spilled fuel/fuel vapor may be present in the vicinity of crashed aircraft. Common sense and good judgment should be exercised when disconnecting the battery or electrical leads under these conditions to avoid arcing of the battery voltage.

b. **Guns.** Since guns have already been covered in the beginning of this chapter, this section deals only with the location, number, and type of guns by aircraft.

c. **Ammunition.** This section deals with location, type and amount of ammunition by aircraft. Most ammunition found in SEA is HEI and should be handled with care. 20-mm ammunition can be electric or percussion fired and the fuzeing can be "Bore" or "Non-Bore" safe depending on the aircraft in which it is used.

WARNING

20-mm electrically primed ammunition is an electro-explosive device and should be handled accordingly. Personnel will ground themselves to the aircraft before handling 20-mm ammunition. It may also fire by percussion. 20-mm HEI ammunition with the PD fuze 175 is relatively "Non-Bore Safe" and should be handled with extreme care.

d. Engine starter cartridges. Aircraft carry both operational (located in the starter breech) and spares. They do not have to be present, but the locations should be checked to be sure. Spare cartridges should still be packaged in their original containers. If a cartridge is not in its container, be sure it is shunted out before handling. (figure 9-23)

WARNING

Engine starter cartridges are electro-explosive devices and should be protected from electro-magnetic transmitting systems.

Be sure all power is disconnected from the aircraft before removing the operational cartridge from the engine starter breech.

Personnel should ground themselves to the aircraft before removing starter cartridges and never let the cartridge contacts come in contact with the aircraft skin.

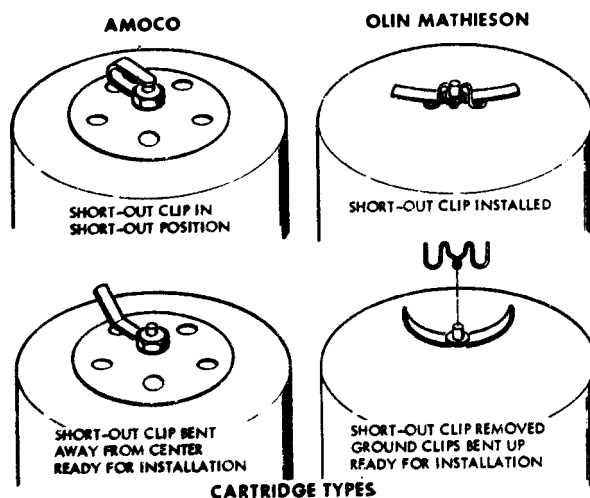


Figure 9-23. Shorting Out Engine Starter Cartridges

e. Survival Kits. Although survival kits vary from aircraft to aircraft, they all contain basically the same items. Some of the hazardous items which may be found are:

- (1) Small arms ammunition (cal. .22 hornet or .38 special)
- (2) MK 13 Day and Night signals (see figure 9-24)
- (3) A/P 25S1, Personnel Distress Signals Kits (see figure 9-25)

NOTE

In some cases, the items listed above may be carried in a survival vest located on the aircrew member's body if present.

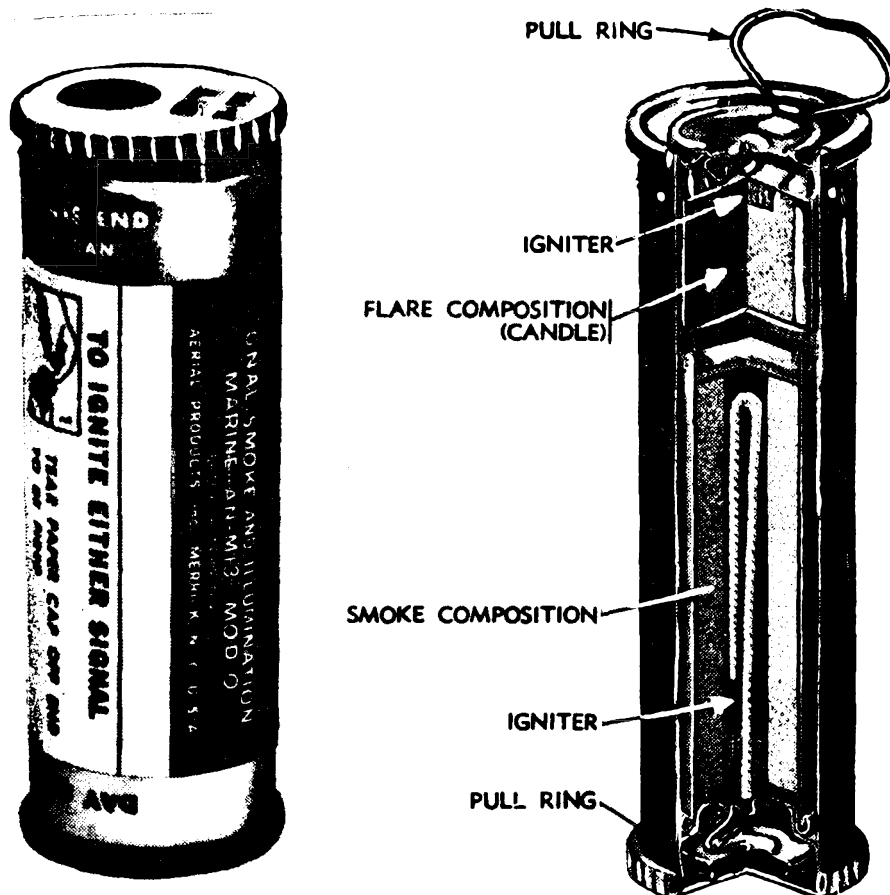


Figure 9-24. Marine Smoke and Illumination Signal, AN-MK13 Mod 0

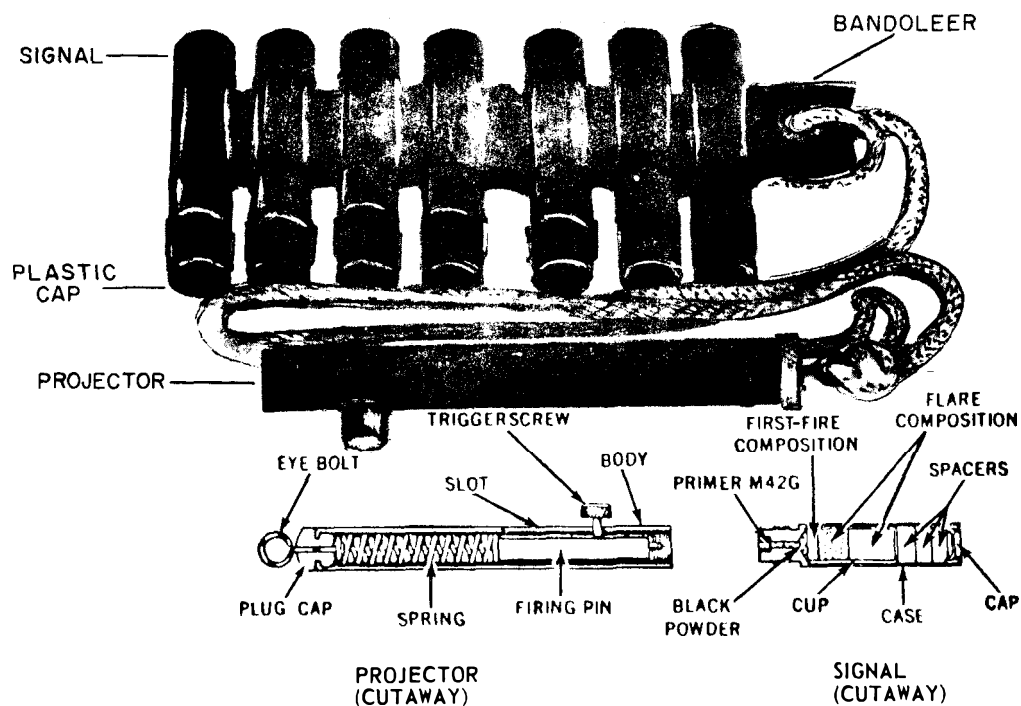


Figure 9-25. Personnel Distress Signal Kit, A/P 25S1

2. F-100D & F Model Aircraft

a. Battery. The battery for the F-100, all models, is located on the left hand side below the canopy. (see figure 9-26)

b. Guns. The gunnery system of the F-100D consists of four M39 20-mm guns and the F-100F of two M39 20-mm guns. The guns are located in the bottom forward section of the fuselage outboard of the nose wheel in gun bays. The F-100D has two guns on each side while the F-100F has one gun on each side. (see figures 9-27 and 9-28)

c. Ammo.

(1) The ammunition system for the F-100D consists of 200 rounds in each of four ammo cans located two on each side above the guns under a separate panel. (see figures 9-28 and 9-29)

(2) The ammunition system for the F-100F consists of 164 rounds in each of two ammo cans located one on each side above the guns under the same panel. (see figure 9-27)

(3) All models of the F-100 use 20-mm electric-primed ammunition with "bore-safe" fuzing.

d. Engine Starter Cartridges: F-100 D/F:

(1) The operational starter cartridge (1 ea.) is located in the breech under the panel directly forward on the tail hook mount on the bottom center line. Door F74. (see figure 9-30)

(2) The spare engine starter cartridge (1 ea.) is located in the center portion of the left link access bay under the leading edge of the left wing aft of the gun bay. (see figure 9-30) PANEL F35.

(3) The F-100 uses the MXU-4/A starter cartridge.

e. Miscellaneous Hazards

(1) The survival kits in the F-100 are located in the buckets of the ejection seats.

(2) Some F-100 aircraft may contain classified equipment destroyers. Consult ECM personnel for further information.

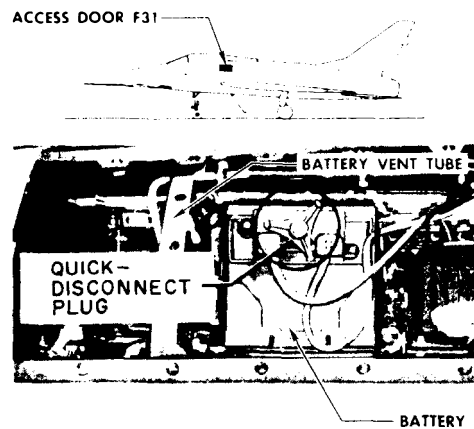


Figure 9-26. Battery Location of F-100 Aircraft (All Models)

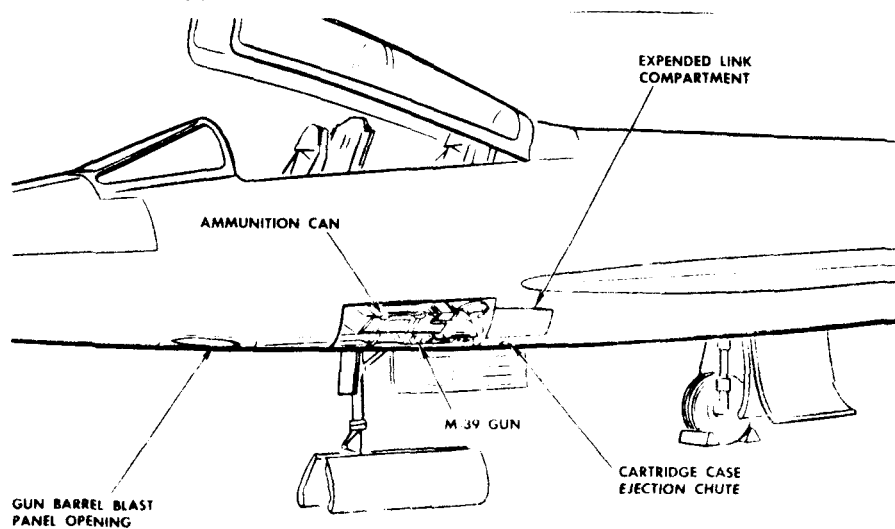


Figure 9-27. Gunnery System F-100F Aircraft

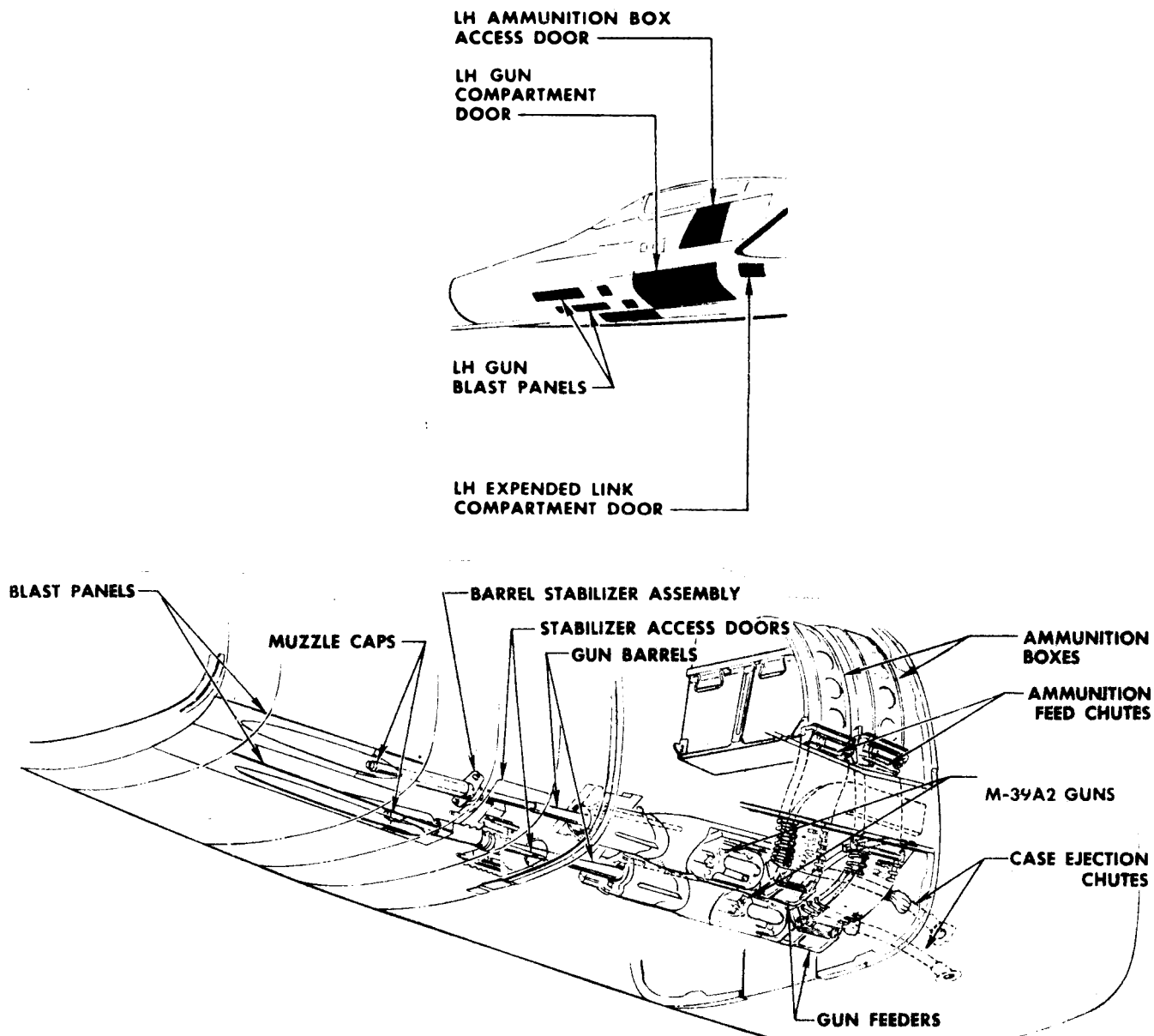


Figure 9-28. Gunnersight System (Left Hand Side)
F-100D Aircraft

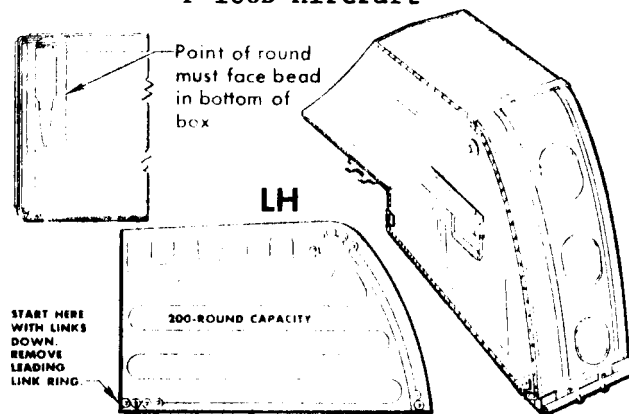
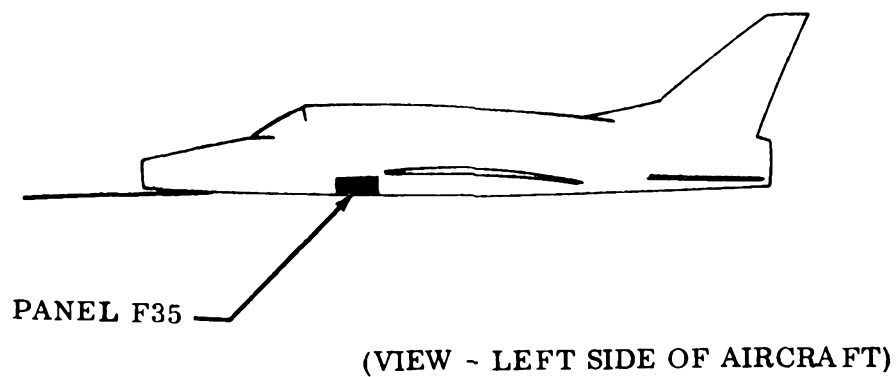
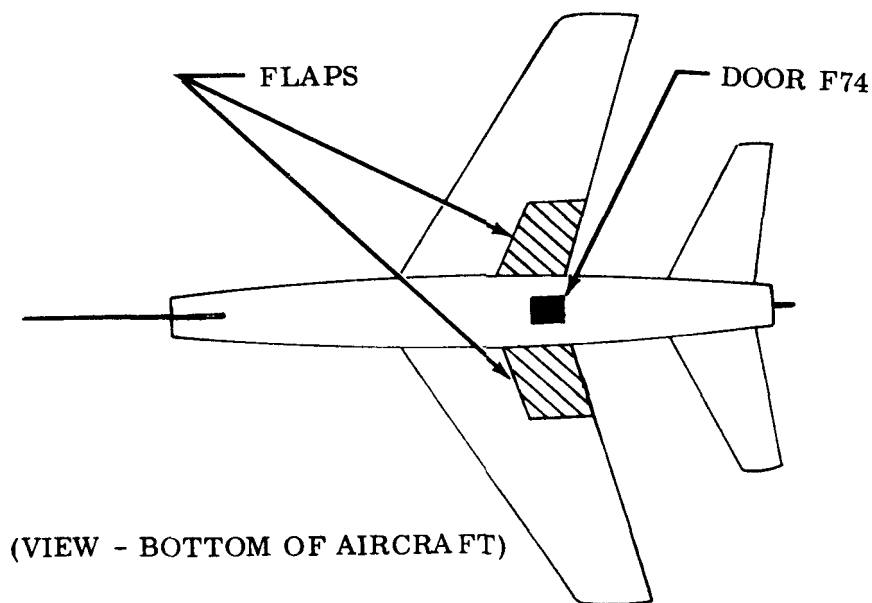


Figure 9-29. Ammunition Can (Typical)
F-100D Aircraft



SPARE STARTER CARTRIDGE LOCATION



OPERATIONAL STARTER CARTRIDGE LOCATION

Figure 9-30. Location of Operational and Spare
Engine Starter Cartridges - F-100D/F
Aircraft

3. F-105D & F Model Aircraft

a. Battery. The battery for the F-105D/F aircraft is on the right hand side below the front windshield under access door FF68. (see figure 9-31)

b. Gun. The gunnery system for the F-105D/F aircraft consists of one M61 20-mm automatic gun located on the left side of the fuselage nose section under the louvered panel. Panel FF15. (see figure 9-32)

c. Ammo. The ammunition system for the F-105D/F aircraft consists of 1028+1 rounds located in a drum. The drum is located under a panel on the upper right side of the fuselage nose section. The F-105D/F uses 20-mm electric-primed ammunition with "bore-safe" fuzing. (see figure 9-32)

d. Engine Starter Cartridges. F-105D/F aircraft may carry one operational and one or two spare starter cartridges. The operational cartridge is located in the breech inside door FF107. The spare cartridges are located behind access doors FF45 and FF46 on unmodified aircraft, and behind FF44 on aircraft modified by T.O. 1F-1050947. All of these access doors are located on the bottom centerline aft of the bomb bay doors. The F-105D/F uses the MXU-4/A starter cartridge. (see figures 9-33 and 9-34)

e. Miscellaneous Hazards

(1) Survival kits. The survival gear in the F-105D/F may be located either in the bucket of the ejection seat or on the person of the individual aircrew member.

(2) The F-105D/F may contain destructors either internally or in pods suspended on its pylons. Maintenance personnel should be consulted for further information as to location and type.

(3) F-105D/F aircraft are known to carry explosive actuated fire extinguisher bottles internally. Maintenance personnel should be consulted for locations and type.

(4) The F-105D/F uses an explosive bolt to release its tail hook and an air bottle pressurized to 3000 psi to drive it to the ground. The air bottle should be bled thru the filler valve before any attempt is made to remove the explosive bolt. (see figures 9-35 and 9-36)

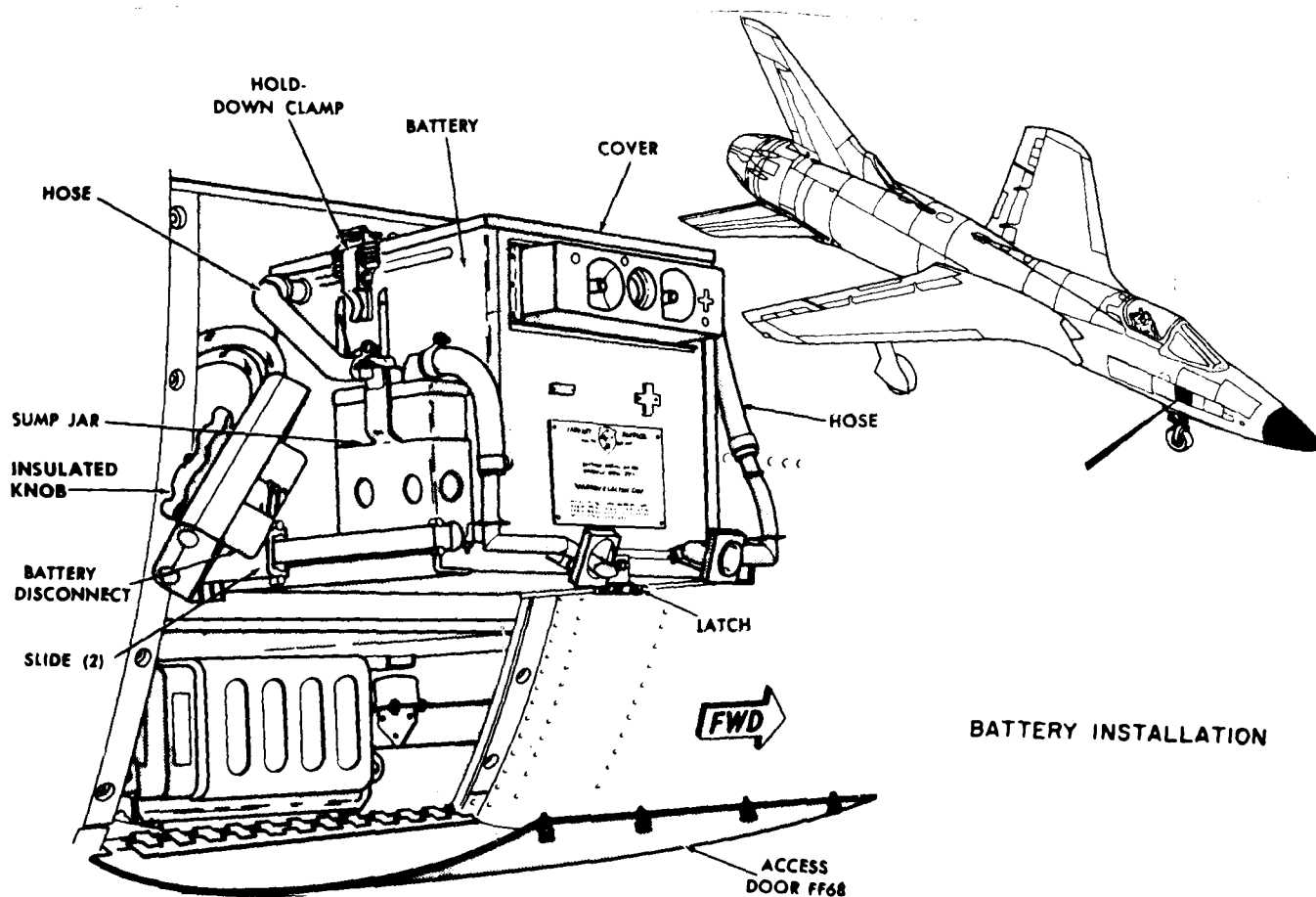


Figure 9-31. Battery System and Unit Location - F-105D/F Aircraft

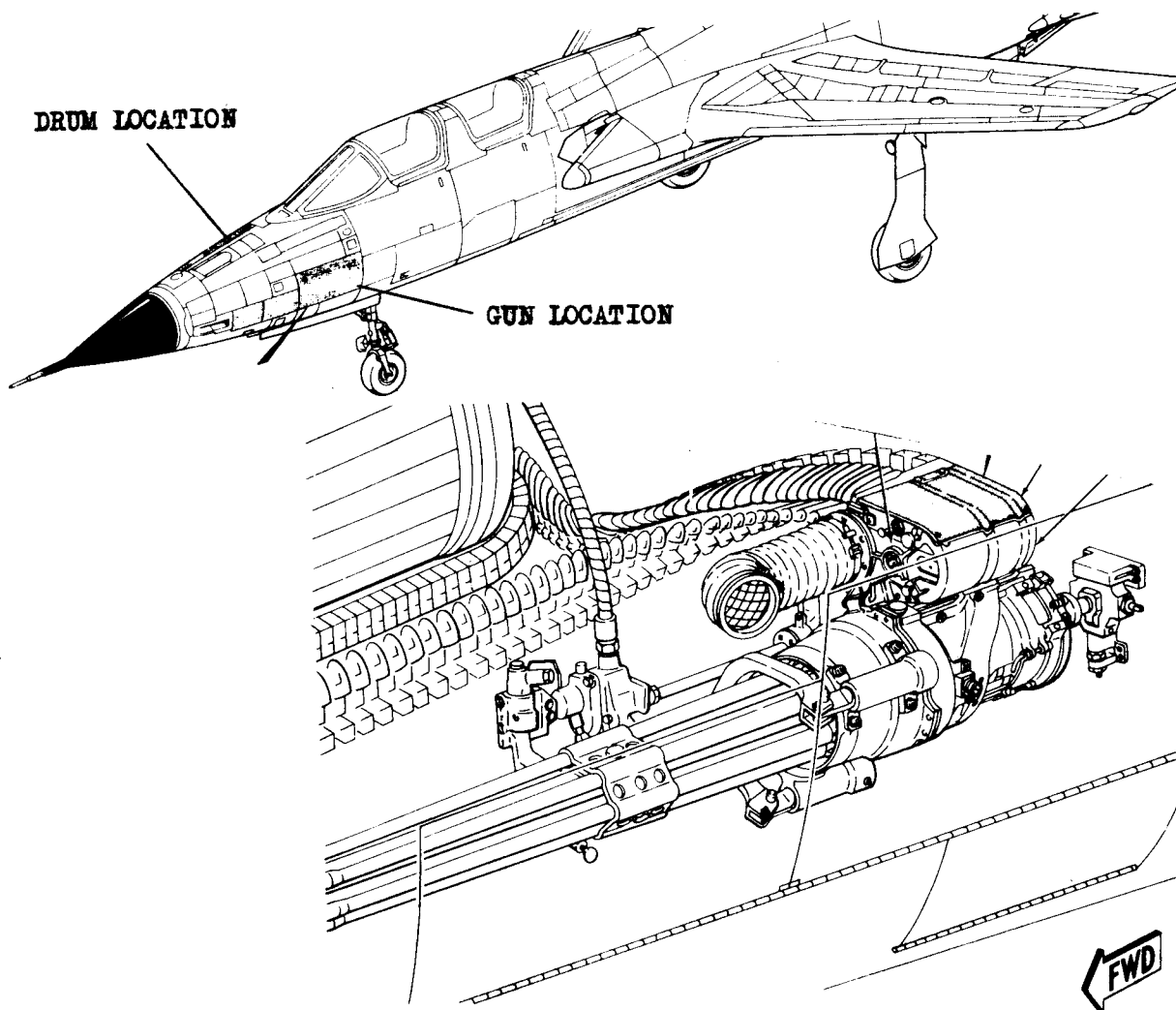


Figure 9-32. Gunnery System F-105D/F Aircraft

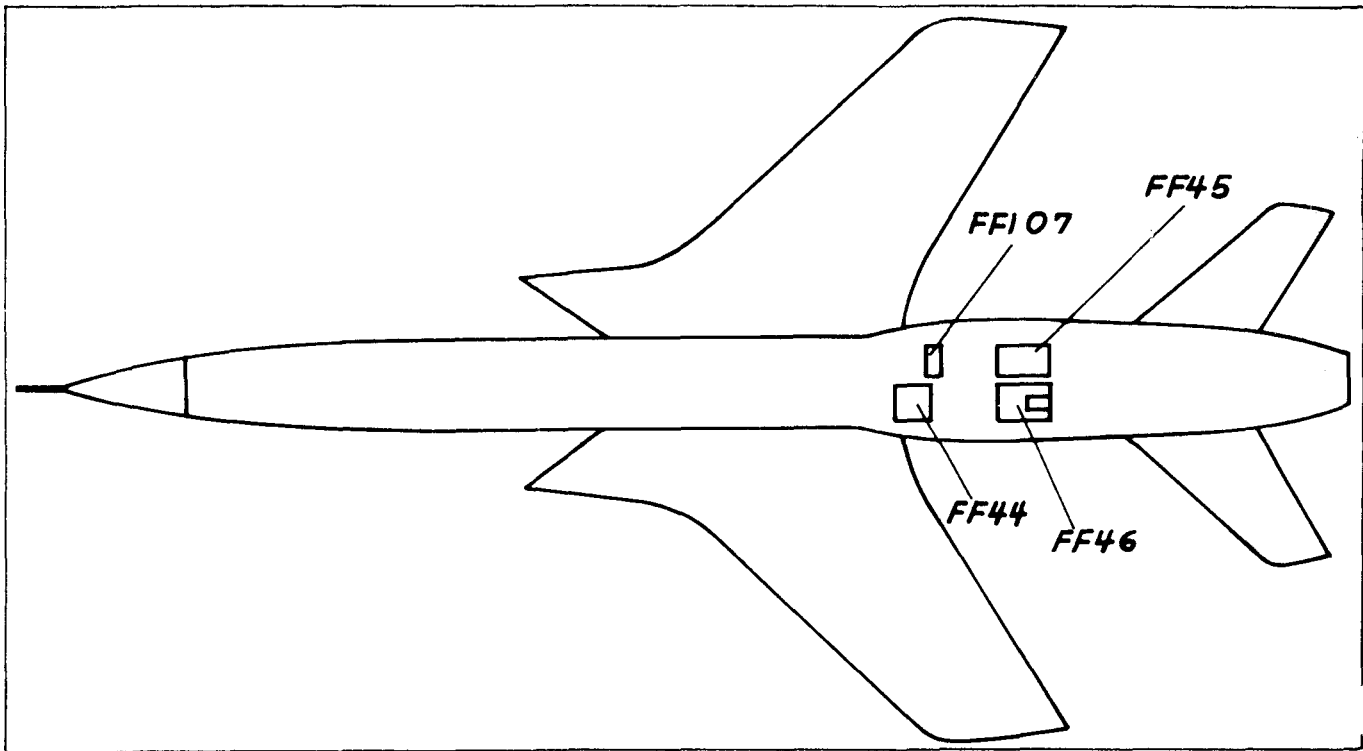


Figure 9-33. Location of Operational and Spare Engine Starter Cartridge - F-105D/F (View - Bottom Centerline)

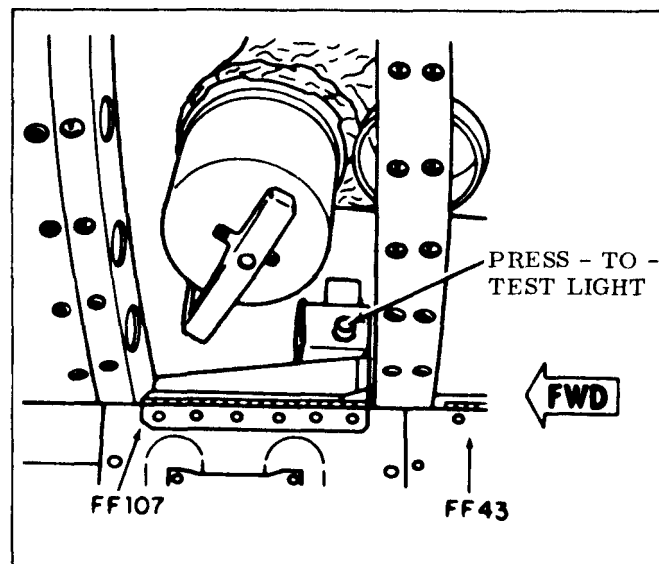


Figure 9-34. Operational Engine Starter Cartridge and Press-to-Test Power Indicator Light

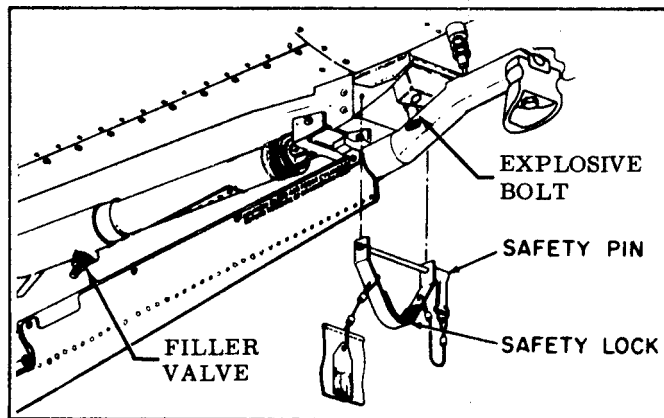


Figure 9-35. F-105D/F Tail Hook Showing Air Bottle Filler Valve and Explosive Bolt

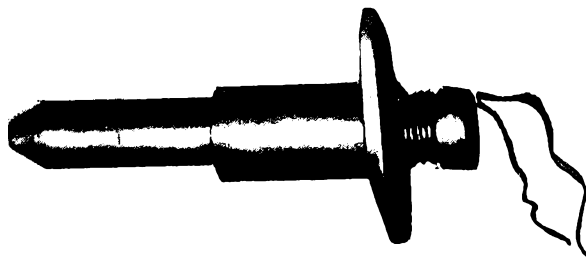


Figure 9-36. Explosive Bolt for F-105D/F Tail Hook

4. F-4C/D/E and RF-4C Model Aircraft

a. Battery

(1) The battery for the F-4C/D aircraft is located in the aft cockpit under the right hand console. Access is gained through the console cover. (see figure 9-37)

(2) The battery for the RF-4C/F-4E is located under the rear seat. Access is gained through panel 508 on the bottom center line of the aircraft. (see figure 9-37)

(3) If access can not be gained to the battery on an F-4 series aircraft, the left and right generator switches located on the forward right console may be used if desired.

b. Guns

(1) RF-4C and F-4C/D aircraft have no provisions for mounting a gunnery system internally. These aircraft use the SUU-16/A or the SUU-23/A gun pods mounted externally. These pods are covered in the guns section of this chapter. (see figures 9-13 and 9-15)

(2) The F-4E aircraft has an M61A1 gun mounted on the bottom center-line under the fuselage nose section. Access is gained to safe the gun through panel 171 directly forward of the nose landing gear (see figures 9-38, 9-17, and 9-18)

c. Ammo

(1) The SUU-16/A and the SUU-23/A gun pods contain 1200 rounds in a drum in the pod directly behind the gun.

(2) The F-4E M61A1 system contains 645 rounds in a drum directly above the gun behind the aircraft radome. (see figures 9-17 and 9-18)

(3) Both the M61A1 system and the SUU-16/23 gun pods use 20-mm electric-primed ammunition with "bore-safe" fuzing.

d. Engine Starter Cartridges. All models of the F-4 may carry two operational and two spare starter cartridges.

(1) The operational cartridge for the right engine is located in the breech inside the right auxiliary air door (panel 81R) on the right side of the centerline bomb ejection rack. (see figure 9-39)

WARNING

Never attempt to enter the auxiliary air doors with aircraft engines running. Be sure door struts are installed or doors are blocked from closing before attempting to work inside them.

(2) The operational cartridge for the left engine is located in the breech inside panel 140 located inboard of the left main landing gear wheelwell. (see figure 9-39)

(3) The spare cartridges are located near the root of each leading wing edge under panels 137L & R. (see figure 9-39)

e. Miscellaneous Hazards

(1) Survival kits. The survival kits in F-4 series aircraft are located in the buckets of the ejection seats.

(2) F-4 series aircraft may carry electronic destructors.

(3) The RF-4C has an ejectable film cassette located under the fuselage nose through panel 503. This system utilizes an ARD 446-1 ejection cartridge and can be safetied with the proper safety pin. (see figure 9-40)

(4) On each side of the fuselage forward of the vertical stabilizer of the RF-4C there is a compartment for carrying photoflash and/or chaff cartridges. There are facilities for 20 M123 photoflash cartridges on each side. (see figures 9-40, 4-41, and 9-42)

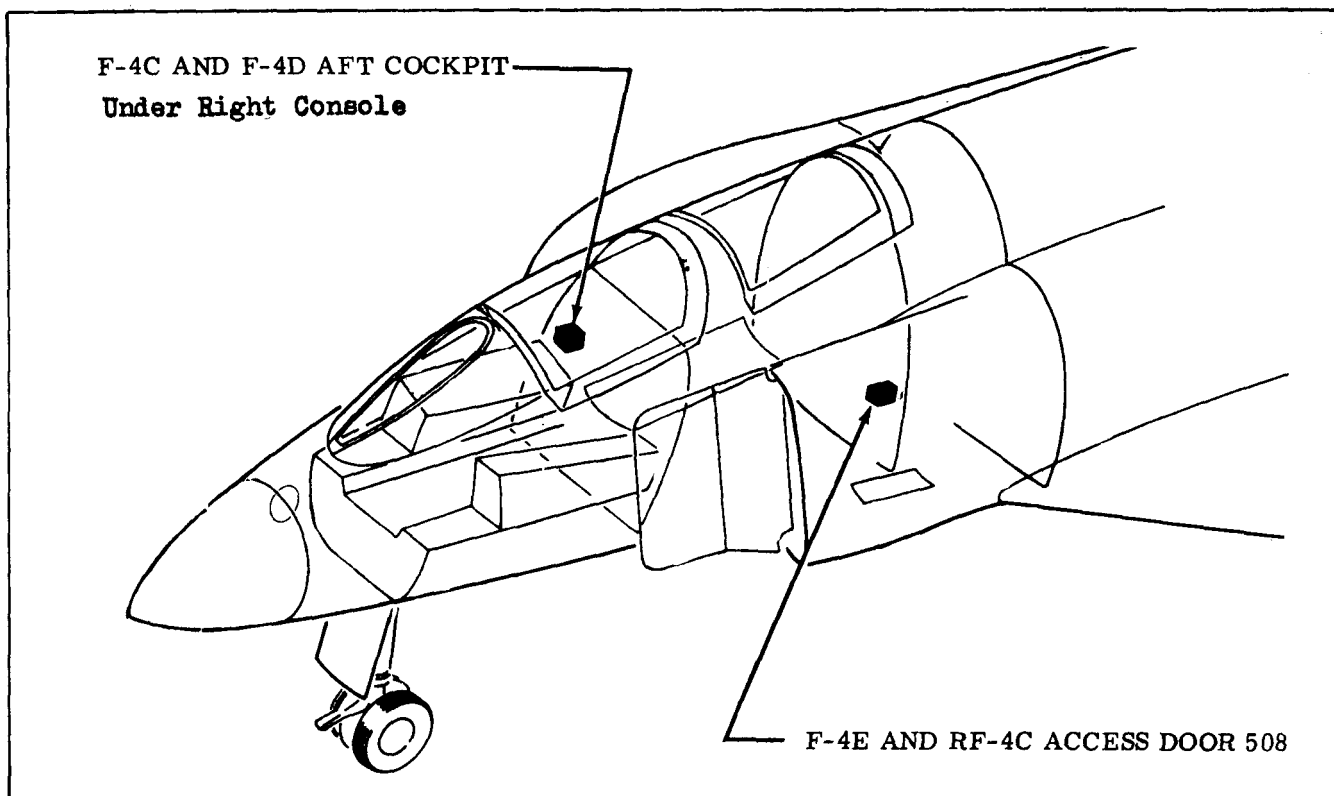


Figure 9-37. Battery Locations, RF-4C, F-4C/D/E

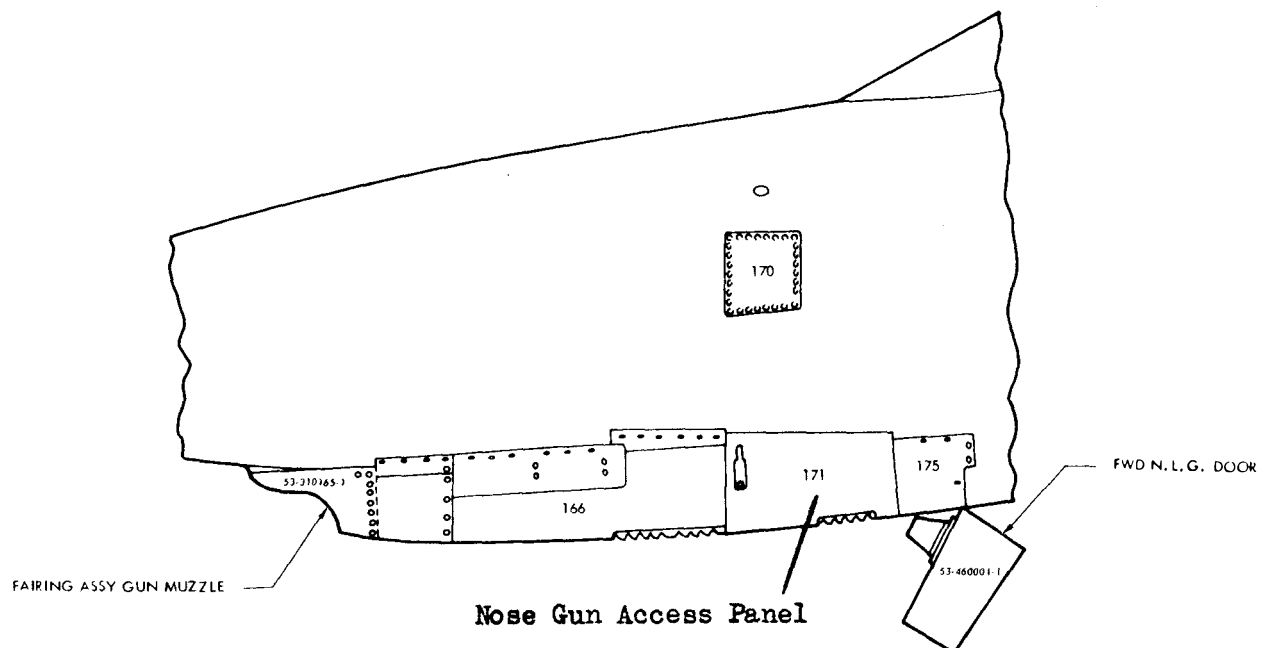


Figure 9-38. Location of Panel 171 for Access to M61A1 Gun in F-4F Aircraft

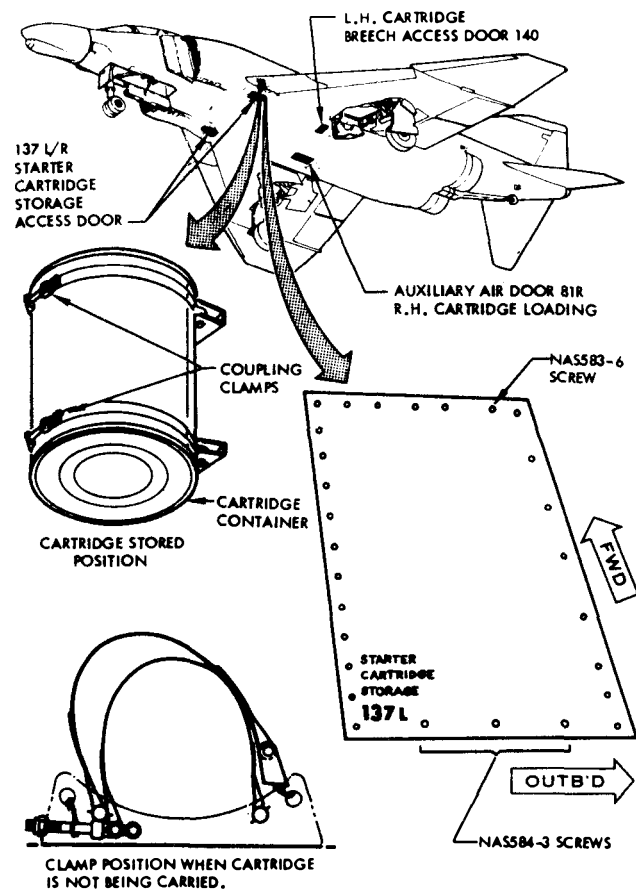


Figure 9-39. Starter Cartridges - Types and Locations

PHOTOFLASH CARTRIDGE EJECTOR DOOR

SAFETY PIN 53E370119-1, -2

PURPOSE: MECHANICALLY LOCK PHOTOFLASH CARTRIDGE EJECTOR DOORS IN THE OPEN POSITION.

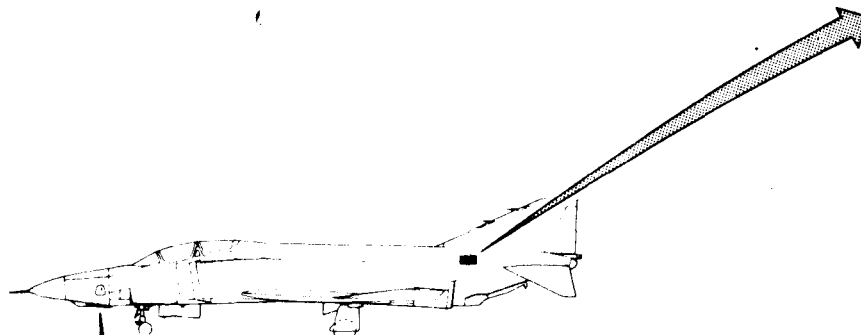
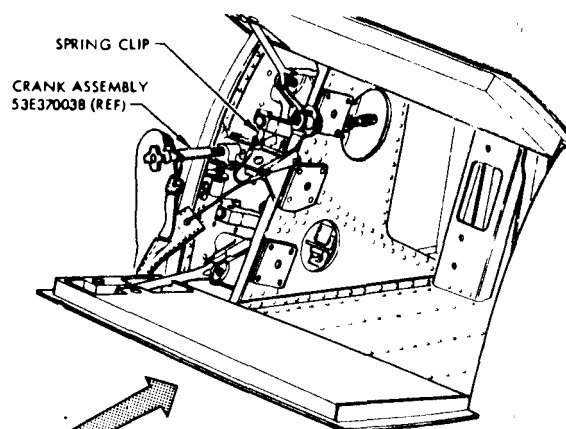
WHEN USED: WHENEVER PERFORMING MAINTENANCE IN EJECTOR COMPARTMENT AND/OR LOADING PHOTOFLASH CARTRIDGES.

LOCATION: PHOTOFLASH CARTRIDGE EJECTOR DOOR MECHANISM FORWARD END OF L/R EJECTOR COMPARTMENTS.

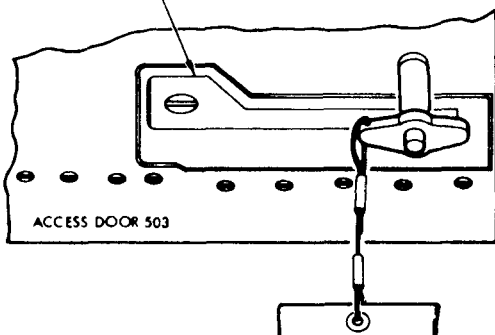
ACCESS: PHOTOFLASH CARTRIDGE EJECTOR DOORS.

INSTALLATION: SQUEEZE SPRING CLIP AND REMOVE FROM PIN. INSERT PIN THROUGH HOLE IN STRUCTURE, THROUGH HOLES IN SPRING CLIP, AND INTO SOCKET PROVIDED. POSITION CLIP TO RETAIN PIN IN SOCKET.

REMOVAL: SQUEEZE SPRING CLIP AND REMOVE PIN.



LEFT DOOR LATCH HANDLE



CASSETTE EJECTION SAFETY PIN 53E370131-1

PURPOSE: TO PREVENT CASSETTE EJECTION BY POSITIONING SAFETY PISTON TO ROUTE CARTRIDGE GENERATED GAS OVERBOARD IN EVENT OF INADVERTENT FIRING.

WHEN USED: WHENEVER THE AIRCRAFT IS ON THE GROUND WITH EJECTABLE CASSETTE INSTALLED AND DURING MOUNTING OF EJECTABLE CASSETTE TO DOOR FRAME.

LOCATION ON LOW ALTITUDE CAMERA STATION ACCESS DOOR NO. 503 ADJACENT TO LEFT DOOR LATCH.

INSTALLATION: INSERT PIN IN SOCKET PROVIDED. PIN CAN BE INSTALLED WITH DOOR EITHER OPEN OR CLOSED.

REMOVAL REVERSE THE INSTALLATION PROCEDURE.

Figure 9-40. Ground Safety Devices - Reconnaissance Systems RF-4C
9-44

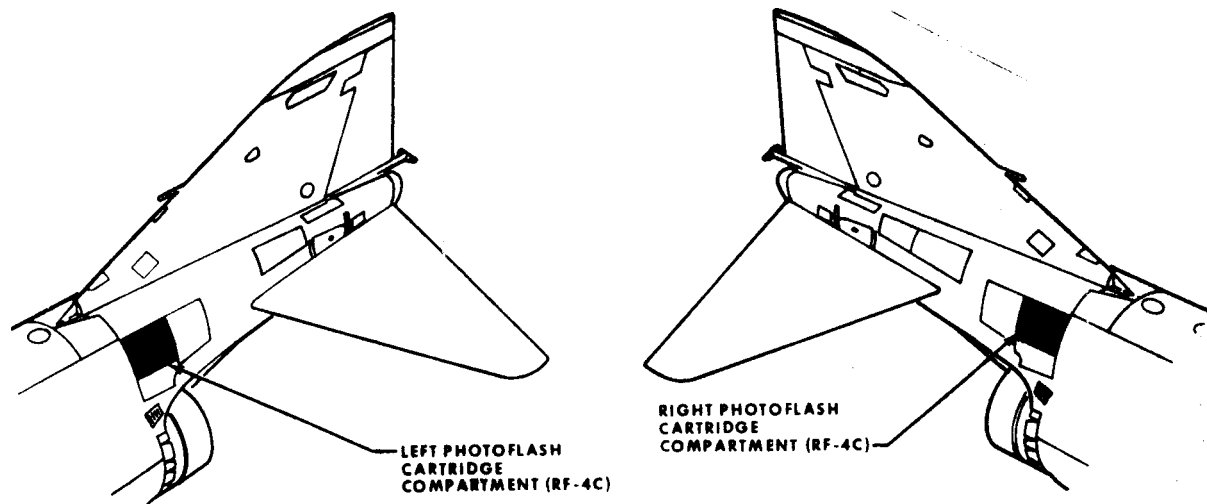


Figure 9-41. Photoflash Cartridge Components Location RF-4C

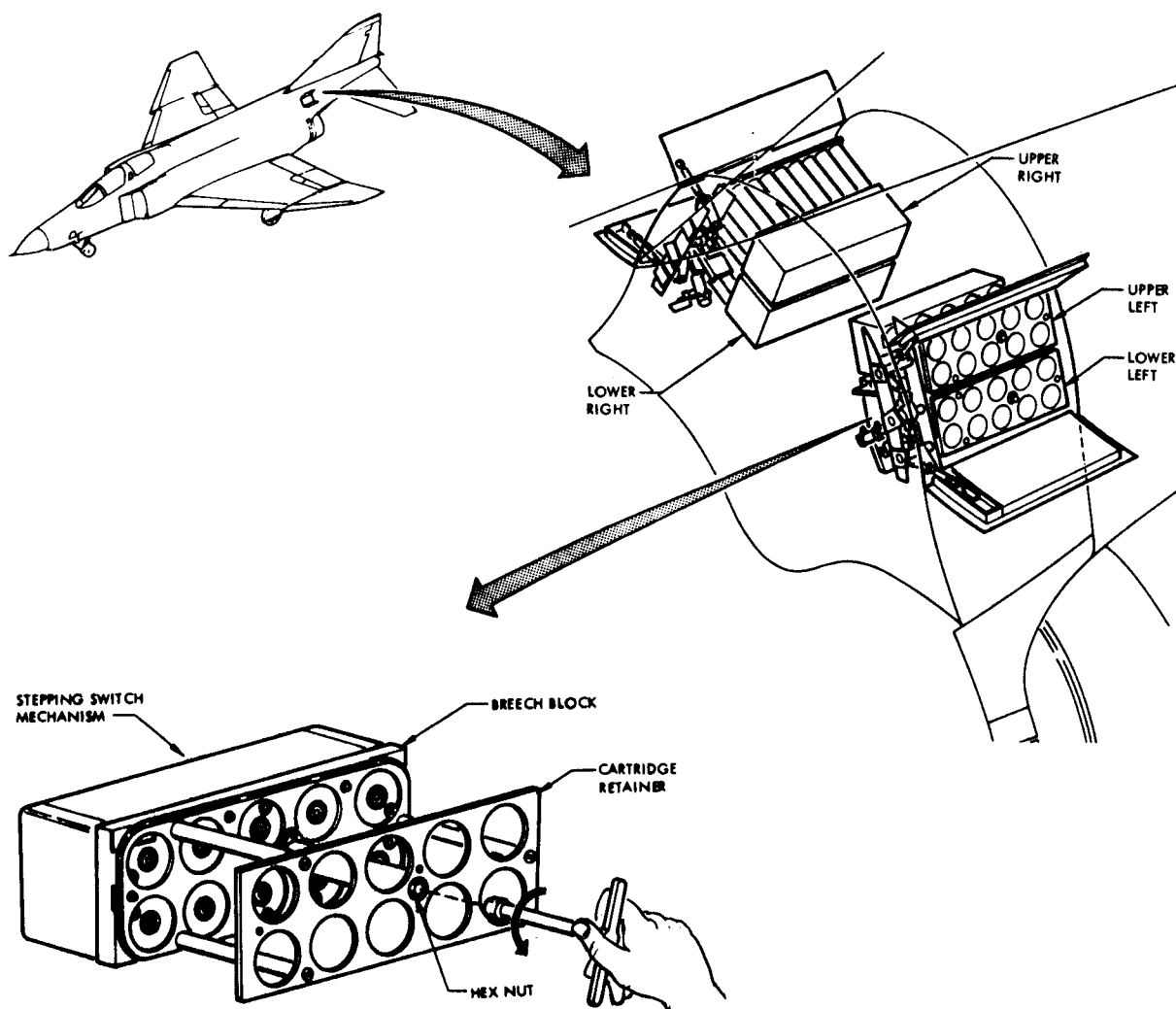


Figure 9-42. Photoflash Cartridge Location and Removal

5. A-1E/H/J Model Aircraft

a. Battery

(1) The battery for the AlE aircraft is located on the right side below the "blue-room". (see figure 9-43)

(2) The battery for the AlH/J aircraft is located on the left side of the fuselage forward of the tail assembly.

b. Guns

(1) The gunnery system of the AlE consists of four M3 20-mm guns located two in each wing. (see figure 9-44)

(2) The gunnery system of the AlH/J consists of four M24 20-mm guns located two in each wing. (see figure 9-44)

NOTE

It is possible that these guns
could be interchanged.

c. Ammo. The ammunition load of A-1 series aircraft consists of 200 rounds per gun.

(1) Ammunition for the outboard guns is located in three cans with access through a panel in the top of the wings. (figure 9-44)

(2) Ammunition for the inboard guns is located in two cans with access through the wheelwells. (figure 9-44)

(3) The M3 uses 20-mm percussion primed "bore" or "non-bore" safe ammunition.

(4) The M24 gun uses 20-mm electric primed "bore" safe ammunition.

d. Miscellaneous Hazards. Survival kits in A-1 series aircraft are located in the buckets of the ejection seats.

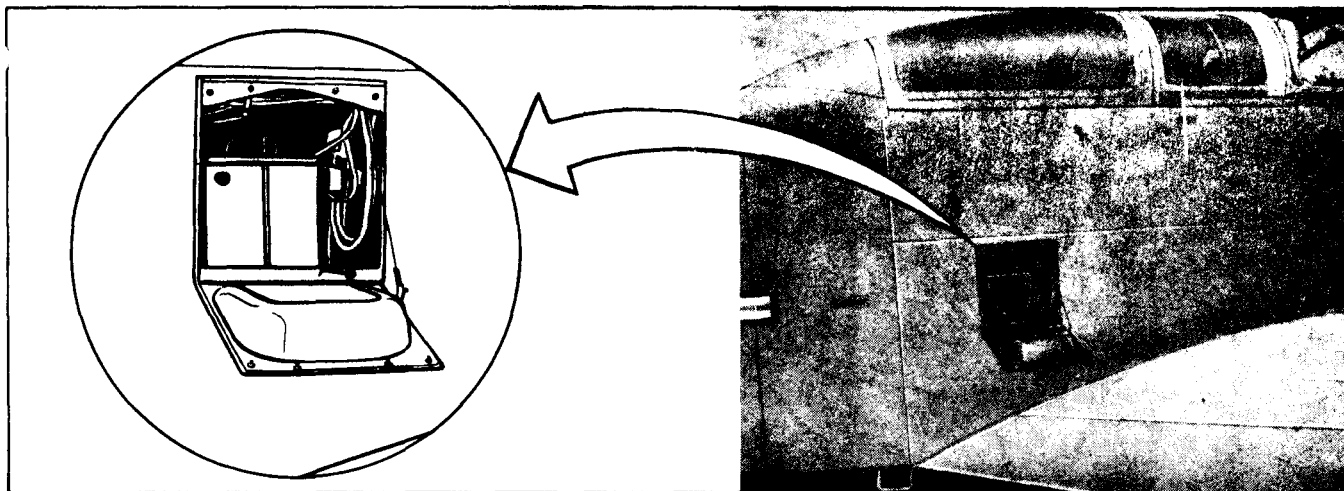


Figure 9-43. Battery System and Unit Location A1E

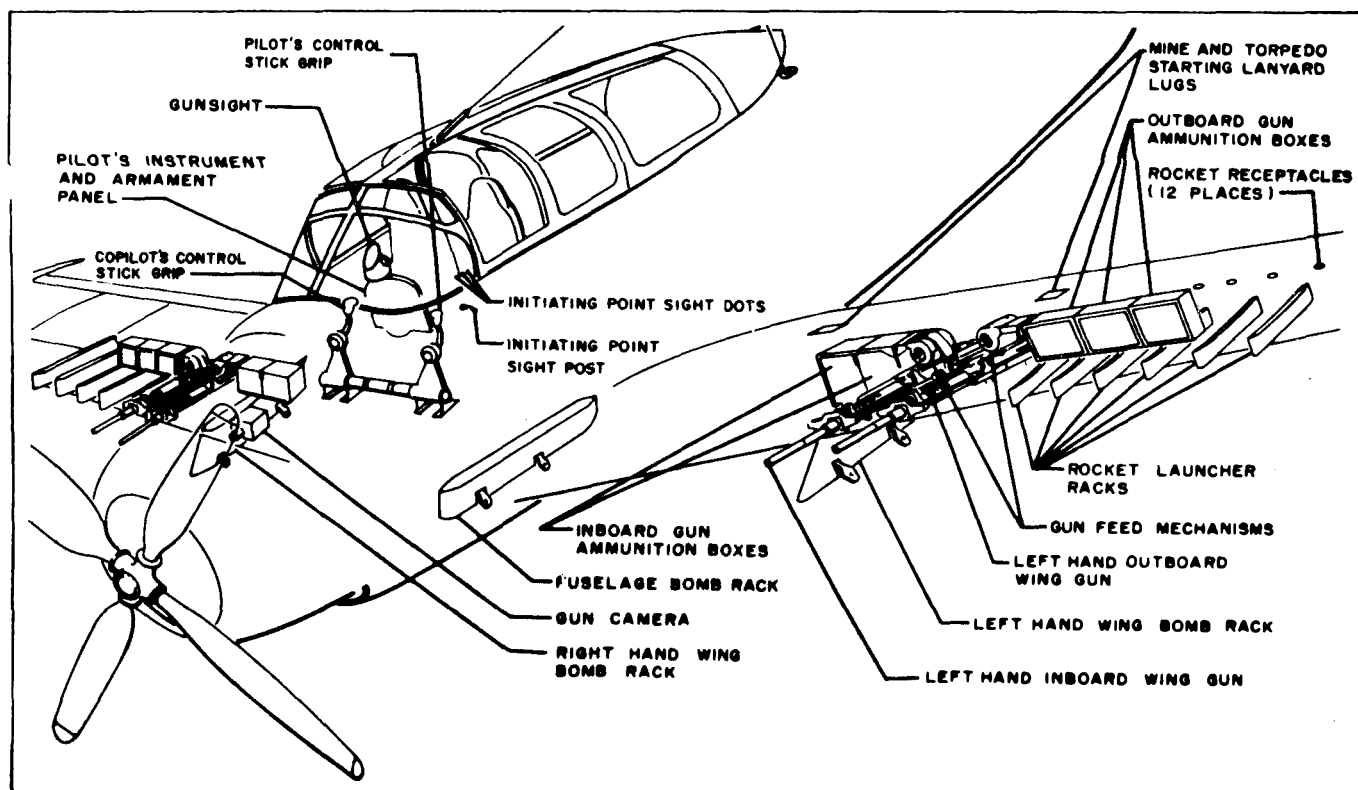


Figure 9-44. 20MM Gunnery Installation A-1 Series Aircraft

Chapter 10

AIRCRAFT SUSPENSION SYSTEMS

OBJECTIVES

To learn the identification, location, function, and safing of pylons and ejector racks, and hazardous components of air munition pylons for the F-4, F-100, F-105, and A-1E aircraft.

INTRODUCTION

In this student text we will discuss aircraft suspension and release systems (bomb racks and pylons) and components of the aircraft that may be pertinent to a safe EOD operation. Reports from SEA have continually indicated a need for this information. Again, keep in mind that we are interested in the items being discussed from an EOD viewpoint--how these items may affect us during the course of our operations. The aircraft that we will cover are:

- o F-100 (D and F models)
- o F-105 (D and F models)
- o F-4 (C, D and E models)
- o A-1 (E model)

TERMINOLOGY

General

Before we can start on the individual aircraft we must clarify the terminology associated with aircraft suspension and release systems. These definitions will apply to all the aircraft we will discuss. Be sure they are clear in your mind.

BOMB RACK (BR). A bomb rack can best be described as an electro-mechanical device designed to carry, arm, and release airmunitions. These racks will normally have 14-inch, 30-inch, or a combination of both 14-inch and 30-inch hook spacing to accommodate the suspension lugs in US munitions. Usually a bomb rack that has only 14-inch hooks is limited to airmunitions that weigh 1000 pounds or less, and the 30-inch hooks accommodate airmunitions which weigh in excess of 1000 pounds. In nearly every case

these racks will have a provision for a mechanical safety pin which will physically prevent the rack hooks from opening and some means of manually releasing the hooks to remove the armunitions from the aircraft when it is on the ground. This is the means of release that is of prime concern to use in EOD.

BOMB EJECTION RACK (BER). A bomb ejection rack is basically the same as the original bomb rack; however, one important item has been added. With the advent of supersonic aircraft, it was discovered that externally carried stores were tending to "hang" under the aircraft after the hooks were released. This action resulted in a hazard to the aircraft when the bombs were fuze with certain fuzes. Explosive cartridges are now incorporated into the bomb rack (see figure 10-1) to forcibly eject the store away from the aircraft--hence the term bomb ejection rack. The addition of these explosive cartridges constitute a definite hazard to personnel working on the aircraft which use the ejection type racks. Most of these ejection racks must have hot gas exhaust ports (see figure 10-1) which would cause serious personal injury if you should be in the area of the port when the cartridge fires. Both the standard bomb rack and the BER will normally have provisions for a ground safety pin and a method of manual release (see figure 10-1).

NOTE

The gas pressure generated by these cartridges in some cases performs more than just ejection of the store; however, to us this is inconsequential. It is sufficient to know that the bomb rack contains explosive cartridges which eject the store; exhausts hot gases when functioned; and must be safed prior to working on a suspension system which contains them.

PYLONS AND ADAPTERS. This nomenclature is at best vague and is applied differently to individual aircraft. Even the aircraft manufacturers do not have a standard nomenclature for them. Usually a "pylon" is considered to be a support assembly, aerodynamically configured to an aircraft, capable of carrying some form of external store such as bombs, fuel tanks, rockets, or missiles. To better illustrate the difficulty when defining these items, let us look at the four aircraft to be discussed in this study guide as examples:

1. The F-100 uses the term "pylon" for all of its external suspension mechanisms.

2. The F-105 uses the term "pylon" for all its bomb racks, but uses "adapter" for one of its missile launchers and "launcher" for another missile adapter.

3. The F-4 uses the term "pylon" for all of its bomb racks and "launcher" for all of its rocket and missile launchers.

4. The A-1E refers to all of its external suspension system as bomb racks.

From this we can see that by technical standards we are incorrect by calling all external stores suspension mechanisms "pylons", but it is only a technicality and regardless of what name we apply to it we need only be correct in knowing:

- How to electrically and mechanically safe these mechanisms.
- How to explosively safe them.
- How to remove the airmunitions which is loaded on them.

In this student text we will use the nomenclature given in the applicable AFTOs.

ADAPTER. This term is usually applied to a mechanism that is used to change a particular suspension system from its original capability to a different one.

NOTE

For U.S. Navy suspension systems, the term "adapter" is used extensively; whereas on USAF suspension systems, the term is infrequently used.

LAUNCHERS. This term "launcher" is used when a suspension system is used to carry and launch aircraft rockets or missiles.

BOMB EJECTION CARTRIDGES. These cartridges come in many different types and the number designations are numerous. The fact that these cartridges are electrically primed and contain gas-producing explosives is all that we in EOD need remember; therefore, an Air Force ARD 446-1 cartridge and a Navy MK-2 cartridge are the same to us. Some models of these cartridges are used to jettison missiles (Navy MK-17 for AGM-12/B and small stores; Air Force ARD 863-1 in the SUU-14 dispenser). It is very important for us to remember that bomb ejection cartridges are

present and that they must be removed before work can be done safely on any mechanism which contains them.

MULTIPLE EJECTOR RACK (MER). This may be a new term to you, but we will find it is a very simple item. A MER consists of six individual 14-inch bomb ejection racks. These six racks are bolted to a strongback (see figure 10-2), giving a single external airmunition station the capability of carrying up to six munitions. Each individual BER bolted to the MER has all the basic components of a 14-inch BER, the basic difference being that these racks use only one ejection cartridge per rack instead of the usual two (see figure 10-3). The manual release for the individual rack is a lever located on the front of the rack (see figure 10-3). Pulling forward on this lever will open both of the bomb hooks simultaneously. Each rack has a provision for two mechanical safing pins (see figure 10-3) and the installation of a pin in either hole will effectively lock the hooks of the rack. The strongback has a provision for lugs to load it into the 30-inch hooks of a bomb rack, or it can be bolted to a bomb pylon adapter. On the rear end of the strongback there is a selector switch to be used to select various loads that can be carried and to provide for inserting an electrical ground safety pin (see figure 10-2). This pin cuts the circuit to the bomb ejection cartridges when it is installed. Also there is an electrical connection between the MER and the aircraft pylon which, when disconnected, will electrically safe the entire MER.

NOTE

The A-1E aircraft uses a slightly different version of the MER which will be discussed in the portion of this SSG that deals with the A-1E aircraft.

TRIPLE EJECTION RACK (TER). This type of rack is a shorter version of the MER. It will carry a total of three items, and the BERs and other components are the same as the MER.

SHACKLES. These mechanisms originated in WW II and are used in bomb-bay applications. The shackle is basically a 14- or 30-inch rack which is attached to the bomb and the assembly is then attached to the appropriate stations in the bomb bay. The shackle or "rack" requires a separate mechanism for normal release. This mechanism is known as the A-5 release mechanism. This mechanism, although separate from the shackle, is used to release the hooks on the shackle either electrically from the cockpit or manually in the bomb bay. The store can be released from its station in one of three ways:

1. Rotating the trip slot on the A-5 release mechanism by use of a standard screwdriver.

2. Activating the release lever on the shackle.
3. Removing both the munition and the shackle from the carrying station as a unit.

NOTE

At present only two aircraft have this system in SEA--the B-52 and the A-26.

Abbreviations

To be sure that you understand the abbreviations used in this study guide, a list of those most frequently encountered follows:

BR--bomb rack

BER--bomb ejection rack

MER--multiple ejection rack

TER--triple ejection rack

MAU--munition auxiliary unit (This term is rapidly replacing the "Aero" and "MK" on the newer aircraft. It is normally applied to bomb racks.)

LAU--launch auxiliary unit. (This term refers to rocket and missile launchers. Like the term "MAU" it is replacing older launch unit terminology. Keeping all of these definitions and abbreviations in mind, we will now discuss the individual aircraft.

F-100 (D AND F MODELS) AIRCRAFT

General

The F-100D aircraft is a single-seat, single-engine, tactical fighter which has seven stations for carrying airmunitions externally (see figure 10-4. The stations which carry munitions on the F-100 aircraft are designated (see table 1):

Outboard wing (L & R)

Intermediate wing (L & R)

Inboard wing (L & R)

Centerline

Outboard Wing Station

This station uses the type III pylon (see figure 10-5). The pylon houses a 14-inch BER which has provisions for a mechanical safety pin and a screwdriver slot (large common tip) for external manual release. Using the screwdriver, turn it counterclockwise in the slot and both hooks will open.

NOTE

When the ground safety pin is installed, the hooks cannot be opened. This is true for all bomb racks.

The bomb ejection rack used in the type III pylon has a provision for two bomb ejection cartridges (see figure 10-5). An additional two cartridges are installed in the pylon for emergency jettison of the pylon and store.

Intermediate Wing Station

This station can be fitted with one of two pylons--the type III which is the same as the one used on the outboard station, or the type VIII. The type VIII pylon (see figure 10-6) houses a 30-inch BER. An additional hook spaced 20 inches apart is incorporated and is used to carry special items. This hook is ganged in with the two 30-inch hooks. The BER used in the type VIII pylon is the same in all other respects as the BER used in the type III pylon. It has provisions for a ground safety pin, a manual release, and two ejection cartridges. This pylon can also be jettisoned in a emergency; therefore, two additional ejection cartridges are installed for this purpose (see figure 10-6).

NOTE

The type VIII pylon is normally used to carry a full tank; however with the 30-inch lug capability, it can easily be adapted to carry most airmunitions.

Inboard Wing Station

This station can be fitted with one of three pylons. We will now discuss each of these pylons.

TYPE I PYLON. This pylon houses the same 14-inch BER as the type III pylon. The only difference between the type I and III pylons is the aluminium fairing which is shaped to fit the contour of the wing. All

components of the type I pylon that are of concern to EOD personnel are the same as those on the type III pylon (see figure 10-5).

TYPE IX PYLON. This pylon (see figure 10-7) is used to carry and launch the AIM-9 (Sidewinder) missile and is configured to carry two of these missiles. Due to the way in which AIM-9s are jettisoned (launched unguided) there are only two explosive cartridges in the pylon, and these are used for pylon jettison (see figure 10-7). The pylon has provisions for two electrical safing pins (one per missile) and two mechanical release handles (one per missile). Rotating the release handle will unlock the missile from the rail and the missile can be unloaded by sliding it forward.

TYPE X PYLON. This pylon is used to carry and launch the AGM-12/B (Bullpup) and the AGM-45 (Shrike) missiles. This pylon is being phased out; however, it could be encountered in the SEA theater. The type X pylon will contain three explosive cartridges. Two of these cartridges are used to jettison the pylon and the third, located in the bottom rear of the pylon, is used to jettison the missile. The pylon requires one electrical safing pin and the missile is unloaded by operating the release handle and sliding the missile forward and off the launch shoes.

Centerline Station

At present the only airmunition pylon that could be used on this station is the type VII (see figure 10-8). The type VII pylon is designed to carry special weapons. Reports from SEA indicate that airmunitions have been loaded on the F-100 centerline station so we will discuss the type VII briefly. The type VII pylon houses a 30-inch bomb rack. The rack has no provision for ejection, but it uses the same type of ground safety pin and mechanical release as the other bomb racks on the F-100 aircraft. Although the type VII pylon does not have an ejection rack, it has a provision for two explosive cartridges for jettison of the pylon (see figure 10-8).

CAUTION

It is known that some loading configurations do not require the use of these cartridges, but as EOD personnel we must assume that they are present until we physically check the cartridge holders. We are interested only in the number of cartridges that could be present.

Table 1. F-100 Pylons

Pylon	Station	Suspension	Number of Cartridges	Safety Pin	To Release Use <i>No Drop well</i>
Type I	Inbrd wing	14-inches <i>BER</i>	4	Mechanical	Screw slot
Type III	Outbrd and int wing	14-inches <i>BER</i>	4	Mechanical	Screw slot
Type VII	Centerline	30-inches <i>BR</i>	2	Mechanical	Screw slot
Type VIII	Int wing	30-inches <i>BER</i>	4	Mechanical	Screw slot
Type IX	Inbrd wing	AIM-9 missile	2	Electric	Manual handle <i>Screw Driver</i>
Type X	Inbrd wing	AGM-12 or AGM-45 missile	3	Electric	Manual handle

Rules of thumb

1. Aim 9/4 - Launched unguided (NO CARTS)
2. AGM 12B/45 - Kicked Backward (ONE CART Emergency Jettison only)
3. F-100 D/F - All Jettisonable

F-105 (D AND F MODEL) AIRCRAFT

The F105 aircraft is a tactical fighter-bomber which has five external stations for carrying munitions.

NOTE

The F-105 series aircraft are equipped with an internal bomb-bay system; however, it is not used for conventional munitions, and it will not be covered in this course.

The five external airmunition stations we will discuss are (see figure 10-9 and table II):

1. Outboard wing (R & L)
2. Inboard wing (R & L)
3. Centerline fuselage (bomb-bay doors closed)

Outboard Wing Station

This station can have one of two type pylons installed--the 14-inch Universal (RAC) BER of the AERO 3/B (AIM-9) missile adapter.

The 14-inch Universal (see figure 10-10). This pylon is quite unique and could cause some difficulty to personnel working on it because it does not conform to standards associated with other racks. The 14-inch BER is housed in the outboard pylon and will have two cartridges for the bomb rack and two cartridges for the emergency jettison of the pylon. Instead of a mechanical safety pin this rack requires two mechanical safety blocks (one for each hook linkage) to prevent the hooks from opening. To manually release the store which it carries, it is necessary to rotate each hook linkage separately because they are not ganged together. The hooks are rotated by using a 7/16-inch wrench on the stud located on each hook linkage (see figure 10-10). To gain access to both the explosive cartridge and the manual release studs, it is necessary to remove an electrical safing plate (see figure 10-10) and undo the dzus fasteners which secure the access panel. Removing the red safing plate will electrically safe the circuits to the explosive cartridges. With the access panel open, the four explosive cartridges can be removed and the release mechanism can be operated or the safety blocks can be installed.

CAUTION

Since the bomb hooks are not ganged together, care must be taken to ensure that the munition which is being unloaded does not bind when one hook is released.

The other pylon that can be used on this station is the AERO 3/B (AIM-9) missile adapter (see figure 10-11). This adapter will accommodate two AIM-9 (Sidewinder) missiles. As mentioned previously these missiles are jettisoned by launching them unguided. No explosive cartridges, therefore, are necessary for this purpose. When installed on the aircraft the pylon itself

cannot be jettisoned and, therefore, with the AERO 3/B adapter there will be no hazard from explosive cartridges (see table II).

Each missile launch rail on the pylon has provisions for an electrical safing pin (see figure 10-11), and the missiles are removed by inserting a 3/8-inch allen key in the nose section release hole (see figure 10-11) to disconnect the umbilical cord. Then, using the same allen key in the detent release hole (see figure 10-11) the missile can be released by aliding it off the rail.

Inboard Wing Station

One of three different pylons may be used on this station. These pylons are the inboard universal pylon, the inboard multiweapons-pylon, and the GAM-83 adapter.

1. The inboard universal pylon houses a 14-inch or a 30-inch bomb ejection rack. These are individual racks, but both of them are identical with the exception of the hook spacing (see figure 10-12). The bomb racks have a provision for two ejection cartridges and the pylon can be jettisoned by two cartridges used for that purpose. The pylon has a provision for two safety pins--one for the hooks (see figure 10-12), which is a mechanical lock and one for the cartridge circuits which is electrical (see figure 10-12). The stores are released from the rack by placing a wrench on the forward hook sear stud (see figure 10-12) and rotating it. These hooks are ganged together so they will both open when the stud is rotated. Access to both the cartridges and manual release stud is by the saem manner as for the outboard universal pylon, except there is no electrical safety switch plate to remove.

2. Inboard multiweapons pylon. This pylon houses a 14- or 30-inch BER. The pylon has four explosive cartridges, two for the rack and two for the pylon (see figure 10-13). This pylon uses two safety pins--one electrical for the cartridges and one mechanical for the hooks (see figure 10-13). Manual release of the stores which are carried can be accomplished by rotating the hex stud on the exterior of the pylon skin (see figure 10-13).

NOTE

There is no hinged access panel on the multi-weapon inboard pylon.

3. GAM-83 adapter. This adapter (pylon) is used to suspend and launch either the AGM-12/B (Bullpup) or the AGM-45 (Shrike) missiles. The pylon cannot be jettisoned, but it contains one explosive cartridge for jettisoning the missile (see figure 10-14). Only for explosive cartridge will be present in this pylon. A provision for one electrical safing pin for the missile launch nad jettison circuits is provided, and the missile is manually released from the launcher by pulling out and lifting up on the manual release handle and sliding the missile forward and off the launch shoes (see figure 10-14).

Centerline Fuselage Station (External Only)

This station can be adapted to accept one of three pylons: the fuselage centerline pylon, the fuselage multiple ejector rack (MER) pylon, and the fuselage multiple weapons rack pylon. These pylons are explained below:

1. Fuselage centerline pylon. This pylon (see figure 10-15) is used to carry only a fuel tank. The tank is bolted to the pylon, and it is hooked externally to the bomb-bay doors as a unit. There are only two cartridges used in this pylon (see figure 10-15). When the cartridges are functioned they will jettison the pylon and the fuel tank as a unit. This pylon has an electromechanical safing pin which when installed breaks the circuit to the jettison cartridges and prevents rotation of the release mechanisms (see figure 10-15). To manually release this pylon and tank assembly from the aircraft, open the access doors at each sway brace, pull out each linkage, and rotate each linkage counterclockwise (see figure 10-15).

NOTE

This procedure is required at each sway brace as the attachment assembly hooks are not ganged together.

2. Fuselage multi-ejector rack pylon. This pylon is similar to the one used for the fuel tank because the MER is bolted to the pylon and the pylon hooks to the bomb-bay doors, and, if jettisoned, the pylon and MER are jettisoned as a unit. The pylon contains two explosive cartridges (see figure 10-16) and uses an electrical safing pin to safe the jettison circuit. The manual release safety consists of a nut and bolt used to secure the manual release handle to the skin of the pylon (see figure 10-16). Removing this nut and bolt and pulling forward on the release handle will release the pylon and the MER as a unit.

3. Fuselage multi-weapon ejector rack (see figure 10-17). This pylon houses a 14-inch and 30-inch BER (MAU-12/B), and it can be used to carry a single airmunition or a MER. When a MER is carried on this pylon, it will be held on the 30-inch lugs of the BER instead of being bolted to the pylon. Since this pylon contains a BER, it will have a provision for four cartridges--all located approximately in the center of the pylon (see figure 10-17). The two cartridge holders used for pylon jettison have a special lock mechanism that must be rotated before the cartridge holders can be removed. This pylon uses two safety pins: one electrical safety pin or the cartridges and one mechanical safety pin for the BER. The manual release for the hooks of the BER is a 3/8-inch square drive insert and the pylon is released manually in the same manner as the MER pylon.

Table II. F-105 Pylons

Pylon	Station	Suspension	Number of Cartridges	Safety Pin	Release
Outboard Universal	Outboard only	14" <i>BER</i>	4	Two safety blocks / <i>Electric SREW</i>	Hex nut <i>7/16"</i> each hook
Inboard Universal	Inboard only	14" or 30" <i>BER</i>	4	1 Mechanical Pin 1 Electric Pin	Hex nut <i>5/8"</i> fwd hook
Inboard Multi-weapon	Inboard only	14" or 30" or 14" and 30"	4	Electrical (1) mechanical (1)	Hex nut
AERO 3/B (AIM-9)	Outboard (normal)	AIM-9(2)	0	Electrical (2)	<i>3/8"</i> Allen key
GAM-83 <i>AGM 12B</i> adapter	Inboard <i>or</i> (normal) <i>outboard</i>	AGM-12/B or AGM-45	1	Electrical <i>Screw</i>	<i>Knob</i> Manual handle
Fuselage C/L pylon	Bomb bay door	Fuel tank	2	Electrical mechanical	Manual latch (2)
Fuselage MER pylon	Bomb bay door	MER	2	Electrical	Manual latch
Fuselage multi-weapon	Bomb bay door	14" and 30" (MAU-12)	4	Electrical and mechanical	<i>Bolt & nut</i> Manual latch; square drive insert <i>7/8"</i>
<i>Fuel TANK</i>	<i>in board</i>	<i>Fuel TANK</i>	<i>2</i>	<i>Electrical Pin</i>	

Rules of Thumb

1. AIM 9/4 Launched unguided (NO CARTS)
2. AGM 12B/45 - Kicked Backward (ONE CART)
3. F-105 - All Jettisonable except missile

F-4 (C, D, AND E MODELS) AIRCRAFT

The F-4 is a two-place, twin-engine tactical fighter-bomber (see figure 10-18). All models of the F-4 aircraft have nine stations for carrying airmunitions externally (see figure 10-18 and table III). These stations are listed below:

1. Centerline
2. Fuselage missile stations (4 each)
3. Inboard wing station (R & L)
4. Outboard wing station (R & L)

We will discuss the suspension systems used on each of these stations.

CENTERLINE STATION. This station contains an AERO 27/A, 14- and 30-inch BER (see figure 10-19). The rack is built into the fuselage centerline and cannot be jettisoned; therefore, there are no explosive cartridges present for this purpose, but there will be two cartridges for stores ejection. These cartridges are contained in a breech assembly on the top of the bomb rack (see figure 10-19). The breech assembly can be rotated 90° to facilitate cartridge removal. The rack is manually safed by installing a safety pin (see figure 10-19), and the stores are released by rotating the manual release stud (see figure 10-19). Access to the safety pin hole, cartridge breech and manual release stud is gained through a large access panel on the side of the bomb ejection rack. When some airmunitions are carried on this station an adapter is used (see figure 10-19). This adapter contains no explosive items and is loaded into the 30-inch hooks of the AERO 27/A.

FUSELAGE MISSILE STATIONS. These four stations are recessed into the skin of the bottom out edge of the fuselage--two stations forward and stations aft. Each station is fitted with an AERO 7/A missile launcher which is designed to carry and launch the AIM-7 (Sparrow) missiles (see figure 10-20). When the missiles are loaded on these stations the front and rear in of each missile extend into the aircraft interior. To get the missile clear of the fuselage prior to launch, two explosive cartridges are used (see figure 10-20). Since the AERO 7/A launchers are an integral part of the airframe, they are not jettisoned; therefore, there are no cartridges present for this purpose. Each launcher has a provision for an electro-mechanical safing pin and a hex stud for manual release (see figure 10-20).

WARNING

Rotating this hex stud will allow the missile to fall free of the aircraft. In this configuration the missile is not on a rail.

Access to the cartridge breech, the safing pin hole, and the manual release stud is through a small panel on the side of each missile launcher.

INBOARD WING STATION. The pylon used on this station houses a 14- and 30-inch BER (MAU-12/B), and it will contain two cartridges for stores release (see figure 10-21). When this bomb rack is installed no provisions are made to jettison the pylons (see table (III)). The bomb rack has provisions for one electromechanical safety pin and the stores are released by inserting a 3/8-inch square drive tool into the release hole and rotating it (see figure 10-21). This pylon can also be used for carrying and launching various missiles by using missile adapters (see table III). The following adapters are used:

1. LAU-34 (see figure 10-22). This adapter is used to suspend and launch the AGM-12/B missile or the AGM-45 missile. The adapter consists of the necessary electronics to launch and jettison the missiles. One explosive cartridge is installed in the aft portion of the LAU-34 for missile jettison (see figure 10-23). The adapter is loaded into the MAU-12B bomb rack by using the 30-inch hooks of the rack (see figure 10-24). Ground safety pinning is accomplished by using the electro-mechanical safety pin provided for the pylon. With the LAU-34 installed, manual release of the missile can be accomplished by either rotating the missile release handle on the adapter (see figure 10-22) or by rotating the bomb rack release mechanism.

CAUTION

When the LAU-34 adapter is installed on the pylon, the two bomb ejection cartridges for the MAU-12/B bomb rack are normally not installed. Be sure you check the cartridge holders for the presence of cartridges.

2. LAU-7/A missile launcher (adapter) (see figure 10-24). This adapter is bolted, one on each side of the pylon (see figure 10-25), and is used to launch the AIM-9 missile. These adapters use no explosive cartridges, but they do contain a high pressure air bottle charged up to 3000 psi (see figure 10-24). The bottle has a pressure indicator and bleeder valve, and it must be considered a potential hazard. Each adapter has a provision for a combination safety pin and release handle (see figure 10-25). When the handle is inserted in the hole provided (see figure 10-24), it electrically safes the missile launch circuits. Rotating the handle will unlock the detends and the missile can be removed from the launch rail.

CAUTION

The MAU-12/B bomb rack cartridge holders should not contain cartridges. For your own safety, check them.

3. AIM-4 missile adapter (see figure 10-26). Three missile adapters can be mounted on one pylon. Two adapters are bolted to the sides of the pylon and the third is suspended from the hooks of the MAU-12/B bomb rack. This adapter, as with the LAU-7/A missile adapter, contains no explosives, and the cartridges for the MAU-12/B rack are normally not installed. Again, for your own safety check to be sure. The safety pin used is the one provided for the MAU-12/B rack. The missiles are removed from the adapters by pulling out on the release latch near the back of each adapter and by sliding the missile forward and off the rails (see figure 10-26).

Outboard Wing Station

The pylon on the outboard wing station also houses a MAU-12/B BER. All EOD procedures for this station will be the same as those for the inboard wing station.

Navy Configuration

The Navy suspension and release systems differ considerably from those of the Air Force. Since the F-4 designed for the Navy and their pylons are used by the USAF, the pylons are often being encountered in SEA, we will discuss them briefly.

FUSELAGE STATIONS. The AERO 27/A centerline BER and the four AERO 7/A fuselage missile pylons are the same as discussed previously.

INBOARD WING STATION. An LAU-17/A wing missile pylon is used on this station (see figure 10-27). The pylon is designed to carry and launch one AIM-7 (Sparrow) missile. The pylon has a provision for an electrical safing pin (see figure 10-27), and is jettisoned by means of one explosive bolt located in the upper forward portion of the pylon (see figure 10-27). The missile is removed from the launch rail by actuating the keeper mechanism (see figure 10-27) and sliding the missile off the rail. The LAU-27 pylon can be adapted to carry the following armaments.

1. AIM-9 missiles by bolting the LAU-7 adapters to each side of the pylon in the same way as described for the AF MAU-12/B pylon (see figure 10-24).

2. Standard armaments by bolting the 30-inch big adapter (see figure 10-28) to the bottom of the pylon. This adapter contains no explosives and the hooks are opened by rotating a hex stud at each hook (see figure 10-28).

3. AGM-12/B or AGM-45 by attaching an LAU-34 missile adapter to the hooks of the 30-inch bomb adapter described in paragraph 2 above (see figure 10-29).

Outboard Station

The outboard station on the F-4 aircraft carries the outboard wing pylon (see figure 10-30) which is normally used for a fuel tank. The pylon has a set of 30-inch hooks, two cartridges for pylon jettison, an electromechanical safing pin, and a manual release that uses a 3/8-inch allen key (see figure 10-30.) This pylon can also be adapted to carry bombs and missiles using the same adapters as used on the LAU-47 wing missile pylon.

Table III - F-4 Pylons and Adapters

Pylon	Station	Suspension	Number of Cartridges	Safety Pin	Release
Aero 27A	Centerline	14-30 inch <i>BER</i>	2	Mechanical <i>Electrical Pin</i>	$\frac{5}{8}$ " Hex nut
Aero 7/A	4 Fuselage recesses	AIM-7 missile	2 (per pylon)	1 electro-mechanical <i>pin</i>	$\frac{5}{8}$ " Hex nut
Inboard wing (MAU-12)	Inboard wing	14-30 inch	2	1 electro-mechanical <i>pin</i>	3/8-inch square drive insert
Outboard wing (MAU-12)	Outboard wing	14-30 inch	2	1 electro-mechanical <i>pin</i>	3/8-inch square drive insert
IAU-17 (Navy)	Inboard wing only	AIM-7 missile	1 (ex bolt)	Electric	Keeper release
Outboard pylon (Navy)	Outboard wing only	Fuel tank	2	1 electro-mechanical <i>pin</i>	3/8-inch allen key

Rules Thumb

1. AIM-9/4 - Launched unguided (no CARTs)
2. AGM 12B/45 - Kicked Backward (one CART)
3. F-4 (AF) - None Jettisonable

Table III - F-4 Pylons and Adapters

Adapter	Station	Suspension	Number of Cartridges	Safety Pin	Release
LAU-34	Inboard or outboard	AGM-121B 14 or 30 or AGM-45 Lugs missile	1	Use pylon pin	Mechanical handle or release rack
LAU-7/A	<i>Bolt ON</i> Inboard or outboard	AIM-9 missile	<i>(3000 lbs Nitrogen Bomb)</i> 0	Electric	Use safety pin
AIM-4	Inboard <i>Bolt ON</i> (normal) <i>OR</i> Lugs	AIM-4 missile	0	Use pylon pin	Spring yellow latch <i>KNOP</i>
Bomb adapter (Navy)	Inboard or outboard	30-inch	0	Use pylon pin	Hex nut each hook
Centerline adapter	C/L for Aero 27	MER and gun pods	0	Use bomb rack pin	Bolted to ordnance

A-1E AIRCRAFT

General

The A-1E is a single-engine (propeller-driven), twin-place aircraft (see figure 10-31) which is used extensively in SEA by both the USAF and RVNAF. It has 15 external stations for carrying airmunitions. These stations are as follows:

1. Centerline station
2. Inboard wing stations (2)
3. Wing stations (12)

CENTERLINE STATION. The A-1E centerline station contains an Aero 3/A bomb ejection rack with a 14 and 30-inch suspension and which uses one (see table IV) explosive cartridge for stores ejection (see figure 10-32). Access to the cartridge breech is through a panel along side the rack, and the removal of the cartridge is accomplished by disconnecting the electric lead and removing the breech cap (see figure 10-32). Manual release is accomplished by pulling on the release cable (see figure 10-32) using the same access panel.

INBOARD WING STATIONS. These two stations carry the MK51 bomb racks (see figure 10-33) which can be either a 14-inch, a 30-inch, or 14 and 30- inch suspension. There are no explosive cartridges passociated with these racks (see table IV). A mechanical ground safing pin is used and a manual release is accomplished by pulling on the release cable (see figure 10-33). Access to this cable is through a panel in a bomb rack fairing (see figure 10-33).

NOTE

The centerline (Aero 3/A) and the two inboard (MK51) bomb racks can carry the MAU-63 multiple rack (MR) (see figure 10-34). The MAU-63 multiple rack is very similar to the MER. The major difference is that gas pressure from the explosive cartridge is used to open the bomb hooks instead of forcing out on an ejector foot. So in theory the racks used on the MAU-63 are not "ejector" racks. They have one explosive cartridge per rack (6 total), and the safety pins and release are the same as the individual racks for the MER. All EOD procedures required on the MER and MAU-63 are the same.

WING STATIONS. There are provisions for installing 12 each Aero 14 bomb racks (6 per wing). These racks have a provision for a 14-inch suspension only, and they do not have explosive cartridges. Provision has been made for installation of a mechanical safing pin (see figure 10-35) and release is accomplished by inserting a small pointed instrument (crimpers or phillips screwdriver) into the release hole (see figure 10-35).

NOTE

The AERO 14 bomb racks also have a provision for carrying and launching fixed fin rockets such as the 5-inch HVAR (see figure 10-35).

Table IV. A-1E Aircraft

Pylon	Position	Suspension	Number of Cartridges	Safety	Release
AERO 3A	Centerline	14-30-inch <i>DER</i>	1	<i>NONE</i> <i>Pull To neck handle in C/P</i>	Cable from C. 1 P. 1
MK 51	Inboard wing	14-inch 30-inch or <i>BR</i> 14-30-inch	0	Mechanical	Cable from C. 1 P. 1
AERO 14	Wing	14-inch <i>BR</i>	0	Mechanical	Pointed tool <i>Safety P. 2</i>
MAU-63	Centerline & inboard wing	14-inch <i>BR</i> <i>MER'S without Ejector Feet.</i>	6	1 electric 6 mechanical	Latch

Bottom hole for Safety To hole for Release

10-21

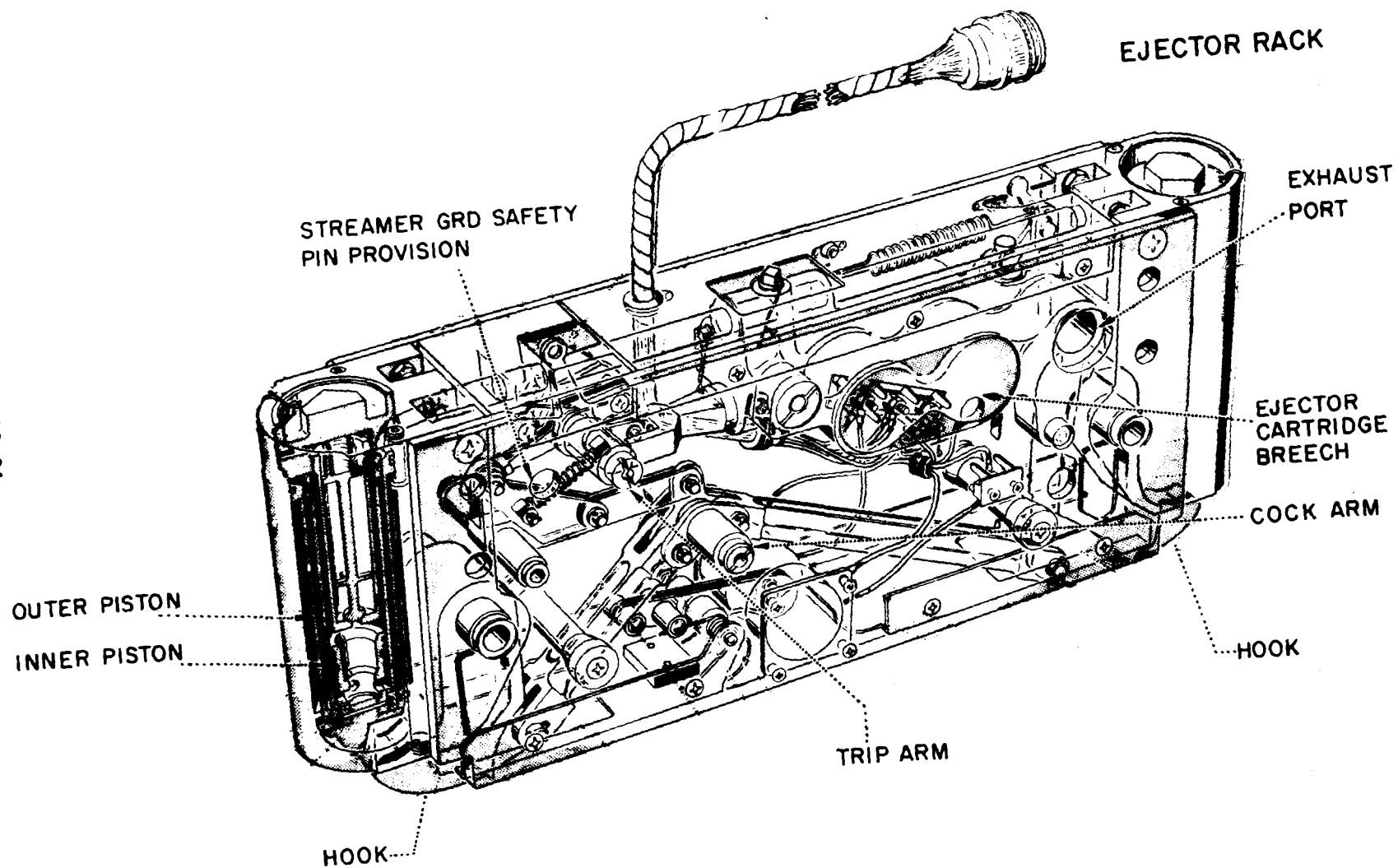
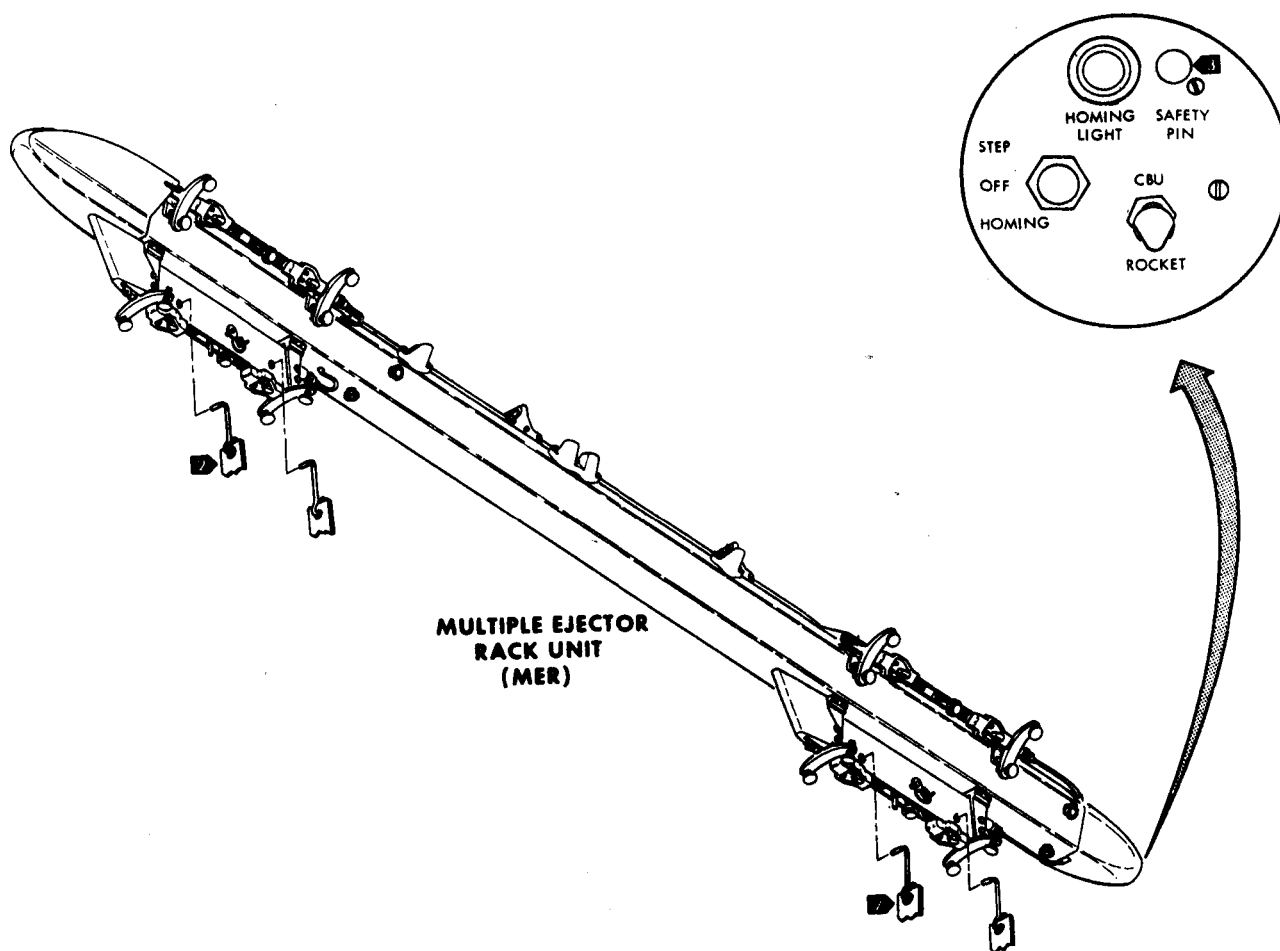


Figure 1. Typical Bomb Ejector Rack



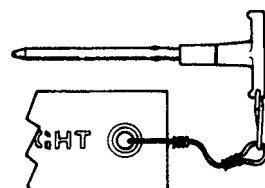
**MULTIPLE EJECTOR
RACK UNIT
(MER)**



SAFETY PIN

NOTE

➤ TWO SAFETY PINS REQUIRED FOR EACH OF THE MER AND TER EJECTOR RACKS.



SAFETY PIN (ELECTRICAL)

NOTE

➤ ONE SAFETY PIN REQUIRED IN EACH MER AND TER

Figure 2. Multiple Ejector Rack (MER)

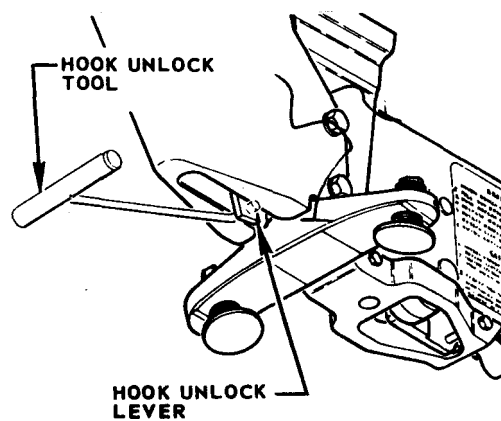
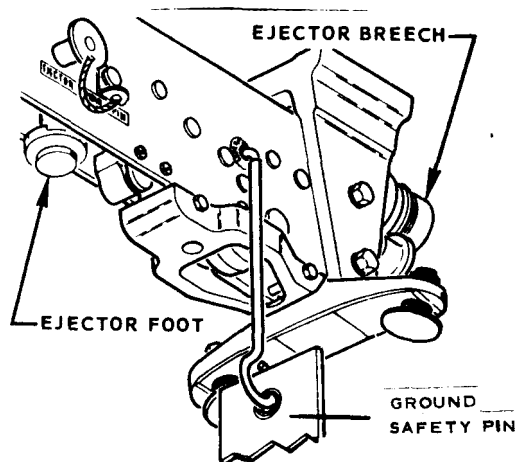


Figure 3. Unlock Lever and Ejector Breech for MER Showing One Mechanical Safety Pin Installed

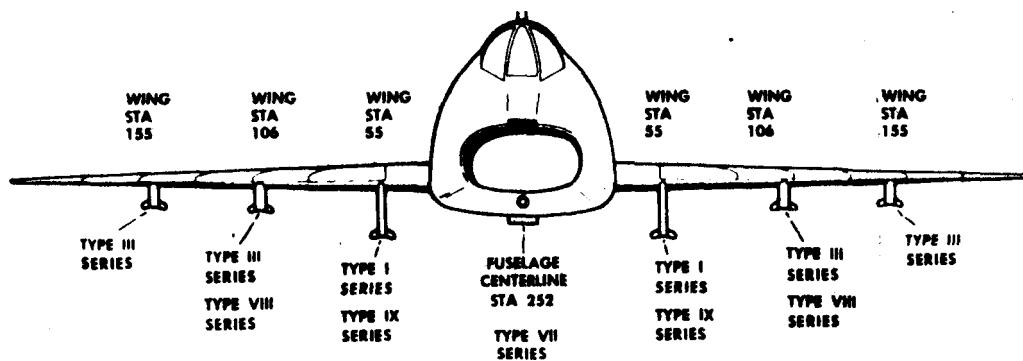
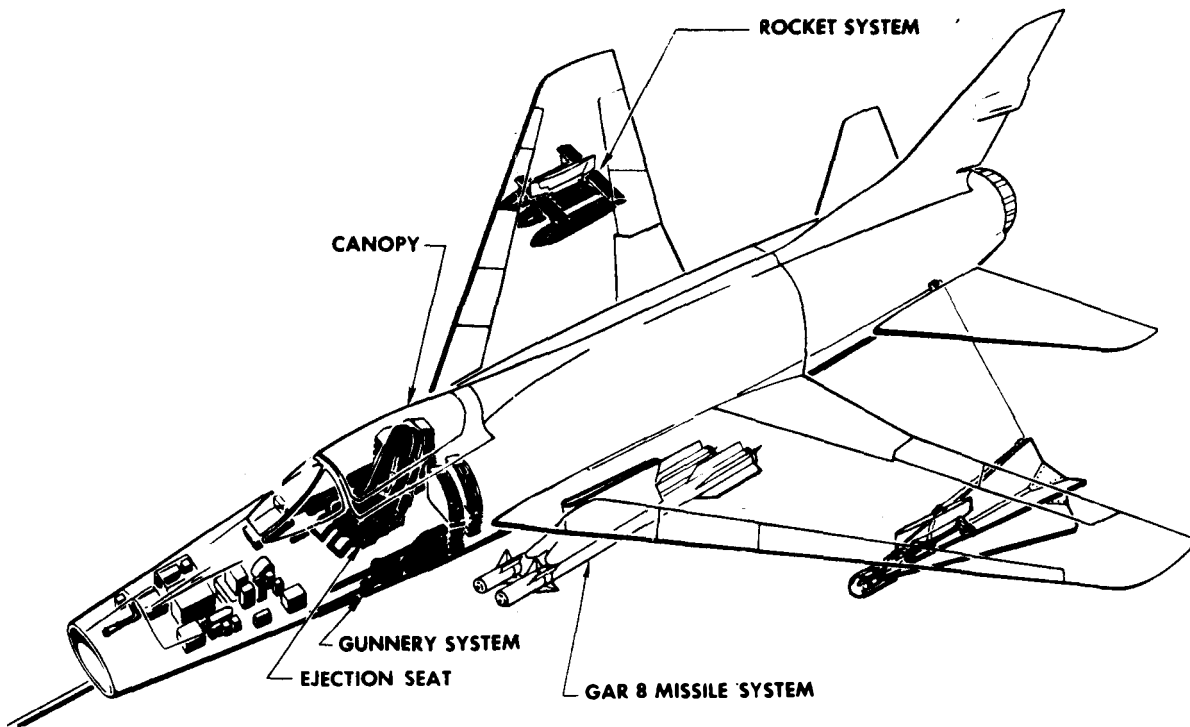


Figure 4. Typical F-100 and Airmunition Stations

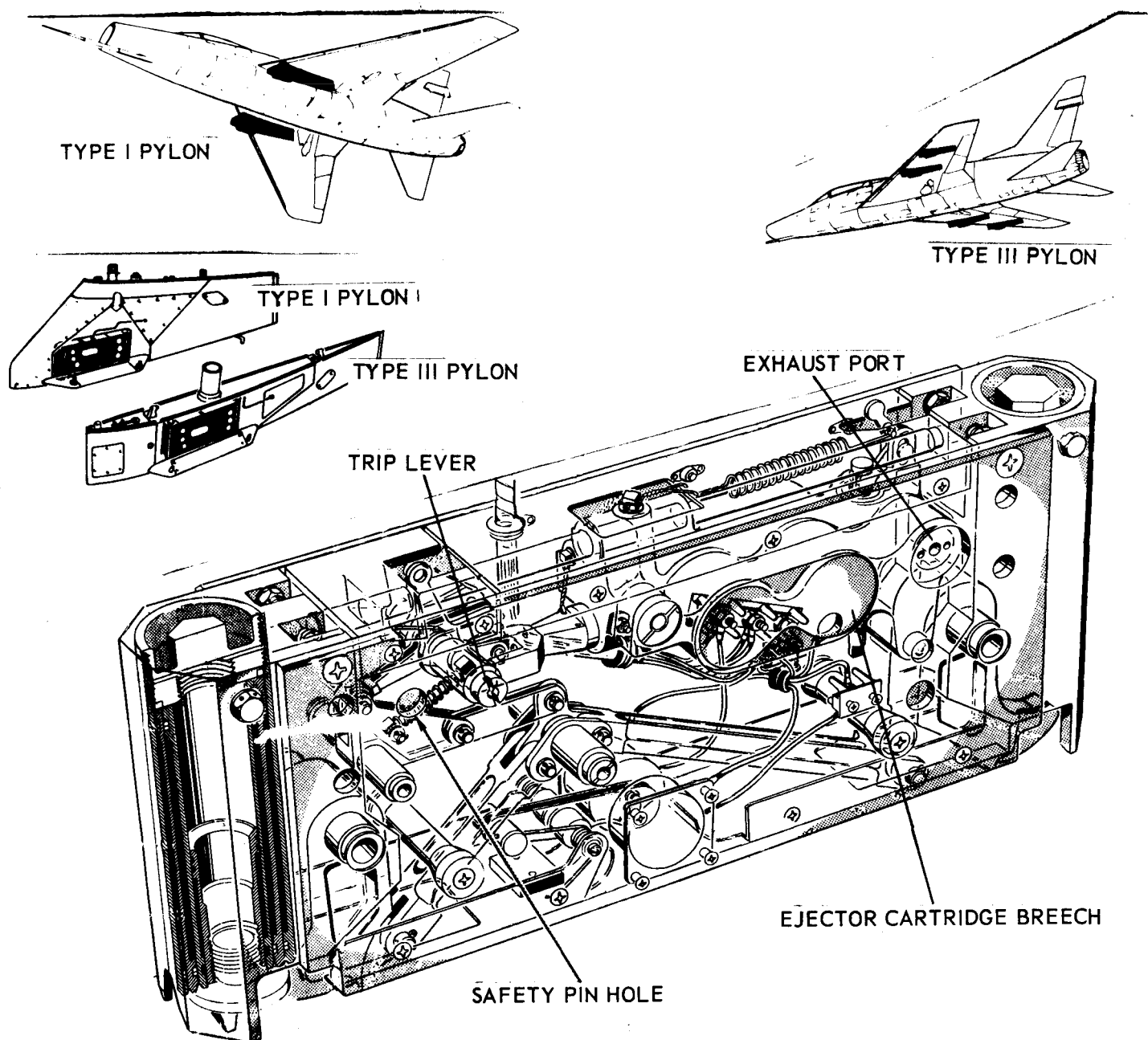


Figure 5. 14" BER for Type I and Type III Pylons (F-100)

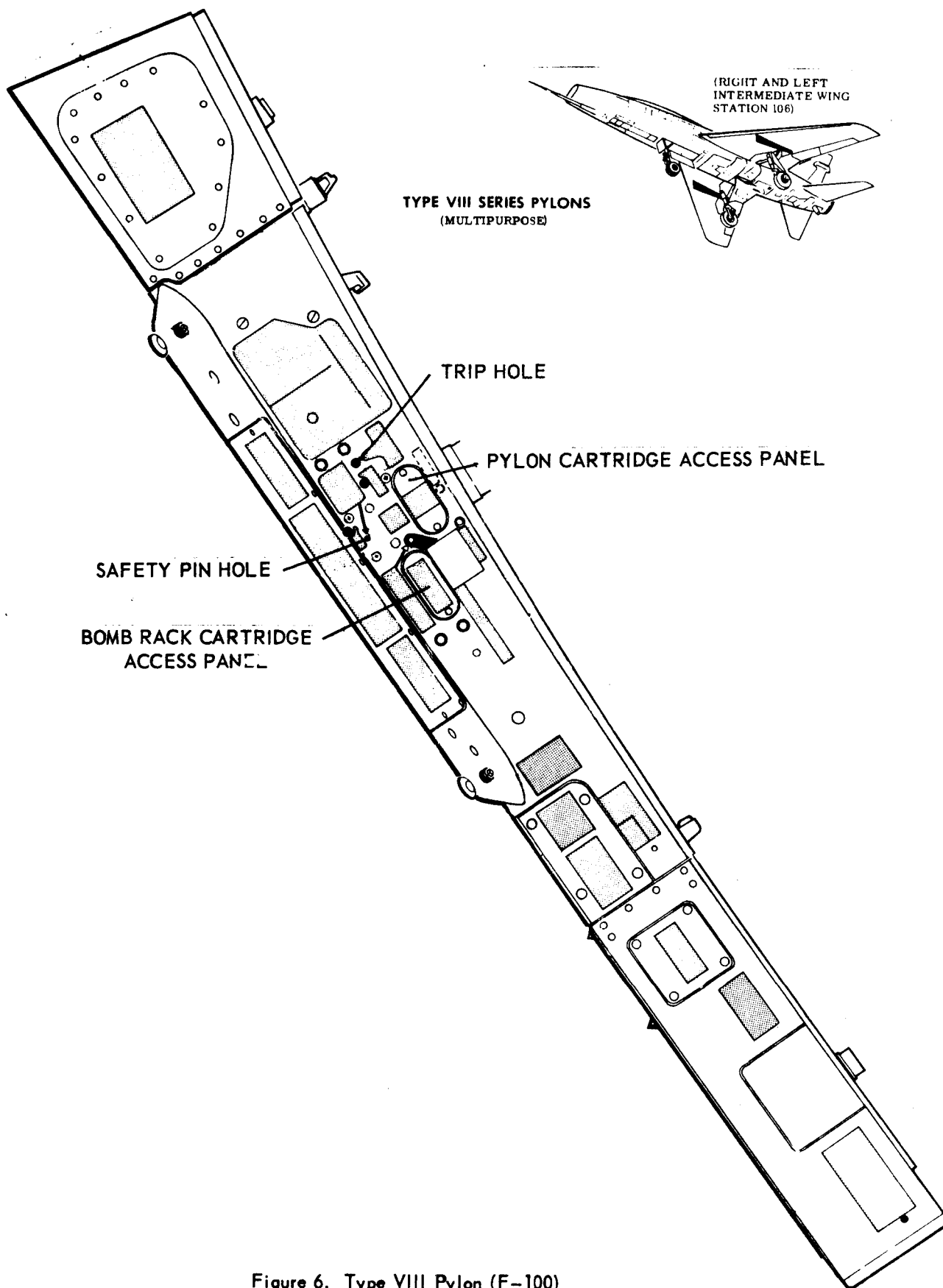


Figure 6. Type VIII Pylon (F-100)

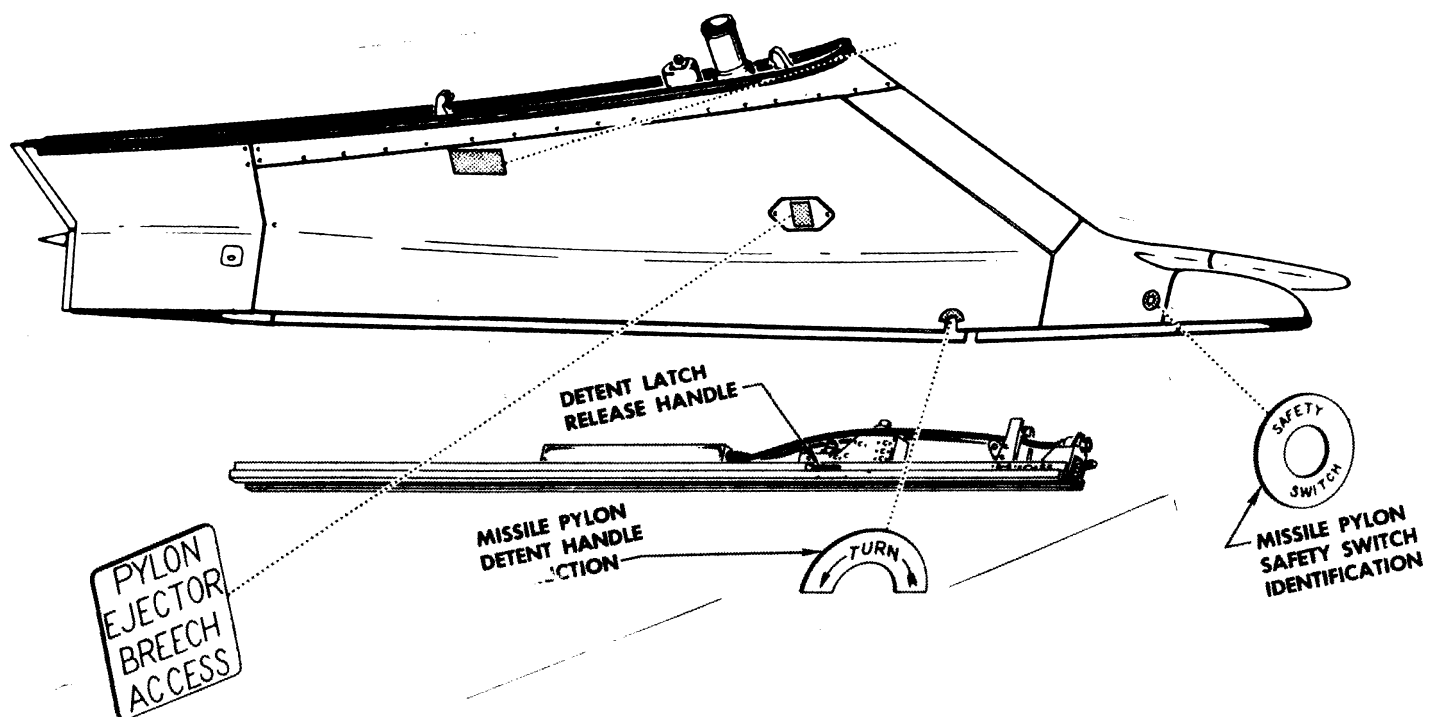


Figure 7. Type IX (AIM-9) Pylon for F-100

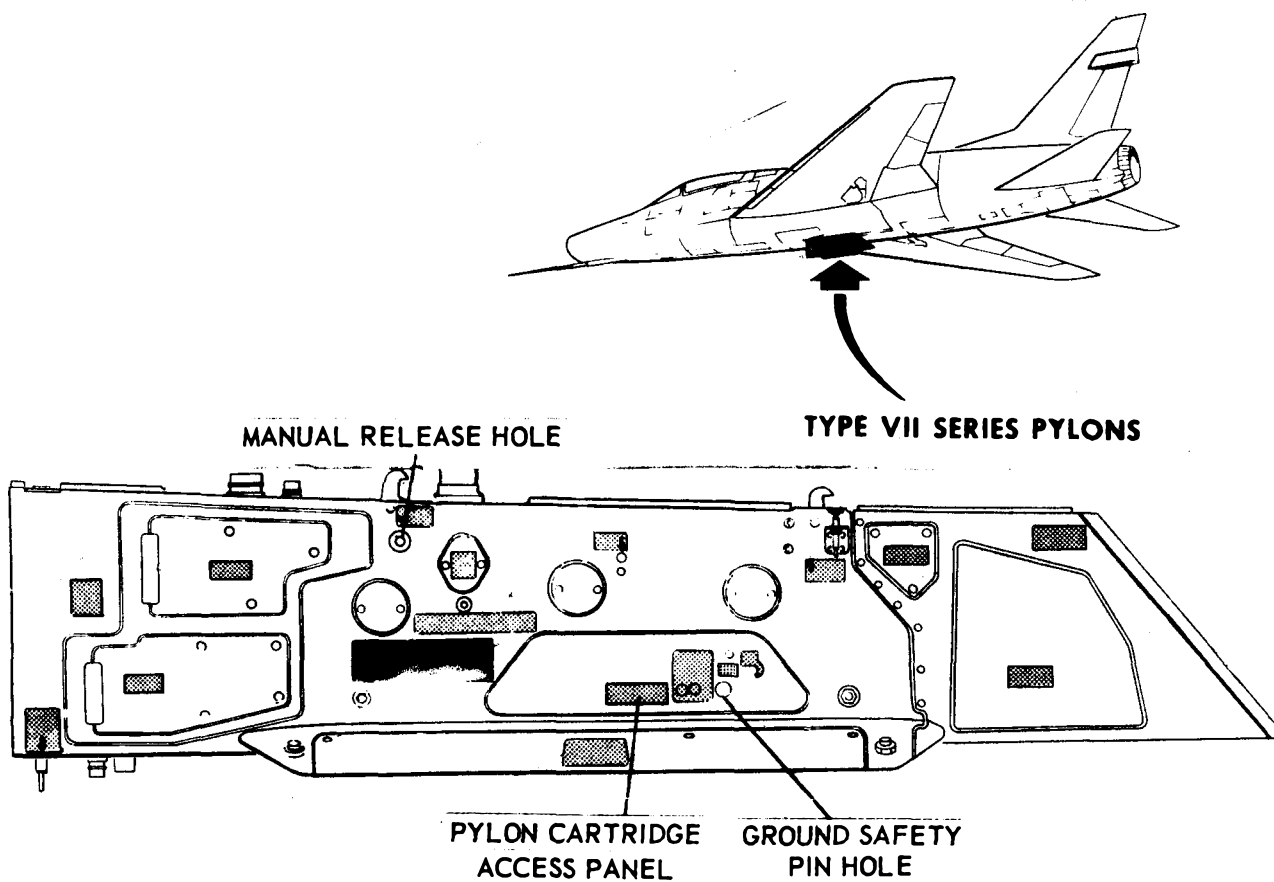


Figure 8. Type VII Pylon (F-100)

GUNNERY SYSTEM

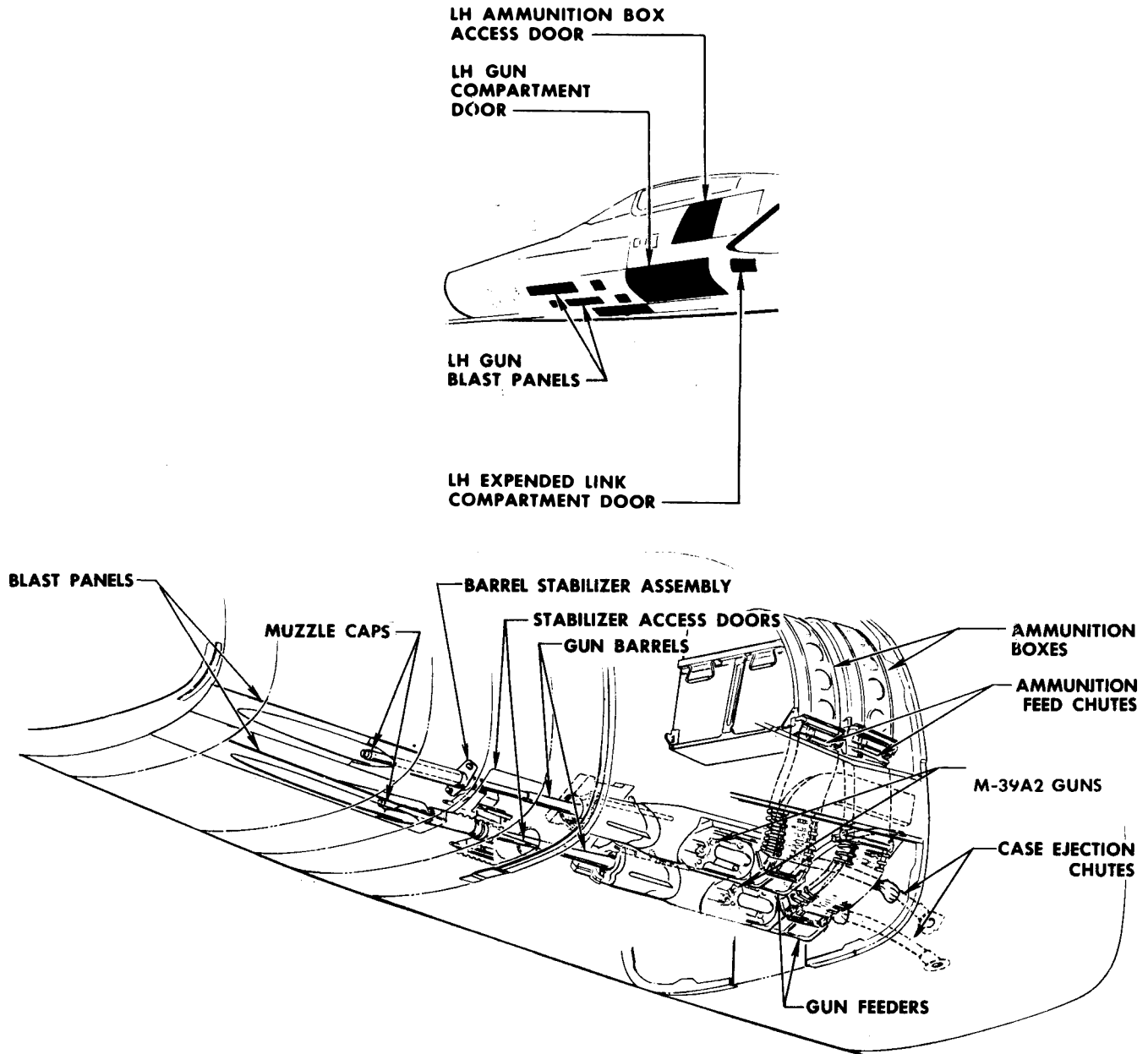


Figure 9. Gunnery System (F-100)

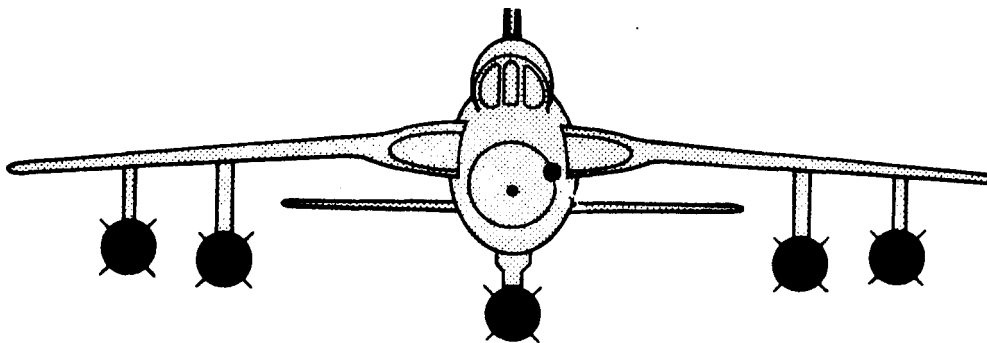
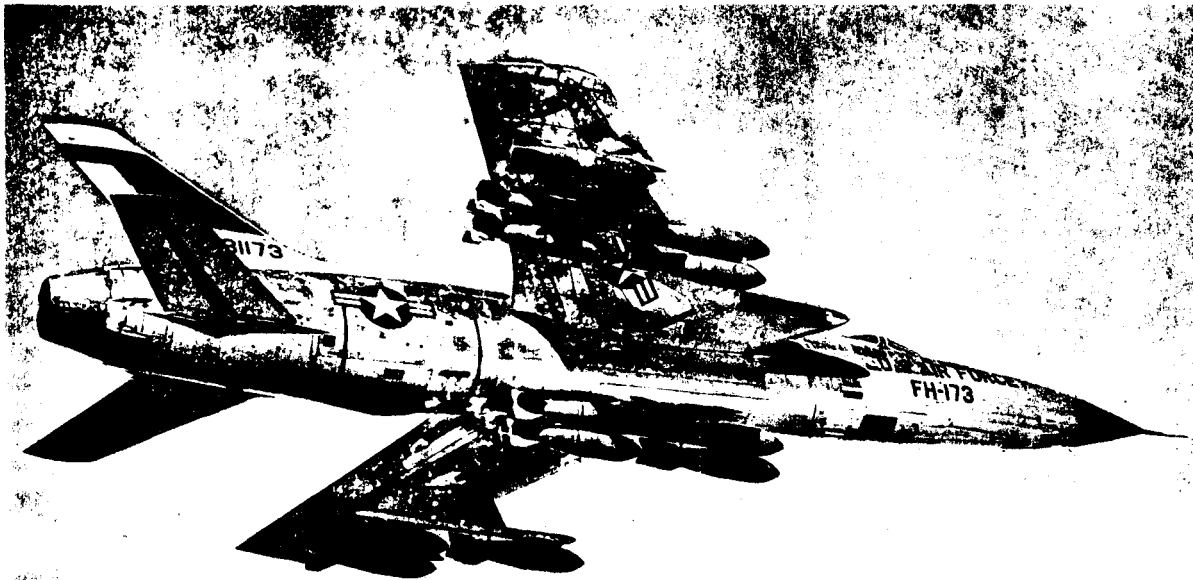


Figure 10. Typical F-105 with Airminutions Stations

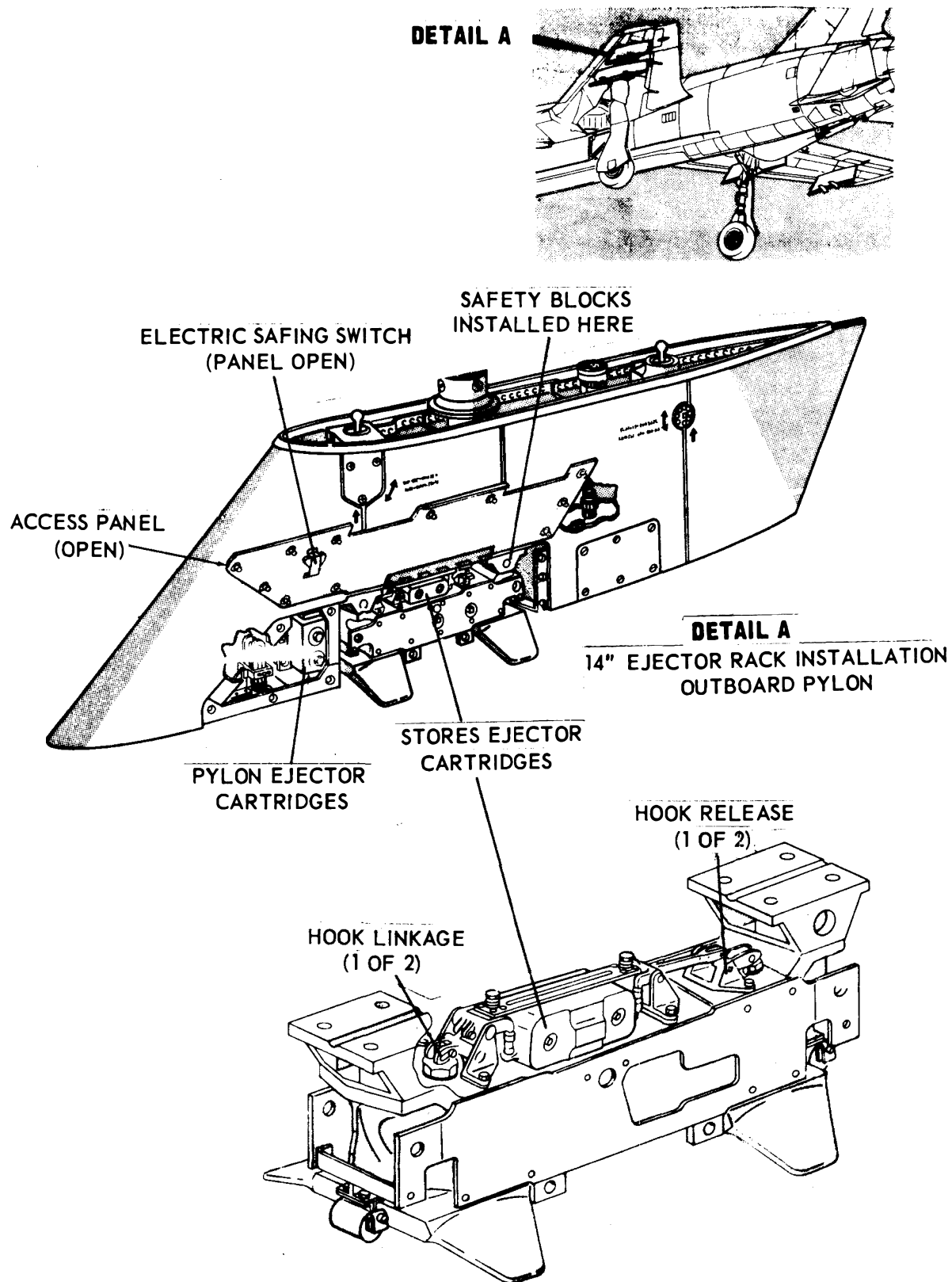


Figure 11. Outboard Universal Pylon (F-105)

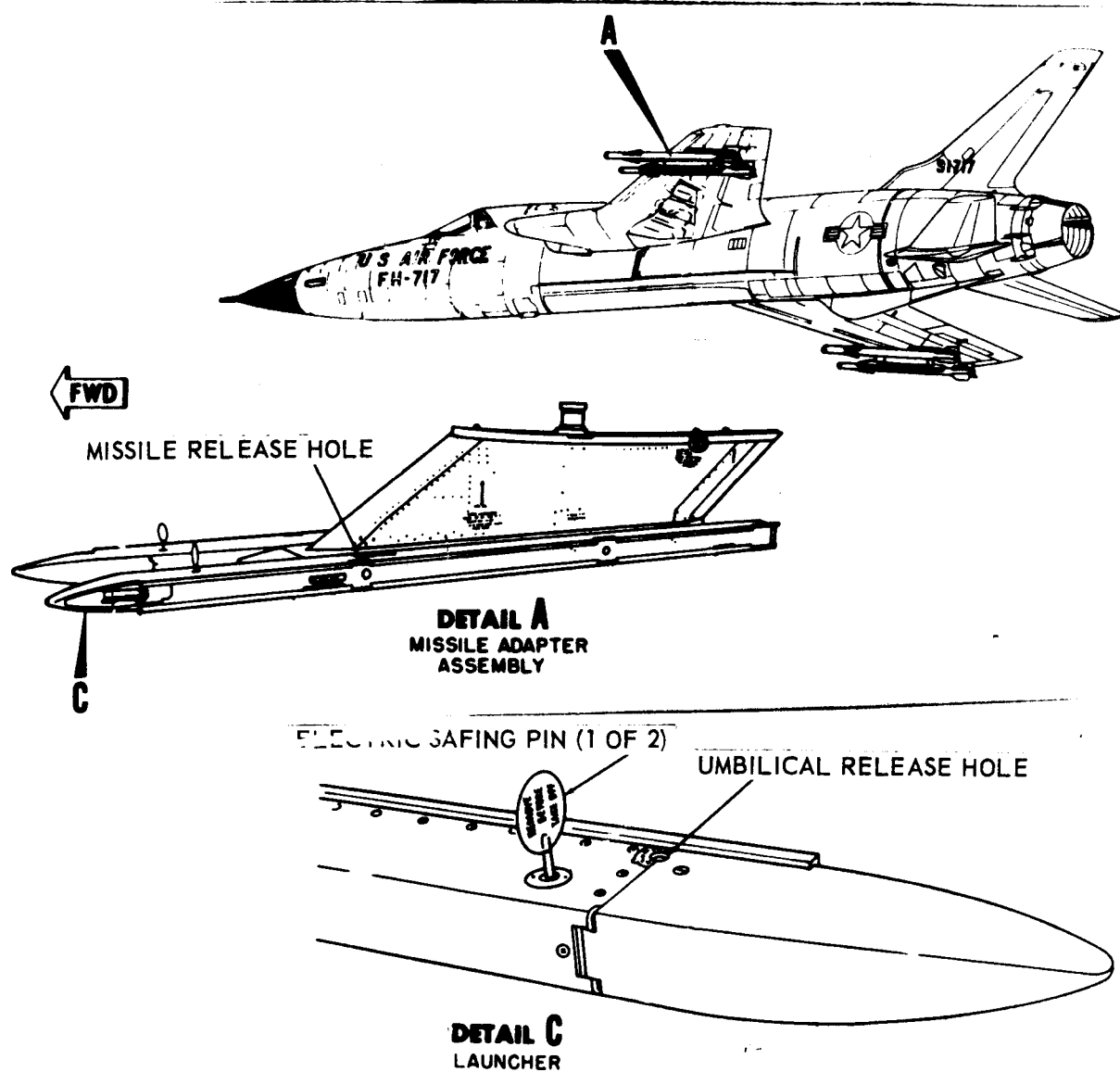


Figure 12. Aero 3B Missile Launcher (F-105)

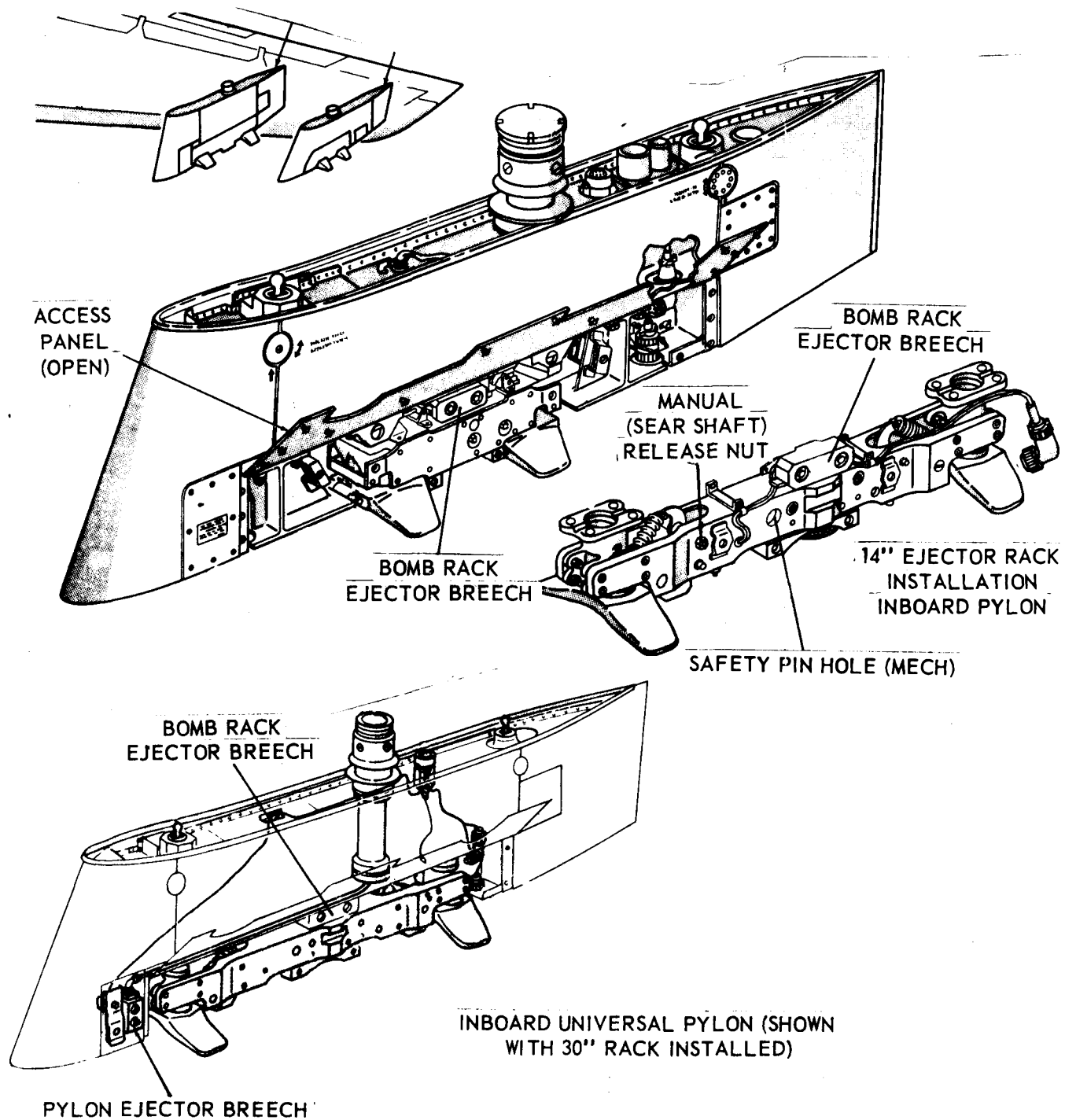


Figure 13. Inboard 14'' and 30'' Universal Pylon (F-105)

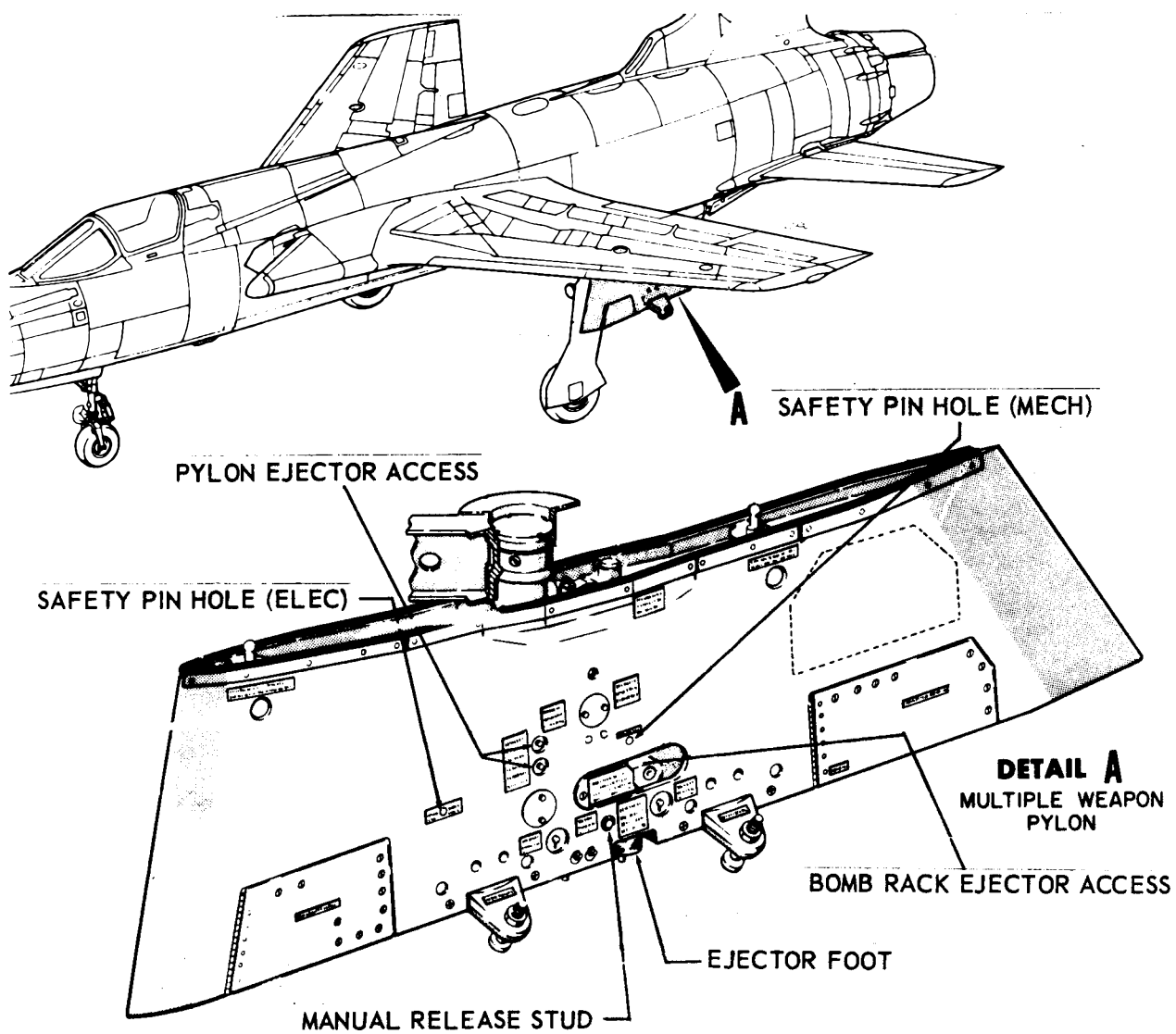


Figure 14. Inboard Multi-Weapon Pylon (F-105)

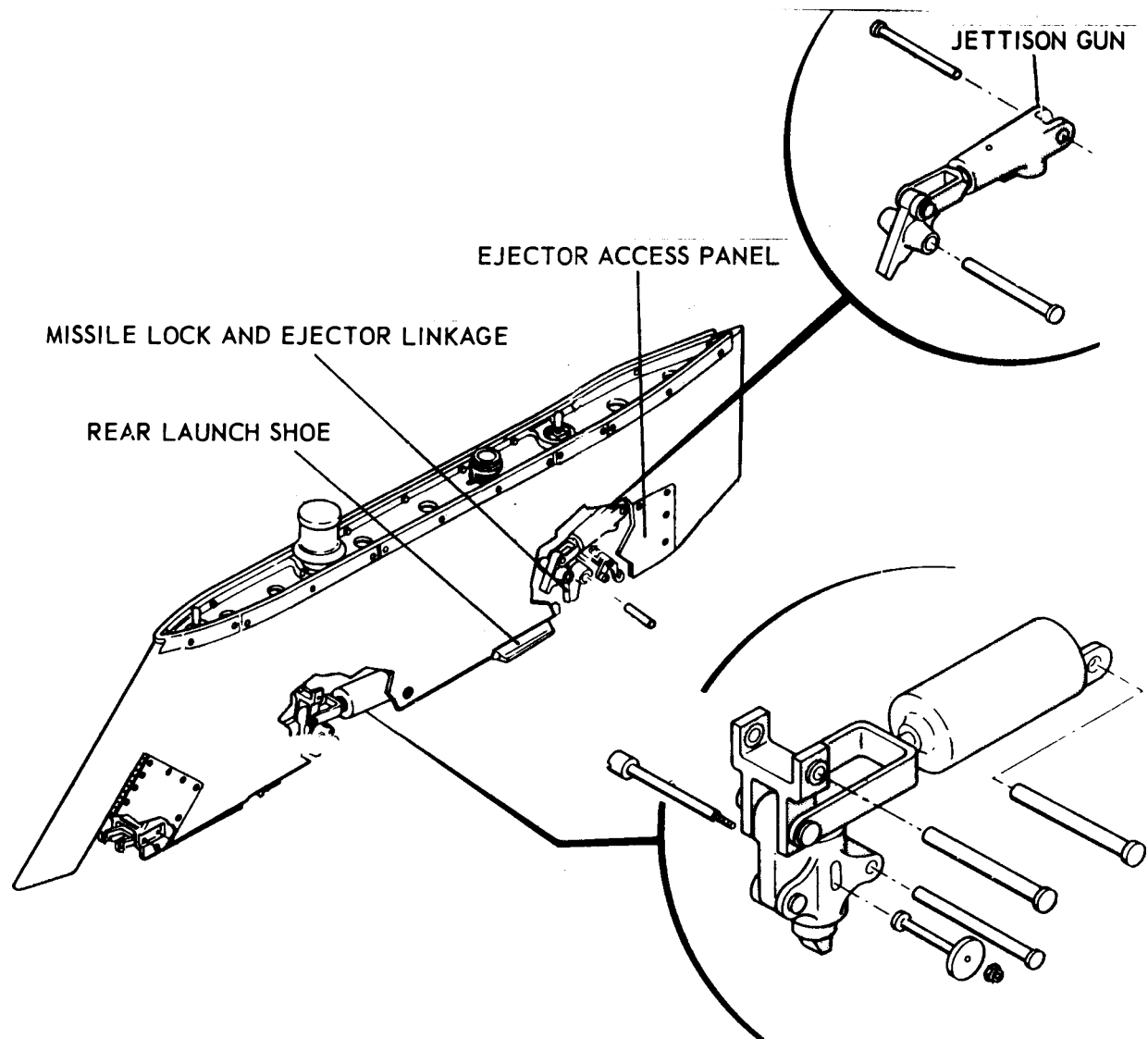


Figure 15. GAM-83 Adapter (F-105)

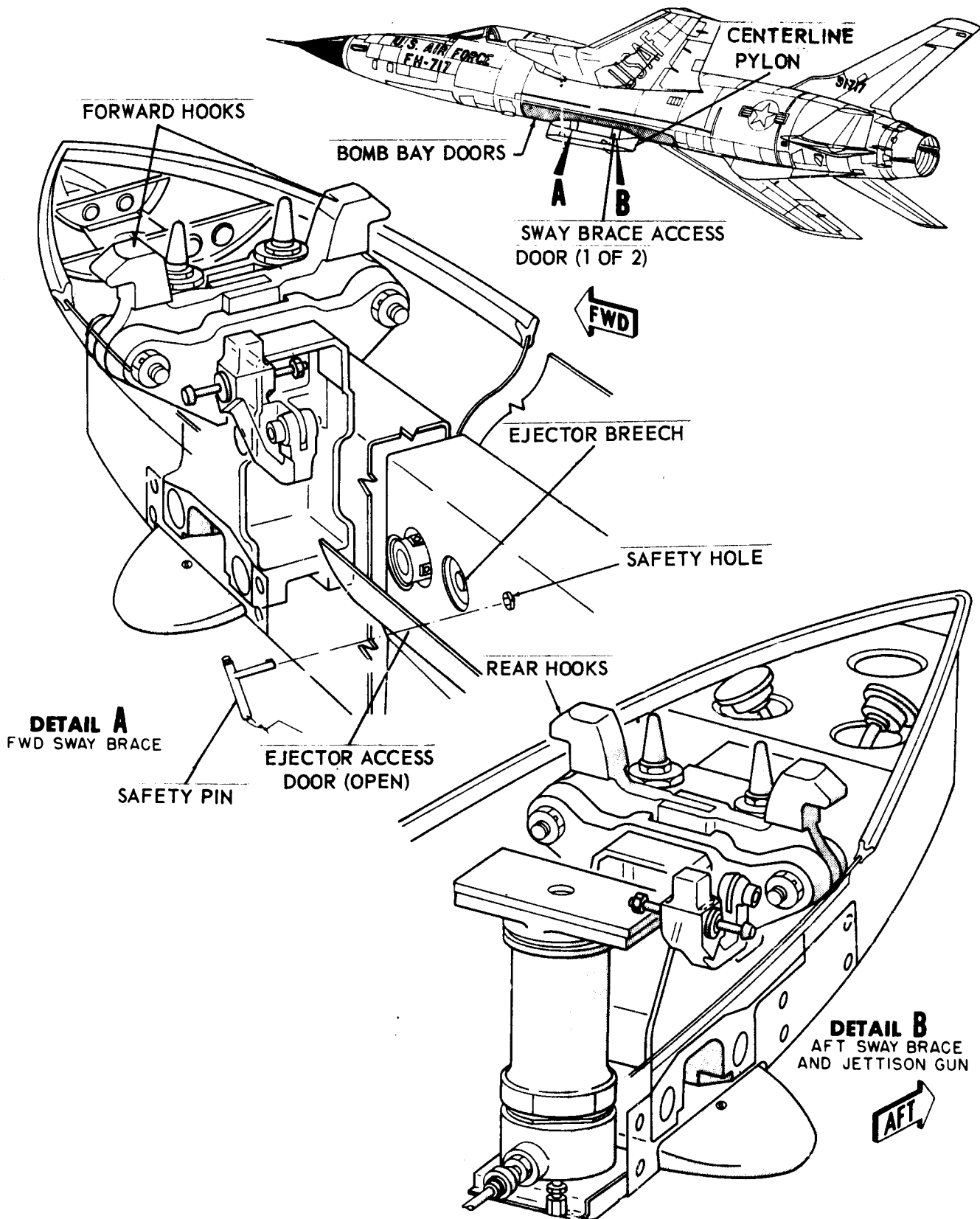
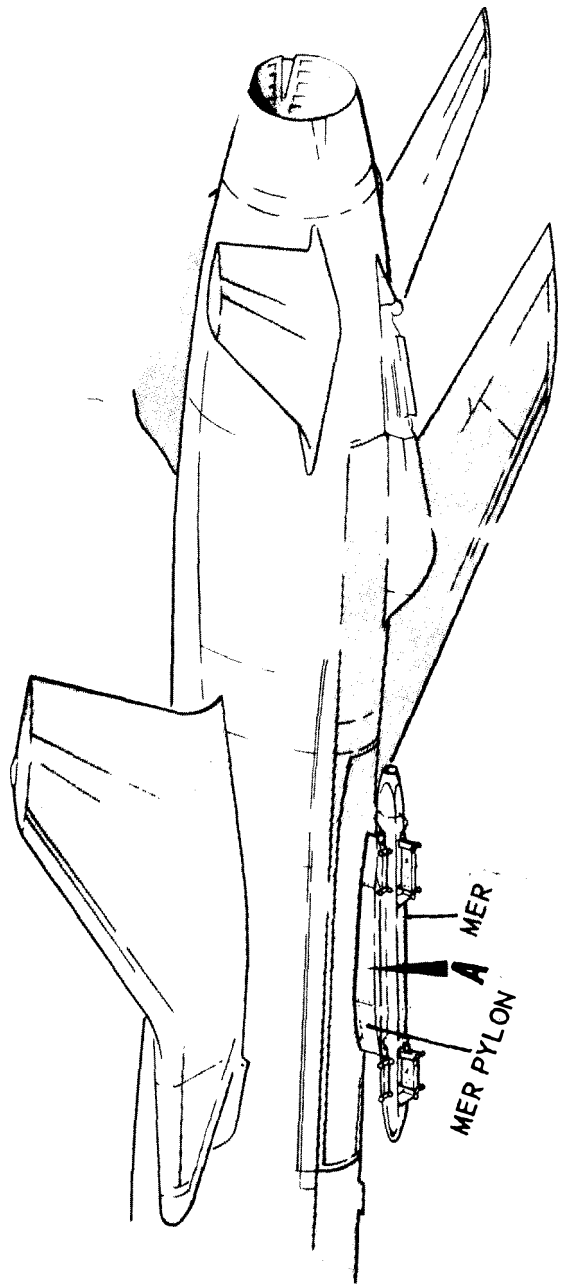


Figure 16. Centerline Fuel Tank Pylon



10-37

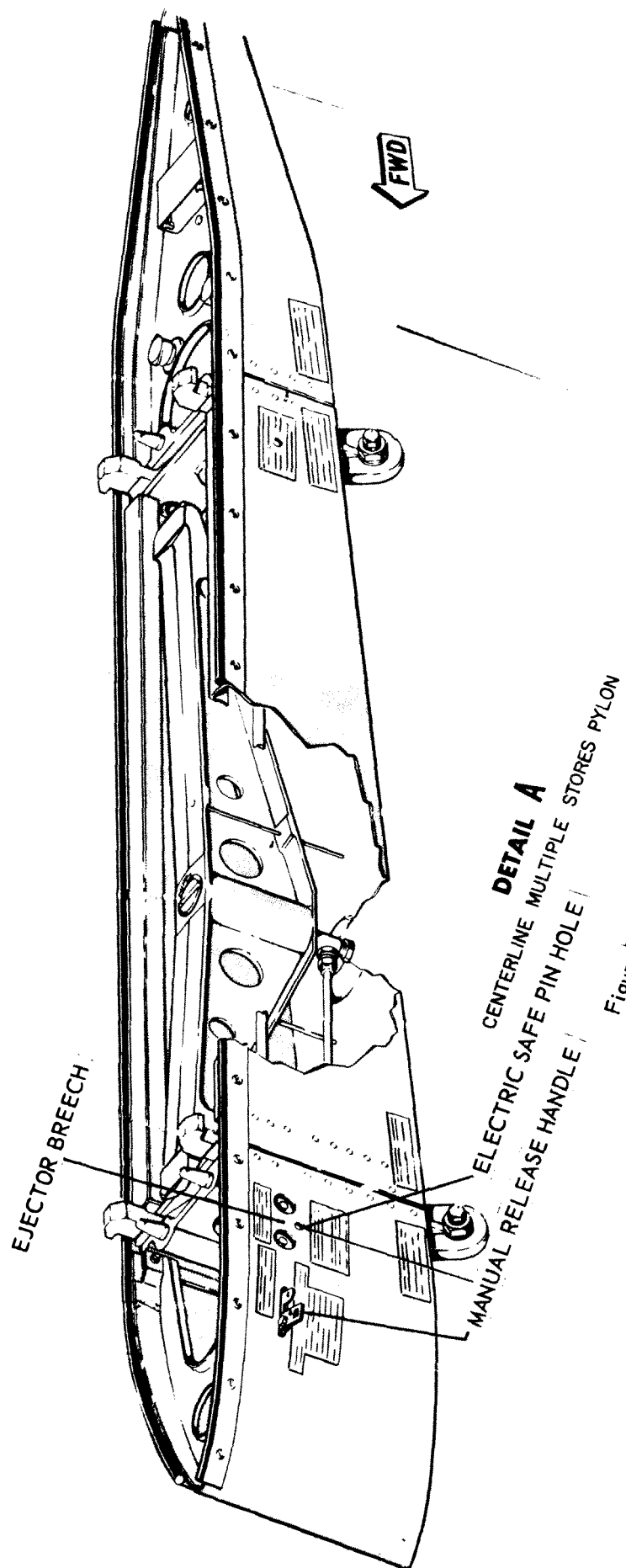


Figure 17. Fuselage Multi-ejector Rack (MER) Pylon (F-105)

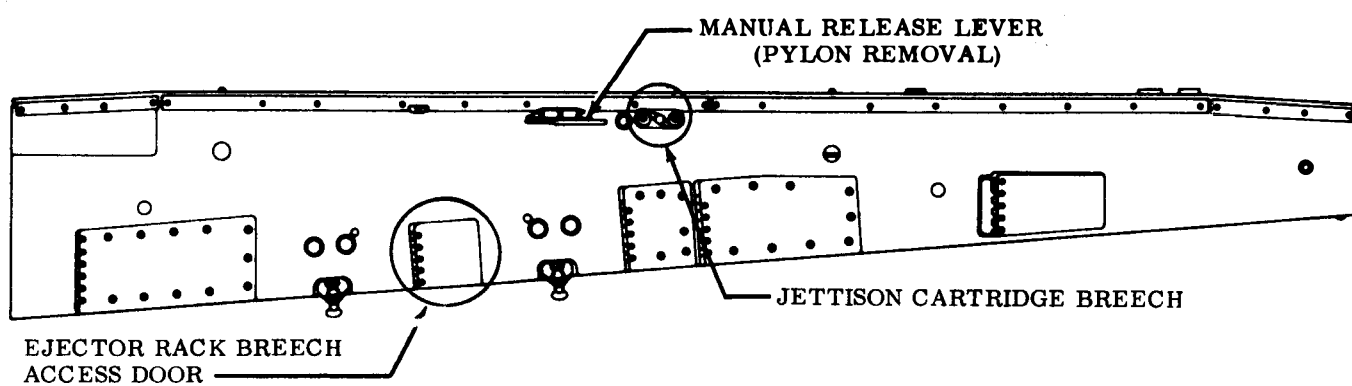


Figure 18. Fuselage Multi-weapon Pylon

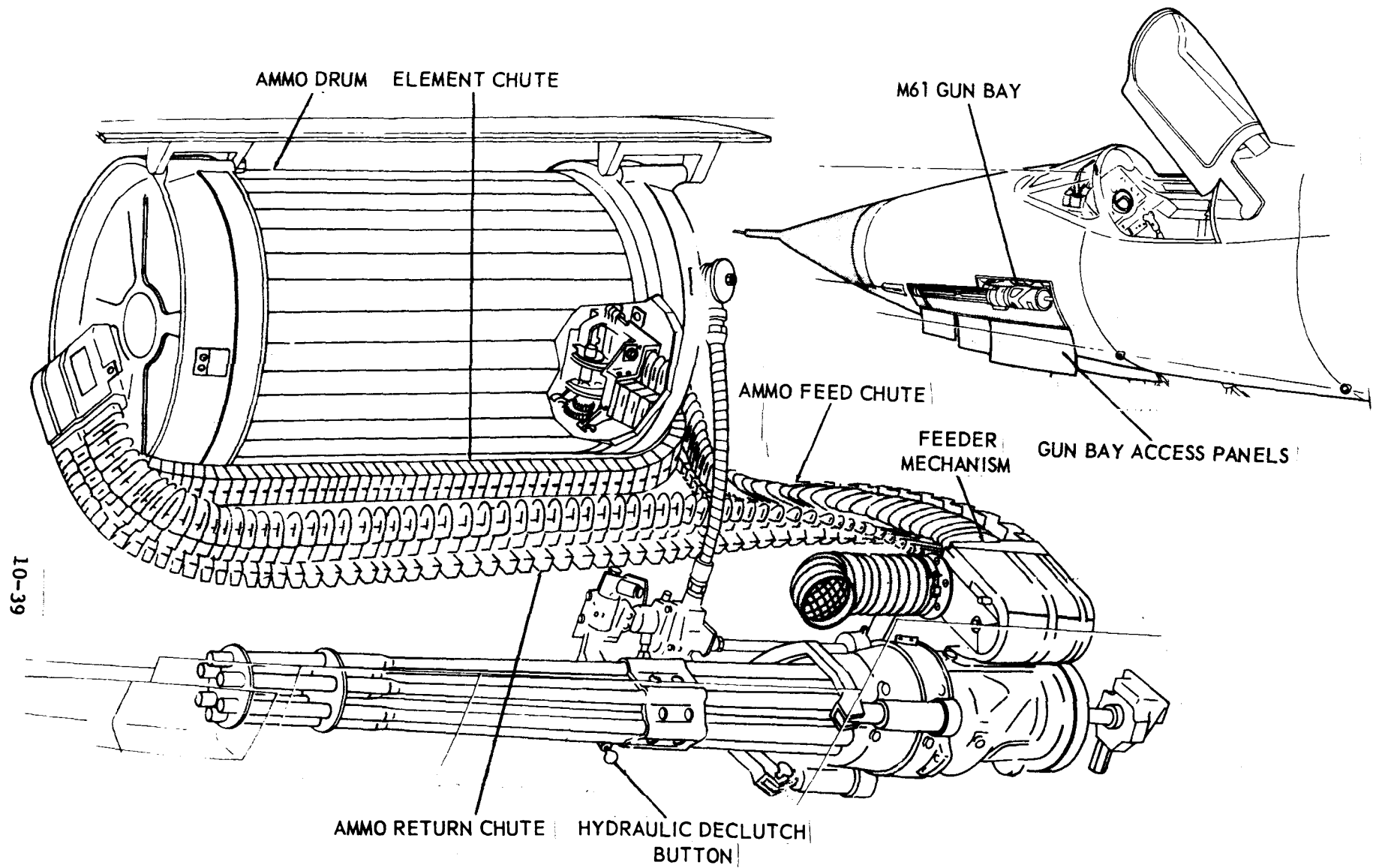


Figure 19. Gunnery System (F-105)

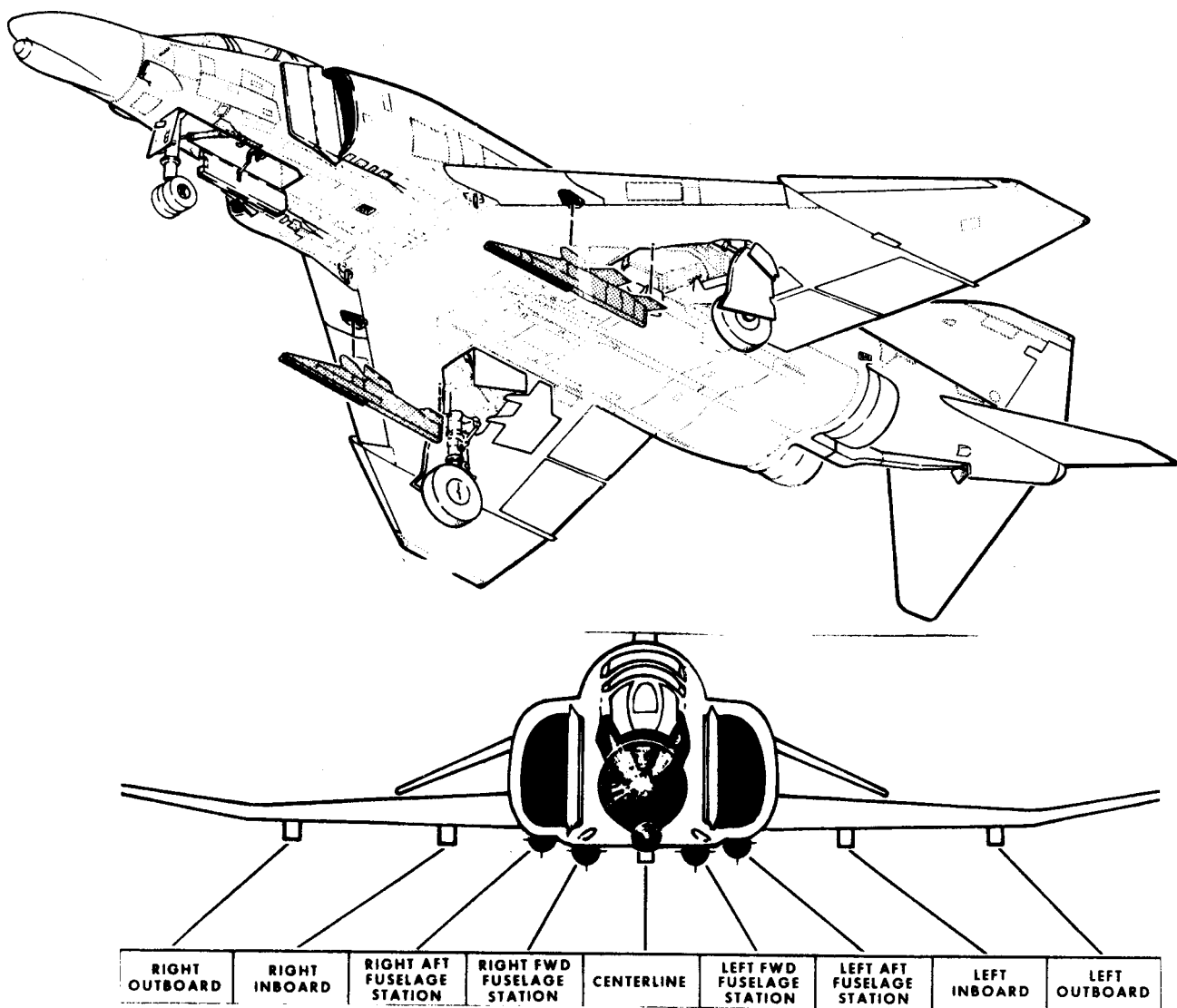


Figure 20. Typical F-4 with Airmunition Stations

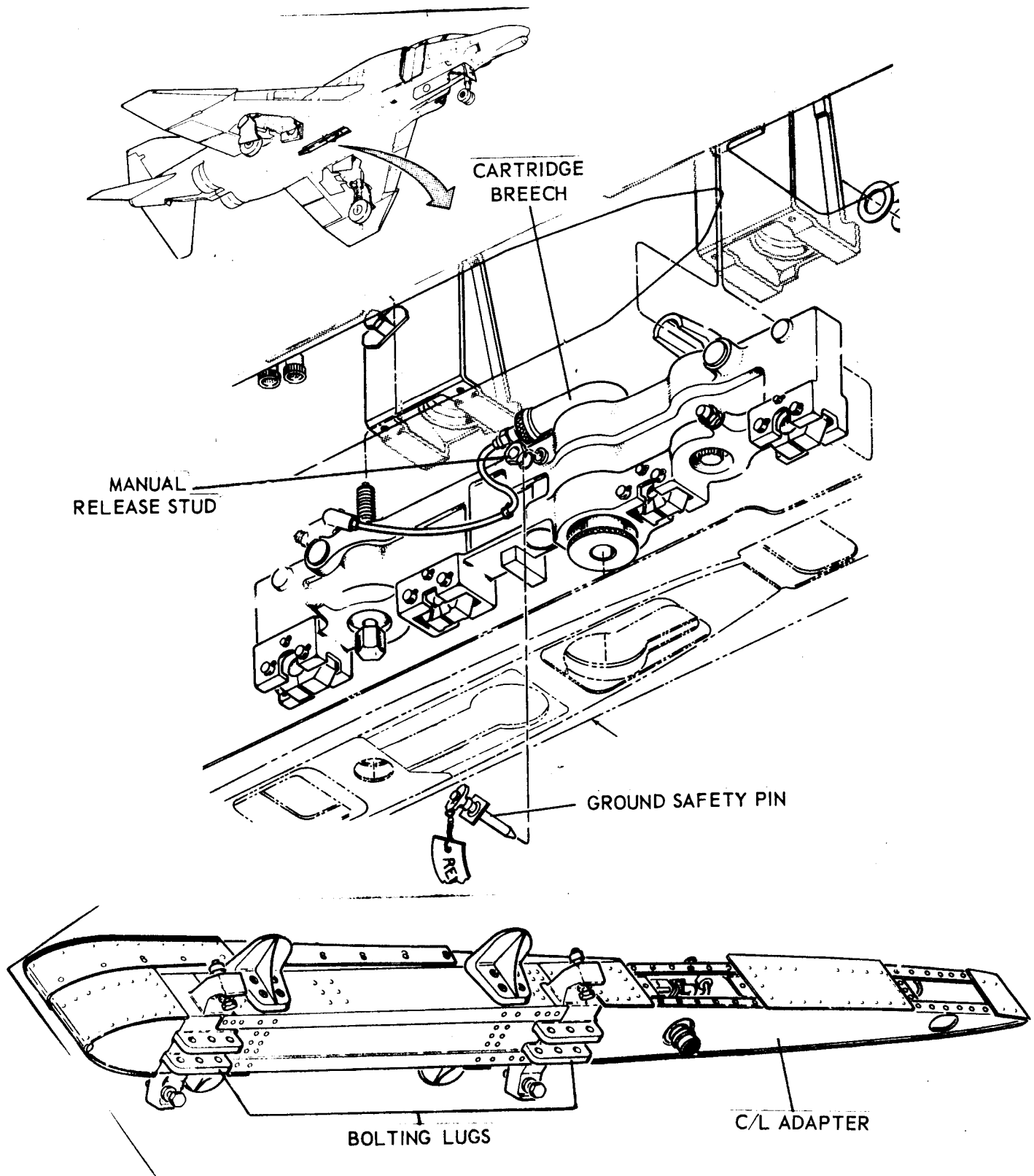


Figure 21. Aero 27/A Bomb Rack and C/L Adapter

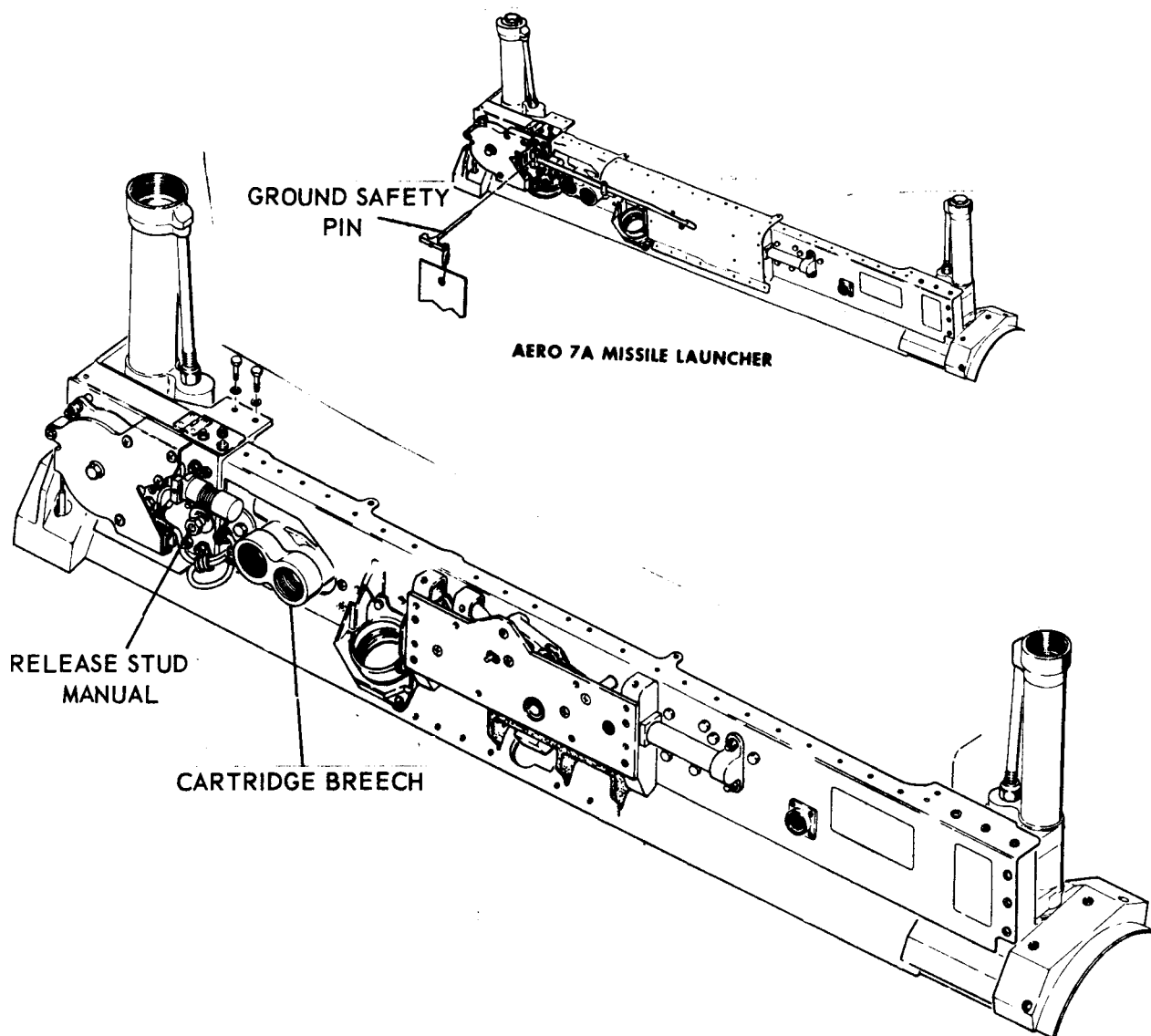


Figure 22. Aero 7A Missile Launcher (F-4)

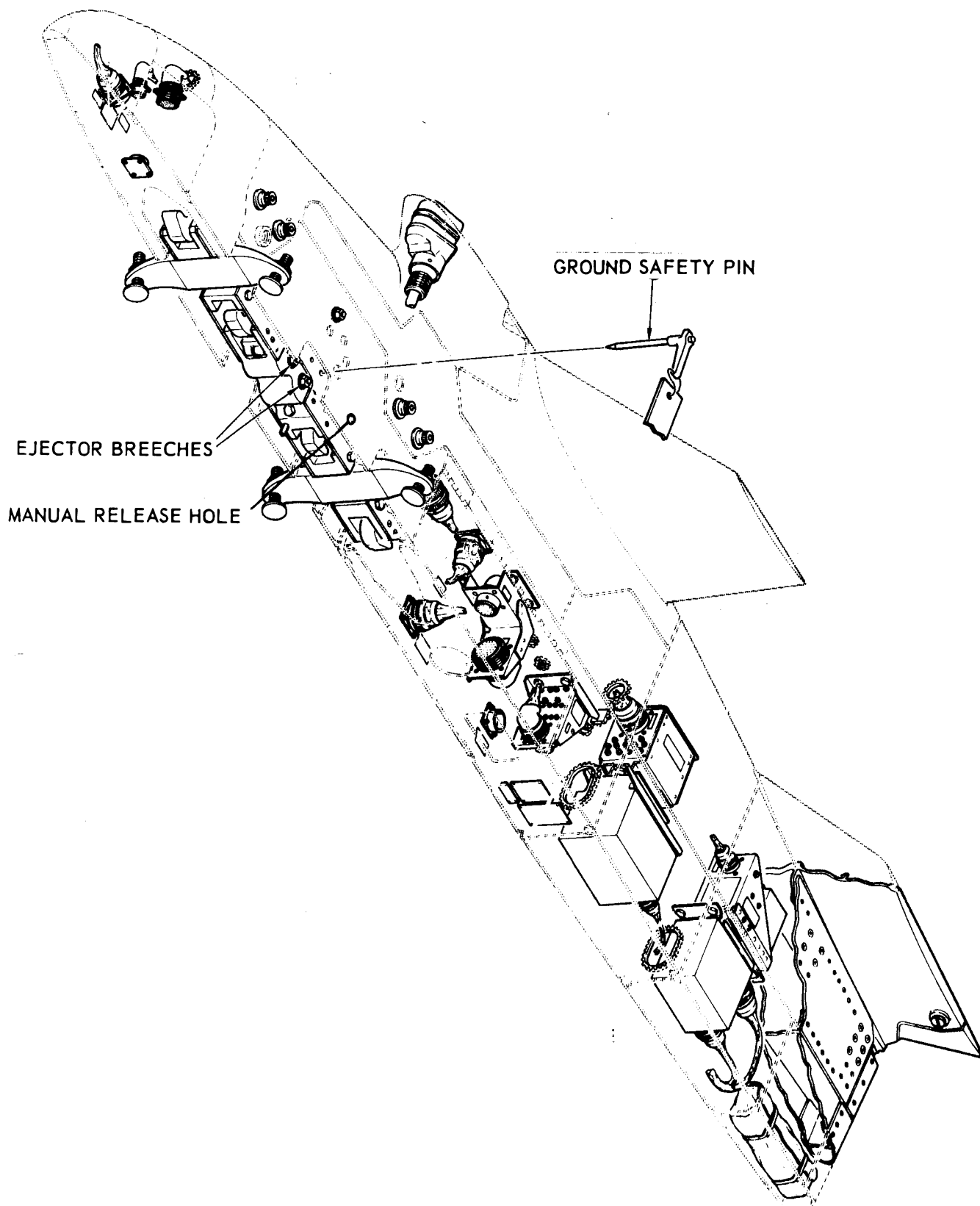


Figure 23. Inboard Multi-weapon Pylon (F-4)

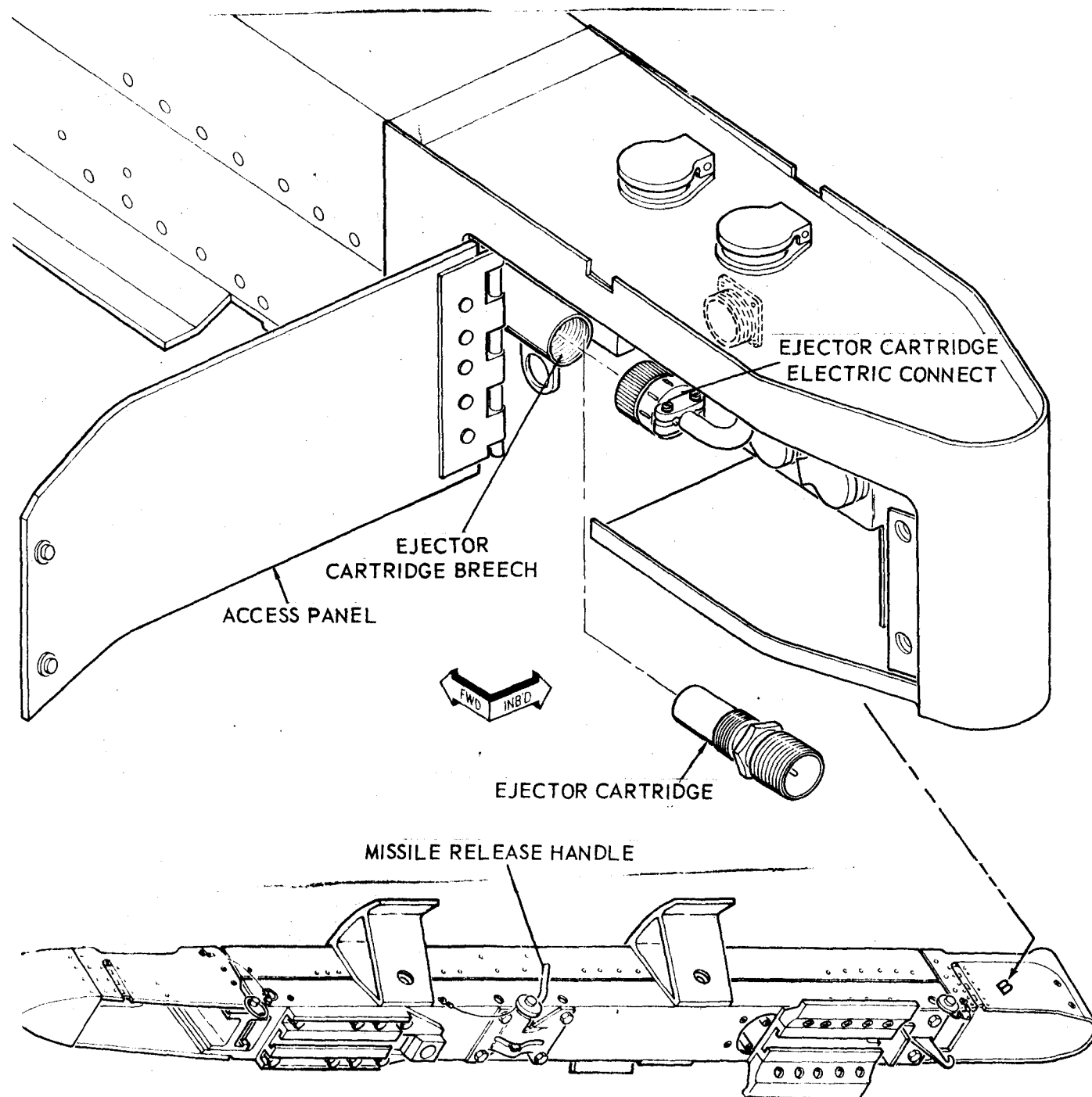


Figure 24. LAU-34A Missile Launcher

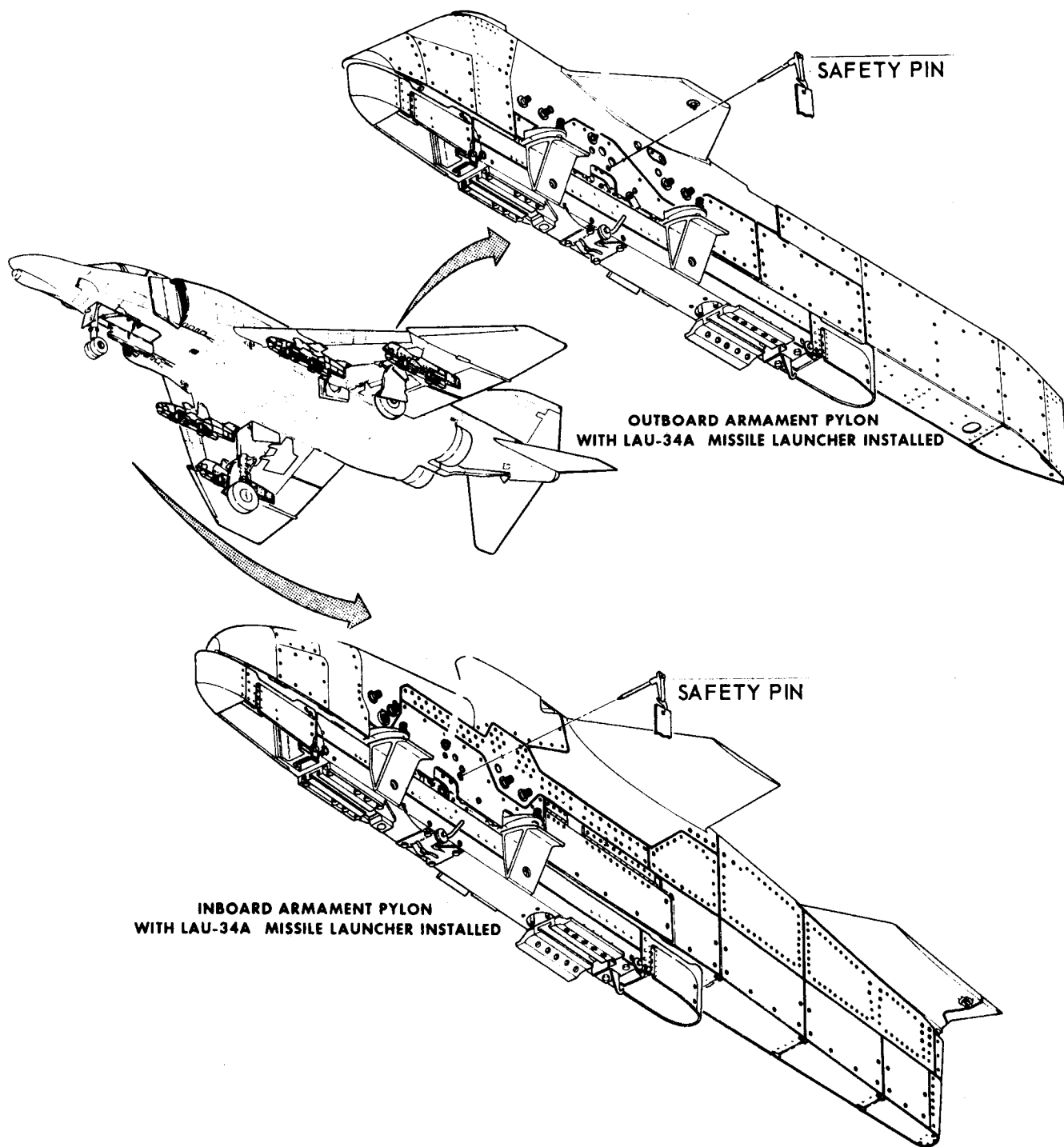


Figure 25. LAU-34A Missile Launcher Installation

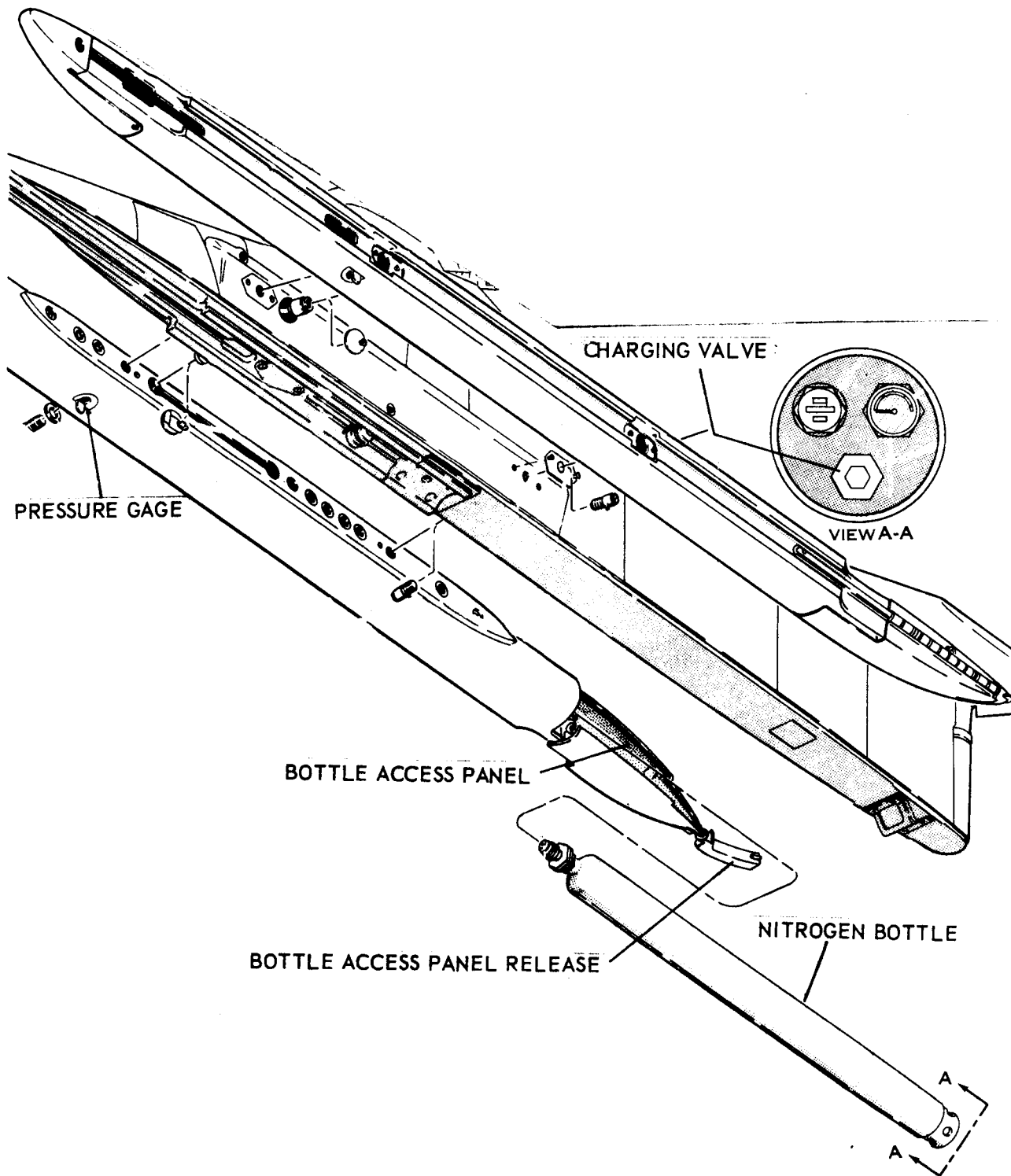


Figure 26. LAU-7A Wing Missile Launcher Showing Nitrogen Bottle

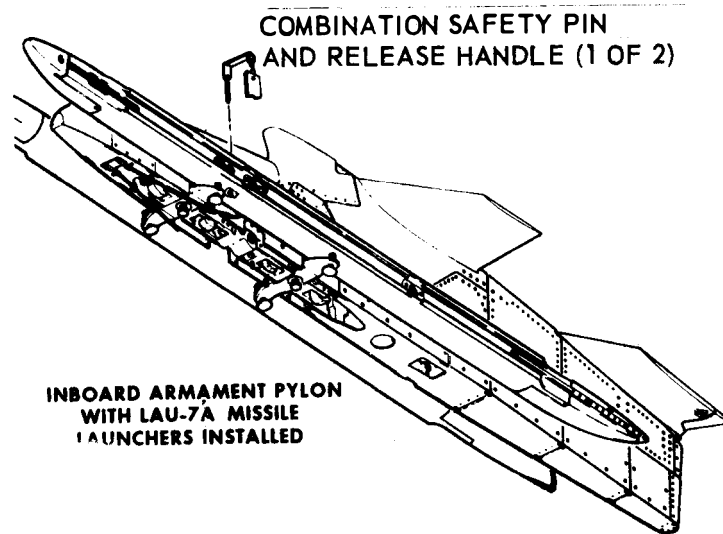


Figure 27. LAU-7A Missile Launcher Installed on Pylon (F-4)

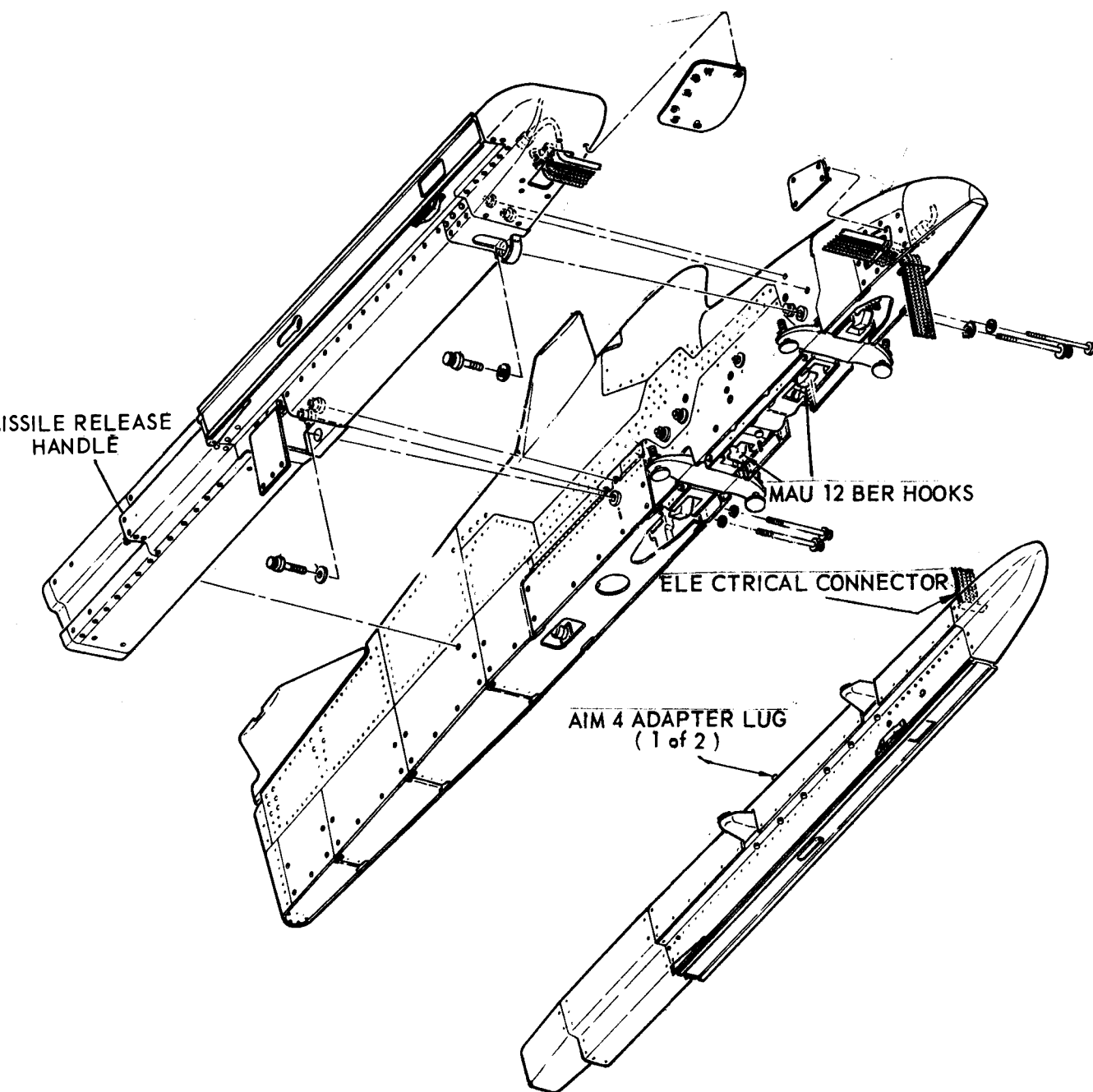


Figure 28. AIM-4 Adapters and Pylon (F-4)

DETAIL A

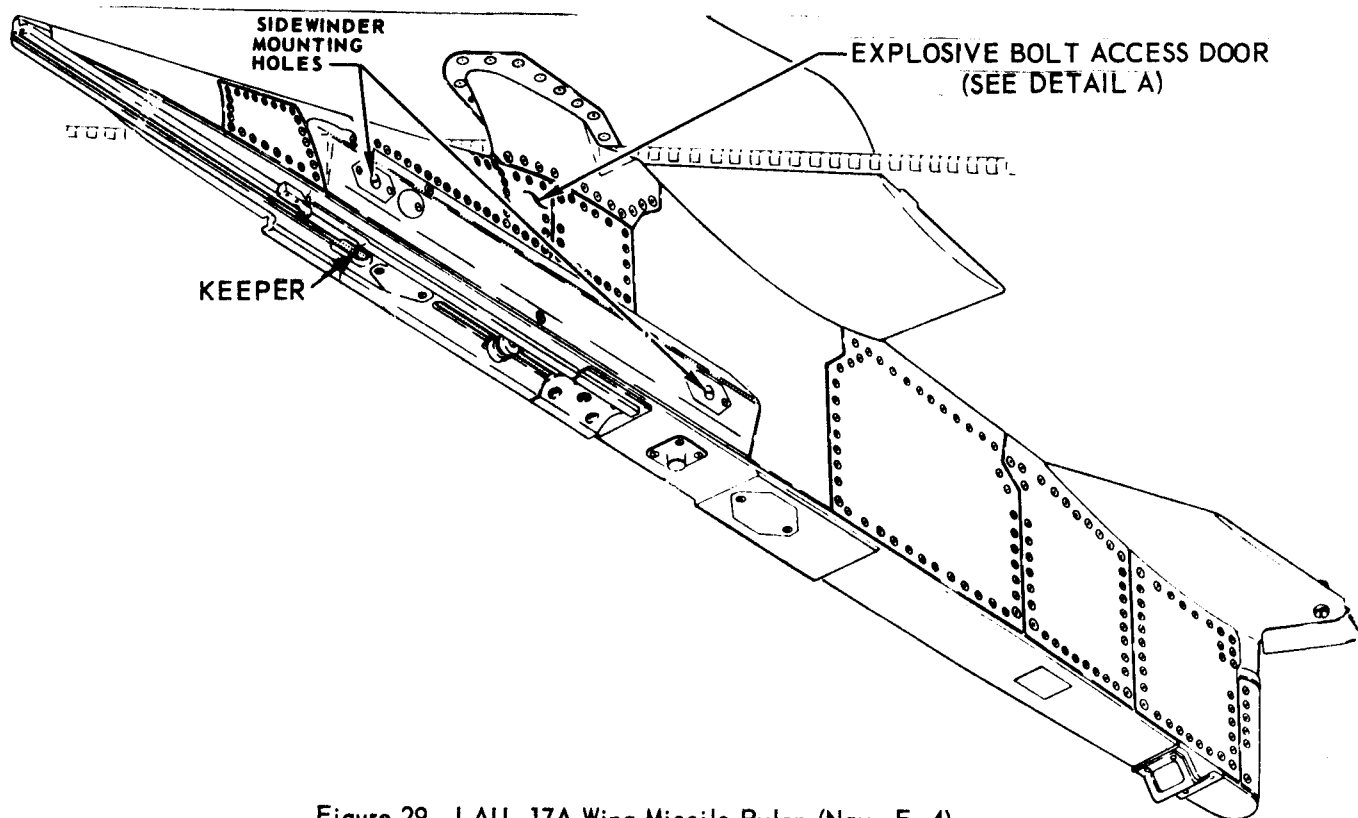
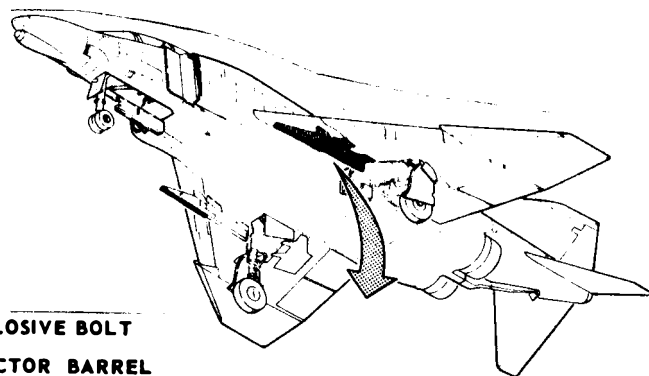
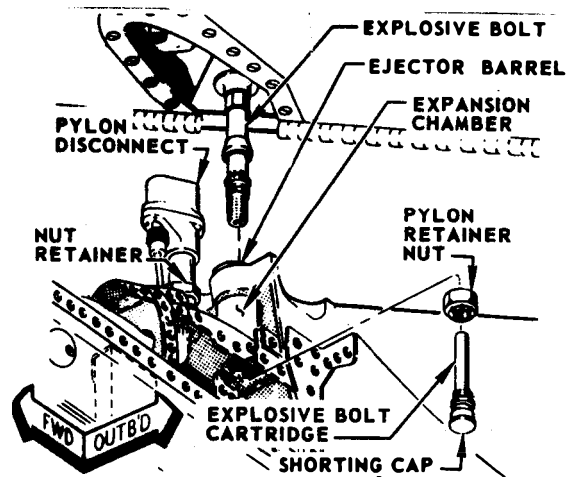


Figure 29. LAU-17A Wing Missile Pylon (Navy F-4)

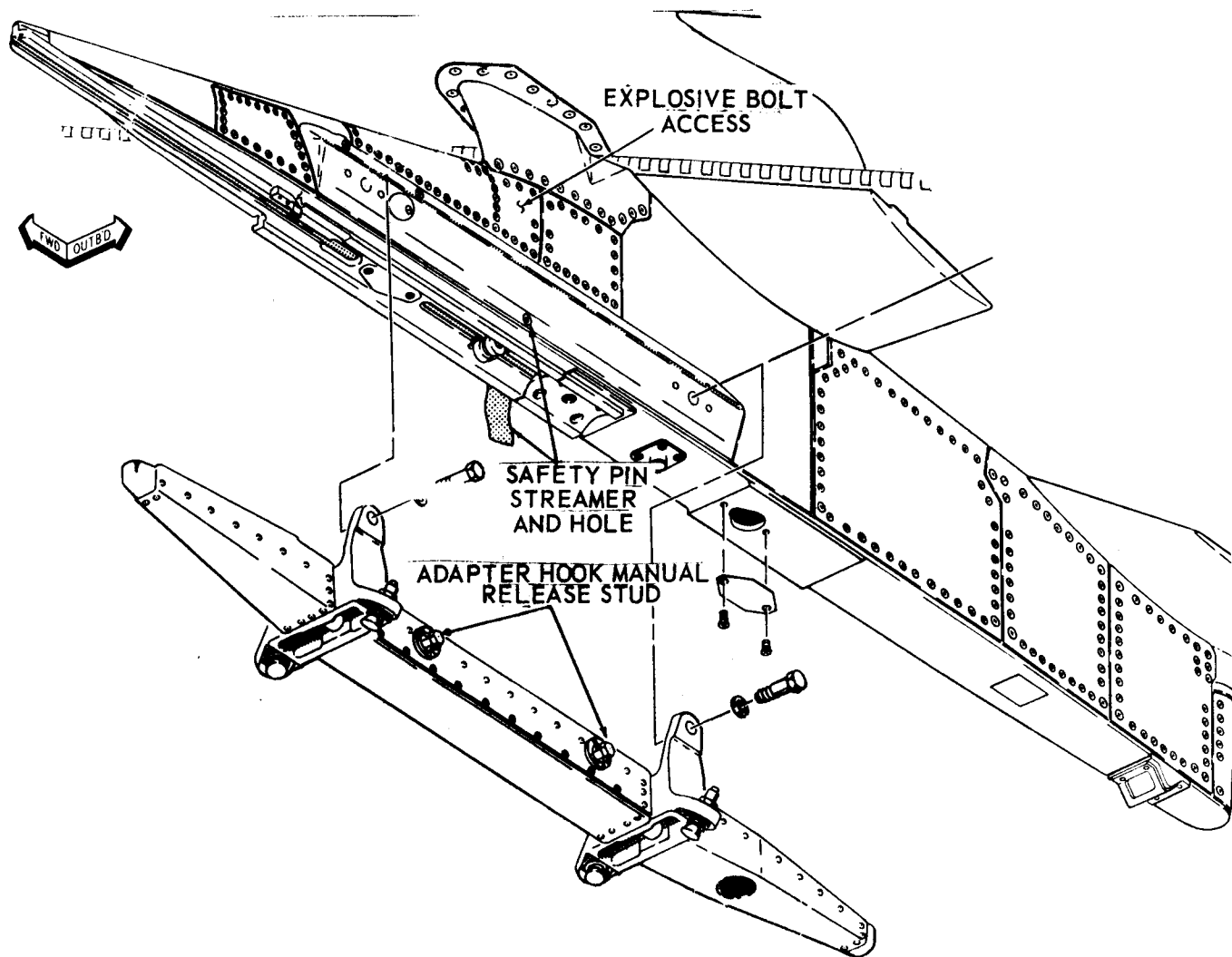


Figure 30. LAU-17A and 30" Lug Adapter (Navy F-4)

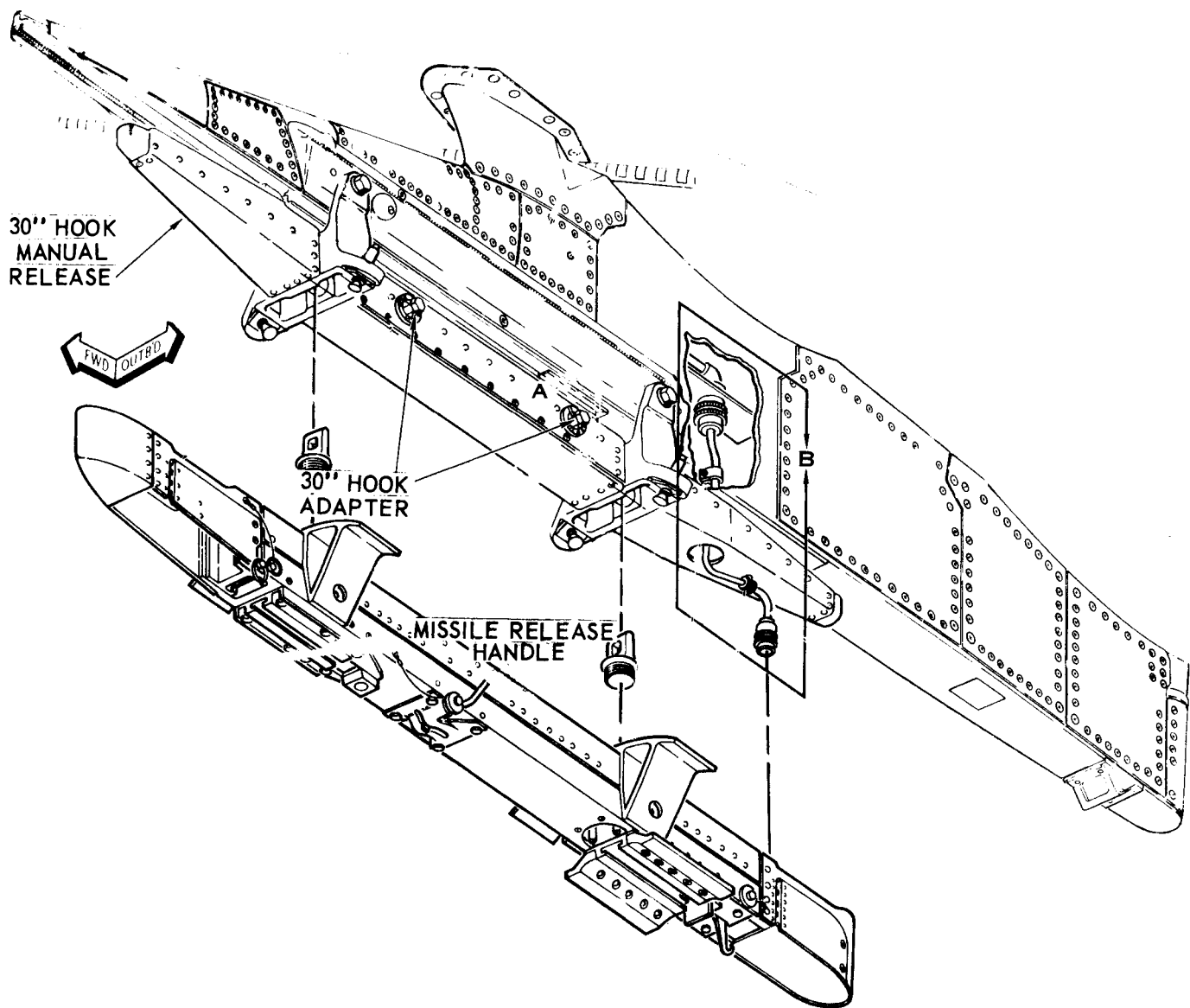


Figure 31. LAU-17A Pylon with LAU-34 Launcher

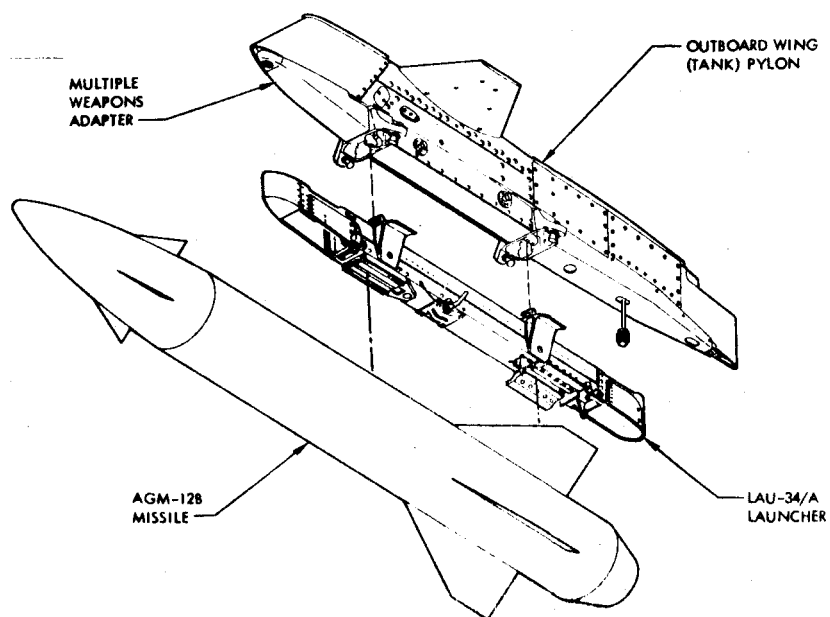
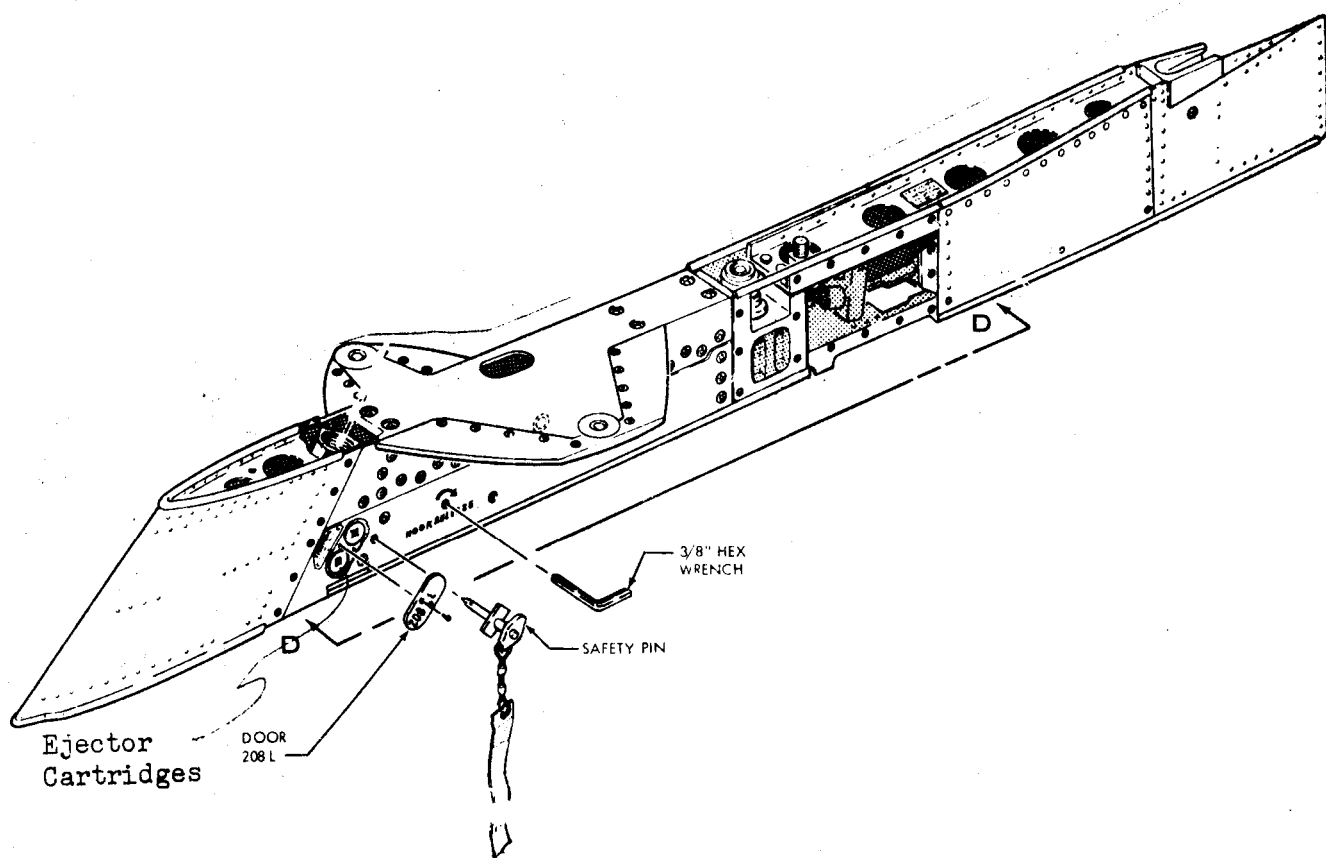


Figure 32. Outboard Wing Pylon Adapted for AGM-12B (Navy F-4)

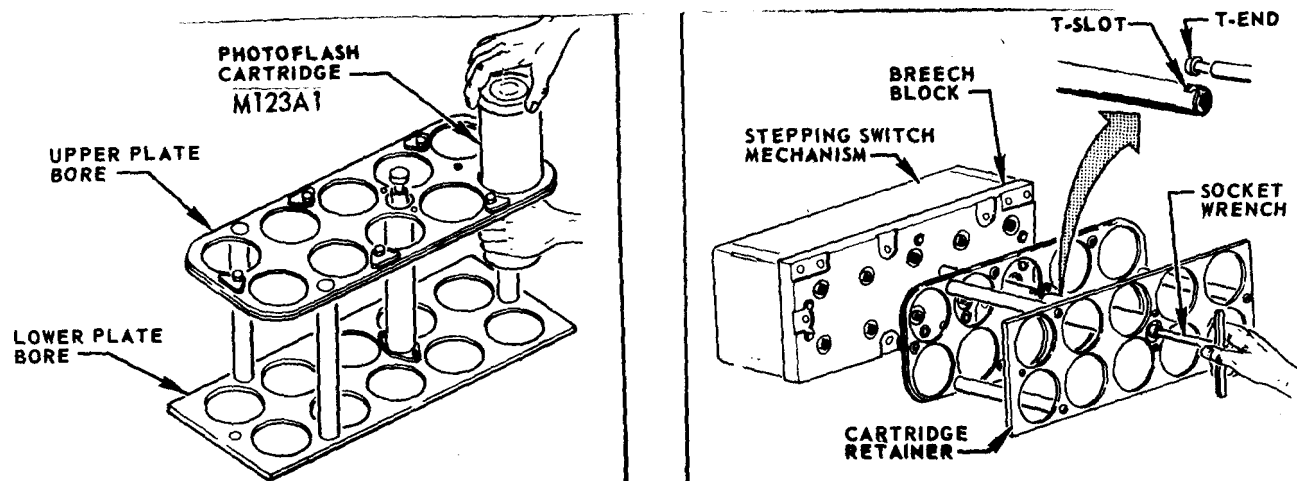


Figure 33. Photoflash Cartridge Holders (RF-4)

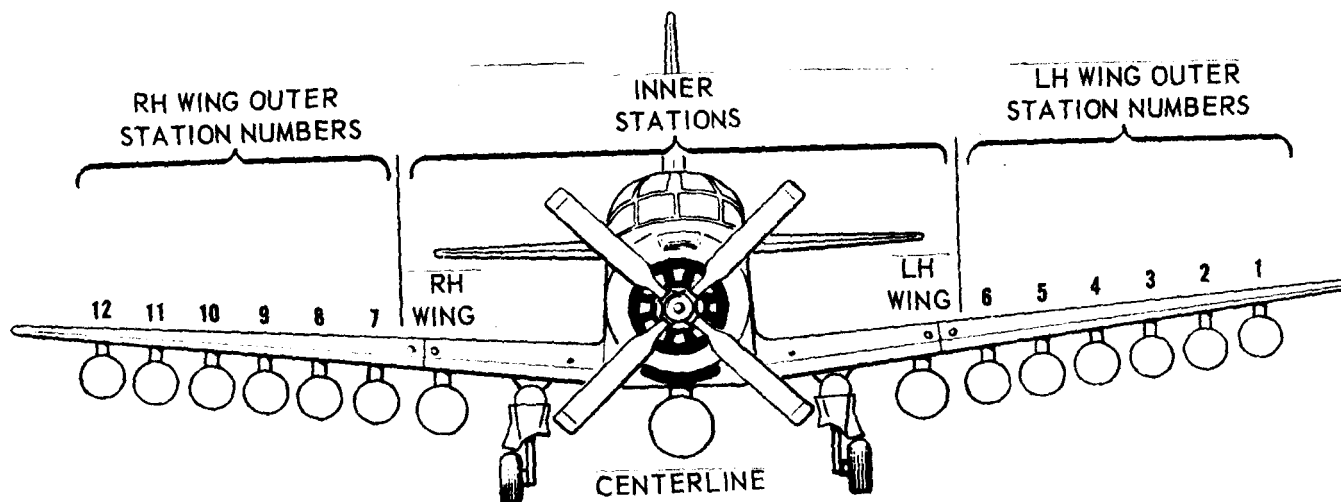


Figure 34. A-1E Aircraft with Airmunition Stations

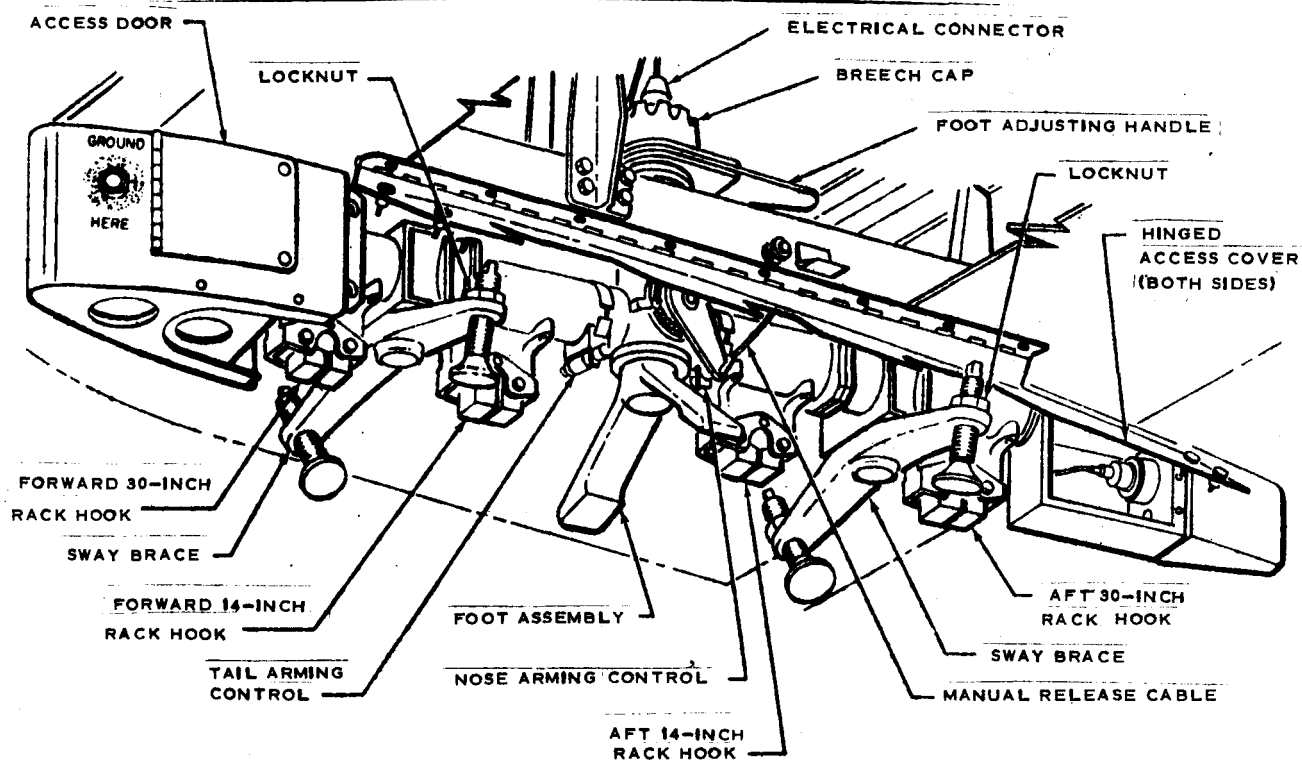


Figure 35. Aero 3A Bomb Ejector Rack (A-1E)