RESTRICTED

OP 998

(SECOND REVISION)

AIRCRAFT PYROTECHNICS AND ACCESSORIES

29 MAY 1947

NAVY DEPARTMENT
BUREAU OF ORDNANCE
WASHINGTON 25, D. C.

29 May 1947

RESTRICTED

ORDNANCE PAMPHLET 998 (SECOND REVISION)

AIRCRAFT PYROTECHNICS AND ACCESSORIES

1. Ordnance Pamphlet 998 (Second Revision) contains a description of and instructions for use of all the aircraft pyrotechnics flares, photoflash bombs, markers, signals, and pyrotechnics accessories used by the Navy on the date of issue. As new items are developed, additional chapters will be distributed.

2. This publication supersedes OP 998 (First Revision) which should be destroyed.

3. War Department Bombing Tables BT PF–A–1 shall not be used in connection with Bomb, Photoflash, M46. Data contained in Chapter 7 of this publication shall be used instead.

4. This publication is RESTRICTED and shall be safeguarded in accordance with security provisions of U. S. Navy Regulations, 1920, Article 76.

G. F. HUSSEY, JR.
Vice Admiral, U. S. Navy
Chief of the Bureau of Ordnance

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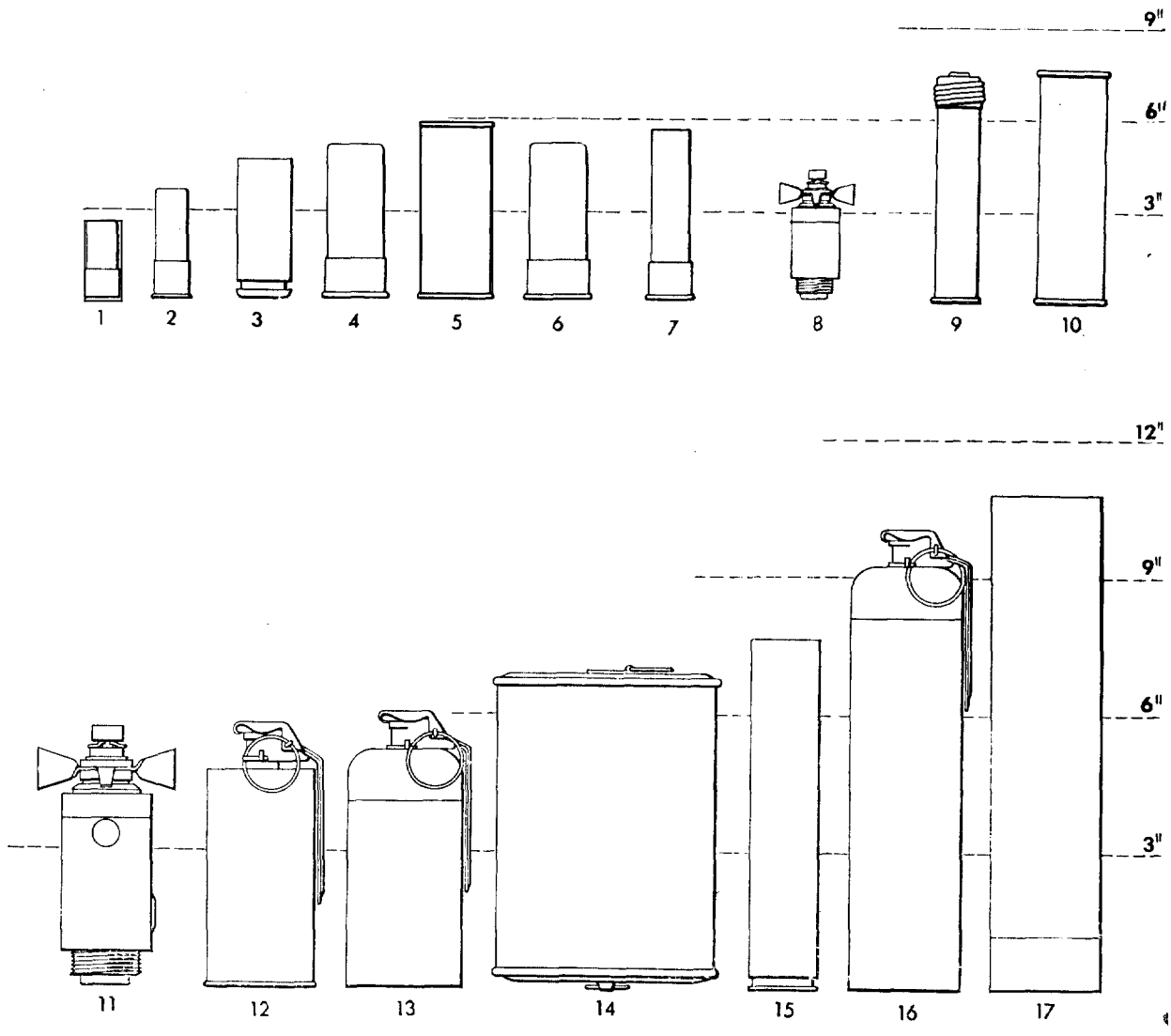

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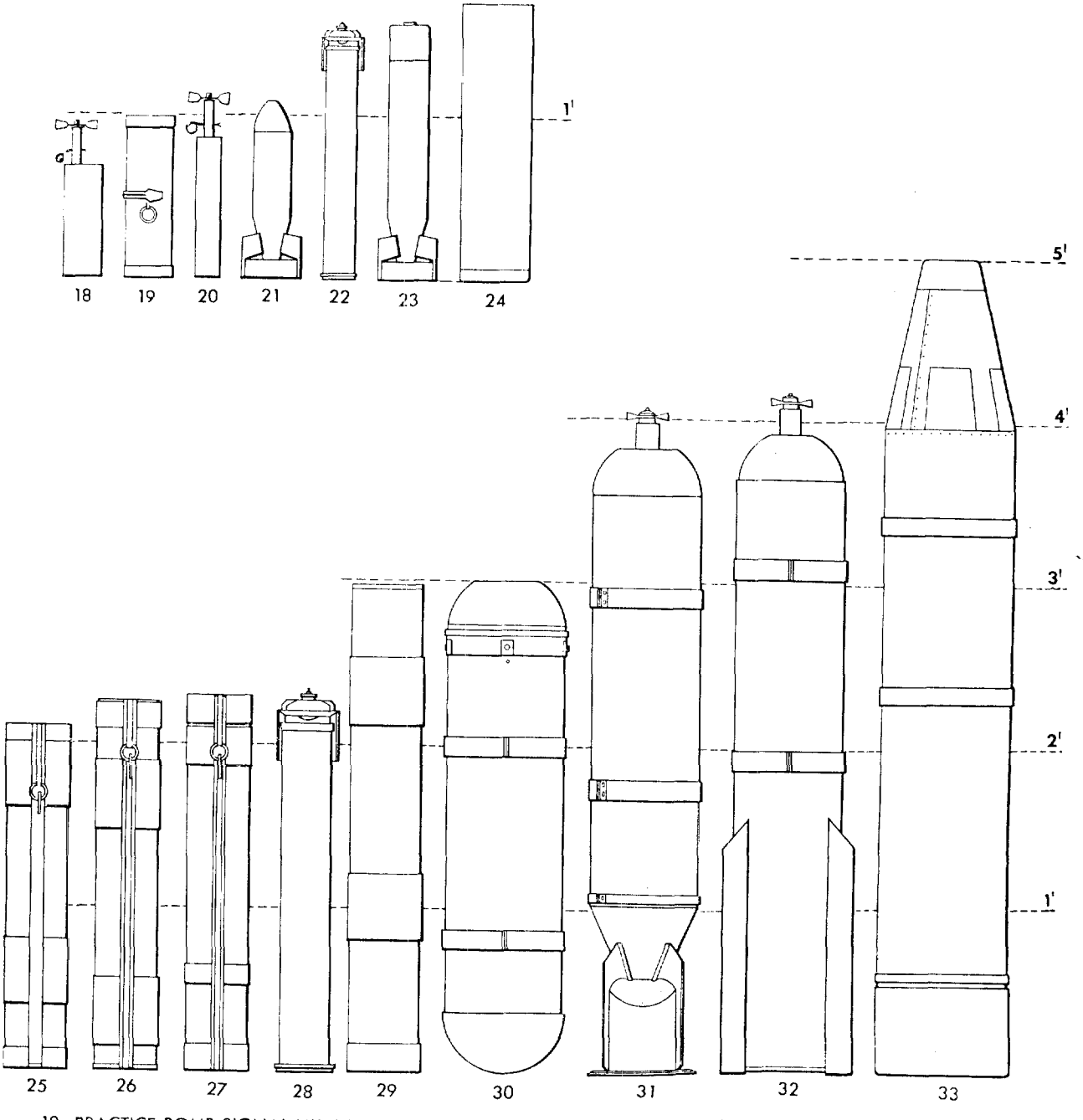

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Figure 1A—Aircraft Pyrotechnics—Types and Comparative Sizes

Chapter 1

INTRODUCTION

Characteristics and Use

Aircraft pyrotechnics are used for signaling, marking, or illuminating in tactical and training operations (Fig. 1). The selection and use of each pyrotechnic item depends on the effect desired.

In general, pyrotechnics are mixtures of oxidizing agents and combustible materials. Other materials are added to the pyrotechnic mixture to brighten the flame, to color the flame or smoke, to retard or accelerate chemical action, or to act as a binder or a chemical stabilizer for the mixture. Some materials used perform more than one of these functions.

The effectiveness of pyrotechnic ammunition depends on the visibility, which is affected by the design of the item, its placement relative to the observer, and the prevailing atmospheric conditions. Variations in design govern the candlepower, the color of the light or smoke produced, and the burning time. The color and reflective characteristics of the background, the distance, the relative position, the angle of observation, and the degree of natural illumination also affect visibility and determine the effectiveness of the pyrotechnic ammunition.

Slick markers are classified as pyrotechnic ammunition, even though these items do not conform to the above conception of pyrotechnics.

Launching Equipment

Hand-held projectors or mechanical equipment mounted in the aircraft are usually required to project or launch aircraft pyrotechnics. Proper launching equipment is referred to in the chapter describing the item with which it is used.

Procurement and Issue

Pyrotechnic ammunition is manufactured for the Bureau of Ordnance by naval activities and commercial organizations, and is provided to the Fleet by the Bureau of Ordnance. Some types of pyrotechnics are procured from the Ordnance Department and Chemical Warfare Service of the Army.

All aircraft pyrotechnics are issued as complete units except Flares, Aircraft, Parachute, M26 and AN–M26, and Bombs, Photoflash, M46 and AN–M46. These exceptions are fuzed at the time they are loaded on the aircraft.

The issue of aircraft pyrotechnics for fleet activities is covered in the Bureau of Ordnance Manual under Sections 2B and 2C. These sections state that Naval Ammunition Depots and Magazines shall supply, on request, materials to fill allowances as established or approved by the Bureau of Ordnance. In requesting pyrotechnic ammunition, it is essential that the correct nomenclature be used. In cases where several colors are available in items bearing the same nomenclature, the desired colors must also be specified. Written requests should be made to the Bureau of Ordnance for pyrotechnics in excess of allowances, and for items not on the allowance lists. Requests from overseas activities should be screened through the appropriate Area or Force Commander.

On new and replacement items, initial distribution is critical and will be made under guidance of the Chief of Naval Operations. Requests through established logistic channels should indicate the following information:

1. Estimated quantity required for immediate important operational purposes.

2. Estimated quantity anticipated for expenditure per month.

3. Stock level considered desirable to cover contingencies.

Issue to ships will be made in accordance with allowance lists. Issue for overseas shipments and shore activities will be made in full container quantities only. In issuing pyrotechnic items, every effort should be made to:

1. Issue the oldest lot on hand first.

2. Issue and ship from a minimum number of lots, and in full original unopened condition.

Records, Reports, and Allowance Lists

For purposes of ammunition maintenance, inventory control, procurement, and distribution and the planning thereof, it is necessary to maintain basic records concerning ammunition on hand and expended for all naval activities, both ashore and afloat. To obtain this information, to disseminate the logistic data required by the Vice Chief of Naval Operations, and to comply with the directives of the Commander in Chief, NAVORD FORM 41B has been established for reporting all ammunition, except gun ammunition, on hand and expended for shore establishments. The forces afloat should submit reports on expenditures of ammunition on NAVORD FORM 41B on a semi-annual basis (1 June and 1 December).

Semi-annual reports of all pyrotechnics on hand are to be submitted to the Bureau of Ordnance on NAVORD FORM 41B, 1 June and 1 December, by all ships and all shore activities not using the ammunition stock recording system. For detailed instructions for filling out these forms, refer to NAVORD FORM 41. The lot number, the contract number, and the manufacturer's initials should be given in these reports.

Allowance lists for aircraft pyrotechnic items have been established for all classes of ships which require this type of ammunition. These allowances may be varied by Force or Type Commanders to meet requirements of operations. In such variations, however, care must be taken to keep within the weight, stability, and immersion limits established by the Bureau of Ships. Ordnance equipment lists have been prepared for most ship types, establishing the weight limitations for pyrotechnics normally carried. These weights must not be exceeded. No training allowances have been established, and all pyrotechnics must be considered available for routine use in tactical and gunnery exercises and in navigational problems.

The oldest stocks on hand should be used first.

Malfunctioning of pyrotechnics should be reported promptly to the Bureau of Ordnance.

Nomenclature and Markings

Current practice is to indicate the model of an item as part of the nomenclature. The Army does this by following the letter "M" with the model number; the Navy follows the word "Mark" (abbreviated "Mk") with the model number. Modifications are indicated by following the model number with the letter "A" or the abbreviation of the word modification, "Mod," for the Army and Navy respectively, and the modification number. Items standardized by the Army and Navy have the model designation preceded by the letters, "AN–". The following model designations are typical examples: AN–Mk 5 Mod 3, or AN–M9A1. Colors of signals are usually indicated by colored bands or embossed markings on the signal case.

When pyrotechnics are manufactured, a lot number is assigned in accordance with pertinent specifications. This lot number is marked on all packings and on the item itself, unless the item is too small to permit such marking. The lot number is required for records such as reports on the condition and functioning, or accidents in which the pyrotechnics are involved. Complete identification of pyrotechnics is furnished by the nomenclature, including the model designation, the color of the item, and the contract number and lot number.

The following information is marked on the packing box of all pyrotechnic items, and on most of the pyrotechnic items: Nomenclature, Mark and Mod numbers, lot numbers, date of manufacture, and the name or initials of the manufacturer.

Ordnance Pamphlet 1511 provides a catalogue list of authorized pyrotechnic assemblies.

This list is primarily a chart which tabulates technical data, including weights of components, and packing information. It also lists which Marks and Mods are interchangeable for issue. A summary of this information is tabulated in the Appendix.

Ordnance Pamplet 1177 describes surface pyrotechnics (including pyrotechnic ammunition used by ships, PT boats, submarines, and ground troops) and the accessories used with that type of ammunition.

Chapter 2

HANDLING AND STOWAGE

General Safety Precautions

Pyrotechnics contain material of an extremely dangerous nature. Special precations for certain pyrotechnics are prescribed in the chapters relating to the particular item. The following general precautions should be observed at all times:

Pyrotechnics should be handled carefully. Rough handling may cause immediate functioning of the item, or may damage it so it will not function properly at the time desired. Some pyrotechnic material is more dangerous than other types of service ammunition, and its proper functioning is equally important.

Whenever possible, pyrotechnics should be stowed in the boxes or watertight containers in which they are supplied. Items should be separated according to type, color, and lot number.

Functioning of pyrotechnics is affected by moisture. Therefore, pyrotechnics should be stowed in a dry, ventilated place. Most pyrotechnics are packed in moisture-proof containers. The seal of such packings should not be broken until just before the item is to be used. Pyrotechnics exposed to moisture should be segregated from other inflammable or explosive material until an examination has proved that they are serviceable and safe.

Pyrotechnics should not be stowed where the direct rays of the sun can strike them. They should be protected against excessive and variable temperatures. The temperature in stowage spaces should be below 100 degrees Fahrenheit. This temperature limitation is imposed because many pyrotechnic items incorporate commercial impact-type primers containing fulminate of mercury, which deteriorates rapidly when stowage temperatures exceed 100 degrees Fahrenheit.

The distances between stowage concentrations required for pyrotechnic ammunition are the same as for smokeless powder. Exceptions to this rule are indicated in the chapters concerning the individual items. For smokeless powder and most pyrotechnic ammunition, the desired distance from inhabited buildings, public railways, and public highways is 800 feet, with a minimum distance of 400 feet. The desired distance between pyrotechnic magazines is 400 feet, with a minimum distance of 200 feet. When the quantity of any one type of pyrotechnic ammunition is large, it shall be stowed separately. The maximum gross weight of pyrotechnic ammunition and containers in one magazine shall not exceed 500,000 pounds.

Aboard ship, smoke-producing pyrotechnics should be stowed above deck if possible, because it is difficult to combat fire in these materials when they are stowed where the smoke produced is not blown away. Water activated items, such as the Depth Charge Marker Mk 2 shall be stowed separately from other pyrotechnics, if practicable, in order to avoid the risk of spreading or extending a fire in those materials when water is being used as the extinguishing agent.

Smoking or carrying lighted cigars, cigarettes or pipes is not permitted in the vicinity of pyrotechnics. Matches and other flame- or spark-producing articles should not be carried near places where pyrotechnics are stowed.

Pyrotechnic ammunition should be kept clean. Foreign substances such as dirt, sand, mud, or grease should be carefully removed before pyrotechnics are stowed or used. Periodic inspection should be made of all pyrotechnics in stock, and all defective units should be segregated for disposal.

When a cartridge-type pyrotechnic misfires, make at least two more attempts to fire it. If it still fails to fire, the pistol or projector may be unloaded after waiting a minimum of 30 seconds. On account of the possibility of a hang-fire, this rule should **never** be disregarded.

Pyrotechnics will not ordinarily be on hand in quantities in excess of the amount necessary to meet immediate requirements. Unfired rounds in excess of such requirements should be restored to their original packings and appropriately marked. In subsequent firings such items should be used first, so that the stock of open packings may be kept at a minimum.

Because of the nature of pyrotechnics, most types deteriorate in a shorter period of time than other types of service ammunition. The oldest serviceable pyrotechnics available should be issued first to insure the continuing availability of a fresh stock.

Pyrotechnic ammunition stowed aboard aircraft should be properly secured. A loose flare stowed in a compartment of a plane being catapulted may ignite and cause an accident if the ripcord or arming plate becomes fouled in other gear or on some projection. Loose pyrotechnic ammunition in the cockpit or compartment of a plane may foul the control mechanism of the plane.

Handling of Photoflash Bombs

Bombs, Photoflash, M46 or AN-M46 are extremely dangerous and must be handled with great care. They detonate with a high-order explosion.

Duds of this pyrotechnic should be handled with extreme caution, particularly if they have distorted or ruptured cases. The slightest friction may set off the loose photoflash powder with which these bombs are loaded. Unfuzing duds of this bomb does not render them safe to handle.

If possible, such duds should be destroyed in place by demolition, using two ½-pound blocks of TNT. These blocks should be placed adjacent to the forward suspension lug, as close as possible to the bomb without touching it. Such work should be undertaken only by bomb disposal officers. Removal of duds is extremely hazardous and should be done only in emergencies.

Handling of Flares

Flares ar more dangerous as a fire hazard than many types of ammunition because they are easily activated. Extreme care is necessary in stowage, use, and handling. Flares exposed to excessive moisture or mechanically damaged by rough handling shall be returned to ammunition depots or disposed of as described below. Flares should never be disassembled and parachutes or other components removed. Inert flares are available for instructional purposes.

Flares should not be left in aircraft which are grounded indefinitely. Navy flares to be returned to stock or to be turned in to ammunition depots after having been mounted in an aircraft ready for release shall be prepared by taping the rip cords to the sides of the flares and setting the fuze on SAFE. The unused flare should be returned to its container at the first opportunity. The container should then be tightly sealed with tape and the opened end of the flare container should be dipped in paraffin, if available.

The fuze of the Flares, Aircraft, Parachute, M26 or AN-M26 shall be disassembled from the flare after replacing the seal wire and safety cotter pin. The arming wire and hang wire shall be coiled and replaced in the hang wire container. The shipping cover, shipping seal, and shipping plug shall be replaced.

Support bands and cotter pins shall be returned with flares when possible.

Disposition of Defective Ammunition

When so directed by the Bureau of Ordnance, defective and obsolete items may be disposed of in one of two ways: Dumping overboard or burning. Dumping must be done at least ten miles off shore and in water more than 500 fathoms deep. This method is preferred to burning because it involves less preparation and hazard. Some items must always be dumped; some always burned; while others may be either dumped or burned. A list of such

restrictions is given under the paragraphs covering dumping and burning.

Photoflash bombs and other pyrotechnics not mentioned in this pamphlet shall be disposed of in accordance with specific Bureau of Ordnance instructions.

Ordnance Pamphlet 1515, "Restricted and Unserviceable Ammunition," lists defective lots of pyrotechnic ammunition, lots which have been suspended from issue pending quality evaluation, and lots which have been restricted in use. This publication is kept up to date by frequent changes.

Preparations for Dumping

Port authorities must be consulted prior to taking explosives out to sea for dumping. Before dumping, all items must be removed from wood packing boxes, crates, or other containers. Extreme caution must be taken to prevent accidental ignition of the loose ammunition made ready for dumping.

Rough handling of deteriorated pyrotechnic ammunition may cause it to ignite. As a further precaution, shield other ammunition on deck in case of accident. To insure rapid sinking, ammunition items which may float should be dumped in weighted sacks or previously perforated metal containers.

Preparations for Burning

When burning deteriorated or obsolete pyrotechnic ammunition, only the quantity to be burned on that day should be moved to the scene of the burning. The following safety measures must also be observed:

1. A suitable site must be selected at least 1,000 feet from any magazine, and at least 1,200 feet from any inhabited building, public highway, public railroad, or station boundary. Dry grass, leaves, or other inflammable materials must be cleared from around the point of burning for a radius of at least 200 feet.

2. An incinerator, pit, or trench about four feet deep must be used to prevent fragments from flying in case an explosion occurs. Excelsior, wood, or similar inflammable material sufficient to produce a hot fire should be placed in the bottom of the incinerator, pit, or trench. The items to be burned must be removed from their containers and placed on top of the inflammable material. A cover of heavy iron grating or wire mesh should be placed over the pit and staked down. The fire should then be ignited from the downwind side with a train of inflammable material of such length that ample safety is provided.

3. Items to be disposed of should be separated and burned in small quantities, and the incinerator or pit bottom allowed to cool before each quantity is burned.

4. Items being prepared for burning should be kept at least 200 feet away from the incinerator, pit or trench. Material to be burned shall be adequately protected to preclude possibility of premature ignition by flying sparks or embers. Personnel must not be stationed at or near material awaiting disposal.

5. A barricade should be erected to protect the personnel conducting the burning operations. There should not be more than the required number of persons present, but never fewer than two.

6. Adequate firebreaks should be provided, and fire fighting equipment should be on hand and ready to protect nearby property.

7. Metal parts remaining after burning should be salvaged for scrap if there are sufficient quantities to be practicable.

Items To Be Burned

The following items must be disposed of by burning and never by dumping:

1. Signal, Drift, Night, AN–Mk 4 and Mods, and AN–Mk 5 and Mods.

2. Aircraft Float Light Mk 4, Mk 5, Mk 6 and Mods.

3. Signal, Miniature Practice Bomb, Fluorescein, AN–Mk 5.

Item To Be Dumped

The following item must be disposed of by dumping and never by burning.

Practice Bomb Signal Mk 6 Mod 0 and Mk 7 Mod 0.

Items To Be Burned or Dumped

The following items may be disposed of either by burning or by dumping:

1. High Altitude Parachute Flares.

2. Aircraft Emergency Identification Signal Mk 6 and Mk 7.

3. Aircraft Parachute Flares (Electrically Operated) 1½ Minute and 3 Minute.

4. Float Flare (Aircraft) Mk 17 and Mods. Prepare for dumping in accordance with the following instructions, puncturing with an instrument which should not penetrate a distance greater than two inches:

a. Puncture the body or bouyancy chamber at least twice at a distance of about 18 inches from the base of the flare.

b. Puncture the buoyancy chamber once or more at a distance of about four feet from the base of the flare.

5. Very Signal Light Mk II. If it is to be dumped, weight it to insure sinking.

6. Grenade, Smoke, White, (H.C.), AN–M8.

7. Aircraft Parachute Flares Mks 4, 5, 6, 8, 10, and 11, M26, and AN–M26; and all modifications of these flares. Because flares may detonate, burn them singly in an upright position as described in paragraph 2 under the heading of "Preparations for Burning."

8. Signal, Aircraft, Red Star, Parachute, M11.

9. Cartridge, Slick Marker, AN–Mk 1 Mod 0. If it is to be dumped, weight it to insure sinking.

10. Signal cartridges, 1½-inch, as follows:

(If they are to be dumped, weight them to insure sinking)

a. Signal Cartridges, Two-Star, Mk 3 Mod 3 and Mk 4.

b. Signal, Aircraft, Double Star, AN–M28 to AN–M33, AN–M37 to AN–M42, and AN–M37A1 to AN–M42A1.

c. Signal, Aircraft, Double Star, (with Tracer) AN–M53 to AN–M58 and AN–M53A1 to AN–M58A1.

d. Signal, Aircraft, Single Star, AN–M43 to AN–M45 and AN–M43A1 to AN–M45A1.

11. Depth Charge Markers, (Day), Mk 1 and Mods. If they are to be dumped, weight them to insure sinking.

12. Depth Charge Marker (Night), Mk 2. May be burned ashore by removing both tear strips and placing it in a tub or drum of water. The item will self-ignite. If it is to be dumped, remove both tear strips at the time of dumping.

Caution: Unless it is weighted, the item may burn on the surface for about 45 to 55 minutes.

13. Distress Smoke Hand Signal Mk 1 Mod 0 and Signal, Distress, Smoke, Hand, AN–Mk 1 Mod 1.

14. Signal, Distress, Two-Star, Red, M75 (T49) and AN–M75.

15. Signal (Distress, Day and Night) Mk 13 Mod 0.

16. Signal, Miniature Practice Bomb, AN–Mk 4. If it is to be burned, use a special pit having tubes and baffles, similar to that used for burning primers and small arms ammunition.

17. Target Identification Smoke Bomb Mk 72 Mod 1. If it is to be dumped, weight it to insure sinking.

18. Fuzes, Flare, Mechanical Time M111, M111A1, and M111A2; and Fuze, Bomb, Mechanical Time, M146. Dump in accordance with instructions on page 5; or burn, one at a time, following the general directions for burning outlined on page 6.

Unserviceable fuzes may also be destroyed by explosion, as follows: Place a small number of fuzes in an open container in a pit or trench at least four feet deep. Place one or more demolition blocks on the top of the container, in intimate contact with the fuzes. Explode with electric blasting caps or with blasting caps and safety fuse, observing the safety measures outlined on page 6 under Preparations for Burning. (Refer to OP 5, paragraphs 1424-1425.)

Demolition or disposal of flares or bombs equipped with these fuzes shall be carried out only by experts trained in this type of work.

Chapter 3

SURVEILLANCE

PURPOSES

This chapter establishes the action necessary for periodic evaluation of the readiness of pyrotechnic ammunition now in service. The objectives are as follows:

1. To verify by service and laboratory tests the readiness condition of pyrotechnic ammunition on hand and to provide necessary data for the evaluation by the Bureau of the condition of all pyrotechnic ammunition in service.

2. Where deterioration is found to be progressive and continuous, to determine the rate of deterioration for the planning of replacement.

3. To eliminate defective material and inferior types of pyrotechnic ammunition from service.

4. To determine the causes of failure in order to provide engineering guides for future procurement.

DIVISION OF RESPONSIBILITY

1. Ships.

a. Surveillance firing of pyrotechnic ammunition is no longer required of ships. However, when pyrotechnic ammunition is fired for any purpose such as training of personnel or during fleet exercises, reports of performance of subject ammunition shall be made on the appropriate performance data card (NAVORD Form 1187).

b. Performance data cards are prepared in check-off form and packed in each container with all new production so that performance can be checked off by the user and the report forwarded direct to the Bureau of Ordnance. Some current stocks packed without forms are still in use. For these it will be necessary to use the basic form (NAVORD Form 1187). Request for these forms should be submitted on NAVGEN Form 47 to the nearest District Publications and Printing Office.

c. The appendix to this chapter contains a list of the performance characteristics of each type of pyrotechnic ammunition. Ships are expected to follow this list of characteristics in reporting pyrotechnic ammunition performance on the performance data card. If the details of performance have not been placed on the data card by the manufacturer of that item, the appropriate list of performance characteristics shall be noted on the performance data card by the ship.

d. Detailed reports of any abnormal conditions of ships pyrotechnic stores such as noted under paragraph 2(b) shall be forwarded to the Bureau of Ordnance.

2. Shore Stations.

a. Shore stations are required to inspect all types of pyrotechnic ammunition at least annually. This inspection shall be as follows:

(1) Pyrotechnic ammunition in opened or non-moisture proof containers shall be inspected visually for signs of corrosion of cases, for swelling of paper bodies exudation, dented or punctured bodies, condition of primers, missing safety pins, frayed rip cords, etc., and the giving off of chemical odors. A sample adequate to determine effects of stowage conditions shall be opened for the above inspection.

(2) Pyrotechnic ammunition in moistureproof packages shall be inspected only for the condition of the package. If the moistureproofness of the packages is suspected, the package shall be opened and contents inspected as above.

b. Reports of abnormal conditions noted during inspection shall be forwarded to the Bureau

of Ordnance and defective items or containers with defective items shall be made available for shipment to the Quality Control Surveillance Laboratories for examination.

c. Surveillance firing from pyrotechnic lots in stocks at Naval Ammunition Depots, magazines, and other storage facilities is no longer required.

3. Quality Control Surveillance Laboratories. The Quality Control Surveillance Laboratories shall select samples of all pyrotechnic ammunition held in storage or in fleet use as directed by the Bureau of Ordnance. For each item of pyrotechnic ammunition and for each manufacturer, the quality level of that type of ammunition shall be determined by appropriate performance and laboratory tests. The quality level so determined shall in each case be compared with the prior determination of quality in order to ascertain whether deterioration associated with age, storage or other factors has taken place. The statistical tests for this deterioration shall be made on the basis of appropriate sampling plans provided by the Bureau.

4. Authorization for Disposition.

a. The Quality Control Surveillance Laboratories will submit reports to the Bureau on the analysis of (1) depot held stocks (2) fleet returned ammunition (3) suspected pyrotechnic ammunition submitted from the annual inspection of stocks by shore stations and from ships.

b. On the basis of accumulated performance data on types of pyrotechnics, the Bureau of Ordnance will determine whether or not particular lots of pyrotechnics or groups of lots shall be withdrawn from service. Depots will be notified of such determinations and where necessary, ships will be authorized to turn in such stocks of pyrotechnic ammunition.

SIGNAL, AIRCRAFT, DOUBLE STAR, AN-M39,(CARTRIDGE) G.G. (Name of pyrotechnic ammunition) | None (Contract number) | USF-1-4 (Assembly lot number)

MANUFACTURER: U. S. Flare Company | DATE OF MANUFACTURE: March, 1943

FROM: U. S. S. CVE 98 (Classification and number) % FPO, San Francisco, (Address) DATE 5 April, 1945

TO: Chief of the Bureau of Ordnance, Navy Department, Washington 25, D. C

REF.: (a) BuOrd Manual 2A1, 2A2, 2A6c, 12C12, 13G (b) OP 908 (c) NAVORD OCL

RECEIVED FROM: NAD, Fallbrook | DATE RECEIVED: 10-4-44

CONDITION OF PACKING: Good | CONDITION OF SEALAGE: Good

STOWAGE HISTORY		ROUND NO. 1	2	3	4	5
EXPOSURE (State number of hours)	TO TEMPERATURE OVER 100° F.	0	0	0		
	TO RELATIVE HUMIDITY OVER 80%	0	0	0		
	TO HOT SUN	0	0	0		
	TO WATER, RAIN, OR SPRAY	0	0	0		
CONDITION OF ROUND AT FIRING	GENERAL CONDITION	✓	✓	✓		
	SEALAGE	✓	✓	✓		

ELEMENTS OF PERFORMANCE	ROUND NO. 1	2	3	4	5
Date fired	4/5	4/5	4/5		
Primer Action	✓	✓	✓		
Propulsion (250 ft.)	✓	✓	✓		
Ignition of Stars	X	✓	✓		
Color	X	✓	✓		
Burning Time (7 S.)	X	✓	✓		

INSTRUCTIONS: Consult references for functional characteristics before firing. Use (✓) for satisfactory or (X) for unsatisfactory. Give details of unsatisfactory condition or performance on reverse side. See enclosure (A) of NAVORD OCL A72-44 for performance data desired.

PYROTECHNIC AMMUNITION PERFORMANCE DATA CARD—NAVORD FORM 1197 (10/44) 18—42123-1

Figure 2—Typical Pyrotechnic Ammunition Performance Data Card

Appendix to Chapter Three

DATA FOR USE OF PERFORMANCE DATA CARDS

Title	Element of Performance
Aircraft Parchute Flares	
Mark 4 and Mods	Rip Cord Parachute Action Burning time (3 min.)
Mark 5 and Mods Mark 6 and Mods Mark 10 and Mods	Firing lanyard Delay before ejection Ejection Parachute Action Burning Time (3 min.)
Mark 8 and Mods Mark 11 and Mods	Rip Cord Parachute Action Delay before ignition Burning Time (3 min.)
AN–M26	Arming wire Delay before ejection Ejection Parachute Action Burning time (3 min.)
Electrically Operated (1½ min. and 3 min.)	Electric circuit Ejection Parachute Action Burning time (1½ or 3 min.)
Flare (High Altitude Parachute) Mk 20	Primer action Height of ejection (1,000 ft.) Parachute Action Burning time (60 sec.)
Aircraft Float Lights and Night Drift Signals Mark 4 Mark 5 Mod 1 Mark 6 Mod 2	Primer action Delay before ignition Burning time (3 min.—Mark 4 10 min.—Mark 5 40 min.—Mark 6)

Aircraft Signals AN–M37 to 42 AN–M42 to 45	Primer action Propulsion Ignition of Stars Burning time (7 sec.) Color
Aircraft Signals AN–M53 to 58 Signal Cartridge Mark 4	Primer action Propulsion Tracer burning time (4 sec.) Star ignition Burning time (5 sec.) Color
Aircraft Emergency Identification Signals Mark 6 Mark 7	Primer action Delay before ejection (4 sec.) Parachute action Burning time (25 sec.) Color (Indicate)
Aircraft Parachute Signal, Red Star, M–11	Primer action Propulsion Delay before ejection (2½ sec.) Parachute action Burning time (30 sec.)
Photoflash Bomb M46	Arming wire Fuze Burst (Indicate type of fuze used)
Cartridge, Slick Marker Mark 1	Primer action Propulsion Delay before burst (11 sec.) Visible Slick
Very Signal Lights Mark 2	Primer action Propusion Burning time (5 to 7 sec.) Color (Indicate)
Depth Charge Markers Mark 1 and Mods	Primer action Delay before burst (15 sec.) Visible Slick
Mark 2	Delay before ignition (less than 90 seconds) Burning time (45 min.)
Grenade, Smoke, White, (HC) AN–M8	Primer action Delay before ignition (4½ sec.) Burning time (3 min.)

Chapter 4

AIRCRAFT PARACHUTE FLARES

Combat Types

Service types of aircraft parachute flares issued to the Fleet are of two distinct categories: (1) Those designed to fall a predetermined distance below the launching aircraft before functioning (Fig. 3), and (2) those designed to function as soon as they are clear of the launching aircraft (Fig. 4).

Flares included in the first category are: Aircraft Parachute Flare Mk 5 and Mods, Aircraft Parachute Flare Mk 6 and Mods, Aircraft Parachute Flare Mk 10 and Mods, and Flares, Aircraft, Parachute, M26 and AN–M26.

Flares included in the second category are: Aircraft Parachute Flares Mk 4 and Mods, Aircraft Parachute Flares Mk 8 and Mods, and Aircraft Parachute Flares Mk 11 and Mods.

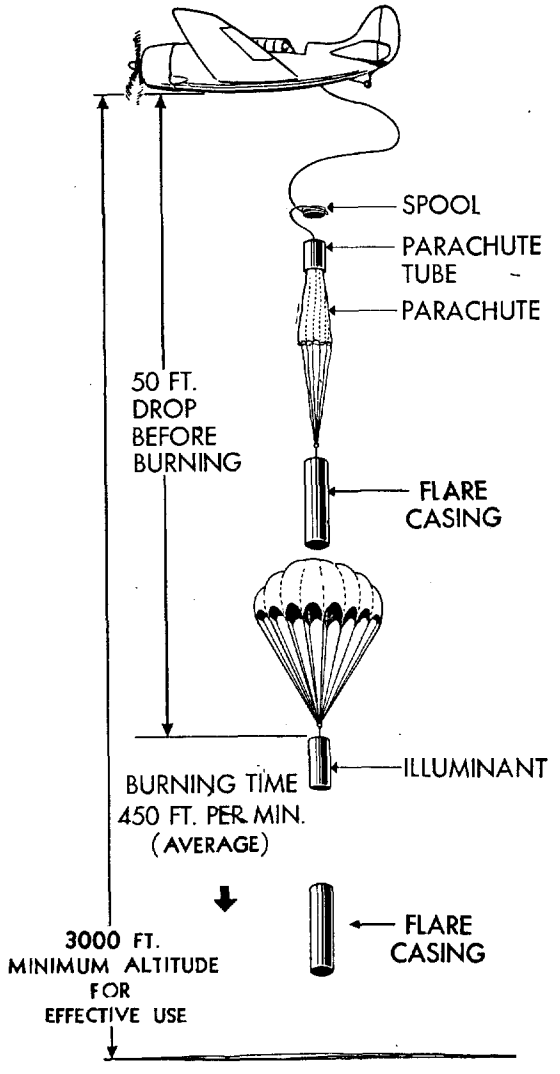


Figure 3—Diagram Showing Aircraft Parachute Flare Mark 4 Operated by a Rip Cord

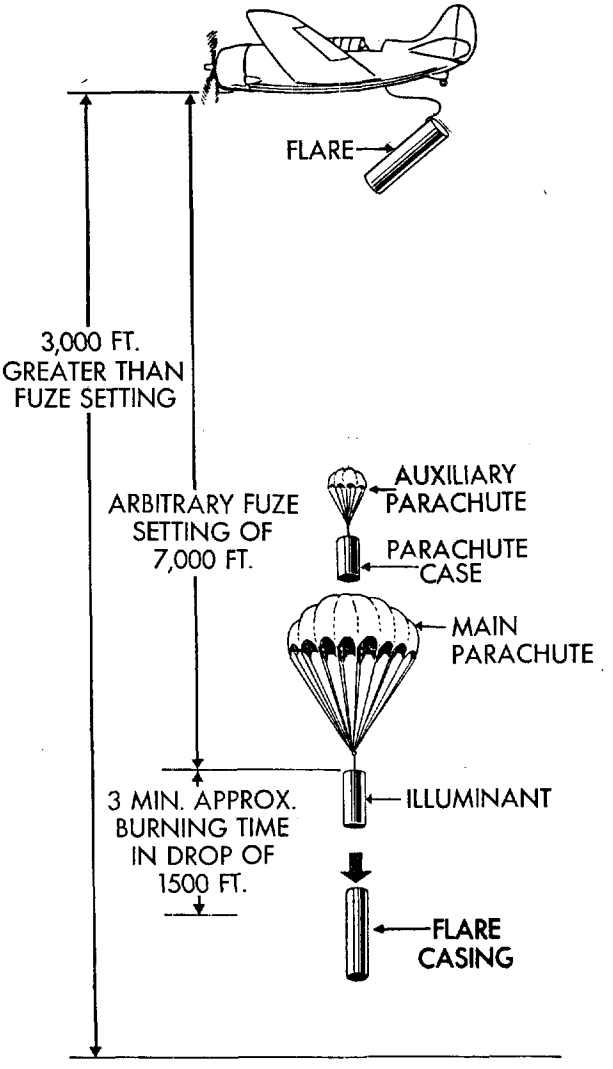


Figure 4—Diagram Showing Operation of Free Falling Parachute Flare

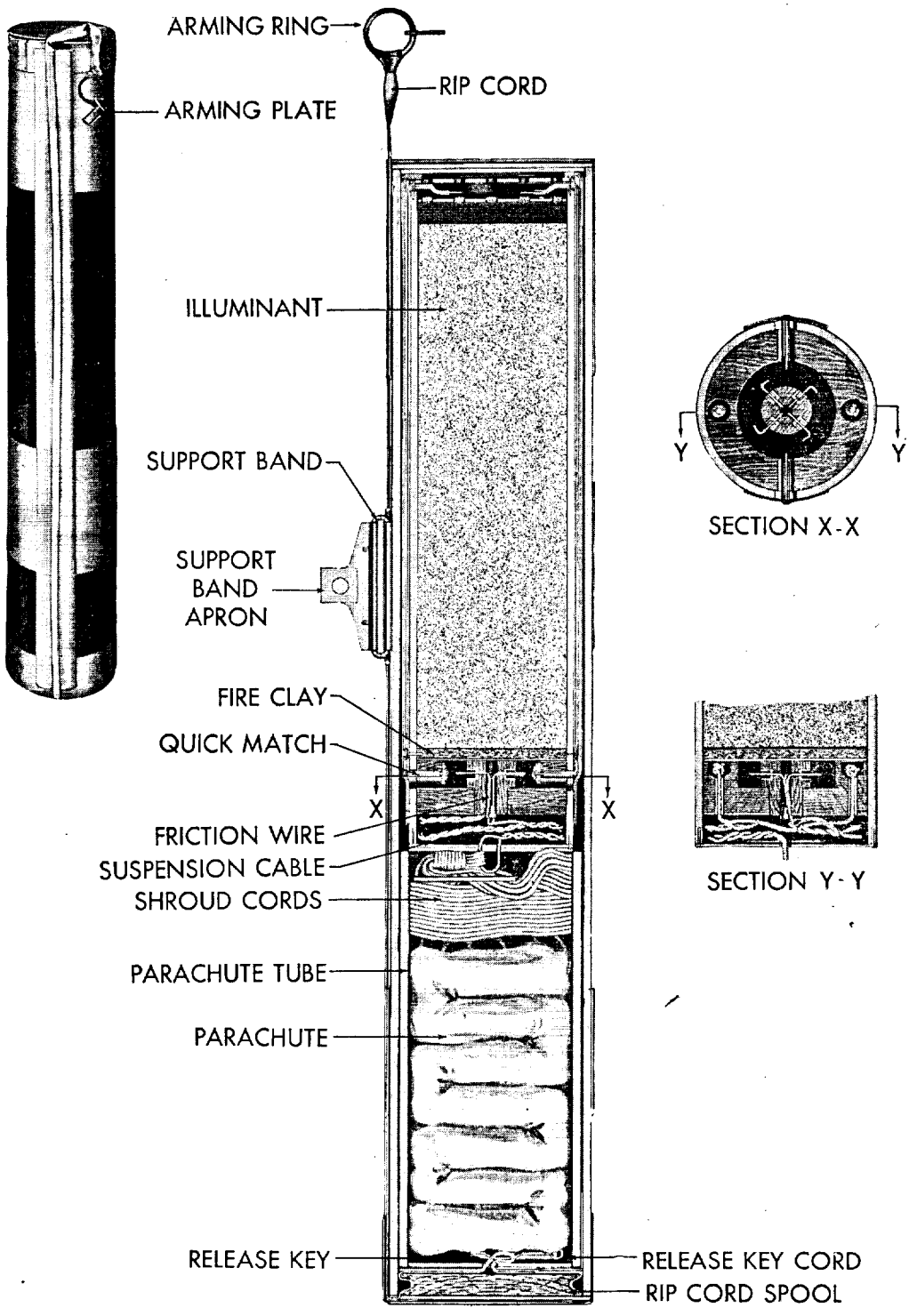


Figure 5—Aircraft Parachute Flare Mk 4 and Mods

Aircraft Parachute Flare Mk 4 and Mods

This flare is used primarily for illuminating a large area sufficiently to permit the landing of aircraft (Fig. 5). It may also be used to illuminate an area for reconnoitering and bombing. However, Aircraft Parachute Flares Mk 5, Mk 6, and Mk 10, having much greater candlepower than Aircraft Parachute Flare Mk 4, are more satisfactory for reconnoitering and bombing. Aircraft Parachute Flare Mk 4 is also used by low flying aircraft to blind the enemy's antiaircraft defenses.

The complete flare, as issued ready for release, weighs approximately 18 pounds. The shellac-impregnated chip board case has a diameter of 4¾ inches and a length of 27⅜ inches.

Two metal steadying bands are fastened to the case. The steadying forks (or sway bracing) of the bomb racks rest against these steadying bands.

Both ends of the case are closed by chip board discs, held in place by gummed cloth and sealed with paraffin. The flare, as issued, is water-repellent but should be kept in the moisture-proof metal shipping container when not installed in a plane.

Markings on the case show where to attach the support band (or bands) when the flare is to be released from a bomb rack. The support bands are shipped in the packing box with the flares.

Operation—When the flare is released from the aircraft, the arming plate on the end of the rip cord is retained by the arming-wire retainer of the bomb rack. The rip cord (fastened to the arming plate) tears along the side of the case until it reaches the end of the flare casing. As the flare continues to fall, the rip cord (wound around a wooden spool inside the end of the flare casing) unwinds from the spool, thus carrying away the end of the flare casing. When the end of the flare casing is torn off, the rip cord pulls the wooden spool and the parachute tube (with the parachute) out of the flare casing. The spool falls away. The tension on the rip cord retains the parachute tube and, as the flare case (containing the flare candle) falls away, the parachute is pulled out of the lower end of the parachute tube by the suspension cable and the parachute shroud lines.

When the parachute and the parachute shrouds are fully extended, the release key cord becomes taut and pulls one end of the release key down away from the chip board cover of the parachute tube. This allows the rip cord to slip through the key and become detached from the parachute tube.

An ignition wire is attached to the suspension cable in such a manner that it is pulled before the suspension cable is fully extended. The ignition wire pulls four friction wires through primer cups of match compound. This ignites a double quick match which burns down the outside of the illuminant case and ignites the primer composition, then the first fire composition, which, in turn, ignites the illuminant composition.

The parachute opens and suspends the flare, and the parachute tube falls clear. Full suspension and ignition occur about 30 to 50 feet below the plane. The flare burns for approximately three minutes with a light intensity of about 300,000 candlepower.

The installation and release of Aircraft Parachute Flare Mk 4 and Mods is described in Chapter 5.

The proper altitude for the release of this type of flare depends upon the purpose for which it is to be used. For purposes of observation or reconnaissance the flare should be released at altitudes of between 1,500 to 5,000 feet, depending upon the area to be observed. This flare should never be released over friendly territory at altitudes less than 1,500 feet, except in cases of extreme emergency. The flare falls approximately 450 feet per minute and would reach the ground before burning is completed.

In making observations extending over considerable time, the succeeding flares should be released approximately three minutes after the previous flare, and in a position most advantageous to the work being conducted. Such procedure reduces the overlap to a minimum, and

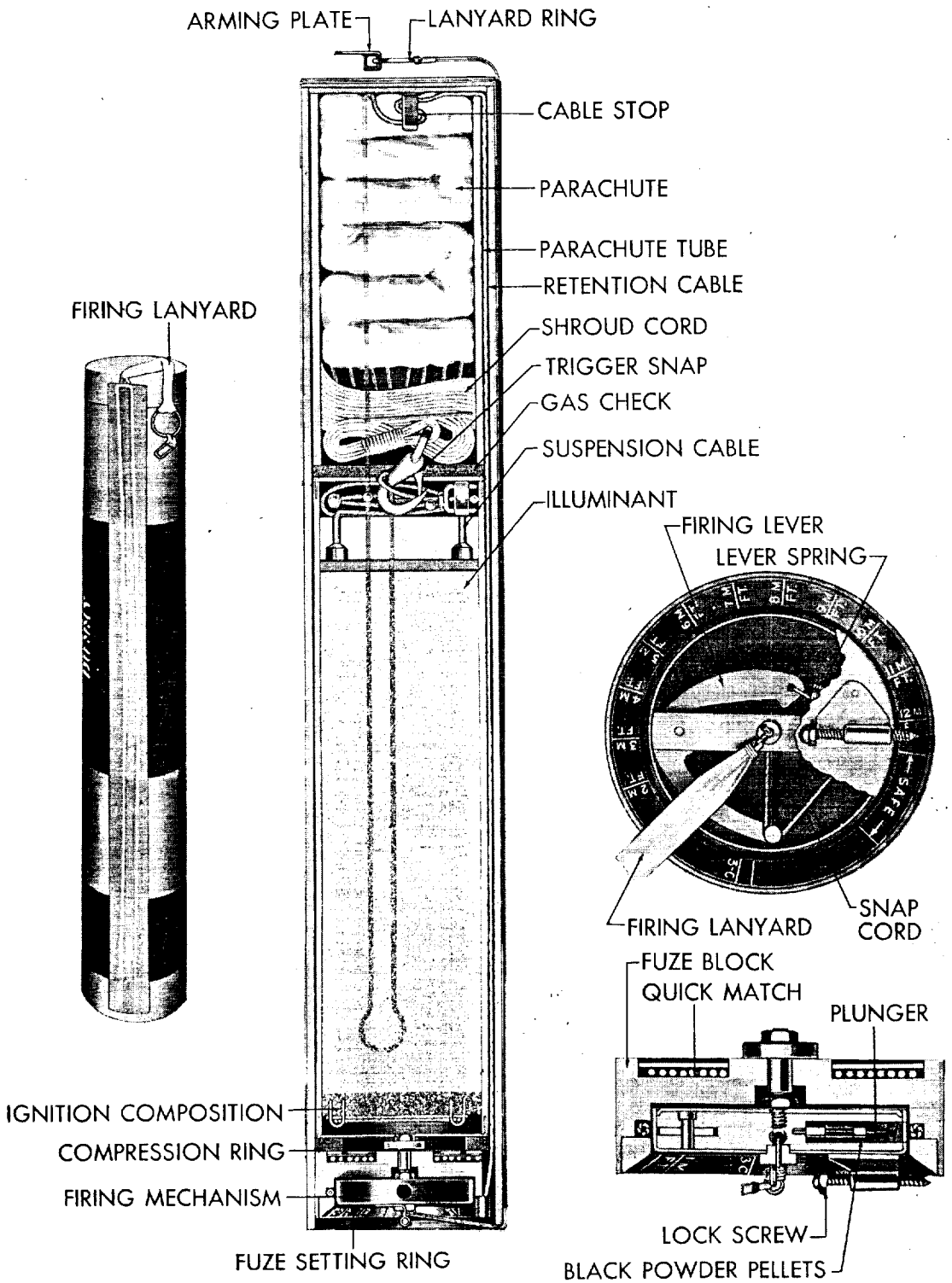


Figure 6—Aircraft Parachute Flare Mk 5 and Mods, and Fuze for Aircraft Parachute Flares Mk 5 and Mk 6

assures continuous illumination upon the area being observed.

Safety Precautions—In addition to the general safety precautions outlined in Chapter 2, the following special precaution should be observed:

This flare should not be launched from bomb bays, because the parachute is pulled out of the flare case by the static line, and may foul the airplane structure.

Packing—Aircraft Parachute Flare Mk 4 and Mods is shipped in a moisture-proof metal container, six containers in one wooden packing box.

Storage—Flares should be stowed in the original moisture-proof containers in a location where the temperature will not exceed 100 degrees Fahrenheit. If this temperature is not exceeded, satisfactory performance can be expected for from six to ten years after the date of manufacture.

Aircraft Parachute Flare Mk5 and Mods

This flare is used for illuminating a large area sufficiently to permit reconnoitering, bombing, or the landing of aircraft. (Fig. 6.) In addition, the light produced by the flare primarily for bombing also has a blinding effect on the operators of antiaircraft weapons.

The complete flare, as issued ready for release, weighs approximately 18 pounds. The shellac-impregnated chip board case has a diameter of 4¾ inches and a length of 27 inches.

Two metal steadying bands are fastened to the case. The steadying forks (or sway bracing) of the bomb racks rest against these steadying bands.

The fuze end of the case is closed by a metal cover. The parachute end of the case is closed by several layers of chip board held in place by gummed cloth and sealed with paraffin. The flare, as issued, is water-repellent but should be kept in the moisture-proof shipping container when not installed in a plane.

Markings on the case show where to attach the support bands when the flare is to be released from a bomb rack. The support bands are shipped in the packing box with the flares.

Mounted in one end of the flare is a variable time delay fuze. The setting is made by turning the indicator on the metal firing mechanism housing to the desired delay. The delay is shown on the fuze setting ring, and indicates the vertical distance the flare will drop before igniting. This distance (or delay) can be varied from 300 feet to 12,000 feet.

Operation—When the flare is released from the aircraft, the arming plate on the end of the rip cord is retained by the arming-wire retainer of the bomb rack. The firing lanyard (fastened to the arming plate) tears along the side of the case and flips off the fuze end cover, and pulls the snap cord attached to the firing lever.

The fuze mechanism of Aircraft Parachute Flare Mk 5 Mod 0 to Mk 5 Mod 7 functions as follows:

The weight of the flare pulls the firing lever away from the primer until the snap cord becomes taut, at which time the snap cord breaks. The firing lever spring then drives the firing lever back against the fulminate of mercury primer. The flame from the primer ignites the black powder pellets in the fuze plunger. Expanding gases from the burning black powder force the sharp point of the plunger radially outward into the safety fuse.* Three small holes near the point of the plunger allow some of the flame to escape from the inside of the plunger into the powder of the safety fuse. The safety fuse burns at the rate of 12 inches per 60-second interval. The point at which this fuse starts to burn is determined by the drop desired before ignition of the flare, and is regulated as described above.

The fuze mechanism of Aircraft Parachute Flare Mk 5 Mod 8 is similar, except that the cord pulls away from the firing lever instead of breaking, thus requiring much less pull to fire the primer. Difficulty has been encountered in obtaining proper functioning of Aircraft Parachute Flare Mk 5 Mod 7 (and lower Mods) when released from bomb shackles in bomb

*Fuse indicates a burning type, while fuze indicates a mechanical type.

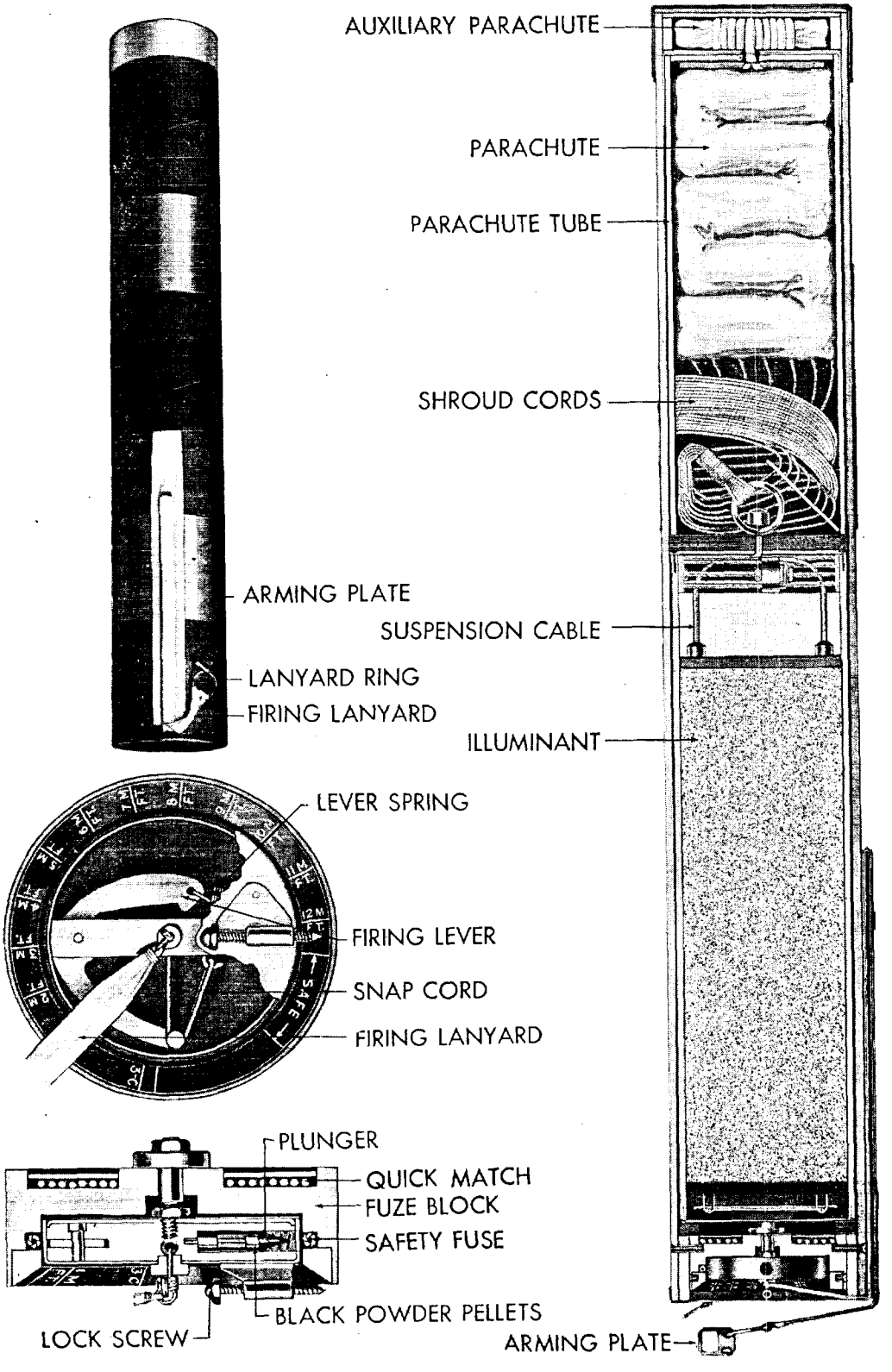


Figure 7—Aircraft Parachute Flare Mk 6 and Mods, and Fuze for Aircraft Parachute Flare Mk 6 Mod 5

bays. (See Chapter 5.) Aircraft Parachute Flare Mk 5 Mod 8 can be released from bomb bays.

The safety fuse (at the periphery of the metal firing mechanism housing) burns its predetermined length and ignites the quick match under the fuze block.

This, in turn, ignites the quick match and fire-cracker fuse stapled to the ignition (or first fire) composition.

When the ignition composition begins to burn, the gases generated force the parachute and illumninant out of the flare case. The parachute opens, and the parachute shroud terminal on the end of the shroud lines slides up the retention cable until it is stopped by the cable stop. A short length of cable beyond the cable stop suspends the flare case well away from the burning flare. This also keeps the case from dropping as a missile hazard.

The pyrotechnic candle burns for approximately three minutes with a light intensity of about 600,000 candlepower. Aircraft Parachute Flares Mk 5, Mk 5 Mod 1, and Mk 5 Mod 2 produce a white light when the pyrotechnic candles burn. Aircraft Parachute Flare Mk 5 Mods 3 to 8 burn with a yellow light.

Aircraft Parachute Flares Mk 5 Mod 0, Mk 5 Mod 1, and Mk 5 Mod 2 are no longer manufactured, but are being used for training purposes until the supply is exhausted.

To use the full burning time of the flare to best advantage, the altitude at which it is to be released should be about 3,000 feet greater than the fuze setting. While burning, the flare falls approximately 1,500 to 1,800 feet.

Aircraft Parachute Flare Mk 5 and Mods can be dropped from any aircraft by at least one of the methods described in Chapter 5. Aircraft Parachute Flares Mk 5 Mod 0 to Mk 5 Mod 7 are **not** suitable for release from bomb bays. Air currents entering the bomb bay tend to reduce the stress on the snap cord, with the result that the cord does not break and the flare remains suspended from the firing lanyard. This allows the flare to toss around in the bomb bay, and it may cause damage to the plane structure. There is also the danger that the flare might ignite while still in the bomb bay. Fatal accidents may occur if a flare becomes hung up in the bomb bay.

This difficulty has been overcome by redesigning the fuze mechanism. The new fuze is incorporated in Aircraft Parachute Flare Mk 5 Mod 8. The fuze of this modification requires only an eight-pound pull to operate the firing lever instead of a pull of approximately 38 pounds required in the previous models. The cord pulls away instead of breaking. The new fuze operates the same as the old fuze, except for the changes in the firing lever and the cord.

Safety Precautions—In addition to the general safety precautions outlined in Chapter 2, the following special precautions should be observed:

Aircraft Parachute Flares Mk 5 Mod 0 to Mk 5 Mod 7 must not be released from bomb bays, except when released by the Carrier, Parachute Flare, Mk 1.

The flare case of Aircraft Parachute Flare Mk 5 Mod 8 is not retained by a retention cable, and falls as a missile hazard. Therefore, Flare Mk 5 Mod 8 should not be used over friendly territory.

Packing—Aircraft Parachute Flare Mk 5 and Mods is shipped in a moisture-proof metal container, six containers in one wooden packing box.

Storage—Flares should be stowed in the original moisture-proof containers in a location where the temperature will not exceed 100 degrees Fahrenheit. If this temperature is not exceeded, satisfactory performance can be expected for from six to ten years after the date of manufacture.

Aircraft Parachute Flare Mk 6 and Mods

This flare is used for illuminating a large area sufficiently to permit reconnoitering and bombing. (Fig. 7) The light produced by the flare primarily for bombing also has a blinding effect on the operators of antiaircraft weapons.

The complete flare, as issued ready for re-

lease, weighs approximately 30 pounds. The shallac-impregnated chip board case, containing a time fuze, a parachute, a small auxiliary parachute, and the pyrotechnic candle, has a diameter of 5⅜ inches and a length of 35¾ inches.

One or two metal support bands which are shipped with the flare can be mounted on the flare (as indicated on the case) so that the flare can be suspended from bomb racks and bomb shackles. The support bands are not needed when the flare is launched from the cockpit or from Flare Container Mk 1 Mod 0. There are also two metal steadying bands fastened to the case, against which the steadying forks or sway bracing of the bomb rack rest.

The rip cord is connected to the firing lever of the time fuze by a snap cord. The fuze end of the flare case is closed by a metal cover, and the parachute end of the flare case is closed by several layers of chip board held in place by gummed cloth and sealed with paraffin. The parachute is connected to the illuminant candle by a steel suspension cable. The flare, as issued, is water resistant but should be kept in the shipping container when not installed in an airplane.

Aircraft Parachute Flare Mk 6 and Mods has a variable time delay fuze. The setting is made by turning the indicator on the metal firing mechanism housing to the desired delay. The delay is shown on the fuze setting ring, and indicates the vertical distance the flare will drop before igniting. This distance (or delay) can be varied from 300 feet to 12,000 feet.

Operation—When the flare is released from the aircraft, the arming plate on the end of the rip cord is retained by the arming-wire retainer of the bomb shackle or bomb rack. The rip cord tears along the side of the case, flips off the metal fuze end cover, and pulls the snap cord attached to the firing lever.

The fuze of Aircraft Parachute Flares Mk 6 Mod 0 to Mk 6 Mod 4 functions as follows:

The firing lever is pulled away from the primer, and when the snap cord breaks, the firing lever spring drives the firing lever back against the primer. The flame from the primer ignites the black powder pellets in the fuze plunger. Expanding gases from the burning black powder force the sharp point of the plunger into the safety fuse.* Three small holes near the point of the plunger allow some of the flame to escape from the inside of the plunger into the powder of the safety fuse. The safety fuse burns at the rate of 12 inches per 60-second interval. The point at which this fuse starts to burn is determined by the drop desired before ignition of the flare, and is regulated as described in Column 1.

The fuze mechanism of Aircraft Parachute Flare Mk 6 Mod 5 is similar, except that the cord pulls away from the firing lever instead of breaking, thus requiring much less pull to fire the primer. A safety screw which prevents firing of the fuze is incorporated in the Fuze Mk 6 Mod 5 Type. This screw must be removed when the flare is installed in the aircraft.

The safety fuse (at the periphery of the metal mechanism housing) burns its predetermined length and ignites the quick-match under the fuze block. This, in turn, ignites the quick-match and fire-cracker fuse stapled to the ignition (or first fire) composition.

When this composition begins to burn, the gases generated force the auxiliary parachute, the parachute in its case, and the illuminant out of the flare case, which falls clear. The auxiliary parachute opens and retards the parachute in its case, allowing the illuminant to pull the shroud cords and parachute out of the parachute case for full suspension of the flare.

The pyrotechnic candle burns for approximately three minutes with a light intensity of about one million candlepower. The color of the light produced is pale yellow.

To use the full burning time of the flare to best advantage, the altitude at which it is to be released should be about 3,000 feet greater than the fuze setting. While burning, the flare falls about 1,500 feet.

Aircraft Parachute Flare Mk 6 and Mods can

*Fuse indicates a burning type, while fuze indicates a mechanical type.

be dropped from any aircraft by at least one of the methods described in Chapter 5.

Safety Precautions—Observe the general safety precautions outlined in Chapter 2.

Packing—Aircraft Parachute Flares Mk 6 and Mods are packed separately in moisture-proof metal containers, four containers in one wooden packing box.

Storage—Flares should be stowed in the original containers in a location where the temperature will not exceed 100 degrees Fahrenheit. If this temperature is not exceeded, satisfactory performance can be expected for from six to ten years after the date of manufacture.

Aircraft Parachute Flare Mk 8 and Mods

This flare was developed during 1943 specifically for night antisubmarine warfare. (Fig. 8.) Its principal characteristics are:

1. Immediate opening of the parachute, similar to the Aircraft Parachute Flare Mk 4 and Mods.

2. Delay between the opening of the parachute and ignition of the pyrotechnic candle. (Aircraft Parachute Flares Mk 8 Mod 0 and Mk 8 Mod 1 incorporate a 90-second delay; the Mk 8 Mod 2 incorporates a 120-second delay.)

3. Light intensity of approximately 500,000 candlepower.

This flare allows a single patrol plane to drop a flare near the target and then to get into position for the attack before the flare ignites and discloses the presence of the attacking plane. The minimum altitude from which these flares can be dropped and obtain full burning time is approximately 2,500 feet.

The complete flare, as issued ready for release, weighs approximately 18 pounds. The shellac-impregnated chip board case has a diameter of 4¾ inches and a length of 25⅛ inches. There are two metal steadying bands fastened to the case. The steadying forks or sway bracing of the bomb rack rest against these steadying bands.

Both ends of the flare case are closed by chip board discs held in place by gummed cloth and sealed with paraffin. The flare, as issued, is water-repellent but should be kept in the moisture-proof metal shipping container when not installed in a plane.

Markings on the case show where the support bands should be attached when the flare is to be released from a bomb rack. The support bands are shipped in the wooden packing box with the flare.

The Aircraft Parachute Flare Mk 8 Mod 0 has been replaced by the Mk 8 Mod 1. Quantities on hand are to be issued for training purposes only.

Operations—As the flare falls away from the aircraft, the arming plate is retained by the armingwire retainer of the bomb. The rip cord (fastened to the arming plate) tears along the side of the flare until it reaches the end of the flare casing. As the flare continues to fall, the rip cord (wound around a wooden spool inside the end of the flare casing) unwinds from the spool, thus tearing away the end of the flare casing. When the end of the flare casing is torn off, the pull of the rip cord pulls the wooden spool and the parachute tube (with the parachute) out of the flare casing. The spool falls away. The tension on the rip cord retains the parachute tube and, as the flare case containing the flare candle falls away, the parachute is pulled out of the lower end of the parachute tube by the suspension cable and the parachute shrouds. When the parachute and parachute shrouds are fully extended, the release key cord becomes taut and pulls one end of the release key down. This allows the rip cord to slip through the key and become detached from the parachute and the parachute tube. The parachute opens and suspends the flare 30 to 50 feet below the aircraft. The parachute tube falls clear.

Ignition of Aircraft Parachute Flare Mk 8 Mod 0 is accomplished by an ignition wire attached to the suspension cable in such a manner that it is pulled before the cable is fully extended. The ignition wire pulls four friction wires through primer cups of quick match compound; this ignites a safety fuse which burns for 90 seconds. The safety fuse is located

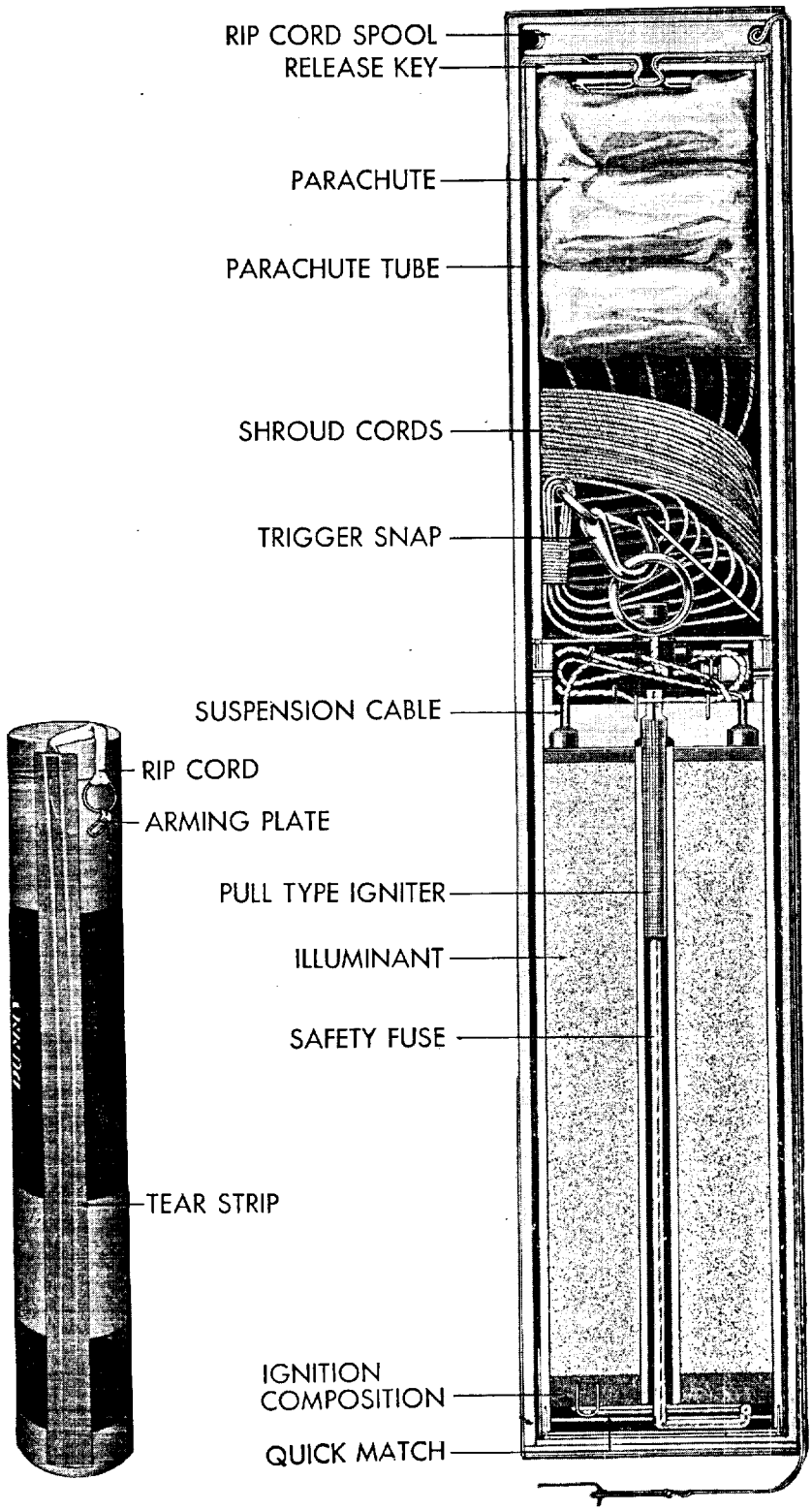


Figure 8—Aircraft Parachute Flare Mk 8 and Mods

between the pyrotechnic candle and the outside flare case. The safety fuse ignites the quick match and then the first fire composition, which, in turn, ignites the illuminant composition.

Ignition of Aircraft Parachute Flares Mk 8 Mod 1 and Mk 8 Mod 2 is accomplished by a pull-type igniter located in the tube in the center of the pyrotechnic candle. The safety fuse is also located in this tube. Aircraft Parachute Flare Mk 8 Mod 1 incorporates a 90-second delay, and the Mk 8 Mod 2 incorporates a 120-second delay. The safety fuse ignites the quick match and then the first fire composition, which, in turn, ignites the illuminant composition. These flares burn for approximately three minutes after being ignited, and with a light intensity of approximately 500,000 candlepower.

Aircraft Parachute Flare Mk 8 and Mods may be released from aircraft by any one of the methods described in Chapter 5.

The minimum altitude from which the Aircraft Parachute Flare Mk 8 Type can be dropped and obtain full burning time is about 2,500 feet. The altitude at which this flare should be used depends upon the tactics to be employed. Aircraft Parachute Flare Mk 8 Mod 0 should not be launched at a speed in excess of 150 knots, as the parachute may not withstand the shock of opening. Aircraft Parachute Flares Mk 8 Mod 1 and Mk 8 Mod 2 have been modified by the incorporation of a snubber device at the lower end of the suspension cable. Aircraft Parachute Flares Mk 8 Mod 1 and Mk 8 Mod 2 can be launched at air speeds up to 220 knots without danger of casualty to the parachute.

Safety Precautions—In addition to the general safety precautions outlined in Chapter 2, the following special precautions should be observed:

Aircraft Parachute Flare Mk 8 Mod 0 should not be launched at speeds in excess of 150 knots.

Aircraft Parachute Flares Mk 8 and Mods should not be launched from bomb bays.

Packing—Aircraft Parachute Flare Mk 8 and Mods is shipped in a moisture-proof metal container, six containers in one wooden box.

Storage—Flares should be stowed in the original containers in a location where the temperature will not exceed 100 degrees Fahrenheit. If this temperature is not exceeded, satisfactory performance can be expected for from six to ten years after the date of manufacture.

Aircraft Parachute Flare Mk 10 Mod 0

This flare is used for illuminating a large area sufficiently to permit reconnoitering and bombing. (Fig. 9.) The light produced by the flare primarily for bombing also has a blinding effect on the operators of antiaircraft weapons.

The complete flare, as issued ready for release, weighs approximately 30 pounds. The shellac-impregnated chip board case—containing a time fuze, a parachute, and the pyrotechnic candle—has a diameter of 5⅜ inches and a length of 35¾ inches.

Aircraft Parachute Flare Mk 10 Mod 0 can be dropped from any aircraft by at least one of the methods described in Chapter 5.

One or two metal support bands which are shipped with the flare can be mounted on the flare (as indicated on the case) so that the flare can be suspended from bomb racks and bomb shackles. The support bands are not needed when the flare is launched from the cockpit or from Flare Container Mk 1 Mod 0. There are also two metal steadying bands fastened to the case, against which the steadying forks or sway bracing of the bomb rack rest.

The firing lanyard is connected to the firing lever of the time fuze by a snap cord. The fuze end of the flare case is closed by a metal cover, and the parachute end of the flare case is closed by several layers of chip board held in place by gummed cloth and sealed with paraffin. The flare, as issued, is water resistant but should be kept in the shipping container when not installed in an airplane.

Aircraft Parachute Flare Mk 10 Mod 0 has a variable time delay fuze. The setting is made by turning the indicator on the metal firing mechanism housing to the desired delay. The delay is shown on the fuze setting ring, and indicates the vertical distance the flare will

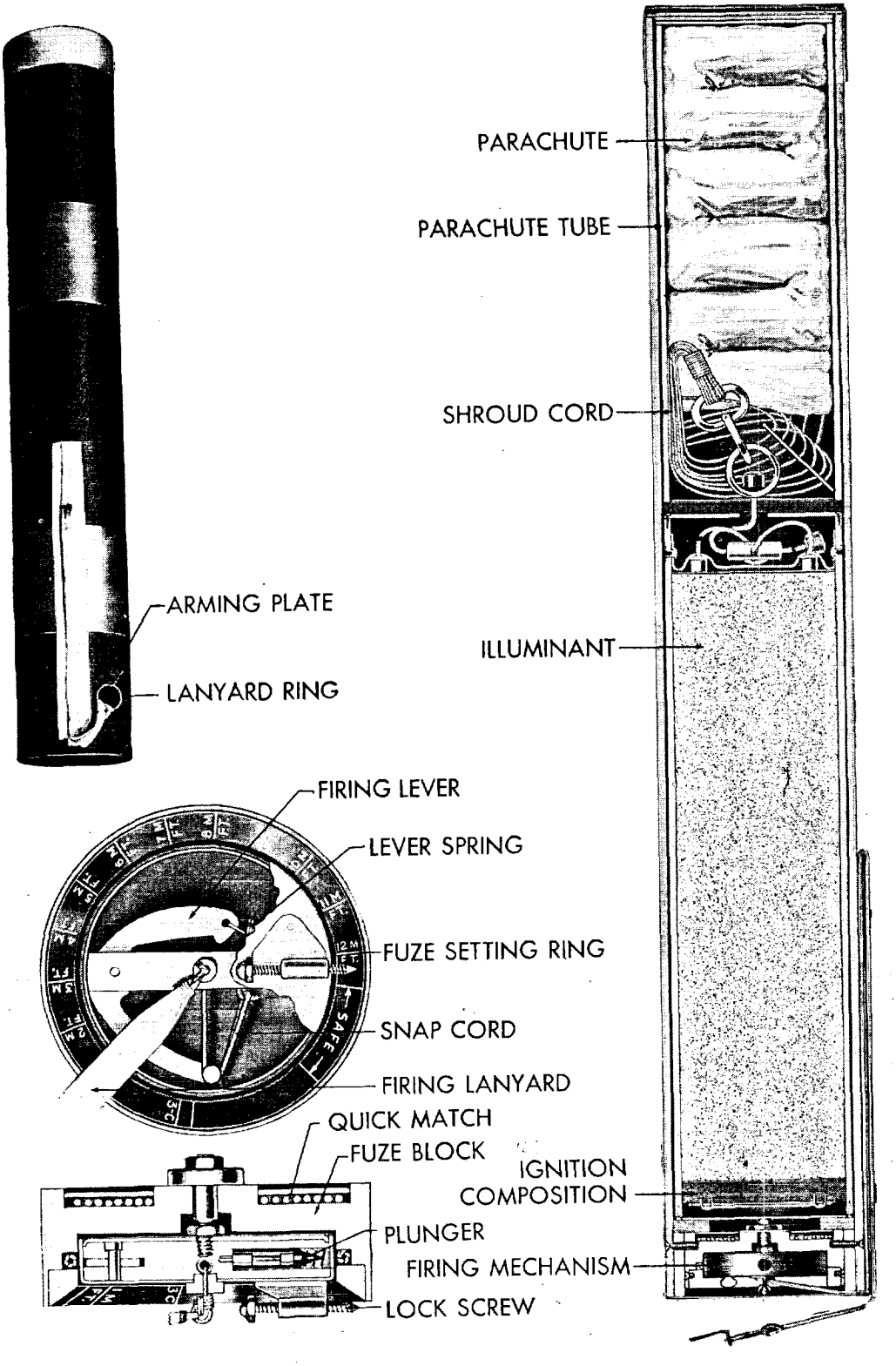


Figure 9—Aircraft Parachute Flare Mk 10 Mod 0, and Fuze

drop before igniting. This distance (or delay) can be varied from 300 feet to 12,000 feet.

Operation—When the flare is released from the aircraft, the arming plate on the end of the firing lanyard is retained by the arming-wire retainer of the bomb shackle or bomb rack. The firing lanyard tears along the side of the case, flips off the metal fuze end cover, and pulls the snap cord attached to the firing lever.

The firing lever is pulled away from the primer, and, when the snap cord is released, the firing lever spring drives the firing lever back against the primer. The flame from the primer ignites the black powder pellets in the fuze plunger. Expanding gases from the burning black powder force the sharp point of the plunger into the safety fuse. Three small holes near the point of the plunger allow some of the flame to escape from the inside of the plunger into the powder of the safety fuse. The safety fuse burns at the rate of 12 inches per 60-second interval. The point at which this fuse starts to burn is determined by the drop desired before ignition of the flare, and is regulated as described above.

The safety fuse (at the periphery of the metal mechanism housing) burns its predetermined length and ignites the quick-match under the fuze block. This, in turn, ignites the quick-match and firecracker fuse stapled to the ignition (or first fire) composition.

When this composition begins to burn, the gases generated force the parachute in the split parachute tube and the illuminant out of the flare case, which falls clear. The split tube falls away and the parachute opens, suspending the flare.

The pyrotechnic candle burns for approximately 4½ minutes, with a minimum light intensity of 750,000 candlepower. The color of the light produced is pale yellow.

To use the full burning time of the flare to best advantage, the altitude at which it is to be released should be about 3,000 feet greater than the fuze setting. While burning, the flare falls about 2,100 feet.

Safety Precautions—Observe the general safety precautions outlined in Chapter 2.

Packing—Aircraft Parachute Flare Mk 10 Mod 0 is packed separately in a moisture-proof metal container, four containers in one wooden packing box.

Storage—Flares should be stowed in the original containers in a location where the temperature will not exceed 100 degrees Fahrenheit. If this temperature is not exceeded, satisfactory performance can be expected for from six to ten years after the date of manufacture.

Aircraft Parachute Flare Mk 11 Mod 0

This flare was developed to supplement Aircraft Parachute Flare Mk 8 and Mods for use in night antisubmarine warfare. (Fig. 10.) It will not be placed on pyrotechnic allowance lists until adequate supplies are available and until reports from the Fleet indicate the quantities desired.

The principal characteristics of this new flare are:

1. Immediate opening of the parachute (similar to the Aircraft Parachute Flares Mk 4 and Mk 8 Types).

2. Selective delay between the opening of the parachute and ignition of the pyrotechnic candle. (Delays between 90 seconds and 180 seconds can be selected at any time prior to take-off of the aircraft.)

3. Light intensity of approximately one million candlepower for a period of three minutes.

This flare allows a single patrol plane to drop a flare near the target and then to get into position for the attack before the flare ignites and discloses the presence of the attacking plane. The minimum altitude from which these flares can be dropped and obtain the full burning time varies between 2,500 feet and 4,000 feet, depending on the delay which has been previously selected. The average rate of descent before ignition is abount 800 feet per minute, and after ignition is about 450 feet per minute.

The complete flare, as issued ready for release, weighs approximately 30 pounds. The

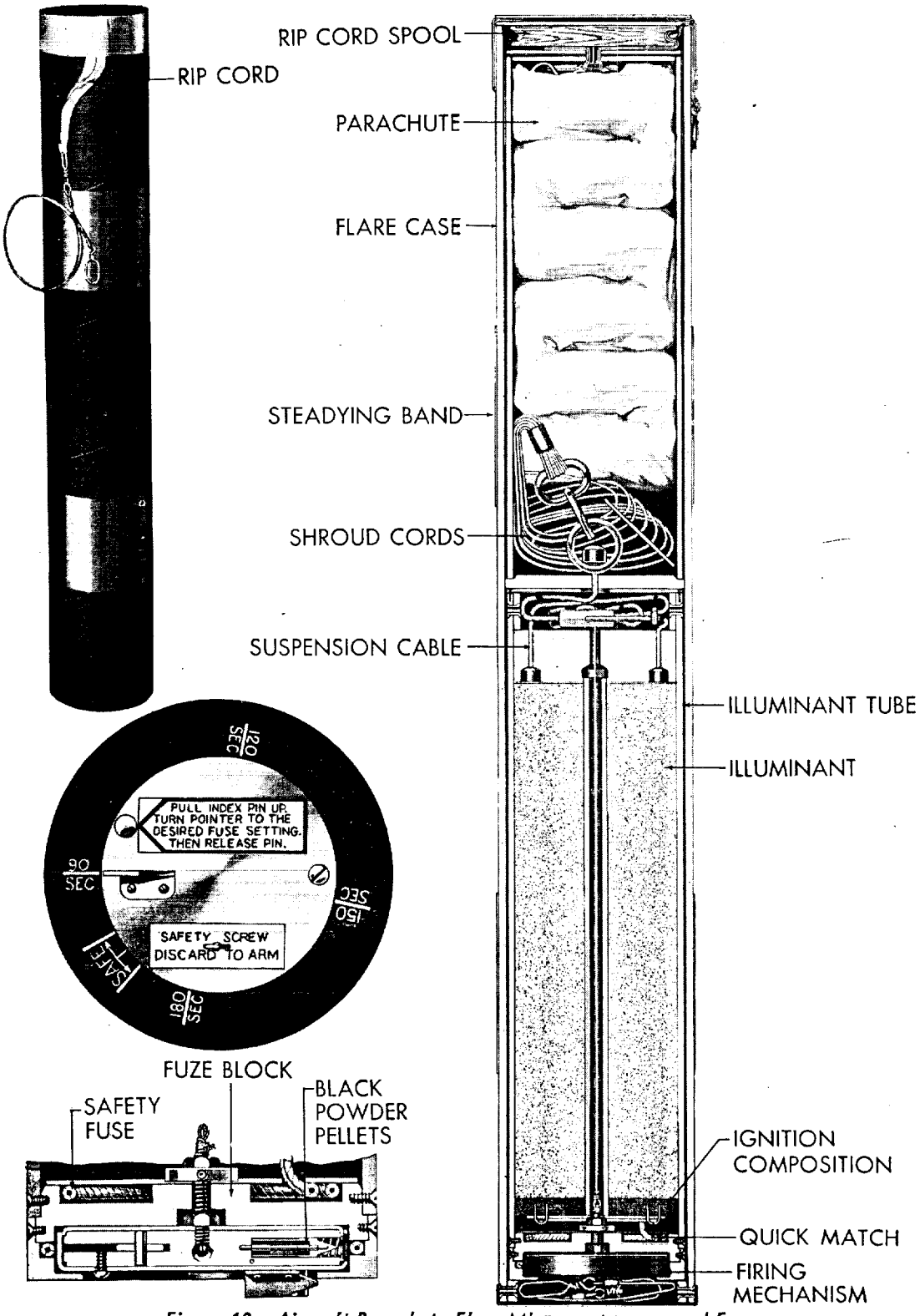


Figure 10—Aircraft Parachute Flare Mk 11 and Mods, and Fuze Assembly Showing Settings

shellac-impregnated chip board case has a diameter of 5⅜ inches and a length of 35¾ inches.

Two metal steadying bands are fastened to the case. The steadying forks or sway-bracing of the bomb rack rest against these steadying bands when the flare is mounted on the aircraft.

The parachute end of the flare case is closed by a chip board disc, held in place by gummed cloth and sealed with paraffin. The fuze end of the flare is closed by a metal fuze end cover under which is stowed the metal lanyard.

The flare, as issued, is water-repellent but should be kept in the moisture-proof shipping container when not installed on an aircraft. Markings on the case show where the support bands should be attached if the flare is to be released from a bomb rack. The support bands are shipped in the wooden packing box with the flare.

The selective delay fuze is set by lifting the spring-loaded plunger and turning the metal fuze housing. The fuze pointer indicates the delay in seconds between launching the flare and ignition of the pyrotechnic candle. Releasing the plunger causes positive locking in the five major settings (90 seconds, 120 seconds, 150 seconds, 180 seconds, and SAFE.)

Operation—As the flare falls away from the aircraft, the swivel loop and flexible metal lanyard are retained by the arming wire retainer of the launching gear. The rip cord, (fastened to the end of the metal lanyard and wound around a wooden spool inside the end of the flare casing) unwinds from the spool, thus carrying away the end of the flare casing. When the end of the flare casing is torn off, the rip cord pulls the wooden spool and the parachute tube (with the parachute) out of the flare casing. The spool falls away. The tension on the rip cord retains the parachute tube and, as the flare case containing the flare candle falls away, the parachute is pulled out of the lower end of the parachute tube by the suspension cable and the parachute shroud lines.

When the parachute and parachute shroud lines are fully extended, the release key cord becomes taut and pulls one end of the release key down. This allows the rip cord to slip through the key and become detached from the parachute tube. The parachute opens and suspends the flare 30 feet to 50 feet below the aircraft. The parachute tube and the flare casing both fall clear.

The selective delay ignition device of the Aircraft Parachute Flare Mk 11 Mod 0 functions in a manner similar to the fuze used in the Mk 5 and Mk 6 types of aircraft parachute flare. Action is initiated by a wire cord attached to the suspension cable so that it is pulled before the cable is fully extended. The wire cord passes through a hole in the center of the pyrotechnic candle. The striker is pulled away from the primer and then released, striking the primer, which ignites the powder pellets in the fuze plunger. The fuze plunger is driven by the gases generated by the black powder pellets into a safety fuse which surrounds the metal fuze housing. The safety fuse burns its predetermined length and ignites the pyrotechnic candle. Gases generated by the burning candle blow the fuze assembly off from the end of the pyrotechnic candle, and the fuze falls clear.

Aircraft Parachute Flare Mk 11 Mod 0 may be released from aircraft by at least one of the methods described in Chapter 5.

The minimum altitude from which the Aircraft Parachute Flare Mk 11 Type can be dropped and obtain full burning time varies between 2,500 feet and 4,000 feet, depending upon the delay selected. The altitude from which this flare should be launched will depend upon the tactics to be employed in that particular case.

Aircraft Parachute Flare Mk 11 Mod 0 has a friction type snubber device at the lower end of the suspension cable, allowing the flare to be launched at speeds as high as 200 knots with satisfactory results.

Safety Precautions—In addition to the general safety precautions outlined in Chapter 2, the following special precaution should be observed:

The Aircraft Parachute Flare Mk 11 Mod 0 should not be launched from bomb bays.

Packing—Aircraft Parachute Flare Mk 11 Mod 0 is shipped in a moisture-proof metal container, four containers in one wooden box.

Storage—Flares should be stowed in the original containers in a location where the temperature will not exceed 100 degrees Fahrenheit. If this temperature is not exceeded, satisfactory performance can be expected for from six to ten years after the date of manufacture.

Flares, Aircraft, Parachute, M26 and AN–M26

These flares provide illumination for night bombardment and reconnaissance. (Fig. 11.) Flare, Aircraft, Parachute, AN–M26 is an improvement of Flare, Aircraft, Parachute, M26. These flares are parachute-supported with shaded candles. The shade is folded around the candle and opens like an umbrella.

The complete flare (with the fuze) weighs approximately 53 pounds. The metal flare case, cylindrical in shape (with tail fins and a rounded nose) has a diameter of eight inches (not including the fins) and a length of 50 inches (with the fuze installed); the diameter across the tail fin is 13½ inches. The case is equipped with two suspension lugs 14 inches apart. A shipping cover with a handle attached closes the tail end of the case. This opening is sealed by a strip of adhesive tape.

Two types of illuminant are used in Flare, Aircraft, Parachute, M26—the standard illuminant which produces a light of approximately 800,000 candlepower, and a substitute illuminant which produces a light of approximately 575,000 candlepower. As the substitute illumant ages, the burning time sometimes decreases to about two minutes, and, at the same time, the light intensity increases to about one million candlepower. A flare with the substitute illuminant can be identified by a blue band painted around the nose, or by blue support bands.

Ignition Delay of Flares, Aircraft, Parachute M26 and AN–M26 is controlled by the Fuzes, Flare, Mechanical Time, M111, M111A1, or M111A2. Of these three fuzes, the M111A2 is the most sturdily constructed, and the most satisfactory. A new fuze which is available for issue in limited quantity is the Fuze, Bomb, Mechanical Time, M146; it is detonator safe and is preferred to any of the above fuzes. It is the only fuze authorized for carrier use with this flare.

For additional details concerning fuzes and the proper procedures for the handling of fuzes, refer to Chapter 7. These fuzes permit the use of the flare for high-altitude bombardment. They may be set to function at 3,000 feet when released from any altitude beeween 5,000 feet and 25,000 feet. The delay is indicated on the time graduation ring. Table 1 shows the fuze setting corresponding to the number of seconds required for a flare to fall from any altitude in the above range to an altitude of 3,000 feet, and the dropping angles to be used with various airplane ground speeds.

This flare is launched only from bomb racks and bomb shackles. If the rack or shackle to be used has only one suspension hook, the flare should be suspended by the after lug, which is above the center of gravity of the flare. If the rack or shackle has two suspension hooks, the flare should be suspended by both lugs.

The flare should be prepared for mounting in the aircraft as described in Chapter 5. Flare, Aircraft, Parachute, M26 can be released at any air speed up to 130 knots. At higher speeds, the drag sleeve is apt to tear away, with the result that the flare will not function properly. For the same reason, Flare AN–M26 must not be released at an air speed in excess of 240 knots.

Operation—Flares may be released safe or armed. When released safe, they may function on impact. When released armed, they function as follows:

Downward movement of the flare withdraws the arming wire from the fuze, allowing the vane to rotate and arm the fuze. Withdrawing the arming wire also allows the release pin to be ejected, thus starting the time mechanism.

When the flare has dropped the length of the hangwire, the latter breaks the seal wire and

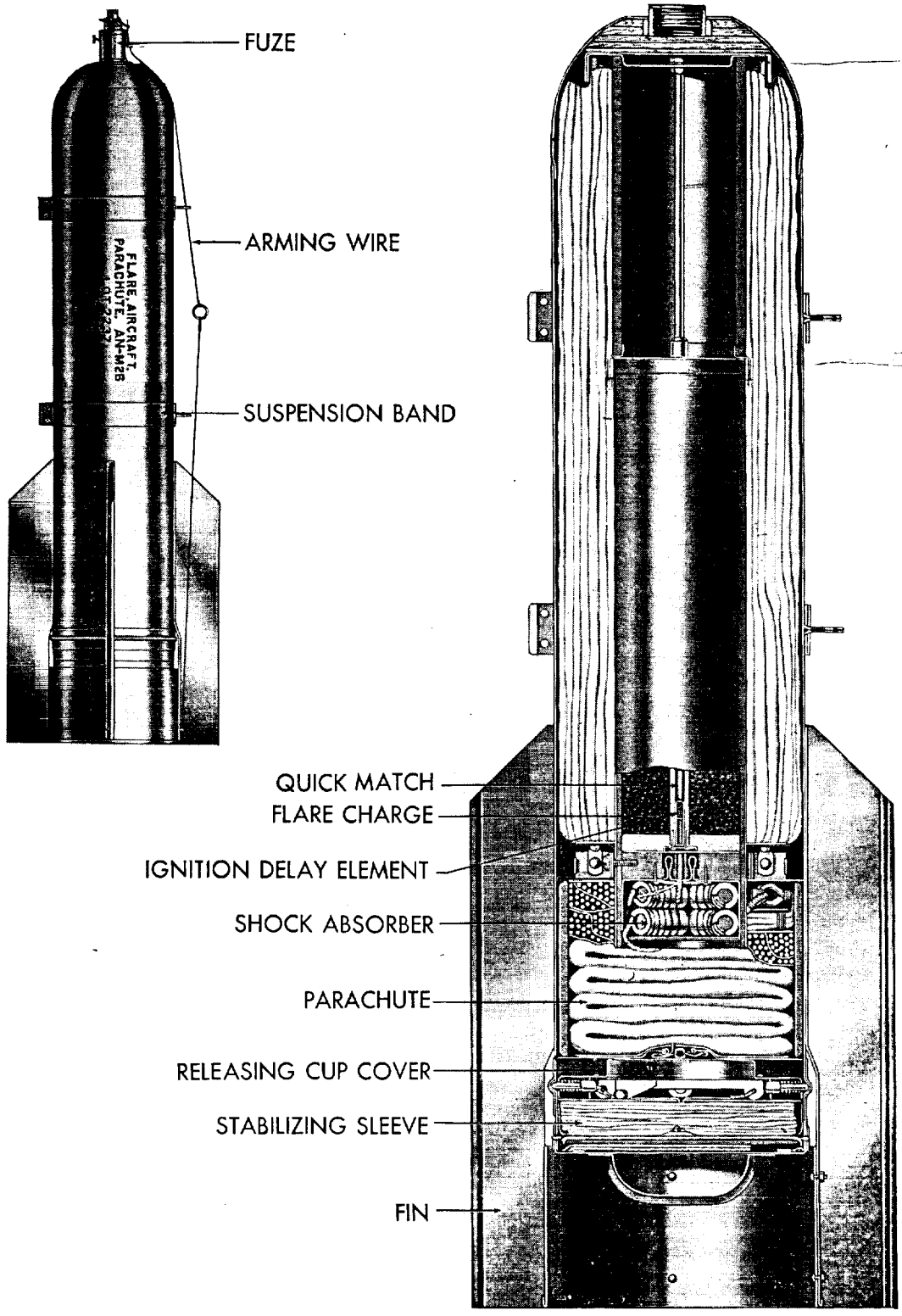


Figure 11—Flares, Aircraft, Parachute, M26 and AN–M26

pulls out the hangwire container, which drops free. Meanwhile, the tear wire, (attached to the hangwire near its end) pulls out the tear wire cord which, in turn, pulls out the drag sleeve and its shrouds. A lengh of cord attached to the shrouds removes the detachable cover lock of the cover releasing cup.

When the flare has dropped the combined length of the hangwire, tear wire, tear wire cord, sleeve, and sleeve shrouds, the tear wire breaks, allowing the flare to drop. The flare is stabilized in flight by the fins and by the drag sleeve. The arming vanes arm the fuze in about five seconds from the time of release.

When the time set on the periphery of the fuze has elapsed, a small charge of black powder is ignited and the gases generated push out the cover releasing cup. The four retaining pins (which engage the groove in the case with one end and also rest against the periphery of the cover releasing cup at the other end) are retracted by the retaining pin springs. This releases the detachable cover to which the sleeve shrouds are attached, and allows the drag sleeve and cover assembly to separate from the flare.

The cover assembly is attached to the parachute by the parachute pull-cord. The pullout cord and the expanding gases from the exploded black powder force the parachute, glass cloth shade, and illuminant from the case, which falls free. As the parachute leaves the case, the parachute pull-out cord breaks and the sleeve falls away from the suspended flare.

The shock caused by the opening of the parachute is taken up by a shock absorber. This is composed of two lengths of metal tubing which have been slipped over the suspension

Table I—Dropping Angles and Fuze Settings

(Altitude of Functioning, 3,000 Feet)

Release altitude (feet)	Fuze setting (seconds)	Dropping angles (degrees) for various ground speeds (knots)					
		122.5	140	157.5	175	192.5	210
5,000	14.0	17.3	19.0	20.7	22.2	23.6	24.9
6,000	18.2	16.1	17.7	19.2	20.6	21.9	23.1
7,000	22.2	14.7	16.2	17.6	18.9	20.0	21.1
8,000	26.1	13.5	14.9	16.1	17.3	18.4	19.5
9,000	29.9	12.4	13.7	14.9	15.9	17.0	18.0
10,000	33.7	11.5	12.7	13.8	14.8	15.8	16.7
11,000	37.3	10.7	11.8	12.8	13.8	14.7	15.6
12,000	40.9	10.1	11.1	12.1	13.0	13.8	14.6
13,000	44.5	9.5	10.5	11.4	12.2	13.0	13.8
14,000	47.9	9.0	9.9	10.8	11.6	12.4	13.1
15,000	51.3	8.5	9.4	10.3	11.1	11.8	12.5
16,000	54.7	8.2	9.0	9.8	10.6	11.3	12.0
17,000	58.0	8.0	8.7	9.4	10.2	10.9	11.5
18,000	61.2	7.7	8.4	9.1	9.8	10.5	11.1
19,000	64.4	7.4	8.0	8.8	9.5	10.1	10.7
20,000	67.6	7.1	7.8	8.5	9.2	9.8	10.4
21,000	70.7	6.9	7.6	8.3	8.9	9.6	10.2
22,000	73.7	6.7	7.4	8.1	8.7	9.3	9.9
23,000	79.6	6.5	7.2	7.8	8.5	9.1	9.6
24,000	76.6	6.4	7.0	7.7	8.3	8.9	9.4
25,000	82.5	6.2	6.8	7.5	8.1	8.7	9.2

cable and then coiled around an arbor about ¾ inch in diameter. The shock is absorbed by straightening the metal tubing.

As the suspension cable straightens, the ignition wires are pulled through the ignition mixture; this starts the ignition train composed of the igniter, the delay element, the quick-match which runs down through the center of the candle, the first fire composition, and the illuminant candle. The delay element burns for abount six seconds, to insure the complete opening of the parachute before the candle ignites. As the candle ignites, the gases generated force off the rib retainer, allowing the rib springs to open the shade. Full ignition is reached in about eight seconds.

The illuminant candle burns for approximately three minutes, with a light intensity of about 800,000 candlepower. The suspended flare drops at an average rate of about 700 feet per minute.

Safety Precautions—In addition to the general safety precautions outlined in Chapter 2, the following special precautions should be observed:

Flare, Aircraft, Parachute, M26 should not be released at an air speed in excess of 130 knots.

Flare, Aircraft, Parachute, AN–M26 should not be released at an air speed in excess of 240 knots.

If short time setting or low launching speed is used with the Fuze M111A2, the fuze should be modified as described on page 62.

Packing—Flare, Aircraft, Parachute, M26 or AN–M26 is packed in an unlined wooden box. Fuzes are shipped separately.

The forward opening of these flares is sealed by a gasket, and the opening closed by the shipping cover is sealed with tape. This makes it unnecessary to pack these flares in a sealed metal container similar to the one used for Navy flares having the shellac-impregnated chip board case. The tap seal at the edge of the shipping cover is not moisture-proof. Therefore, the service life of these flares is only two to three years, while the service life of Navy flares is six to ten years.

Storage—Flares should be stowed in a dry, well ventilated place out of the direct rays of the sun, and protected against excessive or variable temperatures. The temperature in the magazine should not exceed 100 degrees Fahrenheit at any time. Under ideal stowage conditions, the service life of the Flares, Aircraft, Parachute, M26 and AN–M26 is about three years.

Unused flares should be removed from any aircraft which is to be temporarily grounded. The fuze must be disassembled from the flare before returning the flare to stock. The seal wire and safety cotter pin must be replaced before removing the arming wire from the fuze. The arming wire and hangwire should be coiled and replaced in the hangwire container. Replace the shipping cover; seal it with tape; and replace the shipping plug. Care should be taken to repack and reseal the fuze in the original container.

Chapter 5

INSTALLATION OF PARACHUTE FLARES AND LAUNCHING EQUIPMENT

Aircraft parachute flares are launched by one of six methods. The type of flares which can be launched by each method are indicated in Table 2 on page 40.

No bomb racks have been designed to operate with a suspended weight of less than 25 pounds. However, Bomb Racks Mk 50 and Mods and Mk 51 and Mods give satisfactory service with all types of aircraft parachute flares. Aircraft Parachute Flare Mk 5 Mod 8, all Aircraft Parachute Flares Mk 6 and Mk 10 Types, and Flares, Aircraft, Parachute, M26 and AN–M26 can be launched from the following bomb shackles mounted in bomb bays:

Bomb Shackle Mk3 and Mods
Bomb Shackle Mk 4 Mod 2 and above
Bomb Shackle Mk 5 and Mods
Bomb Shackle Mk 8 and Mods

Caution: Aircraft Parachute Flares Mk 4, Mk 8, and Mk11 should not be released from bomb bays, because the parachute is pulled out of the flare case by a static line, and may foul on the airplane structure.

Flares of Navy design are installed on bomb racks and bomb shackles as follows:

Take hold of the arming plate or swivel loop on the end of the rip cord or firing lanyard; tear the rip cord cover clear of the support band locations; but do not tear the rip cord cover to the extreme end of the flare. This may cause ignition of Aircraft Parachute Flares Mk 5, Mk 6, or Mk 10 Type, or may loosen the parachute end cover of the Aircraft Parachute Flares Mk 4, Mk 8, or Mk 11 Type.

Attach the support bands at the locations indicated on the flare case. Pass the hinged end fitting of the support band through the elongated ring in the other end of the band; lift the other hinged fitting; and insert the ¼-inch steel pin through the two ⅜-inch drilled holes in the fittings. Secure with ¼-inch washer and

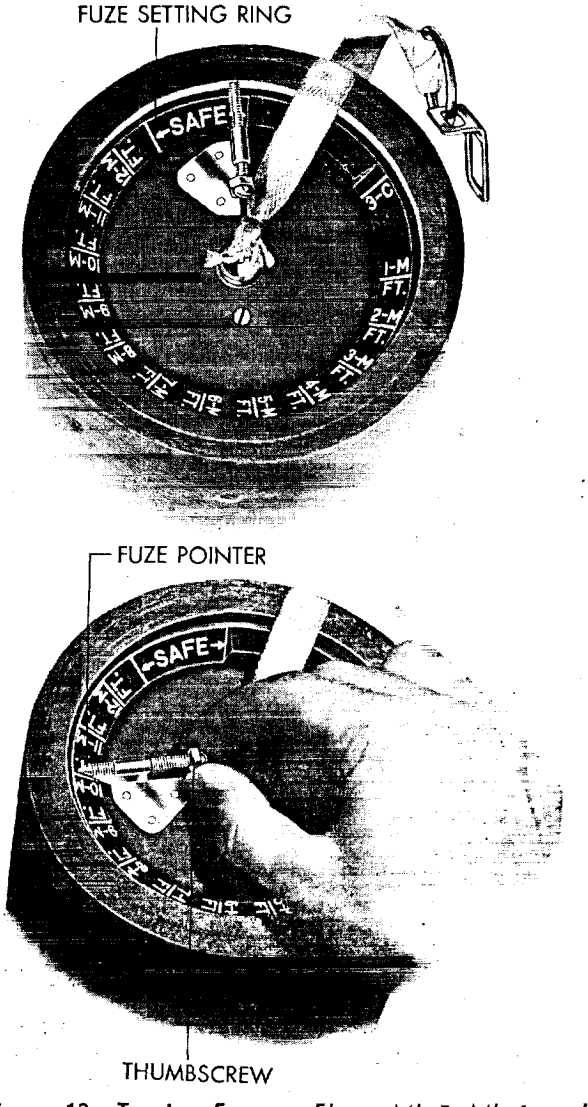


Figure 12—Turning Fuze on Flares Mk 5, Mk 6, and Mk 10 Types

$\frac{1}{10}$-inch cotter pin. Make sure that the rip cord is not under the support band.

When using Aircraft Parachute Flares Mk 5, Mk 6, and Mk 10 Types, remove the metal fuze end cover and set the fuze pointer opposite the drop at which the flare is desired to function (Fig. 14). Tighten the thumbscrew attached to the pointer, so that the point penetrates the chip board flare case. Replace the metal fuze end cover.

When using the Aircraft Parachute Flare Mk 11 Type, remove the metal fuze end cover and the metal lanyard which is shipped in the cavity under the fuze end cover. Clip the metal lanyard to the ring on the end of the rip cord located at the parachute end of the flare case. Set the selective delay fuze by lifting the spring-loaded plunger and turning the metal fuze housing. The fuze pointer indicates the delay in seconds between launching and ignition of the flare. Releasing the plunger automatically locks together the fuze housing and the time graduation ring. Replace the metal end cover.

The Aircraft Parachute Flares Mk 4 and Mk 8 Types do not have adjustable fuzes.

Engage the arming plate or swivel loop with the arming wire retainer of the bomb rack or bomb shackle.

Suspend the flare on the bomb rack or bomb shackle.

Suspend the Aircraft Parachute Flares Mk 4, Mk 8, and Mk 11 Types with the parachute ends forward. These flares must not be launched from bomb bays. Suspend the Aircraft Parachute Flares Mk 5, Mk6, and Mk 10 Types with the fuze ends forward.

When using a bomb rack, adjust the steadying forks or sway bracing against the steadying bands of the flares.

The fuzes of Aircraft Parachute Flares Mk 5 Mod 8, Mk 6 Mod 5, Mk 10 Mod 0, and Mk 11 Mod 0 have a safety screw which **must** be removed after the flare is installed on the bomb rack or bomb shackle. The flare will not function if this safety screw is not removed.

Flares, Aircraft, Parachute, M26 or AN-M26 are installed on bomb racks and bomb shackles as follows:

Unscrew the shipping plug from the nose of the flare.

Inspect the fuze cavity and remove any dirt or corrosion. Clean the threads.

Screw the fuze in place and tighten by hand force only. Do do not use a wrench. If short time setting or low launching speed is to be used with the Fuze M111A2, refer to page 62 for modification of the fuze.

(Proper fuze setting can be determined from Table 1 in Chapter 4.) Set the time delay of the fuze by loosening the thumbscrew and rotating the time graduation ring until the desired delay is indicated. Tighten the thumbscrew.

Remove the shipping cover from the base of the flare; remove the arming wire, the swivel loop, and the outer end of the hangwire assembly, taking care not to pull out the attached end of the hangwire.

Thread the arming wire through the forward suspension lug, then the fuze, and finally through the inner holes of the arming wire guide and vane stop. Cut off all arming wire in excess of four inches in front of the fuze. When installed in this flare, it is not necessary to use a Fahnestock clip (safety clip) with the Fuzes, Flare, Mechanical Time, M111, M111A1, or M111A2, or the Fuze, Bomb, Mechanical Time, M146.

Remove the safety cotter pin from the arming pin, and the seal wire from the vane stop and arming wire guide.

Install the flare on the bomb rack or bomb shackle. If a bomb rack is being used, adjust the steadying forks or sway bracing against the flare case.

Attach the swivel loop to the arming wire retainer of the bomb rack or bomb shackle.

If flares are to be returned to stock after being installed aboard aircraft, the above steps should be accomplished in reverse order. Particular care should be exercised to re-install the safety cotter pin and seal wire before removing the arming wire from the fuze; otherwise the

fuze may be rendered unserviceable, or it may cause the flare to function at the wrong time.

Installation in Flare Launching Tubes

Most combat type airplanes currently in service are equipped with one or more flare launching tubes. These tubes are used to launch all Navy aircraft parachute flares except the Mk 6, Mk 10, and Mk 11 types of aircraft parachute flare. A launching tube large enough to accommodate flares of this size is being developed.

Flare launching tubes of several different designs are in current use. Instructions for the installation of flares in the launching tubes are given in the Aircraft Manual for the model aircraft involved.

Flares are prepared for installation as follows:

When the flare is to be launched from a flare launching tube, the support bands are not used.

When using Aircraft Parachute Flare Mk 5 or Mods, remove the metal fuze end cover and set the fuze pointer opposite the indication of the drop at which the flare is desired to function. Tighten the thumbscrew attached to the pointer so that the point penetrates the chip board flare case. (Aircraft Parachute Flares Mk 4 and Mk 8 Types do not have adjustable fuzes.)

Place the flare in the flare launching tube.

Install Aircraft Parachute Flares Mk 4 and Mk 8 Types with the parachute end upward. Install Aircraft Parachute Flares Mk 5 Type with the fuze end upward.

Secure the arming plate on the end of the rip cord or firing lanyard to the hook provided for the purpose.

Installation in Aircraft Flare Containers

Aircraft Parachute Flares Mk 6 and Mods, Aircraft Parachute Flares Mk 10 and Mods, and Aircraft Parachute Flares Mk 11 and Mods can be launched from the Aircraft Flare Container Mk 1 Type. This flare container is an electrically-operated, jettisonable container for carrying and launching six flares. A description of the flare container appears later in this chapter. Flares may be released one at a time or in

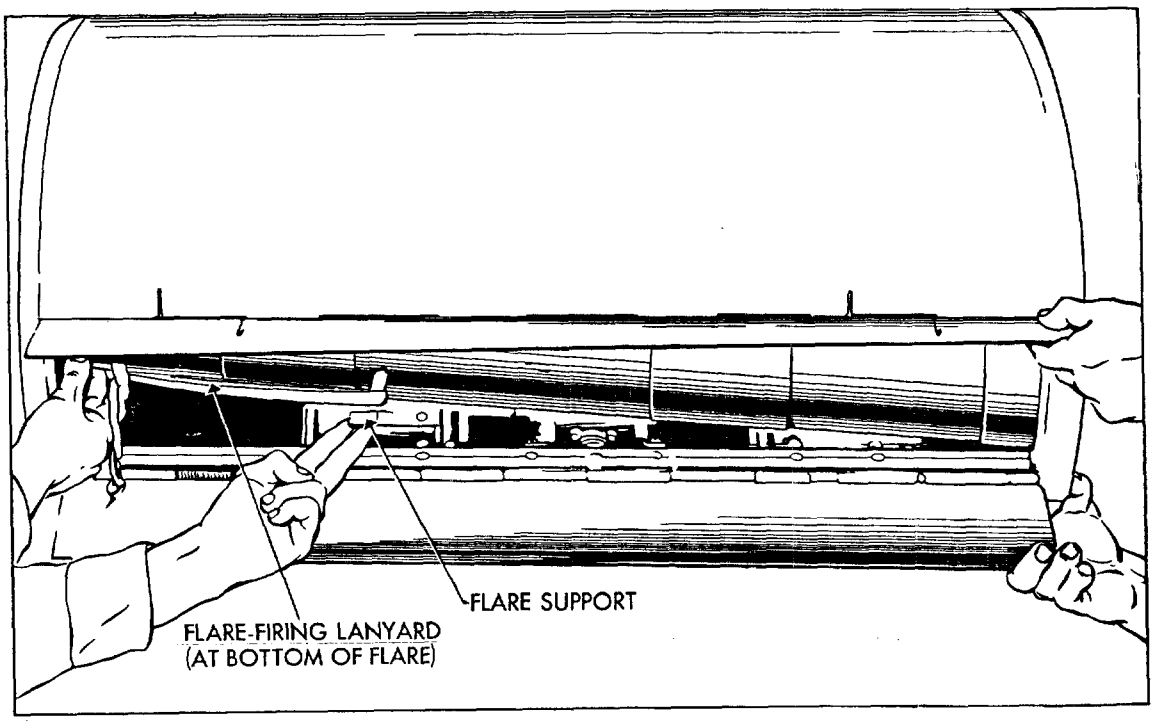


Figure 13—Loading Flare Container

train by electrical impulses from a 24-volt circuit. The container can be suspended from any standard single or double hook (14-inch spacing) bomb rack or bomb shackle. (Fig. 13). However, Aircraft Parachute Flare Mk 11 Type should not be launched from flare containers installed in bomb bays.

The energy for the operation of the container is stored in torsional springs and is released by a solenoid. Before the container can be either loaded or operated, it is necessary to cock the mechanism manually.

The dividing panel assembly inside the container supports three flares on either side by means of metal arms or chocks. The flare rip cords are secured at the after end of the container relative to the airplane. Released flares drop between vertical guides and out through the spring-loaded escape doors.

Flares are installed in the Aircraft Flare Container Mk 1 Type as follows:

Remove the rip cord cover from the side of the flare, taking care not to initiate the fuze of the Flare Mk 6 or Mk 10 Type or loosen the parachute end cover of the Flare Mk 11 Type. The fuzes of Aircraft Parachute Flare Mk 6 Mod 5 and the Aircraft Parachute Flare Mk 10 Mod 0 are initiated by exerting a force of about eight pounds on the rip cord. Fuzes of Aircraft Parachute Flares Mk 6 Type of earlier design require a much greater force. The rip cord should be held lightly in its original position by tabs of adhesive or masking tape.

When using the Aircraft Parachute Flare Mk 6 or Mk 10 type, remove the metal fuze end cover and set the fuze pointer opposite the drop at which the flare is desired to function. Tighten the thumbscrew attached to the pointer, so that the point penetrates the chip board flare case. Discard the metal fuze end cover. When using Aircraft Parachute Flares Mk 6 Mod 5 or Mk 10 Mod 0, remove the safety screw just prior to installing the flare in the flare container. The safety screw must be removed, or the flare will not function when released.

When using the Aircraft Parachute Flare Mk 11 Type, remove the metal fuze end cover and set the selective delay fuze by lifting the spring-loaded plunger and turning the metal fuze housing. The fuze pointer indicates the delay in seconds between launching and ignition of the flare. Releasing the plunger automatically locks together the fuze housing and the time graduation ring. Discard the metal fuze end cover. Remove the safety screw just prior to installing the flare in the flare container.

The Flares Mk 6 and Mk 10 Types should be installed in the container with the fuze end aft with respect to the airplane, and with the rip cord on the under side of the flare. The Flare Mk 11 Type should be installed with the parachute end aft with respect to the airplane. Raise each flare to its station and pull the applicable holding chocks out to the locked position. These chocks retain the flare in position. Jiggle the flare to check positive locking of the chocks.

Insert the arming plate and ring or the swivel loop on the end of the rip cord completely through the slotted opening provided in the bulkhead located aft with respect to the airplane. The arming plate or the swivel loop is retained by a small flat spring projecting over the slot.

Instructions for the proper use and care of the Aircraft Flare Container Mk 1 Mod 0 appear later in this chapter.

When removing flares from the container, the rip cord may become fouled in the container and ignite the flares. Therefore, before Flares Mk 6 and Mk 10 Types are removed from the flare container, the container should be detached from the aircraft and taken to a clear area. Flares are removed from the container by reversing the steps outlined for their installation.

Preparation for Manual Launching

Aircraft parachute flares should not be launched manually except in an emergency. Parachutes of flares launched manually may become fouled on the tail surfaces of the airplane.

Make sure that the flare is stowed securely in the airplane, as ignition of a flare stowed loose

in the cockpit of an airplane, particularly if it is catapulted, may cause a serious accident.

Flares should be prepared for manual launching as follows:

The support bands are not used with this method of release.

Provide an additional 10 feet of rip cord and secure one end to the arming plate or swivel loop on the end of the flare rip cord. Before launching, secure the other end of the rip cord extension to a substantial part of the aircraft structure.

When using the Aircraft Parachute Flare Mk 5, Mk 6, or Mk 10 Type, remove the metal fuze end cover, and set the fuze pointer opposite the drop at which the flare is desired to function. Tighten the thumbscrew attached to the pointer, so that the point penetrates the chip board flare case. When using the Aircraft Parachute Flare Mk 11 Type, remove the metal fuze end cover, and set the selective delay fuze by lifting the spring-loaded plunger and turning the metal fuze housing.

The fuze pointer indicates the delay in seconds between launching and ignition of the flare. Releasing the plunger automatically locks the fuze housing and the time graduation ring together. Discard the safety screws and the metal fuze end cover. The Aircraft Parachute Flares Mk 4 and Mk 8 Types do not have adjustable fuzes.

Manual Launching

Aircraft Parachute Flares Mk 4, Mk 8, and Mk 11 Types should be launched with the parachute end upward. Aircraft Parachute Flares Mk 5, Mk 6, and Mk 10 Types should be launched with the fuze end upward. The flare should be launched with as much downward velocity as possible, so that it will clear the structure of the airplane. The parachutes of the Aircraft Parachute Flares Mk 4, Mk 8, and Mk 11 Types suspend those flares immediately after launching.

Safety Precautions — Aircraft Parachute Flares should not be launched manually except in an emergency. When flares are to be launched manually, and particularly when the airplane is to be catapulted, extreme care must be exercised in securing the flares within the airplane. Ignition of a flare stowed loose in the cockpit of an airplane, particularly if it is catapulted, may cause a serious accident.

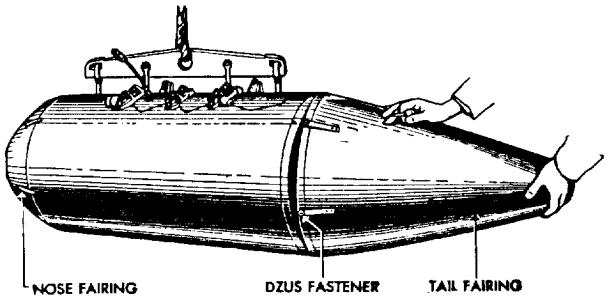


Figure 14—Aircraft Flare Container Mk 1 Mod 0

Aircraft Flare Container Mk 1 Mod 0

Aircraft Flare Container Mk 1 Mod 0 is an electrically-operated jettisonable container for carrying and launching six aircraft parachute flares. (Fig. 14.) Aircraft Parachute Flares Mk 6 and Mods, Aircraft Parachute Flares Mk 10 and Mods, and Aircraft Parachute Flares Mk 11 and Mods can be used with this device when attached to wing racks. Only Aircraft Parachute Flares Mk 6 and Mk 10 Types can be used in the flare container when mounted in bomb bays. Flares are released one at a time by electrical impulses from a 24-volt circuit. The container may be suspended from any standard single or double hook (14-inch spacing) bomb rack or bomb shackle. Instructions for the preparation of the flares for loading and the instructions for loading the flares into the container appeared earlier in this chapter.

The energy for the operation of the flare container is stored in torsional springs, and is released by a solenoid. Before the container can be either loaded or operated, the mechanism must be cocked manually. The dividing panel assembly inside the container (Fig. 15) supports three flares on either side by means of metal arms or chocks. The flare rip cords or firing lanyards are secured at the after end of the container relative to the airplane. Released flares drop through vertical guides and out through spring-loaded escape doors.

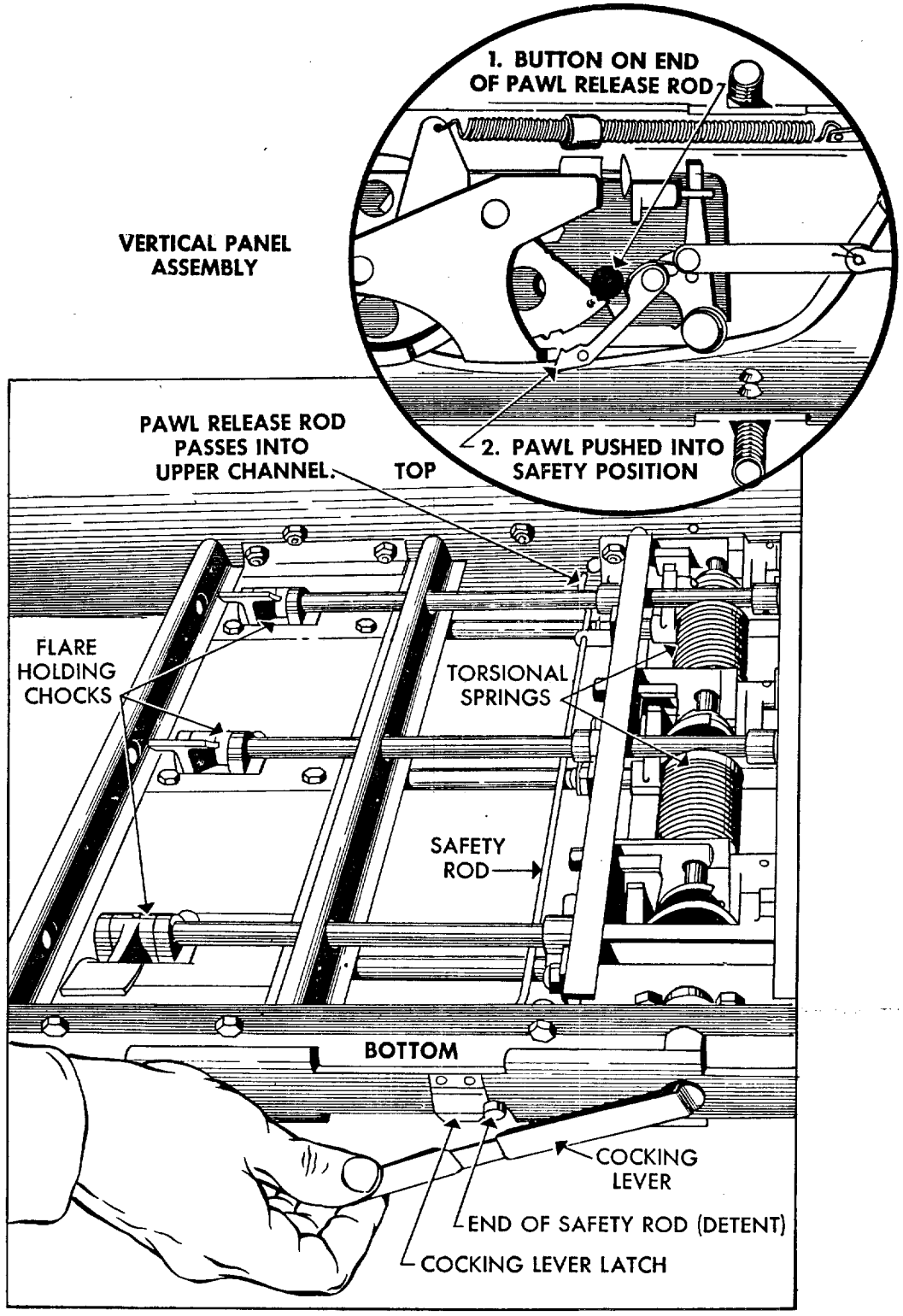
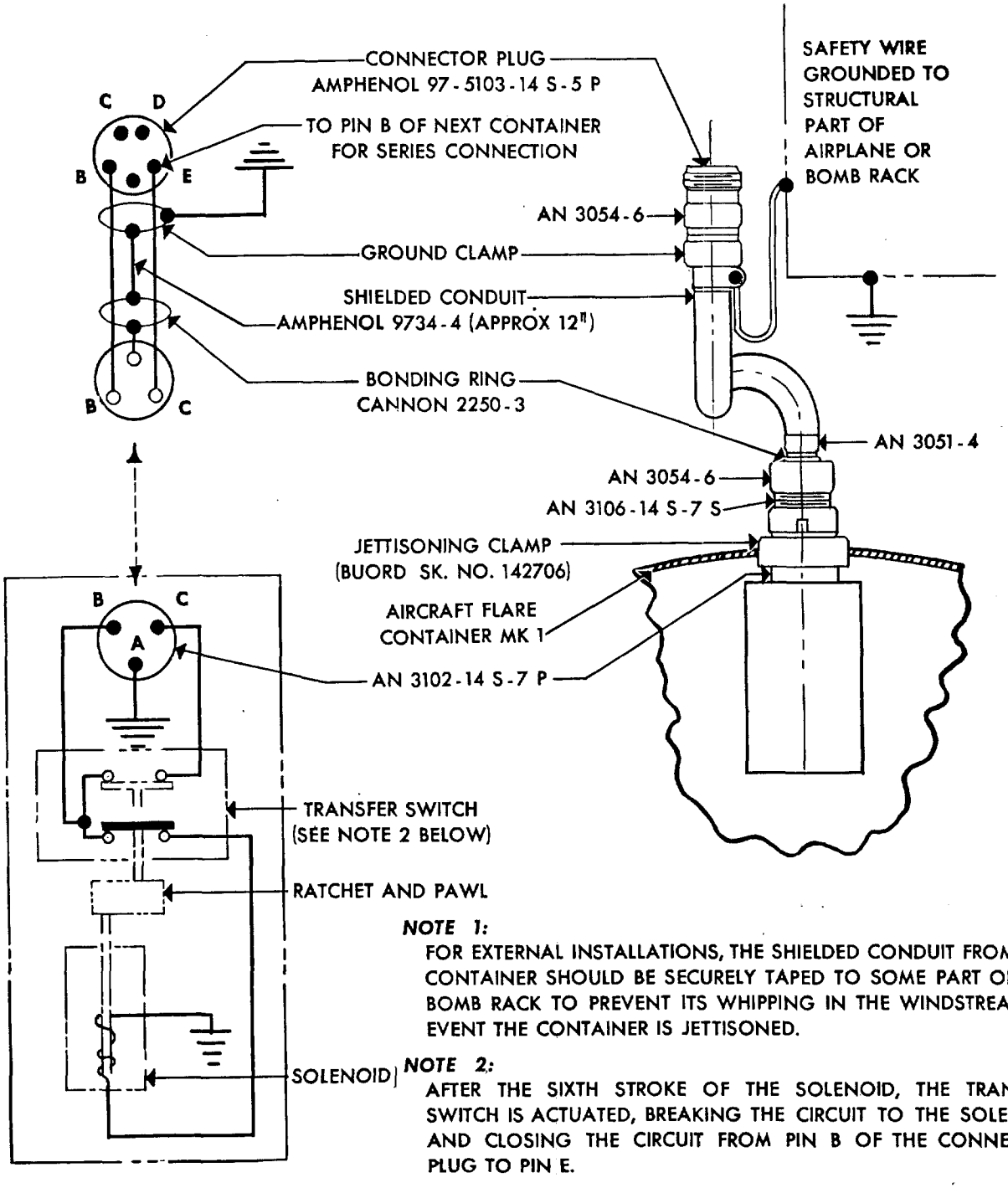


Figure 15—Flare Container: Vertical Panel Assembly



NOTE 1:
FOR EXTERNAL INSTALLATIONS, THE SHIELDED CONDUIT FROM THE CONTAINER SHOULD BE SECURELY TAPED TO SOME PART OF THE BOMB RACK TO PREVENT ITS WHIPPING IN THE WINDSTREAM IN EVENT THE CONTAINER IS JETTISONED.

NOTE 2:
AFTER THE SIXTH STROKE OF THE SOLENOID, THE TRANSFER SWITCH IS ACTUATED, BREAKING THE CIRCUIT TO THE SOLENOID AND CLOSING THE CIRCUIT FROM PIN B OF THE CONNECTOR PLUG TO PIN E.

Figure 16—Wiring Diagram for Flare Container

The cocking feature incorporated in the container eliminates the possibility of malfunctioning due to accidentally loading a partially-cocked container. It is impossible to lock the flare holding chocks in the "up" position for retaining flares unless the mechanism is fully cocked. To cock the container, the cocking lever (at the bottom of the container) must be unlatched by a hard pull, and rotation continued through an arc of about 150 degrees. A separate and distinct click will be heard as the mechanism of each flare station reaches the cocked position.

While the cocking lever remains out of its latched position, the container can be loaded but remains inoperative; that is, electrical impulses may be applied without danger of releasing the flares. Therefore, the cocking lever must be returned to its latched position for operation of the container, or left unlatched as a "safety" to prevent accidental release of flares. The end of the safety rod (which also acts as the detent for the cocking lever latch) should protrude from the bottom of the panel when the cocking lever is unlatched or on SAFE.

As the cocking lever is pushed under the recessed spring clip, the end of the spring-loaded safety rod is forced up and over the cocking lever by a camming action. To see the positive action of the safety device, remove the top center access cover and observe the movement of the ratchet release pawl as the safety rod is worked up and down by hand from the bottom of the container. If the safety rod binds, it should be lubricated with light oil.

Operation—When the solenoid is energized, the spring-loaded plunger, (linked mechanically to the release rack) retracts completely, thereby effecting release of one flare. The solnoid plunger remains retracted as long as the current is on; therefore, to effect release of another flare, the circuit must be broken long enough to allow the spring-loaded plunger to return to the normal position before applying the next electrical impulse. The maximum rate of release is about ten flares per second, but flares must be dropped one at a time and spaced not less than about 45 feet apart to minimize the possibility of interference between flares. Therefore, the flare container's maximum dropping rate of ten per second is considered adequate for effecting any desirable spacing of flares. To trip the release mechanism manually while examining or checking its operation, remove the top access covers, locate the solenoid plunger, and pry inward on it.

Caution: Never insert the hands or fingers into the center access opening on top of the flare container while it is cocked. Fingers caught here, between the release spool and rack release, can be freed by recocking the container, but this can be done only by a second person, because the person whose fingers are caught at the top of the container cannot reach the cocking lever at the bottom.

In the sequence of release, a lower flare is always released before the one above it, releases alternating between the two flare compartments. The sequence of release is definite, but since the container may be installed with either end forward, determination of port and starboard sides is subject to human error. For this reason, it is not advisable to rely on release of a flare from a particular side of the container. For example, if the container is to be only partly loaded, the same number of flares should be loaded into each of the vertical compartments always loading the lowest stations, to insure consecutive live releases.

The flare container has its own transfer switch, which operates after the sixth (last) flare has been released. When more than one container is to be used on an airplane for uninterrupted train release of a series of more than six flares (intervalometer or electric bomb release), an electrical hookup between containers is required.

No hoisting attachments are provided, since the 130-pound empty container can be handled by two men while a third man manipulates the bomb rack or shackle. Five suspension brackets and two removable lugs are provided to permit adapting the container to different types of suspension. For suspension of the container in a bomb against side rails, the removable lugs should be attached to the two suspension brackets located 45 degrees from the top centerline,

to keep the flare compartments approximately vertical. Also, for bomb bay installations, the container can be used without the nose and tail fairings and if desired the spring loaded escape doors may be removed. Both nose and tail fairings employ Dzus fasteners which fit either end of the cylindrical container. When the fairings are needed, care should be taken to install the nose (rounded) fairing forward and the tail (tapered) fairing aft with respect to the airplane.

The container is provided with a 12-inch shielded electrical cable which mates with Plug, Connector, AN–3106–14S–5S or AN–3108–14S–5S. The lead-in at the container is provided with a pull-out plug which requires a minimum pull of 10 pounds to disconnect. A single wire system is employed, the ground wire running through the shielded cable until it reaches the terminal which mates with the AN plug. Near this point, the ground wire is permanently attached to a metal ring provided with a setscrew. To insure a positive electrical ground connection, a safety wire (obtained locally) must be run from this setscrew to a structural metal part of the airplane or bomb rack.

Only the B and E terminals of the AN plug are used, the B terminal being the "hot" connection for release, and the E terminal being used for transfer of electrical impulses to subsequent containers, if any. For external installations, the shielded cable from the container should be securely taped to some part of the bomb rack to prevent it from whipping in the slipstream if the container is jettisoned.

The flare container and Bomb Racks Mk 50 or 51 Type have the same type of connectors; therefore, it is possible to use the electrical cable normally furnished for the bomb rack to operate the flare container. In so doing, however, it should be ascertained whether the bomb release system employs station distributors and/or rack selectors, because it is necessary to bypass station distributors and rack selectors to keep supplying impulses to one station. The armament switches in the pilot's cockpit should be checked to verify that only one station is switched on for operating one container at a time. Simultaneous operation of two or more flare containers would result in interference between flares. The installation should be checked by operation of an empty container. In emergencies it will still be possible to jettison the container if the bomb rack has manual control.

Uninterrupted train release of a series of more than six flares requires that containers be added to the circuit in a series connection; the E terminal of the first container must be connected to the B terminal of the second container, etc. (Fig. 16.) The transfer switch of each container, after release of its sixth (last) flare, automatically throws into the circuit the next loaded container; therefore, it is necessary to keep supplying all electrical impulses to the first flare container in the series at one bomb station, so that each subsequent container in the series will start receiving impulses at the proper time. As before, the station distributor and/or rack selector must be by-passed and the one applicable station switched on to keep impulses going to one station only, thereby avoiding releases of more than one are at a time. The complete installation should be checked by operation of empty containers.

Before loading the container with flares, the complete electrical system and flare container should be checked as follows:

1. With the empty container cocked and all flare holding chocks raised to the locked position, return the cocking lever to the "operating" or latched position, and observe the action of the chocks as electrical impulses (from intervalometer, if being used) are applied. Satisfactory operation is indicated by the holding chocks dropping, one set at a time, to the sides of the vertical panel. The sequence of release is given on page 38.

2. Repeat the above, but leave the cocking lever in the "safe" or unlatched position. The end of the safety rod (which also acts as a part of the cocking lever latch) should now be protruding below the bottom of the container. The "safety" is operating satisfactorily if the holding chocks remain locked, as applied electrical impulses cause the solenoid to operate.

If no sound of an operating solenoid is heard during this test, a bad circuit or solenoid is indicated.

3. To check a flare container for positive operation when more than one container is being operated over a single circuit, utilizing the container's transfer switch—repeat step 1 above, observing the action of the holding chocks in the next flare containers in the proper sequence as the electrical impulses are transferred. Repeat step 2 starting with the last container in the series, with all containers up the line in the release or transferred condition.

Safety Precautions—In addition to the general safety precautions outlined in Chapter 2, the following special precautions should be observed:

The operating mechanism of the container should be kept clean. No oil or grease should be used anywhere on the container except on the safety rod.

Attach the flare firing lanyards to the after end of the container with respect to the airplane, and use the cocking lever "safety" to prevent accidental releases on the ground. Correctly loaded flares are a fire hazard, since they are always "armed."

Before the airplane takes off, the cocking lever must be put in the "operating" or latched position, because this cannot be done while the airplane is in flight.

When the flare container is cocked, hands or fingers should be kept out of the operating mechanism made visible by removal of the inspection covers on top of the container.

Electrical connections should be checked by conducting the test described above.

Before flares Mk 6 or Mk 10 Type are removed from the container, the container should be removed from the aircraft and taken to a clear area.

Bomb Racks and Bomb Shackles

All Navy flares; Army Flares, Aircraft, Parachute, M26 and AN–M26; Bombs, Photoflash, M46 and AN–M46; and Target Identification Bombs Mk 72 Mod 1 can be launched from bomb racks and bomb shackles. However, some types of Navy flares must not be launched from internal bomb bays. (See Table 2.) The following bomb racks and bomb shackles are currently in use, and may be used with all the above flares and photoflash bombs:

(A description of and instructions for the use of bomb racks and bomb shackles are given in the Ordnance Pamphlets listed below.)

Launching Equipment	OP & NavAer Nos.
Bomb Racks Mk 50 and Mods	OP 1475
Bomb Racks Mk 51 and Mods	11-5-504 and 11-5-523
Bomb Shackles Mk 3 and Mods	11-5-509
Bomb Shackles Mk 4 Mod 2 and above	11-5-508
Bomb Shackles Mk 5 and Mods	11-5-507
Bomb Shackles Mk 8 and Mods	11-5-521

Table 2—Methods of Launching Various Types of Flares

Launching Method	Mk 4 and Mods	Mk 5 and Mods	Mk 6 and Mods; Mk 10 and Mods	Mk 8 and Mods	Mk 11 and Mods	M 26 and AN–M26
(1) Bomb racks and externally-mounted bomb shackles	Yes	Yes	Yes	Yes	Yes	Yes
(2) Bomb shackles mounted in bomb bays	No	No*	Yes	No	No	Yes
(3) Flare launching tubes	Yes	Yes	No**	Yes	No**	No
(4) Flare container Mk 1 Mod 0	No	No	Yes	No	Yes****	No
(5) Flare carrier Mk 1#	No	Yes	No	No	No	No
(6) Manual***	Yes	Yes	Yes	Yes	Yes	No

*Aircraft Parachute Flare Mk 5 Mod 8 may be launched from internal bomb bays.
**Flare tubes large enough to accomodate flares the size of the Aircraft Parachute Flare Mk 6 Type will soon be available in new construction of some types of patrol aircraft.
***Not recommended, except in emergency.
****But not when the flare container is mounted in bomb bays.
#The Flare Carrier Mk 1 is supplied by the Bureau of Aeronautics and is used in TBF and TBM types of aircraft only.

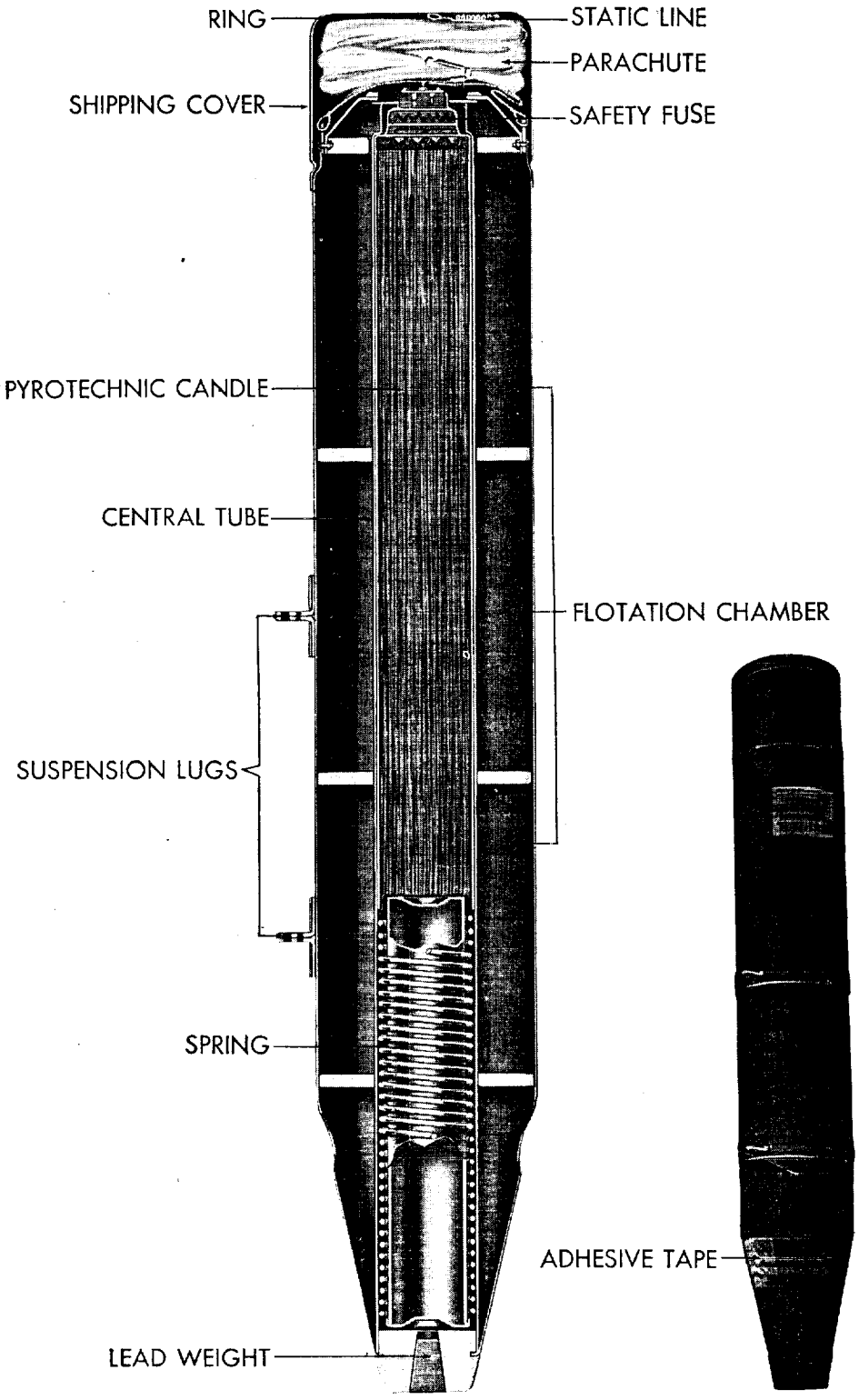


Figure 17—Float Flare (Aircraft) Mk 17 and Mods

Chapter 6

MISCELLANEOUS FLARES

Float Flare (Aircraft) Mk 17 and Mods

This flare is a high-intensity flare for silhouetting and illuminating targets at night. (Figs. 17 and 18.) It incorporates a flotation chamber to provide buoyancy on the water.

The complete flare, as issued ready for release, weighs approximately 88 pounds. The case (exclusive of suspension lugs) has a diameter of 9½ inches and a length of 60¾ inches.

The flare floats on the surface of the water during the period of illumination. The light produced by the Float Flare Mk 17 and Mods is yellowish white and has an intensity of approximately 1,000,000 candlepower for a period of about 4½ minutes. A safety fuse causes a delay between launching and ignition of one minute for the Float Flare Mk 17 Mod 0, and 5½ minutes for the Float Flare Mk 17 Mod 1. The delay is the only difference between the Mods.

When the flare is launched, a parachute opens reducing the rate of descent and preventing damage to the flare on impact with the water. The body of the flare is made of sheet metal, with a lead weight in the lower end. The spring-loaded pyrotechnic candle is contained in a central tube. As the candle burns, it is pushed upward by the spring. This keeps the burning mixture at the top of the flare body.

During shipment, the parachute end of the flare is protected with a steel cover. Before it is loaded into the plane, the adhesive tape which seals the joint between the cover and the flare body must be pulled off and the steel cover removed. Do not remove the canvas hood, because this contains the parachute. Puncture the membranes which close the four holes in the conical nose of the flare body. Attach the flare to the bomb rack (or bomb shackle) with the parachute end aft. Pull only sufficient static line from the pocket in the canvas parachute bag to allow the ring on the end of the static line to be secured to the arming wire retainer of the bomb rack or bomb shackle.

The Float Flare Mk 17 and Mods may be launched from any bomb rack or bomb shackle in current use. Any internal or external bomb station may be used.

All unused flares returned from missions must have the openings originally covered by the membranes sealed by the best means available to prevent the entrance of moisture.

Operation—As the flare falls away from the aircraft, the static line pulls the parachute out of the canvas bag. When the static line becomes taut, a weak link in the static line near the hem of the parachute breaks, allowing the flare assembly to fall away from the aircraft. The safety fuse is ignited by a pull-type igniter. This is actuated by shortening the suspension webbing with the pull wire.

The flares having one-minute delay fuses may be released at altitudes between 100 feet and 4,000 feet. Flares having 5½-minute delay fuses may be released at correspondingly higher altitudes. The rate of descent is between 80 and 100 feet per second. The accuracy of placement which is desired must be considered when selecting the release altitude. Continuous illumination for at least nine minutes can be obtained by dropping two flares together, one Float Flare Mk 17 Mod 0 and one Float Flare Mk 17 Mod 1. These flares may be released from planes traveling at air speeds as high as 220 knots.

Safety Precautions—Observe the general safety precautions outlined in Chapter 2.

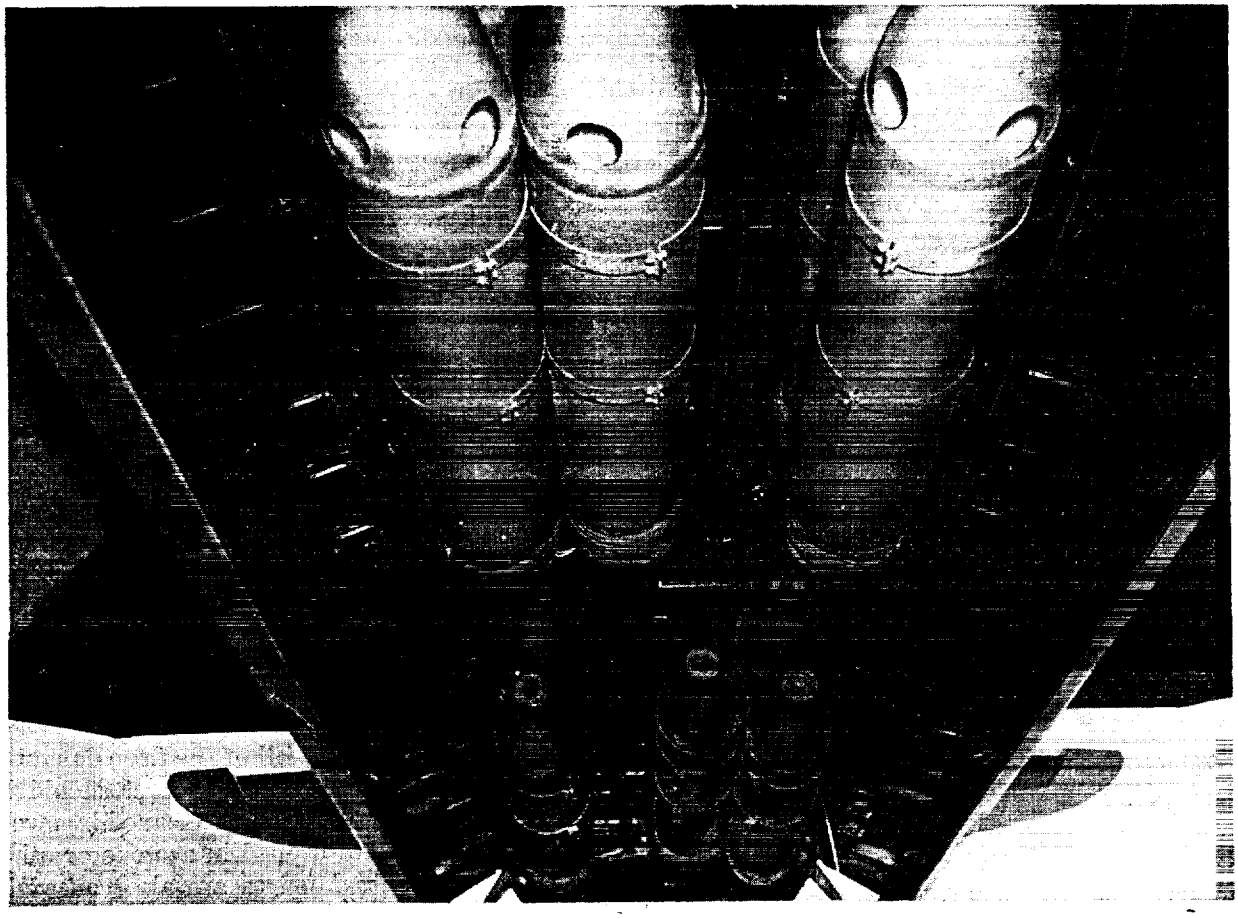


Figure 18—Installation of Float Flares in Bomb Bay

Packing—Float Flares (Aircraft) Mk 17 and Mods are each packed in a box 11¾ inches by 12¾ inches by 64 inches. The weight of each flare in the individual shipping container is approximately 130 pounds.

Storage—These flares should be stowed under the same conditions as other pyrotechnic ammunition.

High Altitude Parachute Flare Mk 20 Mod 0

The High Altitude Parachute Flare Mk 20 Mod 0 is used primarily to illuminate marine landing areas at night, so that incoming seaplanes and flying boats can alight on the water within marked channels (Fig. 19). It is also used to indicate the location of island bases when low ceilings prevent adequate visibility from normal flying altitudes. It has been authorized as standard equipment for air-sea rescue boats for use in search operations. This flare produces a light having an intensity of 85,000 candlepower for a period of one minute.

The flare consists of a steel tube, closed at one end by a copper cup which forms a gas seal between the flare and the bore of the mortar.

The flare weighs four pounds, with a diameter of 2½ inches and a length of 10¾ inches. Within the tube are the pyrotechnic candle, a parachute, and the expelling charge. The cup contains the propelling charge, a mixture of 25 grams of smokeless powder and black powder, and the primer and fuse assembly. The fuse assembly delays the ignition of the expelling charge for five seconds, until the flare reaches an altitude of about 1,000 feet above the water.

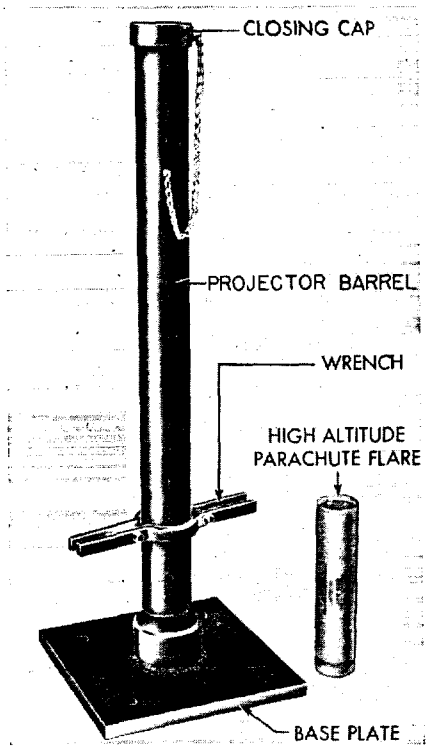


Figure 19—High Altitude Parachute Flare Mk 20 and Projector Mk 13

Flare Projector Mk 13 Mod 0—The High Altitude Parachute Flare Mk 20 is fired from the Flare Projector Mk 13 Mod 0 designed for this use. The projector is a steel tube which screws into a steel base plate. The tube serves as the projector barrel and has a diameter of 2.8 inches and a length of 36 inches. The base plate is one foot square. Four holes are drilled near the corners of the base plate to facilitate attachment to a boat deck or to a base on land. The base plate has a central stud into which a hardened steel firing pin is pressed. This stud and pin may be removed with a socket wrench furnished with the mortar.

Three vent holes in the base plate of the projector release air from the barrel and allow the flare to drop freely down the barrel. A special barrel wrench is clamped to the lower end of the barrel and is used for removing the barrel from the base plate to permit the barrel to be cleaned. Two holes, opposite each other, six inches from the muzzle of the barrel, permit the insertion of a release pin which is attached to a 30-foot lanyard.

Operation—The flare is operated as follows:

1. Remove the closing cap which is attached by a chain to the upper end of the barrel. Attach the lanyard to the release pin, and insert the pin in the pair of holes near the muzzle.

2. Remove the flare from its container, and insert it carefully into the muzzle so that it rests on the release pin with the copper cup end of the flare downward.

3. The flare is fired by pulling the lanyard and release pin. This allows the flare to drop down the barrel. The primer strikes the firing pin and ignites the propelling charge. When the flare reaches an altitude of 1,000 feet, a five-seconds delay fuse, burning of which was initiated by the propelling charge, ignites the expelling charge in the pyrotechnic candle. As the primer ignites the propelling charge, it also breaks the cup away from the flare housing.

Misfires are sometimes caused by a defective primer or a weak impact of the primer on the firing pin. The weak impact may be caused by sluggishness in the fall of the flare down the barrel. To correct this, the barrel should be unscrewed from the base and cleaned by swabbing it with a cloth dipped in acetone or other approved solvent. Misfires are also caused by chips of the copper base cups from previous rounds which remain in the bottom of the barrel and prevent the next round from striking the firing pin in a normal way.

After each operation, the projector must be disassembled with the tools furnished for that purpose, and cleaned.

Safety Precautions—In addition to the general safety precautions outlined in Chapter 2, the following special precautions should be observed:

A suitable barrier should be erected to shield the firing personnel.

The projector should be fastened securely to the deck before being fired.

In case the flare misfires or hangs fire, it is necessary to wait at least three minutes before approaching the projector.

Packing—High Altitude Parachute Flares

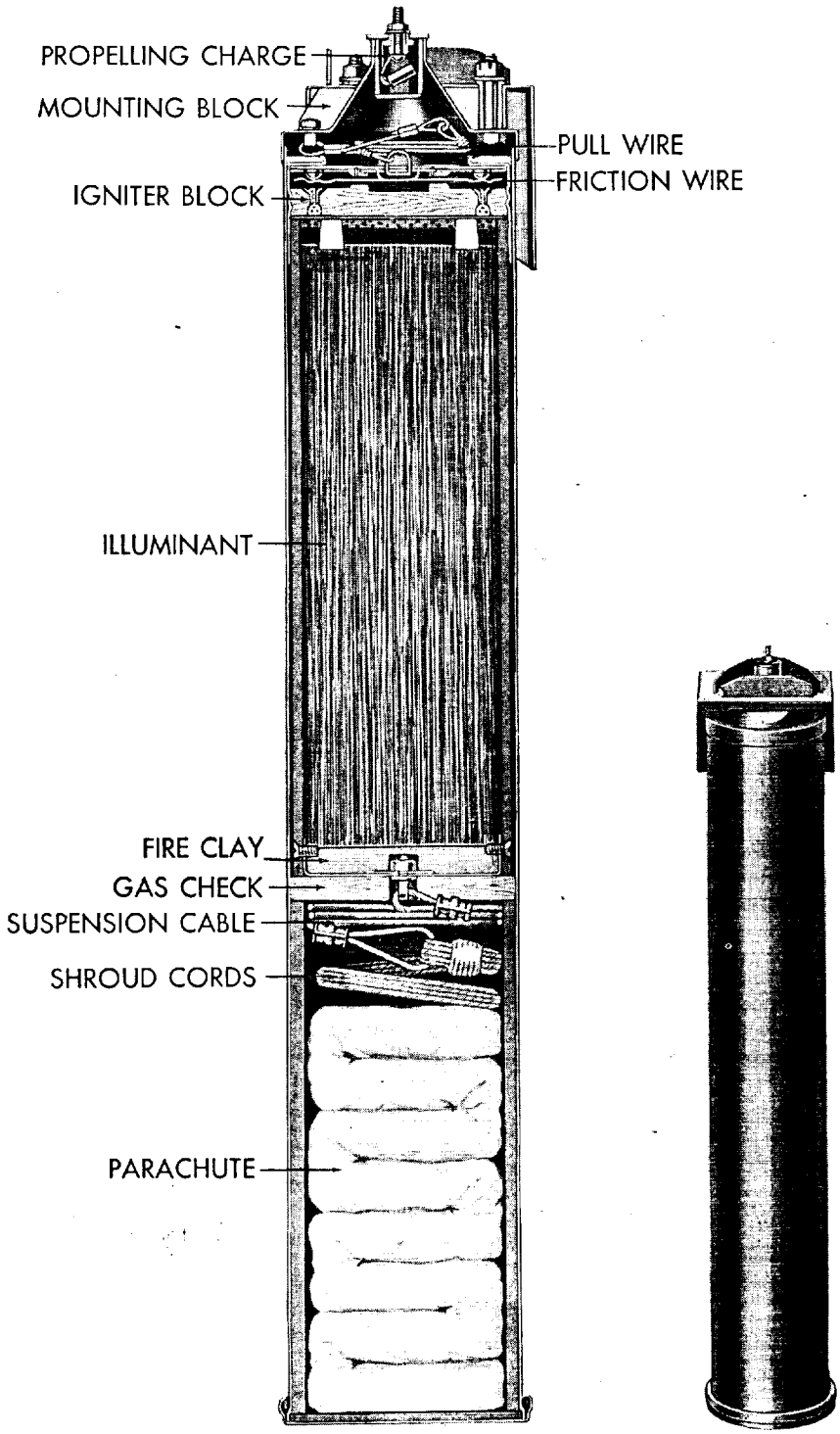


Figure 20—Aircraft Parachute Flare, 3-Minute (Electrically-Operated)

Mk 20 Mod 0 are packed in wooden boxes containing 25 flares each.

Two projectors Mk 13 Mod 0 are packed in a wooden case with the following accessories: two barrel wrenches, eight nuts, eight washers, four extra firing pins, two release pins, and two closing cap attachment chains.

Storage—General rules for the storage of pyrotechnic ammunition apply to the High Altitude Parachute Flare Mk 20 Mod 0.

The projector may be put into storage when not in use.

Aircraft Parachute Flare, 1½ Minute (Electrically-Operated), and Aircraft Parachute Flare, 3 Minute (Electrically-Operated)

These electrically-operated aircraft parachute flares are used in making emergency landings at night. They were designed by a civilian manufacturer for use by commercial airlines. These flares are available under several commercial names. Some have been obtained from commercial sources and have the commercial nomenclature. The Navy nomenclature is Aircraft Parachute Flare, 1½ minute (electrically-operated), and Aircraft Parachute Flare, 3 minute (electrically-operated). (Fig. 22.) The Navy has a number of commercial type aircraft equipped with fixtures for mounting these flares. Both types are issued in a hermetically-sealed cylindrical aluminum case called a "projector tube." One end of this tube is closed by a metal cap and sealed by a rubber gasket; the other end narrows down into a knob with an electrical terminal on the end.

The projector tube of Aircraft Parachute Flare, 1½ minute, (cylindrical for most of its length) has a diameter of 2 7/16 inches and a length of 18¾ inches. The projector tube of the Aircraft Parachute Flare, 3 Minute, has a diameter of 4½ inches and a length of 28 inches.

Main components of Aircraft Parachute Flare 1½ Minute, are:

Projector tube, electric igniter, propelling charge of black powder, inner case, delay fuse, ejection charge, pyrotechnic candle, and a parachute.

Main components of Aircraft Parachute Flare 3 Minute, are:

Projector tube, electric igniter, propelling charge of black powder, pull-wire assembly (which operates the friction igniter), pyrotechnic candle, and a parachute.

A felt gas check pad between the pyrotechnic candle and the parachute assembly protects the parachute from the flame of the propelling charge.

Installation—Detailed instructions for the installation of both types of flare are included in the package with the flare.

Both types of flare are installed in brackets which are usually mounted in the fuselage of the aircraft. The capped end of the projector tube points outward or downward from the fuselage. The flares are installed in the aircraft by inserting them through holes in the fuselage covering. The 1½ minute flares are usually installed so that the metal end caps are flush with the outside covering of the aircraft.

After the flare is installed in an aircraft ready for firing, it needs no servicing except an occasional check on the bracket and wiring circuit.

Operation—Aircraft Parachute Flare, 1½ Minute (electrically-operated), functions as follows:

When the electric circuit is completed by closing the toggle switch in the pilot's compartment, the propelling charge is ignited, and the inner case is forced out of the projector tube. The propelling charge ignites the delay fuse, which burns until the inner case is approximately 40 feet from the plane and then, through an explosive lead-in, ignites the ejection charge. The gases thus generated force the pyrotechnic candle and the parachute from the inner case and, at the same time, the ejection charge ignites the pyrotechnic candle. The parachute opens and suspends the pyrotechnic candle. The candle burns for 1½ minutes, with a light intensity of 110,000 candlepower. The inner

case falls free as a missile hazard, but the projector tube remains in the bracket in the air-aircraft.

Aircraft Parachute Flare, 3 Minute (electrically-operated), functions as follows:

When the electrical circuit is completed by closing the toggle switch in the pilot's compartment, the black powder charge is ignited and forces the flare assembly from the projector tube. As the pyrotechnic candle leaves the projector tube, two friction wires are pulled through the match composition which ignites a two or three second delay element. This, in turn, ignites the pyrotechnic candle. The pull-wire is of sufficient length so that the candle is clear of the aircraft before ignition takes place. The parachute suspends the pyrotechnic candle after a fall of only a few feet below the aircraft. The candle burns for approximately three minutes, with a light intensity of approximately 200,000 candlepower.

To obtain the most effective ground illumination, the 1½ minute flare should be used at an altitude of not more than 1,200 feet, and the 3 minute flare should be used at an altitude of not more than 2,000 feet. After ignition, both types of flare fall at an average rate of about 550 feet per minute. There is danger of starting a fire on the ground if the 1½ minute flare is used at an altitude of less than 850 feet, or if the 3 minute flare is used at an altitude of less than 1,750 feet. These flares should be used over friendly territory only in case of an emergency.

Both types of flare have a safety device which prevents ignition of the pyrotechnic candle until the flare is clear of the aircraft. In the 1½ minute flare an interrupter mechanism is incorporated in the inner case between the time fuse and the ejection charge. This prevents the functioning of the flare until the inner case has left the projector tube and is clear of the aircraft. In the 3 minute flare, the friction igniter is operated by the pull-wire assembly after the pyrotechnic candle and parachute are clear of the airplane structure.

Safety Precautions—In addition to the general safety precautions outlined in Chapter 2, the following special safety precautions should be observed:

Test the circuit before installing a flare in the bracket.

Do not attempt to test the circuit while the flare is in the bracket.

Do not attempt to pass any current through the flare igniter, because this will discharge with a current of less than one ampere.

Do not attempt to solder at the flare terminals. Soldered terminals should be used on the ends of the wires.

Over friendly territory, do not release the 3 minute flare at an altitude of less than 1,750 feet, or the 1½ minute flare at an altitude of less than 850 feet, because there is danger of starting a fire on the ground, since the flare will still be burning when it reaches the ground.

These flares should be removed from an aircraft in which installed, before the aircraft is placed in the hangar for servicing or stowage.

Packing—Aircraft Parachute Flares 1½ Minute (electrically-operated) are packed six to a wooden box. The Aircraft Parachute Flare 3 Minute (electrically-operated) is packed one to a wooden box.

Storage—These flares are hermetically sealed and are waterproof without the separate metal container in which Navy flares are shipped and stored. The temperature in the compartment in which these flares are stored should never exceed 100 degrees Fahrenheit.

Chapter 7

PYROTECHNIC BOMBS AND FUZES

Bombs, Photoflash, M46 and AN-M46

Photoflash bombs provide a light of high intensity and short duration for night photography. Bombs, Photoflash, M46 and AN–M46 were developed to permit planes to engage in night photographic mission at any desired altitude. (Fig. 21.)

This bomb, ready for release and including a 25-pound charge of flash powder, weighs 52 pounds. It has a diameter of eight inches and a length of 48⅝ inches.

These bombs resemble conventional type bombs. They are unfuzed, but fins and suspension bands are attached. The fuzes used with these bombs are the Fuze, Flare, Mechanical Time, M111, M111A1, and M111A2, or the Fuze, Bomb, Mechanical Time M146. For all carrier-based operations, the Fuze, Bomb, Mechanical Time M146 should be used if it is available.

Operation—Bombs, Photoflash, M46 and AN–M46 can be dropped only from bomb racks or bomb shackles. Any bomb rack or bomb shackle in general service can be used.

The bomb may be released safe or armed. If released safe, it may function on impact. For this reason, it should not be jettisoned over friendly territory. When released armed, it functions as follows:

Movement of the bomb downward withdraws the arming wire from the fuze, allowing the vane to rotate and arm the fuze. The release pin is ejected, and starts the time mechanism.

When the time set on the fuze has elapsed, a flashlight powder charge is ignited. The resulting flash of light has a peak intensity of about 500,000,000 candlepower and lasts for approximately ⅕ second.

Installation—The fuze is installed as follows:

1. Remove the shipping plug from the bomb, and inspect the cavity and threads to be sure that they are clean and free of any foreign material. If there is any foreign material present, discard the bomb.

2. Unseal the fuze container; remove the fuze from its packing and inspect it to see that it is not corroded or otherwise unserviceable. Install the arming vane of the Fuzes M111 and M111A1 by pushing it past the spring clip opposite the vane stop. The arming vanes of the fuzes M111A2 and M146 are secured in place.

3. Screw the fuze into the bomb, **hand tight only.**

4. Set the fuze by loosening the thumb screw and rotating the head until the desired number of seconds is indicated by the marker on the side of the fuze body. Tighten the thumb screw. Information for determining the proper fuze setting is given in Tables A, B, C and E at the end of this chapter.

5. The arming wire is threaded through the forward suspension lug, the inner hole in the release pin of the fuze, and then the inner holes of the vane stop. If the Arming Wire Mk 3 (steel) is used, a Fahnestock clip should be slipped onto the end of the wire until it just touches the vane. If a brass arming wire normally supplied with Bombs, Photoflash, M46 and AN–M46 is used, no Fahnestock clip should be used. When a Fahnestock clip is used on a brass arming wire of this size in conjunction with these fuzes, the Fahnestock clip is apt to cut into the brass arming wire and cause excessive stress at the point at which it passes through the release pin. Failures of arming wires are frequent when Fahnestock clips are used on the brass arming wire. After the

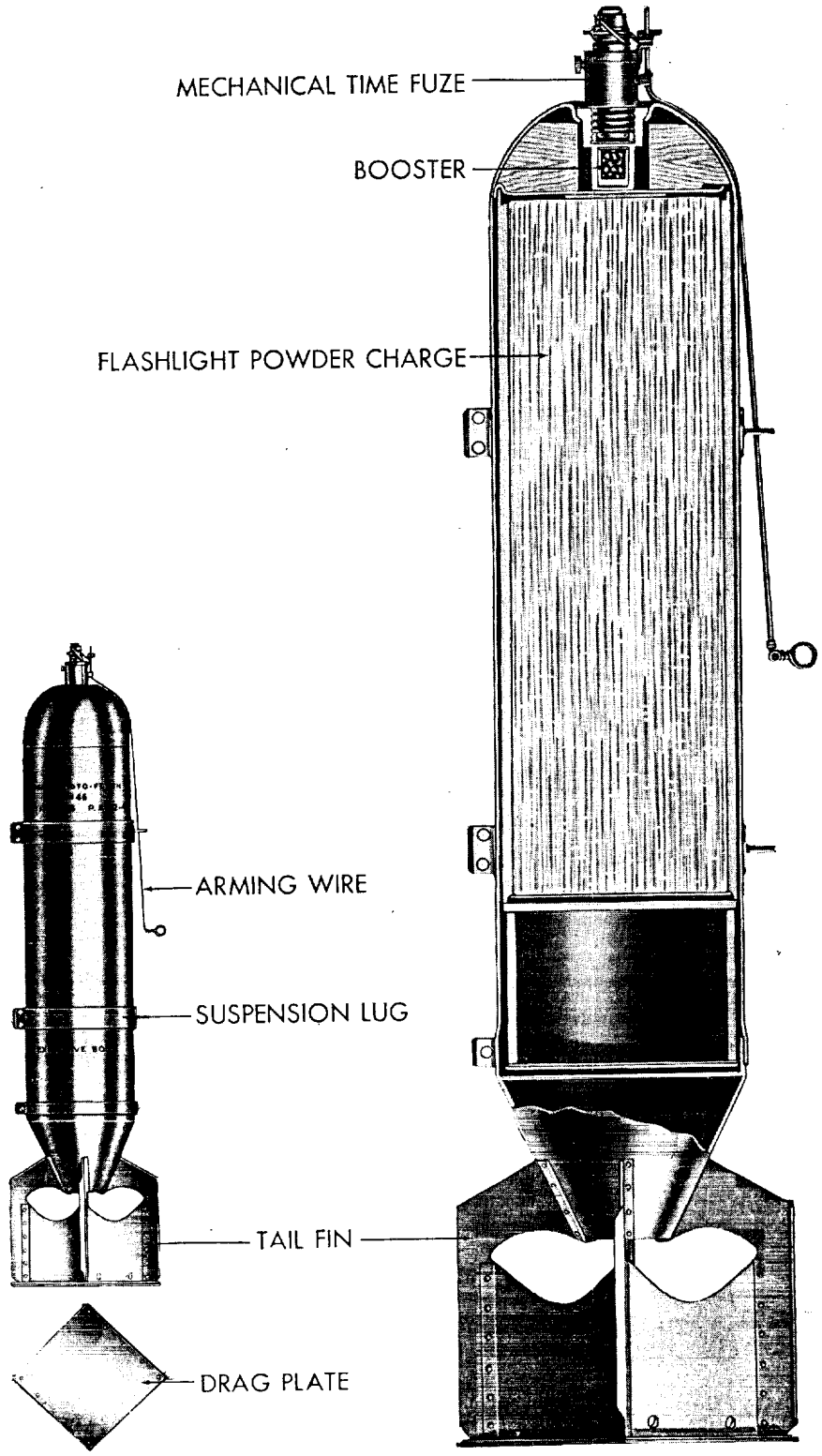


Figure 21—Bomb, Photoflash, M46 and AN–M46

arming wire is installed (and not before), the safety cotter pin is removed from the arming pin and the shipping wire from the vane stop. The bomb is then suspended from the bomb rack or shackle and the arming ring it attached to the arming wire retainer. Cut off any excess arming wire, leaving only about three or four inches protruding beyond the end of the fuze. Remove burrs from the end of the arming wire.

Safety Precautions—In addition to the general safety precautions outlined in Chapter 2, the following special precautions should be observed:

These bombs are loaded with a pyrotechnic composition which is easily ignited by sparks, shocks, or friction. When ignited, these bombs explode with extreme violence and intense heat. Therfore, they must be handled with the same care as black powder, and with even greater care than ordinary pyrotechnic materials and conventional bombs.

The bomb cases should not be hammered or cut.

Do not attempt to disassemble a photoflash bomb, as it is extremely dangerous.

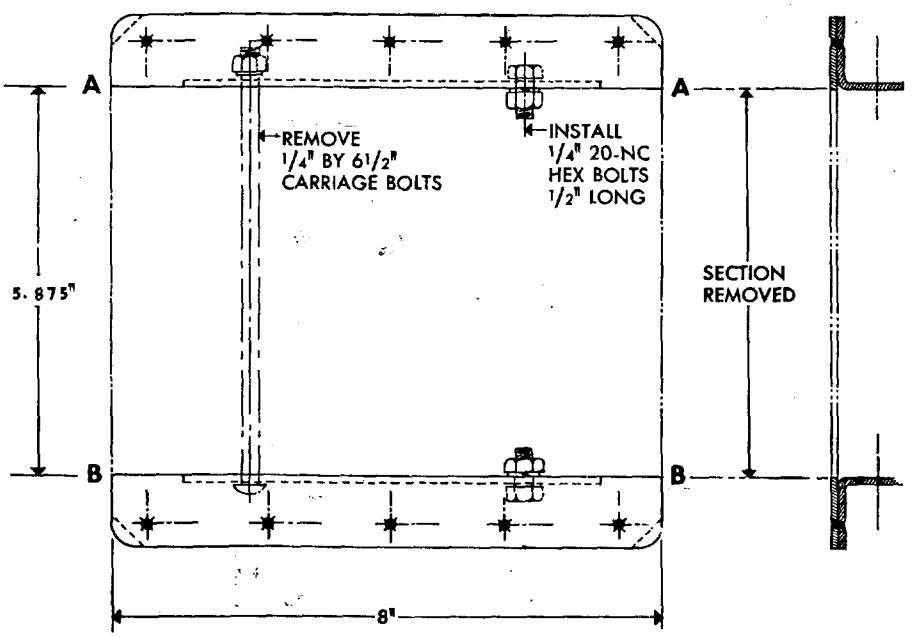
No work should be done on these bombs except unpacking, fuzing, and installing them on aircraft.

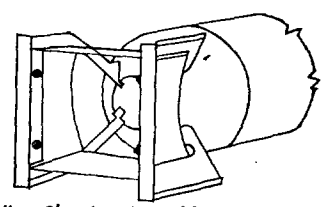
Because of the brilliance of the flash produced by this bomb, it is detrimental to the vision to watch the explosion of photoflash bombs.

Packing—Bombs, Photoflash, M46 and AN-M46 are packed one to a wire-bound wooden box. Suspension bands are removable, but are packed mounted on the bomb. Fuzes, Flare, Mechanical Time, M111, M111A1, or M111A2 and Fuze, Bomb, Mechanical Time M146, used with the bomb, are packed and shipped separately. The arming wire is packed with the photoflash bomb. The steel Arming Wire Mk 3, for use with this bomb, is issued and shipped separately.

Stowage—No other type of ammunition should be stowed with photoflash bombs.

Stowage Afloat: Photoflash bombs may be stowed in regular pyrotechnic magazines if no separate locker is available and if not more than ten photoflash bombs are stowed in any one magazine. They must be secured against any movement, or rubbing against each other, the deck, bulkheads, or other items.





View Showing Assembly of Modified Trail Angle Plate on Bomb Tail

CAUTION:—REMOVE TRAIL PLATE FROM BOMB BEFORE ATTEMPTING MODIFICATIONS.

Figure 22—Modification of Trail Plate for Bombs, Photoflash, AN-M46

Stowage at Advanced Bases: Photoflash bombs should be stowed in separate magazines, buildings, or dumps. They should be protected from rain, inclement weather, the direct rays of the sun, and excessive temperatures. Not more than 1,000 photoflash bombs may be stowed in any one space. Magazines and dumps should be separated by the same distances as those for high explosives.

Stowage at Air Stations, Section Bases, and Ammunition Depots: Photoflash bombs should be stowed in earth-covered magazines spaced according to the American Table of Distances.

Modifications of Bombs, Photoflash, M46 and AN-M46

As currently issued, Bombs, Photoflash, M26 and AN–M46 are equipped with a full size trail or drag plate which covers the entire area of the rear of the tail. When equipped with this trail plate, the bomb has too much trail for most photographic conditions. When the trail plate is removed, the bomb is satisfactory for some types of photographic work but has insufficient trail for other types.

The use of a modified (angle) trail plate gives satisfactory results for most types of photographic work, while the elimination of the trail plate is desirable for other usage. Accordingly, the bombing tables A, B, C, D, E, and F at the end of this chapter were prepared from data obtained from tests. These tables are issued for service, and supersede previous bombing tables for Bombs, Photoflash, M46 altered by either removing or modifying the trail plates.

Remove the trail plate and modify by cutting along lines AA and BB (Fig. 22) thus removing a section approximately eight inches by 5⅞ inches. Cutting may be accomplished by using a hacksaw, cutting torch, or cold chisel. After cutting the plate, smooth the cut edges with a file.

Replace the two ¼-inch by 6½-inch carriage bolts with which the trail plate is secured to the trail assembly by four ¼-inch 20–NC standard hex bolts ½-inch long. The nuts and lock washers removed from the carriage bolts plus two ¼-inch 20–NC hex nuts and two ¼-inch lock washers are required to assemble the angle trail plates in place of the full trail plate. The bombing tables were based on the use of hexagonal bolts ½-inch long. Longer bolts will cause an increase in trail angle.

Safety Precautions

No modifications to the trail plate of the photoflash bomb should be attempted without first removing the trail plate from the bomb body.

Machining or welding operations on the tails must be carried out at a safe distance away from the bomb bodies to prevent damage to the bodies and the consequent danger of detonation.

Bombing Data—Explanatory Notes

The bombing table for using Bomb, Photoflash, M46 is composed of eight parts as follows:

Table A—Data for obtaining vertical photos, using bombing with angle trail plates.

Table B—Data for obtaining vertical photos, using bomb with no trail plates.

Table C—Fuze settings, camera tilt, and shutter speeds for obtaining tilted photos, using bomb with angle trail plates.

Table D—Tangents of release angles, for use with Table A.

Table E—Fuze settings, camera tilt, and shutter speeds for obtaining tilted photos, using bomb with no trail plates.

Table F—Tangents of release angles, for use with Table B.

Fig. 25—Graph showing trail angle at instant of burst, using bomb with angle trail plates.

Fig. 26—Graph showing trail angle at instant of burst, using bomb with no trail plates.

Vertical Photos—Tables A and B show for each altitude a single Indicated Air Speed at which the aircraft must be flown to obtain vertical photographs. If the speeed is higher, the bomb will burst too far aft to give proper illumination; if lower, the bomb will carry too far forward into the camera field.

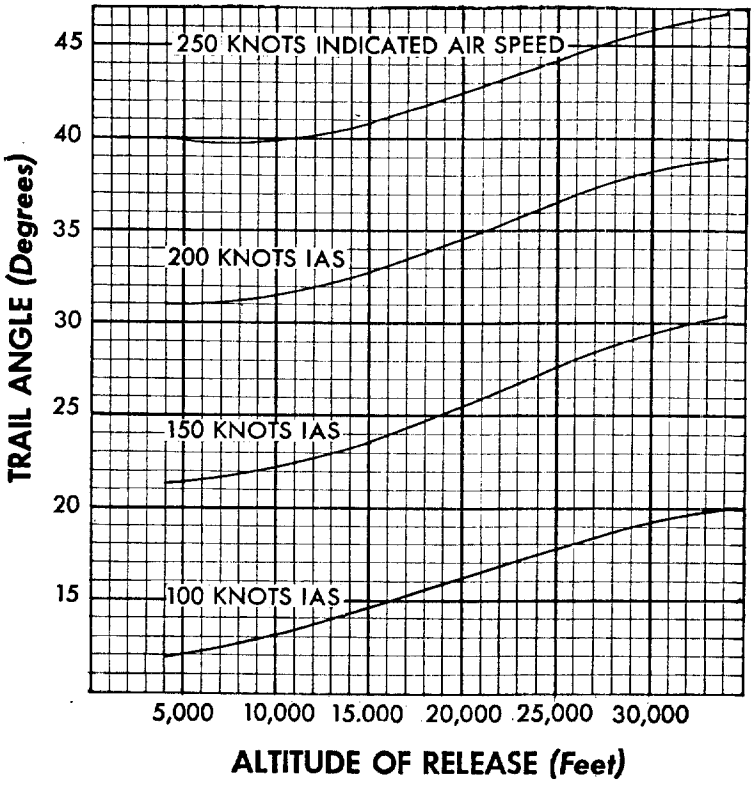


Figure 23—Graph of Trail Angle at Instant of Burst, Bomb, Photoflash, M46 With Angle Trail Plate

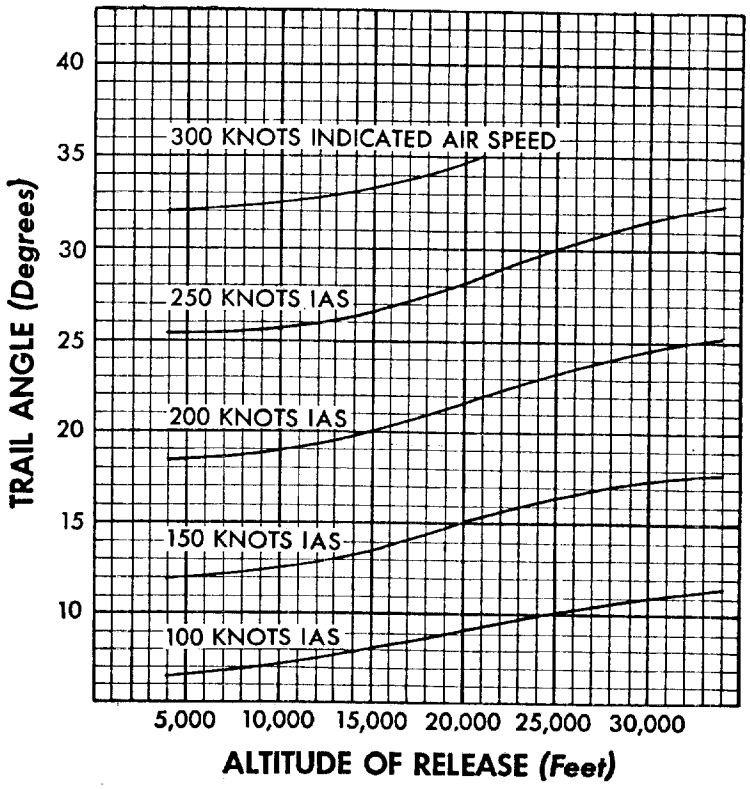


Figure 24—Graph of Trail Angle at Instant of Burst, Bomb, Photoflash, M46 With No Trail Plate

Tilted Photos—Where tilted photographs are acceptable, the aircraft may be flown at any desired speed. At high speeds, however, the trail of the bomb is such that the camera must be tilted aft to photgraph the illuminated areas (Tables C and E).

Tangents of Release Angle are used rather than Release Angles to simplify Tables D and F. (The Release Angle is the angle beween the vertical and the line of sight at the instant of release.)

The tables of Tangent of Release Angle are tabulated against Ground Speed (to take account of head winds or tail winds). If it is not possible to determine ground speed, True Air Speed must be substituted. This substitution should be resorted to, only in case of necessity, however, since considerable error in release angle may result.

Curves giving trail angle of bomb at instant of burst (Figs. 23 and 24) provide information for adjusting the photoelectric cell to bring the bomb burst within its field of view.

Examples in using the tables:

Problem 1

Given: Aircraft to be flown at 15,000 feet altitude. Vertical photographs required.

Procedure—Since this altitude is covered by both Tables A and B, a choice of two Indicated Air Speeds is possible—126 knots (bombs with Angle Trail Plates) and 196 knots (bombs with no Trail Plates). If the aircraft is capable of the higher speed, the higher speed would be chosen for safety reasons. In such case, bombs with no trail plates are prepared and fuzes set in accordance with Table B (28.8 seconds). The shutter speed given by the table is 1/25 second. The approach over the target is then

Table A—Data For Obtaining Vertical Photos, Using Bomb, Photoflash, M46, With Angle Trail Plates

Altitude of Plane Above Terrain (ft.)	Indicated Air Speed (kts.)	Fuze Setting (Sec.)	Shutter Speed (Sec.)	Ground Speed (Knots)				
				125	150	175	200	225
				Tangent of Release Angle (Degrees)				
5,000	164	16.3	1/50	.69	.83	.97	1.10	1.24
6,000	162	17.4	1/50	.61	.74	.86	.98	1.10
7,000	159	18.5	1/50	.56	.67	.78	.89	1.00
8,000	156	19.7	1/50	.52	.63	.73	.83	.94
9,000	153	21.0	1/50	.49	.59	.69	.79	.89
10,000	149	22.4	1/50	.47	.57	.66	.75	.85
11,000	145	23.9	1/50	.46	.55	.64	.74	.82
12,000	141	25.5	1/50	.45	.54	.63	.72	.81
13,000	136	27.3	1/25	.44	.53	.62	.71	.80
14,000	131	29.2	1/25	.44	.53	.62	.71	.80
15,000	126	31.3	1/25	.44	.53	.62	.71	.80
16,000	121	33.5	1/25	.44	.53	.62	.71	.80
17,000	116	35.8	1/25	.45	.53	.62	.71	.80
18,000	111	38.1	1/25	.45	.54	.63	.71	.80
19,000	106	40.4	1/25	.45	.54	.63	.72	.81

made at 196 knots Indicated Air Speed and the bomber determines the ground speed to be, for example, 200 knots. Table B is re-entered, and the tangent of the release angle obtained (.65 degree).

Problem 2

Given: Aircraft to be flown at 20,000 feet altitude. Desired Indicated Air Speed 200 knots. Tilted photographs acceptable.

Table B—Data For Obtaining Vertical Photos, Using Bomb, Photoflash, M46 With No Trail Plates

Altitude of Plane Above Terrain (ft.)	Indicated Air Speed (kts.)	Fuze Setting (Sec.)	Shutter Speed (Sec.)	Ground Speed (Knots)					
				175	200	225	250	275	300
				Tangent of Release Angle (Degrees)					
12,000	214	23.7	1/50	.58	.67	.75	.83	.92	1.00
13,000	208	25.3	1/25	.57	.65	.74	.82	.90	.98
14,000	202	27.0	1/25	.57	.65	.74	.82	.90	.98
15,000	196	28.8	1/25	.57	.65	.73	.81	.89	.97
16,000	189	30.6	1/25	.57	.65	.73	.81	.89	.97
17,000	183	32.4	1/25	.56	.64	.72	.80	.89	.97
18,000	176	34.3	1/25	.56	.64	.72	.80	.88	.96
19,000	170	36.1	1/25	.56	.64	.72	.80	.88	.96
20,000	164	37.8	1/25	.56	.64	.72	.80	.88	.96
21,000	159	39.4	1/25	.56	.64	.72	.80	.87	.95
22,000	155	40.9	1/25	.55	.63	.71	.78	.86	.94
23,000	151	42.3	1/25	.54	.62	.70	.78	.85	.93
24,000	147	43.6	1/25	.54	.61	.69	.77	.85	.92
25,000	144	44.8	(open)	.53	.61	.68	.76	.84	.91
26,000	141	46.1	(open)	.53	.60	.68	.75	.82	.90
27,000	138	47.3	(open)	.52	.59	.67	.74	.81	.89
28,000	136	48.5	(open)	.51	.58	.66	.73	.80	.87
29,000	134	49.7	(open)	.51	.58	.65	.72	.79	.87
30,000	132	50.9	(open)	.50	.57	.64	.72	.79	.86
31,000	130	52.0	(open)	.50	.57	.64	.71	.78	.85
32,000	128	53.1	(open)	.49	.56	.63	.70	.77	.84
33,000	126	54.2	(open)	.49	.55	.62	.69	.76	.83
34,000	125	55.2	(open)	.48	.55	.62	.69	.75	.82

Table C—Fuze Settings, Camera Tilt, and Shutter Speeds For Obtaining Tilted Photos, Using Bomb, Photoflash, M46 With Angle Trail Plates

Shutter Speed	Altitude of Plane Above Terrain (Feet)	Indicated Air Speed (Knots)															
		130		140		150		160		170		180		190		200	
		Fuze Setting	Camera Tilt	Fuze Setting	Camera Tilt	Fuze Setting	Camera Tilt	Fuze Setting	Camera Tilt	Fuze Setting	Camera Tilt	Fuze Setting	Camera Tilt	Fuze Setting	Camera Tilt	Fuze Setting	Camera Tilt
		(sec.)	(deg.)	(sec.)	(deg.)	(sec.)	(deg.)	(sec.)	(deg.)	(sec.)	(deg.)	(sec.)	(deg.)	(sec.)	(deg.)	(sec.)	(deg.)
1/50-Second	5,000	—	—	—	—	—	—	—	—	16.2	1.2	16.3	3.2	16.4	5.1	16.4	7.0
	6,000	—	—	—	—	—	—	17.3	0	17.3	1.6	17.4	3.6	17.5	5.4	17.5	7.3
	7,000	—	—	—	—	—	—	18.4	0.2	18.5	2.1	18.6	4.0	18.6	5.8	18.7	7.7
	8,000	—	—	—	—	—	—	19.6	0.8	19.7	2.7	19.8	4.5	19.8	6.3	19.9	8.2
	9,000	—	—	—	—	20.9	0	20.9	1.5	21.0	3.4	21.1	5.1	21.1	6.9	21.2	8.8
	10,000	—	—	—	—	22.3	0.3	22.3	2.3	22.4	4.1	22.5	5.8	22.5	7.6	22.6	9.5
	11,000	—	—	—	—	23.8	1.0	23.9	3.0	24.0	4.9	24.0	6.6	24.1	8.4	24.1	10.1
	12,000	—	—	25.5	0	25.5	1.8	25.6	3.8	25.7	5.7	25.7	7.5	25.8	9.2	25.8	10.8
	13,000	—	—	27.3	0.8	27.3	2.6	27.4	4.7	27.5	6.5	27.5	8.3	27.6	10.0	27.6	11.6
	14,000	29.3	0	29.3	1.7	29.3	3.5	29.4	5.5	29.5	7.3	29.5	9.1	29.6	10.8	—	—
1/25-Second	15,000	31.4	0.9	31.4	2.6	31.4	4.4	31.5	6.3	31.6	8.1	31.6	9.9	31.7	11.6		
	16,000	33.6	1.8	33.6	3.5	33.7	5.3	33.8	7.1	33.8	8.9	33.9	10.6	—	—		
	17,000	35.9	2.7	36.0	4.5	36.1	6.3	36.2	8.0	36.2	9.7	—	—	—	—		
	18,000	38.3	3.6	38.4	5.4	38.5	7.2	38.6	8.9	38.7	10.6	—	—	—	—		
	19,000	40.7	4.5	40.8	6.3	40.9	8.1	41.0	9.8	—	—	—	—	—	—		
	20,000	43.0	5.4	43.1	7.1	43.2	8.9	43.3	10.8								
	21,000	45.1	6.2	45.2	7.9	45.3	9.7	—	—								
	22,000	47.1	6.9	47.2	8.6	47.2	10.4	- -	—								
	23,000	48.9	7.6	49.0	9.3	—	—	—	—								
	24,000	50.6	8.2	50.7	9.9	—	—	—	—								
Open Shutter	25,000	52.3	8.7	52.4	10.4												
	26,000	53.9	9.2	—	—												
	27,000	55.5	9.7	—	—												
	28,000	57.1	10.1	—	—												
	29,000	58.7	10.5	—	—												
	30,000	60.2	10.8														

Table D—Tangents of Release Angles for Obtaining Tiled Photos, Using Bomb, Photoflash, M46 With Angle Trail Plates

Altitude of Plane Above Terrain	Ground Speed (Knots)								
	100	125	150	175	200	225	250	275	300
	Tangents of Release Angles (Degrees)								
5,000	.55	.69	.83	.97	1.10	1.24	1.38	1.52	1.65
6,000	.49	.61	.74	.86	.98	1.10	1.23	1.35	1.47
7,000	.45	.56	.67	.78	.90	1.01	1.12	1.23	1.34
8,000	.42	.52	.63	.73	.83	.94	1.04	1.15	1.25
9,000	.40	.49	.59	.69	.79	.89	.99	1.09	1.19
10,000	.38	.47	.57	.66	.76	.85	.95	1.04	1.14
11,000	.37	.46	.55	.64	.74	.83	.92	1.01	1.10
12,000	.36	.45	.54	.63	.72	.81	.90	.99	1.08
13,000	.36	.45	.54	.62	.71	.80	.89	.98	1.07
14,000	.35	.44	.53	.62	.71	.80	.89	.98	1.06
15,000	.35	.44	.53	.62	.71	.80	.89	.98	1.06
16,000	.36	.44	.53	.62	.71	.80	.89	.98	1.07
17,000	.36	.45	.54	.63	.72	.81	.90	.99	1.07
18,000	.36	.45	.54	.63	.72	.81	.90	.99	1.08
19,000	.36	.45	.54	.64	.73	.82	.91	1.00	1.09
20,000	.36	.46	.55	.64	.73	.82	.91	1.00	1.09
21,000	.36	.45	.55	.64	.73	.82	.91	1.00	1.09
22,000	.36	.45	.54	.63	.72	.81	.90	.99	1.08
23,000	—	.45	.54	.63	.72	.81	.90	.99	—
24,000	—	.45	.53	.62	.71	.80	.89	.98	—
25,000	—	.44	.53	.62	.71	.80	.88	.97	
26,000	—	.44	.53	.61	.70	.79	.88	.96	
27,000	—	.43	.52	.61	.70	.78	.87	.96	
28,000	—	.43	.52	.60	.69	.77	.86	.95	
29,000	—	.43	.51	.60	.68	.77	.85	.94	
30,000	—	.42	.51	.59	.68	.76	.85	.93	

(For the desired camera tilt, subtract from the above values the correction given below.)

Tilt Angle (Deg.)	1°	2°	3°	4°	5°	6°	7°	8°	9°	10°	11°	12°
Subtract (Deg.)	.02°	.03°	.05°	.07°	.09°	.11°	.12°	.14°	.16°	.18°	.19°	.21°

Table E—Fuze Settings, Camera Tilt and Shutter Speeds For Obtaining Tilted Photos, Using Bomb, Photoflash, M46 With No Trail Plates

Shutter Speed	Altitude of Plane Above Terrain (Feet)	Indicated Air Speed (Knots) 130 Fuze Setting (sec.)	130 Camera Tilt (deg.)	140 Fuze Setting (sec.)	140 Camera Tilt (deg.)	150 Fuze Setting (sec.)	150 Camera Tilt (deg.)	160 Fuze Setting (sec.)	160 Camera Tilt (deg.)	170 Fuze Setting (sec.)	170 Camera Tilt (deg.)	180 Fuze Setting (sec.)	180 Camera Tilt (deg.)	190 Fuze Setting (sec.)	190 Camera Tilt (deg.)	200 Fuze Setting (sec.)	200 Camera Tilt (deg.)
	14,000	—	—	—	—	—	—	—	—	—	—	—	—	—	—	26.9	0
1/25-Second	15,000	—	—	—	—	—	—	—	—	—	—	—	—	—	—	28.7	0.5
1/25-Second	16,000	—	—	—	—	—	—	—	—	—	—	—	—	30.4	0	30.5	1.3
1/25-Second	17,000	—	—	—	—	—	—	—	—	—	—	32.3	0	32.4	0.9	32.4	2.1
1/25-Second	18,000	—	—	—	—	—	—	—	—	—	—	34.2	0.3	34.3	1.7	34.3	3.0
1/25-Second	19,000	—	—	—	—	—	—	—	—	36.0	0	36.0	1.2	36.1	2.5	36.2	3.8
1/25-Second	20,000	—	—	—	—	—	—	—	—	37.8	0.8	37.8	2.0	37.9	3.3	38.0	4.6
1/25-Second	21,000	—	—	—	—	—	—	39.5	0	39.5	1.4	39.5	2.7	39.6	4.0	39.7	5.3
1/25-Second	22,000	—	—	—	—	—	—	40.9	0.7	41.0	2.0	41.0	3.3	41.1	4.7	41.2	6.0
1/25-Second	23,000	—	—	—	—	42.2	0	42.3	1.3	42.4	2.6	42.4	3.9	42.5	5.3	42.6	6.6
1/25-Second	24,000	—	—	—	—	43.6	0.4	43.6	1.8	43.7	3.2	43.8	4.5	43.9	5.8	44.0	7.2
Open Shutter	25,000	—	—	—	—	44.9	0.9	44.9	2.3	45.0	3.7	45.1	5.0	45.2	6.3	45.3	7.7
Open Shutter	26,000	—	—	46.1	0	46.2	1.3	46.2	2.7	46.3	4.1	46.4	5.4	46.5	6.7	46.6	8.1
Open Shutter	27,000	—	—	47.4	0.3	47.5	1.6	47.5	3.0	47.6	4.4	47.7	5.8	47.8	7.1	47.9	8.5
Open Shutter	28,000	—	—	48.6	0.6	48.7	1.9	48.8	3.3	48.9	4.7	49.0	6.1	49.0	7.5	49.1	8.9
Open Shutter	29,000	—	—	49.8	0.9	49.9	2.2	50.0	3.5	50.1	4.9	50.2	6.4	50.2	7.8	50.3	9.2
Open Shutter	30,000	—	—	51.0	1.2	51.1	2.5	51.2	3.8	51.3	5.2	51.4	6.7	51.4	8.1	51.5	9.5
Open Shutter	31,000	52.1	0	52.1	1.4	52.2	2.7	52.3	4.1	52.4	5.5	52.5	7.0	52.6	8.4	52.7	9.8
Open Shutter	32,000	53.1	0.3	53.2	1.6	53.3	2.9	53.4	4.3	53.5	5.8	53.6	7.2	53.7	8.7	53.8	10.1
Open Shutter	33,000	54.2	0.5	54.3	1.8	54.4	3.1	54.5	4.5	54.6	6.0	54.7	7.5	54.8	9.0	54.9	10.4
Open Shutter	34,000	55.3	0.7	55.3	2.0	55.4	3.3	55.5	4.7	55.6	6.2	55.7	7.7	55.8	9.2	55.9	10.6

Table F—Tangents of Release Angles For Obtaining Tilted Photos, Using Bomb, Photoflash, M46 With No Trail Plates

Altitude of Plane Above Terrain (Feet)	Ground Speed (Knots)										
	150	175	200	225	250	275	300	325	350	375	400
	Tangents of Release Angles (Degrees)										
14,000	.49	.57	.65	.73	.81	.89	.97	1.05			
15,000	.48	.56	.65	.73	.81	.89	.97	1.05	—		
16,000	.48	.56	.64	.72	.80	.88	.96	1.04	—		
17,000	.48	.56	.64	.72	.80	.88	.96	1.05	—		
18,000	.48	.56	.64	.72	.80	.88	.96	1.05	—		
19,000	.48	.56	.64	.72	.80	.88	.96	1.04	1.12		
20,000	.48	.56	.64	.72	.80	.88	.96	1.04	1.12	—	
21,000	.48	.56	.64	.71	.79	.87	.95	1.03	1.11	—	
22,000	.47	.55	.63	.71	.79	.87	.94	1.02	1.10	—	
23,000	.47	.54	.62	.70	.78	.86	.93	1.01	1.09	—	
24,000	.46	.54	.62	.69	.77	.85	.92	1.00	1.08	1.15	
25,000	.46	.53	.61	.68	.76	.84	.91	.99	1.07	1.14	—
26,000	.45	.53	.60	.68	.75	.83	.90	.98	1.05	1.13	—
27,000	.45	.52	.60	.67	.74	.82	.89	.97	1.04	1.12	—
28,000	.44	.52	.59	.66	.74	.81	.88	.96	1.03	1.10	—
29,000	.44	.51	.58	.66	.73	.80	.87	.95	1.02	1.09	1.17
30,000	.43	.50	.58	.65	.72	.79	.87	.94	1.01	1.08	1.15
31,000	.43	.50	.57	.64	.71	.78	.86	.93	1.00	1.07	1.14
32,000	.42	.49	.56	.63	.71	.78	.85	.92	.99	1.06	1.13
33,000	.42	.49	.56	.63	.70	.77	.84	.91	.98	1.05	1.12
34,000	.41	.48	.55	.62	.69	.76	.83	.90	.96	1.03	1.10

(For the desired camera tilt, subtract from the above values the correction given below.)

Tilt Angle (Deg.)	1°	2°	3°	4°	5°	6°	7°	8°	9°	10°	11°	12°
Subtract (Deg.)	.02°	.03°	.05°	.07°	.09°	.11°	.12°	.14°	.16°	.18°	.19°	.21°

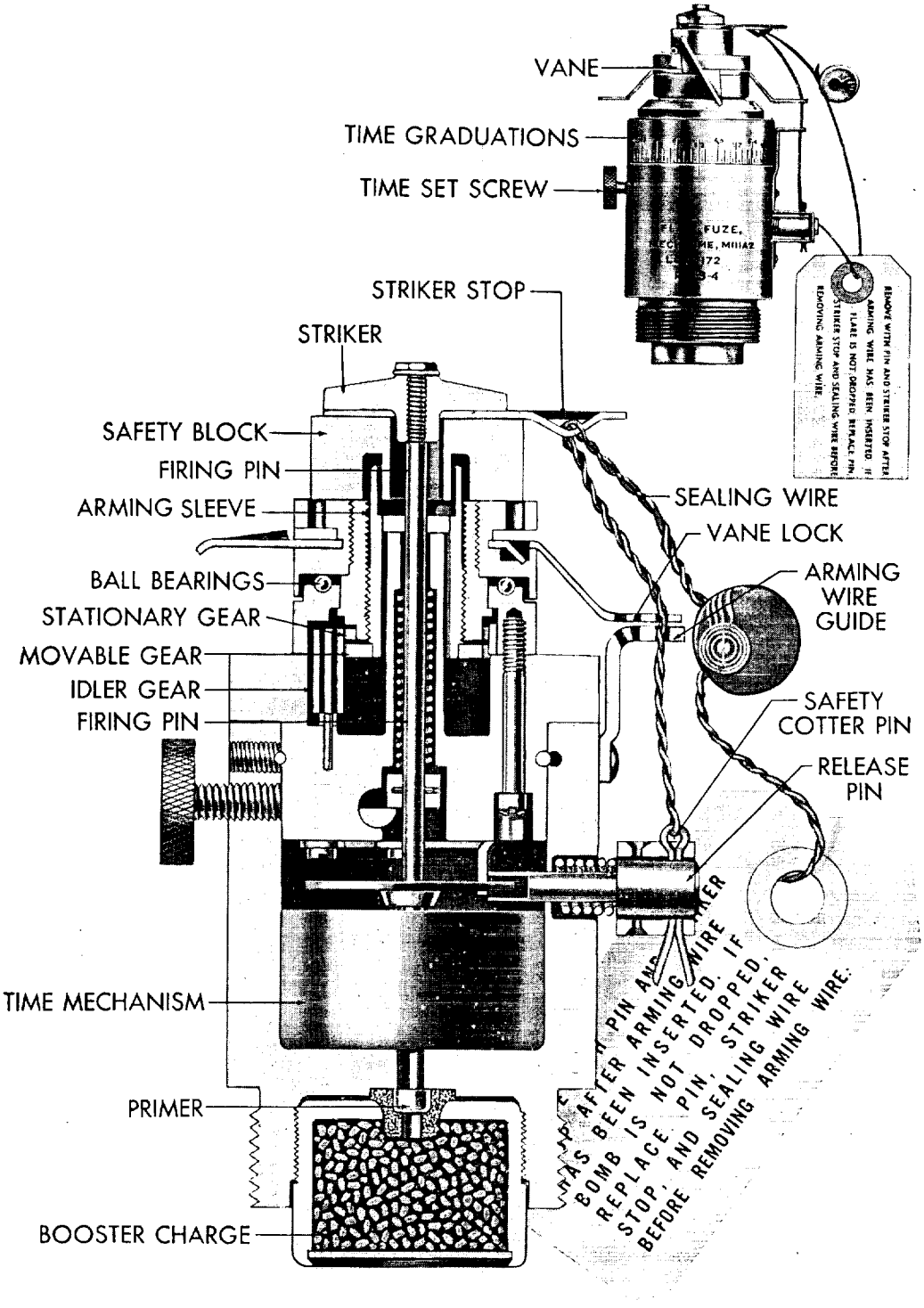


Figure 25—Fuze, Flare, Mechanical Time, M111

Procedure—Table E (for bombs with No Trail Plates) is found to cover this altitude. The bombs are prepared and fuzes set in accordance with the table (38.0 seconds). The camera is adjusted to tilt 4.6 degrees aft, and the shutter speed set to 1/25 second. During the approach at 200 knots Indicated Air Speed, the ground speed is found to be, say, 300 knots. Table F is then entered, and the tangent of the release angle obtained (.96–.08=.88 degree).

Fuzes, Flare, Mechanical Time, M111, M111A1 and M111A2

These fuzes were designed for use with Flare, Aircraft, Parachute, and are also used with other firing Ordnance items. (Fig. 25). They are not detonator-safe and may be used for land-based operations only when Fuze M146 is not available. Fuzes, Flare, Mechanical Time, M111, M111A1, and M111A2, must **never** be used in shipboard operations.

The complete fuze weighs approximately one pound and has a length of 4⅛ inches. The fuze body has a diameter of 1¾ inches, but projections on the fuze body increase the overall width to 2⅝ inches.

As Fuzes M111 and M111A1 are issued, the arming vane is not attached to the fuze but is assembled when the fuze is installed in the bomb or flare. The vane is composed of two blades with a four-inch span. Fuze M111A2 is issued with the arming vane (three-inch span) attached. Fuze settings are engraved on the time graduation ring, which can be turned in relation to the fuze body.

Fuze M111 can be set to cause functioning of the bomb or flare with a delay of from 15 seconds to 92 seconds after the bomb has been released from the aircraft. Fuzes M111A1 and M111A2 can be set to cause functioning of the bomb or flare with a delay of from five seconds to 92 seconds after the bomb or flare has been released from the aircraft. Graduations in all fuzes are divided into ½-second increments and numbered every three seconds. The delay required for any occasion can be determined from the fuze setting table appended to the section describing the item with which the fuze is to be used.

Fuzes, Flare, Mechanical Time, M111, M111A1, and M111A2, are used with the Flares, Aircraft, Parachute, M26 and AN–M26, and with Bombs, Photoflash M46 and AN–M46. These items are described in Chapters 4 and 7. Use of this fuze with aircraft bomb clusters is described in OP 988.

Delay arming is obtained by means of a reduction gear train between the arming vane assembly and the arming sleeve. The reduction gear is operated by the arming vane. The safety block is released after approximately 1,000 feet of air travel along the trajectory of the bomb or flare.

The striker and the firing pin are secured together and form the striker-firing pin assembly. In the unarmed or "safe" position, a safety block is interposed between the striker and the nut on the delay arming mechanism to prevent the firing pin from being driven into the primer. The safety block is held in place by the arming sleeve until the arming sleeve is withdrawn by the rotation of the arming vane.

In the armed position, the half-round cocking pin (controlled by the time mechanism through the timing disc and a series of levers) holds the firing pin away from the primer. The firing pin is at all times under the pressure of the firing pin spring, which tends to drive it into the primer. Since the firing pin and the primer are always in line, the fuze is liable to fire if the fuze body is crushed, even though the fuze is in the "safe" condition.

The explosive components consist of a primer and a black powder booster charge. The primer fits into the primer holder which projects into the booster charge.

Operation—As the flare or bomb falls away from the aircraft, the arming wire is withdrawn from the vane stop, the arming wire guide, and the release pin. The arming vane turns and arms the fuze as described above. The arming pin is forced out by the arming pin spring and disengages from a slot in the timing

disc mounted on the time mechanism. After the timing disc is released, the time mechanism drives it at a constant rate. When the predetermined delay has elapsed, the timing disc lever (which bears against the edge of the timing disc) falls into the slot in the timing disc vacated by the release pin. This lever is connected to the half-round cocking pin through a series of small levers. As the timing disc lever drops into the slot of the timing disc, the cocking pin is released and is free to turn. This allows the shoulder of the firing pin to slip by the cocking pin under the action of the firing pin spring, and the firing pin impinges on the primer.

This fuze will function at the time set on the time graduation ring within a limitation of plus or minus one second.

If the bomb or flare is released from the aircraft in the safe condition, the arming wire is released by the arming wire retainer in the bomb rack or shackle and drops with the bomb or flare, thereby preventing the fuze from arming. However, since the firing pin and the primer are always in line, the fuze is liable to fire if the fuze body is crushed by impact.

When a fuzed photoflash bomb or aircraft parachute flare is attached to the bomb rack or shackle of an aircraft with the arming wire in place, the fuze is in the unarmed condition and does not become armed until the photoflash bomb or flare has been released with the arming wire retained in the rack and has travelled the distance along the trajectory necessary to arm the fuze. The safety block prevents the firing pin from striking the primer until the fuze is armed (or crushed).

During shipping and stowage, the arming mechanism is prevented from turning by a seal wire inserted through the arming wire guide and the vane stop. The seal wire also passes through the striker stop, which is inserted between the striker and the safety blocks to relieve the spring pressure from the cocking pin. The seal wire also passes through the cotter pin which retains the arming pin. The ends of the seal wire are fastened together by a car seal.

Remove the shipping plug from the photoflash bomb or aircraft parachute flare, and inspect the fuze cavity and the threads to be sure that they are clean and free from foreign material.

Unseal the fuze container; remove the fuze from the packing; and inspect it to see that it is not corroded or otherwise unserviceable. Install the arming vane on Fuzes M111 and M111A1 by shoving it past the spring clip opposite to the vane stop. Fuze M111A2 is issued with the arming vane installed.

Set the fuze by loosening the thumbscrew and rotating the time graduation ring until the desired number of seconds is indicated. Tighten the thumbscrew.

Screw the fuze into the fuze cavity, hand tight only.

Thread the arming wire through the forward suspension lug, then the inner hole of the release pin, and finally through the inner holes of the arming wire guide and the vane stop. If the brass arming wire issued with the bomb or the flare is used, no Fahnestock clip should be used on the arming wire. However, if the Arming Wire (Steel) Mk 3 Mod 0 is used, a Fahnestock clip should be slipped on the end of the arming wire until it just touches the vane stop. After installing the photoflash bomb or aircraft parachute flare on the aircraft, cut off any excess arming wire, leaving about three inches to four inches protruding beyond the end of the fuze. Remove all burrs from the end of the arming wire. When this is done (and not until), remove the seal wire, the striker stop, and the cotter pin.

Either the arming wire or the seal wire and cotter pin must be in the fuze at all times.

In case the cotter pin is removed before the arming wire is installed, the arming pin will be ejected and the time mechanism will function. Under this condition the fuze is still safe to handle as long as the safety block is in place, but the fuze is partially armed, is unserviceable, and must be disposed of carefully as soon as possible by dumping, burning, or explosion. Only properly trained experts shall do this work. See page 7.

If a fuzed bomb or flare is not used, it should be unfuzed and returned to storage by reversing the steps outlined for preparing the fuze for operation. It is important to install the seal wire and cotter pin before removing the arming wire. The fuze must be returned to its container and sealed with tape to delay corrosion.

After the photoflash bomb or aircraft parachute flare is installed in the releasing gear of the aircraft before take-off, make sure that the arming wire is correctly assembled and installed in the proper holes in the fuze assembly, and that the seal wire, the striker stop, and the cotter pin have been removed. At the time of assembly, the reduction gear mechanism is coated with a colloidal graphite which acts as a lubricant. Other lubricants or preservatives of any kind are not necessary and should not be used on this fuze.

Fuzes which have been installed and exposed to weather for approximately three weeks should be replaced with new fuzes. However, it may be necessary to replace the fuzes after a shorter period of exposure, depending upon the weather conditions under which the aircraft is operating.

Fuzes which have the arming sleeve protruding less than ⅛ inch above the surface of the nut are considered partially armed. The arming sleeve can be seen between the arming blocks of the Fuzes M111 and M111A1, and at the opening of the single C-shaped arming block used in Fuze M111A2.

Upon removing the striker stop (after threading the arming wire in place), if the striker clamps down against the safety blocks, the fuze is considered partially armed.

Fuzes from which the arming pin is missing are partially armed.

Fuzes from which the seal wire is missing should be carefully checked for partial arming. If the striker stop is missing or out of place, the striker should be tested to see if a spring force holds it against the safety blocks. If the striker clamps tight against the safety blocks, the fuze is partially armed.

Safety Precautions—In addition to the general safety precautions outlined in Chapter 2, the following special precautions should be observed:

Extreme care should be exercised in selecting targets in friendly territory when tactics require the use of bombs or flares equipped with this fuze, since the fuze body is crushed by impact.

Demolition or disposal of flares or bombs equipped with this fuze should be carried out only by experts trained in this type of work.

No attempt should be made to disassemble these fuzes. Fuzes which have become damaged, corroded, or otherwise unserviceable, should be disposed of as soon as possible by dumping, burning, or explosion. **See page 7.**

Modification of the Fuze M111A2 for use with Flares—A high percentage of malfunctioning is encountered in the Flares, Aircraft, Parachute, M26 and AN–M26 when fuzed with a Fuze, Flare, Mechanical Time, M111A2 with a low time setting (15 seconds or less), and released at speeds below 170 knots. This probably results from oscillation of the flare due to fluttering of the drag sleeve which causes the arming vane to rotate too slowly to withdraw the arming sleeve completely; this allows ejection of the safety block before the time setting expires, and the striker clamps down on the safety block.

To prevent malfunctioning of the Fuze M111A2 due to failures to arm, the blades of the arming vane should be bent back so that they will make a 30-degree angle with the plane of rotation instead of the 60-degree angle now used. The resulting increased torque on the vane will cause faster rotation, insuring reliable functioning on the Flares M26 and AN–M26 at settings of eight seconds and above and release speeds of 170 knots. For settings below eight seconds and below release speeds of 170 knots, in addition to bending the vane as described above, the fuze should be pre-armed by 130 turns of the vane. Therefore, when fuze settings below 20 seconds are contemplated, Fuzes M111A2 should be modified accordingly. Vanes may be bent by competent personnel, using pliers.

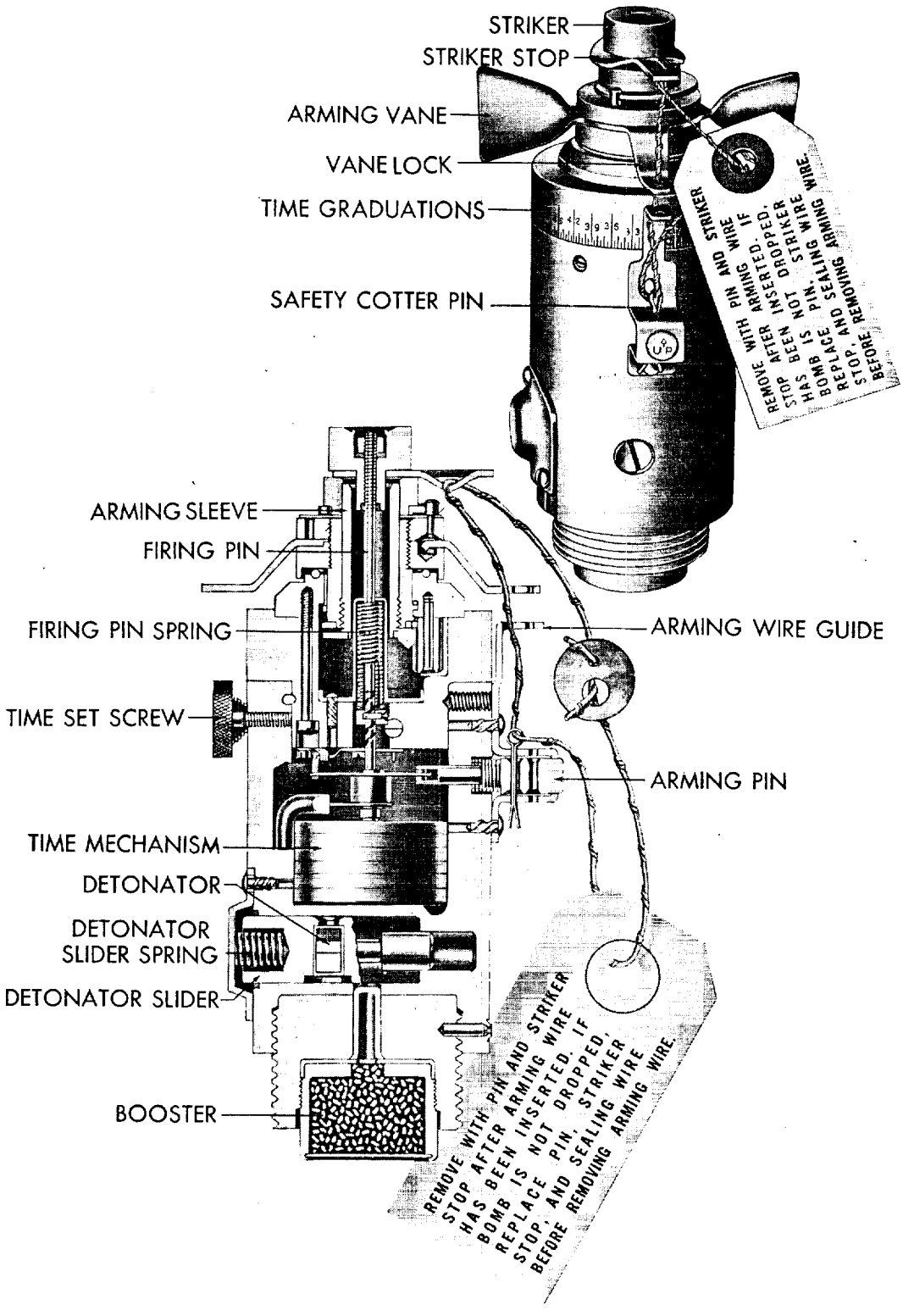


Figure 26—Fuze, Bomb, Mechanical Time, M146

The foregoing vane-bending requirement applies to most of the Fuzes M111A2 now in stock. However, with Fuzes M111A2 of the most recent production (which have positively rotating safety blocks with settings of eight seconds and speeds of release of 170 knots), reliable functioning is obtained without bending the vanes. For lower fuze settings or lower speeds of release, the vanes of these fuzes of recent production should also be modified by bending them to the 30-degree angle.

In all cases after a vane is bent, it should be turned back and forth for a few revolutions to insure that the arming mechanism is free.

Fuzes with the positively rotating safety blocks can be identified by the two studs which protrude from the vane locking nut.

Packing—The fuze is issued in a metal container 2¾ inches in diameter and 4½ inches long. It is issued with the vanes detached, but included in the fuze container.

Fifty fuze containers are shipped in one wooden shipping box.

Storage—Fuzes should be stored in a dry, well-ventilated place. The temperature of the locker or magazine should not be allowed to exceed 100 degrees Fahrenheit.

Fuze, Bomb, Mechanical Time, M146

Fuze, Bomb, Mechanical Time, M146 consists essentially of a Fuze, Flare, Mechanical Time, M111A2, with the detonator out of line with the firing pin until after the bomb has been released from the bomb shackle, and the arming wire withdrawn from the arming pin of the fuze. (Fig. 26). The fuze can be set to cause functioning of the bomb or flare with a delay of from five seconds to 92 seconds after the bomb or flare has been released from the aircraft. The fuze settings are engraved on the time graduation ring. Graduations are divided into ½-second increments, and numbered every three seconds.

The complete fuze weighs approximately 1¼ pounds. The fuze body has a diameter of 1⅞ inches, but projections on the fuze body make the overall width three inches. The length is approximately 5⅝ inches.

The arming vane operates a gear mechanism which releases the safety block after approximately 1,000 feet of air travel. The ejection of the spring-loaded arming pin, (held by the safety cotter pin during shipment) and by the arming wire when assembled in the bomb, starts the time mechanism at the moment the bomb is released and the arming wire is withdrawn from the fuze.

The body of the fuze houses a spring-loaded detonator slider, the time mechanism, the arming stem, and the booster cup. The detonator is located in the detonator slider, which is held by the arming stem in the unarmed position against a spring. In this position the detonator is out of line with the firing pin. Approximately 4½ seconds after the arming wire is removed, the time mechanism releases the arming stem, which then pivots and allows the detonator slider to move to the armed position. When in the armed position, the detonator is in line with the firing pin. The detonator slider is secured in the armed position by a spring-loaded detent. Fuze, Bomb, Mechanical Time, M146 is for use with Flares, Aircraft, Parachute, M26 and AN--M26, and with Bombs, Photoflash, B46 and AN–M46. These items are described in Chapters 4 and 7.

Fuze Bomb, Mechanical Time, M146 is installed in photoflash bombs and aircraft parachute flares in the same manner as the Fuze, Flare, Mechanical Time, M111 and modifications of that fuze, as described earlier in this chapter.

Safety Precautions—In addition to the general safety precautions outlined in Chapter 2, the special safety precautions relative to armed and partially armed Fuzes M111, M111A1, and M111A2 also apply to Fuzes M146.

When Bombs, Photoflash, M46 and AN–M46, and Flares, Aircraft Parachute, M26 and AN–M26 are used in carrier-based operations, Fuze,

Bomb, Mechanical Time, M146 must be used for safety reasons. Fuze, Flare, Mechanical

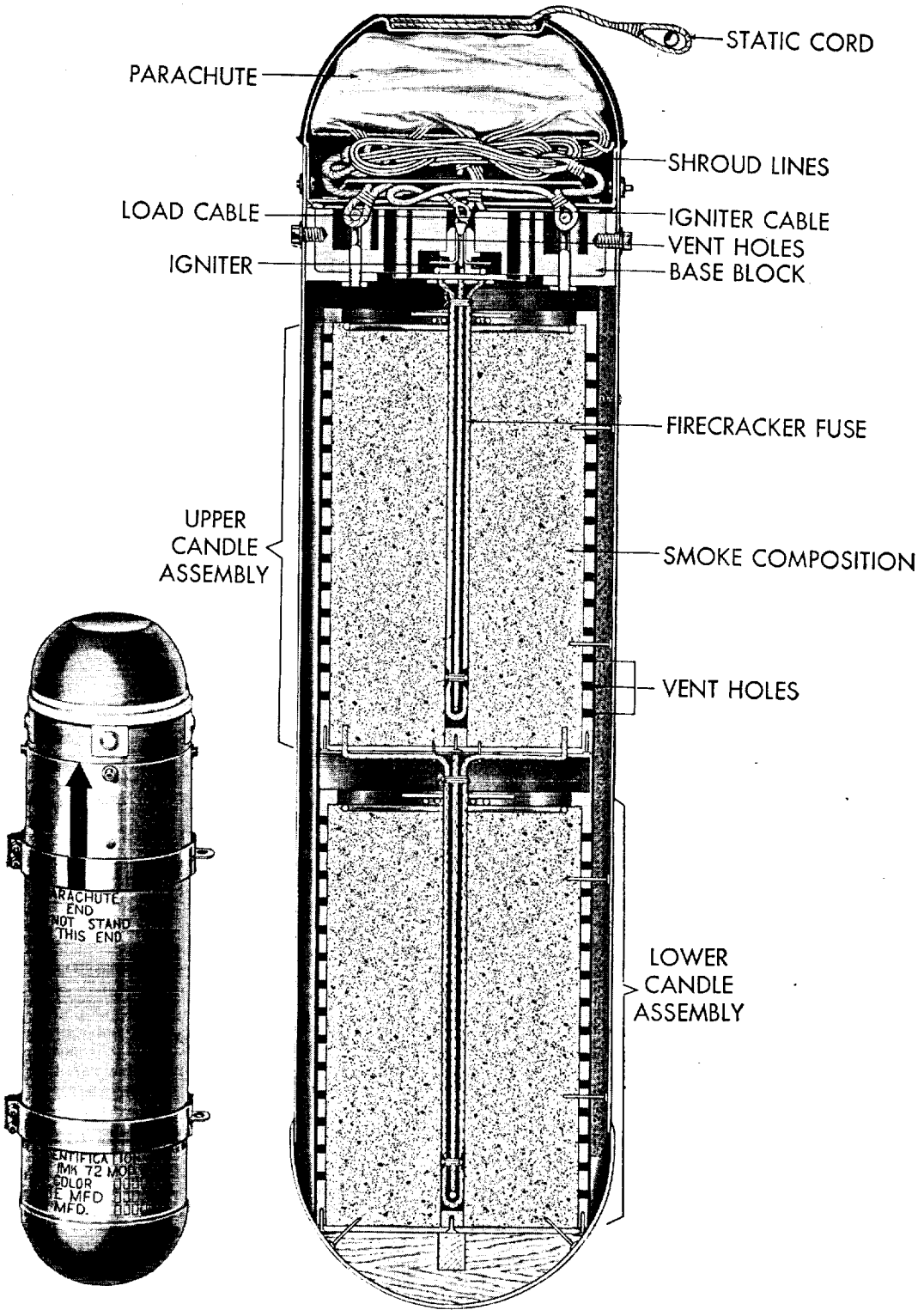


Figure 27—Target Identification Smoke Bomb Mk 72 Mod 1

Time, M111, M111A1, and M111A2 must not be used for shipboard operations, because they are not detonator safe; however, they may be used in land-based operations if no Fuzes, Bomb, Mechanical Time, M146 are available.

Packing—These fuzes are issued in hermetically sealed containers.

Fifteen fuze containers are shipped in one wooden shipping box.

Storage—Fuzes should be stored in a dry, well-ventilated place. The temperature of the locker or magazine should not be allowed to exceed 100 degrees Fahrenheit.

Target Identification Smoke Bomb Mk72 Mod 1

This smoke bomb provides a long-burning colored smoke marker used by the air coordinator to pin-point shore targets. (Fig. 27.) It is also used by scout planes from warships to pin-point shore targets. This marker is for use over land only, because it will not float on water.

The complete bomb weighs 45 pounds. It has a diameter of 8¾ inches and a length of 36 inches.

The bomb consists of a sheet steel bomb body and a parachute pack attached to the top of the bomb body by a bayonet joint.

The parachute pack is a molded container housing a four-foot hemispherical parachute, the shroud lines, load cables, igniter cable, and the static cord which extends out of the top of the pack.

The bomb casing contains a base block in the tail which incorporates the igniter assembly, 12 vent holes, and four eyebolts. The load cables are attached to the eyebolts, and the igniter cable is attached to the pull-type igniters. The upper and lower candle assemblies are located between the base block and the nose. These candles are composed of smoke-producing composition. A firecracker fuse runs through the center of each smoke candle.

The bomb is suspended by two lugs 14 inches apart, welded to suspension bands which are bolted to the case.

This bomb can be carried on all standard external double suspension racks and shackles. In addition to using this bomb on double suspension racks or shackles, it can be suspended from the Bomb Adapter Mk 5 Mod 0 (used with Rocket Launchers Mk 5 and Mods) when that item is available. These bombs may be released from external suspension on all types of planes in any normal flight attitude, and can withstand catapult launching and arrested landings.

It is installed on a bomb rack or bomb shackle with the parachute end forward in the same manner as a bomb. An arming wire should be secured to the static line at the point where it emerges from the parachute pack.

Operation—When the bomb is released from the rack or shackle, the static cord is retained by the rack or shackle to which it is attached. The static cord, through a series of short lines inside the pack, removes the molded cover of the pack and pulls out the parachute. The molded cover and false bottom of the pack fall away. After the parachute is open, a weak link in the static cord breaks, and the static cord is retained by the rack or shackle.

As the parachute is opened, the igniter cable, attached to one of the four load cables, actuates four pull-type igniters. The primers ignite the firecracker fuse running through the center of the upper candle. This fuse ignites the smoke-producing composition in the upper candle. The candle burns from the center hole toward the outside, and generates colored smoke. The smoke goes through holes in the candle case into the outside bomb case, and then emerges from the bomb through 12 vents in the base block and forms a cloud of colored smoke. Smoke is produced about eight seconds after release of the bomb.

When the upper candle is nearly burned out, the firecracker fuse from the lower candle is ignited, and in turn ignites the lower candle. The lower candle burns in the same manner as the upper candle.

The maximum rate of fall for this bomb is about 50 feet per second.

The bomb produces a red-orange colored smoke in sufficient volume to be seen at 15,000 feet for 10 miles, under normal conditions. It burns approximately five minutes.

The lower the altitude from which this bomb is released, the greater the accuracy that will be obtained. Because of the rapid opening of the chute, little trail can be expected. A high wind will cause drift. The bomb will operate satisfactorily when launched at any speed likely to be encountered with aircraft currently in service.

Safety Precautions—In addition to the general safety precautions outlined in Chapter 2, the following special precaution should be observed:

This bomb must not be stood on its parachute end.

Packing—The Bomb Mk 72 Mod 1 is packed in individual hermetically-sealed steel shipping containers, 12 inches in diameter and 41 inches in length. The total weight of the bomb and container is 80 pounds.

Stowage—The Bomb Mk 72 Mod 1 should be stowed in the shipping box until it is being readied for installation on an aircraft.

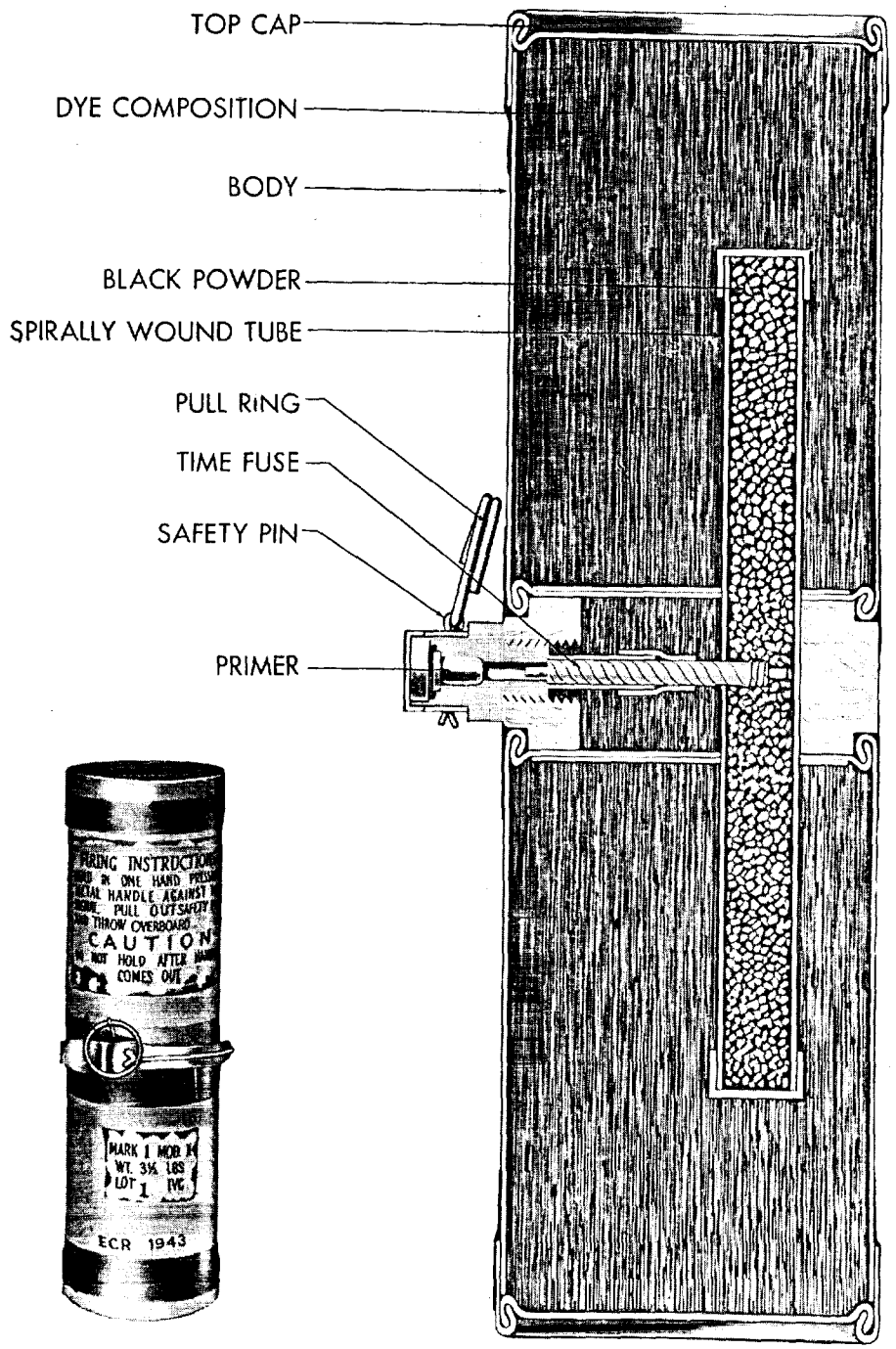


Figure 28—Depth Charge Marker, Day, Mk 1 and Mods

Chapter 8

MARKERS

Depth Charge Marker, Day, Mk 1 and Mods

These depth charge markers are used for indicating the initial point of contact with submarines, and to provide a reference point for further search and attack during day operations. (Fig. 28.)

They may be launched by hand from aircraft at altitudes up to 1,000 feet or from the decks of surface vessels. After launching, the dye containers in the marker burst, spreading dye on the surface of the water. The dye is rusty red in color, but a water solution of the dye is yellow green.

The spot on the water can be seen for about 3,000 yards from the deck of a ship, and about five miles from aircraft. The distance from which this spot can be seen depends on weather conditions, the observer's altitude, the quality of the daylight, and the position of the sun in relation to the observer. The spot usually remains for at least 45 minutes, and under favorable weather and wind conditions for a longer period.

This marker weighs approximately 3½ pounds. It has a diameter of 3½ inches and a length of 11⅞ inches. The firing mechanism protrudes about ⅞ inch from one side.

The marker consists of a circular wooden block on which is mounted a grenade firing mechanism. Fluorescein dye is contained in two cylindrical kraft paper containers, one attached to each flat side of the wooden block. A plastic tube extending through the wooden block into both of the paper cans contain the bursting charge of black powder. Depth Charge Marker Mk 1 Mod 1 contains dye having a fluorescein concentration of about 38%, while Depth Charge Marker Mk 1 Mod 2 contains dye having fluorescein concentration of about 86%.

Operation—When the marker has been launched, the release lever is forced off by the striker, which is at all times under the tension of the striker actuating spring. The striker rotates about the hinge pin, and the striker point impinges on the primer. The primer ignites the time fuse, which burns for approximately 15 seconds and then ignites the bursting charge. The gases thus evolved burst the dye containers and spread the dye on the water.

To prepare the marker for launching from aircraft at altitudes up to 1,000 feet, grasp the marker firmly in one hand, being sure that the release lever is held firmly against the body of the marker. With the other hand, pull the safety ring which is attached to the safety cotter pin. After removal of the safety cotter pin, launch the marker by throwing it over the side.

Depth Charge Markers, Day, Mk 1 and Mods may be launched from aircraft at any altitude, provided the safety cotter pin is not removed. Impact with the surface of the water will crush the cardboard container, releasing the dye to produce a slick slightly smaller as compared to the slick produced when the marker is dropped in armed condition.

Safety Precautions—In addition to the general safety precautions outlined in Chapter 2, the following special precautions should be observed:

After removing the safety cotter pin, the release lever can move away from the body of the marker and release the striker; therefore it is extremely important to hold the release lever securely against the body of the marker until the marker is launched. Only a small movement of the release lever is required to free the striker.

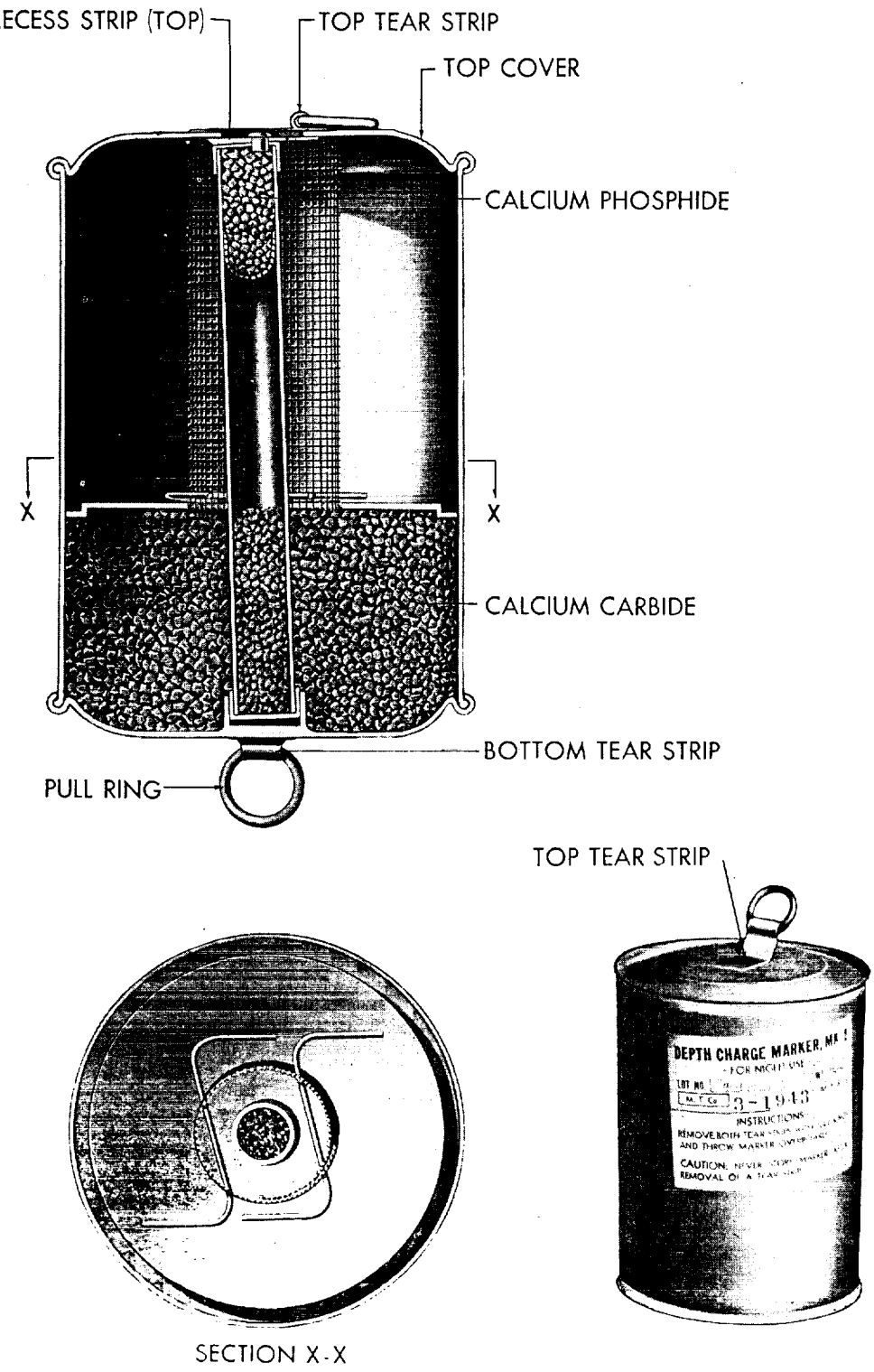


Figure 29—Depth Charge Marker, Night, Mk 2

Do not remove the safety cotter pin from the firing mechanism unless the marker is held properly (as described above) and is ready for launching.

Do not replace the safety cotter pin after it has been removed.

After the safety cotter pin is removed, do not release the grip on the release lever until the signal is launched.

Do not remove the firing mechanism from the marker under any circumstances.

Packing—The Depth Charge Markers, Day, Mk 1 Mod 1 is packed individually in an asphalt impregnated cardboard container of the mailing tube type, sealed with adhesive tape. Ten containers are packed in one wooden box. Formerly, 20 containers were packed in one wooden box; many of these larger boxes are still on hand.

The Depth Charge Marker, Day, Mk 1 Mod 2 is packed individually in a moisture-vapor-proof bag, and then in a carton. Ten of these cartons are packed in a wooden box.

Stowage—Depth Charge Markers, Day, Mk 1 and Mods should be stowed in a dry, well-ventilated place. The temperature in the locker or magazine should not be allowed to exceed 100 degrees Fahrenheit.

Depth Charge Marker, Night, Mk 2

Depth Charge Marker, Night, Mk 2 is used for indicating the initial point of contact with submarines, and to provide a reference point for further search and attack during night operations. (Fig. 29.)

This marker may be launched by hand from aircraft at altitudes up to 3,000 feet. After impact with the water, the gases generated give a flame about nine inches high. Under average atmospheric conditions the flame is visible from the deck of a ship at distances up to four miles, and from aircraft at distances up to 10 miles.

The marker weighs about 2½ pounds. It consists of a sealed, cylindrical metal can containing the chemical charge. The can has a diameter of five inches and a length of seven inches.

A centrally-located tube within the can contains a small charge of calcium phosphide. The main charge of calcium carbide surrounds this tube. A tear strip, with a pull ring attached, on each end of the container seals two small holes to permit the entrance of water when the marker is thrown overboard.

Operation—Before launching, the two tear strips are pulled off the ends of the container. It is launched by throwing it overboard.

Water enters the container through the holes in the bottom and reacts with both the calcium carbide and the calcium phosphide. Acetylene, (an inflammable gas) and phosphine (a spontaneously-ignited gas) are produced for at least 45 minutes. Both gases escape from the holes in the top, and ignite within about 70 to 90 seconds after impact with the water. In extremely cold weather, the ignition delay may be longer. If the flame is put out by rough water, the gases will ignite again. No smoke is emitted during the burning period.

Safety Precautions—In addition to the general safety precautions outlined in Chapter 2, the following special precautions should be observed:

Stow separately from other pyrotechnics, if practicable.

Do not stow depth charge markers in a compartment equipped with sprinklers or fight fires with water because the markers are ignited by chemical reactions between water and the chemicals within the marker.

Do not handle the marker or remove it from its container by grasping the tear strip pull-ring.

The tear strips must not be removed until just prior to use.

Periodic inspections should be made to insure that one or both tear strips have not been accidentally removed, and that no leaks exist in the seams.

Markers in which the water-tight integrity has been broken may evolve acetylene and

phosphine, gradually and without ignition. This gas may collect in enclosed places to produce hazardous concentrations that can explode if ignited.

Packing—Depth Charge Markers, Night, Mk 2 are packed 12 to a corrugated cardboard container.

Stowage—Ignition of these markers is caused by chemical reactions between water and the chemicals within the marker. Therefore, this marker should be stowed in a dry locker or compartment not equipped with sprinklers.

Cartridge, Slick Marker, AN–Mk 1 Mod 0

Cartridge, Slick Marker, AN–Mk 1 Mod 0 was developed primarily for use by aircraft engaged in antisubmarine warfare (Fig. 30). It has also been used for air-sea rescue, as a drift signal, and for other purposes requiring a reference point on the water.

The cartridge weighs about four ounces; it has a diameter of 1½ inches and a length of 3¾ inches.

This cartridge is fired from the Pistol, Pyrotechnic, AN–M8. The projectile bursts after being fired, and provides a slick on the surface of the water. The slick is placed at a point directly beneath the plane when the pistol is fired by aiming downward and aft so that the horizontal component of the muzzle velocity equals the speed of the plane.

It is composed of a shot gun type case, a primer, a black powder propelling charge, and the dye-filled projectile. The projectile consists of an aluminum container, containing 28 grams of fluorescein dye, a black powder bursting charge, and a length of safety fuse.

Operation—When the cartridge is fired, the powder in the head of the case propells the dye-filled projectile from the pistol, at the same time igniting the safety fuse. The fuse burns for 11 seconds before igniting the bursting charge in the projectile. The bursting charge forces the dye out into the water. The dye, a highly-soluble sodium salt, quickly creates a small bright green slick on the surface of the water.

The projectile has a positive buoyancy, so that it will remain on or near the surface of the water until the bursting charge disperses the dye to form the slick. If the projectile bursts in the air, the dye may spread over a large area and be so dispersed that a visible slick will not be created; therefore, the cartridge should not be fired from altitudes in excess of 500 feet.

The pyrotechnic pistol may be mounted in the Mount M1 for the Pistol AN–M8, or may be hand held. The propelling charge gives the projectile a muzzle velocity of approximately 300 feet per second. To obtain a vertical drop of the projectile relative to a point on the surface of the water, the pistol should be aimed downward and aft at the following angles from the vertical, according to the ground speed at which the aircraft is traveling:

Ground Speed (Knots)	Angle of Aim from Vertical (Degrees)
25	8
50	16
75	23
100	34
125	45
150	58
175	90

Safety Precautions—Observe the general safety precautions outlined in Chapter 2.

Packing—Ten cartridges are packed in a carton and five cartons are placed in a packed

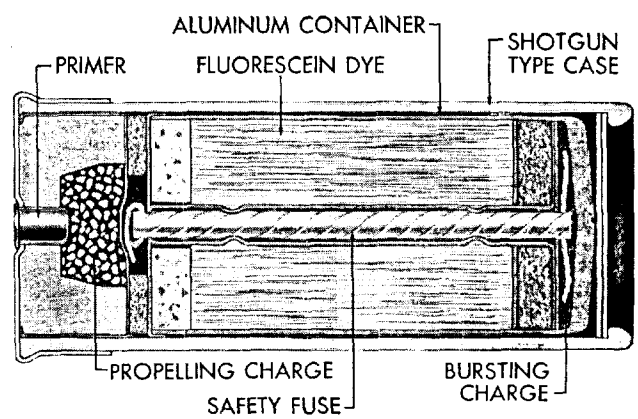


Figure 30—Cartridge, Slick Marker, AN–Mk 1 Mod 0

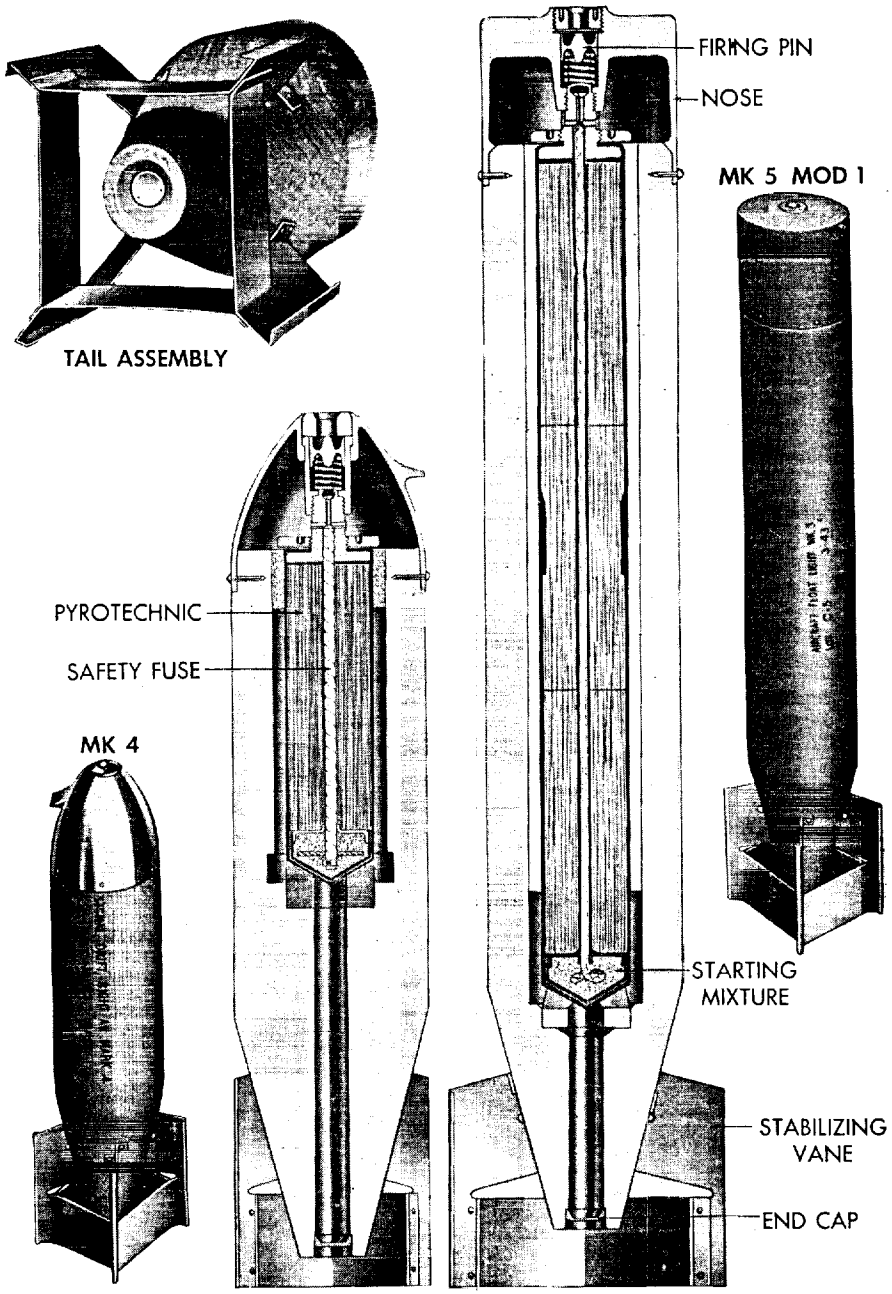


Figure 31—Signal, Drift, Night, AN–Mk 4 and Mods and AN–Mk 5 Mod 1

container. Five of the containers are packed in a wooden box.

Storage—Slick marker cartridges should be stored in a cool, dry place. They may be stored with signal cartridges under conditions recommended for the storing of pyrotechnic items.

Signals, Drift, Night, AN–Mk 4 and Mods, and AN–Mk 5 and Mod 1 and Mod 2

The Army and Navy have standardized the Navy's Aircraft Float Lights Mk 4 and Mk 5 Mod 1. They are now known as Signals, Drift, Night AN–Mk 4 and Mods and AN–Mk 5 Mods 1 and 2. (Fig. 31.)

When the drift signal is thrown from an aircraft during daylight or at night, it floats on the water and gives a light and smoke which are visible to an observer in the airplane from which it was dropped. These signals are used in obtaining the drift of the airplane from which it was dropped; for marking the location of a submarine or other object to which an aircraft desires to call the attention of observers on surface vessels; for determining the wind direction before landing; or to mark the location of the surface for emergency landings at night.

Night drift signals will function satisfactorily when launched from airplanes flying at speeds above 100 knots and altitudes above 50 feet.

Signal, Drift, Night, AN–Mk 4 weighs approximately two pounds. It has a diameter of three inches, but fins on the body increase the width to 4¼ inches. It has a length of 13 inches.

Signal, Drift, Night, AN–Mk 5 and Mods weighs approximately four pounds. It has a diameter of three inches, but fins on the body increase the width to 4¼ inches. It has a length of 19 inches.

Signals, Drift, Night, AN–Mk 4 and AN–Mk 5 Mod 1 are used in the same manner and for the same purpose. The Signal AN–Mk 4 burns for about three minutes, while the Signal AN–Mk 5 Mod 1 burns for about 12 minutes. If both signals are available, the burning time desired should govern the selection.

The appearance of these signals differs in that the AN–Mk 4 has an oval-shaped die-cast nose with a lug on one side to turn the missile so it will not strike the bottom in shallow water. The Signal AN–Mk 5 Mod 1 has a flat die-cast nose and is about six inches longer.

The bodies of both signals are made from wood, and are about three inches in diameter. The tail end of the body is tapered to a diameter of one inch; the sheet-metal tail assembly is mounted on this end. The die-cast nose, which contains the water impact fuze, is mounted on the other end. The tail assemblies and the fuze mechanisms of both signals are identical.

The pyrotechnic mixture is formed into pellets approximately four inches long and 1¼ inches in diameter, with a 0.22-inch hole down the center. One pellet is used in the Signal AN–Mk 4 and three pellets, end to end, are used in the Signal AN–Mk 5 and Mods.

The pellets are enclosed in a pyrotechnic tube to keep the hygroscopic pyrotechnic material from absorbing moisture through the wooden body. Originally, tin was used for this tube, but in recent lots, lead and zinc have been substituted.

Operation—When launched from aircraft, the signal falls with the nose downward. On impact with the surface, the water breaks the lead sealing disk, and drives the firing pin back against the primer. Flame from the primer ignites the safety fuse which runs the length of the hole in the center of the pellets. The safety fuse burns about 10 seconds in the Signal AN–Mk 4, and about nine sconds in the Signal AN–Mk 5. This gives the signal enough time to return to the surface and right itself.

The safety fuse ignites a length of quick match which, in turn, ignites the starting mixture. The starting mixture burns with sufficient heat to ignite the pellet. The gases generated break open the pyrotechnic tube and force out the cap which seals the end of the discharge tube in the tail. A flame 12 to 15 inches high and a white smoke are produced. The flame can be seen at night a distance of six or seven miles in clear weather. Because the smoke is white, daylight observation is difficult under hazy conditions.

Drift signals are stowed aboard aircraft in racks mounted in any accessible position. They are launched by tossing them over the side, preferably in a horizontal position with the nose end forward.

Safety Precautions—In addition to the general safety precautions outlined in Chapter 2, the following special precautions should be observed:

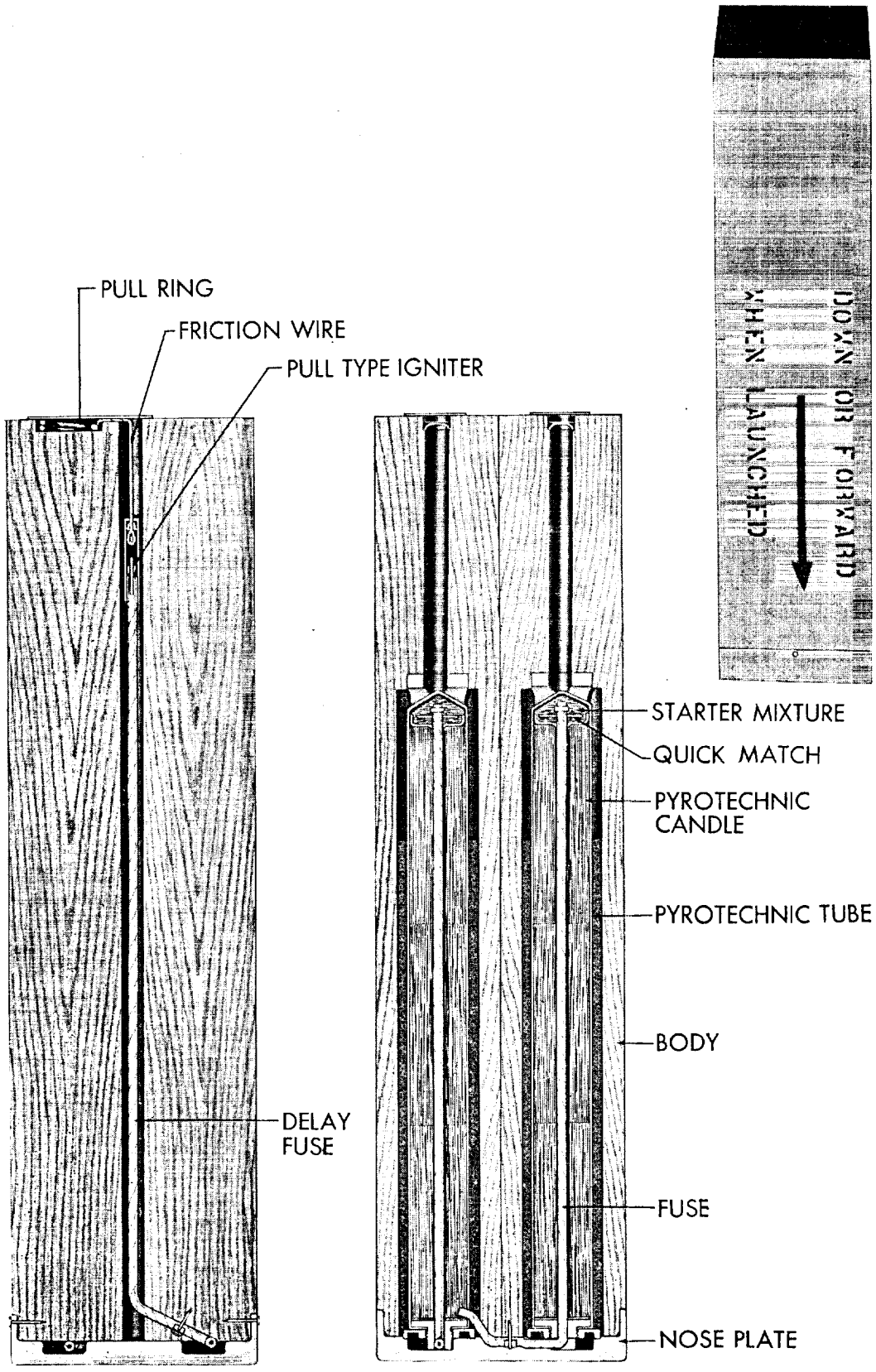


Figure 32—Aircraft Float Light Mk 6 and Mods

Drift signals should be stowed in pyrotechnic lockers above decks, because burning of the pyrotechnic mixture in drift signals creates large quantities of smoke, making fighting of such fires difficult.

Packing—Drift signals are packed in individual corrugated boxes wrapped in a moisture-vapor-proof material. They are shipped 25 in a wooden box.

Storage—Burning of the pyrotechnic mixture in drift signals results in large quantities of smoke; therefore, fighting of fires below decks is very difficult. For this reason, drift signals should be stowed in pyrotechnic lockers above decks, especially in vessels carrying a large allowance of these signals. However, stowage in a pyrotechnic magazine is acceptable.

Stowage aboard ship or at shore stations should be so selected that the temperature will not exceed 100 degrees Fahrenheit. Whenever possible, drift signals should be stowed in the containers in which they are supplied. Aboard aircraft, drift signals should be stowed in a location protected from the direct rays of the sun, from excessive heat, and from spray and moisture.

Aircraft Float Light Mk 6 and Mods

Aircraft Float Light Mk 6 and Mods provides a long burning surface marker for use during daylight or at night. (Fig. 32.) It consists of four Signals, Drift, Night, An Mk 5 Mod 1 pyrotechnic candles, contained in a wooden body. A flat die-cast metal nose piece is attached to the nose end of the body. Each pyrotechnic candle burns successively through a separate hole in the tail end of the body. A Mk 6 type of aircraft float light produces a flame about 10 to 12 inches high, and a dense, grayish-white smoke for a period of at least 40 minutes.

This float light is thrown overboard from an aircraft or surface vessel. The nose piece causes the float light to be stable during the dropping period, and to remain in an upright position, nose downward, while in the water.

Aircraft Float Light Mk 6 weighs approximately 16 pounds. The wooden body, including the metal nose, is 5⅛ inches square and has a length of 20¼ inches.

Aircraft Float Light Mk 6 Mod 0 is ignited by impact-type igniters located in the nose piece, and functions on water impact only. Originally, these float lights did not acquire flight stability until they had fallen at least 300 feet below the aircraft; therefore, a pull-type igniter was incorporated in float lights of recent manufacture. The float light with the pull-type igniter is designated Aircraft Float Light Mk 6 Mod 2, and may be launched from aircraft at any altitude up to 5,000 feet. These float lights may also be used from surface vessels.

Aircraft Float Lights Mk 6 Type are launched by hand. The pull-type igniter, located in the tail end of the float light, is actuated at the time the float light is launched by sharply pulling the ring attached to the friction wire, either by hand or by a lanyard attached to the structure of the aircraft. The float light must be launched immediately after the igniter has been actuated.

Four holes in the tail end of the float light are closed by a metal cap and sealed with a piece of adhesive tape. As the pyrotechnic candle begins to burn, the gas pressure produced forces out the metal caps and breaks the adhesive tape seal, allowing the gases to escape and burn. The adhesive tape must not be removed before launching the float light. A combustion type delay fuse provides continuity of ignition between the igniter and the top of the first candle, and between the bottom of one candle and the top of the next. A delay of 90 seconds occurs between actuation of the igniter and ignition of the first candle. Normally, no delay occurs during the transfer of ignition from one candle to the next.

Safety Precautions—In addition to the general safety precautions outlined in Chapter 2, the following special precautions should be observed:

Do not remove the square pieces of adhesive tape from the wooden body before launching the float light.

The float light must be launched immediately after the igniter has been actuatd.

Packing—The Aircraft Float Light Mk 6 and Mods is packaged six units to a wooden shipping box. Individual rounds of recent production are packed in moisture-vapor-proof containers.

Storage—If possible, float lights should be stowed in pyrotechnic lockers above decks, because the large quantity of smoke produced in case of fire makes fire-fighting difficult. The pyrotechnic stowage aboard ship or at shore stations should be so selected that the temperature will not exceed 100 degrees Fahrenheit. Float lights should be stowed in the original shipping container, except when placed aboard aircraft in a ready condition.

Chapter 9

RECOGNITION AND DISTRESS SIGNALS, AND PROJECTORS

Aircraft Signals (Army), and Signal Cartridges (Navy)

Aircraft Signals and Signal Cartridges are fired in the Pistol, Pyrotechnic, AN–M8 as a method of identification for and communication between aircraft and surface vessels. These signals can be seen during the day or night. (Distress signals are described in other chapters of this publication.)

Aircraft Signals are manufactured for the Army. They project one or two free stars of the same or different colors. Colors in current use are red, yellow, and green. All aircraft signals weigh from four to six ounces, are approximately 1½ inches in diameter and between 3 and 3⅞ inches in length.

All aircraft signals, except the AN–M53 to AN–M58 series, have a similar internal construction.

Arrangements were made for the Army to produce all signals of this type. Manufacture of the Mk 3 Mod 3 and the Mk 4 types of signals was discontinued in favor of the equivalent Army aircraft signals, which are now issued to Navy activities.

The following is a list of the correct nomenclature for cartridge-type signals used by the Navy for identification:

Aircraft Signals

Signal, Aircraft, Double Star, Red-Red, AN–M28

Signal, Aircraft, Double Star, Yellow-Yellow, AN–M29

Signal, Aircraft, Double Star, Green-Green, AN–M30

Signal, Aircraft, Double Star, Red-Yellow, AN–M31

Signal, Aircraft, Double Star, Red-Green, AN–M32

Signal, Aircraft, Double Star, Green-Yellow, AN–M33

Signal, Aircraft, Double Star, Red-Red, AN–M37 or AN–M37A1

Signal, Aircraft, Double Star, Yellow-Yellow, AN–M38 or AN–M38A1

Signal, Aircraft, Double Star, Green-Green, AN–M39 or AN–M39A1

Signal, Aircraft, Double Star, Red-Yellow, AN–M40 or AN–M40A1

Signal, Aircraft, Double Star, Red-Green, AN–M41 or AN–M41A1

Signal, Aircraft, Double Star, Green-Yellow, AN–M42 or AN–M42A1

Signal, Aircraft, Single Star, Red, AN–M43 or AN–M43A1

Signal, Aircraft, Single Star, Yellow, AN–M44 or AN–M44A1

Signal, Aircraft, Single Star, Green, AN–M45 or AN–M45A1

Signal, Aircraft, Yellow Tracer, Red-Yellow Double Star, AN–M53 or AN–M53A1

Signal, Aircraft, Green Tracer, Red-Red, Double Star, AN–M54 or AN–M54A1

Signal, Aircraft, Green Tracer, Green-Red, Double Star, AN–M55 or AN–M55A1

Signal, Aircraft, Red Tracer, Green-Green, Double Star, AN–M56 or AN–M56A1

Signal, Aircraft, Red Tracer, Red-Red, Double Star, AN–M57 or AN–M57A1

Signal, Aircraft, Red Tracer, Green-Red, Double Star, AN–M58 or AN–M58A1

Signal Cartridge, Two-Star, Mk 3 Mod 3

(The following color combinations are all included under the above designation, and must be specified when ordering: Red-Yellow; Yellow-Yellow; Green-Green; Red-Yellow; Red-Green and Green-Yellow.)

Signal Cartridge, Two-Star (with tracer) Mk 4.

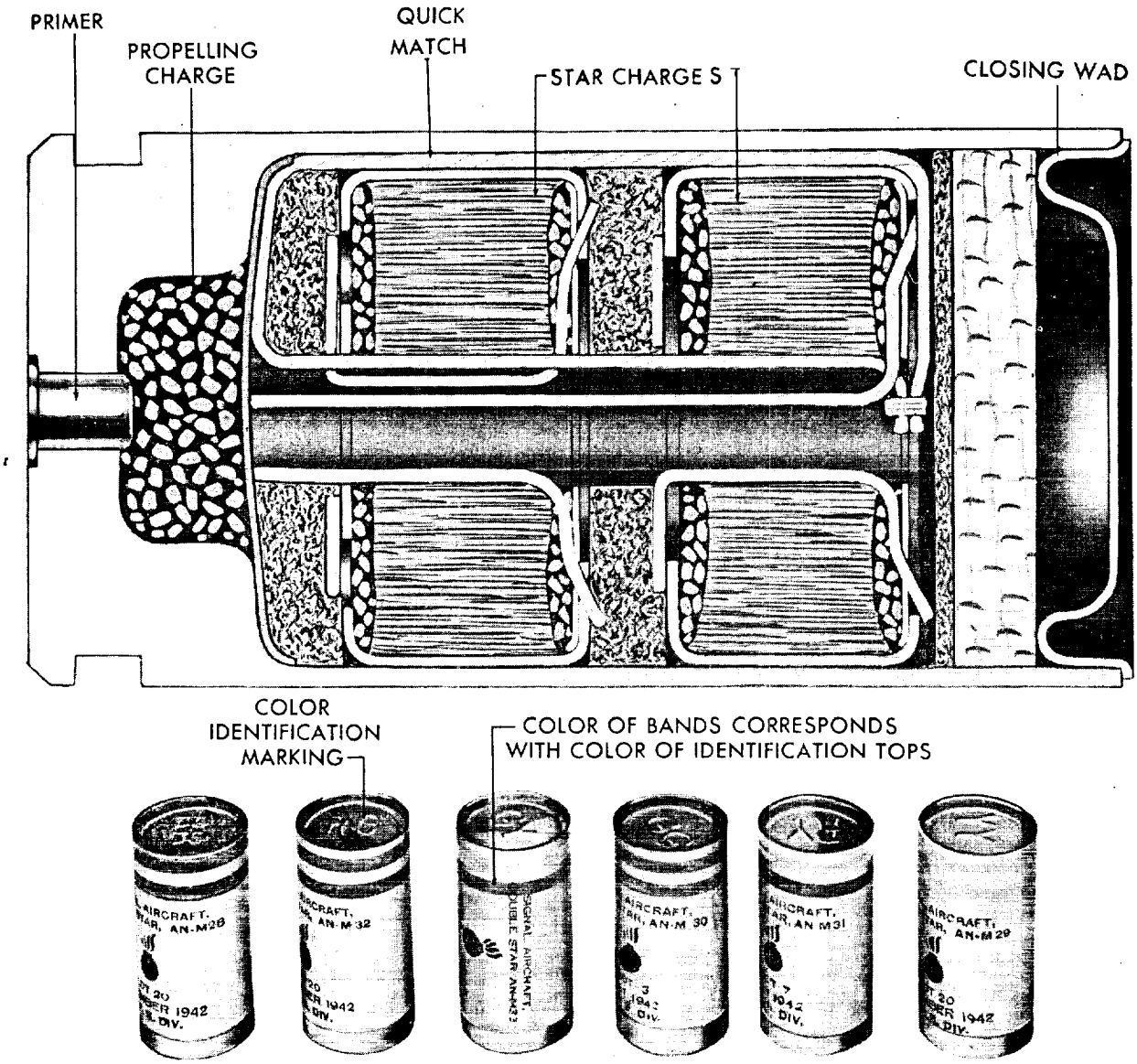


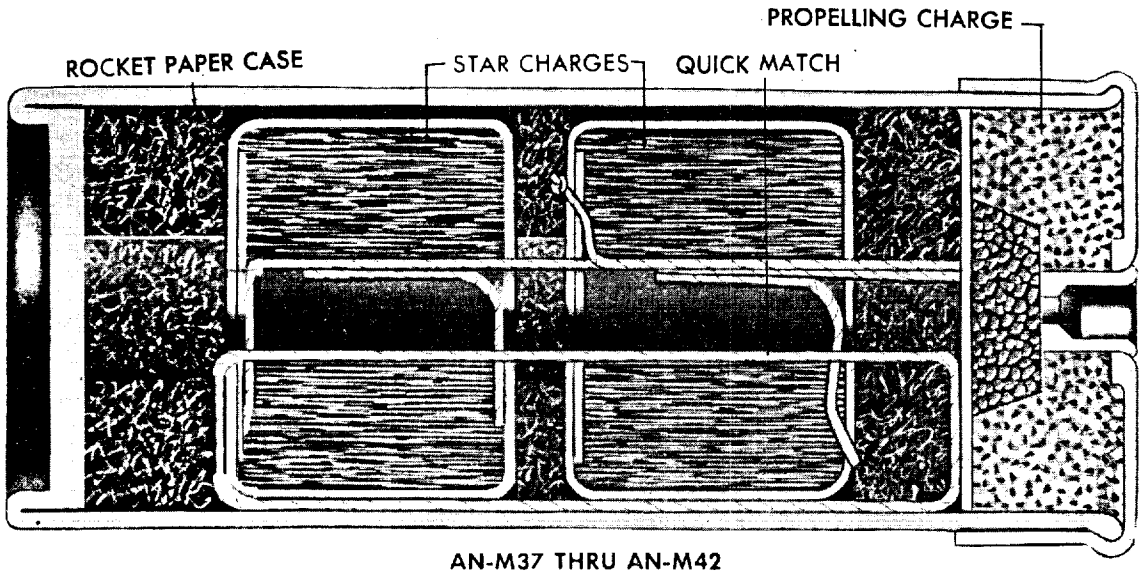
Figure 33—Signals, Aircraft, AN–M28 to AN–M33, Inclusive

(The following colors are included under the above nomenclature, and should be specified when ordering: Red-Red Stars—Red Tracer; Green-Green Stars—Red Tracer; Red-Green Stars—Red Tracer; Red-Red Stars—Green Tracer; Red-Green Stars—Green Tracer; Red-Yellow Stars—Yellow Tracer. See page 78.)

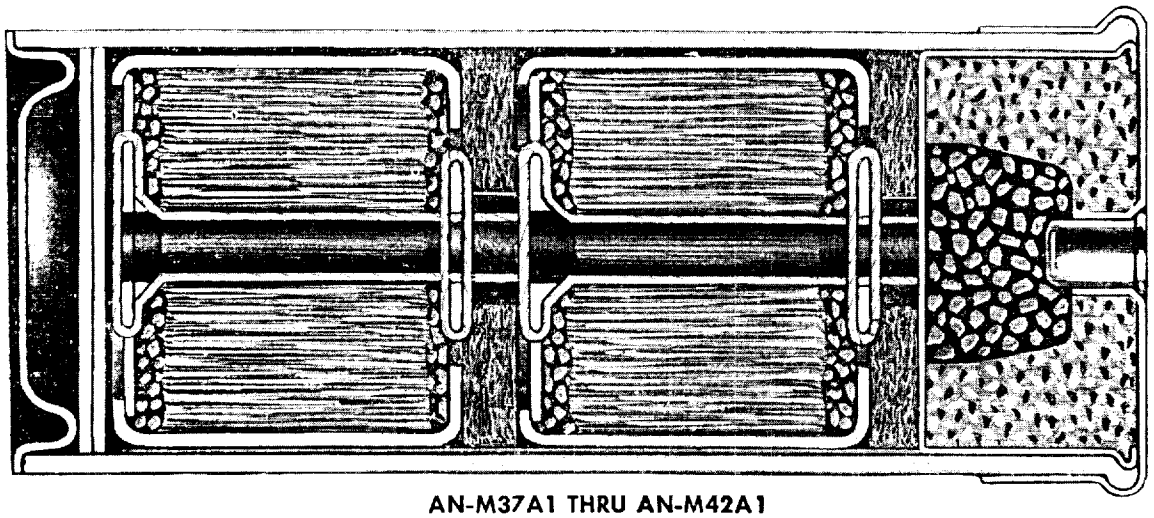
Signals, Aircraft, AN–M28 to AN–M33 series (Fig. 33), and Signal Cartridges, Mk 3 Mod 3 and Mk 4, are no longer manufactured, but issues are being made from stocks on hand until the supply is exhausted.

Cartridge cases of the Signals, Aircraft, AN–M28 to AN–M33 series of the "rimless" type are extruded from aluminum or fabricated from steel and plastic. These signals are now obsolete.

Around the circumference of the cartridge base a groove is provided into which the extractor of Pistol, Pyrotechnic, AN–M8 fits, thus securing the cartridge in the barrel of the pistol. This design was adopted to permit muzzle loading of Pistol, Pyrotechnic, M2, which is also obsolete.



AN-M37 THRU AN-M42
(Shotgun Type Cartridge Case)



AN-M37A1 THRU AN-M42A1
(All Metal Case)

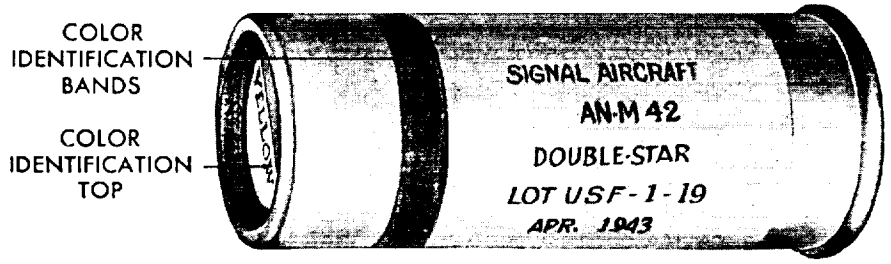
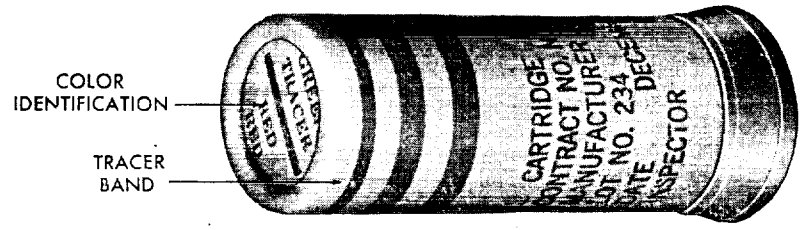
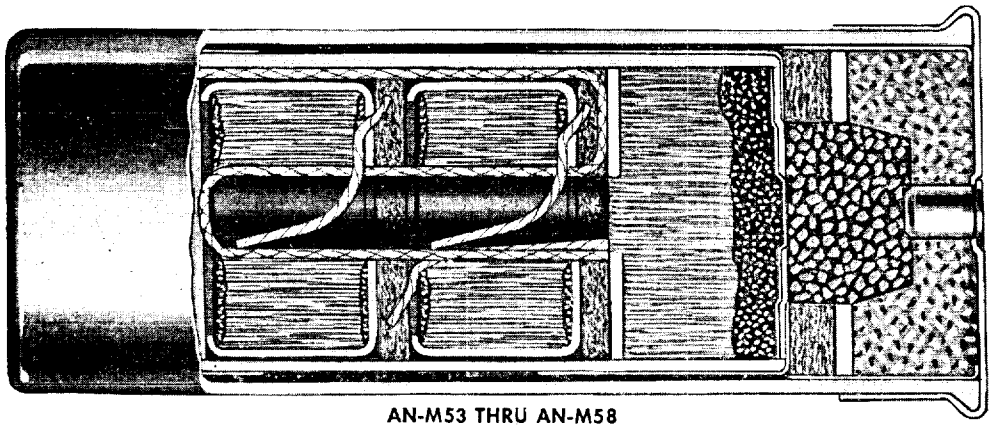
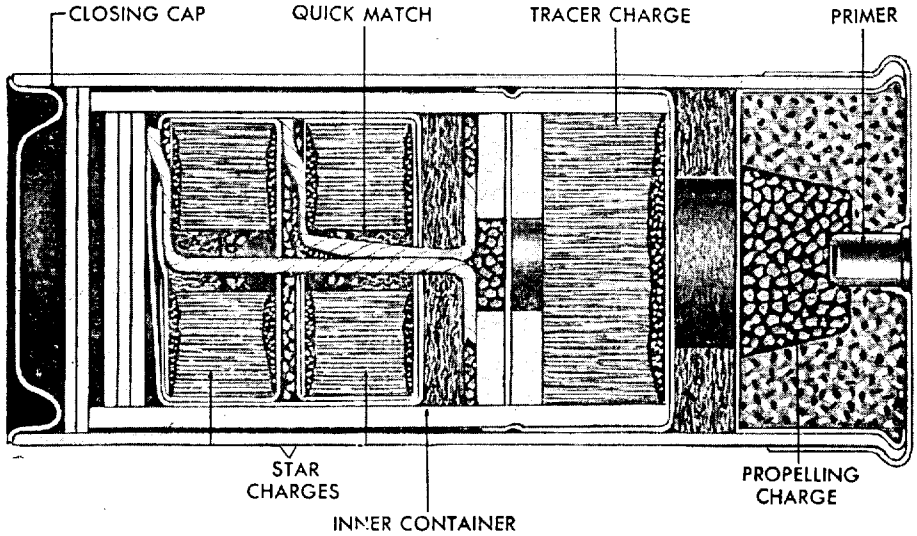


Figure 34—Signals, Aircraft, AN–M37 to AN–M42, Inclusive





AN-M53 THRU AN-M58
(Shotgun Type Cartridge Case)



AN-M53A1 THRU AN-M58A*
(All Metal Case)

Figure 35—Signals, Aircraft, AN–M53 to AN–M58, Inclusive

The closing wad and either the triangular-shaped dots or the colored bands on the side of the cartridge case are the same color as the stars. These signals can be identified in the dark by letters embossed on the metal closing wad of the signal, and indicating the color of the stars.

The internal construction of Signals, Aircraft, AN–M37 to AN–M42 series (Fig. 34), is similar to that of the AN–M28 to AN–M33 series. Signals, Aircraft, AN–M37 to AN–M42 series are contained in a shot gun type cartridge case made from standard rocket paper inserted in a brass base. Two colored bands around the paper end of the cartridge case indicate the colors of the stars. The names of the colors of the stars are also printed on the paper closing wad. No means of color identification in the dark is provided.

Signals, Aircraft, AN–M43 to AN–M45 series are similar to Signals, Aircraft, AN–M37 to AN–M42 series, except that they contain only one star. The extra space in the cartridge case is filled by a cardboard spacer. The color of the star is indicated by a band on the case, and the name of color is printed on the closing wad.

The external appearance of Signals, Aircraft, AN–M53 to AN–M58 series (Fig. 35) is identical to that of the AN–M37 to AN–M42 series. However, the internal construction of this series differs from the AN–M37 to AN–M42 series in that the star charges are contained within an inner container, closed at one end by the tracer composition. This inner container also contains a bursting charge, ignited by the tracer composition when it burns through. The color of the stars is indicated on the cartridge case in a manner similar to that of the signals previously described, with an additional narrower band indicating the color of the tracer. The names of the colors of the stars and the tracer are also printed on the paper closing wad.

AN–M37 to AN–M42 series, AN–M43 to AN–M45 series, and AN–M53 to AN–M58 series signals have been altered by assembling them in an all-metal cartridge case similar in appearance to the shot gun type cartridge case previously used. All signals incorporating the metal cartridge case have the letter "A" and the numeral "1" added to the designation; for example, Signal, Aircraft, Double Star, Red-Red, AN–M37A1.

Signal Cartridges, Two-Star, Mk 3 Mod 3 are similar to the Signals, Aircraft, AN–M37 to AN–M42 series. The Cartridges Mk 3 Mod 3 Type are the only series of signals which cannot be identified by the printed information on the cartridge case. There is no printing on the cartridge case to indicate the lot number, date of manufacture, or the nomenclature, including the Mark and Mod designation. Two colored bands around the paper end of the cartridge case indicate the color of the stars. These signals have now been declared obsolete.

Signal Cartridges, Two-Star, (with tracer) Mk 4 are similar in appearance and functioning to the Signals, Aircraft, AN–M53 to AN–M58 series. The color of the stars is indicated on the cartridge case by two wide bands near the paper end of the case; a narrow band indicates the color of the tracer. The names of the colors of the stars and the tracer are printed on the paper closing wad. Information for identifying the signal cartridge is printed on the cartridge case.

Operation—All signal cartridges or aircraft signals which do not contain tracers function in the same manner, as follows:

When the firing pin strikes the primer, the primer ignites the black powder propelling charge. As the stars are propelled from the barrel of the projector, they are ignited by the propelling charge. When fired from the ground, the stars reach full brilliance after traveling about 40 or 50 feet, and rise to a height of about 250 feet. The stars can be distinguished at distances up to about five miles at night, and about two or three miles in daylight. The stars burn for about seven seconds.

Signal cartridges and aircraft signals containing tracers function in a slightly different manner, as follows:

While the inner container is propelled from the barrel of the projector, the tracer is ignited by the propelling charge. The tracer burns for

about four seconds, then ignites the bursting charge and the two stars within the inner container. In effect, upon leaving the barrel of the projector, the tracer appears as a single star and rises to a height of about 250 feet when fired from the ground; at this point, the star separates into two stars, which fall separately. The tracer and stars can be seen about five miles at night, and about two or three miles in daylight.

Safety Precautions—Observe the general safety precautions outlined in Chapter 2.

Packing—Signals, Aircraft, AN–M28 to AN–M33 series are packed six cartridges to a carton, and 12 cartons to a wooden packing box. Signals, Aircraft, AN–M37 to AN–M42 series, AN–M43 to AN–M45 series, and AN–M53 to AN–M58 series are packed 12 cartridges to a carton and 12 cartons to a wooden packing box. Markings on boxes and cartons identify the contents.

Signal Cartridges Mk 3 Mod 3 and Signal Cartridges Mk 4 are packed ten cartridges to a carton, five cartons to the container, and four containers to the wooden packing box.

Storage—Aircraft signals and signal cartridges are carried aboard aircraft in racks or in belts mounted in any convenient location away from the direct rays of the sun. The primers of these signals contain mercury fulminate, which deteriorates rapidly under conditions of high temperature and humidity. Magazine stowage temperatures should never exceed 100 degrees Fahrenheit.

All types of these signals are subject to rapid deterioration in the tropics and must be inspected frequently to insure their reliability. In general, if these signals are removed from their sealed containers they will deteriorate within three weeks in the tropics. Signals in metal cases will not deteriorate as rapidly but should be checked for functioning frequently.

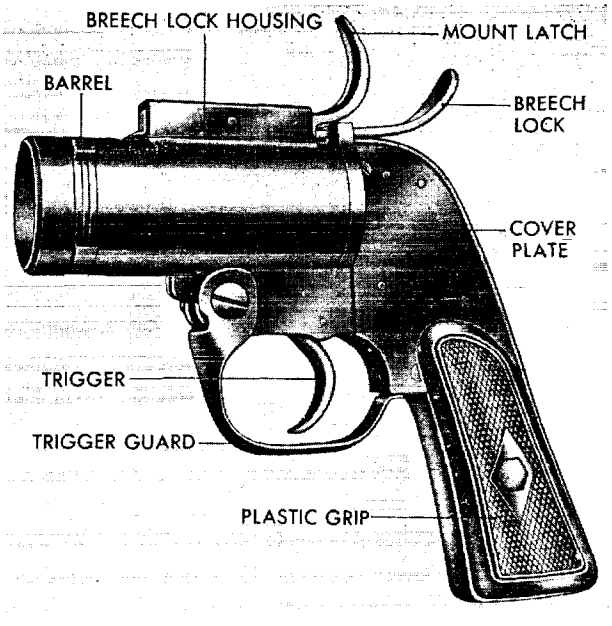


Figure 36—Pistol, Pyrotechnic, AN–M8

Pistol, Pyrotechnic, AN-M8

The Pistol, Pyrotechnic, AN–M8, with or without mount, is standard equipment for naval aircraft, including training airplanes. (Figs. 36, 37, and 38). The Mount M1 for Pistol,

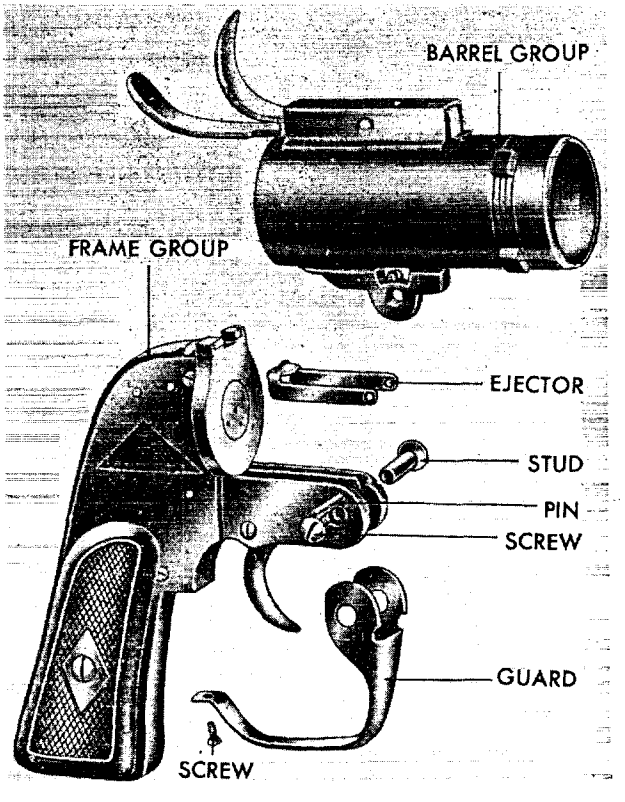


Figure 37—Pistol, Pyrotechnic, AN–M8, Disassembled

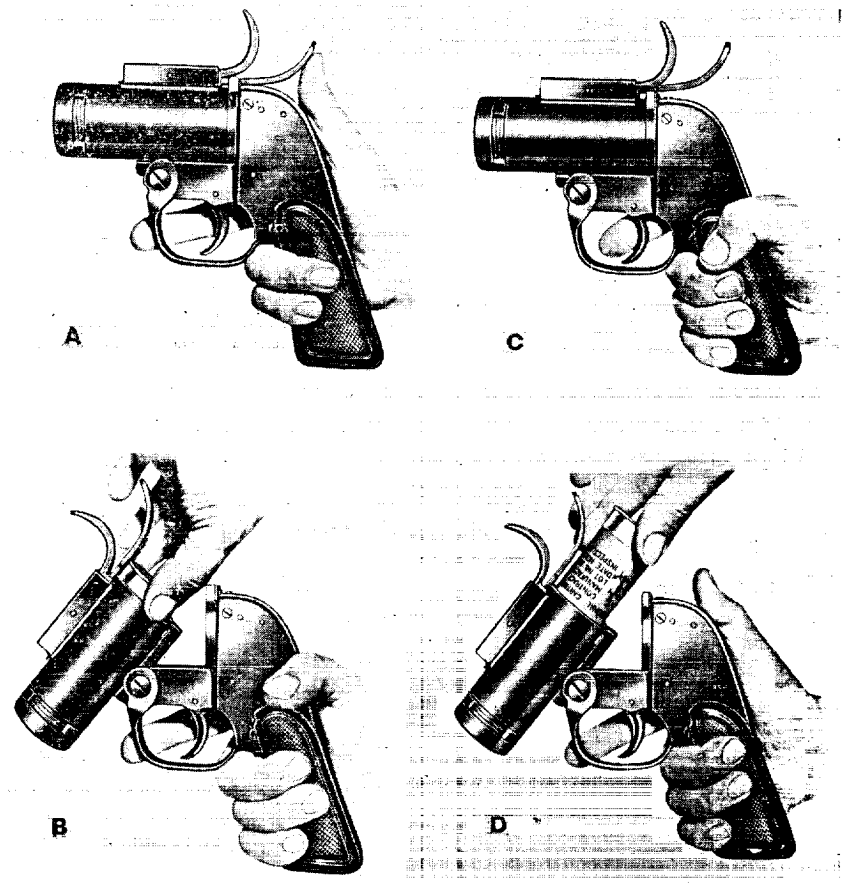


Figure 38.—Pistol, Pyrotechnic, AN–M8: Tripping Breech Lock (A), Loading (B), Firing (C), and Extracting (D)

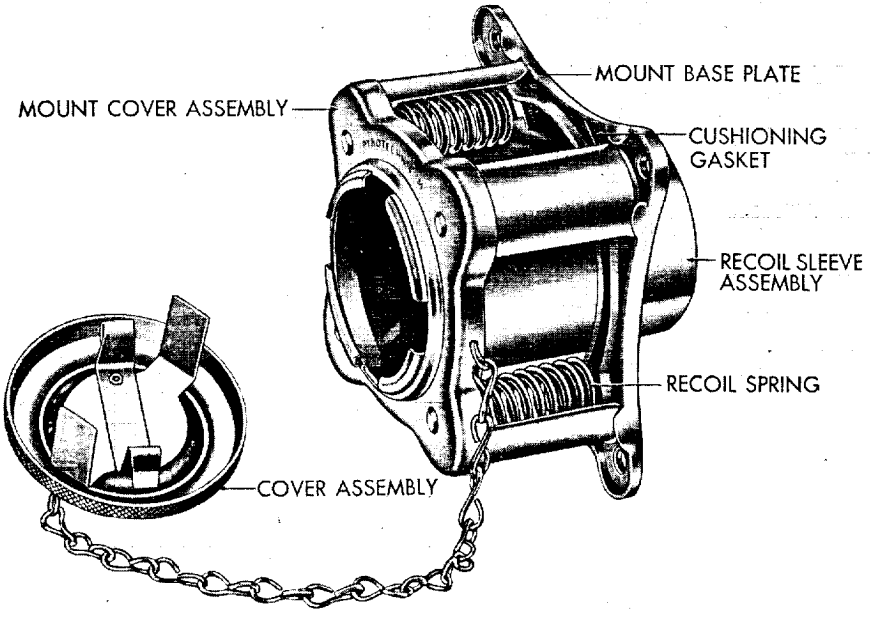


Figure 39—Mount M1 for Pistol, Pyrotechnic, AN–M8

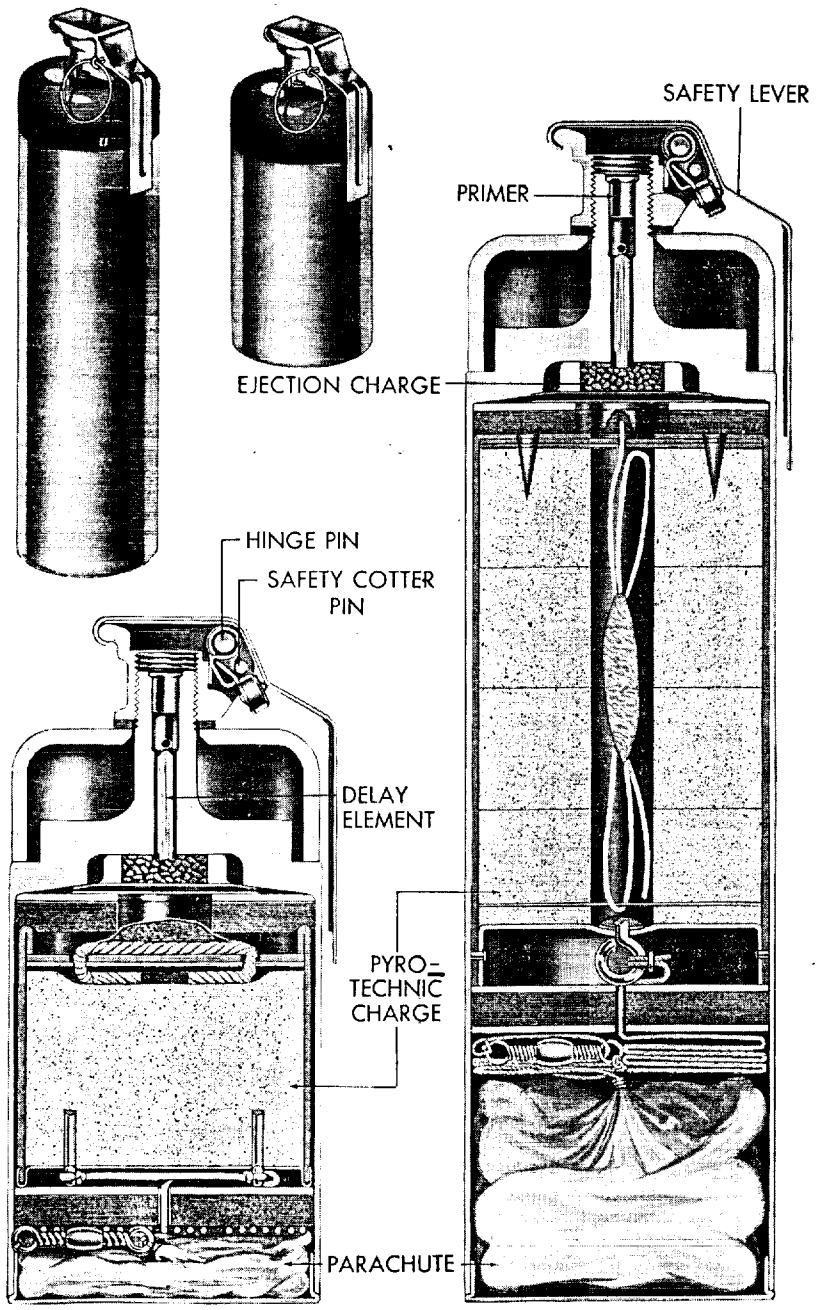


Figure 40—Aircraft Emergency Identification Signals Mk 6 and Mk 7

Pyrotechnic, AN–M8 (Fig. 39) attaches the pistol to the aircraft so that it may be fired through an opening in the fuselage. The pistol can be detached from the mount and fired while held in the hand.

Pistol, Pyrotechnic, AN–M8 is a breech-loading double-action signal pistol. The barrel, hinged to the frame, is held in firing position by the breech lock. The plastic grips, back plate, and cover plate fasten to the aluminum frame and act as a housing for the firing mechanism.

For detailed description and disassembly instructions, refer to TM 9–290 or TM 9–1290.

Safety Precautions — Pyrotechnic pistols should never be used for firing shotgun cartridges or any ammunition except that prescribed for use in them.

When loading and firing any pyrotechnic pistol, care should be taken never to point it toward other personnel or vessels.

Recoil of the pistol will be encountered when firing signal cartridges or aircraft signals, particularly with rocket signals. Therefore, to absorb the recoil shock when fired by hand, the pistol should be held with the elbow slightly bent.

Care, Cleaning, and Lubrication—Pistol, Pyrotechnic, AN–M48 must be kept in serviceable condition at all times. After each firing, it should be cleaned thoroughly and all principal parts wiped with a cloth impregnated with a light machine oil. When assembled, the exposed parts should be wiped with a dry cloth. To remove the powder residue, the barrel should be swabbed with a cloth dampened with acetone or other approved solvent.

Aircraft Emergency Identification Signals Mk 6 and Mk 7

Aircraft Emergency Identification Signals Mk 6 and Mk 7 are launched by hand as a method of identification for aircraft and surface vessels. (Fig. 40.) They produce colored stars for use at night, and colored smokes for use in daylight.

The signals are contained in aluminum cylinders about 2½ inches in diameter. Signal (Star) Mk 6 is about six inches long and weighs 1⅜ pounds; Signal (Smoke) Mk 7 is about 10 inches long and weighs 2½ pounds.

The grenade firing mechanism used to fire the signal is screwed to one end; the other end is closed by a metal cap.

In the aluminum case are an ejection charge, a pyrotechnic candle, and a parachute. The parachutes are of silk, rayon, or paper. Signals Mk 6 and Mk 7 are essentially the same, except for their length and the composition of the pyrotechnic candle.

The cylindrical surface of the signal is marked to indicate the type and color of the signal. The closing cap of the star signal is embossed to permit identification in the dark. The red star signal has a dot in the center of the cap; the white star signal has a short straight line in place of the dot; and the green star signal has a wide V in place of the dot. All three signals have an arc of a circle, one inch long, embossed near the edge of the cap. The closing cap of the smoke signal is not embossed, but is painted the approximate color of the smoke that will be produced.

Operation—When the signal has been launched, the release lever is forced off by the striker, which is at all times under tension of the striker actuating spring. The striker rotates about the hinge pin and the striker point impinges on the primer. The primer ignites the delay element, which burns for nearly three seconds and then ignites the ejection charge.

The gases generated from the burning of the ejection charge push out the closing cap, the parachute, and the pyrotechnic candle, and, at the same time, ignite the starting mixture. The parachute opens and suspends the signal, which burns for about 25 seconds. The stars can be seen about eight to ten miles. The color of the smoke signals can be distinguished at a distance of about 5,000 to 6,000 yards.

Aircraft emergency identification signals are launched by hand from an aircraft in flight. The operator grasps the signal firmly in one hand, being sure that the release lever is held against the body of the signal. With the other

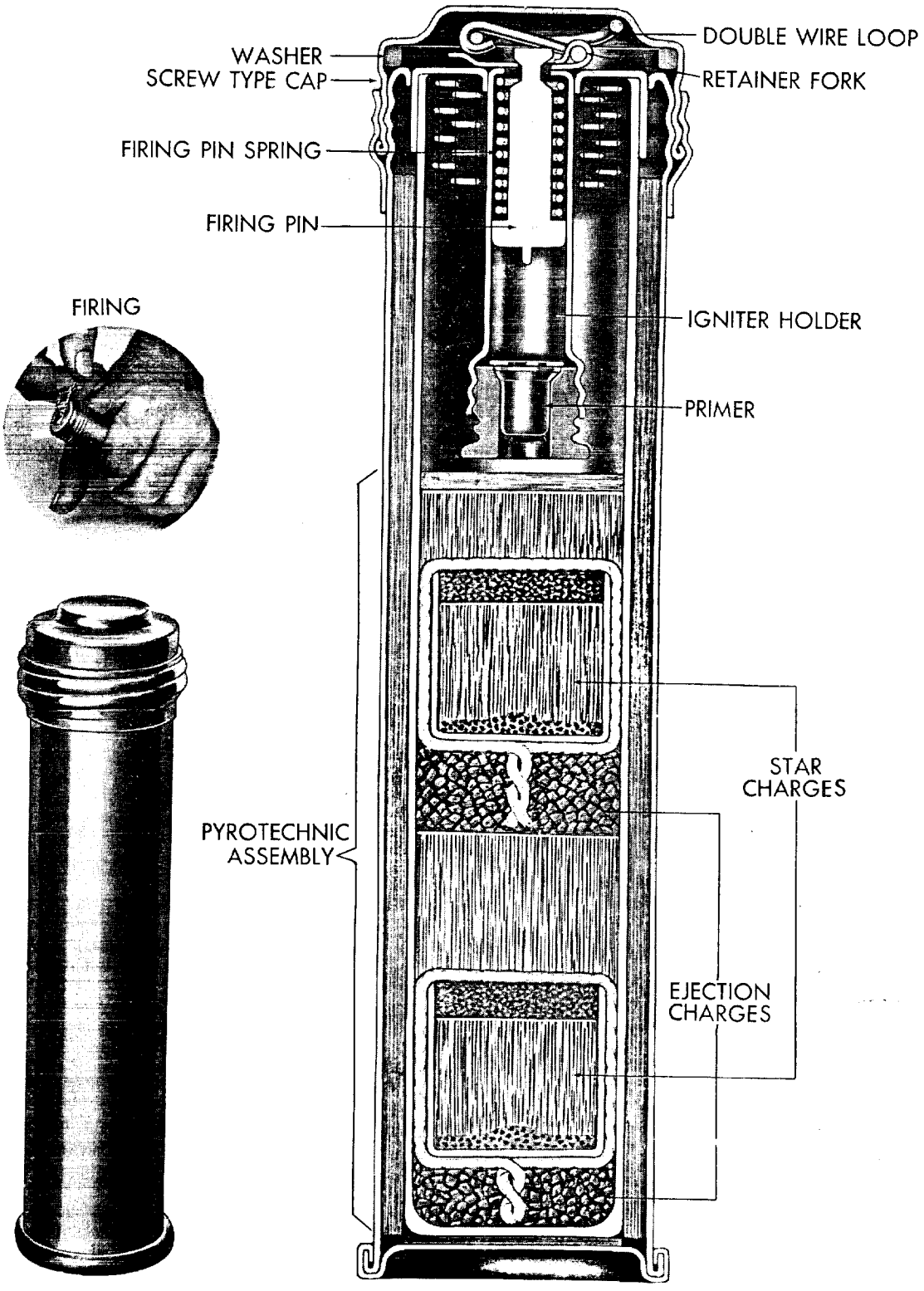


Figure 41—Signal, Distress, Two-Star, Red, M75 (T49) and AN–M75

hand, the safety ring (attached to the safety cotter pin) is pulled. The safety cotter pin may also be removed by catching the safety ring on a stationary hook located within the airplane. After removal of the safety cotter pin, the signal is launched by throwing it overboard.

Safety Precautions.—In addition to the general safety precautions outlined in Chapter 2, the following special precautions should be observed:

After removing the safety cotter pin, the release lever can move away from the body of the signal and release the striker. Only a small movement of the release lever is required to free the striker. Therefore, it is extremely important to hold the release lever securely against the case of the signal until the signal is launched.

Do not remove the safety cotter pin from the firing mechanism unless the signal is held properly (as described above), and is ready for launching.

Do not replace the safety cotter pin after it has been removed.

Do not release the grip on the release lever while the safety cotter pin is removed, or until the signal is launched.

Do not examine the signal while it is in the plane, except for identification.

Do not remove the firing mechanism.

Packing.—Each signal is packed in a lightweight, moisture-proof container of the mailing tube type. Twelve of these containers are packed in an unlined, wooden box.

Storage—Aircraft emergency identification signals should be stowed in a dry, well-ventilated location out of the direct rays of the sun. The temperature in the storage space should not be allowed to exceed 100 degrees Fahrenheit.

Signal, Distress, Two-Star, Red, M75 (T49) and AN-M75

Signal, Distress, Two-Star, Red, M75, and AN–M75 (formerly designated Signal, Distress, Two-Star, Red, T49) is a night distress signal for use by aircraft personnel when forced down over water. (Fig. 41).

It is a hand-held signal that may be carried in pockets of life vests, flight suits, or life rafts. The signal case has a length of five inches, a diameter of 1⅛ inches, and a weight of 5½ ounces. This signal is relatively new to the Naval Service and will not be placed on pyrotechnic allowance lists until adequate supplies are available, and until reports from the Fleet indicate the quantities desired.

Operation—Remove the screw-type cap and hold the signal in one hand with the igniter end pointed upward. Before attempting to fire the signal, unfold and fully extend the double wire loops attached to the notched retainer fork. A twist of the assembly or a sharp pull at right angles to the case releases the spring-loaded fir-

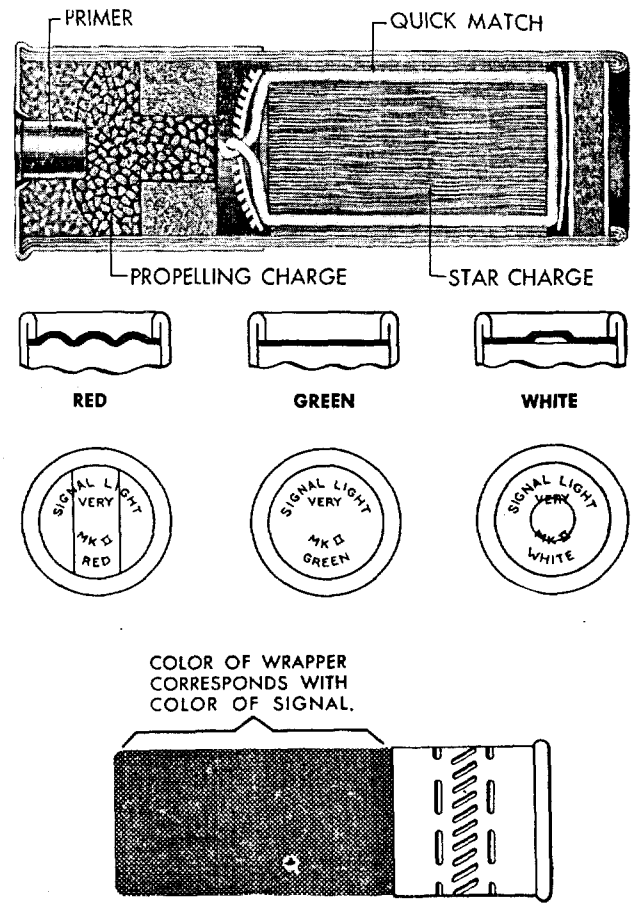


Figure 42—Very Signal Lights Mk II

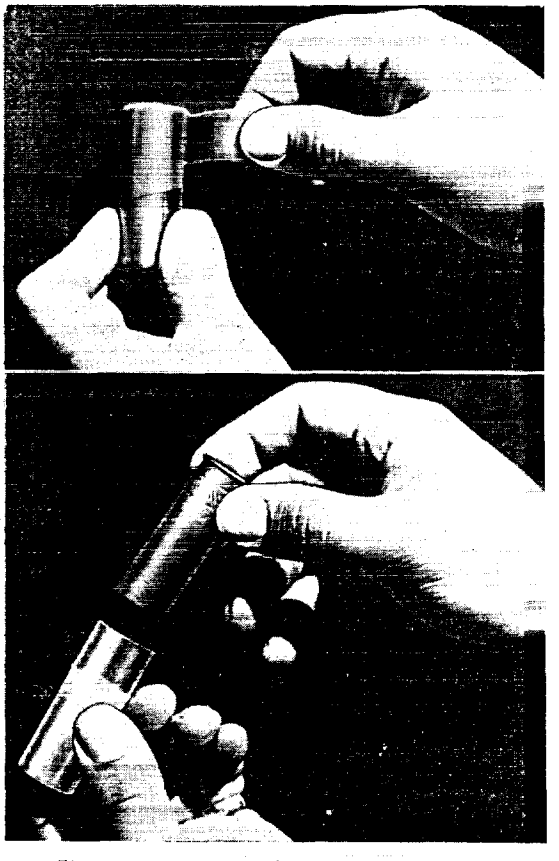


Figure 43—Plastic Case for Very Signal Light Mark II

ing pin activating the signal. After a delay of two to four seconds, the first star is ejected to a height of about 125 feet. Following a further delay of from two to four seconds, the second star is ejected to the same height. The burning time of the star is from four to six seconds at a minimum intensity of 8,000 candlepower.

Safety Precautions—In addition to the general safety precautions outlined in Chapter 2, the following special precautions should be observed:

Signals should not be handled roughly.

The ignition end of the signal should be aimed upward, to leeward, and away from the body and face. Do not look into the top of the signal.

When the release fork is disengaged from the striker, the primer is ignited and this throws the igniter holder about 10 feet away from the signal.

Packing—These signals are obtained in two types of packings. Originally they were individually enclosed in moisture-proof bags, and ten signals were packed in a sealed cardboard carton. Ten such containers were packed in a shipping carton. A newer packing consists of five signals in a metal can, and 16 of these cans to a wooden box.

Storage—Distress signals should be stored in a cool, dry place, the temperature of which will never exceed 100 degrees Fahrenheit.

Very Signal Light Mk II

Very Signal Lights Mk II (commonly known as Very signal cartridges) are used primarily as distress signals (Fig. 42). They resemble 10-gauge shotgun shells, and are designed to be fired from a Very Signal Pistol Mk 3 or Mk 5, or a Hand Projector Mk 3 or Mk 4.

Twelve of these signals, four of each color, with a Hand Projector Mk 3 or Mk 4, make up the Pyrotechnic Signal Kit placed with the emergency equipment for life floats and floater nets on surface vessels. The collapsible rubber life rafts carried by aircraft have a similar kit with six red signals. Each cartridge in these kits is enclosed in a plastic tube (Fig. 43). The kit of six signals is distributed by the Bureau of Aeronautics.

The empty shell and the primer case are of commercial grades used in the manufacture of 10-gage shotgun shells. The star charge is a cylinder of pyrotechnic material reinforced with wire and wrapped with quick match. The star is separated from the propelling charge by a hard felt wad to protect it from the violence of the explosion. The propellant consists of about 25 grains (1⅔ grams) of black powder.

Very Signal Light Mk II has a diameter of ⅞ inch, a length of 2⅜ inches, and a weight of 1⅛ ounces. These lights are supplied in three colors—red, white, and green. Each color has a maximum visibility of about one mile. The paper wrapping is the same color as the light produced by the star. For identification by

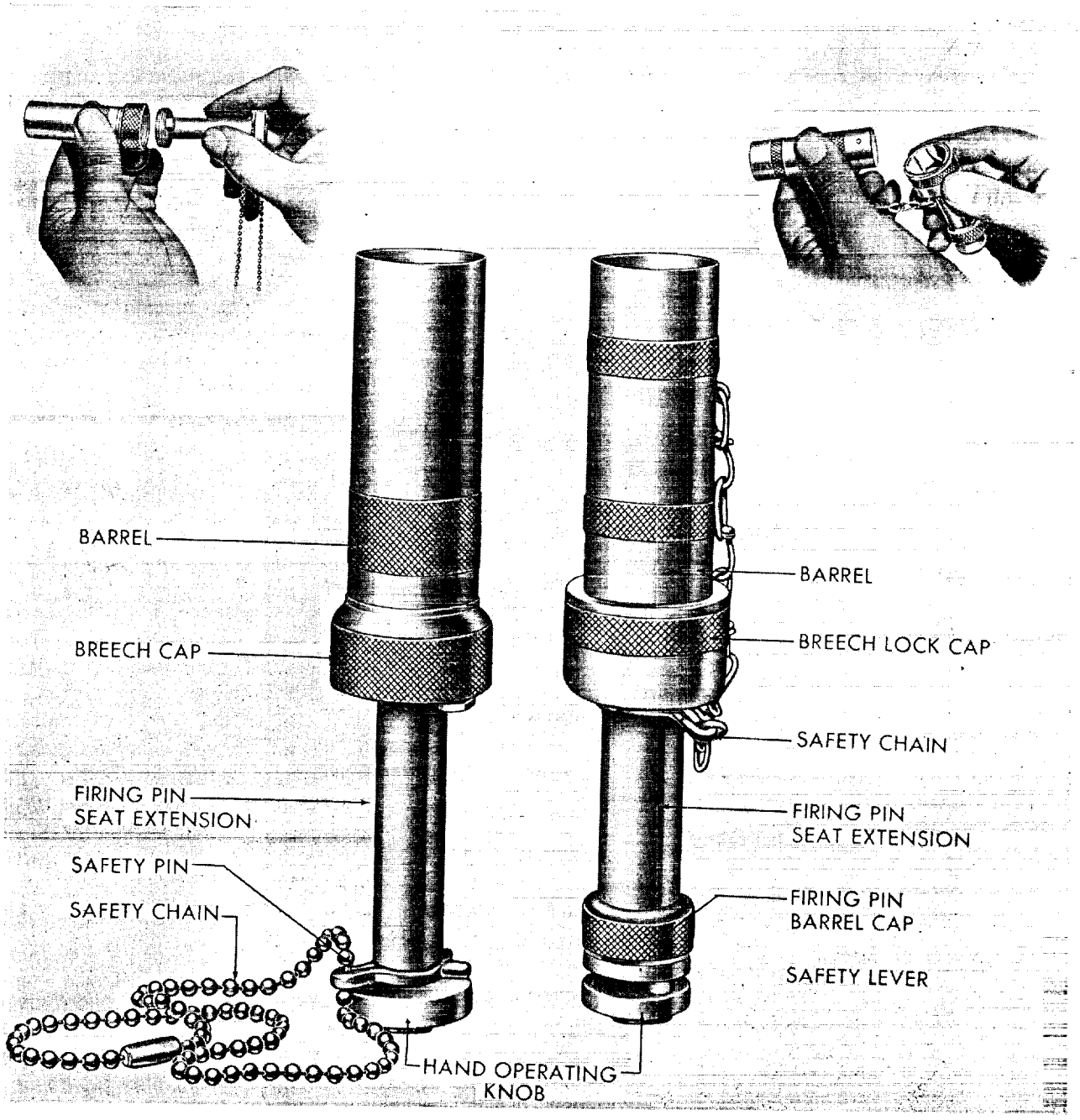


Figure 44—Hand Projectors Mk 3 (left) and Mk 4 (right)

touch in the dark, the closing wad of each cartridge is shaped as noted below:

Red Star (burns for seven seconds; produces red light of 300 candlepower) : The closing wad is corrugated.

White Star (burns for six seconds; produces white light of 250 candlepower) : The closing wad has a small cone in the center.

Green Star (burns for five seconds; produces green light of 600 candlepower) : The closing wad is smooth.

Operation—When the primer is struck by the

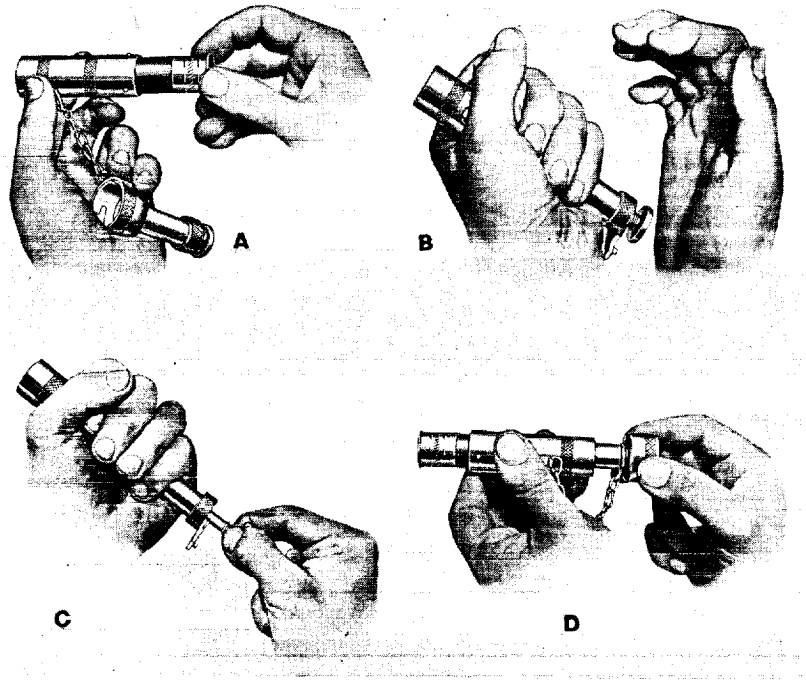


Figure 45—Loading the Hand Projector: Loading (A), Firing (B), Alternate Method of Firing (C); Ejecting Shell (D)

firing pin it explodes, igniting the black powder charge. The explosion of the black powder drives the star charge out the muzzle of the pistol (or the projector) and, at the same time, ignites the quick match, which, in turn, ignites the star charge. The star ignites as it leaves the barrel, and burns as it rises to a height of about 200 feet.

Safety Precautions—Observe the general safety precautions outlined in Chapter 2.

Packing—Very signal lights were packed ten per waxed carton, 25 cartons per waxed cardboard container, and four containers (1,000 rounds) per metal-lined box.

Recent production is packed ten rounds per hermetically-sealed metal can, and 100 cans per wooden box. Considerable stocks of Very signal lights in the old packing are being repackaged in metal cans.

Storage—Very signal lights should be stowed in a dry, well-ventilated location out of the direct rays of the sun. The temperature in the magazine should not exceed 100 degrees Fahrenheit.

Hand Projectors Mk 3 and Mk 4

Hand projectors for use with Very signal lights are described in detail in other ordnance publications; however, as they are relatively new, the following brief description is given:

Hand Projector Mk 3 (Fig. 44) consists of a barrel about three inches in length closed at one end by a breech plug. The firing pin and firing pin housing extend back along the axis of the barrel and are attached to the breech plug.

A handle on the end of the firing pin, and a safety cotter pin between the handle and firing pin housing, keep the firing pin from resting against the primer of the cartridge. The assembled projector has a diameter of about 1¼ inches and a length of 5½ inches.

Hand Projector Mk 4 is similar to the Mk 3, except that the Mk 4 has a bayonet connection between the breech plug and the barrel instead of a threaded connection.

Operation—To load the projector, remove the breech plug from the barrel, insert a cartridge in the barrel, and replace the breech plug. (Fig. 45). The projector is put in firing

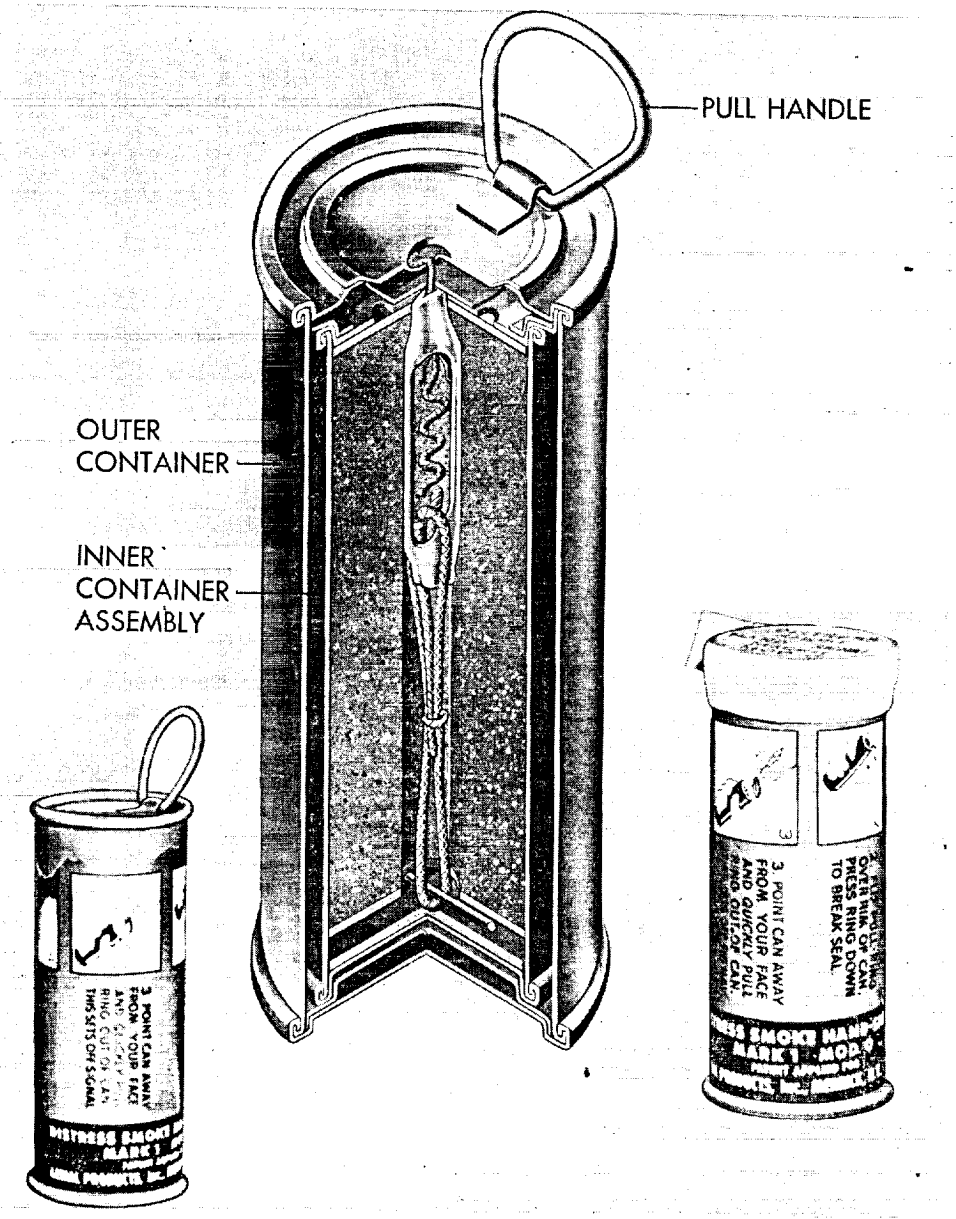


Figure 46—Distress Smoke Hand Signal Mk 1 Mod 0, and Signal, Distress, Smoke, Hand, AN–Mk 1 Mod 1

condition by disengaging the safety cotter pin or lever from the firing pin. The signal is fired by holding the barrel in one hand and pulling back on the firing pin handle with the other hand. When the handle is released, the spring in the firing pin housing drives the firing pin against the primer of the cartridge. The signal may also be fired by striking the handle of the projector against the palm of the hand or any substantial object.

Safety Precautions—Hand projectors should never be used for firing shotgun cartridges or any ammunition except that prescribed for use in them.

When loading and firing any hand projector, care should be taken never to point it in the direction of other personnel or vessels.

If the projector has been exposed to salt water it should be broken down and cleaned, as salt crystals may have jammed the firing pin.

Packing—Hand projectors are packed in the Abandon Ship Kits or in the life raft kits issued by the Bureau of Aeronautics.

Storage—Hand projectors may be put into storage when not in use.

Distress Smoke Hand Signal Mk 1 Mod 0 and Signal, Distress, Smoke, Hand, AN–Mk 1 Mod 1

Distress Smoke Hand Signal Mk 1 Mod 0 is similar in purpose to the Grenade, Smoke, White (H.C.), AN–M8, which it is gradually replacing in life-raft kits (Fig. 46). Distress Smoke Hand Signal Mk 1 Mod 0 has been modified by minor changes in materials and has been standardized jointly by the Army and Navy as the Signal, Distress, Smoke, Hand, AN–Mk 1 Mod 1.

The improvements consist of a modified design of pull wire resulting in a signal less subject to accidental ignition when dropped. A brass pull wire replaces the steel pull wire originally used.

These signals are relatively new to the Naval Service and will not be placed on Pyrotechnic Allowance Lists until adequate supplies are available, and until reports from the field indicate the quantities desired.

The signal has a diameter of 1⅝ inches and a length of 3⅞ inches; it weighs six ounces.

These signals contain a pyrotechnic mixture which, when ignited, produces orange smoke for a period of about 18 seconds. One end of the signal is closed by a soldered cap. A pull-ring for insertion of the index finger secured to the soldered cap, is used to fire the signal.

Operation—The signal can be held in the hand during the burning period. It is ignited as follows:

1. Tear off the sealing tape from around the end of the cylinder, and remove the paper cap.

2. Point the cylinder away from face and give a quick pull on the pull-ring, which will come away from the can. A friction igniter attached to the inner side of the soldered cap causes ignition of the smoke mixture, resulting in the immediate emission of smoke.

Safety Precautions—In addition to the general safety precautions outlined in Chapter 2, the following special precautions should be observed:

Signals should not be handled roughly. To prevent the possibility of hot drippings or discharge falling on the hand, the signal should be held to leeward at arm's length at an angle of about 30 degrees upward from the horizontal.

Packing—One Hundred Distress Smoke Hand Signals Mk 1 Type are packed in a wooden shipping case. Corrugated dividers segregate the signals within the packing case.

Stowage—Distress smoke hand signals should be stowed in a cool dry place, the temperature of which will never exceed 100 degrees Fahrenheit. These signals may be stowed with other types of pyrotechnic ammunition. The signal is water-tight, and is not affected by moisture.

Signal (Distress, Day and Night) Mk 13 Mod 0

The Signal Mk 13 Mod 0 is a combination distress signal for use under day or night distress conditions. (Fig. 47). Because of its small size it can be carried conveniently in pockets of life vests, flight suits, or life rafts. It is particularly

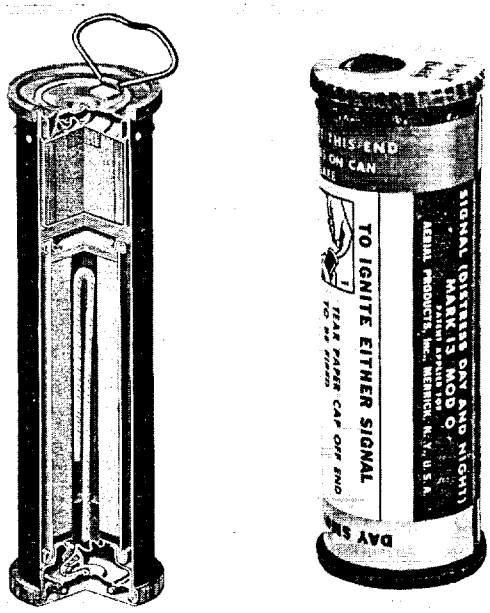


Figure 47—Signal (Distress, Day and Night) Mk 13 Mod 0

adapted for use by aircraft pilots downed at sea.

This signal is similar in appearance and operation to the Signal, Distress, Smoke, Hand, AN–Mk 1 Mod 1. Whereas the Signal AN–Mk 1 Mod 1 is for use only under daytime distress conditions, the Signal Mk 13 Mod 0 contains the same orange smoke canister in addition to a pyrotechnic flare pellet for use at night.

The signal consists of a metal cylindrical outer case 5⅛ inches long and 1⅝ inches in diameter. The signal weighs 6½ ounces.

Both ends of the metal tube are closed by a soldered cap to which is attached a pull ring for insertion of the index finger. Upon removal of the soldered closing cap, a brass wire attached to the bottom is pulled through a small cup coated with a friction igniting composition. This action results in igniting the pyrotechnic flare or the smoke composition, depending on which pull ring is removed. Smoke emission time is approximately 18 seconds; flare burning time is 18 to 20 seconds. Average intensity of the burning flare is 3,000 candlepower. The soldered caps on both ends of the signal are covered with a paper cap to prevent accidental ignition. These paper caps should be removed before actual use, so that the pull ring will be readily accessible when desired.

Each section of the signal is waterproofed and insulated against transfer of heat from one section to the other.

Operation—The signal body carries an illustrated decalcomania which shows in detail the method of operation. The flare end of the tube (for night use) can be identified by a series of embossed projections extending around the case approximately ¼-inch below the closure.

The following steps should be followed in the operation of this signal:

1. Having determined which end of the signal it is desired to use (smoke for day, flare for night) remove the paper cap which is glued to the signal body. (Ordinarily this cap should be removed before the time of actual use.)

2. Point the signal away from the face, and give a quick pull on the pull ring, which will come away from the can, thereby igniting the composition.

Note: If unable to remove the soldered cap in this manner, bring the pull ring down over the rim of the can and twist, using the ring as a lever to break the seal.

3. Hold the signal at arm's length at an angle of about 30 degrees upward, to the leeward, to prevent hot drippings or discharge from falling on the hand.

After one end has been used, the signal should immediately be doused in the water in order to cool the metal parts. The signal should then be retained for use of the opposite end if required.

Safety Precautions—In addition to the general safety precautions outlined in Chapter 2, the following special precautions should be observed:

Signals should not be handled roughly.

To prevent the possibility of hot drippings or discharge falling on the hand, the signal should be held to leeward at arm's length at an angle of about 30 degrees upward from the horizontal.

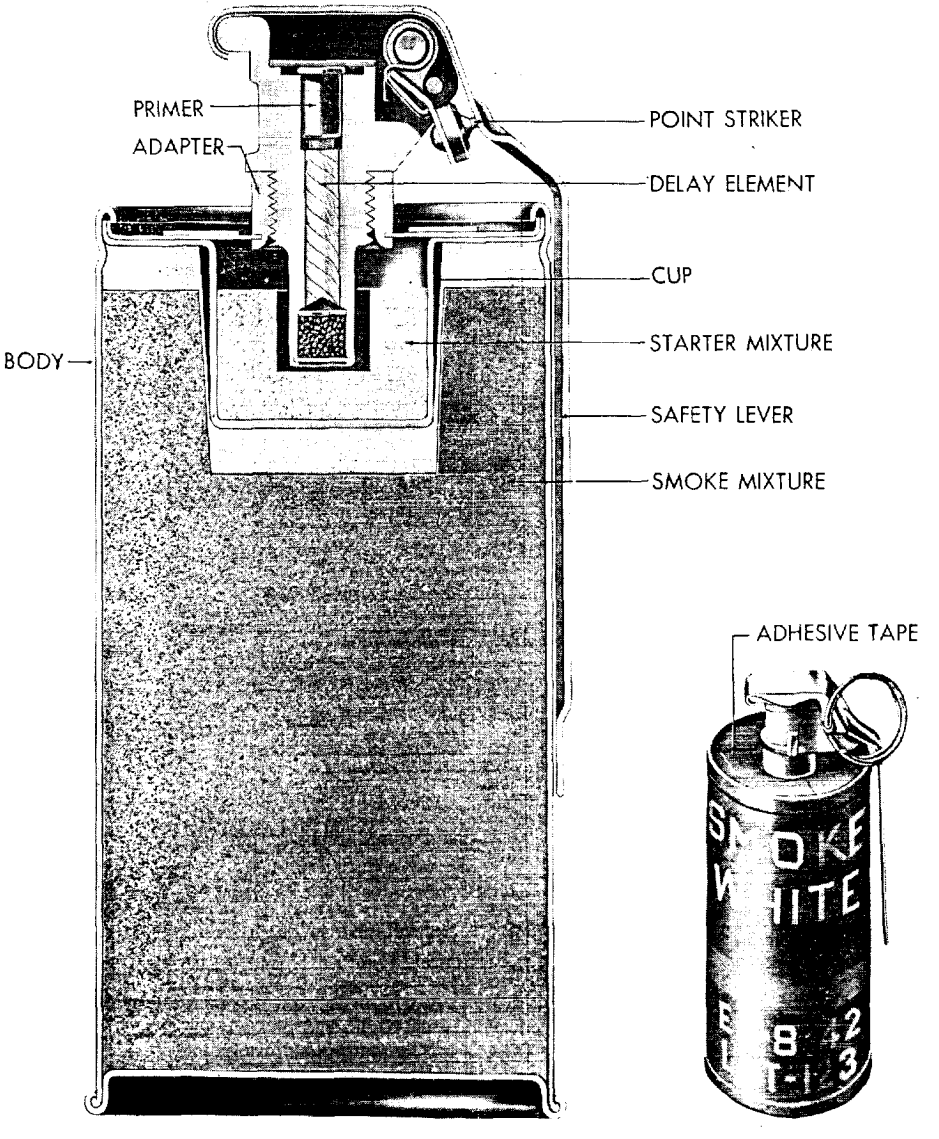


Figure 48—Grenade, Smoke, Hand, White, (H.C.), AN–M8

Never attempt to ignite both ends of the signal at the same time.

If possible, after using one end, the signal should immediately be doused in water before using the other end.

Packing—These signals are shipped in wooden boxes containing 100 signals. The weight of the box containing the 100 signals is approximately 70 pounds. A metal can to carry twelve signals suitable for stowage on life boats, floater nets etc., may also be made available later.

Stowage—The Signal Mk 13 Mod 0 should be stowed in a cool, dry place, in accordance with standard pyrotechnic stowage rules.

Grenade, Smoke, White (H.C.), AN-M8

This grenade was originally furnished to attract attention to aviation personnel after a forced landing. (Fig. 48). In view of the development of the distress Signals Mk 1 and Mk 13, the AN–M8 Grenade should no longer be carried for that purpose unless the newer signals are not available.

The grenade generates a dense white cloud of smoke for a period of about three minutes after ignition.

The signal is a metal cylinder, having a diameter of approximately 2½ inches, a length of 5¾ inches, and a weight of 1⅝ pounds.

A grenade-firing mechanism is attached to one end. The grenade is painted gray and marked in yellow with one band, the letters HC above the work SMOKE.

The cylindrical portion of the grenade is nearly full of a solid smoke-producing mixture. A circular zinc cup, located in a depression in the top of the smoke-producing mixture, contains a starting mixture.

The grenade-firing mechanism, mounted above the starting mixture, is made up primarily of a delay element, a primer, a striker, and a release handle.

There are four ¼-inch holes in the top of the cylinder through which the smoke escapes. These holes are covered by adhesive tape until the grenade is prepared for firing.

The signal may be clamped on the end of a handle (provided by the Bureau of Aeronautics and carried as a part of the plane's equipment), or, if no handle is available, it may be set on or thrown to the ground.

Two of these grenades are included in collapsible rubber life raft equipment. A clamp is furnished for fastening the grenade to an oar or handle.

Operation—The operator grasps the signal in one hand, being sure that the release lever is held against the body of the signal. With the other hand, the safety ring (attached to the safety cotter pin) is pulled. After removal of the safety cotter pin, the grenade should be extended on the end of the handle, or set on, or thrown to the ground.

When the release lever is freed by the operator, it is forced off by the striker, which is under the tension of the striker actuating spring. The striker rotates about the hinge pin and fires the primer. The primer ignites a delay element which burns for approximately three seconds and then ignites the starting mixture.

The starting mixture burns through the zinc cup and starts a chemical reaction in the smoke mixture, generating considerable heat with the formation of zinc chloride.

The zinc chloride (a gray-white smoke composed of finely divided solid particles) escapes into the air. The zinc chloride particles readily absorb moisture and become highly obscuring liquid particles. The grenade burns about 3½ minutes at full volume.

Safety Precautions—In addition to the general safety precautions outlined in Chapter 2, the following special precautions should be observed:

After removing the safety cotter pin, the release lever can move away from the body of the signal. Only a small movement of the release lever is required to release the striker. Therefore, it is extremely important to hold the

release lever securely against the case of the signal until the signal is launched.

While burning, the signal should be held to leeward. If thrown, the grenade should be thrown with a full arm swing as prescribed for hand genades. If fire is to be avoided, it should not be thrown or placed within five feet of dry grass or other inflammable material.

Personnel should remain at least five feet away from a burning grenade. The smoke is normally harmless in concentrations encountered in the open. It burns with vigor and throws out hot particles.

Do not remove the safety cotter pin of the firing mechanism unless the signal is held properly (as described above) and is ready for launching.

Do not replace the safety cotter pin after it has been removed, unless the area is clear of personnel, planes, and buildings.

Do not grip on the release lever while the safety cotter pin is removed, or until the signal is launched.

Do not remove the firing mechanism.

Do not use the grenade in confined spaces without wearing gas masks or rescue breathing apparatus.

Do not attempt disassembly of these signals.

Packing—These grenades are individually packed in moisture-resistant fiber containers, 25 to a wooden box.

Storage—Smoke Grenades should be stowed in a dry, well-ventilated location, away from the direct rays of the sun. The temperature in the locker, or magazine, should not be allowed to exceed 100 degrees Fahrenheit.

Aboard ship they should be stowed topside. At ammunition depots they should be stowed with other H.C. munitions.

Signal, Aircraft, Red Star, Parachute, M11

This aircraft parachute signal is used as a distress signal from grounded planes. (Fig. 49). It is visible from the air at distances up

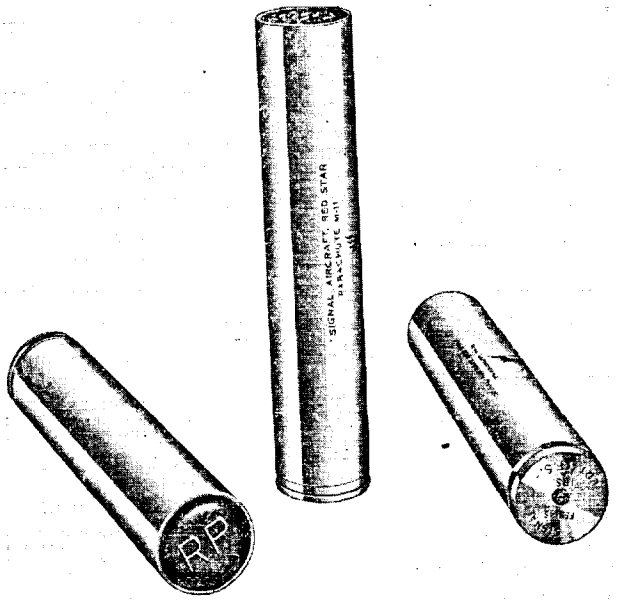


Figure 49—Signal, Red Star, Aircraft, Parachute, M11

to seven to eight miles under average atmospheric conditions. The head of the aluminum case in which it is assembled has a groove which is engaged by the extractor of the pistol or projector. The letters RP are embossed on the metal closing wad in the other end of the case. When the signal functions, the case acts as the barrel of a gun. The outer case contains a primer, a propelling charge, and an inner case. The inner case contains a delay fuze, an expelling charge, a pyrotechnic candle, and a parachute. The case has a diameter of 1½ inches, a length of 7⅝ inches, and a weight of 9½ ounces.

Except for length, the outer case is similar in appearance to the Signal, Aircraft, AN–M31. (Fig. 35).

The signal may be fired in the Pyrotechnic Pistol AN–M8, the Pyrotechnic Pistol M2, which is obsolescent, or the Hand Pyrotechnic Discharger M9. This signal cannot be fired from the Molin type pyrotechnic dischargers, which are obsolete.

Operation—Functioning of the explosive train occurs in the following steps:

The primer explodes on impact of the firing

pin and ignites the propelling charge, which, in turn, ignites the delay fuze and propels the inner case outward.

The delay fuze burns about 2½ seconds, and then ignites the expelling charge.

The expelling charge ignites the pyrotechnic candle, and expels it and the parachute from the inner case.

The candle burns for about 30 seconds with a red light of approximately 20,000 candlepower. The burning candle is supported by the parachute and falls at an average rate of six feet per second. The candle begins to burn at a height of about 225 feet above the ground.

Safety Precautions—Observe the general safety precautions outlined in Chaptr 2.

Packing—These signals are packed 12 in a cardboard carton, five cartons in a wooden box. The cartons and boxes are marked with identifying information.

Stowage—These signals are stowed aboard aircraft in a rack or belt mounted in any convenient location where the direct rays of the sun will not fall on them.

Aircraft parachute signals should be stowed in a dry, well-ventilated location out of the direct rays of the sun. The temperature in the magazine should not exceed 100 degrees Fahrenheit.

Chapter 10

PRACTICE BOMB SIGNALS

Miniature Practice Bomb, Signal, Mk 4 and Mods

This signal is designed to be used in all miniature practice bombs. (Fig. 50). Its purpose is to indicate the point of impact of the bomb by the creation of a flash and a puff of white smoke. This enables an immediate estimate of accuracy to be made.

The Signal Mk 4 Mods 0, 1 and 2 are 10-gage paper shotgun shells of extra length. They have a diameter of 7/8 inch, a length of 5¾ inches, and a weight of two ounces. They contain an expelling charge of black powder and are primed with a commercial primer. The pyrotechnic charge is separated from the expelling charge by a paper disk and a 10-gage gun wad. The end of the shells are closed by felt wads secured by crimping the end of the shells.

The Signal Mk 4 Mod 0 has been used by the Fleet for several years and therefore is a familiar item. The Mk 4 Mods 1 and 2 were procured for issue to activities limited by environment to performing practice bombing in the vicinity of inflamable areas. These signals contain inert materials which produce very little flash and a smoke puff markedly inferior to that of the Mod 0 signal.

The Signal Mk 4 Mod 3 is similar to the Signal Mk 4 Mod 0 but differs in that (a) the cartridge case is extruded aluminum in place of paper, (b) a primer mixture with improved storage characteristics has been used and, (c) a new pyrotechnic load which produces about the same flash but a superior smoke puff has been incorporated. These signals are expected to be available late in 1947.

Signals Mk 4 can be used in any of the following miniature practice bombs:

Bomb Designation	Weight (lb.)	Alloy Used in Bomb
AN–Mk 5 and Mods	3	Zinc, lead, antimony
Mk 19*	13	Lead, antimony (with steel sleeve)
Mk 19 Mod 1	13	Lead, antimony
Mk 23 (Stamped AN–Mk 23) and AN–Mk 23 Mod 1	3	Cast Iron
Mk 43 (Stamped AN–Mk 43) and AN–Mk 43 Mod 1	4.5	Lead, antimony

*Do not use Miniature Practice Bomb Mk 19 Mod 0 against armored target boats.

These signals, when installed in any of the above miniature practice bombs, do not consistently produce a visible signal on impact with water or soft earth when dropped from altitudes of 10,000 feet or higher; this is probably because the bomb when dropped from that height enters the water or earth so quickly that the signal has not had time to function.

The bomb signal should be inspected prior to loading, to see that it is in good condition, dry, and not swelled or deformed. The primer should be flush with (or slightly below) the base of the signal cartridge. Signals not complying with the above should be discarded.

Operation—Place the signal in position in the bomb. Reject the signal if it does not slide into place by its own weight, without the use of force. Place the firing pin assembly into the nose of the bomb with a firing pin toward the signal. The firing pin assembly should slide into place without the use of any force. It should only be necessary to adjust the position

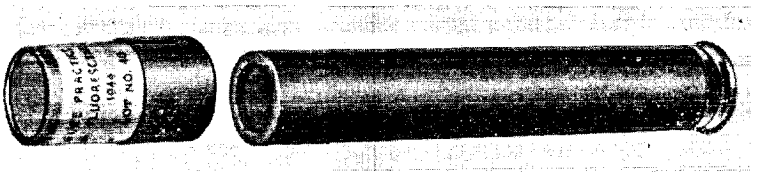


Figure 50—Signal, Miniature Practice Bomb, AN–Mk 4 and Signal, Miniature Practice Bomb, (Fluorescein) AN–Mk 5

of the mechanism in the bomb so that the cotter pins can be inserted. When the signal is in place, no pressure or force should be applied to the firing mechanism. After inserting into the bomb, spread the cotter pins slightly in all practice bombs except the Mk 19 and Mods.

The firing pin assembly of the Practice Bomb Mk 19 Mod 0 and Mk19 Mod 1 is held in place by a different method. A plain pin takes the place of the two cotter pins to keep the firing pin assembly from falling out. It is necessary to peen a slight amount of the lead alloy around the end of the pin, or place a small piece of adhesive tape (about 1½ inches square) over both ends of the pin. **Do not bend the pin to retain it in place.**

When the practice bomb strikes the water or earth, the firing pin in the nose of the bomb is forced against the primer of the signal. The primer ignites the expelling charge, which forces the pyrotechnic charge out through the opening in the tail of the bomb and, at the same time, ignites it. A reddish flash and a puff of white smoke are produced.

Safety Precautions—Observe the general safety precautions outlined in Chapter 2.

Packing—Fifty of these signals are packed in a cardboard carton, and 25 cartons are packed in a wooden shipping box.

Storage—Miniature practice bomb signals should be stowed in a dry, well-ventilated location out of the direct rays of the sun, at a temperature not exceeding 100° Fahrenheit.

Miniature Practice Bomb, Fluorescein, Signal Mk 5

This signal, for use in dive bombing practice, can be used in any miniature practice bomb in which the Miniature Practice Bomb, Signal Mk 4 can be used. (Fig. 50). It is dropped only on water targets during daylight. When a wind is blowing, the smoke from the Miniature Practice Bomb, Signal Mk 4 often blows away before the pilot can get into position to view the results of his attack.

The signal, approximately the diameter of a ten-gage shotgun shell, has a diameter of ⅞-inch, a length of 1¾ inches, and a weight of ½ ounce. A shoulder, which increases the diameter of one end, serves to locate the signal in the bomb.

It is composed of a plastic cylinder containing 10 grams of fluorescein dye. This dye is a highly-soluble salt of sodium, brick red in color, becoming bright green when dissolved in water. The slick can be seen from an altitude of 15,000 feet.

Operation—The bomb is prepared for use by removing the cotter pin and the firing pin assembly. Then, insert the signal with the small end of the signal toward the tail of the bomb. Secure the signal in the bomb by replacing the cotter pin. Spread the ends of the cotter pin. If practicable, retain the discarded firing pin assemblies as spares, or return them to the nearest supply point.

The bombs are dropped in the same manner as normally. Upon impact, water enters the nose of the bomb, breaks the weak ends of the plastic container, and forces the dye out the tail end of the bomb.

Safety Precautions — Observe the general safety precautions outlined in Chapter 2.

Packing—Two hundred of these signals are packed in a cardboard carton, and five cartons are packed in a wooden shipping box.

Storage—Miniature practice bomb signals should be stowed in a dry, well-ventilated location out of the direct rays of the sun.

Practice Bomb Signal Mk 6 Mod 0

Practice Bomb Signal Mk 6 Mod 0 is designed for use with the 500-pound Practice Bomb Mk 65 Mod 0 and the 1,000-pound Practice Bomb Mk 66 Mod 0. (Fig. 51). These bombs, constructed of $\frac{1}{16}$-inch sheet steel, have dimensions identical to AN Standard General Purpose Bombs.

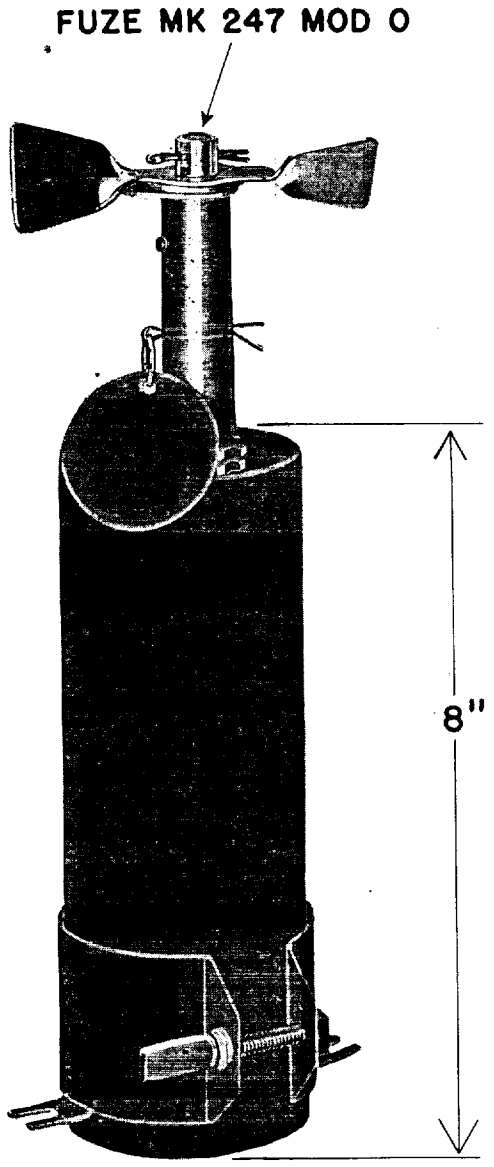


Figure 51—Practice Bomb Signal Mk 6 Mod 0

These bombs are safe for all types of service usage, including catapult take-offs and arrested landings when assembled with Practice Bomb Signal Mk 6 Mod 0.

The Practice Bomb Signal Mk 6 Type contains about two pounds of black powder and is used with the above bombs primarily as a spotting charge in practice maneuvers. The signal is attached to the tail assembly of the bomb, with the forward end of the signal seated in an indentation in after end of the bomb body.

Practice Bomb Signal Mk 6 Mod 0 has a diameter of three inches, a length of 11 inches, and a weight of $3\frac{3}{4}$ pounds.

The forward section of the signal is a sheet steel cylindrical container having a diameter of about $2\frac{7}{8}$ inches and a length of eight inches, filled with black powder. When the signal is completely assembled, a chamber in the after end of the container contains a caliber .38 blank cartridge. The cartridge is secured in the chamber by the firing pin container, or assembly. The firing pin container is about three inches long and contains a jump-out type arming pin. The firing pin is motivated by the impact of the bomb with the ground or water. When available, the Fuze Mark 247 should be used in place of the firing device described above.

Assembly of the Signal—After loading the bomb with water or sand, the bomb is placed on its side and the tail fin assembly slipped over the after end of the bomb body. Before the fin assembly is attached to the bomb body, the signal strap must be assembled to the fin sleeve. This is accomplished by squeezing the ends together, thus permitting the slots to be slipped under the rivets on the fin sleeve. The signal strap should then be bolted to the fin assembly with the nut, bolt, and lock washer provided. Depending on the type of suspension, the holes in the fin assembly should be aligned so that the tail fins will clear the aircraft's structure when the bomb is installed. Install and tighten the fin assembly attachment bolts, making sure that the lock washers are in place.

Slide the cylindrical section of the Practice Bomb Signal Mk 6 Mod 0 through the signal strap with the cartridge chamber aft. The

cartridge chamber is off center, and the cylinder must be rotated so that the cartridge chamber is in line with the suspension lug. Press the cylinder firmly in place so that the forward ends seat securely into the indentation in the bomb body. Insert the bolt in the strap, and tighten the bolt until the cylinder is securely held in place.

Adjust the firing pin container until it is in the correct position to permit a straight pull for the arming wire, and then lock the container in position by tightening the lock nuts.

Installation of the Arming Wire—To install the arming wire, the jump-out pin spring should be compressed until the second hole in the jump-out pin appears. Then, a standard single arming wire Mk 1 should be threaded through the after suspension lug, inserted in the second hole in the jump-out pin, and extended two to three inches beyond. The cotter pin should be removed after the bomb is in place on the aircraft. If the bomb is to be installed in a bomb bay, no safety (Fahnestock) clip is required on the arming wire. For external suspension, one safety clip may be installed on the arming wire.

Operation—Upon release of the bomb from the aircraft, the arming wire is withdrawn from the jump-out arming pin, and the firing pin is then held back from the blank caliber .38 cartridge only by the anti-creep spring. Upon impact of the bomb, the firing pin overcomes the force of this spring, and is driven against the primer of the blank caliber .38 cartridge, which, in turn, ignites the black powder charge. A visible flash and puff of smoke are produced by the black powder charge.

If it is necessary to disassemble the complete round into its components, the instructions for installing the Practice Bomb Signal Mk 6 Mod 0 should be carried out in reverse order, and the components restored to the original condition and packings.

Caution: Before the arming wire is removed, the cotter pin must be installed.

The fin assembly attachment bolts must be tight, and the lock washers installed under the bolt heads.

The firing pin container must be positioned so that it is in line with the suspension lugs and the arming wire has a straight pull through the jump-out pin.

Safety Precautions—In addition to the general safety precautions outlined in Chapter 2, the following special precautions should be observed:

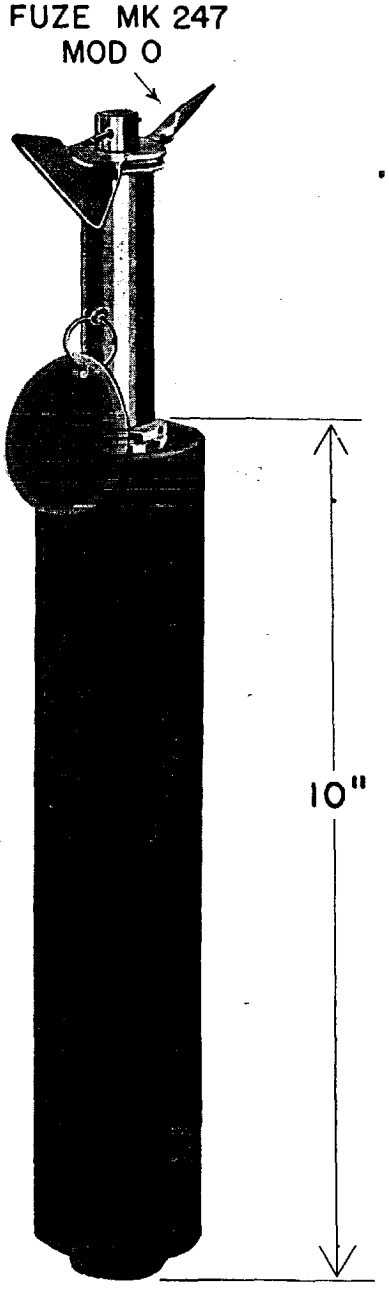


Figure 52—Practice Bomb Signal Mk 7 Mod 0

The cotter pin must not be removed from the jump-out pin in the practice signal until the arming wire is in place. On disassembly of the complete round, the cotter pin must be installed before the arming pin is removed.

Packing—Each Practice Bomb Signal Mk 6 Mod 0 is packed in a corrugated chip board box. Eight signals are shipped in a wooden box.

Storage—Practice bomb signals should be stowed in a dry, well-ventilated location out of the direct rays of the sun.

Practice Bomb Signal Mk 7 Mod 0

The Practice Bomb Signal Mk 7 Mod 0 (Fig. 52) is designed for use with the 100-pound Practice Bomb Mk 15 Mod 3. These bombs are safe for all types of service use (including catapult take-offs and arrested landings) when assembled with Practice Bomb Signals Mk 7 Mod 0 incorporating the Fuze Mk 247 Mod 0.

The Practice Bomb Signal Mk 7 Mod 0 contains about one pound of black powder and is used with the Practice Bomb Mk 15 Mod 3 primarily as a spotting charge. The signal is attached to the tail assembly of the bomb with the signal seated in an opening in the after end of the bomb body.

The Practice Bomb Signal Mk 7 Mod 0 is similar in construction and operation to the Mk 6 Mod 0, but has a body diameter of 2 inches and a length of approximately 14 inches when assembled with its fuze. The body of the signal is a sheet-steel cylindrical container having a diameter of 2 inches and a length of 10 inches, filled with black powder. When the signal is completely assembled, a chamber in the after end of the body contains a caliber .38 blank cartridge. The cartridge is secured in the chamber by a Fuze Mk 247 Mod 0. The Fuze Mk 247 Mod 0 (Fig. 53) is about 4½ inches long and contains a firing pin armed by rotation of a

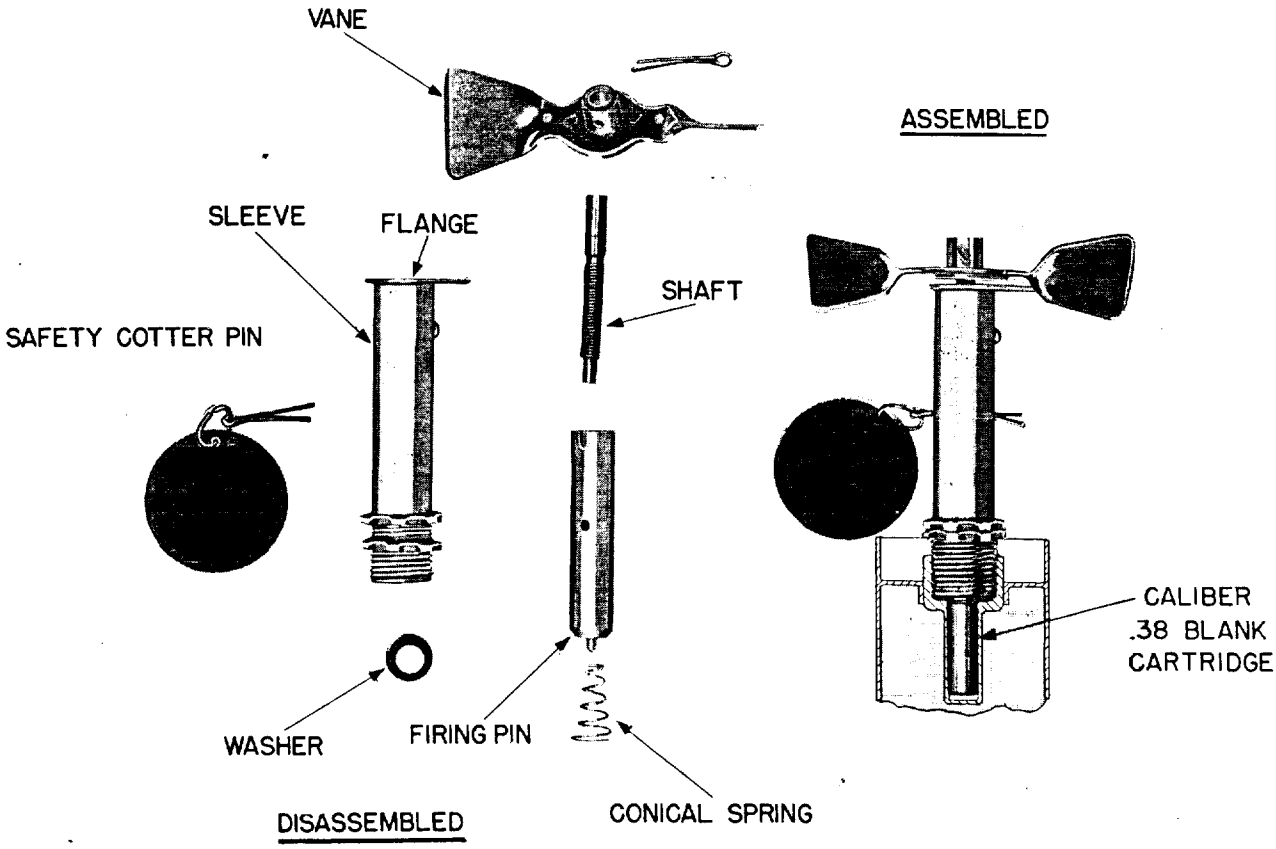


Figure 53—Fuze Mk 247 Mod 0

vane and motivated by impact of the bomb with ground or water. This fuze supersedes the jump-out pin fuze used with the Practice Bomb Signal Mk 6 Mod 0 and may be issued to replace that assembly. It is safer than the jump-out pin fuze because it requires air travel in addition to withdrawal of the arming wire for arming.

Assembly of the Signal—Depending upon the type of suspension, the suspension bands of the Practice Bomb Mk 15 Mod 3 should be aligned so that the tail fins will clear the aircraft's structure when the bomb is installed. This should be done before the signal is installed, as the fuze must be aligned with the suspension lugs. Preparatory to installing the Practice Bomb Signal Mk 7 Mod 0, remove the thumb nuts, lockwashers, and C-plate from the two studs beside the opening in the after end of the bomb.

Unpack the Practice Bomb Signal Mk 7 Mod 0. Install the arming vane (loose in the carton) on the fuze shaft and secure it with the cotter pin provided. Disassemble the fuze from the signal. Insert the caliber .38 blank cartridge provided into the cartridge chamber. Screw the Fuze Mk 247 Mod 0 into the signal and secure it with the two lock nuts. Insert the signal into the opening in the after end of the bomb until it seats firmly, then adjust it until the arming wire hole in the fuze flange is in line with the bomb suspension lugs. Place the C-plate around the fuze and over the signal in the bomb by taking up on the thumb nuts until they are finger tight.

If it is necessary to disassemble the complete round into its components, the instructions for installing the signal should be carried out in reverse order, and the components restored to the original condition and packings. **Caution:** Before the arming wire is removed, the safety cotter pin must be installed in the fuze.

Installation of the Arming Wire—Thread a standard single Arming Wire Mk 1 through the after suspension lug, and insert it through the hole in the fuze flange and one of the holes in the vane until it extends 2 to 3 inches beyond. Install one safety (Fahnestock) clip on the arming wire. The safety cotter pin should be left in place until after the bomb (with arming wire installed) is in place in the aircraft; the safety cotter pin must then be removed to permit the fuze to function when the bomb is dropped.

Operation—Upon release of the bomb from the aircraft, the arming wire is withdrawn from the fuze and the arming vane is free to be rotated by the air stream. This rotation screws the arming shaft out of the firing pin and allows the arming vane and shaft to fall off. The firing pin is then held back from the caliber .38 blank cartridge only by a conical spring. The arming distance is from 65 to 240 feet of air travel, depending upon the individual fuze and launching conditions. Upon impact of the bomb, the firing pin overcomes the force of the spring and is driven against the primer of the caliber .38 blank cartridge, which, in turn, ignites the black powder charge. A visible flash and light grey smoke are produced by the black powder charge.

Safety Precautions—In addition to the safety precautions outlined in Chapter 2, the following special precautions should be observed:

The safety cotter pin must not be removed from the fuze until after the arming wire is in place. On disassembly of the complete round, the safety cotter pin must be installed before the arming wire is removed.

Packing—Each Practice Bomb Signal Mk 7 Mod 0 is packed in a corrugated cardboard carton, assembled with a Fuze Mk 247 Mod 0. The 20-mm Ammunition Box Mk 3 Mod 1 will accomodate 12 cartons. The vane of the Fuze Mk 247 Mod 0 is not attached when shipped, but is placed beside the fuze in the carton. The cotter pin for securing the arming vane to the fuze and a caliber .38 blank cartridge are provided in an envelope in the carton.

Storage—Practice Bomb Signals Mk 7 Mod 0 should be stowed in a dry, well ventilated location out of the direct rays of the sun.

APPENDIX

SPECIAL SAFETY PRECAUTIONS

In addition to the general safety precautions outlined in Chapter 2 (Handling and Stowage), the following special precautions should be observed in connection with the items listed:

Aircraft Parachute Flares Mk 4, Mk 8, and Mods

These flares should not be released from bomb bays, because the parachute is pulled out of the flare case by the static line and may foul the airplane structure.

Aircraft Parachute Flare Mk 8 Mod 0 should not be launched at a speed in excess of 150 knots.

Aircraft Parachute Flare Mk 5 and Mods

Aircraft Parachute Flares Mk 5 Mod 0 to Mk 5 Mod 7 must not be released from bomb bays.

The flare case of Aircraft Parachute Flare Mk 5 Mod 8 falls as a missile hazard.

Aircraft Parachute Flare Mk 11 Mod 0

This flare should not be launched from bomb bays.

Flares, Aircraft, Parachute, M26 and AN–M26

Aircraft parachute flares should not be launched manually except in case of emergency. Parachutes of flares launched manually may become fouled on the tail surfaces of the airplane.

Make sure that the flare is stowed securely in the airplane, as ignition of a flare stowed loose in the cockpit of an airplane, particularly if it is catapulted, may cause a serious accident.

Flare, Aircraft, Parachute, M26 should not be released at a speed in excess of 130 knots.

Flare, Aircraft, Parachute, AN–M26 should not be released at a speed in excess of 240 knots.

Aircraft Flare Container Mk 1 Mod 0

The operating mechanism of the container should be kept clean. No oil or grease should be used anywhere on the container except on the safety rod.

Attach the flare firing lanyards to the after end of the container with respect to the airplane, and use the cocking lever "safety" to prevent accidental releases on the ground. Correctly loaded flares are a fire hazard, since they are always "armed."

Before the airplane takes off, the cocking lever must be put in the "operating" or latched position, because this cannot be done while the airplane is in flight.

When the flare container is cocked, hands or fingers should be kept out of the operating mechanism made visible by removal of the inspection covers at top of the container.

Electrical connections should be checked by conducting the test described above.

When removing flares from the container, the ripcord may become fouled in the container and ignite the flare. Therefore, before Flares Mk6 and Mk 10 Types are removed from the flare container, the container should be detached from the aircraft and taken to a clear area. Flares are removed from the container by reversing the steps outlined for their installation.

High Altitude Parachute Flare

A suitable barrier should be erected to shield the firing personnel.

The mortar should be fastened securely to the deck before being fired.

In case the flare misfires or hangs fire, it is necessary to wait at least three minutes before approaching the mortar.

Misfires are sometimes caused by a defective primer or a weak impact of the primer on the firing pin. The weak impact may be caused by sluggishness in the fall of the flare down the barrel. To correct this, the barrel should be unscrewed from the base and cleaned by swabbing it with a cloth dipped in acetone or other approved solvent. Misfires are also caused by chips of the copper base cups from previous rounds which remain in the bottom of the barrel and prevent the next round from striking the firing pin in the normal way.

After each operation, the mortar must be disassembled with the tools furnished for that purpose, and cleaned.

Aircraft Parachute Flare 1½-Minute and 3 Minute

Test the circuit before installing a flare in the bracket.

Do not attempt to test the circuit while the flare is in the bracket.

Do not attempt to pass any current through the flare igniter, because this will discharge with a current of less than one ampere.

Do not attempt to solder at the flare terminals. Soldered terminals should be used on the ends of the wire.

Over friendly territory, do not release the 3-minute flare at an altitude of less than 1,750 feet, or the 1½-minute flare at an altitude of less than 850 feet, because there is danger of starting a fire on the ground, since the flare will still be ignited when it reaches the ground.

These flares should be removed from an aircraft in which installed before the aircraft is placed in the hangar for servicing or stowage.

Bombs, Photoflash, M46 and AN-M46

These bombs are loaded with a pyrotechnic composition which is easily ignited by sparks or friction. When ignited, these bombs explode with extreme violence and intense heat. Therefore, they must be handled with the same care as black powder, and with even greater care than ordinary pyrotechnic materials and conventional bombs.

The bomb cases should not be hammered or cut.

Do not attempt to disassemble a photoflash bomb, as it is extremely dangerous.

No work should be done on these bombs except unpacking, fuzing, and installing them on aircraft.

Because of the brilliance of the flash produced by this bomb, it is detrimental to the vision to watch the explosion of photoflash bombs.

Modified Bomb, Photoflash, M46 and AN-M46

No modifications to the trail plate of the photoflash bomb should be attempted without first removing the trail plate from the bomb body.

Machining or welding operations on the tails must be carried out at a safe distance away from the bomb bodies to prevent damage to the bodies and the consequent danger of detonation.

Fuzes, Flare, Mechanical Time, M111, M111A1 and M111A2, and Fuze, Bomb, Mechanical Time, M146

Extreme care should be exercised in selecting targets in friendly territory when tactics require the use of bombs or flares equipped with this fuze, since the fuze body is crushed by impact.

Demolition or disposal of flares or bombs equipped with this fuze should be carried out only by experts trained in this type of work.

All partially armed fuzes should be carefully disposed of as soon as possible by dumping, burning, or exploding. See page 7.

Safety blocks will be missing from fuzes which are armed. An armed fuze should not

be handled by personnel other than those specially trained in disposal work.

No attempt should be made to disassemble these fuzes. Fuzes which have become damaged, corroded, or otherwise unserviceable should be disposed of as soon as possible. See page 7.

When Bombs, Photoflash, M46 and AN–M46 and Flares, Aircraft, Parachute, M26 and AN–M26 are used in carrier-based operations, Fuze, Bomb, Mechanical Time M146 must be used for safety reasons. Fuzes, Flare, Mechanical Time, M111, M111A1, and M111A2 must not be used for shipboard operations, because they are not detonator safe. Fuzes M111, M111A1, and M111A2 may be used in land-based operations if no Fuzes, Bomb, Mechanical Time, M146 are available.

Bomb (Target Identification, Smoke) Mk 72 Mod 1

This bomb must never be stood on its parachute end.

Depth Charge Marker, Day, Mk 1 and Mods

After removing the safety cotter pin, the release lever can move away from the body of the marker and release the striker; therefore, it is extremely important to hold the release lever securely against the body of the marker until the marker is launched. Only a small movement of the reverse lever is required to free the striker.

Do not remove the safety cotter pin from the firing mechanism unless the marker is held properly (as described above) and is ready for launching.

Do not replace the safety cotter pin after it has been removed.

After the safety cotter pin is removed, do not release the grip on the release lever until the signal is launched.

Do not remove the firing mechanism from the marker under any circumstances.

Depth Charge Marker, Night, Mk 2

Do not stow depth charge markers in a compartment equipped with sprinklers, because the markers are ignited by chemical reactions between water and the chemicals within the marker.

Do not handle the marker or remove it from its container by grasping the tear strip pull-ring.

The tear strips must not be removed until just prior to use.

Periodic inspections should be made to insure that one or both tear strips have not been accidentally removed, and that no leaks exist in the seams.

Markers in which the water-tight integrity has been broken may evolve acetylene and phosphine, gradually and without ignition. This gas may collect in enclosed places to produce hazardous concentration that can explode if ignited.

Signals, Drift, Night, AN–Mk 4 and Mods and AN-Mk 5 and Mods

Drift signals should be stowed in pyrotechnic lockers above decks, because burning of the pyrotechnic mixture in drift signals creates large quantities of smoke, making fighting of such fires difficult.

Aircraft Float Light Mk 6 and Mods

Do not remove the square pieces of adhesive tape from the wooden body before launching the float light.

The float light must be launched immediately after the igniter has been actuated.

Pistol, Pyrotechnic, AN-M8

Pyrotechnic pistols should never be used for firing shotgun cartridges or any ammunition except that prescribed for use in them.

When loading and firing any pyrotechnic pistol, care should be taken never to point it toward other personnel or vessels.

Recoil of the pistol will be encountered when firing signal cartridges or aircraft signals, particularly with rocket signals. Therefore, to absorb the recoil shock when fired by hand,

the pistol should be held with the elbow slightly bent.

Aircraft Emergency Identification Signals Mk 6 and Mk 7

After removing the safety cotter pin, the release lever can move away from the body of the signal and release the striker. Only a small movement of the release lever is required to free the striker. Therefore, it is extremely important to hold the release lever securely against the case of the signal until the signal is launched.

Do not remove the safety cotter pin from the firing mechanism unless the signal is held properly (as described above) and is ready for launching.

Do not replace the safety cotter pin after it has been removed.

Do not release the grip on the release lever while the safety cotter pin is removed, or until the signal is launched.

Do not examine the signal while it is in the plane, except for identification.

Do not remove the firing mechanism.

Signal, Distress, Two-Star, Red M75 (T49) and AN-M75

Signals should not be handled roughly.

The ignition end of the signal should be aimed upward, to leward, and away from the body and face. Do not look into the top of the signal.

When the release fork is disengaged from the striker, the primer is ignited and this throws the igniter holder about 10 feet away from the signal.

Hand Projector Mk 3 and Mk 4

Hand projectors should never be used for firing shotgun cartridges or any ammunition except that prescribed for use in them.

When loading and firing any hand projector, care should be taken never to point it in the direction of other personnel or vessels.

If the projector has been exposed to salt water, it should be broken down and cleaned, as salt crystals may have jammed the firing pin.

Distress Smoke Hand Signal Mk 1 Mod 0 and Signal, Distress, Smoke, Hand, AN–Mk 1 Mod 1

Signals should not be handled roughly.

To prevent the possibility of hot drippings or discharge falling on the hand, the signal should be held to leeward at arm's length at an angle of about 30 degrees upward from the horizontal.

Signal, (Distress, Day and Night) Mk 13 Mod 0

In addition to the special precautions outlined above for distress smoke hand signals, observe also the following:

Never attempt to ignite both ends of the signal at the same time.

If possible, after using one end, the signal should immediately be doused in water before using the other end.

Grenade, White Smoke, (H.C.), AN-M8

After removing the safety cotter pin, the release lever can move away from the body of the signal. Only a small movement of the release lever is required to release the striker. Therefore, it is extremely important to hold the release lever securely against the case of the signal until the signal is launched.

While burning, the signal should be held to leeward. If thrown, the grenade should be thrown with a full arm swing as prescribed for hand grenades. If fire is to be avoided, it should not be thrown or placed within five feet of dry grass or other inflammable material.

Personnel should remain at least five feet away from a burning grenade. The smoke is normally harmless, in concentrations encountered in the open. It burns with vigor and throws out hot particles.

Do not remove the safety cotter pin of the firing mechanism unless the signal is held properly (as described above) and is ready for launching.

Do not replace the safety cotter pin after it has been removed, unless the area is clear of personnel, planes, and buildings.

Do not grip on the release lever while the safety cotter pin is removed, or until the signal is launched.

Do not remove the firing mechanism.

Do not use the grenade in confined spaces without wearing gas masks or rescue breathing apparatus.

Do not attempt disassembly of these signals.

Practice Bomb Signal Mk 6 Mod 0 and Mk 7 Mod 0

The cotter pin must not be removed from the jump-out pin in the practice signal until the arming wire is in place. On disassembly of the complete round, the cotter pin must be installed before the arming wire is removed.

TECHNICAL DATA

Pyrotechnic Item	Effect	Approximate Burning Time	Approximate Delay Before Ignition	Approximate Dimensions (inches)	Approximate Weight
Aircraft Parachute Flares:	illumination				
Mk 4 and Mods	300,000 cp	3 min.	none	27⅜x4¾ dia.	18 lb.
Mk 5 and Mods	600,000 cp	3 min.	variable	27x4¾ dia.	18 lb.
Mk 11 Mod 0	1,000,000 cp	3 min.	variable	35¾x5⅜ dia.	30 lb.
Mk 8 Mods 0 and 1	500,000 cp	3 min.	90 sec.	25⅛x4¾ dia.	18 lb.
Mk 8 Mod 2	500,000 cp	3 min.	120 sec.	25⅛x4¾ dia.	18 lb.
Mk 10 Mod 0	750,000 cp	4½ min.	variable	35¾x5⅜ dia.	30 lb.
Mk 6 and Mods	1,000,000 cp	3 min.	selective	35¾x5⅜ dia.	30 lb.
M26 and AN–M26	800,000 cp	3 min.	variable	50 (fuzed) x8½ dia.	53 lb.
High Altitude	85,000 cp	1 min.	5 sec.	10¾x2½ dia.	4 lb.
1½ minute	110,000 cp	1½ min.	1½ sec.	18¾x2 7/16 dia.	4¼ lb.
3 minute	200,000 cp	3 min.	1½ sec.	28x4½ dia.	22 lb.
Float Flares (Aircraft):	illumination				
Mk 17 Mod 0	1,000,000 cp	4½ min.	1 min.	60¾x9½ dia.	88 lb.
Mk 17 Mod 1	1,000,000 cp	4½ min.	5½ min.	60¾x9½ dia.	88 lb.
Bombs, Photoflash M46 and AN–M46	illumination 500,000,000 cp	⅕ sec.	variable	48⅝ (fuzed) x8 dia.	52 lb.
Fuzes, Flare, Mechanical Time, M111, M111A1, and M111A2	variable delay	—	—	4 3/16x1¾ (3 at vane)	1 lb.
Fuze, Bomb, Mechanical Time, M146	variable delay	—	—	5⅝x1⅞ dia. (3 at vane)	1¼ lb.
Target Identification Smoke Bomb Mk 72 Mod 1	orange smoke	5 min.	8 sec.	36x8¾ dia.	45 lb.
Depth Charge Markers:					
Day, Mk 1 and Mods	slick	—	15 sec.	11⅞x3½ dia.	3½ lb.
Night, Mk 2	flame	55 min.	80 sec.	7x5 dia.	2½ lb.
Cartridge, Slick Marker, AN–Mk 1 Mod 0	slick	—	11 sec.	3⅔x1½ dia.	4 oz.
Signals, Drift, Night					
AN–Mk 4 and Mods	flame, smoke	3½ min.	11 sec.	13x3 dia. (4¼ at fins)	2 lb.
AN–Mk 5 Mod 1	flame, smoke	12 min.	11 sec.	19x3 dia. (4¼ at fins)	4 lb.
Aircraft Float Light, Mk 6 and Mods	flame, smoke	40 min.	90 sec.	20¼ x5⅛x5⅛	16 lb.
Aircraft Signals (Army):	recognition, communications				
AN–M28 to AN–M33	double stars	7 sec.	none	3x1½ dia.	5 oz.
AN–M37 to AN–M42	double stars	7 sec.	none	3⅞x1½ dia.	6 oz.
AN–M43 to AN–M45	double stars	7 sec.	none	3⅞x1½ dia.	4½ oz.
AN–M53 to AN–M58	tracer, double stars	4 sec.	none	3⅞x1½ dia.	4 oz.
Signal Cartridges:	recognition, communications				
Mk 3 Mod 3	double stars	7 sec.	none	3⅞x1½ dia.	4 oz.
Mk 4	tracer, double stars	5 sec.	none	3⅞x1½ dia.	5 oz.
Very Signal Lights Mk II	star	6 sec.	none	2⅜x⅞ dia.	1⅛ oz.

TECHNICAL DATA (Cont'd)

Pyrotechnic Item	Effect	Approximate Burning Time	Approximate Delay Before Ignition	Approximate Dimensions (inches)	Approximate Weight
Signal, Distress, Two-Star, Red, M75 (T49) and AN–M75	two stars	5 sec. (each star)	3 sec.	5x1 1/8 dia.	5 1/2 oz.
Aircraft Emergency Identification Signals:					
Mk 6	colored star	25 sec.	3 sec.	6x2 1/2 dia.	1 3/8 lb.
Mk 7	colored smoke	25 sec.	3 sec.	10x2 1/2 dia.	2 1/2 lb.
Distress Smoke Hand Signal Mk 1 Mod 0, and Signal, Distress, Smoke, Hand, AN–Mk 1 Mod 1	orange smoke	18 sec.	none	3 7/8 x1 5/8 dia.	6 oz.
Signal (Distress, Day and Night), Mk 13 Mod 0	red flame, orange smoke	18 sec.	none	5 1/8 x1 5/8 dia.	6 1/2 oz.
Grenade Smoke, White (H.C.), AN–M8	white smoke	3 1/2 min.	3 sec.	5 3/4 x2 1/2 dia.	1 5/8 lb.
Signal, Aircraft, Parachute, Red Star, M11	red star	30 sec.	2 1/2 sec.	7 5/8 x1 1/2 dia.	9 1/2 oz.
Signals, Miniature Practice Bomb:					
AN–Mk 4	smoke puff	burst	none	5 3/4 x 7/8 dia.	2 oz.
(Fluorescein) AN–Mk 5	green slick	none	—	1 3/4 x 7/8 dia.	1/2 oz.
Practice Bomb Signals:					
Mk 6 Mod 0	smoke puff	burst	none	11x3 dia.	2 1/2 lb.
Mk 7 Mod 0	smoke puff	burst	none	11x2 dia.	3 3/4 lb.

SHIPPING DATA

Pyrotechnic Item	Number per Shipping Box	Approximate Weight of Box Filled (pounds)	Approximate Dimensions of Box (inches)	Approximate Displacement of Box (cubic feet)
Aircraft Parachute Flares:				
Mk 4 and Mods	6	170	33 1/8 x20 1/2 x14	5.50
Mk 5 and Mods	6	170	33 1/8 x20 1/2 x14	5.50
Mk 6 and Mods	4	176	41 1/4 x15 3/4 x14 1/4	5.75
Mk 8 and Mods	6	161	31 1/8x20 1/2x14	5.15
Mk 10 Mod 0	4	176	41 1/4 x15 3/4 x14 1/4	5.75
Mk 11 Mod 0	4	176	41 1/4 x15 3/4 x14 1/4	5.75
M26 and AN-M26	1	98	50 1/2 x12 3/8 x11 3/4	4.21
High Altitude	25	118	17x15 1/2x12 1/2	2.04
1 1/2 minute	6	41	17 3/8 x11x5 1/2	1.33
3 minute	1	31	35 1/2 x5 1/4 x5 1/4	0.79
Float Flares (Aircraft), Mk 17 and Mods	1	130	59x12 1/2 x12	5.56
Bombs, Photoflash, M46 and AN-M46	1	76	48 7/8 x10 5/8 x9 7/8	2.93
Fuzes, Flare, Mechanical Time, M111, M111A1, and M111A2	50	74	16 7/8 x15 1/4 x11 3/4	1.70
Fuze, Bomb, Mechanical Time, M146	15	47	20 5/8 x12 1/8 x9	1.32
Target Identification Smoke Bomb Mk 72 Mod 1	1			
Depth Charge Markers:				
Day, Mk 1 and Mods	10	68	29 1/2 x12 1/8 x12 1/8	2.82
Night, Mk 2	10	36	21x16 1/8 x8 1/2	1.28
Cartridge, Slick Marker, AN-Mk 1 Mod 0	200	39	22 3/8 x19 1/2 x10 3/4	2.72
Signals, Drift, Night:				
AN-Mk 4 and Mods	25	65	19x16 1/2 x14	2.55
AN-Mk 5 and Mods	25	125	21x20 3/4 x17 1/2	4.42
Aircraft Float Light, Mk 6 and Mods	6	125	21 1/4 x21 1/4 x12 1/2	3.27
Aircraft Signals (Army):				
AN-M28 to AN-M33	144	75 to 79	26 5/8 x12 7/8 x10 7/8	2.1
All Other Signals	144	73 to 98	28 1/8 x13 5/8 x12 5/8	2.8
Signal Cartridges:				
Mk 3 Mod 3	200	88	22 3/8 x19 1/2 x10 3/4	2.72
Mk 4	200	100	22 3/8 x19 1/2 x10 3/4	2.72
Aircraft Emergency Identification Signals:				
Mk 6	12	27	13 5/8 x9 3/4 x7 1/2	0.56
Mk 7	12	36	13 5/8 x9 3/4 x10 7/8	0.84
Signal, Distress, Two-Star, Red, M75 (T49) and AN-M75	100	60	18 3/8 x14 1/2 x9 1/8	1.63
Very Signal Light Mk II	1000	100	24x15 1/4 x12 1/4	2.60
Distress Smoke Hand Signal Mk 1 Mod 0, and Signal, Distress, Smoke, Hand, AN-Mk 1 Mod 1	100	50	21x20x6	1.46
Signal (Distress, Day and Night), Mk 13 Mod 0	100	70	—	—
Grenade, Smoke, White (H.C.), AN M8	25	62	13 3/4 x17 3/4 x8 1/2	1.59

SHIPPING DATA (Cont'd)

Pyrotechnic Item	Number per Shipping Box	Approximate Weight of Box Filled (pounds)	Approximate Dimensions of Box (inches)	Approximate Displacement of Box (cubic feet)
Signal, Aircraft, Parachute, Red Star, M11	60	61	24⅝ x 14¼ x 11¼	2.3
Signals, Miniature Practice Bomb:				
AN–Mk 5	500	59	24⅜ x 13¾ x 10⅞	2.10
(Fluorescein) AN–Mk 5	1000	67	31⅞ x 12¼ x 11½	2.6
Practice Bomb Signals:				
Mk 6 Mod 0	8			
Mk 7 Mod 0	12			

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