

NAVORD OP 2213

FIRST REVISION

CHANGE 19

**PYROTECHNIC, SCREENING, AND
DYE MARKING DEVICES**



**THIS PUBLICATION SUPERSEDES NAVWEPS OP 2213, DATED 31 DECEMBER
1957 AS WELL AS ALL CHANGES AND SUPPLEMENTS THERETO**

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FOREWORD

Ordnance Pamphlet 2213 (First Revision) describes pyrotechnics, dye markers, and screening devices and provides instructions for their safe use. It includes all pertinent data from the following OP's and supersedes them in their entirety: OP 2624, 20 April 1959; OP 2882, 15 June 1961; OP 2969 (First Revision), 1 June 1962; OP 2997 (First Revision), 15 March 1963; OP 2998 (Preliminary), 26 January 1961; OP 2999 (Preliminary), 31 January 1961; OP 3012 (Preliminary), 19 December 1960; OP 3018 (Preliminary), 1 September 1964; OP 3135 (Volumes 1 and 2), 1 September 1962. With the inclusion of Change 10, this First Revision also supersedes BUWEPS Instructions 8051.1 of 27 August 1962 and 8053.1 of 25 September 1964.

The loose-leaf character of this pamphlet permits insertion of changed or corrected pages as necessary. If any errors are discovered or if any pyrotechnic, dye marking, or screening devices in service use are found to have been omitted from this issuance, the Naval Ammunition Depot, Crane, Indiana (Code RD), should be notified immediately.

Every effort will be made to keep this publication current and correct at all times.

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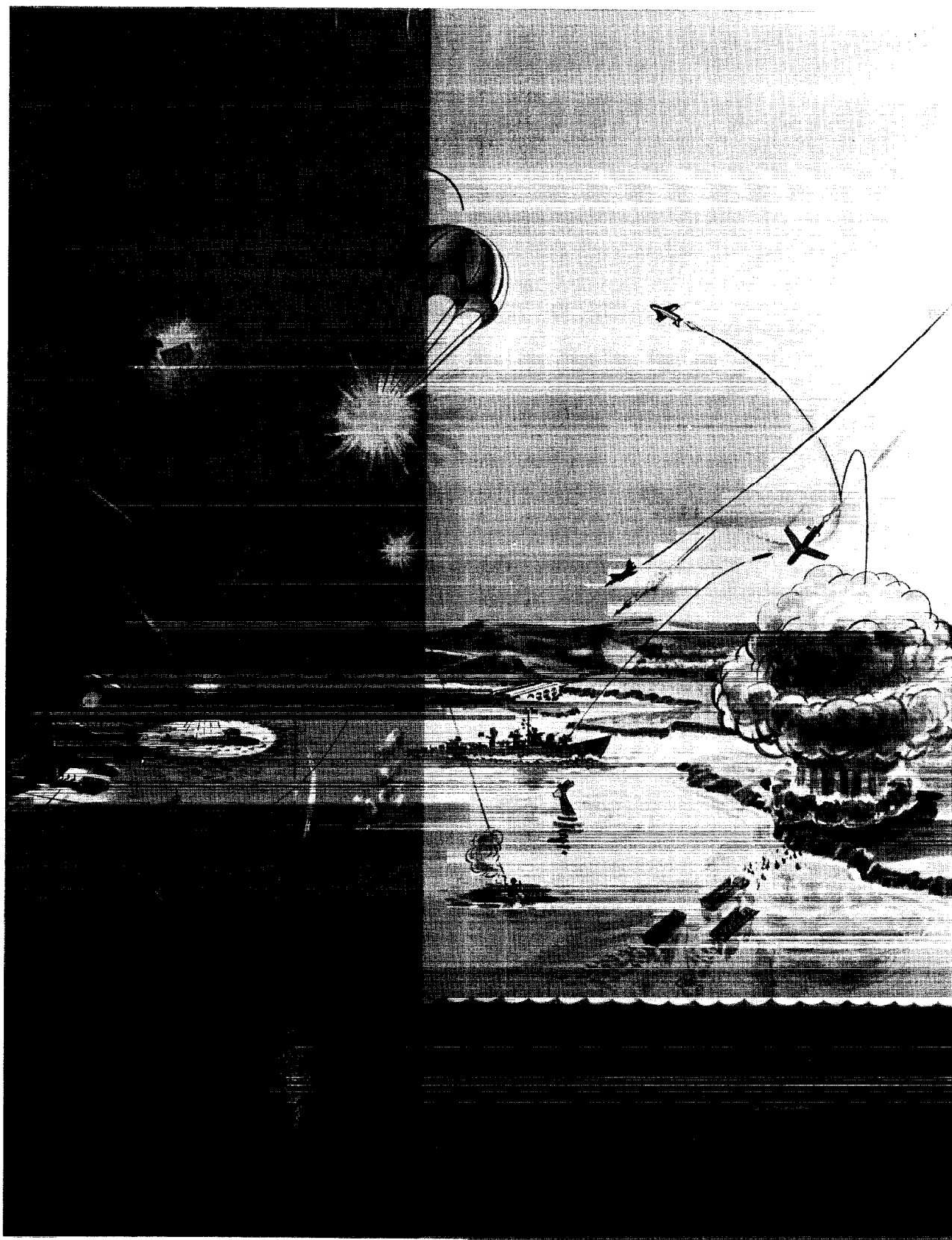
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Pyrotechnics in Air, on Surface, and Under Water — Night & Day

CHAPTER 1

INTRODUCTION

1-1. SCOPE

This pamphlet describes certain pyrotechnic, dye marking, and screening devices which had been released for fleet use at the time of its issuance. It also describes associated mechanisms and equipment. Subsequent changes and additions required to keep this pamphlet correct and current will be issued for appropriate insertion as they develop.

1-1-1. General. All of the pyrotechnics and many of the screening devices described contain combustible chemicals which, when ignited, generate a flame, flash, infrared radiation, smoke, or sound display (or combinations of these effects) for a broad variety of purposes. These purposes include visual and audible signaling, area or target illumination, reference point marking, indication of practice weapon fuze action or impact, tracking, weapon effects simulation, and screening. The dye devices covered herein are used for establishing reference points on the ocean's surface. Their display is not a product of combustion although the coloring composition may be spread on the water by an explosive means. By the same token, some of the screening devices depend not upon combustion for their effectiveness but, instead, upon chemical reaction of finely divided chemicals with moisture in the air.

1-1-2. Arrangement of Contents. The arrangement of material and chapter coverage in this pamphlet is as follows:

Chapter 1: Information of a general nature pertaining to all devices described herein except reporting and disposition information which is contained in Chapters 2 and 3 respectively.

Chapter 2: Regulations and approved format for reporting explosive accidents and incidents involving pyrotechnics and screening chemicals and generators.

Chapter 3: Basic regulations relative to disposition of unserviceable pyrotechnic and screening devices.

Chapter 4: Inert devices, such as pistols and mortar-type tubes, used for firing signaling or illuminating pyrotechnics into the air.

Chapter 5: Hand-manipulated pyrotechnic devices used for various signaling purposes such as identification, recognition, warning, distress, etc.

Chapter 6: Pyrotechnic devices that cast relatively long-lasting illumination on areas or targets to enhance visibility.

Chapter 7: Aircraft-launched pyrotechnic devices that provide floating smoke and/or flame reference points on the ocean's surface.

Chapter 8: Pyrotechnic devices that are expressly designed to be launched from submerged submarines.

Chapter 9: Dye-containing devices launched either from aircraft or on the surface to produce reference points.

Chapter 10: Pyrotechnic devices that produce intense, short-duration illumination for night photography.

Chapter 11: Devices which, by a flash of light or a puff of smoke, show the time and place of practice weapons fuze action or impact.

Chapter 12: Pyrotechnic devices used in the tracking of aircraft, targets, and missiles or other weapons.

Chapter 13: Pyrotechnic devices that produce visible, audible, or otherwise detectable effects similar to those produced by lethal ammunition or other weaponry.

Chapter 14: Chemical agents and devices used for the generation of smoke screens.

Chapter 15: Pyrotechnic devices that do not fit logically into other chapters of this pamphlet.

Chapter 16: Devices that produce low-intensity luminescence for a variety of purposes.

1-1-3. Consolidation of Information. This chapter covers, in the broadest way, such subjects as identification, color coding, handling and storage, and overall safety precautions. Information of any kind which applies to a whole class or family of devices; e.g., submarine-launched devices, but not to other classes or families, is found in the introductory portion of the chapter on that class or family. Where two or more (but not all) devices in a single chapter have identical characteristics or procedures for making ready, removal, etc., or identical handling, storage, or safety rules, these provisions are included only in the first-appearing description. Subsequent descriptions in such a grouping refer to the paragraph containing this information (see Section 1-7).

1-1-4. Individual Item Descriptions. Within each of the substantive chapters of this pamphlet, individual devices are covered as to intended use, external and internal design characteristics, functioning, packaging, and requisitioning. If there is special equipment associated with the installation, attachment, or launching of the device being described, such equipment is identified and likewise described. Make-ready procedures, handling and storage rules, and safety precautions which apply exclusively to individual items are included in the appropriate individual item descriptions.

1-2. FACTORS AFFECTING VISIBILITY

The principal factors which affect the visibility of any pyrotechnic display are (1) contrast of the display with its background and (2) light transmission characteristics of the atmosphere. A light-colored smoke is seen better against a dark background; a dark-colored smoke against a light background. Colored-flame devices are obviously more effective against darkness. In addition, light sources such as colored-flame pyrotechnics, when viewed from appropriate locations, are visible from greater distances than are displays such as smoke and dye which depend upon reflected light for their effectiveness. In general, high-candlepower flame can be seen from a greater distance than can low-candlepower flame.

1-2

1-3. IGNITION TRAINS

Pyrotechnic devices generally are initiated by means of an "ignition train." This train typically consists of an igniter, a delay element, and a starting mix. Ignition trains are said to be "out-of-line" or "indirect" if one element of the train (when in the safety position) is so displaced as to render complete functioning impossible. Pyrotechnic devices with out-of-line features cannot function until the displaced element is brought into line by some external force, such as centrifugal force or a change in hydrostatic pressure. Systems that contain no shunting or other ignition-interrupting features are said to have "direct-firing" ignition trains.

1-4. IDENTIFICATION

Pyrotechnic devices are marked to show the nomenclature, the mark and mod number, the manufacturer's symbol, and the date of manufacture, Federal Stock number, and inspection acceptance stamp.

1-5. COLOR CODING

Color coding is required by MIL-STD-709. Under this system, the primary uses and relative hazards of ammunition items are indicated by different colors and combinations of colors. MIL-STD-709 requires generally that all pyrotechnic devices be identified either by an all-white exterior or by a white band around the device's circumference. Pyrotechnics containing significant quantities of low explosives for ignition, separation, propulsion, etc., are additionally marked with a narrow brown band on the white surface or immediately adjacent to the white band. Devices such as artillery or nuclear simulators which contain high explosives, are marked with a narrow yellow band in the same way. Similarly, smoke-screening devices have light green-colored bands as set forth in Chapter 14 of this pamphlet.

1-6. HANDLING AND STORAGE

All pyrotechnic and smoke-screening devices are designed to withstand normal handling. They should, however, be handled as little as possible to lessen the chances of damage which might cause accidental ignition or leakage. Many devices contain materials of a dangerous nature and are therefore designed with safety features which must be maintained in good operating condition. Dents, deformations, or cracks in the outer body may interfere with the proper functioning of these safety features or might cause ignition during handling or storage. It is therefore imperative that extreme care be taken to prevent damage to containers of pyrotechnics and screening devices. The following specific precautions are applicable:

1-6-1. Effect of Moisture. The proper functioning of pyrotechnic, dye marking, and screening devices is frequently affected by moisture. Some compositions may become more sensitive and dangerous when exposed to moisture, while others tend to become difficult to ignite and less dependable in operation. Many devices, particularly submarine-launched pyrotechnics, are sealed against moisture penetration. Care must be exercised to prevent damage that would interfere with seals since some screening devices produce their smoke by reaction of their chemical contents with moisture in the air. All container seals must be kept intact, and exterior paint on screening device containers, in particular, must be periodically inspected for chipping or other signs of deterioration and repainted as necessary.

1-6-2. Effect of Temperature. Pyrotechnic and some screening devices may be adversely affected by excessively high or variable temperatures. Storage should be in dry, well-ventilated places which provide the greatest possible protection from such conditions. These devices should never be stored where direct rays of the sun could generate excessively high temperatures. Most devices described in this pamphlet have been tested to withstand temperatures from -65°F to 160°F and, there-

fore, will probably be safe from deterioration or damage within that range. However, it is recommended that every reasonable effort be made to maintain storage temperatures at not more than 100°F.

1-6-3. Effect of Pressure Variations. Some pyrotechnics are armed and ignited by varying the pressure of their surroundings. Extreme care must be taken to avoid damage to the seals of such devices. Under no circumstances shall such sealing features be loosened, removed, or otherwise tampered with.

1-6-4. Other References. For additional information on handling, transportation, and storage of pyrotechnics, see OP 4, Ammunition Afloat; CG 108, Coast Guard Rules and Regulations; OP 5 (Vol. 1), Ammunition Ashore; and 49 CFR 71-78, Federal Regulations.

1-7. MAKE-READY PROCEDURES

The steps necessary for preparing pyrotechnics and screening devices for launching and use vary considerably. Generally speaking, submarine pyrotechnics are made ready through similar procedures since all are designed to be launched through ejection tubes. Such uniformity does not, however, apply to other classes or families of items covered by this pamphlet. This pamphlet does not repeat identical procedures. If the same rules apply to a whole class or family of devices, make-ready procedures will be found only in the introductory portion of the chapter on that family. If the same make-ready procedures apply to several, but not all, devices in a family, they are set forth only in the material on the first-described item in such a grouping. Each item description, as appropriate, contains a paragraph entitled **Make-Ready Procedures** which either sets forth the full procedures or clearly states where such procedures are to be found. Descriptions of devices such as cartridges and hand-manipulated items for which there are essentially no procedures which precede actual ignition and firing, do not contain such a paragraph.

1-8. SAFETY PRECAUTIONS

All pyrotechnic and screening devices, while designed and tested to be safe under normal conditions, are subject to accidental ignition because of a wide variety of circumstances. The one and best general rule to follow is simply this: Be constantly aware that pyrotechnics contain chemical components that are intended to burn with intense heat, and act accordingly. In furtherance of this, the following specifics should be kept in mind:

1-8-1. Protecting the Initiation Mechanism. Pyrotechnic and screening devices are normally equipped with some type of safety pin or lock or tape which is designed to prevent accidental activation of the initiation mechanism. Such equipment must not be tampered with, struck, bent, or otherwise damaged or removed until immediately before it is intended to launch the device. Any devices which show signs of damage to safety features are considered unserviceable and must be carefully segregated for prompt disposition in accordance with Chapter 3 of this pamphlet.

1-8-2. Results of Accidental Initiation. If a pyrotechnic device should be accidentally ignited, its functioning will, in all cases, result in a fire hazard. In a confined area, the gases generated by this combustion could present a serious toxic hazard. (See para 1-8-6 following). Signaling devices containing propellant charges which are designed to propel the pyrotechnic candle into the air create an extremely dangerous missile hazard if they are accidentally ignited.

1-8-3. Fighting Pyrotechnic Fires. Pyrotechnic compositions characteristically contain their own oxidants and therefore do not depend upon atmospheric oxygen for combustion. For this reason, the exclusion of air, by whatever means, from a pyrotechnic fire is usually ineffective. Many pyrotechnic mixtures, particularly illuminating flare compositions, burn with intense heat — up to 4500 degrees F. Normally available extinguishers are of little or no value in fires of this kind. Carbon dioxide and carbon tetrachloride (Pyrene) ex-

tinguishers, in addition to being ineffective, are potential sources of danger in that they tend to produce oxidants — either chlorine or oxygen — which support combustion. Moreover, the Pyrene-type extinguishers may worsen the condition by generating chlorine and phosgene both of which are poisonous gases. Foam-type extinguishers are equally ineffective because they work on the exclusion-of-air principle. It is recommended, therefore, that water, in flooding quantities and at low pressure, be used to cool the surrounding area and thus to prevent spread of the fire. Firefighting tests have established that properly controlled and directed water is the best fire extinguishing agent for aircraft parachute flares burning in the open. Special firefighting instructions for smoke-generating agents are set forth in Chapter 14 of this pamphlet.

1-8-4. Smoking Regulations. Smoking or the carrying of lighted cigarettes, cigars, or pipes must not be permitted in or near pyrotechnic storage magazines. Matches and any and all types of spark- and flame-producing devices shall not be carried into pyrotechnic magazines.

1-8-5. Cautions and Warnings. All special cautions and warnings appearing under individual item descriptions in this pamphlet shall be rigidly adhered to, as shall any and all special safety rules which may be set forth for individual items.

1-8-6. Toxic Hazards. Many chemicals used in pyrotechnics, screening equipment, and dye marking devices are poisonous to men and animals if taken internally. This also applies to the residues of burned pyrotechnics. From the inhalation standpoint, the products of pyrotechnic devices and smoke generators often present a serious problem. Although many of the smokes and fumes given off by pyrotechnics and screening devices are considered nontoxic and are only mildly irritating to the eyes and nasal passages when encountered in relatively light concentrations out-of-doors, heavy concentrations in closely confined spaces are dangerous and may be lethal if for no other reason than that they reduce the amount of

available oxygen in the air. Anything more than a brief exposure to the gases of combustion or to screening smokes should be avoided or should be protected against through the use of appropriate gas masks. OP 2793, Toxic Hazards Associated with Pyrotechnic Items, gives specific toxicity information on some of the pyrotechnic devices covered by this pamphlet.

1-8-7. Application of OP 4 and OP 5. Safety rules governing the handling of pyrotechnics as contained in OP 4, Ammunition Afloat, and OP 5, Ammunition Ashore, shall be followed as they relate to pyrotechnics and screening chemicals and equipment.

1-9. NOMENCLATURE

The markings on some pyrotechnics and screening devices may differ from that shown in this pamphlet. However, these devices are designated in accordance with the official BU-WEPS nomenclature as set forth in OD 12067.

CHAPTER 2

REPORTING ACCIDENTS AND INCIDENTS

2-1. GENERAL REQUIREMENT

All accidents, incidents, and malfunctions involving pyrotechnics and screening devices or related explosive materials, and defective pyrotechnics or screening devices shall be reported as required by BUWEPSINST 8020.6A, Subj: Accidents, Malfunctions, and Incidents Involving Nonnuclear Explosive Ordnance and Material. U. S. Marine Corps activities are exempted if reports are submitted in accordance with USMC Technical Instruction TI-8010-15/A.

2-1-1. Definitions. The principal terms of concern in this chapter are defined and interpreted as follows:

2-1-1-1. Explosive Materials. All military explosive or combustible chemicals used in pyrotechnics and/or screening devices in the bulk or loose state. All separate or mixed chemicals used in or associated with pyrotechnics or screening devices which may burn or explode or which may cause such pyrotechnics or screening devices to burn or explode.

2-1-1-2. Explosive Accident. Any accidental explosion or fire involving pyrotechnics, screening devices, or related explosive materials, including the inadvertent actuation, jettisoning, release, or launching of pyrotechnics or screening devices resulting in fire and/or explosion and damage to property.

2-1-1-3. Explosive Incident. Any occurrence involving pyrotechnics, screening devices, or related explosive materials which creates a potentially hazardous situation. Such incidents include but are not necessarily limited to:

(a) Human errors in processing, assembling, testing, loading, storing, transporting, handl-

ing, using, or disposing of pyrotechnics, screening devices, or related explosive materials.

(b) Unusual or unexpected occurrences, unnatural phenomena, unfavorable environments (e.g., RADHAZ), or instances of equipment failure which may damage or affect the safety or reliability of pyrotechnics, screening devices, or related explosive materials.

(c) Loss or abandonment of pyrotechnics, screening devices, or related explosive materials resulting in potential hazard to untrained personnel which may find the item.

(d) Misuse or unauthorized alteration of pyrotechnics, screening devices, or related explosive materials.

2-1-1-4. Malfunction. The term malfunction applies when a pyrotechnic or screening device is intentionally launched, actuated, or fired and fails to function in the manner for which it was designed. Malfunctions may be either major or minor.

(a) **MAJOR MALFUNCTION.** A failure to function which results in, or is potentially capable of resulting in, personal injury and or material casualty.

(b) **MINOR MALFUNCTION.** A failure to function which does not result in injury or casualty and for which the potential for injury or casualty is remote.

2-1-1-5. Dangerously Defective Items. Pyrotechnics, screening devices, or related explosive materials which, on visual examination or local test, are found to be capable of resulting in an accident or a malfunction. Examples: Rupture of outer containers exposing fillers, protruding primers, partially armed fuzes, etc.

2-2. DISCUSSION

All military pyrotechnics and screening devices are designed with as high a degree of safety and reliability as can be humanly foreseen. Prior to release for service use, tests are conducted at all stages of development, fleet evaluation, and production. After release to service use, tests continue for safety and reliability to determine effects of aging in storage. As in any accident-prevention program, in order to improve safety and reliability of pyrotechnics, screening devices, ancillary equipment, and pertinent instructions, causes of accidents, incidents, or malfunctions must be rapidly and accurately determined, and appropriate corrective action must be taken immediately.

2-3. ACTION

All ships and stations experiencing accidents, incidents, or malfunctions involving pyrotechnics, screening devices, or related explosive materials, as such accidents, incidents, or malfunctions are defined herein, shall:

2-3-1. Discontinue use of the item involved pending local inspection, interrogation, and assessment of probable cause. Depending on the degree of damage or casualties (accidents), the degree of potential hazard (incidents), the ability to attribute cause with some assurance, and operational necessity such as acceptance of calculated risk in combat emergency, usage may be resumed. Severe damage, casualties, potential hazards, inability to determine cause, or other prevailing factors should govern the decision to discontinue local use of the entire type of pyrotechnic or screening device involved or to suspend the specific lot involved pending a complete technical evaluation and/or an on-site investigation by technically trained personnel.

2-3-2. Report all occurrences to BUWEPS and SPCC, Code 730 Mechanicsburg. To assure that reports are complete and concise, the standard format as set forth in paragraph 2-7 following

shall be used. Accidents, significant incidents, major malfunctions, and dangerously defective items shall be reported by message within 24 hours. A speedletter may be used for minor malfunctions as well as for any accident, incident, or defect where a lesser degree of urgency is clearly evident. Amplifying information should be submitted by supplemental message or speedletter when it becomes available. If the message does not or cannot completely describe the occurrence, a follow-up written report, complete with appropriate photographs, shall be submitted. The choice of message versus letter reports shall depend upon the degree of hazard and potential hazard which requires dissemination to other activities or special action to prevent recurrence. In this regard, preventive procedures depend upon accurate and timely feed-in of data on fleet experience; an unreported incident could well result in a future accident under the same or similar circumstances.

2-3-3. Collect all available evidence. Because explosive accidents and major malfunctions involving pyrotechnics, screening devices, or related explosive materials are usually characterized by destruction or loss of the offending item, the difficulty in positive determination of cause is magnified. All fragments and remains of the item should be collected for examination and tests. Photographs of damage to equipment and to the area of occurrence, if practicable, are desirable. On occasion, minor malfunctions or incidents have resulted in the unnecessary disposal of the item involved. In most cases, the hazard associated with an incident or minor malfunction is at the precise time of the occurrence or immediately thereafter. Accordingly, after an approved interval has passed, a misfire or minor malfunction should be suitably tagged, set aside, and returned to the nearest issuing activity for investigation and appropriate tests. However, nothing in this paragraph is to be construed as prohibiting the immediate disposal of any pyrotechnic, screening device, or related explosive material which, in the judgment of the Commanding Office, constitutes a hazard.

2-4 RESPONSIBILITY OF SPCC CODE 730, MECHANICSBURG

As inventory manager for conventional ammunition, which includes all pyrotechnics, screening devices, and related explosive materials, and in accordance with properly delegated authority, the Ships Parts Control Center, Mechanicsburg, Pennsylvania, is responsible for withdrawal from service use and removal from issuable stocks all items, segments, or lots of pyrotechnics, screening devices, and related explosive materials which are reported as being involved in accidents, incidents, or malfunctions as here defined, as well as all such items as are found to be defective. Accordingly, SPCC, Code 730, Mechanicsburg, will take action, as set forth in BUWEPSINST 8020.6A, in all instances wherein pyrotechnics, screening devices, and/or related explosive materials are involved in such accidents, incidents, or malfunctions. This action includes the following:

2-4-1. Clearing proposed action with the appropriate NAVORDSYSCOM or NAV-AIRSYSCOM code as required by the current instruction in the 8020.6 series.

2-4-2. Issuing all suspensions, restrictions, releases, and reclassification to permanently unserviceable status.

2-4-3. Maintaining a complete and current listing of all suspended, restricted, and permanently unserviceable pyrotechnics, screening devices, and related explosive materials, including obsolete and out-of-stock items of the same.

2-4-4. Following up all cases of suspension of pyrotechnics, screening devices, and/or related explosive materials, and ultimately releasing the same to service use or reclassifying to permanently unserviceable status. This involves acquisition and shipment of samples of the offending devices and/or materials to an appropriate test activity and the periodic follow-up on test results until final resolution.

CHANGE 10**2-5. RESPONSIBILITY OF NAD CRANE AS COGNIZANT FIELD ACTIVITY**

The Naval Ammunition Depot, Crane, Indiana, has been designated as the cognizant field activity for all pyrotechnics, screening devices, and related explosive materials. As such, it is responsible for action as follows:

2-5-1. Within 24 hours of the receipt of a report that a pyrotechnic or screening device or any related explosive material is the cause or the suspected cause of an accident or major malfunction or that such a device or material is dangerously defective, NAD Crane shall submit comments and recommendations for item suspension, tests, or on-site investigation, as appropriate, to SPCC, Code 730 (information copy to BUWEPS only).

2-5-2. If requested by SPCC, NAD Crane will conduct tests for determination of cause and for final resolution of suspended or unserviceable pyrotechnics, screening devices, and related explosive materials.

2-5-3. When requested by BUWEPS or SPCC, NAD Crane will provide technically qualified investigative personnel for on-site inquiry and inspection of accidents or malfunctions involving pyrotechnics, screening devices, and related explosive materials.

2-5-4. If report involves a minor malfunction or a minor incident, NAD Crane may exercise its option as to commenting or recommending action.

2-6. BUWEPS RESPONSIBILITY

Based on the nature and the urgency of the original report, and information as to what effect withdrawal from service use will have on fleet readiness as balanced against probability of effects and of recurrence, BUWEPS will clear each reported instance and will authorize action as proposed by SPCC or will request SPCC to take action if none is proposed. The Bureau will assist in arranging for tests, in shipping samples as appropriate, and in providing support as required in the premises.

2-3

2-7. MESSAGE FORMAT

Reports submitted in accordance with the preceding requirements shall be in the following form:

From: (Activity Submitting Report)
 To: BUWEPS
 SPCC, Code 730, Mechanicsburg,
 Pennsylvania
 Info: CNO (See Note 1 Below)
 CMC (See Note 2 Below)
 Chain of Command (As
 Appropriate)
 NAD Crane Code RD (CFA)
 NOTS China Lake (PFA-A/C Pyro
 Only)
 USMC, Liaison Officer, U. S. Army
 Ammunition and Supply Agency,
 Joliet, Illinois
 NAVAVSAFGEN, Norfolk, Va.
 (A/C Pyro Only)
 NOL White Oak, Md. (Subsurface
 Pyro Only)
 NWL, Dahlgren, Va. (Accidents
 and Incidents Only)

Subj: Report
 8060-1 (See Note 3 Below)

1. Complete nomenclature of item involved, including Mk and Mod and logistic (DOD) code or Federal Stock Number.
2. Complete round lot number or serial number (include fuze lot number if applicable).
3. Description of occurrence (include date, time, place of occurrence, identification of releasing aircraft, launching or firing equipment, and conditions of release, launching, etc.).
4. Number and extent of casualties (specify military personnel, civilian employee, contractor personnel, or other, as appropriate).
5. Description of damage to equipment or property (specify government or private).
6. Number of items involved out of total fired or being processed during run,

exercise, or batch.

7. Weight of explosive involved — actual or estimated.
8. Number of rounds remaining on hand from lot involved (include information as to availability of malfunctioned round or remaining fragments).
9. Describe any exposure to climatic or electromagnetic environmental conditions, as applicable.
10. Comments as appropriate (include cause, known or probable; effect on launcher capability; adequacy of operating instructions and safety precautions; local action being taken to preclude recurrence; request for assistance; recommendations; etc.).
11. Statement whether or not investigation will be conducted in accordance with the JAG Manual.

Note 1: Include CNO as info for all accidents and malfunctions involving injury or loss of personnel or major damage to equipment only.

Note 2: Include CMC as info for U. S. Marine Corps accidents and malfunctions involving injury or loss of personnel or major damage to equipment.

Note 3: Insert, in blank space, explosive accident, explosive incident, ordnance malfunction, or defective ordnance, as appropriate.

CHAPTER 3

DISPOSITION OF UNSERVICEABLE PYROTECHNIC AND SCREENING DEVICES

3-1. GENERAL

Many of the pyrotechnic and screening devices described in this pamphlet contain combustible chemicals which react violently and dangerously under certain conditions. The hazards inherent in these reactions are frequently increased by such factors as age, improper storage conditions, rough handling, moisture penetration, excessive temperatures, damage to shipping containers, or other mishaps that would cause the devices to become unserviceable and necessarily disposable. In most cases, the element of imminent danger does not exist, and such unserviceable pyrotechnics and screening devices on ships at sea may properly be segregated for normal return to an appropriate shore station for disposition in accordance with current instructions and regulations of OP 5, Vol. 1 Chapter 29. Conditions may develop, however, which demand immediate, emergency disposal of potentially hazardous devices, in which case disposition is the responsibility of the Commanding Officer. If, in the Commanding Officer's best judgment, immediate disposition is necessary to protect lives and property, he shall order such disposition by the most appropriate means available. In all cases, he shall notify the Bureau of Naval Weapons at the earliest practicable time as to the facts and circumstances.

3-2. EMERGENCY METHODS OF DISPOSITION

Pyrotechnic and screening devices which are found to be damaged and possibly dangerous to personnel or to a ship should be disposed of either by burning or by dumping at sea. Since damage may well cause a lessening of the ef-

fectiveness of safety features designed into the device, disposition by burning poses special problems relating to safety. Therefore, in most cases, such unserviceable devices will be disposed of by throwing them over the side. This being true, the following considerations must be borne in mind: Many pyrotechnics are designed with positive buoyancy. Except where the nature of the emergency makes it positively impossible to do otherwise, such devices must not be left to float on the surface. Some pyrotechnics may be punctured to assure negative buoyancy, but puncturing is NOT recommended because of the obvious danger of igniting the pyrotechnic composition. Negative buoyancy which assures, beyond question, the permanent sinking of the device is therefore to be obtained either by the firm attachment of a suitable weight to the device to be disposed of or by placing the device in a weighted container which fulfills the requirements of paragraph 3-3 following. If circumstances relating to urgency permit, unserviceable pyrotechnics must be dumped at depths of more than 500 fathoms and at least 10 miles from shore.

3-3. BUOYANCY CRITERIA

A minimum weight of 100 pounds per cubic foot shall be used to classify disposable material as having acceptable negative buoyancy. Physical tests by immersion shall be conducted when there is any question of buoyancy classification.

3-4. SPECIAL PRECAUTIONS PRECEDING DUMPING

When dumping pyrotechnics, all material must be removed from wood packing boxes, crates,

cardboard tubes, or metal containers. Extreme caution must be taken to prevent accidental ignition of the loose pyrotechnics made ready for dumping since obsolete or deteriorated pyrotechnics can be ignited by rough handling. The material to be disposed of must be stowed on deck in a location suitable for ready jettisoning in the event of accidental ignition. It is also advisable to shield other pyrotechnics and ammunition from the disposable material to avoid greater hazard in case of accident.

CHAPTER 4

PYROTECHNIC PISTOLS, PROJECTORS, AND ACCESSORIES

4-1. INTRODUCTION

This chapter covers various types of mechanisms used in firing signaling and illuminating devices. All of the items described in this chapter are 2A cognizance and must be requisitioned accordingly.

4-1-1. General Safety Precautions. The following precautions apply.

4-1-1-1. None of these mechanisms shall be used for firing any device other than that for which it was designed.

4-1-1-2. While loading, firing, or unloading any of these devices, care must be taken to avoid pointing the muzzle toward the user's body or toward friendly personnel or equipment.

4-1-1-3. If any of these devices is loaded and not fired, it must be unloaded immediately since none is equipped with positive safing features. A pyrotechnic pistol is cocked as long as the breech is closed. Under no circumstances shall any type of hand projector be carried in a loaded condition.

4-1-1-4. If a cartridge-type pyrotechnic misfires, two more attempts shall be made to fire it. If a pistol is being used, at least 30 seconds must elapse before the breech is opened. If a mortar-type projector misfires, 3 minutes must

elapse before approaching the projector. In all misfires, the pyrotechnic device involved shall be set aside for return to an appropriate shore station for investigation by the cognizant field activity, or it shall be disposed of by being thrown overboard immediately upon removal from the projector.

4-1-1-5. Mortar-type projectors must be firmly secured and must be shielded from personnel by a suitable barrier.

4-1-1-6. All of these devices should be aimed upward at an angle approximately 60 degrees from the horizontal unless otherwise specified. This provides the most easily seen signal and protects surrounding personnel and areas from possible harm.

4-2. PISTOL-TYPE PROJECTORS

All pyrotechnics pistols are breech-loaded, double-action, signal-shot devices. The barrel is hinged to the frame and held in position by a breech lock or latch pin. All are fired by pulling a pistol-type trigger. These devices should be kept clean by wiping with a lint-free cloth dampened with light machine oil. Powder residue is removed with any approved solvent.

4-2-1. Pistol, Pyrotechnic Mk 1
(Formerly Rocket Signal Pistol,
Mk 1)

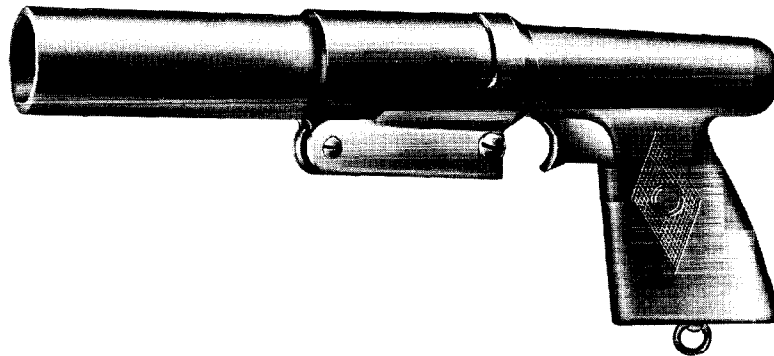


Figure 4.2.1 Pyrotechnic Pistol, Mk 1

4-2-1-1. Intended Use. This pistol (see Figure 4.2.1) may be used for any kind of day or night signaling. It fires the Signal, Illumination, Marine, Mk 1, and Signal, Smoke, Marine, Mk 2 (formerly Pistol Rocket Signals) which are described in Chapter 5 of this pamphlet.

4-2-1-2. Description. This pistol consists of a barrel, a breech, and a grip. The barrel and breech are made from light dye-cast metal; the grip is molded bakelite and contains the firing mechanism.

4-2-1-3. Operation. This pistol is operated by pushing on the breech lock with the thumb, opening the breech with a downward pressure on the muzzle end of the barrel, inserting a signal, closing the breech, and pulling the trigger.

4-2-1-4. Safety Precautions. The safety precautions as set forth in paragraph 4-1-1 of this chapter apply.

4-2-1-5. Identification Data. This pistol is listed under FSN 1095-038-5044. No DOD number has been assigned.

4-2-2-1. Intended Use. This pistol (see Figure 4.2.2) is designed especially for firing the white, red, or green Signal, Illumination, Marine, Mk 2, (formerly Very Signal Light) which is described in Chapter 5 of this pamphlet.

4-2-2-2. Associated Equipment. Cartridge Belt, Mk 1 (FSN 8465-038-5050, DOD Code No. X172), and Holster, Mk 5 (FSN 1095-092-9960, DOD Code No. X171), are available for carrying this pistol and a supply of signals.

4-2-2-3. Description. This pistol consists of a plastic frame on which are mounted the required metal parts, all of which should be maintained as set forth in paragraph 4-2 preceding.

4-2-2-4. Operation. The breech of this pistol is opened by pushing the latch pin at the bottom of the barrel just forward of the trigger and by forcing the muzzle downward. After a signal is inserted, the breech is closed.

4-2-2-5. Safety Precautions. The safety precautions of paragraph 4-1-1 of this chapter apply.

4-2-2-6. Identification Data. This pistol is listed under List of Drawings SK 102657, Specification MIL-P-18540, FSN 1095-038-5043, and DOD Code No. X169. Spare parts are obtainable in three sets, namely: Vessel Set (FSN 1095-038-5063, DOD Code X170), Shore Base Set (FSN 1095-038-5065), and Tender Set (FSN 1095-038-5064, DOD Code X558).

4-2-2. Pistol, Pyrotechnic, Mk 5
(Formerly Very Signal Pistol, Mk 5)

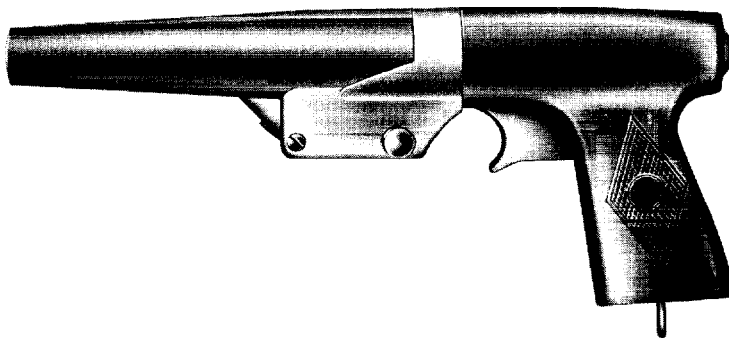


Figure 4.2.2 Pyrotechnic Pistol, Mk 5

OK

DEPARTMENT OF THE NAVY
NAVAL ORDNANCE SYSTEMS COMMAND
WASHINGTON, D. C. 20360

PYROTECHNIC , SCREENING,
AND DYE MARKING DEVICES

NAVORD OP 2213
FIRST REVISION CHANGE 19

1 January 1969

PAGE 1 OF 1 PAGE (S)

PUBLISHED BY DIRECTION OF
COMMANDER, NAVAL ORDNANCE SYSTEMS COMMAND

After the attached enclosures have been inserted, record this CHANGE on the change record sheet.

Remove and insert the following pages except where indicated.

1. Title and Foreword
2. A and B
3. 5-33 and 5-34
4. 6-12G thru 6-12 Q/R

4-2-3. Pistol, Pyrotechnic, AN-M8.



4-2-3-1. Intended Use. This pistol (see Figure 4.2.3.) is designed to fire various cartridge-type distress and identification signals described in Chapter 5 of this pamphlet. In many cases (as stated in the descriptions of particular signals), it is interchangeable with the Pyrotechnic Pistol, Mk 1 (paragraph 4-2-1 preceding).

4-2-3-2. Description. The hinged barrel is held in place by a breech lock. The plastic grips, back plate, and cover plate fasten to the aluminum frame and act as a housing for the firing mechanism.

4-2-3-3. Operation. Loading is accomplished by raising the breech lock with the thumb and allowing the breech to open. After a signal is inserted, the breech is closed.

4-2-3-4. Safety Precautions. The safety precautions of paragraph 4-1-1 of this chapter apply.

4-2-3-5. Identification Data. This pistol is listed under Dwg. No. F-7265657, Specification MIL-P-1299, and FSN 1095-726-5820. No DOD Code No. has been assigned.

**4-3. HAND-HELD PROJECTORS
NON PISTOL-TYPE.**

The projectors described in this section are designed expressly for use with particular signals

as indicated in the individual item descriptions following.

4-3-1. Projectors, Pyrotechnic, Hand, Mks 3 and 4.

NOTE: Both of these projectors are obsolete and should not be in the supply system. If found in the system, they should be returned to an ammunition depot for appropriate disposition. No requisitioning action should be initiated.

4-3-2. Projector, Signal, Surface, Mk 31 Mod O.

4-3-2-1. Intended Use. This projector is part of the Signal Kit, Illumination, Mk 79 Mod O, which is fully described in Chapter 5 of this pamphlet.

4-4. MORTAR-TYPE PROJECTORS

The signal projectors in this section are bolted or otherwise firmly secured to the deck or other surface. They are equipped with a base and a vertical barrel through which the signal slides to strike a fixed firing pin in the base.

4-4-1. Projector, Signal, Mk 1.

NOTE: This projector is obsolete and should not be in the supply system. If found in the system, it should be returned to an ammunition depot for appropriate disposition. No requisitioning action should be initiated.

4-4-2. Projector, Flare, Mk 13.

(Illustration top of page 4-4)

4-4-2-1. Intended Use. This device (see Figure 4.4.1) is designed to project the Surface High Altitude Parachute Flare, Mk 20, which is described in Chapter 6 of this pamphlet.

4-4-2-2. Description. The projector consists of a steel barrel which screws into a square baseplate. The baseplate is drilled for bolting to a deck or land base. In the center of the base is a stud with a firing pin press-fitted into it. A socket wrench, issued with the projector, is used to remove this stud. Three vent holes in the baseplate permit escape of air so that the flare drops freely onto the firing pin

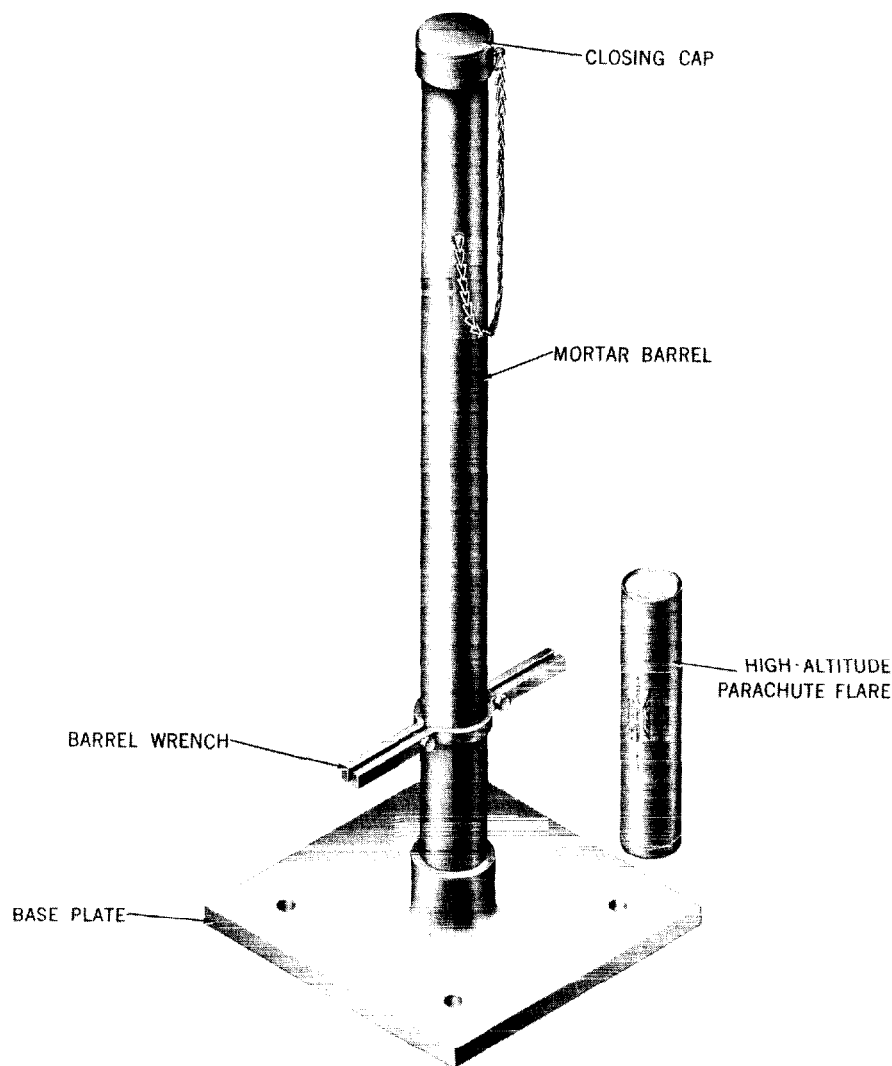


Figure 4.4.1 Flare Projector, Mk 13

when released. A wrench clamped to the lower part of the barrel facilitates removal for repair and cleaning. About 6 inches from the barrel muzzle are the holes for insertion of the release pin. A 30-foot lanyard is attached to the release pin. The muzzle is closed with a screw-on closing cap when the projector is not in use.

4-4-2-3. Accessories and Spare Parts. The following accessories and spare parts are shipped with the projector: 2 barrel wrenches, 8 nuts, 8 washers, 4 extra firing pins, 2 release pins, and 2 chains for attaching the closing cap.

4-4-2-4. Operation. This projector is operated by removing the closing cap and inserting a release pin in the holes near the muzzle. The flare is carefully lowered into the muzzle, primer end down, until it rests on the release pin. The lanyard, always pulled from behind a protective barrier, removes the release pin and allows the flare to slide to the bottom of the barrel where the primer strikes the firing pin.

WARNING

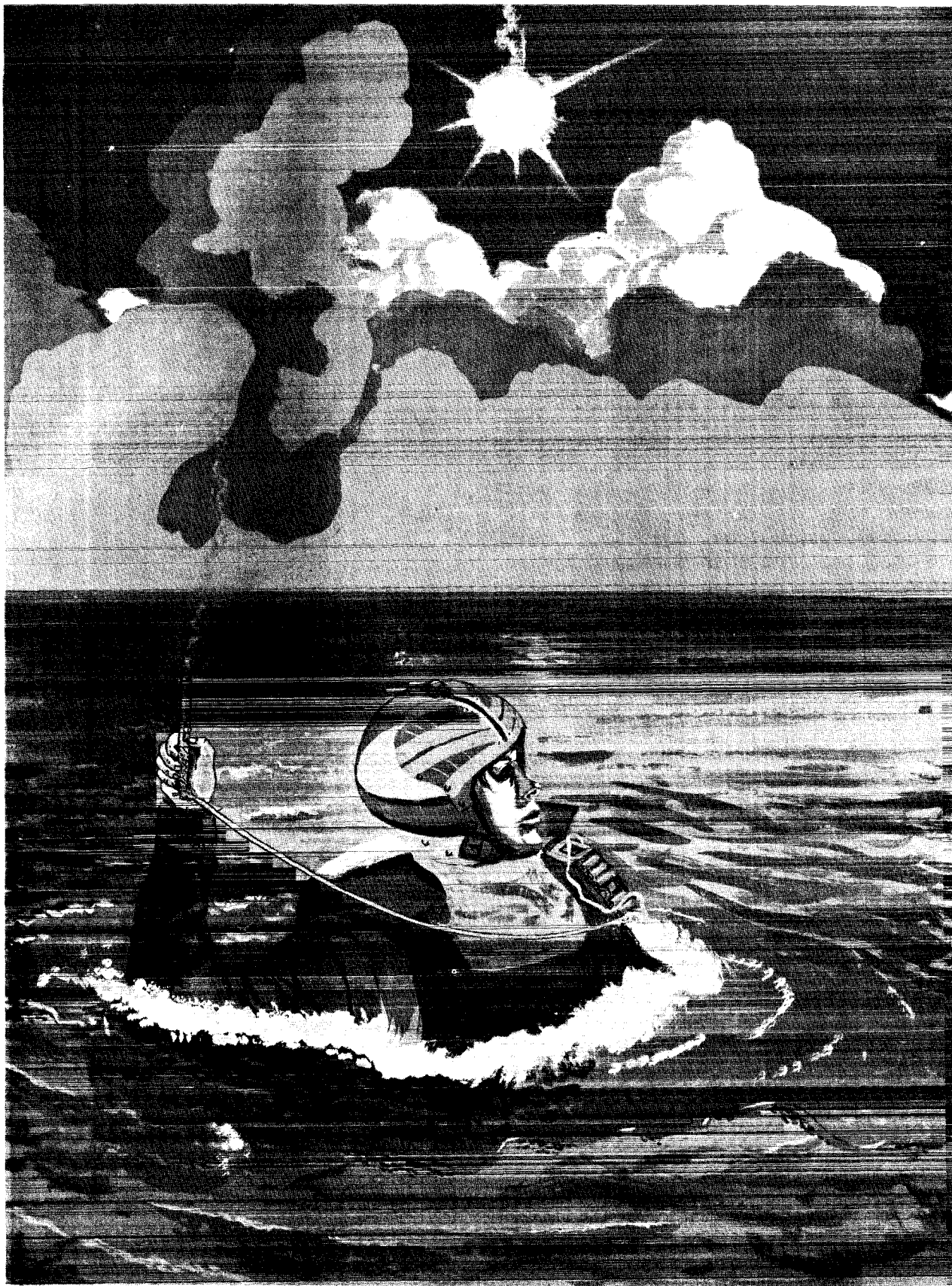
The lanyard must not become fouled. It must not be pulled accidentally so

as to cause premature firing.

4-4-2-5. Maintenance. Misfires may be caused by a defective primer or by weak impact of the primer on the firing pin. The projector barrel must be kept clean at all times. If a deposit from a previous firing is present, it must be removed by swabbing the barrel with an approved solvent. The barrel wrench is used to unscrew the barrel to facilitate cleaning. The base also must be kept clear and the vent holes kept open. Chips from previous rounds must be removed since they could prevent impact of the primer on the firing pin. The barrel must be unscrewed to remove a misfire.

4-4-2-6. Safety Precautions. The safety precautions set forth in paragraph 4-1-1 apply to this projector. In addition, care must be taken to assure that the release pin is properly in the holes in the barrel before inserting a signal. Personnel not engaged in the actual loading and firing of this device must stand clear, protected by a suitable barrier, during its operation.

4-4-2-7. Identification Data. This projector is listed under List of Drawings 165813, FSN 1055-038-5066, and DOD Code No. X167.



Downed Flyer Using Illumination Signal Kit, Mk 79

CHAPTER 5

HAND-MANIPULATED SIGNALING DEVICES

5-1. INTRODUCTION

This chapter provides information on signaling devices that are launched from pistols, rifles, or other hand-held projectors (including outer cases that serve as projectors); those that are held directly in the hand during their complete functioning; and those that are held in the hand only until ignited after which they are either thrown overboard or emplaced in or on the ground. These devices are used for signaling as opposed to marking and illuminating.

5-1-1. Handling and Storage. The devices covered by this chapter shall be handled and stored in accordance with the general provisions of paragraph 1-6 of Chapter 1 of this pamphlet. They should be stored in their original shipping containers until ready for use. If removed and not used, they should be returned to their original containers, which should then be resealed. Such returned devices shall be used before a new container is opened.

5-1-2. Safety Precautions. The following special precautions shall be enforced:

5-1-2-1. Devices that function completely while being held in the hand must be pointed to leeward and held, arm-length, at an angle of approximately 45 degrees above the horizontal to prevent burns caused by hot drippings.

NOTE: This does not apply to devices fired from hand-held projectors which are usually fired vertically.

5-1-2-2. Pistol-projected devices and rifle grenades must not be pointed in the direction of friendly personnel or craft.

5-1-2-3. If any cartridge-type device misfires, at least two additional attempts shall be made to fire it. After the last such attempt, not less

than 30 seconds must elapse before unloading because of the possibility of a hangfire.

5-1-2-4. Personnel must not look into the muzzle of a pyrotechnic pistol or into the firing end of any signaling device.

5-1-2-5. Pyrotechnic devices in aircraft must be secured to prevent damage to the pyrotechnics or possible fouling of aircraft controls.

5-1-2-6. Cartridge-type signaling devices must be handled so as to avoid a blow on the primer which might cause ignition.

5-1-2-7. When devices with grenade-type firing mechanisms are being launched, the safety lever must be held firmly against the body of the device while the safety cotter pin is removed and until the device is launched. The safety cotter pin must not be removed until just before the device is to be launched. Once removed, it must not be replaced; the signal must be launched. The firing mechanism of these signals must not be tampered with. Handling, especially in aircraft, should be held to a minimum.

5-1-2-8. The general safety rules set forth in Chapter 1 of this pamphlet apply and shall be rigidly adhered to in the transportation, handling, storage, and operation of all pyrotechnic devices covered by this chapter.

WARNING

The falling display or burned-out debris from some cartridge-type devices may present a hazard to surface personnel. Users of these devices should be aware that such a hazard exists.

5-1-3. Toxic Hazards. For toxic hazards associated with these devices, see paragraph 1-8-6 of Chapter 1 of this pamphlet.

5-1-4. **Disposition.** Hand-manipulated signaling devices which are found to be unserviceable for any reason shall be disposed of in accordance with the requirements of Chapter 3 of this pamphlet.

5-1-5. **Reporting of Accidents and Incidents.** All explosive accidents and incidents involving devices covered by this chapter shall be reported in accordance with the provisions of Chapter 2 of this pamphlet.

TABLE 5-1
HAND-MANIPULATED SIGNALING DEVICES SUMMARY

Item	Para-graph	Launched From	Display	Burn Time (Sec.)	Min. Alt. (Ft.) *	Max. Lgth. (In.)	Max. Diam. (In.)	Approx. Weight (Oz.)
Signal, Illum., Marine, Mk 2 (Very Signal Cartridge)	5-2-1	Pyrotechnic Pistol Mk 5	Free-falling Red, Green, or White Star	6	200	2.43	0.88	1.1
Signal, Smoke, Marine (Rocket), Mk 2 Mods (Pistol Rocket Signal)	5-2-2	Pyro Pistol Mk 1 or AN-M8	Parachute-Suspended Colored Smoke	20-30	500	14.00	1.68	16.0
Signal, Illum., Aircraft, M11 (Signal, A/C, Red Star, Parachute)	5-2-3	Pyrotechnic Pistol AN-M8	Parachute-Suspended Red Star	30	150	7.69	1.57	9.6
Signal, Illum., Aircraft, AN-M37A2 thru AN-M42A2	5-2-4	Pyrotechnic Pistol AN-M8	Two Free-falling Colored Stars (Same or Different Colors)	7	250	3.85	1.57	6.0
Signal, Illum., Aircraft, AN-M43A2 thru AN-M45A2	5-2-5	Pyrotechnic Pistol AN-M8	Free-falling Single Red, Green, or Yellow Star	7	250	3.85	1.57	5.0
Signal, Illum., Aircraft, AN-53A2 thru AN-M58A2	5-2-6	Pyrotechnic Pistol AN-M8	Free-falling Tracer and Two Colored Stars (Same or Different Colors)	Tracer: 2.5 to 4 Stars: 3 to 4.5	250	3.85	1.57	4-6
Signal, Illum., Marine, Mk 1 Mods (Pistol Rocket Signal)	5-2-7	Pyro Pistol Mk 1 or AN-M8	Mod 0: Free-falling Red, Gr. or Y Star Mod 1: Para-Susp. Red Star	Mod 0: 7 Mod 1: 20	500	14	1.68	16
Signal, Illum., Ground, M17A1 thru M22A1 (Ground Signal)	5-3-1	Rifle or Carbine Launcher	Odd Nos.: Single Star Colored, Para-Susp. Even Nos.: 5-Star Colored Cluster Free-falling	Star: 20 Cluster: 4	600	10.4	1.9	16-17
Grenade, Rifle, Smoke, M22A2	5-3-2	Rifle Launcher	Green Smoke Cloud on Impact	8	600	10.14	1.88	16
Grenade, Rifle, Smoke, Streamer, M23 and M23A1	5-3-3	Rifle Launcher	Streams of Colored Smoke During Flight	12	600	10.5	1.9	18
Signal, Illum., Ground, M51A1 and M52A1	5-3-4	Rifle Launcher	M51: Para-suspended Single Red Star M52: Free-falling 5-Red Star Cluster	20-30	600	10.5	1.88	16
Signal, Smoke, Ground, M62, M64, and M65	5-3-5	Rifle Launcher	Six Smoke Streamers: M62-Red, M64-Yellow, M65-Green	20	600	10.4	1.88	15
Navy Light, Mk 1 Mods (Fusee, Warning Railroad)	5-4-1	Held in Hand While Functioning	Mod 0 - Red Light Mod 1 - Blue Light	Mod 0: 135 Mod 1: 75	—	9.5	1.45	7
Signal, Smoke and Illum., Marine, Mk 13 (Signal, Distress, Day & Night)	5-4-3	Held in hand while functioning	Day-Orange Smoke Night-Red Flame	20	—	5.18	1.63	6.4

* Above launch point

HAND-MANIPULATED SIGNALING DEVICES

TABLE 5-1 (continued)

Item	Para-graph	Launched From	Display	Burn Time (Sec.)	Min. Alt. (Ft.)	Max. Lgth. (In.)	Max. Diam. (In.)	Approx. Weight (Oz.)
Signal, Smoke and Illum., Marine, Mk 38	5-4-4	Held in Hand while functioning	Day-Green Smoke Night-Green Flame	Smoke-28 Flame-23	*	5.18	1.63	6.4
Signal, Illum., Ground, M125A1 thru M129A1	5-5-1	Hand Outer case is projector	M125:5 Free-falling Stars. M126-128: Para-susp. colored Star. M129: Para-Suspended Red Smoke	See Para. 5-5-1-8	600	10.14	1.88	21.0
Signal, Illum., Marine, AN-M75	5-5-2	Hand. Outer case is projector	Two Free-falling Red Stars	5	175	5.0	1.25	5.5
Signal, Hand Fired, Mk 80 (Contained in Signal, Kit, Illum., Mk 79, Mod O)	5-5-3	Signal Projector, Mk 31 Mod O	Single Free-falling Red Star	4.5	250	2.25	0.52	12
Signal, Illum., Aircraft, Mk 6 Mod O (A/C Emerg. Ident. Signal)	5-6-1	Hand-thrown From Aircraft. Grenade Type	Para-Suspended Red, Green, or White Star	25	—	5.95	2.6	18
Signal, Smoke, Aircraft, Mk 7 Mod O (A/C Emerg. Ident. Signal)	5-6-2	Hand-thrown From Aircraft. Grenade Type	Para-Suspended Red, Green, Yellow, or Black Smoke	25	—	9.57	2.5	28
Fusee, Warning, Railroad, M72	5-6-3	Ground (Hand-Emplaced)	Red Flame	20 Minutes	—	15.88	0.9	10
Grenade, Hand, Smoke, HC, AN-M8	5-6-4	Hand-Thrown	White Smoke Cloud	105	—	4.5	2.5	23
Grenade, Hand, Smoke, M18	5-6-5	Hand-Thrown	Red, Green, Yellow, or Violet Smoke	50	—	4.5	2.5	23
Cartridge, Signal, Mk 130	5-7-1	38-Caliber Revolver	Red Streak	5.5 - 7.5	800	1.55	0.379	0.39

* Above launch point

5-2. DEVICES FIRED FROM PYROTECHNIC PISTOLS.

All devices covered by this section are cartridge-type signals designed to be launched from pyrotechnic pistols as indicated in the descriptions which follow.

5-2-1. Signal, Illumination, Marine, Mk 2. (Formerly Very Signal Cartridge, Mk 2) (Illustration top of page 5-4)

5-2-1-1. Intended Use. This device (see Figure 5.2.1) is fired from Pyrotechnic Pistol, Mk 5 (see Chapter 4), either from the surface or from aircraft, primarily as a distress signal. It displays a red, green, or white star with a burning time of approximately 6 seconds at an altitude of roughly 200 feet above the point of launching.

5-2-1-2. External Features. This signal resembles a 10-gage shotgun shell. It weighs

approximately 1.1 ounces. The color of the display is indicated by the color of its paper case. To assist in night identification, the closing wad of the green star is smooth, that of the red star has three parallel ridges, and that of the white star has a conical projection in its center.

5-2-1-3. Functional Description. The primer is ignited by the pistol firing pin. The primer ignites a propelling charge which initiates a quickmatch wrapped around the star composition and propels the star composition into the air. The quickmatch ignites the star composition.

5-2-1-4. Handling and Storage. This signal shall be handled and stored in accordance with paragraph 5-1-1 of this chapter.

WARNING

The pyrotechnic pistol is cocked at all times when the breech is closed.

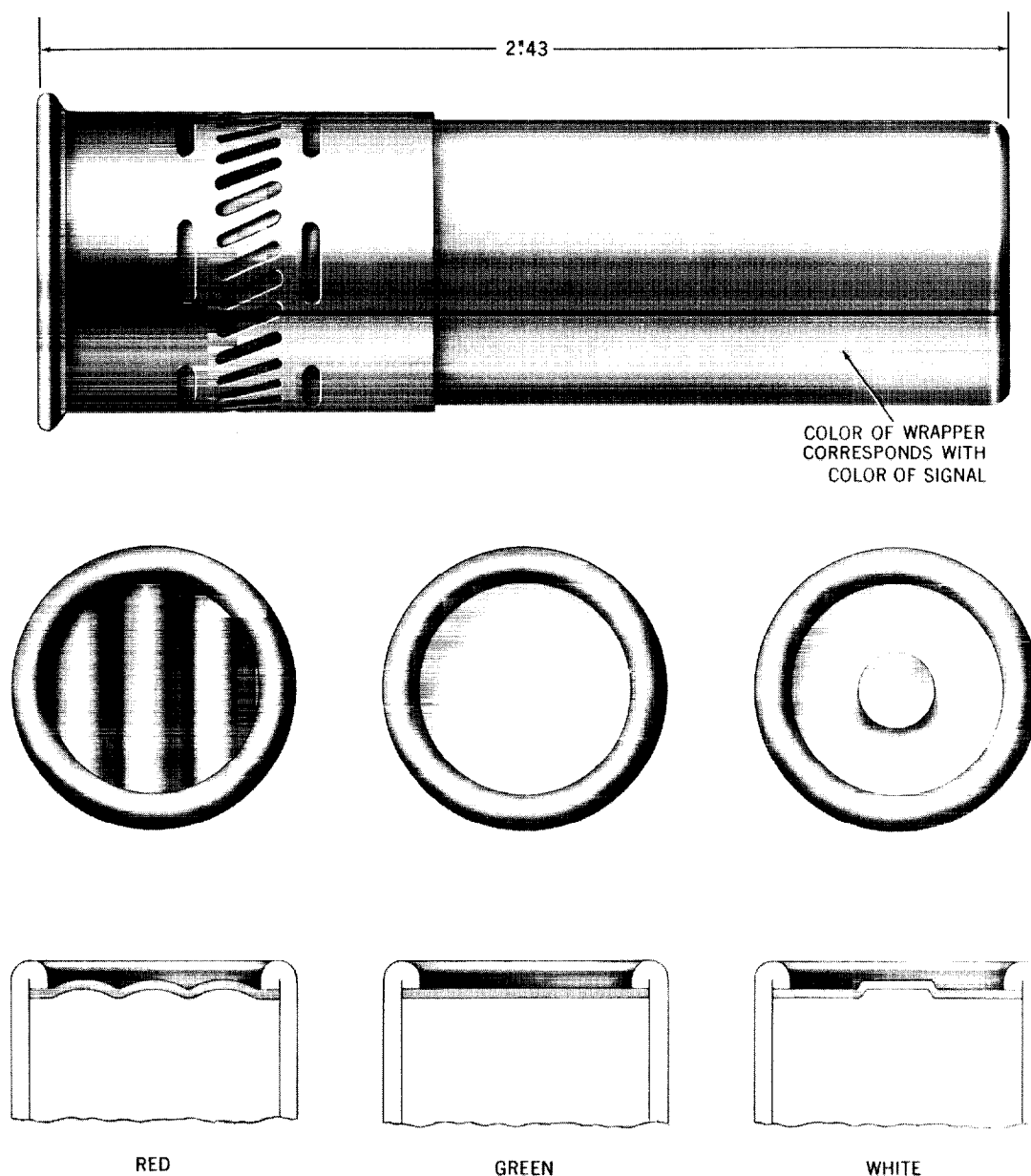


Figure 5.2.1 Marine Illumination Signal, Mk 2

Signals shall not be placed in the pistol until just prior to use. Unfired signals must not be left in the pistol.

5-2-1-5. Safety Precautions. The safety precautions of paragraph 5-1-2 of this chapter apply to this device.

5-2-1-6. Shipping Containers. These signals

are shipped in metal boxes, packed either 400, 450, or 1000 to the box. Such filled boxes weigh approximately 49, 52, and 100 pounds respectively.

5-2-1-7. Identification Data. This signal is listed under Dwg. No. 344562, Specification MIL-S-18737, and FSN and DOD Codes as follows: Green - 1370-038-4930, L541; Red -

HAND-MANIPULATED SIGNALING DEVICES

1370-038-4929, L542; White - 1370-038-4928, L543.

5-2-2. Signal, Smoke, Marine (Rocket), Mk 2 Mods 0 and 1. (Formerly Pistol Rocket Signal (Smoke), Mk 2 Mods 0 and 1)

mods of this device, both of which are available in the supply system, are very similar. They differ only in construction details of the rocket motor and in the weight of the expelling charge.

5-2-2-3. External Features. This 1-pound

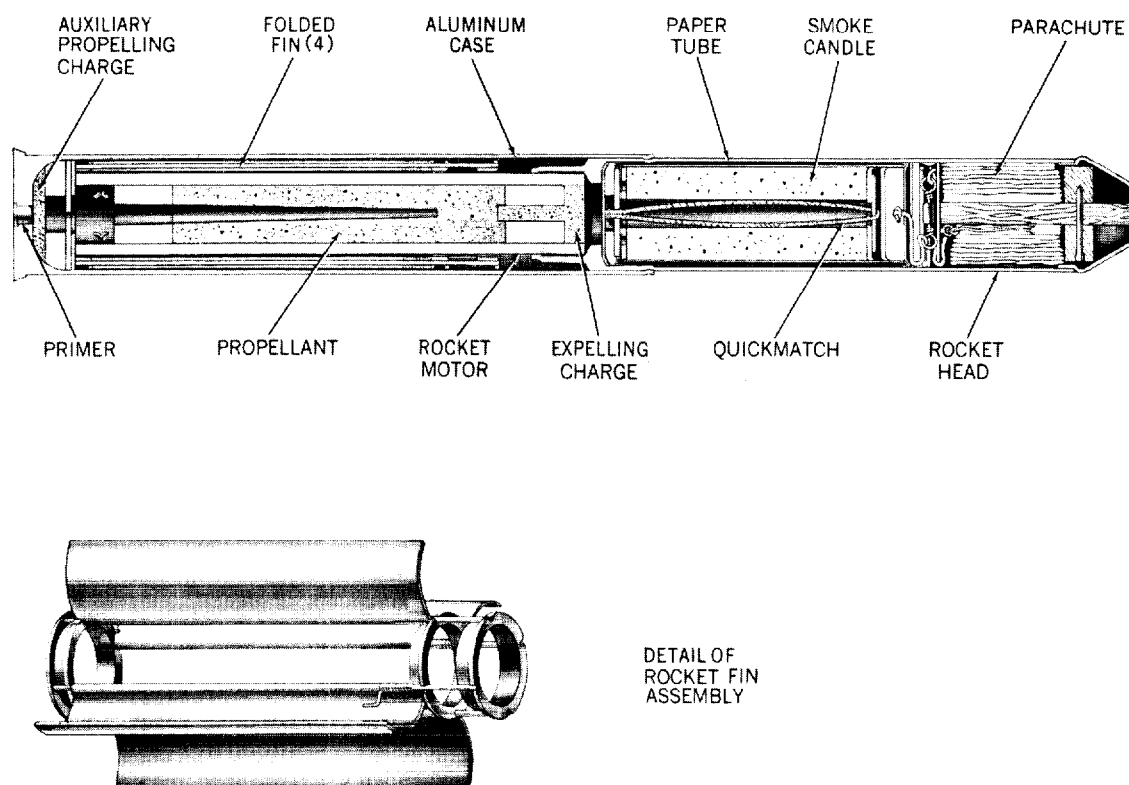


Figure 5.2.2 Marine Smoke Signal, Mk 2

5-2-2-1. Intended Use. This device (see Figure 5.2.2) is used for signaling between surface craft and aircraft. It is fired from either Pyrotechnic Pistol, Mk 1 (paragraph 4-2-1) or Pyrotechnic Pistol, AN-M8 (paragraph 4-2-3). Its red smoke display is parachute suspended, and persists for 20 to 30 seconds at a minimum height of approximately 500 feet above its launching point.

5-2-2-2. Difference Between Mods. The two

signal is 14 inches long. Its base diameter is 1.68 inches. It is aluminum encased. A percussion primer, Mk 5, is fitted into its base end, and its forward end is fitted with a truncated nose cap.

5-2-2-4. Internal Description. This signal consists of a rocket motor and a rocket head which contains a pyrotechnic smoke candle and a parachute. Immediately forward of the primer is a small auxiliary propelling charge. The rocket motor con-

tains a black powder propellant charge and an expelling charge. Four folding vanes are attached to the base of the motor. The curved vanes are approximately 4 inches long and 1 inch wide.

5-2-2-5. Functioning. When the pistol firing pin strikes the primer, the auxiliary propelling charge ignites. This combustion projects the rocket to a height of approximately 30 feet and simultaneously ignites the main propellant charge. The folded vanes spring open to stabilize flight to an altitude of as much as 650 feet. Upon reaching peak altitude, the rocket motor ignites the expelling charge which ignites the quickmatch and expels the smoke candle and parachute. The quickmatch ignites the smoke candle which is then suspended on the parachute.

5-2-2-6. Handling and Storage. The general rules of paragraph 5-1-1 of this chapter apply.

WARNING

Pyrotechnic pistols contain no safing mechanism; they are cocked when the breech is closed. Do not load until ready to use. Remove unfired signals immediately.

5-2-2-7. Safety Precautions. In addition to the precautions set forth in paragraph 5-1-2 of this chapter, the following must be observed:

(1) Visibly damaged, dented, or corroded signals must not be loaded into pyrotechnic pistols. They must be carefully segregated for disposition in accordance with Chapter 3 of this pamphlet.

(2) Under no circumstances shall these signals be disassembled or tampered with. Misfires must be disposed of immediately.

(3) This signal is propelled with considerable force. Always point the pistol upward and away from the body and from nearby friendly personnel and equipment while loading, firing, or unloading.

(4) Signals must not be removed from

individual shipping containers (mailing tubes) until immediately before use.

(5) Signals that have been unpackaged must not be restowed except as originally packaged. They must be thoroughly dried before being resealed in their mailing tube containers.

5-2-2-8. Shipping Containers. Mk 2 Marine Smoke Signals are packaged in individual waterproof mailing tubes, and the tubes are packed as indicated in paragraph 5-2-2-9 following.

5-2-2-9. Identification Data. The following table applies:

SIGNAL, SMOKE, MARINE (ROCKET), MK 2 MODS
(Specification: MIL-S-18568)

Mod	Packaging	Assy. Dwg.	FSN	DOD Code
0	50/Wooden Box	2127743	1370-038-4966	L201
1	24/Mk 1 Box	2127744	1370-038-4977	L201
1	24/Mk 11-0 Cntr	2127744	1370-707-0580	L201
1	50/Wooden Box	2127744	1370-082-9959	L201
1	50/Metal Can	2127744	1370-038-4972	L201

5-2-3. Signal, Illumination, Aircraft, M11.
(Formerly Signal, Aircraft, Red Star, Parachute, M11)

5-2-3-1. Intended Use. This device (see Figure 5.2.3) is designed to be fired from Pyrotechnic Pistol, AN-M8 (see Chapter 4), either from aircraft or from the surface, as a distress signal. It displays a single, parachute-suspended red star of approximately 20,000 candlepower which burns for 30 seconds and which can be seen for 7 to 8 miles in clear weather.

5-2-3-2. External Features. This 9.6 ounce signal consists of a cylindrical aluminum outer case approximately 7-1/2 inches long and 1-1/2 inches in diameter. It contains a percussion-type primer. The outer case has an extraction groove at one end and a metal closing wad at the other. The closing wad has raised letter "RP" (Red Parachute) to facilitate night identification.

5-2-3-3. Functional Description. The pistol firing pin sets off the primer which ignites the propelling charge. The propelling

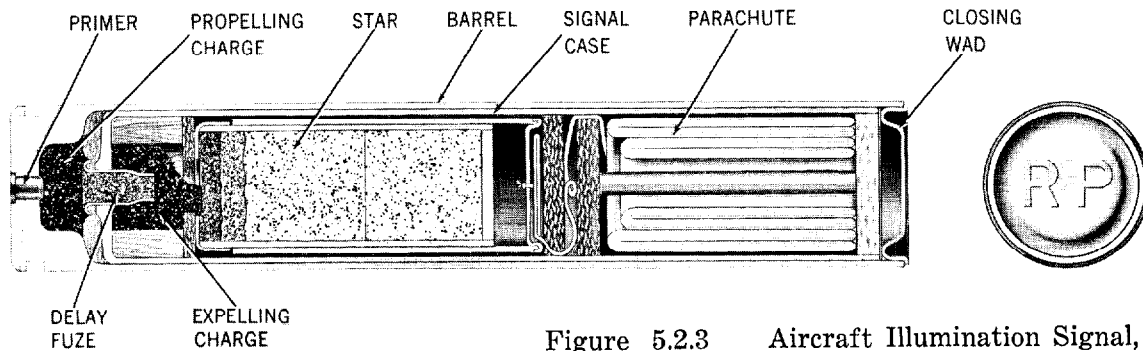


Figure 5.2.3 Aircraft Illumination Signal, M11

charge ignites the 2.5-second delay fuse and propels the inner case containing the pyrotechnic candle and parachute out of the barrel. The delay fuse ignites the expelling charge which ignites the pyrotechnic candle and expels the candle and the parachute 150 to 250 feet above the point of launching. The suspended rate of fall is approximately 6 feet per second.

5-2-3-4. Handling and Storage. This signal shall be handled and stored in accordance with paragraph 5-1-1 of this chapter.

WARNING

The pyrotechnic pistol is cocked

at all times when the breech is closed. Signals shall not be placed in the pistol until just prior to use. Unfired signals must not be left in the pistol.

5-2-3-5. Safety Precautions. The safety rules in paragraph 5-1-2 of this chapter apply.

5-2-3-6. Shipping Containers. These signals are shipped in a wooden box (drawing No. 76-16-167), 60 signals to the box. The gross weight of a filled box is approximately 61 pounds.

5-2-3-7. Identification Data. This signal is

listed under Dwg. No. 78-0-10, FSN 1370-541-0215, and DOD Code No. L178.

5-2-4. Signal, Illumination, Aircraft, AN-M-37A2 thru AN-M42A2 Series, Double Star.

projected (see para 5-2-4-7 following). All have aluminum cases with rimmed bases to fit the pistol ejector. Each is approximately 4 inches long and 1½ inches in diameter. The display colors are indicated by ¼-inch bands

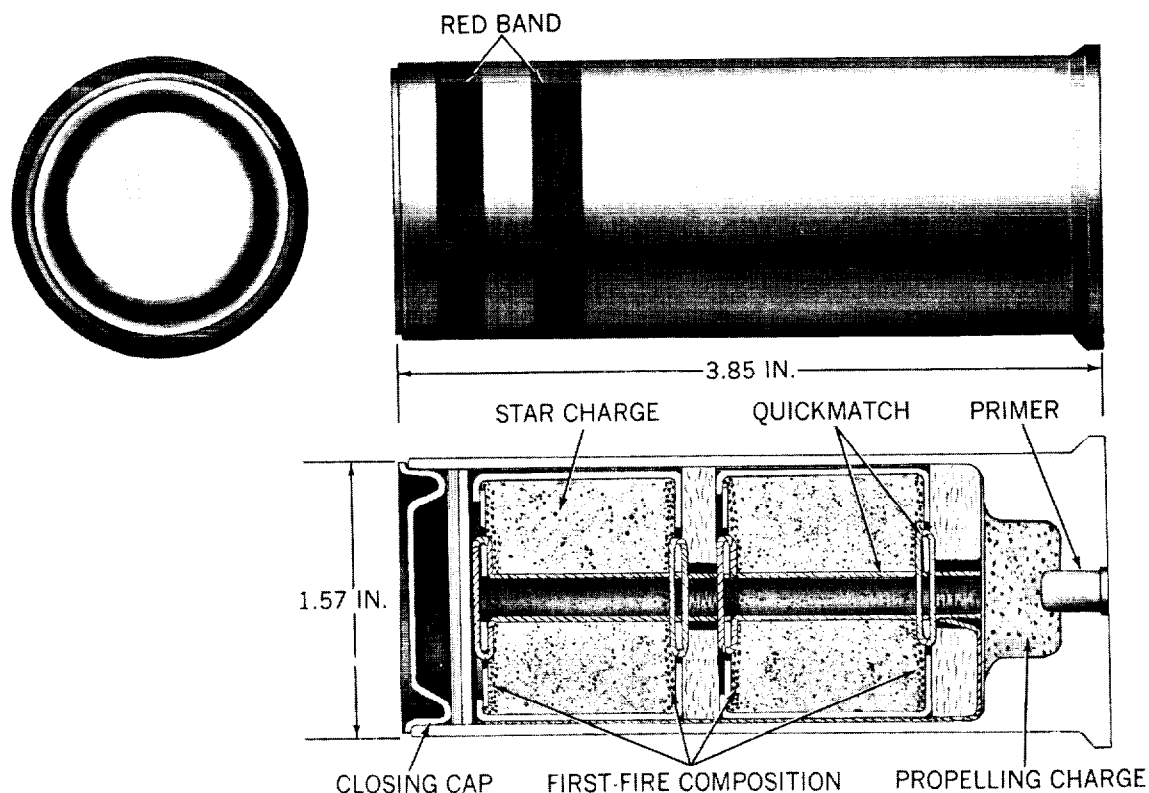


Figure 5.2.4 Aircraft Illumination Signal, AN-M37A2 - AN-M42A2

5-2-4-1. Intended Use. These signals (see Figure 5.2.4) are fired from Pyrotechnic Pistol, AN-M8 (see Chapter 4), either from aircraft or from the surface for day or night identification or signaling. Each signal projects two stars — burning time 7 seconds — of the same or different colors to an altitude of approximately 250 feet above the point of launching. The 25,000-candlepower stars are visible from 2 to 3 miles in daylight and 5 miles at night in clear weather. These signals have no delay feature.

5-2-4-2. External Features. The signals in this series differ only in the color of the stars

around the circumference and by colors on the closing wad. No provision is made for identification by touch.

5-2-4-3. Functional Description. These devices are functioned by the pistol firing pin striking the primer. The primer ignites the propelling charge (2.5 grams black powder) which projects the stars and ignites the quickmatch. The quickmatch ignites the stars.

5-2-4-4. Handling and Storage. These signals shall be handled and stored in accordance with paragraph 5-1-1 of this chapter.

WARNING

The pyrotechnic pistol is cocked at all times when the breech is closed. Signals shall not be placed in the pistol until just prior to use. Unfired signals must not be left in the pistol.

5-2-4-5. Safety Precautions. The safety rules in paragraph 5-1-2 of this chapter apply.

5-2-4-6. Shipping Containers. These signals are shipped in wooden boxes (dwg. No. 8836-950), 80 to the box. Within each box are 8 fiberboard cartons (dwg. No. 8836949), each containing 10 signals. Each filled wooden box weighs approximately 57.5 pounds.

5-2-4-7. Identification Data. The various signals in this series are identified as follows:

Model	Double-Star Display	Dwg. No.	Spec.	FSN	DOD Code
AN-M37A2	Red/Red	8847462	MIL-S-1398	1370-540-8506	L225
38A2	Yellow/Yellow	"	"	1370-618-5786	L226
39A2	Green/Green	"	"	1370-801-4014	L227
40A2	Red/Yellow	"	"	1370-541-9628	L228
41A2	Red/Green	"	"	1370-540-8500	L229
42A2	Green/Yellow	"	"	1370-540-8505	L230

5-2-5. Signal, Illumination, Aircraft, AN-M-43A2 thru AN-M45A2 Series, Single Star.

(Illustration on page 5-9)

5-2-5-1. Description. In respect to use, description, functioning, handling and storage, safety precautions, and mode of shipment, the signals in this series are identical to those de-

scribed in paragraph 5-2-4 preceding, except that: (1) these signals display single red, green, or yellow stars, and (2) the color of the display is indicated by 1/2-inch bands around the circumference instead of 1/4-inch bands (see Figure 5.2.5).

5-2-5-2. Identification Data. The various signals in the series are identified as follows:

Model	Single-Star Display	Dwg. No.	Spec.	FSN	DOD Code
AN-M43A2	Red	8847467	MIL-S-1419	1370-618-5790	L231
44A2	Yellow	"	"	1370-540-8508	L232
45A2	Green	"	"	1370-028-5967	L233

5-2-6. Signal, Illumination, Aircraft, AN-M-53A2 thru AN-M58A2 Series, Tracer Double Star.

(Illustration on page 5-10)

5-2-6-1. Description. In respect to use, description, functioning, handling and storage, safety precautions, and mode of shipment, the signals in this series are identical to those described in paragraph 5-2-4 preceding, except

that: (1) these signals project a tracer in addition to two stars, (2) the color of the display is indicated by a 1/4-inch band near the closing wad for the tracer and two 1/2-inch bands near the center of the signal body for the two stars, and (3) these signals have a 4-second delay and a shorter burning time. (see Figure 5.2.6).

5-2-6-2. Identification Data. The various signals in this series are identified as follows:

Model	Tracer	Display Stars	Dwg. No.	Spec.	FSN	DOD Code
AN-M53A2	Yellow	Red/Yellow	8847441	MIL-S-1399	1370-580-1394	L234
54A2	Green	Red/Red	"	"	1370-580-1399	L235
56A2	Red	Green/Green	"	"	1370-580-1397	L237
57A2	Red	Red/Red	"	"	1370-580-1395	L238
58A2	Red	Green/Red	"	"	1370-580-1396	L239

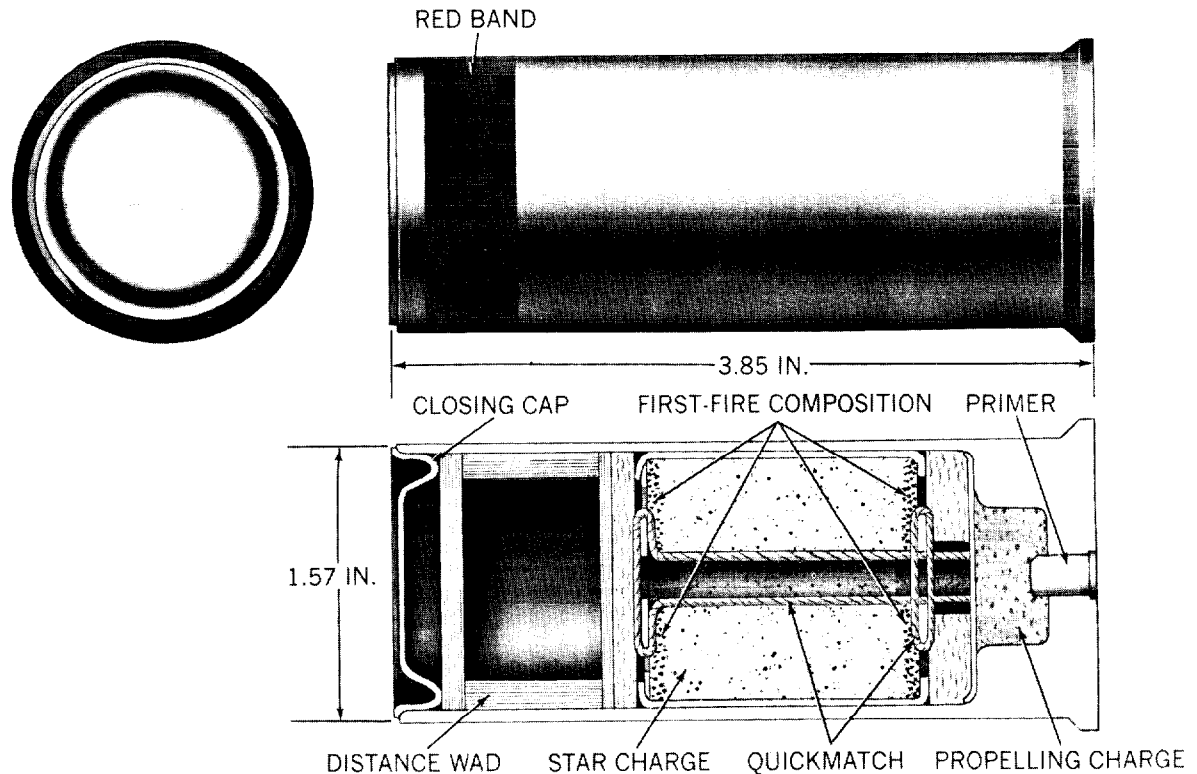


Figure 5.2.5 Aircraft Illumination Signal, AN-M43A2 - AN-M45A2

5-2-7. Signal, Illumination, Marine, Mk 1 Mods 0, 1, and 4.

(Formerly Pistol Rocket Signal, Mk 1 Mods 0, 1, and 4)

(Illustration on page 5-11)

NOTE: Signal, Illumination, Marine Mk 1 Mod 4 is obsolete and should not be in the supply system. If any are found in the system, they should be returned to an ammunition depot for appropriate disposition.

5-2-7-1. Intended Use. This signal (see Figure 5.2.7) is fired from either Pyrotechnic Pistol, Mk 1 or Pyrotechnic Pistol, AN-M8 (see Chapter 4) for any appropriate signaling purpose.

5-2-7-2. External Features. This 1-pound signal has an aluminum case 14 inches long and 1.68 inches in diameter. A percussion-type primer is centered in its rimmed base. It has an ogive nose.

5-2-7-3. Functional Description. When the firing pin strikes the primer, an auxiliary expelling charge is ignited projecting the upper section to an altitude of approximately 30 feet above the launching point. The auxiliary expelling charge also ignites the rocket propellant. Folded fins attached to the base of the rocket head spring out to stabilize flight to a minimum height of 500 feet. The rocket propellant ignites the main expellant charge which expels and ignites the pyrotechnic composition.

5-2-7-4. Differences between Mods. Mod 0 produces a red, green, or yellow 7- to 11-second star which falls free and leaves a trail of white light similar to the tail of a comet. Mod 1 produces a single 20- to 30-second parachute-suspended red star.

5-2-7-5. Handling, Storage, and Safety. The general rules of paragraphs 5-1-1 and 5-1-2 of this chapter apply to this signal.

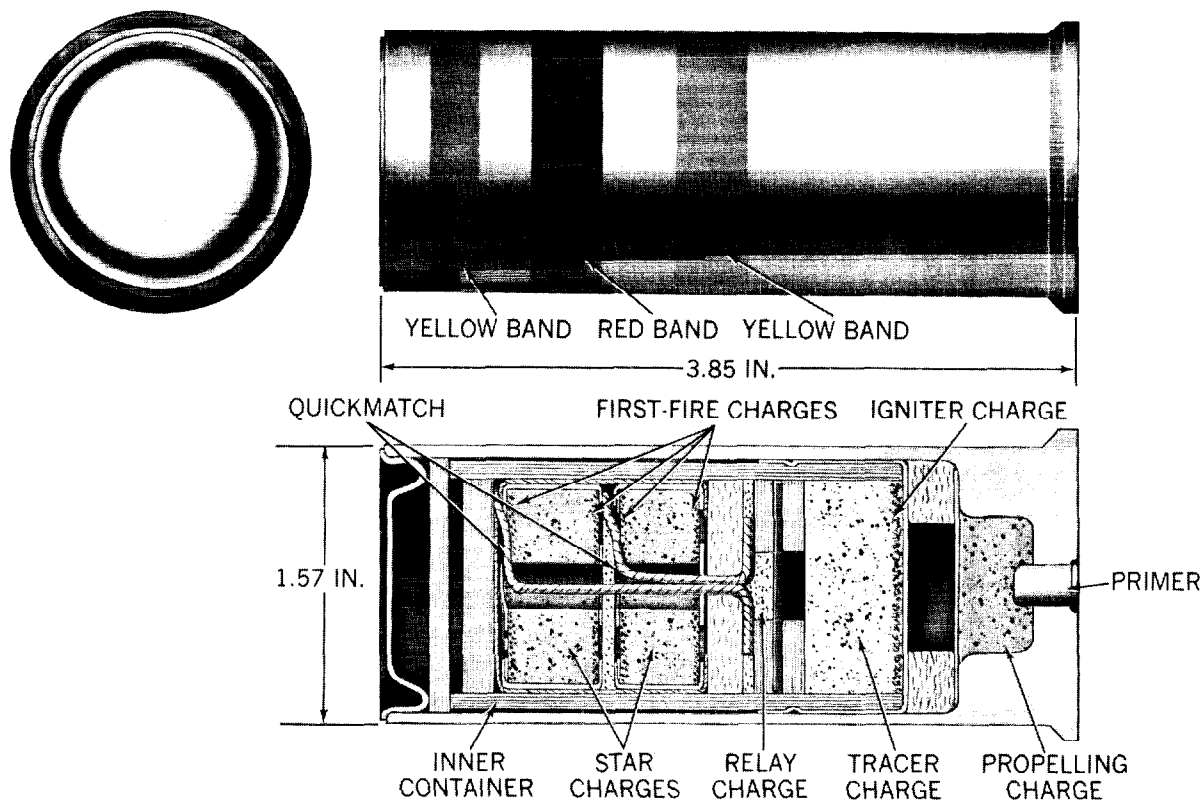


Figure 5.2.6 Aircraft Illumination Signal, AN-M53A2 - AN-M58A2

5-2-7-6. Shipping Containers. These signals are packed in individual waterproof mailing tubes, 50 tubes to a wooden box. A filled box weighs approximately 90 pounds.

5-2-7-7. Identification Data. All of these signals are covered by Dwg. No. 344418 and Specification MIL-S-18568. FSN and DOD Code Nos. are as follows:

Color	FSN	Dod Code
Mod O Green	1370-038-4980	L190
Mod O Yellow	1370-038-4981	L192
Mod O Red	1370-038-4979	L191
Mod 1 Red	1370-038-4982	L193

5-2-8. Signal, Illumination, Marine, Mk 3 Mod O.
(Formerly Pistol Rocket Signal, Mk 3 Mod O)

NOTE: This signal is obsolete and should not be in the supply system. If any are found in the system, they should be returned to an ammunition depot for appropriate disposition.

5-3. DEVICES FIRED FROM RIFLE GRENADE LAUNCHERS.

All of the devices described in this section are designed to be launched or fired from rifle grenade launchers as indicated in the individual item descriptions which follow.

5-3-1. Signal, Illumination, Ground, M17A1 thru M22A1.
(Formerly Ground Signal, M17A1 thru M22A1 Series)
(Illustration top of page 5-12)

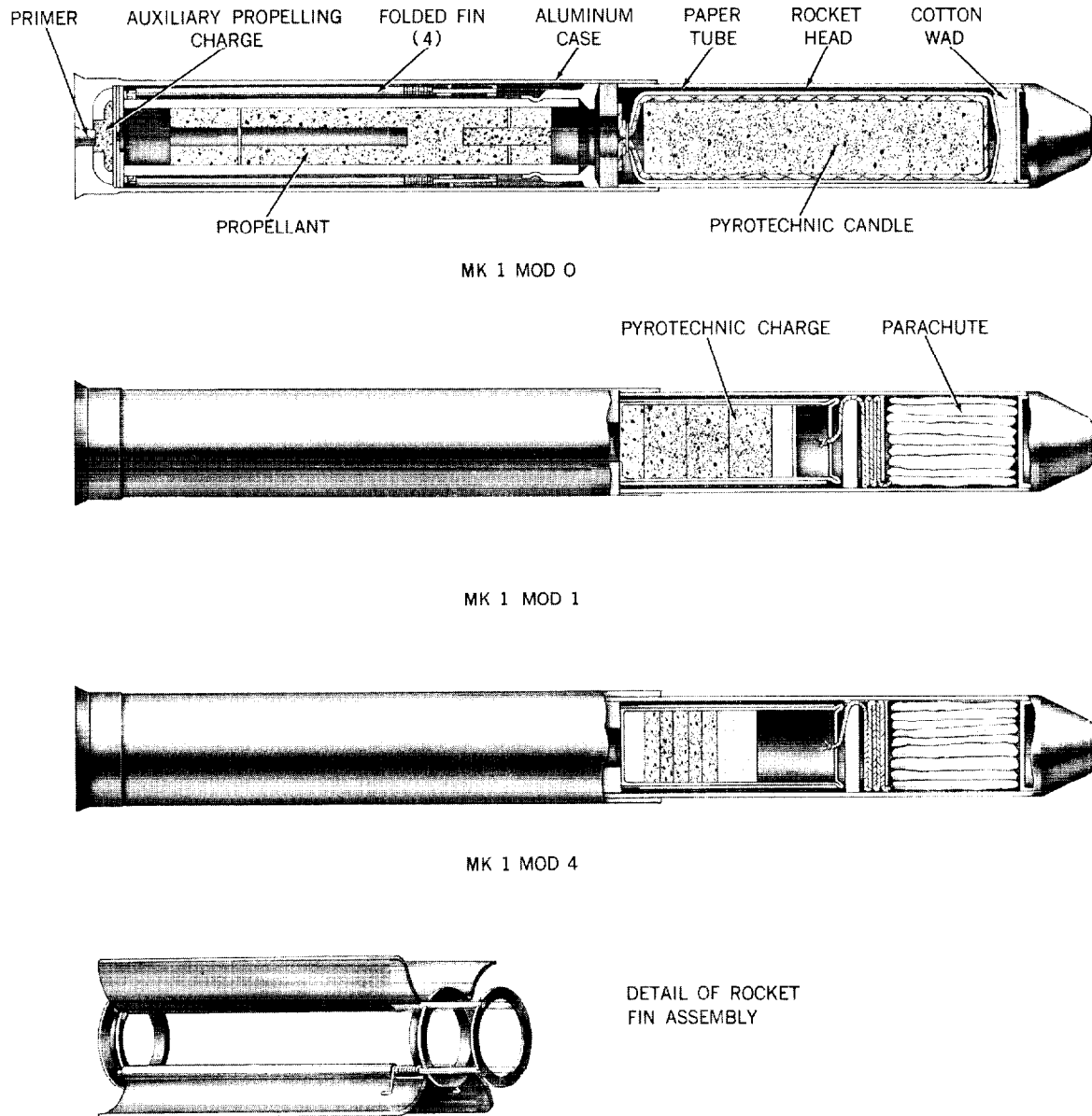


Figure 5.2.7 Marine Illumination Signal, Mk 1

5-3-1-1. Intended Use. These signals (see Figure 5.3.1) are designed to be fired from a rifle or a carbine fitted with a launcher for signaling by ground units. They produce either a parachute-suspended colored star or a cluster of free-falling colored stars (see paragraph 5-3-1-8).

5-3-1-2. External Features. These signals are similar in appearance except that the A1 series have aluminum bodies whereas the A1B2 series have steel bodies. The cylindrical body is approximately 10½ inches long and 1.9 inches in diameter, with a closing cap at one end and a tail and fuze housing at the other. The tail is fitted with a circular fin. A cork plug, to

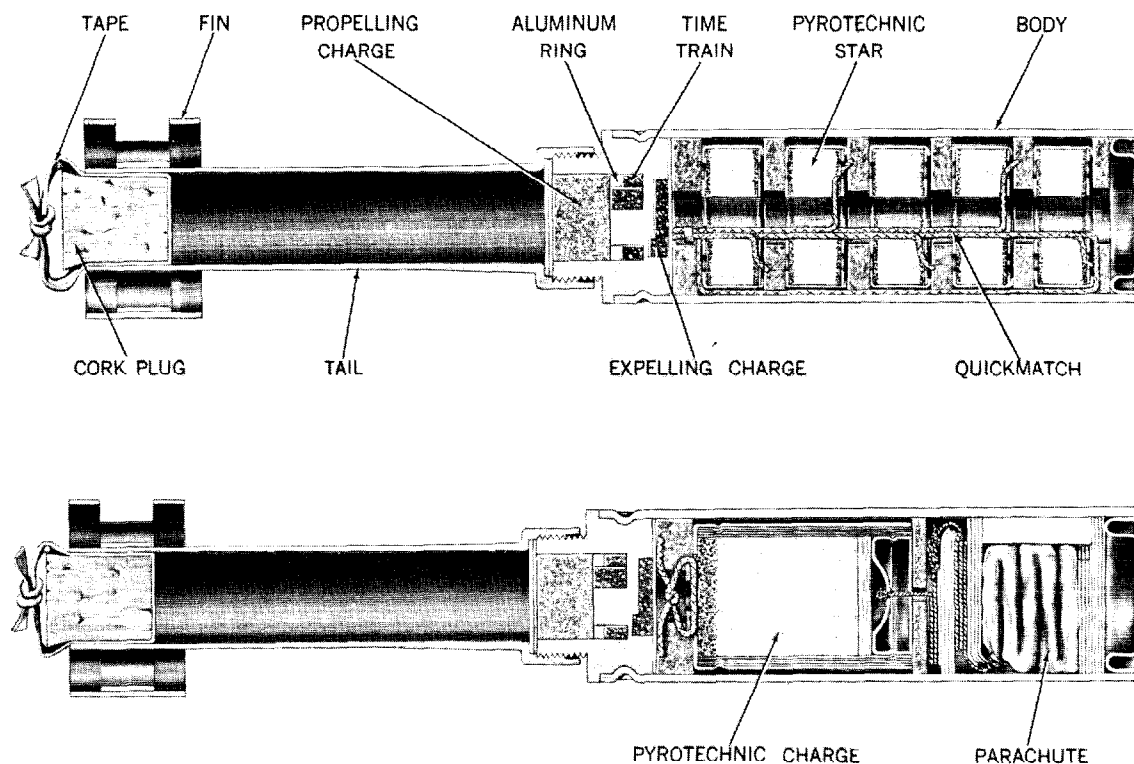


Figure 5.3.1 Ground Illumination Signal, M17A1 - M22A1

which is attached a pull tape, closes the finned end. Raised letters on the closing cap facilitate identification at night: "W" for white, "G" for green, and "A" for amber. The letter "P" indicates a parachute-suspended star, while "S" indicates a cluster of five free-falling stars. Thus, "WS" means five free-falling white stars, and "GP" means a single parachute-suspended green star.

5-3-1-3. Make-Ready Procedures. These devices may be launched by grenade launcher M7 or M7A1 attached to a service rifle using rifle grenade cartridge, caliber .30, M3, or by grenade launcher M8 attached to a carbine using grenade cartridge, caliber .30, M6. The following steps are taken to prepare for launching:

(1) Remove the signal from its sealed container and inspect it for serviceability.

(2) Remove the cork plug from the finned end by pulling on the pull tape.

(3) Remove the special blank cartridge from the under side of the cork plug (in some cases, these cartridges are packed separately in the shipping container).

(4) Load the rifle or carbine with the proper grenade cartridge.

(5) Secure the rifle or carbine locking device.

5-3-1-4. Functional Description. Parachute-suspended signals (M17, M19, and M21 series) burn 20 to 30 seconds. Free-falling clusters burn 4 to 10 seconds. The parachute-suspended stars fall at a rate of 7 feet per second. In firing these signals, the rifle or carbine butt shall be placed firmly on the ground with the barrel inclined at an angle of approximately 15 degrees from the vertical. The grenade-launching cartridge projects the signal and ignites the propelling charge. The propelling charge sets off the delay element which burns

through to the expelling charge. The expelling charge ejects the pyrotechnic composition and ignites the quickmatch which, in turn, ignites the star or stars.

5-3-1-5. Handling and Storage. These devices shall be handled and stored in accordance with the general rules contained in paragraph 5-1-1 of this chapter.

5-3-1-6. Safety Precautions. The following special safety rules specifically pertinent to these signals shall be observed in addition to the general rules in paragraph 5-1-2 of this chapter:

- (1) Containers must not be unsealed until just before it is intended to fire the signal.
- (2) Cork plugs shall not be removed except as an actual step in make-ready procedures (see paragraph 5-3-1-3 preceding).
- (3) If the order to launch a signal is reversed after the signal has been removed from its container, the cork plug must be replaced and the signal returned to its container and resealed.
- (4) Only specified grenade-launching cartridges may be used. Ball-type ammunition must never be used to launch a grenade or signal.
- (5) Visibly defective signals must be segregated for disposal at the earliest practicable time.
- (6) Grenade rifles and carbines must never be pointed in the direction of friendly personnel or equipment. Falling signal cases present a serious missile hazard.
- (7) All personnel within range are required to wear steel helmets.
- (8) Personnel near the point of launching should wear eye-protective goggles to avoid injury from blow-back of burning powder.

5-3-1-7. Shipping Containers. These devices are packed in individual fiber containers, 30 and 48 signals to a wooden box. Each box contains 50 grenade cartridges, M3, and 30 cartridges, M6. Filled wooden boxes weigh 63 or

99 pounds, depending upon the number of signals contained therein.

5-3-1-8. Identification Data. The following table provides information relating to these signals:

PARACHUTE-SUSPENDED SINGLE STAR				
Model	Dwg. No.	Display	FSN	Dod Code
M17A1	395774	White	1370-554-1146	L327
M19A1	395776	Green	1370-965-0864	L310
M21A1	395778	Amber	1370-529-8547	L309
FREE-FALLING 5-STAR CLUSTER				
M18A1	395775	White	1370-529-8558	L316
M20A1	395777	Green	1370-529-8556	L325
M22A1	395779	Amber	1370-529-8546	L313

5-3-2. Grenade, Rifle, Smoke, M22A2.
(Illustration on page 5-14)

5-3-2-1. Intended Use. This device (see Figure 5.3.2) is designed to be launched either from an M1 rifle using a launcher M7 or M7A1 and a caliber .30, M3 grenade cartridge or from an M1903A3 rifle using an M1 launcher with caliber .30, M3 cartridge. It is used for signaling by ground forces, producing green smoke.

5-3-2-2. External Features. This device differs from the Signal, Illumination, Ground, M17A1 through M22A1 described in the preceding paragraph 5-3-1 in that it has a round nose cap and does not have a cork plug in its stabilizer. The outer case is painted blue-gray with a yellow band and yellow markings. There is a safety pin fitted into the stabilizer section which prevents impact fuze functioning.

5-3-2-3. Functional Description. When the device is placed on the rifle launcher, the safety pin is withdrawn. Hot gases from the cartridge project the grenade to the impact point. On impact, the inertia firing pin overcomes the firing pin spring tension and strikes the M45 primer which ignites the starter mixture. The starter mixture ignites the smoke mixture which is emitted through holes in the base of the grenade.

5-3-2-4. Handling and Storage. This device must not be lifted or handled by the safety pin pull ring. Care must be taken to avoid damage to the stabilizer assembly. All general handling

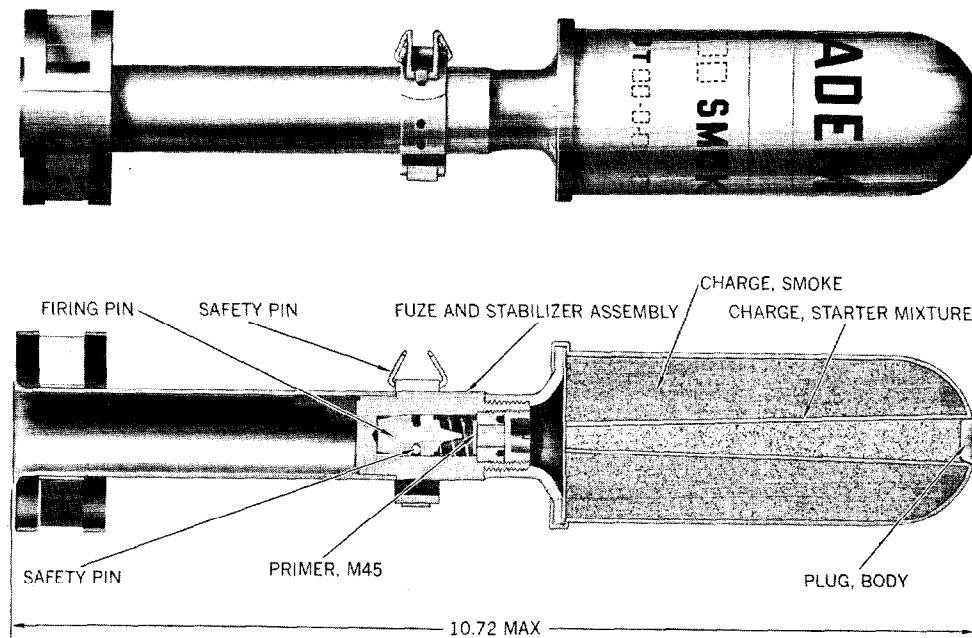


Figure 5.3.2 Rifle Smoke Grenade, M22A2

and storage rules in paragraph 5-1-1 of this chapter must be observed.

5-3-2-5. Safety Precautions. This grenade must not be placed in the launcher unless it is to be fired immediately. The safety pin shall remain in place until ready to launch. If it is not fired, it must be rendered safe by replacing the safety pin *before* it is removed from the launcher. Devices with cracked or distorted stabilizers shall not be used. Only the blank cartridges specified in paragraph 5-3-2-1 of this section shall be used. All general safety rules set forth in paragraph 5-1-2 of this chapter apply.

5-3-2-6. Shipping Containers. These devices are packed in individual containers, 10 containers to a wooden box. Each box displaces 1.04 cubic feet.

5-3-2-7. Identification Data. This device is listed under Dwg. No. 82-0-117-5, Specification MIL-G-20473, FSN 1330-028-5909, and DOD Code No. G995.

5-3-3. Grenade, Rifle, Smoke, Streamer, M23 & M23A1. (Illustration top of page 5-15)

5-3-3-1. Intended Use. This device (see Figure 5.3.3) is similar in all descriptive and operational respects to the Grenade, Rifle, Smoke, M22A2, described in the preceding paragraph

5-3-2, except that it emits streams of colored smoke during flight instead of a cloud of smoke after impact, and that it does not contain an impact fuze or safety pin; the starter mix is directly ignited by hot gases and flame from the M45 primer.

5-3-3-2. Identification Data. All of these devices are covered by Dwg. No. 82-0-139 and Specification MIL-G-13598. FSN and DOD Code Nos. are as follows:

Model	Display	FSN	DOD Code
M23	Green	1330-028-5889	H000
M23	Red	1330-028-5887	H015
M23	Violet	1330-301-1984	H025
M23	Yellow	1330-028-5888	H040
M23A1	Green	1330-028-5916	H000
M23A1	Violet	None	None
M23A1	Yellow	1330-028-5917	H040
M23A1	Red	1330-028-5915	H015

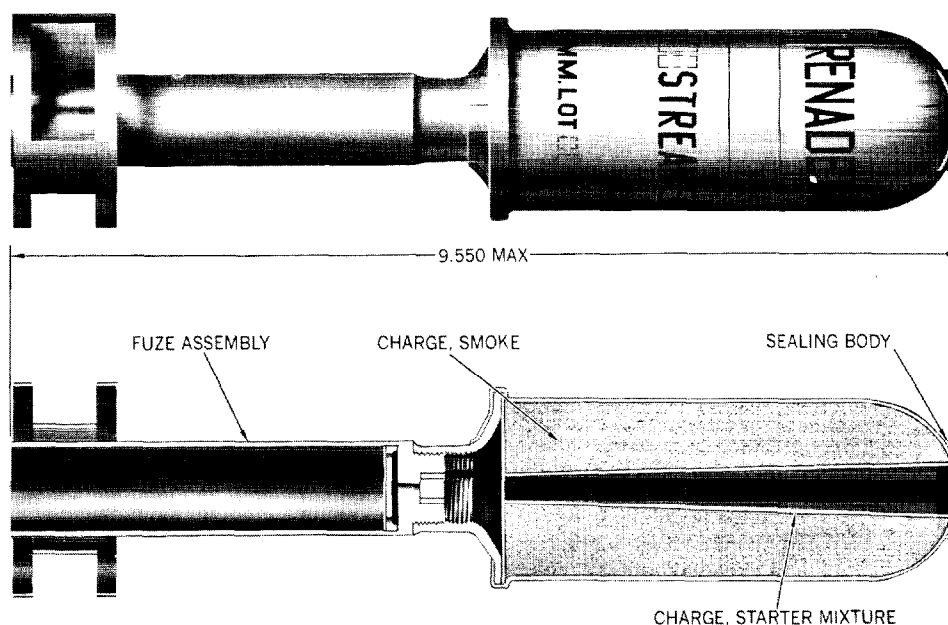


Figure 5.3.3 Rifle Smoke Grenade, Streamer, M23A1

5-3-4. Signal, Illumination, Ground, M51A1 and M52A1.

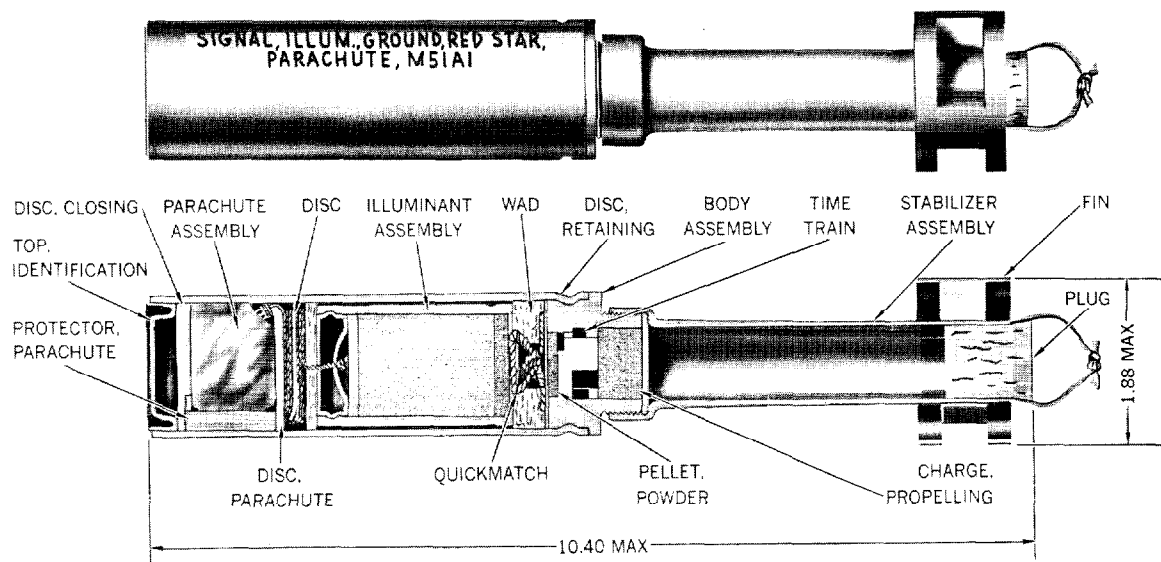


Figure 5.3.4 Ground Illumination Signal, M51A1 & M52A1

5-3-4-1. Intended Use. These signals (see Figure 5.3.4) are designed to be fired from a service rifle using caliber .30 rifle grenade cartridge, M3, and grenade launcher, M7 series.

They project either a parachute-suspended red star or a cluster of five free-falling red stars for night signaling by ground troops.

5-3-4-2. External Features. This signal consists of a drawn aluminum body approximately 10½ inches long and 2 inches in diameter, secured at one end by crimping to an aluminum fuze housing, with a stabilizer located at the fuze end. A cork plug with pull tape closes the finned end of the stabilizer. The opposite end of the M51A1 is closed by a red cap on which is embossed "RP" for red parachute. The closing cap of the M52A1 is embossed "RS" for red star cluster.

5-3-4-3. Functional Description. Gases produced by the grenade cartridge launch this signal. Since these gases do not lift the signal to the desired altitude, a propelling charge is assembled in the base of the signal and is ignited by the cartridge. The propelling charge provides the needed extra boost and also ignites the time train which burns in both directions providing a 5½-second delay, during which time the signal rises to approximately 600 feet. The time train then flashes through the flash hole to the black powder expelling charge. The expelling charge forces the candle and the parachute out and ignites the quickmatch which sets off the priming charge. The priming charge ignites the first-fire composition which, in turn, ignites the star.

5-3-4-4. Handling and Storage. This device shall be handled and stored in accordance with paragraph 5-1-1 of this chapter.

5-3-4-5. Safety Precautions. The general safety rules in paragraph 5-1-2 of this chapter apply. In addition, the following special rules shall be observed:

- (1) Do not remove this signal from its container until just before firing.
- (2) Do not pull cork plug until signal has been attached to the launcher.
- (3) After pulling the plug, do not point ejection end of the signal toward the body, toward friendly personnel, or toward flammable materials.
- (4) Do not permit expended signal body to fall on friendly personnel or equipment.
- (5) Dented, cracked, or otherwise damaged signals shall not be used. They must be re-

sealed in their containers and segregated for appropriate early disposition.

5-3-4-6. Shipping Containers. These signals are packed in individual fiber containers, 48 containers per box, with 50 grenade cartridges, M3. They also may be obtained 30 to the box with the same number of grenade cartridges.

5-3-4-7. Identification Data. The following table provides information relative to these signals:

Model	Dwg. Nos.	FSN	DOD Code
M51A1	78-0-37	1370-529-8550	L326
M52A1	78-0-38	1370-028-5998	L315

5-3-5. Signal, Smoke, Ground, M62, M64, and M65. (Illustrations top of page 5-17)

5-3-5-1. Intended Use. These signals (Figure 5.3.5) are the same as the Signal, Illumination, Ground, M51A1, described in paragraph 5-3-4 preceding except that: (1) they produce six red, yellow, or green smoke streamers respectively, instead of a parachute-suspended red star; (2) they are used for daytime signaling; and (3) each has an appropriately colored 1-inch band around its nose section instead of embossed letters on its closing cap. This signal burns for 20 seconds and is visible for 5 miles. Handling and storage and safety precautions are the same as for the M51A1 signal (see paragraph 5-3-4 preceding).

5-3-5-2. Shipping Containers. These signals are individually packed in fiber containers, 10 to a metal can, 3 metal cans to a wooden box. Each metal can also contains 10 grenade cartridges, M3.

5-3-5-3. Identification Data. All of these signals are covered by Dwg. No. 78-0-106 and Specification MIL-S-20471. FSN and DOD Code Nos. are as follows:

Model	Smoke Color	FSN	DOD Code
M62	Red	Not available	L320
M64	Yellow	1370-028-6000	L322
M65	Green	Not available	L318

✓

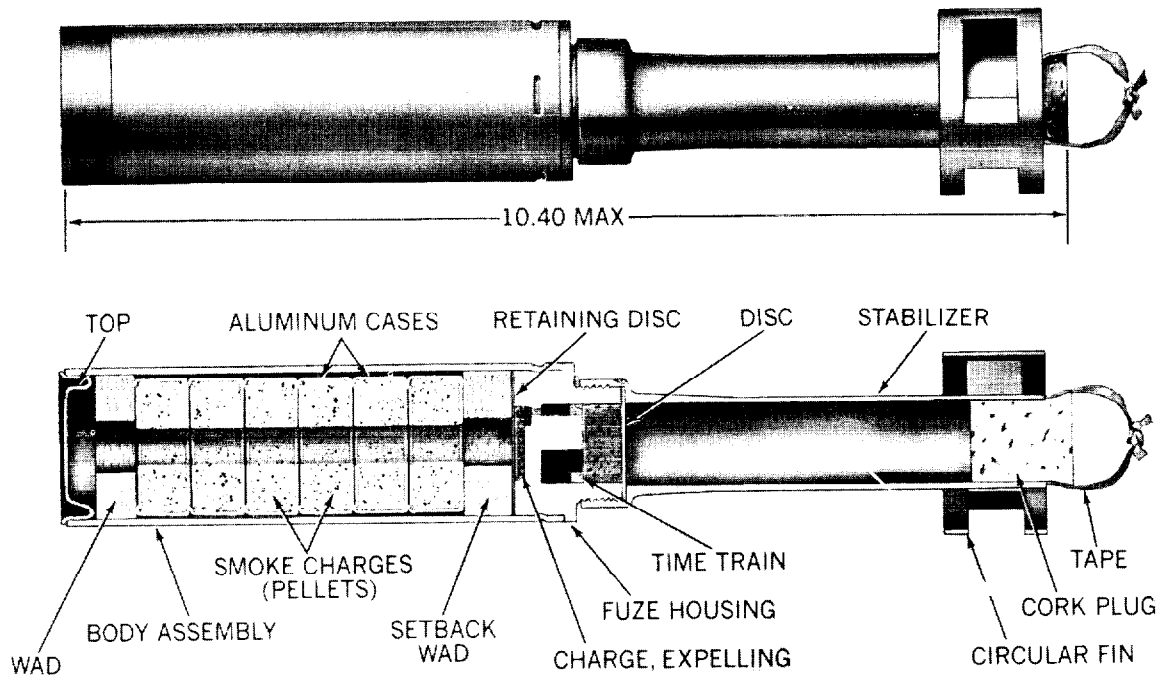


Figure 5.3.5 Ground Smoke Signal, M62, M64, & M65

5-4. DEVICES HELD IN HAND WHILE FUNCTIONING.

All of the devices described in this section are designed to be held directly in the hand throughout the time of their functioning.

5-4-1. Navy Light, Mk 1 Mods 0 and 1. (Sometimes listed as Fusee, Warning, Railroad, Mk 1)

5-4-1-1. Intended Use. This device (see Figure 5.4.1) is designed to produce a bright light for recognition and signaling purposes. The mods differ only in the color of the flame produced. The light can be seen up to 3 miles in clear weather. The red signal (Mod 0) burns for 135 seconds and the blue (Mod 1) for 75 seconds.

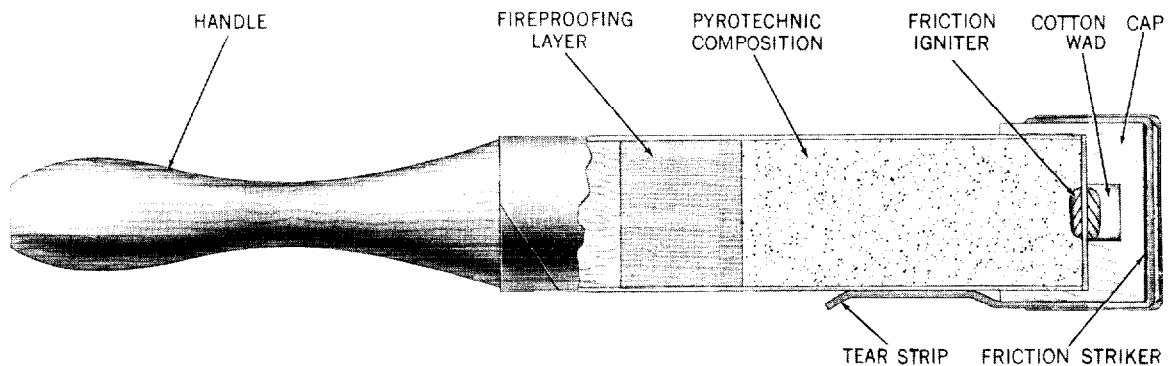


Figure 5.4.1 Navy Light, Mk 1 Mod 1

5-4-1-2. External Features. This device consists of a paper tube containing the pyrotechnic composition. It is fitted with a wooden handle at one end. The opposite end is closed by a cover which has an exterior coating of the same abrasive material found on the side of a safety-match box. Beneath the cover is a small cotton wad that protects the friction igniter which is impregnated in a cloth substance covering the pyrotechnic composition. The friction igniter is the same material as is used in the head of a safety match.

5-4-1-3. Functional Description. The signal is ignited by scraping the inverted cover across the friction igniter. To do this, the cover must first be removed by removing the tear strip. The device should be pointed upward and away from the body while being ignited.

5-4-1-4. Handling and Storage. The signal is particularly subject to deterioration from moisture. It should be kept in its waterproof container until ready for use. Other handling and storage requirements of paragraph 5-1-1 of this chapter are applicable.

5-4-1-5. Safety Precautions. All of the general rules of paragraph 5-1-2 of this chapter must be observed in handling and operating this device. In addition, devices that have been kept in unsealed containers for as much as six months must be returned to appropriate shore stations at the earliest opportunity because of

the effects of moisture. If there is encrustation on the signal body or if a vinegar-like odor is detected, the devices must be disposed of in accordance with chapter 3 of this pamphlet. Such action must be reported to the Bureau of Naval Weapons.

5-4-1-6. Shipping Containers. These signals are shipped in metal containers, six or 12 signals to the container. These metal containers are packed in cardboard cartons, 12 containers to the carton. The weight of a carton of 144 signals is approximately 70 pounds.

5-4-1-7. Identification Data. Both mods of this signal are covered by Dwg. No. 344438 and Specification MIL-S-18600. FSN and DOD Code Nos. are as follows:

Mod	Color	FSN	DOD Code
0	Red	1370-038-4950	L536
1	Blue	1370-038-4951	L535

5-4-2. Signal, Smoke, Marine, AN-Mk 1 Mod 0
(Formerly Distress, Smoke, Hand Signal, AN-Mk1)

NOTE: This signal is obsolete and should not be in the supply system. If any are found in the system, they should be returned to an ammunition depot for appropriate disposition.

5-4-3. Signal, Smoke and Illumination, Marine, Mk 13 Mod 0
(Formerly Signal, Distress, Day & Night, Mk 13 Mod 0)

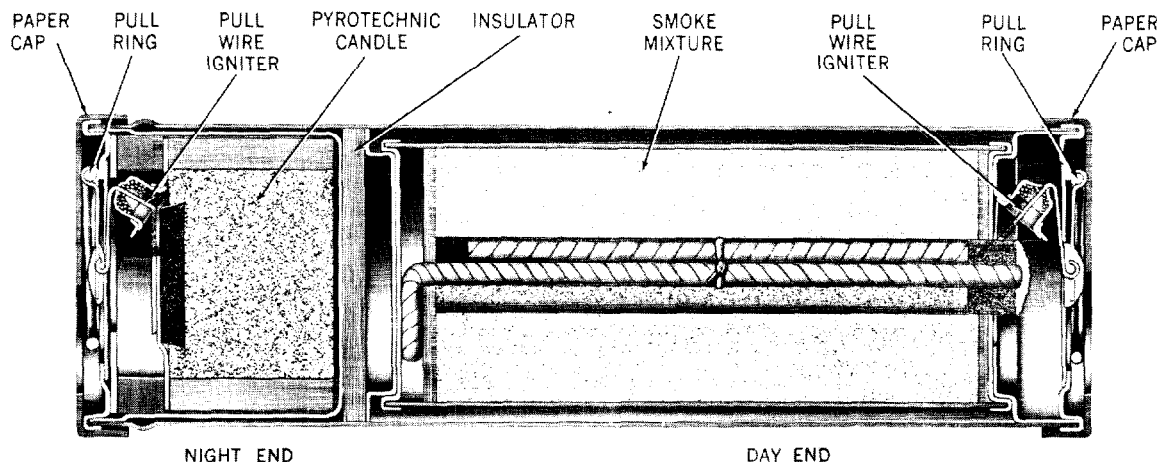


Figure 5.4.2 Marine Smoke & Illumination Signal, Mk 13

5-4-3-1. Intended Use. This signal (see Figure 5.4.2) is used for either day or night signaling, as appropriate, by aircraft personnel downed at sea. Its weight (6.4 ounces) and its small size permit its being carried in life vest or flight suit pockets and on life rafts. It emits orange smoke for day use and red flame for night use. Burning time for each is approximately 20 seconds.

5-4-3-2. External Features. This signal consists of a metal cylinder closed at each end by a protective paper cup. Instructions for operation are on the case. There are eight raised spherical beads around the circumference on the night, or flame, end approximately 1/4 inch from the cap to identify that end for use in darkness.

5-4-3-3. Functional Description. A sharp, quick pull on the pull ring causes a friction wire, which is attached to the pull strip seal, to move through the ignition cup and ignite the flare mixture (night) or the smoke mixture (day), depending upon which type of display is desired.

5-4-3-4. Operating Instructions. After choosing the type of display desired — smoke for day or flame for night — this device shall be operated as follows:

- (1) Remove the paper cover from the end to be ignited. WARNING: Do not point signal toward face or body.

- (2) Hinge pull ring from center position outward over rim of signal case.

- (3) Using thumb, press pull ring down over rim until seal is broken.

- (4) Hold signal firmly and exert quick pull on lanyard, igniting signal.

- (5) Extend arm fully, holding signal at approximately 45° angle from horizontal to prevent burns from hot drippings.

- (6) After using one end, douse signal in water and save for use in the event other type of display may be needed.

5-4-3-5. Handling and Storage. This device shall be handled and stored in accordance with paragraph 5-1-1 of this Chapter.

5-4-3-6. Safety Precautions. Under no circumstances shall both ends of this signal be ignited at the same time. After using one end, the signal should be doused in water to cool the metal parts and retained for possible use of the other end. The general safety precautions of paragraph 5-1-2 of this chapter apply.

5-4-3-7. Shipping Containers. These signals are packaged twelve per Mk 3 Mod 0 aluminum container, nine such containers (108 signals) per wooden box, the gross weight of which is approximately 93 pounds.

5-4-3-8. Identification Data. This signal is listed under LD 165580, Specification MIL-S-18655, FSN 1370-309-5027, and DOD Code No. L275.

5-4-4. Signal, Smoke and Illumination, Marine, Mk 38.

5-4-4-1. Intended Use. This signal is identical to the Signal, Smoke and Illumination, Marine, Mk 13, described in the preceding paragraph 5-4-3 except that it emits green smoke (burning time 28 seconds) for day use and a green flame (burning time 23 seconds) for night use.

5-4-4-2. Identification Data. This signal is listed under LD 299351, Specification OS 7139, and DOD Code No. L270.

5-5. HAND-HELD SIGNAL PROJECTING DEVICES (NON-PISTOL).

The pyrotechnics in this section are launched either from small projectors

designed to be held in the hand or from their outer cases which remain in the hand and which are, in effect, projectors.

5-5-1. Signal, Illumination, Ground, Green
Star Cluster, M125A1

5-5-1-1. Intended Use. This rocket-propelled, fin-stabilized device (see figure 5.5.1) is hand-launched from the surface for appropriate signaling purposes, usually at night.

5-5-1-2. External Features. The signal is contained within a cylindrical aluminum case approximately 10 inches long and 1.6 inches in diameter. Approximately 1-1/4 inches from the primer end of the case is a 1/8-inch red-lacquered knurled band around the entire circumference. During shipment and storage, the end opposite the primer is covered by a firing cap. Under the firing cap is a green-colored cork sealing disc into which the point of the firing pin is partially imbedded. Complete firing instructions (see paragraph 5-5-1-5) are stenciled on the outer case in addition to normal identification.

5-5-1-3. Internal Description. The signal body contains an illuminant composition assembly consisting of five pyrotechnic "star" candles (each with its own first-fire charge and quickmatch) and a candle-initiating assembly which is made up of a black powder delay element and a black powder charge. The quickmatch elements, located at each end of each candle, surround axial openings in the candles and are thus in a position to be ignited by the expelling charge. Attached to the candle-initiating assembly is a rocket motor assembly containing rocket motor propellant. At the base of the rocket motor assembly are the nozzle plug and the steel stabilizing fins which are folded into a position parallel to the signal axis. All of the above assemblies are contained within the launcher tube. A No. 68 primer and an initiating charge are located in the base of the launcher tube.

5-5-1-4. Operation. When the primer is ignited by action of the firing pin (see paragraph 5-5-1-5), its flame ignites the black powder initiating charge. Flame from the initiating charge travels through holes in the assembly bolt and simultaneously ignites the rocket motor propellant and the black powder delay charge. Gases generated by the burning initiating charge expel the signal from the launcher tube. Since the initiating charge is relatively small, it propels the signal to a

height of only 20 feet, and its recoil is slight. When the signal leaves the launcher tube, the four flexible steel fins unfold to stabilize the signal during flight. At the 20-foot height, gases generated by the burning propellant expand through four nozzles in the nozzle plug and rapidly propel the signal upward. At the highest point of the signal's flight, the delay charge, at the end of its burning, ignites the expelling charge which expels the five-star candle assembly and simultaneously ignites the quickmatch. The quickmatch, in turn, ignites the first-fire composition of each of the five candles, and the candles burn for 4 to 8 seconds, producing five separate green stars.

5-5-1-5. Firing Instructions. The following step-by-step instructions are to be followed in using this signal:

(1) Remove the signal from its container in accordance with instructions printed on the container.

(2) Hold the signal in the left hand, red knurled band up, with thumb and forefinger in alignment with red band.

(3) Withdraw the firing cap from the lower end of the signal.

(4) Point the ejection end of the signal (the end opposite the red knurled band) away from the body and away from friendly personnel, equipment, and materials, and SLOWLY push the firing cap onto the primer (red band) end until the cap is aligned with the lower edge of the knurled band. DO NOT permit the cap to go beyond the lower edge of the band.

(5) Hold the signal FIRMLY with the left hand at arm's length; keep signal in a truly vertical position, firing cap downward.

(6) Strike the firing cap bottom sharply with the palm of the right hand, keeping the left arm rigid.

5-5-1-6. Handling and Storage. This signal shall be handled and stored in accordance with the general provisions of paragraph 5-1-1. In addition, the following special rules apply:

(1) The signal must not be removed from its hermetically sealed container until immediately before it is to be used.

(2) No signal shall be stored or re-stored unless it is securely sealed in its steel container.

(3) In all handling, care must be taken to avoid striking the signal primer.

(4) Dented, cracked, or otherwise damaged signals must not be used. They must be disposed of in accordance with the provisions of Chapter 3 of this pamphlet.

(5) If a signal misfires, additional attempts

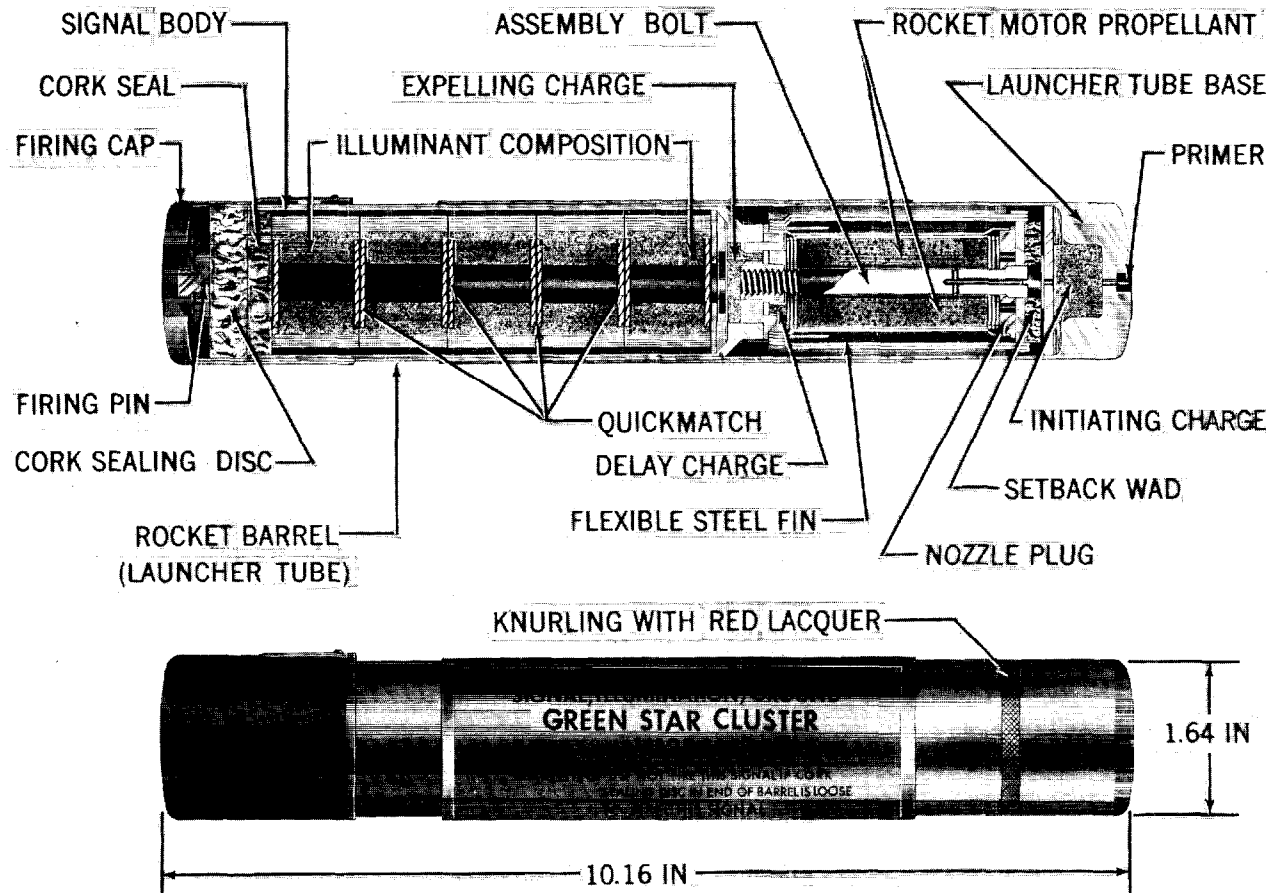


Figure 5.5.1. Ground Illumination Signal, M125A1

should be made to fire it by striking the firing cap. Be SURE that the signal's firing end is pointed upward and away from friendly personnel and equipment. If the signal still does not fire, it should be thrown over the side if at sea. Under the same circumstances on land, the signal should be placed on the ground with neither end pointing toward friendly personnel or equipment. All personnel must be warned to stay away from the signal's location for at least 30 minutes.

5-5-1-7. Safety Precautions. In addition to the general safety precautions spelled out in paragraph 5-1-2, the following special rules shall be strictly observed:

- (1) DO NOT remove the signal from its hermetically sealed container until immediately before use.
- (2) Read and follow the firing instructions on the signal body.
- (3) When pushing the firing cap onto the primer end of the signal, be sure that the signal is not pointed toward your own body or

toward friendly personnel, equipment, or materials.

(4) Push the firing cap SLOWLY over the primer end of the signal, being sure not to push it beyond the lower edge of the red knurled band.

(5) Exercise due care to prevent the expended rocket body from falling on friendly personnel or flammable materials.

(6) Before installing the firing cap over the primer end of the signal, be sure to avoid striking the primer.

(7) DO NOT attempt to use dented, cracked, or otherwise damaged or deteriorated signals. They must be segregated for early disposal.

(8) The person firing the signal and all friendly personnel in the immediate vicinity should wear helmets to avoid injury by the falling spent rocket motor and other debris.

(9) Misfired signals must NOT be approached until at least 30 minutes has elapsed since firing was attempted.

5-5-1-8. Firing Angles. Normally, this

signal is held in a vertical position (90° elevation) when firing (see paragraph 5-5-1-5). However, other angles of elevation may be used under the following circumstances:

- (1) To compensate for high wind velocities.
- (2) To place the signal display in a better position to be seen by search and rescue aircraft that are flying lower than the signal's maximum altitude of functioning.
- (3) To compensate for and to take advantage of widely different topographical elevations in ground-to-ground signaling, such as would be advantageous for personnel on a mountain to attract the attention of those in an adjacent valley, or for personnel in a valley to attract the attention of personnel beyond an intervening ridge or other obstruction.

NOTE: If the signals are fired at angles of less than 90 degrees, the altitude attained is, of course, reduced, and the altitude of candle burn-out is correspondingly lessened. If the firing angle is 60 degrees or less, the candle will, in almost all cases, be still burning after it strikes the surface.

5-5-1-9. Reporting Accidents and Incidents. All accidents and incidents and all misfires and malfunctions involving this signal shall be reported as required by Chapter 2 of this pamphlet.

5-5-1-10. Shipping Containers. This signal is packaged in its own individual hermetically sealed metal container; 36 such containers (36 signals) are packed in a wooden box.

5-5-1-11. Identification Data. Ground Illumination Signal, Green Star Cluster, M125A1, is listed under Dwg. No. 8797920, Specification MIL-S-13261, FSN 1370-629-2335, and DOD Code No. L314.

5-5-2. Signal, Illumination, Marine, AN-M75.
(Illustration top of page 5-22)

5-5-2-1. Intended Use. This signal (see Figure 5.5.2) is used for night distress signaling by aircraft personnel downed at sea. Its weight (5.54 ounces) and its small size permit its being carried in life vest or flight suit pockets and on life rafts. It propels two red stars, successively to an altitude of approximately 175 feet which are visible from 2-1/2 to 3 miles in daylight and 12 to 15 miles at night in clear weather. Each star burns for approximately 5 seconds.

5-5-2-2. External Features. This device consists of a cylindrical outer case of waterproof material which is insulated from the inner case. The outer case, except for the metal cap, is painted red. The igniter end is closed by a screw-type sealing cap and a tape strip. The other end is closed by a permanently fixed metal cover.

5-5-2-3. Functional Description. This signal has a direct firing or ignition system. The igniter consists of a spring-loaded firing pin, a retaining fork which holds the firing pin in a cocked position, and a primer. A two-piece firing linkage connects the retaining fork to the firing ring. When the firing ring is pulled, the retaining fork releases the firing pin which ignites the primer. The primer

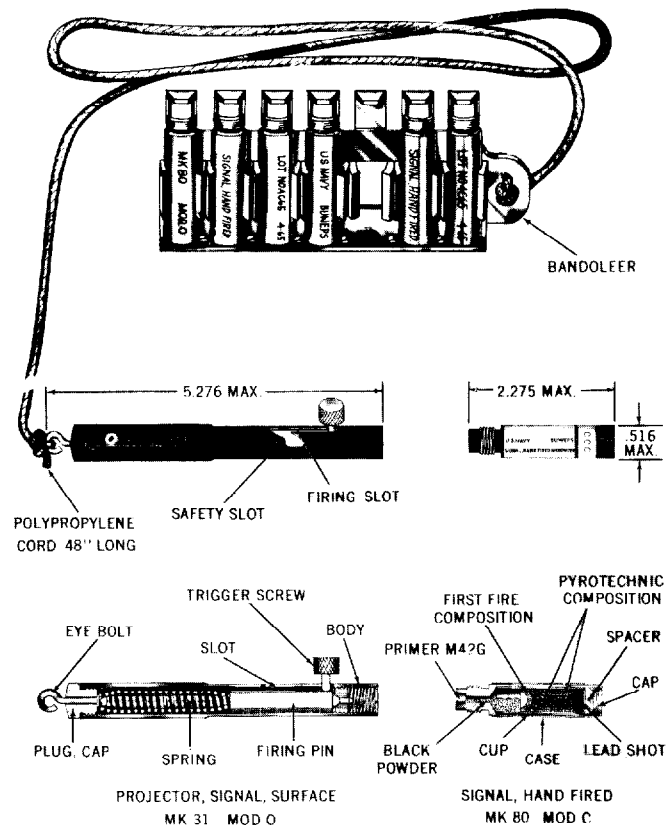


Figure 5.5.3 Illumination Signal Kit, Mk 79 Mod 0

(1) Remove the bandoleer and projector from plastic envelope.

(2) Cock the firing pin of the projector. This is accomplished by moving the trigger screw to the bottom of the vertical slot and slipping it to the right so that it catches at the top of the angular (safety) slot.

(3) Bend protective plastic tab away from signal in bandoleer to allow attachment of projector.

WARNING

The plastic tabs over the signals in the bandoleer protect the percussion primers from being struck accidentally. They should be kept intact until just before loading signal into projector.

(4) Mate projector with signal and rotate

projector to right until signal is seated.

(5) Hold projector over head with arm fully extended. The projector shall be pointed at a slight angle away from the body.

(6) While firmly gripping the projector, fire the signal by slipping the trigger screw to the left out of the safety slot and into the firing slot.

NOTE: This action shall be one continuous movement such that the thumb does not interfere with the forward motion of the trigger screw when it is brought into the firing slot.

(7) If the signal fails to fire, try again to fire it by depressing the trigger screw to the bottom of the firing slot with the thumb and releasing it quickly.

(8) Unscrew spent signal case or signal which has failed to fire. Discard by throwing overboard.

(9) To fire another signal repeat the above steps.

5-5-3-5. Handling and Storage. This kit should be stored in a dry, well-ventilated location and shielded from direct rays of the sun. The safety precautions in the paragraph following must be observed in all handling operations.

5-5-3-6. Safety Precautions. The following special safety precautions apply:

(1) Signals in this kit are ignited by percussion primers which must be protected against being struck. Protruding tabs of the bandoleer that extend over signal bases prevent accidental striking of the primers. They must not be torn off or bent back except in loading a signal into the projector.

(2) The projector must not be loaded until immediately before firing. If a signal is loaded into the projector and not fired immediately, it must be returned to the bandoleer.

(3) Signals must be inspected periodically to assure that they are not dented or otherwise damaged.

WARNING

Dented or damaged signals shall not be used. Dents or other imperfections might result in violent action of the signal when fired.

(4) Signals must be kept away from fire and other heat sources.

(5) The projector trigger screw must be checked frequently to assure that it is tight. A loose trigger can release the firing pin prematurely and cause injury, or it might fall out and be lost during emergency loading, thereby making the projector useless.

(6) The trigger screw must be in the safety slot while a signal is being loaded.

(7) In firing the projector, care must be taken to raise the arm well above the head with the projector held in a vertical position. A loaded projector must never be pointed toward other personnel or toward the body of the user.

5-5-3-7. Shipping Containers. This complete kit is packaged 102 kits to a metal Mk 2 Ammunition Component Box. The signals, which may be requisitioned separately, are packaged 1400 to a metal container.

5-5-3-8. Identification Data. This signal kit is listed under BUWEPS LD 615184, Dwg. No. 2150423, FSN 1370-866-9788, and DOD Code No. X667. The Signal, Hand Fired, Mk 80 Mod 0 is listed under BUWEPS LD 615183 and Specification WS 4622. The Projector, Signal, Surface, Mk 31 Mod 0 is listed under BUWEPS LD 615182 and Specification WS 1903.

5-5-3-9. Service Life. While no absolute service life has yet been established, it is confidently anticipated that these kits, including particularly the hand-fired Signals, Mk 80 Mod 0, will be serviceable for a minimum of 5 years from date of manufacture.

5-5-4. Signal, Illumination, Ground, Red Star, Parachute, M126A1, and White Star, Parachute, M127A1

5-5-4-1. Intended Use. These devices (see figure 5.5.4) are used for appropriate nighttime signaling purposes. They are similar to Ground Illumination Signal, M125A1, which is described in paragraph 5-5-1, except for the display produced. Signal M126A1 produces a parachute-suspended red star which burns for approximately 50 seconds while descending at the rate of 8 feet per second. Signal M127A1 burns for approximately 36 seconds and falls at the rate of 10 to 15 feet per second. The M127A1 signal produces a parachute-suspended white star. Both signals project to an altitude of 650 to 700 feet when fired vertically.

5-5-4-2. Description. In outward appearance, these signals are identical to Ground Illumination Signal, M125A1 (paragraph 5-5-1), except for their nomenclature stenciling. Interiorly, primers, initiating charges, rocket motor assemblies, fin assemblies, and delay elements are identical. These signals differ from the M125A1 in that (1) they contain single star candles, and (2) they contain parachute assemblies.

5-5-4-3. Operation. Ground Illumination Signals, M126A1 and M127A1 operate in the same manner as Signal, M125A1 (paragraph 5-5-1) except that, at the highest point in the signals' flight, the delay charge ignites a single quick-match which, in turn, ignites a single first-fire composition that starts combustion of the pyrotechnic illuminant composition. Instead of producing five free-falling stars (as in the M125A1), these signals produce single parachute-suspended red and white, relatively long-burning stars.

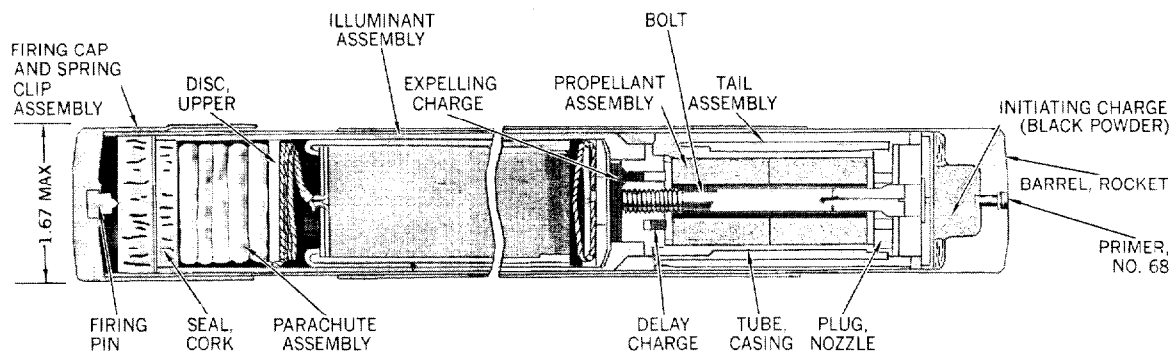


Figure 5.5.4 Ground Illumination Signal, M126A1 - M127A1

5-5-4-4. Firing Instructions. These signals are fired the same way as Ground Illumination Signal, Green Star Cluster, M125A1 (see paragraph 5-5-1-5).

5-5-4-5. Handling and Storage and Safety Precautions. The same handling and storage rules and safety precautions set forth in paragraphs 5-5-1-6 and 5-5-1-7 apply to signals M126A1 and M127A1.

5-5-4-6. Reporting Accidents and Incidents. All accidents and incidents and all misfires and malfunctions involving these signals shall be reported as required by Chapter 2 of this pamphlet.

5-5-4-7. Shipping Containers. These signals like the M125A1, are packaged in individual hermetically sealed metal containers, 36 containers to a wooden box.

5-5-4-8. Identification Data. The following table applies:

	M126A1	M127A1
Dwg.	8797968	879768
Specification	MIL-S-13257	MIL-S-13257
FSN	1370-629-2336	1370-753-1859
DOD Code No.	L311	L312

5-5-5. Signal, Smoke, Ground, Green, Parachute, M128A1 and Red, Parachute, M129A1.

5-5-5-1. Intended Use. These signaling devices (see figure 5.5.5) are rocket-propelled and fin-stabilized and are similar to Signals M126A1 and M127A1 which are described in paragraph 5-5-4, except that they produce parachute-suspended smoke displays instead of flame

(star) displays. They are designed for use during daylight.

5-5-5-2. Other Characteristics. All firing instructions, operating characteristics, handling and storage requirements, safety precautions, and packaging methods for these signals are identical to those set forth for the signals described in paragraph 5-5-4.

5-5-5-3. Reporting Accidents and Incidents. All accidents and incidents and all misfires and malfunctions involving these signals shall be reported as required by Chapter 2 of this pamphlet.

5-5-5-4. Identification Data. The following table applies:

	M128A1	M129A1
Dwg.	8797996	8797996
Specification	MIL-S-13303	MIL-S-13303
FSN	1370-301-1131	1370-301-1132
DOD Code No.	L324	L323

5-6. DEVICES HELD IN HAND ONLY WHILE IGNITING

The signaling devices described in this section are expressly designed to be held in the hand during ignition only. They are then thrown overboard or placed in or on the ground.

5-6-1. Signal, Illumination, Aircraft, Mk 6 Mod 0.

(Formerly Aircraft Emergency Identification Signal, Mk 6 Mod 0)
(Illustration top of page 5-25)

5-6-1-1. Intended Use. This signal (see Figure 5.6.1) is designed to be hand-launched from aircraft to produce red, green, or white

parachute-suspended stars for night-time identification purposes. The signals burn for approximately 25 seconds with candlepower as follows: Red-2400, Green-1500, White-27,000.

5-6-1-2. External Features. This 1.2-pound device consists of an aluminum cylindrical case with a grenade-type firing mechanism screwed into one end. The other end is closed by a metal cap which has a raised

pattern to facilitate night identification. A single dot indicates a red star; a short straight line indicates a white star; a wide V indicates a green star. All three have a raised curved line 1 inch long near the edge of the cap. The outer surface of the signal is stenciled to show the color of the star in addition to the normal marking showing mark and mod, name of manufacturer, lot number, and date of manufacture.

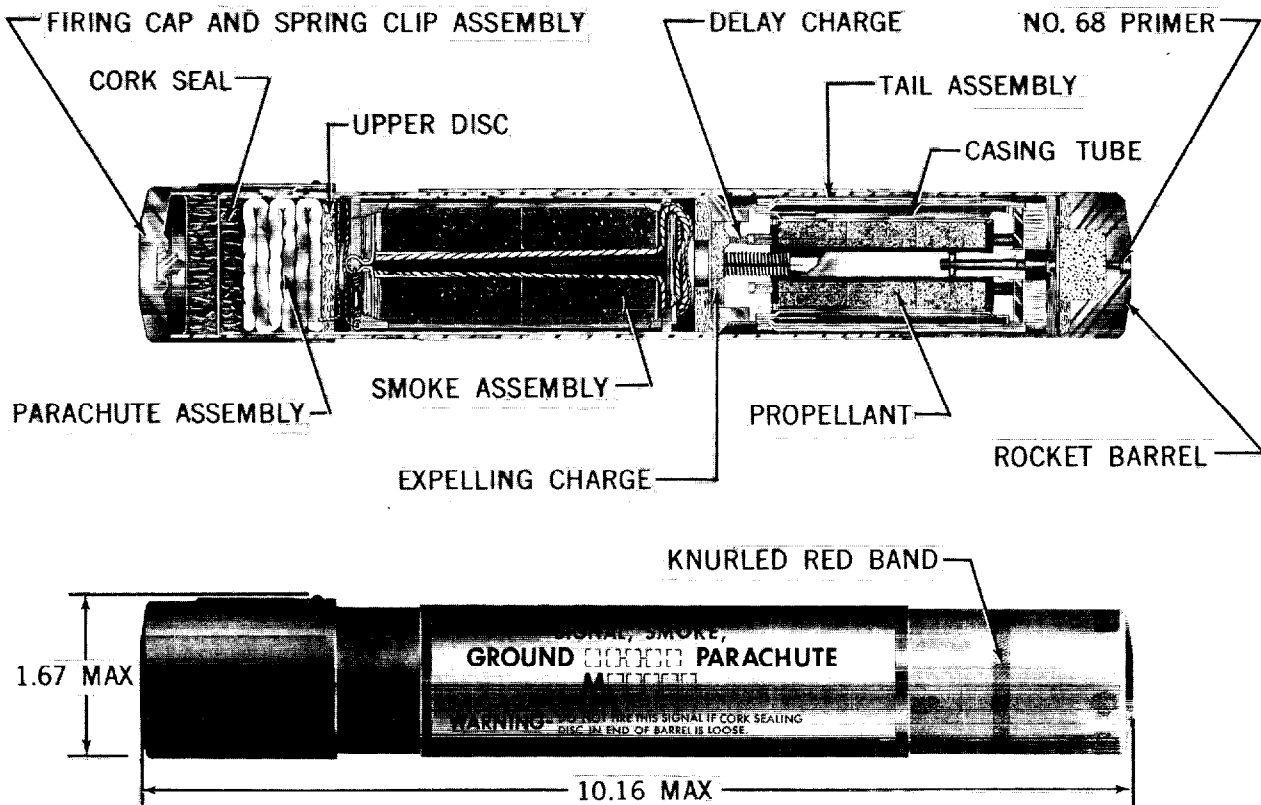


Figure 5.5.5 Ground Smoke Signal, M128A1 and M129A1

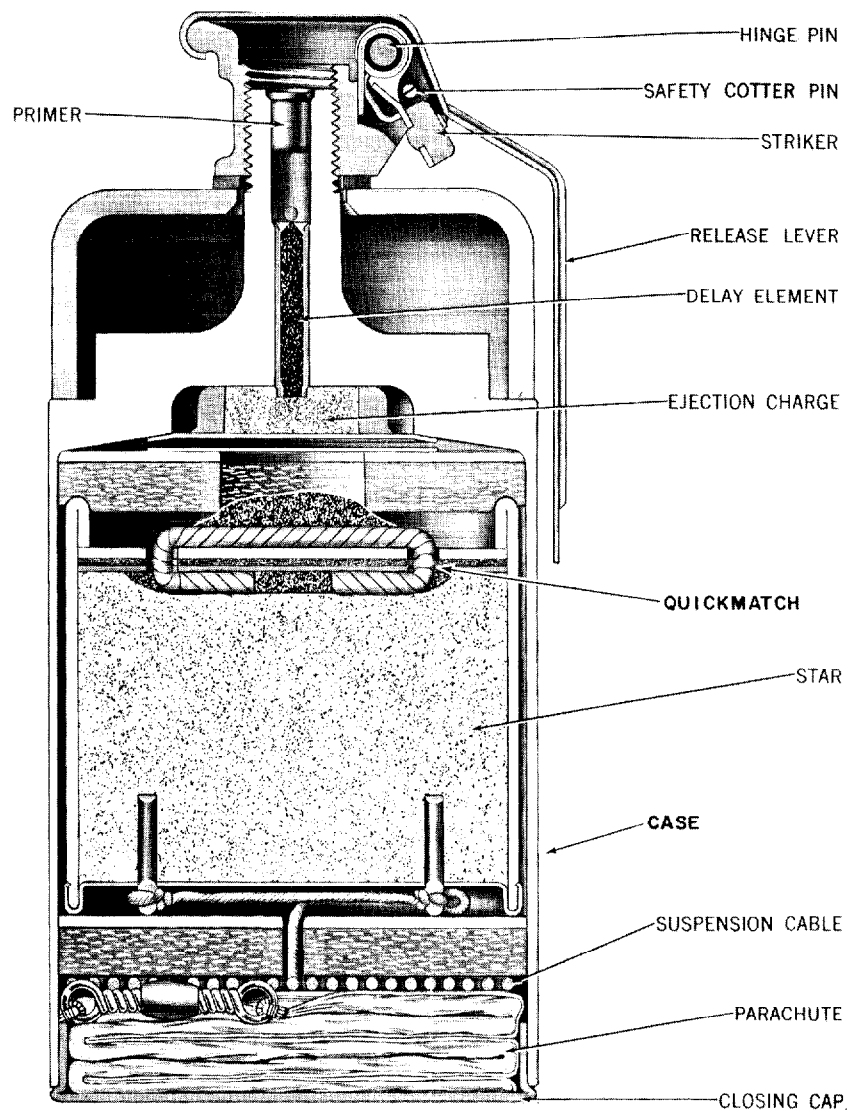


Figure 5.6.1 Aircraft Illumination Signal, Mk 6

5-6-1-3. Functional Description. This device has a direct firing system. When launched, it is grasped in one hand with the release lever held firmly against the body of the signal. The pull ring, which is attached to the safety cotter pin, is pulled with the other hand or may be pulled by catching it on a stationary hook inside the aircraft. The signal is then thrown overboard. When the release lever is permitted to move away from the body of the signal, it is thrown off by the spring-loaded striker

which rotates and strikes the primer. The primer ignites the 3-second delay element which, in turn, ignites the black powder ejection charge. The ejection charge forces off the closing cap and ejects the parachute and the pyrotechnic star. The ejection charge also ignites a quickmatch which ignites the star.

5-6-1-4. Handling and Storage. This device shall be handled and stored in accordance with paragraph 5-1-1 of this chapter.

5-6-1-5. Safety Precautions. The safety precautions of paragraph 5-1-2 of this chapter apply.

5-6-1-6. Shipping Containers. This signal is shipped in wooden boxes (Drawing No. 232-446), 12 rounds to the box. Each filled box weighs approximately 27 pounds.

5-6-1-7. Identification Data. The following table provides information relating to this signal:

Color	Green	Red	White
Dwg. No.	233406	233406	233406
Specification	OS 2175	OS 2175	OS 2175
FSN	1370-092-9941	1370-092-9940	1370-092-9942
DOD Code No.	L175	L176	L177

5-6-2. Signal, Smoke, Aircraft, Mk 7 Mod O.
(Formerly Aircraft Emergency Identification Signal, Mk 7 Mod O)

(Illustration page 5-27)

5-6-2-1. Intended Use. This signal (see Figure 5.6.2) is intended to be hand-launched from aircraft as a means of daytime identification. It produces red, green, yellow, or black smoke. The parachute-suspended smoke charge burns for approximately 25 seconds.

5-6-2-2. External Features. This signal consists of an aluminum cylindrical case with a grenade-type firing mechanism screwed into

side the aircraft. The signal is then thrown overboard. When the safety lever is released, it is thrown off by the spring-loaded striker which rotates and strikes the primer. The primer ignites a 4-second delay element which, in turn, ignites the black powder ejection charge. The ejection charge forces off the closing cap and expels the parachute and the smoke charge. The ejection charge also ignites the smoke charge.

5-6-2-4. Handling and Storage. This device shall be handled and stored in accordance with paragraph 5-1-2 of this chapter.

5-6-2-5. Safety Precautions. The safety rules of paragraph 5-1-3 of this chapter apply.

5-6-2-6. Shipping Containers. This signal is shipped in wooden boxes (Drawing No. 233-447), 12 rounds to the box. Each filled box weighs approximately 36 pounds.

5-6-2-7. Identification Data. The following table provides information relating to this signal:

Color	Black	Green	Red	Yellow
Dwg. No.	233405	233405	233405	233405
Specification	OS 2175	OS 2175	OS 2175	OS 2175
FSN	1370-092-9946	1370-092-9944	1370-092-9943	1370-092-9945
DOD Code No.	L162	L163	L164	L165

one end. The other end is fitted with a metal closing cap painted the same color as the smoke produced.

5-6-2-3. Functional Description. This signal has a direct firing system. When launched, it is grasped in one hand with the safety lever held firmly against the body of the signal. The pull ring, which is attached to the safety cotter pin, is pulled with the other hand or may be pulled by catching it on a stationary hook in-

5-6-3. Fusee, Warning, Railroad, M72.

5-6-3-1. Intended Use. This device (see Figure 5.6.3) is primarily intended to be used for outlining emergency airfields under conditions of poor visibility. It may also be used for recognition or signaling. Its red flare burns for approximately 20 minutes.

5-6-3-2. External Features. The fusee consists of a cylindrical paper tube closed at both

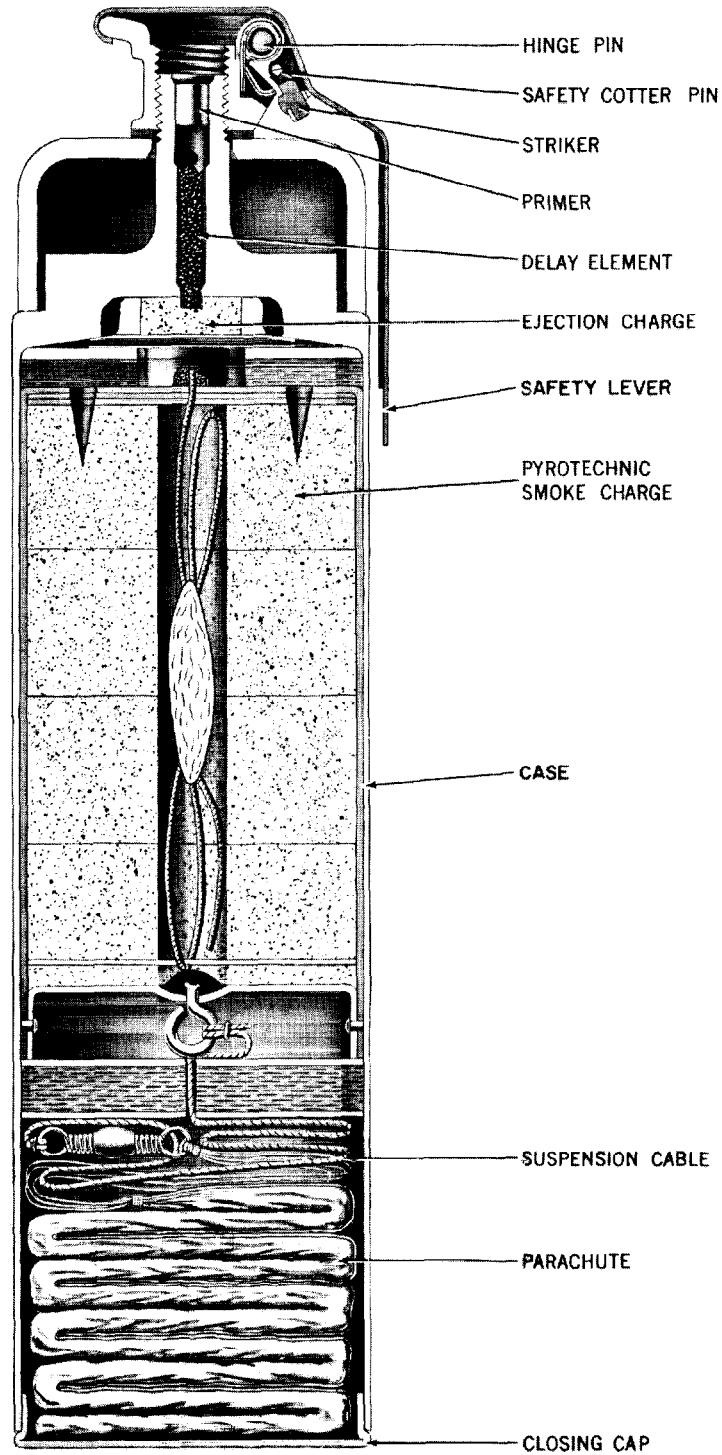


Figure 5.6.2 Aircraft Smoke Signal, Mk 7

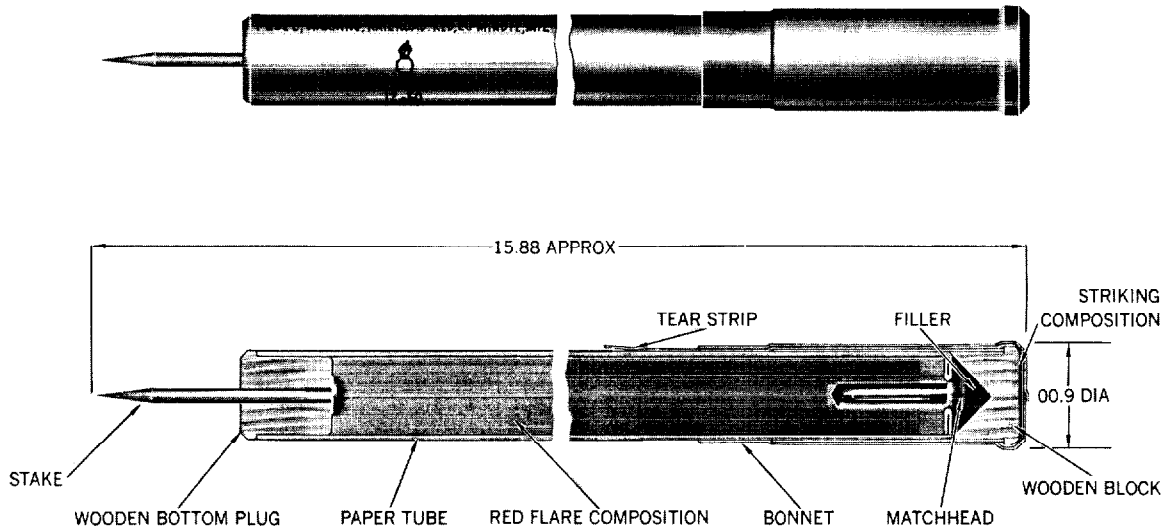


Figure 5.6.3 Railroad Warning Fusee, M72

ends with wooden blocks. The lower wooden block is fitted with a stake, or spike, for insertion into ground or soft wood. The top surface of the upper block is covered with a striking composition with which the priming charge is ignited. A bonnet of red kraft papers covers the striking surface and the upper block. This bonnet is removed by a tear strip.

5-6-3-3. Functional Description. This device is ignited by striking a matchhead which is embedded in the top of the pyrotechnic composition. With the aid of the tear strip, remove the bonnet. Remove the wooden block and the soft paper filler which covers the matchhead. Strike the matchhead with the striking composition on the outer surface of the block. Stick the fusee in an inclined position in ground or soft wood and stand clear.

5-6-3-4. Handling and Storage. The fusee shall be handled and stored in accordance with the provisions of paragraph 5-1-1 of this chapter.

5-6-3-5. Safety Precautions. The general safety precautions in paragraph 5-1-2 of this chapter apply.

5-6-3-6. Shipping Containers. This device is packed 10 to the cardboard carton, 4 cartons to the wooden box.

5-6-3-7. Identification Data. This fusee is listed under Dwg. No. 78-0-94, Specification MIL-F-20409, FSN 1370-096-3135, and DOD Code No. L508.

5-6-4. Grenade, Hand, Smoke, HC, AN-M8.
(Illustration on page 5-29)

5-6-4-1. Intended Use. This smoke grenade (see Figure 5.6.4) is used for daytime ground and ground-to-air signaling. It may also be used in training or in combat for screening purposes (see Chapter 14).

5-6-4-2. External Features. This device consists of a thin sheet-metal cylinder filled with 16 to 19 ounces of Type C HC (Hexachloroethane) smoke mixture. It is fitted with an M201A1 igniting fuze. The body is approximately 2½ inches in diameter and 4½ inches from top to bottom. There are four tape-covered smoke-emission holes around the fuze at the top. The safety lever is held in place by a cotter pin to which is attached a pull ring.

5-6-4-3. Functional Description. The safety lever must be held firmly against the grenade body while the cotter pin is removed and until the grenade is thrown. Releasing the safety lever allows the striker to hit the primer which ignites the 1.2- to 2-second delay element of the M201A1 fuze. At the end of the delay, the ignition mixture is ignited, and this, in turn, ignites the starter mixture which is contained

within a plastic cup imbedded in the top of the HC smoke composition. When this cup melts, the starter mixture ignites the smoke composition. Gases of combustion blow off the adhesive tape over the emission holes, and dense white smoke is emitted for 105 to 150 seconds.

5-6-4-4. Handling and Storage. Type C HC smoke composition is subject to decomposition

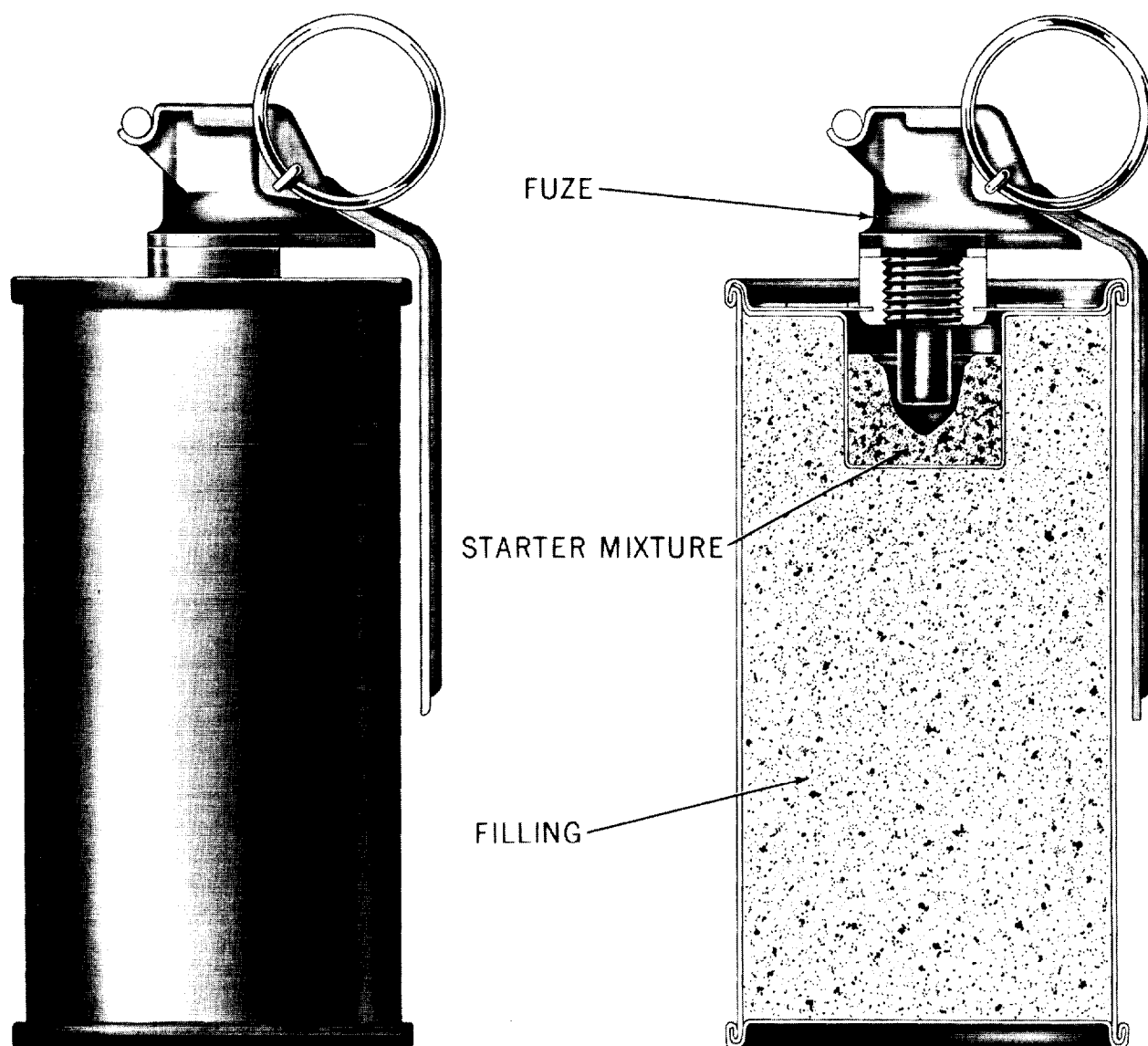


Figure 5.6.4 HC Smoke Hand Grenade, AN-M8

in contact with moisture and generates some heat. Under ordinary stowage conditions, this is not sufficient to cause spontaneous combustion. However, this device must be handled with care so as not to destroy its watertight integrity. Stowage should be topside convenient for jettisoning and should not be near ventilation intakes. This device must be protected from water and from the direct rays of the sun. This grenade is a Group D chemical munition. Stacking methods in storage must allow for good ventilation to all parts of the stack (see Chapter 14).

5-6-4-5. Safety Precautions. In addition to the general safety precautions of paragraph 5-1-2 of this chapter, the following special safety rules apply:

- (1) Do not attempt to recover or tamper with grenade duds.
- (2) Do not lift or handle by pull ring.
- (3) If the grenade is accidentally activated, throw it as far away as possible immediately, being careful to avoid personnel and friendly craft.
- (4) If the grenade is dropped after pulling the safety pin, move quickly to a safe distance.
- (5) HC smoke is toxic in high concentrations. Gas masks must be worn in the event that there is an accidental release of this smoke in confined areas (see Chapter 14).

5-6-4-6. Shipping Containers. This device is packed in a sealed metal container. There are 16 containers to a wooden box. A filled box weighs approximately 41 pounds.

5-6-4-7. Identification Data. This grenade is listed under Dwg. No. C13-19-18, Specification MIL-G-12327, FSN 1330-219-8511, and DOD Code No. G930.

5-6-5. Grenade, Hand, Smoke, M18.
(Illustration on page 5-31)

5-6-5-1. Intended Use. This device is designed to be used by ground forces for daytime ground-to-ground and ground-to-air signaling.

5-6-5-2. External Features. This grenade (see Figure 5.6.5) consists of a cylindrical metal container, approximately 4½ inches high and 2½ inches in diameter, into the top of which is fitted a fuze, M201A1. The container is filled with 11½ ounces of red, green, yellow, or violet smoke mixture. There are four smoke-emission holes in the top and one in the bottom, each sealed with adhesive tape to protect the smoke composition from moisture. The fuze safety lever is held in place by a cotter pin to which is attached a pull ring. The body of the grenade is stenciled to show smoke color.

5-6-5-3. Functional Description. The safety lever must be held firmly against the grenade body while the cotter pin is removed and until the grenade is thrown. Release of the safety lever allows the striker to hit the primer which ignites the 1.2- to 2-second delay element of the M201A1 fuze. At the end of the delay, the ignition mixture is ignited, and this, in turn, ignites the starter mixture which is spread as a thin coating over the top of the smoke composition as well as on the surface of the hole through the center of that composition. The starter mix ignites the smoke composition, and gases are generated which blow off the tape covering the emission holes. Smoke emits for 50 to 90 seconds. The smoke may be green, red, yellow, or violet (see paragraph 5-6-5-7 following).

5-6-5-4. Handling and Storage. This grenade shall be handled and stored in accordance with the specifications as set forth in paragraph 5-1-1 of this chapter.

5-6-5-5. Safety Precautions. The general safety rules contained in paragraph 5-1-2 apply to this grenade.

5-6-5-6. Shipping Containers. This grenade is packed in individual sealed metal or fiber-board containers, 16 containers to a wooden box. A filled box weighs approximately 34 pounds.

5-6-5-7. Identification Data. The following table provides information relating to this grenade:

HAND-MANIPULATED SIGNALING DEVICES

Color	Green	Red	Yellow	Violet
Dwg. No.	D13-19-36	D13-19-36	D13-19-36	D13-19-36
Specification	MIL-G-12326	MIL-G-12326	MIL-G-12326	MIL-G-12326
FSN	1330-289-6851	1330-289-6852	1330-289-6854	1330-289-6853
DOD Code No.	G940	G950	G945	G955

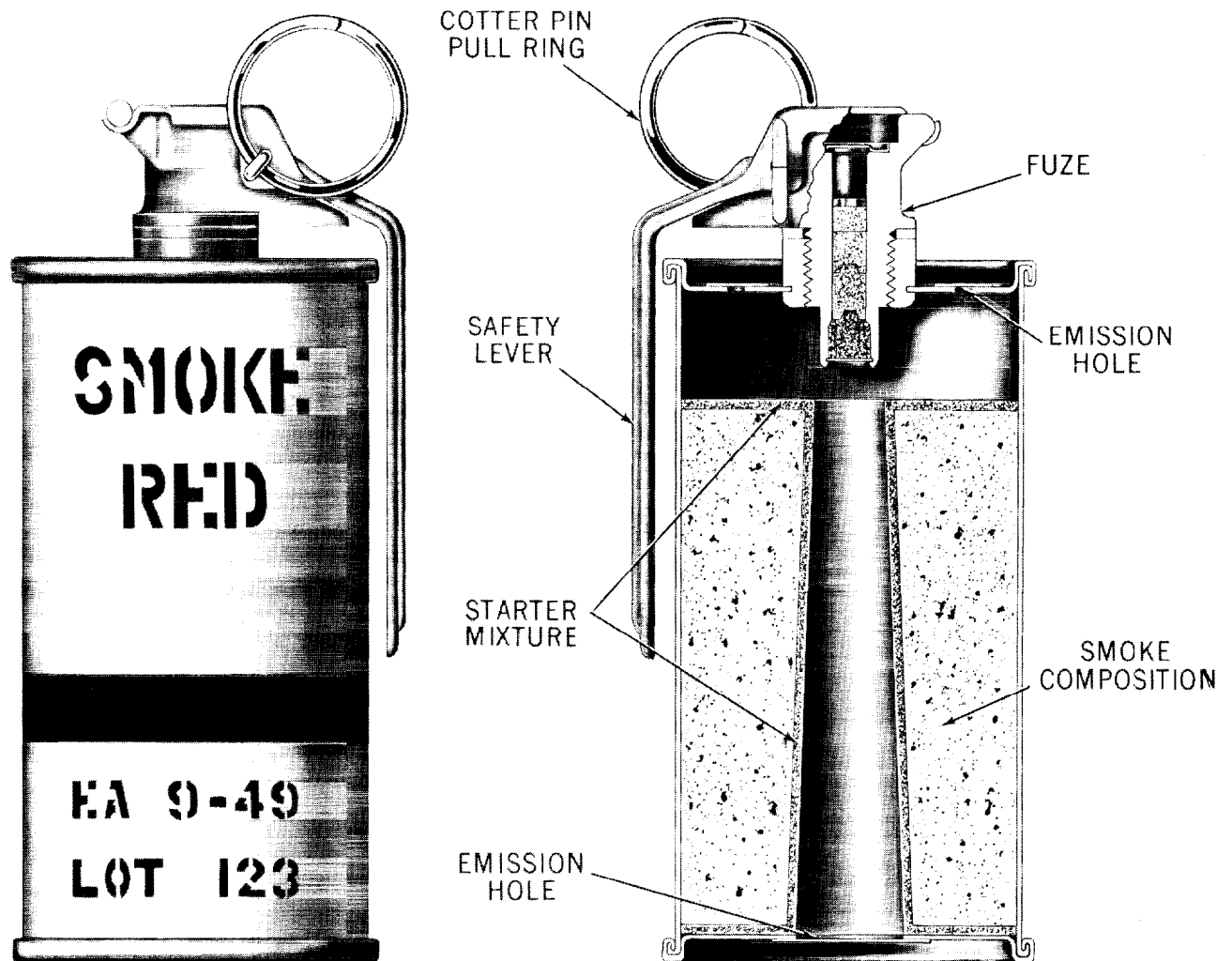


Figure 5.6.5 Smoke Hand Grenade, M18

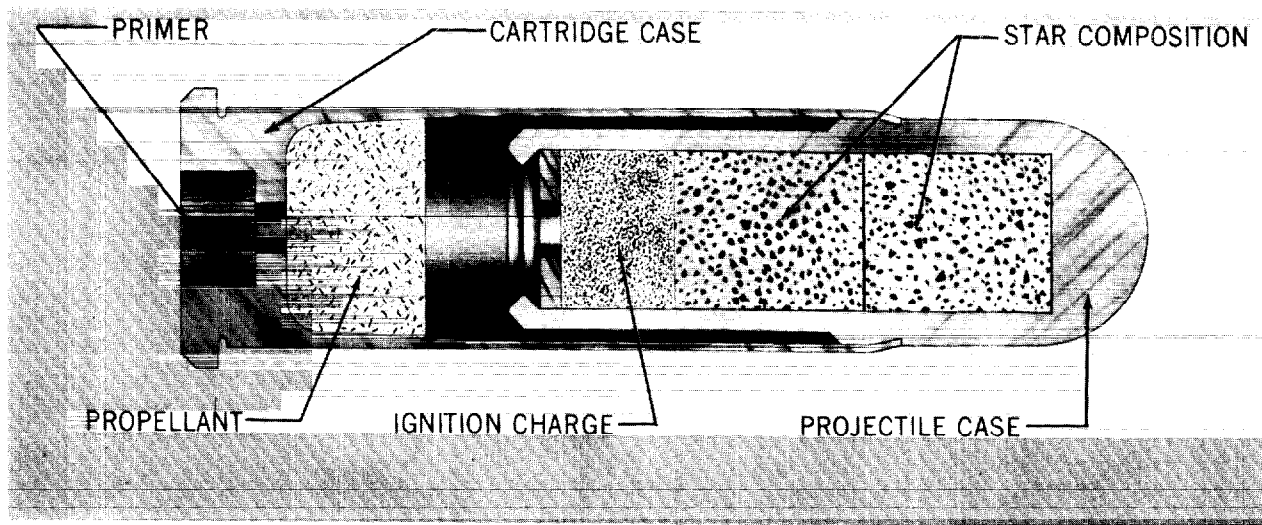


Figure 5.7.1. Signal Cartridge, Mk 130 Mod 0 (Red)

5-7. DEVICES FIRED FROM STANDARD SMALL ARMS

The pyrotechnic signals described in this section are fired from revolvers or semi-automatic pistols presently available in the supply system. The signal cartridges are totally compatible with the particular side arm with which they are designed to be used and require no special equipment of any kind.

5-7-1. Cartridge, Signal, Mk 130 Mod 0 (Red)

5-7-1-1. Intended Use. This cartridge (see Figure 5.7.1) is fired from a standard 38-caliber revolver for signaling purposes, particularly for distress signaling by airmen who are downed in jungle areas.

5-7-1-2. Description. The Mk 130 Signal Cartridge consists of a brass cartridge case, a projectile case, and a percussion-type primer. The exposed portion of its projectile case is colored magenta, a deep purplish red, to distinguish this round from the 38-caliber lethal round. Its length is 1.55 inches maximum; its diameter, 0.379 inch. It weighs approximately 11 grams.

Its base is rimmed to fit the pistol ejector. Its projectile case contains an ignition charge and a pyrotechnic "star" composition. A propellant charge at the base of the primer is capable of projecting the signal display to an average altitude of 1700 feet above the launch point, with a force sufficient to penetrate all normal jungle foliage cover except tree limbs of considerable size.

5-7-1-3. Operation. This device is loaded into the chamber of a standard 38-caliber revolver in precisely the same way as is lethal ammunition, and it is fired in the same way. Because of its relatively high muzzle velocity, it may be aimed at an angle of 90 degrees from the horizontal. Its ballistic characteristics make it unsuitable for use as a defensive weapon at ranges exceeding 50 yards. Its display appears to the naked eye as a streak that extends from just above the point of firing throughout its total trajectory. It burns for 5.5 to 7.5 seconds.

5-7-1-4. Handling and Storage. The Mk 130 Cartridge is classified as Class B explosives under Code of Federal Regulations (49 CFR 71-78) and as Class IIC explosives

under Coast Guard Rules and Regulations (C. G. 108), and must be stored and handled as such. In general, the provisions of Section 1-6 of Chapter 1 of this pamphlet apply.

5-7-1-5. Safety Precautions. As is true of all ammunition which is initiated by a blow on a percussion-type primer, care should be taken to avoid dropping the cartridge or otherwise striking its primer with any hard object. Under no circumstances should a side arm loaded with these signals be pointed toward friendly personnel.

5-7-1-6. Shipping Containers. These signal cartridges are packaged 50 per cardboard box, 24 such cardboard boxes to a metal container. Two of these metal containers (2400 rounds)

are packaged for shipment in a wirebound wooden box.

5-7-1-7. Identification Data. The Mk 130 Signal Cartridge is listed under LD 615293, NAVORD Dwg. No. 2113240, Specification WS 2013, FSN 1370-883-9023, and DOD Code No. LA21.

5-7-2. Cartridge, Signal, Mks 121 (Red), 122 (Green), and 123 (Yellow) Mod 0.

5-7-2-1. Intended Use. This cartridge (Figure 5.7.2.) is fired from a semi-automatic 9MM side arm for nighttime signaling purposes. It was expressly designed for use by SEAL teams, but it may also be used for any appropriate nighttime signaling by personnel who are equipped with the 9MM semi-automatic pistol.

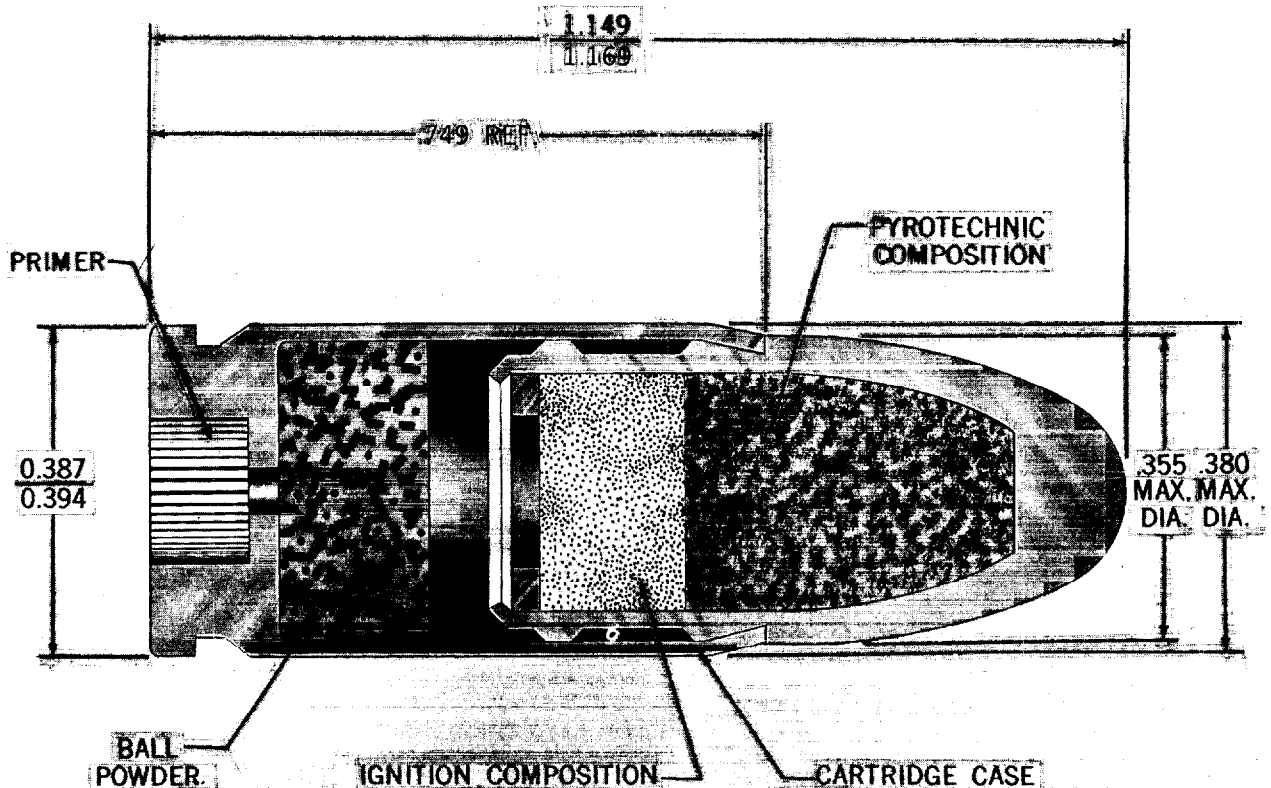


Figure 5.7.2. Signal Cartridge Mks 121, 122, and 123

5-7-2-2. **Description.** These three signal cartridges are identical except for their chemical pyrotechnic compositions, the color of their displays, their band coloring, and their nomenclatures. Each of the three signal cartridges is identified as to its display color by a 3/16-inch band of that color painted around the nose of that cartridge. This colored band also distinguishes the signal cartridge from the lethal round used with the same pistol. The cartridge case contains an ignition composition and a pyrotechnic composition. Centered in the base of the cartridge case is a primer, 116M-282A. The ball powder propellant charge, which is ignited by the primer, projects the pyrotechnic signal to an average height of approximately 1650 feet with a force sufficient to ensure an effective display above most jungle foliage.

5-7-2-3. **Operation.** These cartridges are loaded into the clip of a 9-mm pistol in the same way as are ball rounds. Single rounds may be loaded directly into the breech of the pistol, but an empty clip must be in the pistol in order for the round to be fired. The propellant charge in these signal cartridges is not powerful enough to force the pistol slide to the rear for ejecting the case of the fired round. Therefore, when successive rounds are being fired from a clip, it is necessary to manually eject each expended cartridge case. Like the Mk 130 cartridge (see paragraph 5-7-1-3), the displays produced by these signal cartridges appear to the naked eye as continuous streaks

of light extending from just above the point of firing to the point of burnout. The average burning time of the pyrotechnic composition is 4 seconds.

5-7-2-4. **Handling and Storage.** These cartridges shall be handled and stored in accordance with current regulations for Class B pyrotechnics (49 CFR 71-78). Coast Guard Rules and Regulations, CG-108, for Class IIC explosives also apply, as do the specifications of OP 5, Ammunition Ashore. As is true for all percussion-initiated devices, care must be taken to avoid accidental striking of the primer. These cartridges must be kept away from excessive heat sources at all times. The general provisions of Section 1-6 of Chapter 1 of this pamphlet are pertinent to these signal devices and must be observed.

5-7-2-5. **Safety Precautions.** The provisions of paragraph 5-7-1-5 are equally applicable to Mk 121, 122, and 123 Signal Cartridges.

5-7-2-6. **Shipping Containers.** Mk 121, 122, and 123 Signal Cartridges are packaged 50 to a cardboard box, 25 cardboard boxes (1250 cartridges) to a metal container the gross (filled) weight of which is approximately 27 pounds. Each metal container occupies approximately 0.32 cubic feet of space.

5-7-2-7. **Identification Data.** The following information applies to these cartridges:

	Mk 121 (Red)	Mk 122 (Green)	Mk 123 (Yellow)
Assembly Dwg No.	2113159	2113198	2113199
Specification	WS 3011A	WS 3011A	WS 3011A
Federal Stock No.	1370-804-4466	1370-804-4468	1370-804-4409
DOD Code No.	LA 26	LA 27	LA 28

CHAPTER 6

AREA AND TARGET ILLUMINATING DEVICES

6-1. INTRODUCTION.

This chapter contains information on pyrotechnic devices which provide high-intensity light for the purpose of illuminating targets or areas.

6-1-1. Arrangement of Material in this Chapter. This chapter is subdivided on the basis of launching or releasing source.

6-1-2. Handling and Storage. Illuminating devices normally contain powdered magnesium mixed with an oxidizer. They are designed to burn for relatively long periods of time, developing high temperatures. Once ignited, they are difficult to extinguish. Rough handling must be avoided since the devices are easily activated. Handling and storage rules in Chapter 1 of this pamphlet apply. Illuminating devices at sea shall be stored in primary pyrotechnic magazines only fully packaged as received. Opening of shipping containers and other make-ready work shall be done above decks, not in magazine areas. Devices that are in any way prepared for use and not used must not be restowed in primary magazines; instead, they must be carefully checked to assure that they are fully safed before being

stowed in ready-service lockers or segregated areas above decks, subject to jettisoning in case of accidental ignition. If safing cannot be positively assured, they must be jettisoned immediately if at sea or moved to a safe area for disposal if ashore.

6-1-3. Safety Precautions. The general safety precautions in Section 1-8 of Chapter 1 of this pamphlet must be observed. All pyrotechnic devices aboard aircraft must be securely fastened, especially if the plane is to be catapulted; loose pyrotechnics may be damaged so as to ignite prematurely, or they may cause physical damage to the aircraft. These devices must never be disassembled aboard ship or aircraft nor shall the parachutes or other components be removed. Illuminating pyrotechnics are a greater hazard than many types of ammunition because they are relatively easy to activate.

6-1-4. Disposition. Illuminating pyrotechnic devices which are found to be bent, dented, or in any way damaged so as to raise a question as to their serviceability shall be disposed of in accordance with the provisions of Chapter 3 of this pamphlet.

6-1-5. Reporting of Accidents and Incidents. All explosive accidents and incidents and all malfunctions involving illuminating devices shall be reported in accordance with the provisions of Chapter 2 of this pamphlet.

TABLE 6-1
ILLUMINATING DEVICES SUMMARY

Item	Paragraph	Approx. C.P.	Burn Time (Sec.)	Approx. Length (In.)	Approx. Diam. (In.)	Approx. Weight (Lb.)	Launched From
Flare, Aircraft, Parachute, Mk 4	6-2-1			Obsolete			
Flare, Aircraft, Parachute, Mk 5 Mods 3-8	6-2-2	600,000	180	27.00	4.75	18	Aircraft
Flare, Aircraft, Parachute, Mk 5 Mod 9	6-2-2	1,000,000	180	27.00	4.75	18	Aircraft

TABLE 6-1 (continued)

Item	Para-graph	Approx. C. P.	Burn Time (Sec.)	Approx. Length (In.)	Approx. Diam. (In.)	Approx. Weight (Lb.)	Launched From
Flare, Aircraft, Parachute, Mk 5 Mod 10	6-2-2	1,250,000	180	27.00	4.75	18	Aircraft
Flare, Aircraft, Parachute, Mk 6 Mods	6-2-3	1,000,000	180	35.75	5.37	30	Aircraft
Flare, Aircraft, Parachute, Mk 8 Mods	6-2-4	500,000	180	25.12	4.75	18	Aircraft
Flare, Aircraft, Parachute, Mk 10	6-2-5			Obsolete			
Flare, Aircraft, Parachute, Mk 24 Mods 2 and 2A	6-2-6	2,000,000	150	36.00	4.87	24	Aircraft
Flare, Aircraft, Parachute, Mk 24 Mods 3 and 4	6-2-6	2,000,000	180	36.00	4.87	27	Aircraft
Flare, Aircraft, Parachute, M26A1	6-2-7			Obsolete			
Flare, Aircraft, Parachute, Mk 45 Mod 0	6-2-8	2,000,000	210	36.00	4.87	28	Aircraft
Projectile Load, Illuminating, Mk 4 Mod 3	6-3-1	120,000	25	-	-	3.63	3" Gun
Projectile Load, Illuminating, Mk 4 Mod 4	6-3-1	240,000	43	-	-	10.66	4" Gun
Projectile Load, Illuminating, Mk 4 Mod 5	6-3-1	275,000	60	-	-	16.94	5"/38 Gun
Projectile Load, Illuminating, Mk 4 Mod 6	6-3-1	400,000	51	-	-	31.77	6" Gun

TABLE 6-1 (continued)

Item	Para-graph	Approx. C. P.	Burn Time (Sec.)	Approx. Length (In.)	Approx. Diam. (In.)	Approx. Weight (Lb.)	Launched From
Projectile Load, Illuminating, Mk 4 Mod 7	6-3-1	275,000	55	-	-	18.34	5"/54 Gun
Projectile Load, Illuminating, Mk 7	6-3-2	400,000	51	-	-	32.98	6"/47 Gun
Projectile Load, Illuminating, Mk 9 Mod 0	6-3-3	600,000	50	12.017	4.40	35.00	6"/47 Gun
Projectile Load, Illuminating, Mk 9 Mod 1	6-3-3	900,000	50	12.017	4.40	35.00	6"/47 Gun
Projectile Load, Illuminating, Mk 11	6-3-4	600,000	50	12.50	4.00	16.30	5" Gun
Projectile Load, Illuminating, Mk 12	6-3-5	250,000	25	7.50	2.175	3.65	3"/50 Gun
Flare, Surface, High Altitude, Parachute, Mk 20	6-4-1	80,000	60	10.75	2.40	5.00	Mk 13 Projector
Cartridge, 60 MM, Illuminating, M83A2	6-4-2	145,000	25	14.28	-	3.77	60 MM Mortar
Cartridge, 81 MM, Illuminating, M301A2	6-4-3	-	55	22.48	-	10.71	81 MM Mortar
Flare, Surface, Mk 1	6-5-1	75,000	65	5.38	2.38	3.75	Tree or Post
Flare, Surface, M 48	6-5-2	110,000	20	7.30	2.50	5.00	Ground
Flare, Surface, M49	6-5-3	40,000	55	6.00	3.00	1.44	Tree or Post
Grenade, Hand, Illuminating, Mk 1 Mod 1	6-6-1	55,000	30	4.30	2.10	.65	Hand or Rifle
Grenade, Hand, Illuminating, Mk 1 Mod 2	6-6-1	55,000	30	4.30	2.10	.60	Hand or Rifle

6-2. AIRCRAFT-LAUNCHED ILLUMINATING DEVICES.

The devices described in this section are designed to be launched or dropped from aircraft. Some of these devices are equipped with time fuzes which control their functioning at a pre-determined distance from the launching plane. Others are activated immediately when launched from the aircraft. All applications of these flares shall be in accordance with the flight manual for the particular aircraft being employed.

6-2-1. Flare, Aircraft, Parachute, Mk 4.

NOTE: This flare is obsolete and should not be in the supply system. If any are found in the system, they should be returned to an ammunition depot for appropriate disposition.

6-2-2. Flare, Aircraft, Parachute, Mk 5, Mods 3, 4, 5, 6, 7, 8, 9, & 10.

(Illustration top of page 6-4)

6-2-2-1. Intended Use. This flare (Figure 6.2.1) is launched from aircraft to produce a parachute-suspended light source for the purpose of illuminating a target or an area (see Table 6-1).

6-2-2-2. External Features. This device consists of a cylindrical chipboard outer case closed at its fuze end by a metal cover and at its parachute end by chipboard disks held in place by gummed cloth sealed with paraffin. Mods 3 through 8 have their lanyards taped along the full length of the outer case. The lanyard of Mods 9 and 10 is folded and placed under the metal cap at the fuze end. Two metal steadying bands are fastened to the case against which the sway braces of the bomb rack rest.

6-2-2-3. Functional Description. All mods of this device are ignited by a preset, variable-delay time fuze which is under the metal cover. Mods 3 through 7 are operated by a snap cord which breaks with a force of roughly 38 pounds to release the firing lever. Mods 8, 9, and 10 have been modified to require only an 8-pound

pull to operate the firing lever. In these later mods, the cord pulls away instead of breaking. When the flare is launched, the firing lever is released and strikes the primer. The primer ignites the safety fuze which sets off the quick-match under the fuze block. This ignites the firecracker fuze which is stapled to the first-fire composition, forcing the parachute and the 13-pound illuminant composition out of the case. The parachute tube, which is of split construction, falls away. In Mods 3 through 7, a retention cable slides through the trigger snap on the end of the shroud lines until it reaches a cable stop. A short length of cable on one side of this stop suspends the flare case. The longer length on the other side suspends the illuminant. This keeps the case from dropping as a missile hazard. In Mods 8, 9, and 10, the flare case is not secured and falls free. In Mods 3 through 8, the shock of the opening parachute is partially absorbed by a snubber consisting of lead balls on a suspension cable which is pulled through a hole smaller than the balls, thus shearing some lead from each ball as it is pulled through. The last ball, which is much larger, acts as a stop. In Mods 9 and 10, the suspension cable passes through a connection in which friction absorbs the shock. To use the full burning time of the flare to best advantage, the release altitude must be at least 3000 feet more than the fuze setting. The flare falls 1500 to 1800 feet while burning.

6-2-2-4. Associated Equipment. These flares are packaged with conventional one-lug-type suspension bands.

6-2-2-5. Make-Ready Procedures. These flares shall be prepared for launching in accordance with instructions contained in the flight manual for the particular aircraft being used.

6-2-2-6. Handling and Storage. This device shall be handled and stored in accordance with the provisions of paragraph 6-1-2 of this chapter.

6-2-2-7. Safety Precautions. The general safety precautions appearing in paragraph 6-1-3 of this chapter apply. In addition, to preclude the possibility of accidental hangups, any Mk 5 Flare found in the system which has

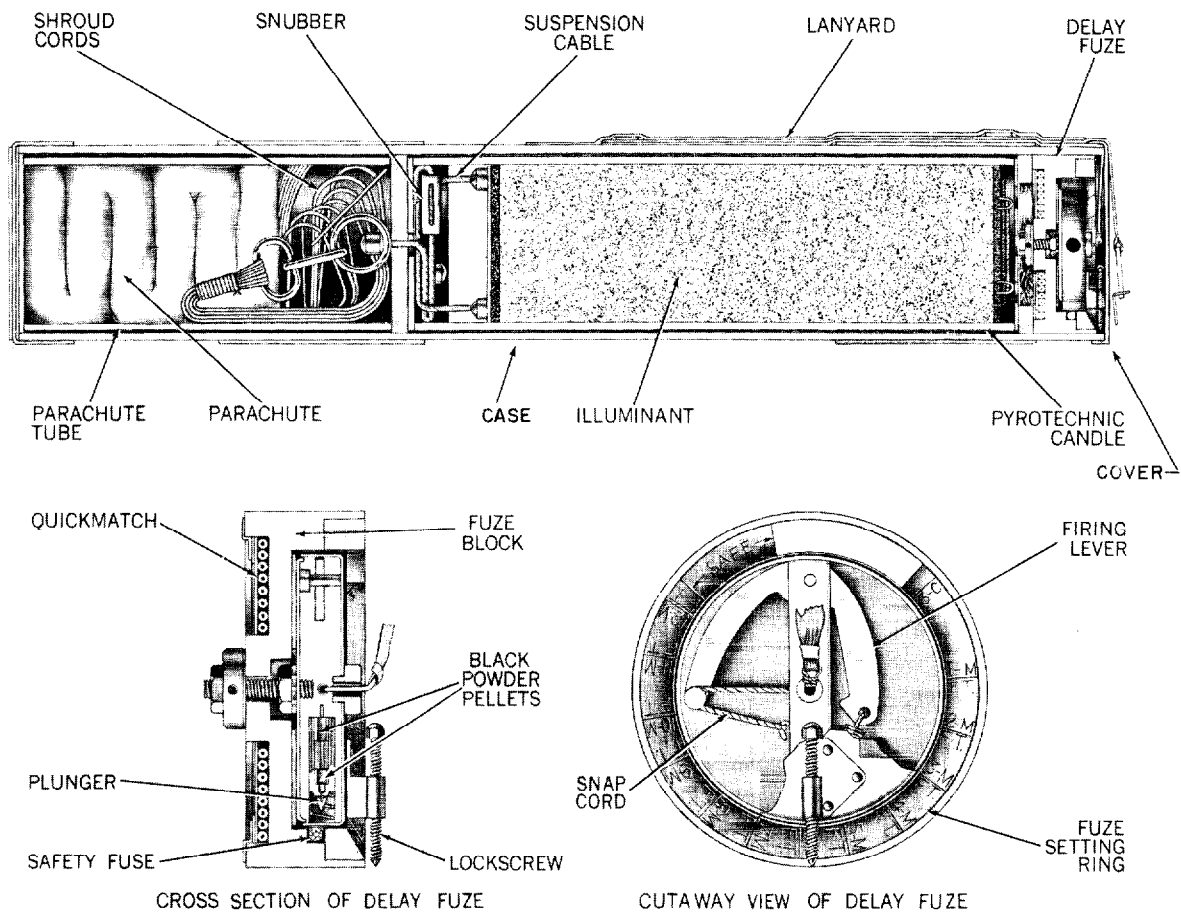


Figure 6.2.1 Aircraft Parachute Flare, Mk 5

a foulable double-ribbon firing lanyard shall not be used until the double ribbon has been taped together to prevent its looping around the flare lock screw. The following steps shall be taken if double-ribbon lanyards are found:

- (1) Be sure that the flare fuze is set on "safe" and that the safety thumbscrew is in place.
- (2) Using a cloth tape (such as friction tape or adhesive tape), bind the two ribbons together 18 inches from the fuze end of the flare.
- (3) In installing the flare, be sure that the lanyard runs over the end of the flare 180 degrees from the lock screw.

WARNING

Mods 8, 9, and 10 shall not be launched over friendly territory

since the case falls free and presents a serious missile hazard.

6-2-2-8. Shipping Containers. All mods of this flare are packaged in wooden boxes as follows: Mods 3 through 8, six to the box; Mods 9 and 10, four to the box. Filled boxes weigh 170 pounds.

6-2-2-9. Identification Data. The following table applies to this flare:

FLARE, AIRCRAFT, PARACHUTE, MK 5 MODS
(Specification MIL-F-18569)

Mods	Dwg. No.	FSN	DOD Code No.
3	115098	1370-092-9894	L385
4	115098	1370-725-3546	L385
5	115098	1370-725-3549	L385
6	115098	1370-725-7846	L385
7	115098	1370-725-7845	L385
8	115098	1370-092-9908	L385
9	1331779	1370-092-9911	L385
10	1331795	1370-092-9916	L380

6-2-3. Flare, Aircraft, Parachute, Mk 6 Mods 3, 4, 5, and 6.

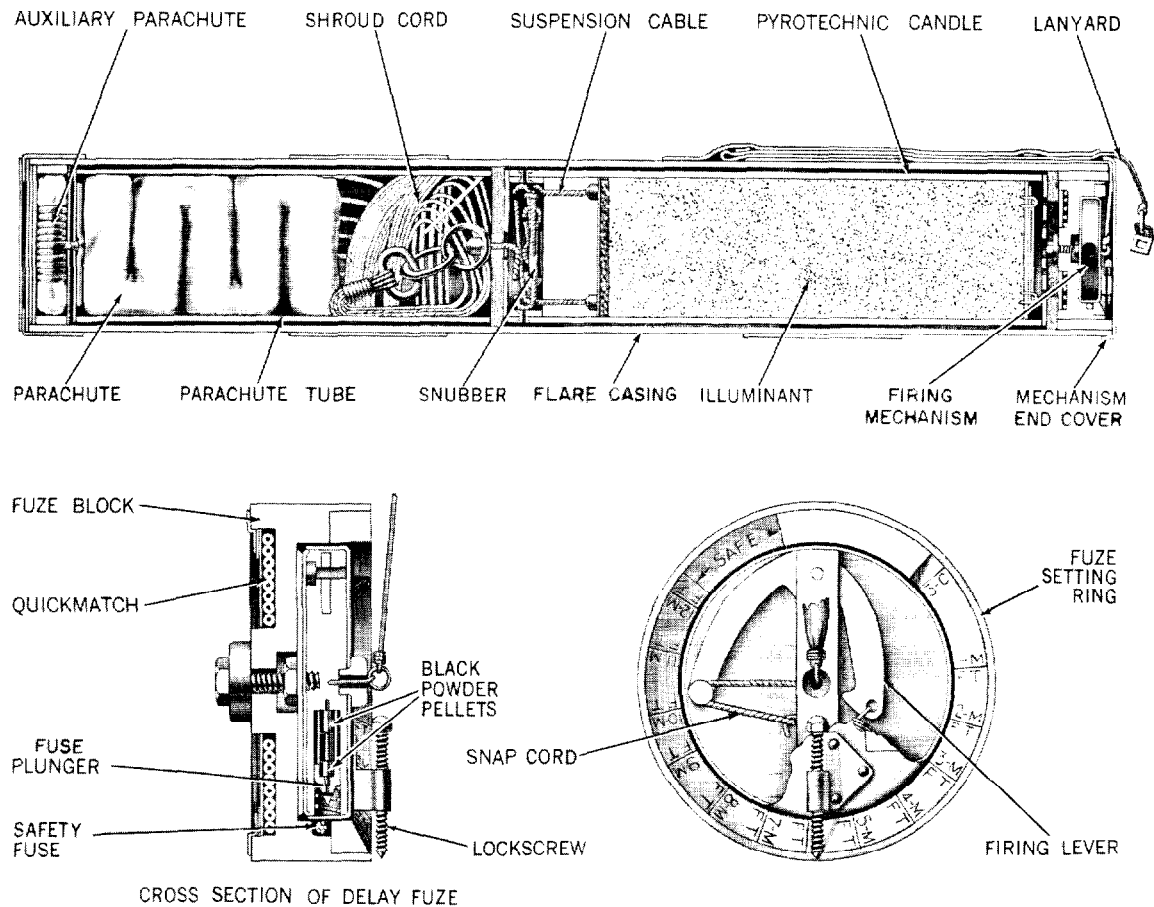


Figure 6.2.2 Aircraft Parachute Flare. Mk 6

6-2-3-1. Intended Use. This flare (see Figure 6.2.2) is used for the same purposes as the Aircraft Parachute Flare, Mk 5, described in paragraph 6-2-2 preceding. For candlepower ratings, burning times, etc., see Table 6-1.

6-2-3-2. External Features. This device consists of a shellac-impregnated chipboard cylinder closed at its fuze end by a metal cover and at its parachute end by chipboard disks held in place by gummed cloth sealed with paraffin. A lanyard, at the end of which is an arming plate, is adhered by a tape cover to the outer case of Mods 3, 4, and 5. The lanyard of Mod 6 is folded and contained under the fuze-end metal cover. Two metal steadying bands are

fastened to the case, against which the sway braces of the bomb rack rest. Suspension bands are shipped with the flare.

6-2-3-3. Functional Description. This flare has a preset, variable-delay time fuze. The fuzes of Mods 3 and 4 are operated by a snap cord which must break before the firing lever is released to strike the primer. In the fuzes of Mods 5 and 6, the cord is pulled away from the firing lever. When the flare is released from the aircraft, the arming plate on the end of the lanyard is retained by the arming-wire retainer of the bomb rack. The lanyard exerts a pull on the cord attached to the firing lever. As this cord breaks (or is pulled away in the

case of Mods 5 and 6), the lever spring drives the firing lever back against the primer which ignites the black powder pellets in the fuze plunger. Gases from these pellets force the point of the plunger into the safety fuse. The safety fuse burns for a length of time determined by the fuze setting and then ignites the quickmatch under the fuze block. This, in turn, ignites the firecracker-type fuse which is stapled to the first-fire composition. Gases from this combustion force the auxiliary parachute, the encased main parachute, and the flare candle out of the flare case which then falls free. The first-fire composition also ignites the pyrotechnic candle. The auxiliary parachute retards the main parachute in its case, allowing the 17.4-pound candle to pull the shroud cords and main parachute out for full suspension of the burning pyrotechnic composition.

6-2-3-4. Associated Equipment. These flares are packaged with conventional one-lug-type suspension bands.

6-2-3-5. Applications. Installation and launching limitations in relation to this flare shall be in accordance with the appropriate flight manual for the particular aircraft being employed.

6-2-3-6. Handling and Storage. This device shall be handled and stored in accordance with provisions of paragraph 6-1-2 of this chapter.

6-2-3-7. Safety Precautions. The general safety precautions appearing in paragraph 6-1-3 of this chapter apply. In addition, to preclude the possibility of accidental hangups, any Mk 6 Flare found in the system which has a foulable double-ribbon lanyard shall not be used until the double ribbon has been taped together to prevent its looping around the flare lock screw. The following steps shall be taken if double-ribbon lanyards are found:

(1) Be sure that the flare fuze is set on "safe" and that the safety thumbscrew is in place.

(2) Using a cloth tape (such as friction tape or adhesive tape), bind the two ribbons together 18 inches from the fuze end of the flare.

(3) In installing the flare, be sure that the lanyard runs over the end of the flare 180 degrees from the lock screw.

WARNING

While installing this flare, extreme care must be taken not to foul or exert pressure on the lanyard.

WARNING

Remove the safety screw only after all other installation steps have been completed.

6-2-3-8. Shipping Containers. Mods 3, 4, and 5 are packaged four to a wooden box; Mod 6, two to a wooden box. The filled boxes weigh 176 to 102 pounds, respectively.

6-2-3-9. Identification Data. The following table applies to this flare:

FLARE, AIRCRAFT, PARACHUTE, MK 6 MODS
(Specification MIL-F-18569)

Mods	Dwg. No.	FSN	DOD Code No.
3	115077	1370-092-9901	L386
4	115077	1370-725-5825	L386
5	115077	1370-203-4220	L386
6	LD 282709	1370-092-9915	L386

NOTE: Mods 3, 4, and 5 have been indicated as disposable by SPCC. If any of these mods are found in the supply system, they should be segregated for appropriate disposition.

6-2-4. Flare, Aircraft, Parachute, Mk 8 Mods 1 and 2
(Illustration on page 6-7)

NOTE: Mod 1 has been indicated as disposable by SPCC. If any Aircraft Parachute Flares, Mk 8 Mod 1 are found in the supply system, they should be segregated for appropriate disposition.

6-2-4-1. Intended Use. This flare (see Figure 6.2.3) was developed expressly for anti-submarine warfare uses. Its parachute opens immediately after launching and, after a delay of 90 seconds (Mod 1) or 120 seconds (Mod 2), it produces a pale yellow illumination. For candlepower ratings, burning times, etc., see Table 6-1.

6-2-4-2. External Features. This flare consists of a cylindrical, shellac-impregnated chip-

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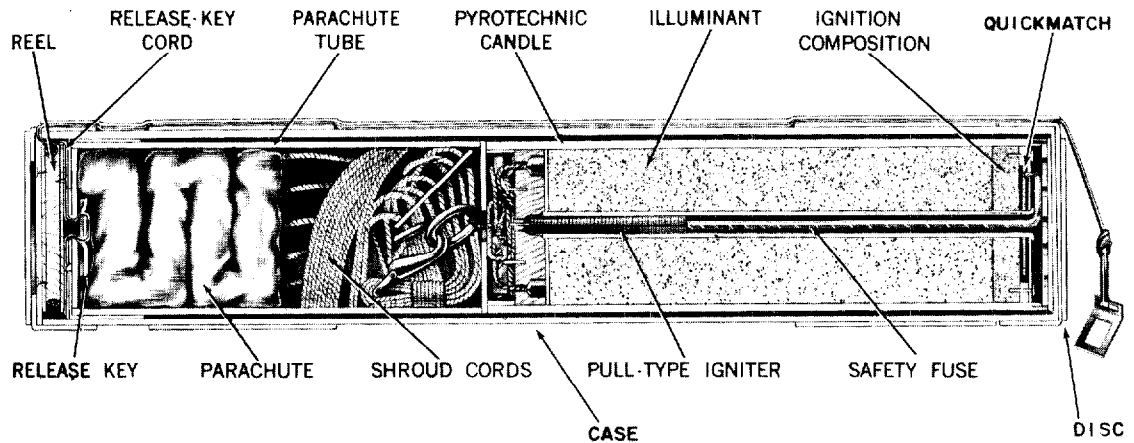


Figure 6.2.3 Aircraft Parachute Flare, Mk 8

board tube with two metal steadying bands against which the sway braces of the bomb rack rest. Both ends of the tube are closed by chipboard disks, held in place by gummed cloth sealed with paraffin. A lanyard, to the end of which is attached an arming plate, runs the full length of the outer case and is attached to the tube by a tape lanyard cover. The illuminant end of the case is appropriately stenciled.

6-2-4-3. Functional Description. When this device is launched, the arming plate on the end

of the lanyard is retained by the aircraft. The rip cord, attached to the other end of the lanyard, tears along the side of the case and unwinds from a wood reel in the end of the flare case. This action pulls the end of the case, the reel, and the encased parachute out of the flare case, and the reel falls free. Tension on the lanyard and rip cord retains the parachute tube and, as the flare case containing the pyrotechnic candle falls away, the suspension cable and shroud cords pull the parachute from its tube.

The snubber absorbs some of the shock. When the parachute is fully extended, the release key cord pulls down one end of the release key, allowing the rip cord to become detached from the parachute tube and permitting it to fall free. Approximately 30 to 50 feet below the plane, the parachute opens to suspend the pyrotechnic candle. The pull-type igniter is initiated by the extended suspension cable. This ignites the safety fuse which burns through the center tube in the candle. The safety fuse ignites the quickmatch which sets off the first-fire composition, and the first-fire composition, in turn, ignites the candle.

6-2-4-4. Associated Equipment. Conventional one-lug-type suspension bands are supplied with the flares.

6-2-4-5. Applications. Installation and launching limitations in relation to this flare shall be in accordance with the appropriate flight manual for the particular aircraft being employed.

6-2-4-6. Handling and Storage. This device shall be handled and stored in accordance with the provisions of paragraph 6-1-2 of this chapter.

6-2-4-7. Safety Precautions. The general safety rules in paragraph 6-1-3 of this chapter apply.

6-2-4-8. Shipping Containers. This device is packaged six rounds to a wooden box. A filled box weights roughly 161 pounds.

6-2-4-9. Identification Data. The following table applies to this flare:

FLARE, AIRCRAFT, PARACHUTE, MK 8 MODS
(Specification MIL-F-18536)

Mods	Dwg. No.	FSN	DOD Code No.
1	364663	1370-092-9906	L381
2	364663	1370-093-9909	L387

6-2-5. Flare, Aircraft, Parachute, Mk 10.

NOTE: This flare is obsolete and should not be in the supply system. If any are found in the system, they should be returned to an ammunition depot for appropriate disposition.

6-2-6. Flare, Aircraft, Parachute, Mk 24 Mods 2, 2A, 3, and 4.

NOTE (1): Mod 1, Mod 2 without suspension bands, and Mod 2 inert have been declared obsolete by SPCC Change Notice of 9 December 1966. If any of these items are found in the stocks of any ships or stations, they should be returned to an ammunition depot for appropriate disposition action.

NOTE (2): Mod 2 (with suspension bands) has been placed in restricted status. It must not be used unless it is modified to include a lanyard retaining pin.

NOTE (3): Mod 5 of this flare was cancelled before production commenced.

6-2-6-1. Intended Use. All mods of this aircraft-launched flare are intended for use in any condition calling for intense illumination. For candlepower ratings, burning times, etc., of the various mods, see Table 6-1.

6-2-6-2. Description. This aluminum-encased flare is equipped with two variable-delay fuzes (Figure 6.2.4): one that controls ejection of the candle and parachute from the outer case, and a second that controls candle ignition. The fuze end of the flare case is covered with a taped-in-place plastic weather cap. Under this cap are the two dials used for setting the fuzes (see paragraph 6-2-6-4 following) and a flexible stainless steel lanyard approximately

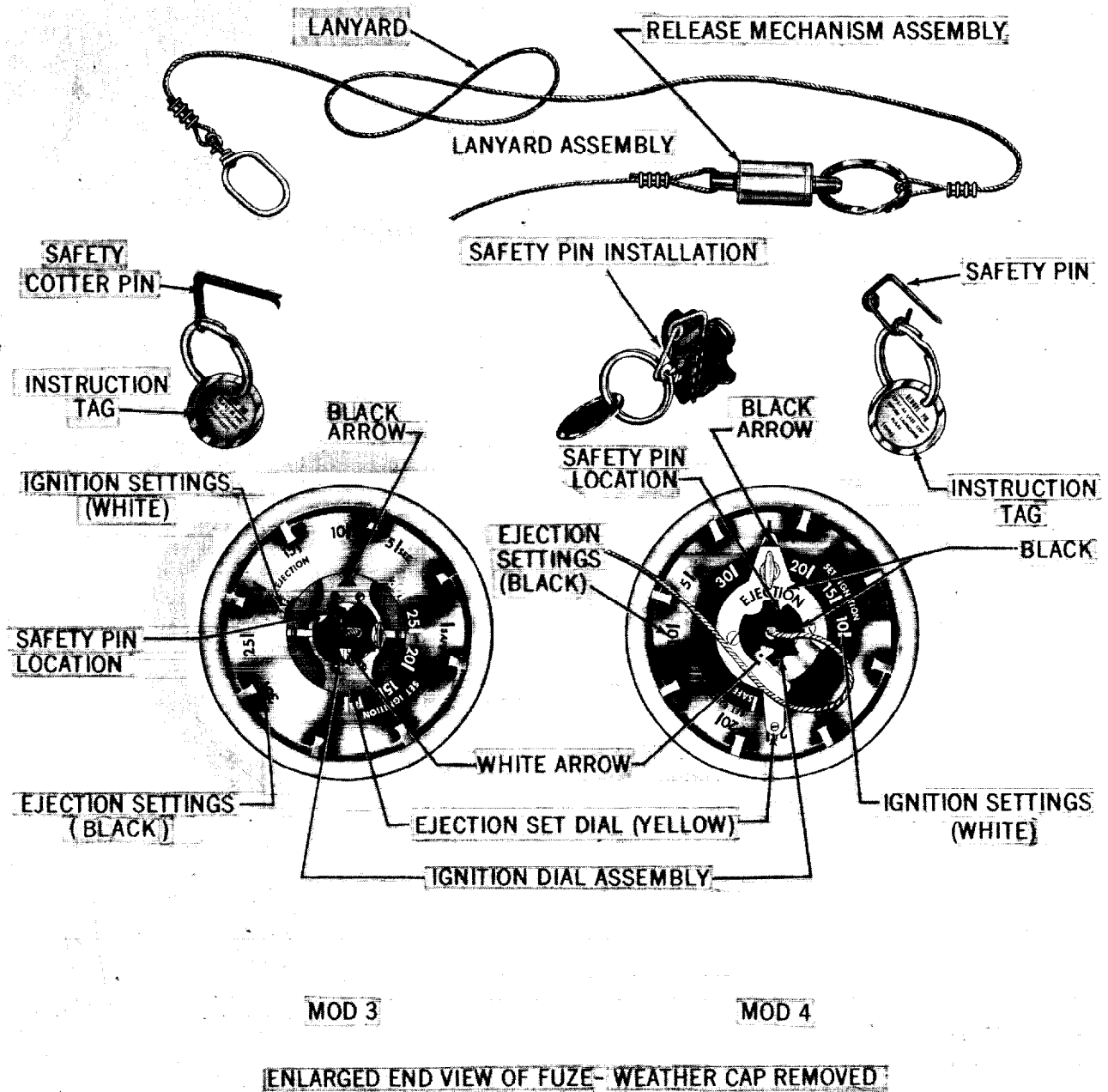


Figure 6.2.4. Aircraft Parachute Flare Mk 24 Mods 3 and 4, External View

40 inches long (Mod 4 assembled with a drogue tray, as described in paragraph 6-2-6-14 following, is an exception). Near the fuze end of the lanyard is a release mechanism that separates the longer section of the lanyard from the flare when a force of approximately 50 pounds is exerted. A desiccant bag is also contained within the fuze cavity under the weather cap. Adhered to the outer case is a label, or decal, which gives precise fuze-setting and safing information.

6-2-6-3. Differences Among Mods. The various mods of the Mk 24 Flare differ from one another in the following significant respects:

(1) In Mod 2, ignition fuze settings (inner circle of white figures) on the fuze block include 5- to 30-second intervals. The 5-second ignition setting has been omitted in Mods 2A, 3, and 4.

(2) Mod 2, as modified (see paragraph 6-2-6-4 following), contains a specially designed retaining pin that straddles a brass sleeve crimped to the lanyard. Mods 2A and 3 have an ordinary cotter pin inserted through the bottom portion of the ignition fuze-setting dial. Mod 4 uses a spring-steel pin that is inserted through the same hole as in Mods 2A and 3 and that is held in the fuze assembly as shown in Figure 6.2.4. The use of unmodified Mod 2 is restricted because it did not include any type of safety pin in the fuze mechanism. It must not be used unless modified.

(3) Mod 4 also includes a different ejection fuze-setting dial that is stamped out of flat metal. It is yellow in color, shaped more effectively as a pointer, and does not have to be depressed in setting the fuze. It includes in its design a thumbscrew that locks it at "safe" or any desired time setting.

(4) There are certain internal manufacturing differences among the various

mods which, except for weight and burning times (see Table 6-1), do not effect handling or functioning of the flare.

6-2-6-4. Fuze Description. All mods of this flare contain two variable-delay fuzes - the ejection fuze and the ignition fuze (Figures 6.2.4 and 6.2.5). Each fuze is controlled as to desired time of functioning by dials. The larger yellow-colored pointer is used for selecting ejection delays in conjunction with the outer ring of 5-second-interval settings. (The colors of ejection time settings and of the arrow pointer were changed during Mod 3 production. Mods 2, 2A, and earlier Mod 3 flares had a red arrow pointer and yellow numerals; in most lots since March 1966, the color of the arrow pointer and the ejection time settings is black. Mod 4 follows this same color pattern - black arrow and black numerals.) The smaller, gray or black dial which is centered on top of the yellow ejection dial (see note below) is used for selecting ignition delays in conjunction with the inner ring of white 5-second-interval settings. (Mod 4 ignition settings are on black background). BOTH fuze-setting dials MUST BE in "safe" position while the flare is being handled prior to setting the fuzes, and BOTH MUST BE set at other than "safe" to assure complete flare functioning. A safety cotter pin is inserted through the ignition dial of Mods 2A and 3. An improved reusable spring-steel safety pin is in the Mod 4 ignition dial. These pins lock the flare lanyard and prevent its being pulled accidentally to initiate flare functioning. Mod 2, originally manufactured without any means of locking the lanyard, may have been modified to include a positive stop retaining pin. This mod must not be used unless this modification has been made.

NOTE: In modified Mod 2, the ignition dial is partially hidden from view by the lanyard retaining mechanism; the white arrow on the dial is completely hidden. A white

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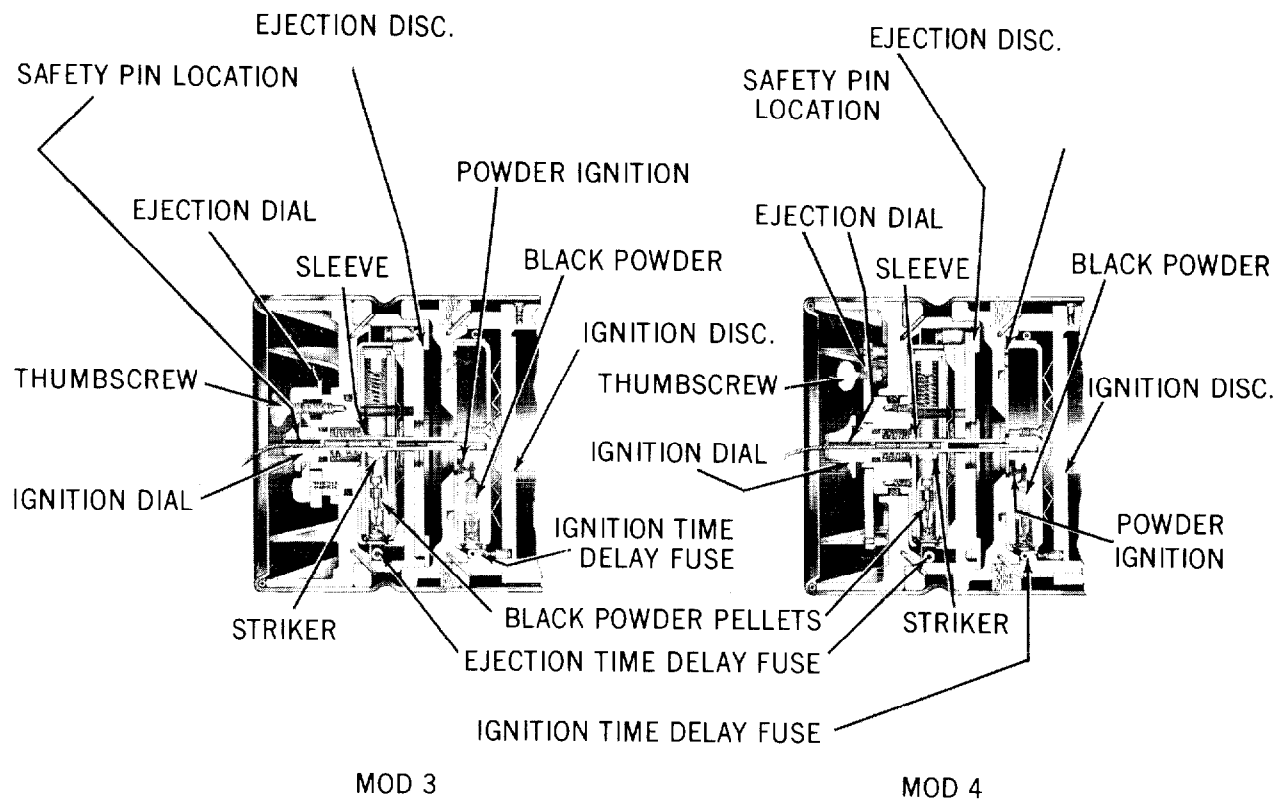
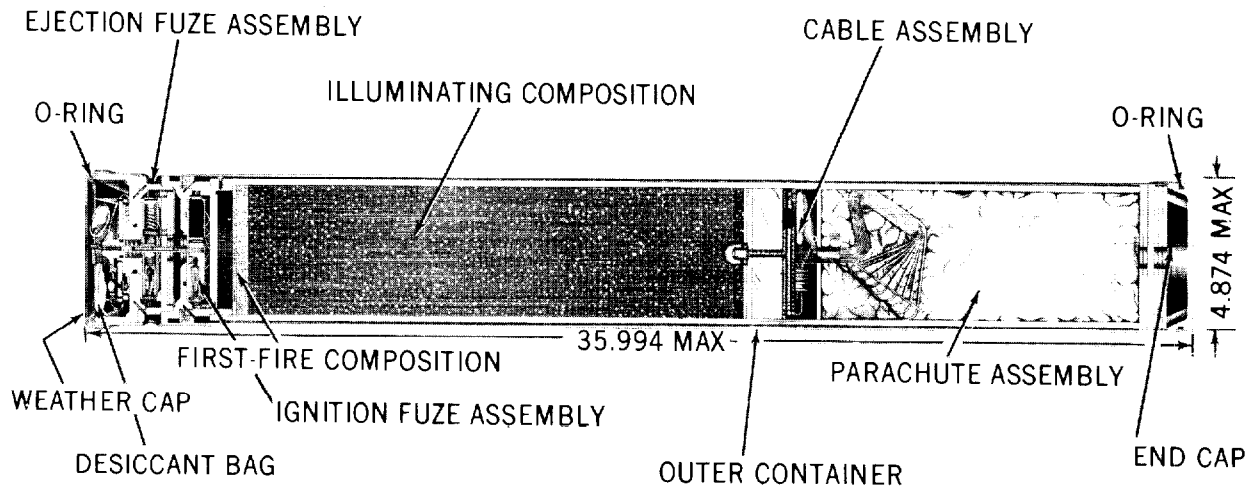


Figure 6.2.5. Aircraft Parachute Flare Mk 24 Mods 3 and 4, Cross Section

painted mark in the concave surface of the dial indicates the location of the arrow for fuze-setting purposes (see information sheet in shipping container).

WARNING

The retaining pin (modified Mod 2), the safety cotter pin (Mods 2A and 3), and the safety pin (Mod 4) must not be removed except as the **LAST STEP** before launching the flare. In case of wing rack or other external loading, this means after **ALL** other make-ready steps have been completed.

6-2-6-5. Applications. Installation and external carriage procedures in respect to use of this flare with various bomb racks and specific aircraft shall be in accordance with Aviation Armament Change No. 494 or Aviation Armament Bulletin No. 347 (Rev.). Other applications, launching limitations, jettisoning, down-loading, and re-storing procedures which are not specifically covered in this pamphlet shall be in accordance with appropriate manuals for the particular aircraft being employed.

6-2-6-6. Fuze Delay Intervals. All mods of this flare have 5- to 30-second ejection fuze-setting intervals. Mod 2 has 5- to 30-second ignition fuze-setting intervals, but the 5-second ignition setting is not to be used. Starting with Mod 2A and continuing through all production lots of Mods 3 and 4, the 5-second ignition setting has been eliminated from the dial. Thus, the ejection fuze of all mods may be set at any 5-second delay from 5 to 30, and the ignition fuze may be set only at 10- to 30-second intervals.

6-2-6-7. Facts to be Considered in Setting Fuzes. To obtain maximum effective ground illumination from this flare, fuzes should be set with regard to a launch altitude which assures candle burnout before the flare strikes the ground and preferably at a height of not more than 350 feet above ground level (A. G. L.). In setting fuzes, therefore, and in determining the best launch altitude, certain essential facts should be understood. The small table below is based on the lowest permissible ignition fuze setting (10-second delay). Facts to be considered are:

(1) Between launch and ejection, the flare falls approximately 300 feet during the first 5

seconds, 700 feet during the next 5 seconds, and 1,000 feet during each succeeding 5-second interval.

(2) Between ejection and ignition, the rate of fall is approximately 15 feet per second.

(3) After the candle ignites, the average rate of descent is 7.5 feet per second.

(4) Mods 2 and 2A burn for approximately 150 seconds or 1125 feet of fall before burnout; Mods 3 and 4 burn for approximately 180 seconds or 1350 feet of fall before burnout.

LAUNCH ALTITUDES TO OBTAIN BURNOUT AT 300 TO 350 FEET A.G.L.

(Using 10-second ignition fuze setting)

Ejec. Fuze Settings	Launch Alt. (Mods 2 & 2A)	Launch Alt. (Mods 3 & 4)
5	1900	2100
10	2600	2800
15	3600	3800
20	4600	4800
25	5600	5800
30	6600	6800

NOTE 1: For each additional 5-sec. interval on ignition fuze, add 75 feet to above readings.

NOTE 2: There is no 5-sec. ignition delay setting on Mods 2A, 3, or 4 fuze dial.

WARNING

In setting fuzes (see Figure 6.2.4), care must be taken to follow exactly the procedure specified in the decal on the flare body. The larger yellow ejection dial indicator **MUST** be used in conjunction with the **OUTER** ring of figures; the small (center) dark-colored ignition dial indicator **MUST** be used in conjunction with the **INNER** ring of figures. Ejection will probably occur in less than 1 second if ejection dial indicator is set by error at the 30-second ignition setting. Flare ignition in less than 4 seconds is possible if ignition dial indicator is set by error at 30-second ejection setting.

6-2-6-8. Setting Mods 2, 2A, and 3 Fuzes. The

tool described in paragraph 6-2-6-12 following shall be used in setting the ejection fuze in all mods of this flare except Mod 4 which does not require a tool. The following steps shall be taken in setting the fuzes in Mods 2, 2A, and 3:

- (1) Remove and keep thumbscrew (Mods 2A and 3 only).

WARNING

The retaining pin (modified Mod 2) and the cotter pin (Mods 2A and 3) do not interfere with fuze setting. They must NOT be removed except as the last step before launching flare.

- (2) Using the tool described in paragraph 6-2-6-12 following, depress ejection dial (yellow) and turn clockwise. When near desired setting (outer ring of black or yellow figures), release downward pressure and continue turning until setting is reached.

NOTE: Setting points are the index marks to the right of the figures and to the left of "safe" on the fuze face. If dial indicator arrows are not pointed directly toward these index marks, a dud may result.

- (3) Exert upward pull on fuze-setting tool to assure that ejection dial returns to undepressed position.

- (4) Using thumb and fingers, depress and turn ignition dial (gray with white arrow) to desired setting (inner ring of white figures).

NOTE: Both dials must be set at other than "safe" to assure proper flare functioning. Dials must return to fully undepressed position at settings or a dud may result. Be sure that dials are pointed directly toward settings when upward pull is exerted.

WARNING

In setting fuzes (see Figure 6.2.4), care must be taken to follow exactly the procedure specified in the decal on the flare body. The larger yellow ejection dial indicator MUST be used in conjunction with the OUTER ring of figures; the small (center) dark-colored ignition dial indicator MUST

be used in conjunction with the INNER ring of figures. Ejection will probably occur in less than 1 second if ejection dial indicator is set by error at the 30-second ignition setting. Flare ignition in less than 4 seconds is possible if ignition dial indicator is set by error at 30-second ejection setting.

6-2-6-9. Setting Mod 4 Fuzes. The following steps shall be taken in setting fuzes in Mod 4.

- (1) Depress and turn ignition pointer (small center dial) either clockwise or counterclockwise to desired setting (inner ring of white figures on black background).

NOTE: Setting points are the index marks to the right of the figures and to the left of "safe" on the fuze face. If dial indicator arrows are not pointed directly toward these index marks, a dud may result.

- (2) Check to assure that pointer has clicked into undepressed position at setting. If in position, dial will not turn without depressing.

- (3) Loosen thumbscrew in ejection pointer (larger outer dial) by backing off counterclockwise two turns.

- (4) Turn ejection pointer to desired setting (outer ring of black figures).

NOTE: Ejection pointer does not depress.

- (5) Turn thumbscrew clockwise until tight.

6-2-6-10. Safing Mods 2, 2A and 3 Fuzes. The following steps shall be taken in restoring Mods 2, 2A, and 3 fuze dials to "safe" condition.

NOTE: In resetting Mk 24 Flare Fuzes to "safe" as described in steps (1) through (6) following and in steps (1) through (5) in paragraph 6-2-6-11, it is imperative that the action be accomplished while the flare is on the aircraft and the aircraft is on the flight deck or runway. If for any reason the flare cannot be rendered safe in this manner, it will be off-loaded in the presence of Explosives

Ordnance Disposal (EOD) personnel who will immediately dispose of the flare by jettisoning it over the side if on board ship, or by removing it to

a safe area if ashore. All precautions and warnings contained in Aviation Armament Bulletin (AAB) 347 must be strictly complied with.

4. CONCLUSIONS

0 1

11. *Journal of the American Medical Association*, 273, 1995, 1031-1032.

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1. *Journal of the American Medical Association*, 1997; 277: 1039-1043.

100% 90% 80% 70% 60% 50% 40% 30% 20% 10% 0%

1000

•

(1) Place prong slots beneath opposite sides of the yellow ejection dial (Mods 2, 2A, and 3 only).

(2) Turn tool clockwise until prongs engage opposite ears of dial.

(3) Set fuze as in paragraph 6-2-6-8 preceding.

NOTE: This tool is also designed for restoring ejection dial to an undepressed condition either at a selected time setting or at "safe."

WARNING

Ejection of the pyrotechnic candle and its parachute from the flare case is violent. In the event of accidental ignition when the case is not held firmly in any type of launcher, personnel must stand clear of the longitudinal axis of the flare to avoid being struck. The aluminum case constitutes a serious missile hazard at distances up to 150 feet.

6-2-6-13. Functioning. In all mods, after the fuzes are set and the cotter pin or safety pin has been removed, a 12-pound pull on the lanyard starts fuze action. The lanyard raises the sleeve, causing the spring-loaded striker to strike the primer which ignites black powder in the plunger and drives the perforated point of the plunger into the ejection time-delayed fuze at a position determined by the ejection dial setting. Flame emitting through the perforations ignites the fuze. At the end of the preset delay, the ejection time-delayed fuze ignites the ejection disc which forces the parachute assembly, the candle, and the ignition fuze assembly from the outer case with considerable force (see warning preceding this paragraph). The ejection disc, also, ignites the ignition powder which, in turn, ignites black powder in the ignition plunger and forces the plunger point into the ignition

time-delayed fuze at a position determined by the ignition dial setting. At the end of the preset ignition delay, the ignition fuze ignites the ignition disc which ignites the first-fire composition, and the first-fire composition ignites the candle which is suspended on the parachute to produce the desired illumination.

6-2-6-14. Use with SUU-40/A and SUU-44/A Parachute Flare Dispensers. Some Mk 24 Aircraft Parachute Flares are manufactured and shipped assembled in drogue trays (Figure 6.2.7) for launching exclusively with the SUU-40/A and SUU-44/A Parachute Flare Dispensers. All handling and loading of such assemblies shall be in accordance with Handbook, Operation and Service Instructions, NAVAIR 11-75AA-39. Flares assembled in this way have a modified lanyard which connects to the safety pin and to the tray. Separation of the drogue tray from the flare pulls the safety pin and functions the fuze after launch from the dispenser has been accomplished. Shipping containers in which trayed flares are packaged include two plastic weather caps, and a plastic bag in which are two red tags, two extension lanyards complete with release mechanisms and key rings, and two spring clips. A separate plastic bag contains one shear pin for the dispenser.

6-2-6-15. Removing Drogue Trays. If conditions arise that positively demand launching of tray-equipped flares as standard Mk 24 Mod 4's, the following steps shall be taken:

(1) Check to be sure that ejection and ignition fuzes are set at "Safe."

(2) Remove spring clip connecting flare lanyard to tray.

(3) Carefully disconnect safety pin key ring from lanyard.

(4) Remove shipping tape from flare and tray.

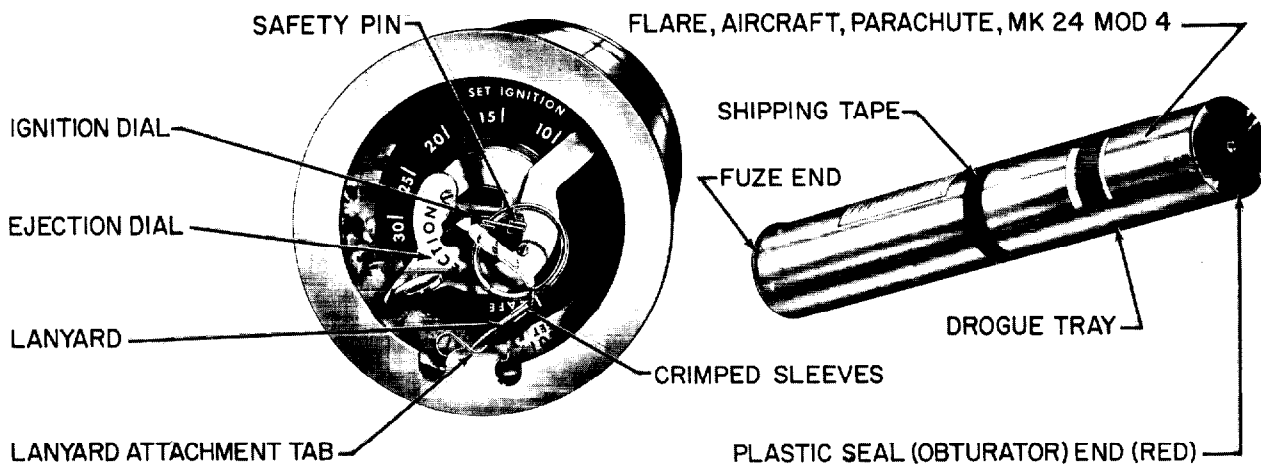


Figure 6.2.7. Aircraft Parachute Flare Mk 24 Assembled With Drogue Tray

(5) Separate tray from flare and retain tray for possible future use.

(6) Attach key ring on extension lanyard to end of short lanyard.

(7) If flare is not to be used immediately, attach red tag to safety pin key ring, coil lanyard in fuze well, place plastic weather cap over fuze end of flare, and secure weather cap with tape. Place flare in ready-service locker.

(8) If flare is to be used immediately, prepare in accordance with appropriate current instructions.

6-2-6-16. Retraining After Removal of Drogue Tray. In the event that it is desired to restore a flare to trayed condition, the following steps shall be taken:

(1) Remove flare and drogue tray from their separate packages.

(2) Inspect both items for dents or damage of any kind.

(3) Remove weather cap from fuze end of flare and retain.

(4) Carefully uncoil lanyard from fuze well.

(5) Check flare fuze to be certain that both ejection and ignition dial indicators are at "Safe," and that spring-steel safety pin is properly in place.

(6) Disconnect extension lanyard by twisting key ring off short lanyard, and return extension lanyard, including release mechanism and key ring, to original packaged condition.

(7) Place flare in drogue tray so that fuze end of flare is toward open end of tray.

(8) Position flare in tray so that 15-second ejection fuze setting is directly beneath hole in lanyard-attachment tab on tray.

(9) Using olive drab cloth ordnance tape (PPP-T-60) 1 inch wide, wrap once around center of tray and flare. Fold back 1/2 inch of end for ease of removal.

(10) Remove red tag from safety pin key ring.

(11) Attach safety pin key ring through the loop formed by the double cable and the two crimped sleeves.

(12) Attach end of short flare lanyard to lanyard-attachment tab of tray by thrusting the loop through the tab hole and installing a spring clip. Ensure that the longer leg of the clip is behind the tab and through the lanyard loop.

(13) If retrayed flare is not to be used immediately, store in ready-service locker.

(14) If flare-tray assembly is to be used immediately, insert in SUU-40/A or SUU-44/A Parachute Flare Dispenser in accordance with NAVAIR 11-75AA-39.

6-2-6-17. Handling and Storage. This flare contains a magnesium-oxidant composition that burns to produce very high temperatures. In all handling and storage operations, utmost care must be exercised to avoid damage which might cause accidental ignition. The general rules in Section 1-6 of Chapter 1 of this pamphlet must be observed, as applicable. The following regulations apply specifically to flare storage and handling at sea:

(1) Flares shall be stowed in separate primary pyrotechnic flare magazines below decks in fully packaged condition as received. Such flare magazines should be equipped for deluging.

(2) Only the number of flares needed for one night's planned operations shall be removed from primary magazine stowage.

(3) Shipping containers shall not be opened in the magazine area.

(4) Under no conditions shall flares be returned to primary magazine stowage if the shipping containers have been opened.

(5) The number of flares removed from primary magazine stowage shall not exceed

the capacity of ready-service lockers above decks.

(6) Flares that have been unpackaged must be stowed in flare lockers located in outboard sponsons or in segregated areas at flight deck level, subject to immediate jettisoning in case of flare ignition.

(7) If no type of ready-service locker is available above decks, only the exact number of flares needed for one strike shall be prepared for installation on wing racks. All flares so prepared that are not launched shall be jettisoned. They must not be returned to primary magazine stowage.

(8) If authorized ready-service lockers are available, flares that have been prepared for launching and not launched are to be stowed in such lockers but not until they have been rigidly inspected for safe condition. This inspection shall assure that safety pins are positively in place, that fuzes are in "safe" position, and that thumbscrews are securely tightened. If these conditions cannot be assured beyond question, the flares must be jettisoned immediately; they must not be stowed.

(9) Taping and other make-ready operations must not be performed in or near stowage areas. Such work shall be done only at flight deck level or in outboard areas which allow immediate jettisoning.

6-2-6-18. Stowage of Loaded Dispensers. Since ready stowage space for loaded SUU-40/A and SUU-44/A Dispensers is not available, and it is not feasible to provide such specialized space, authorization for temporary stowage is at the discretion of Type Commanders. SUU-40/A and/or SUU-44/A Parachute Flare Dispensers which have been loaded with flares preparatory to subsequent attachment to aircraft or which have been down-loaded from aircraft still containing all or some of their flares may, at the discretion of the

appropriate Type Commander, be stowed temporarily in any convenient location at flight deck level subject to immediate jet-tisoning in case of fire in the vicinity.

WARNING

The cartridges in the dispenser which are used for ejecting the flares are not components of the dispenser and **MUST BE REMOVED** prior to stowage as provided for in paragraph 6-2-6-18.

6-2-6-19. Safety Precautions. In addition to the general precautions set forth in paragraph 6-1-3 of this chapter, the following special precautions must be observed:

(1) The plastic weather cap covering the fuze end of the flare must not be removed until immediately before the flare is to be prepared for launching. If flares are prepared for use and are not used, the weather cap must be replaced, but only after all of the safing procedures outlined in paragraphs 6-2-6-10 or 6-2-6-11 preceding have been completed.

(2) In wing or bomb rack installation, the retaining pin (modified Mod 2), the cotter pin (Mods 2A and 3), and the safety pin (Mod 4) must not be removed except as the FINAL STEP before aircraft take-off. In removing the pin, extreme care must be taken to avoid contact with the flare lanyard.

(3) In hand-launching operations, safety pins must not be removed from the fuze assembly until immediately before launching the flare.

(4) If flares are prepared for launching and are not launched, safety pins must be reinserted in the fuze assembly before any other safing or down-loading steps are commenced. No pull or pressure of any kind is to be exerted on the flare lanyard while the safety pin is out of the fuze assembly.

(5) Any flare that has been prepared for launching and not launched must be thoroughly and carefully inspected to assure that it is safe before it may be placed in any type of storage. If the safety pin cannot be properly and positively reinserted in the fuze assembly, if fuze dials cannot be securely locked in "safe" position, or if the thumbscrew (Mods 2A, 3, and 4) cannot be firmly tightened, the flare must be disposed of. Pending such disposition, it must be segregated from all other pyrotechnics and munitions.

(6) If flare lanyards have been taped and the flares are not to be used immediately, they may be placed in ready-service storage lockers without removing the tape only if they have been inspected as in subparagraph (5) preceding. In such cases, the plastic weather cap must be restored to the fuze end of the flare and secured with tape.

(7) Fuze-setting dials are to be kept in "safe" position at all times prior to the time of setting preparatory to launch. They must be returned to "safe" if the flare is prepared for launching and is not launched, but only after the safety pin has been reinserted in the fuze assembly.

(8) In installing suspension bands for wing rack carriage, the optimum torque value for the band screws is 60 to 70 pounds-inches. A lesser torque may permit the flare to loosen partially on the rack and thus damage the aircraft. A greater torque may deform the flare case and render it unsafe to handle.

(9) If the ejection fuze is accidentally actuated when the flare is not firmly secured in a launcher or on a wing rack, personnel must move away from the longitudinal axis to avoid being struck by either the candle or the outer case. Ejection action is violent. The aluminum case is a missile hazard at distances up to 150 feet.

6-2-6-20. Disposition. Dented, cracked,

AREA AND TARGET ILLUMINATING DEVICES

or otherwise damaged and unserviceable flares shall be disposed of in accordance with the provisions of Chapter 3 of this pamphlet.

6-2-6-21. Shipping Containers. Two Mk 24 Flares have been packaged in either wooden or white plastic boxes. Almost all flares now in the supply system are in plastic containers. For ease of identification, all Mod 4's with drogue trays, as described in paragraph 6-2-6-14 preceding, are packaged in blue plastic. Packages of some earlier lots of Mods 1 and 2 contained four suspension bands for wing rack installation but this practice was discontinued. Suspension bands are normally obtainable only by separate requisitioning (FSN 1370-571-7641. DOD Code No. L103). A wooden box containing two flares weighs approximately 82 pounds; a filled white plastic box weighs approximately 52 pounds; a filled blue plastic box (drogue tray) weighs approximately 60 pounds.

6-2-6-22. Identification Data. The following table applies to this flare:

FLARE, AIRCRAFT, PARACHUTE, MK 24 MODS (Specification NAVWEPS OS 8786)

Mod	See Note	BUWEPS LD	Assy Dwg.	FSN	DOD Code No.
2	A	615148	2141496	1370-045-9621	L379
2A	A	615211	2141513	1370-868-9879	L379
2A		615211	2141513	1370-788-1540	L407
2A	B			1370-878-1054	L409
3	A	282090	2141509	1370-797-8837	L379
3		615194	2141509	1370-570-6157	L407
3	B			1370-907-6585	L409
3	C			6910-907-6586	-
4		615207	2141515	1370-918-7052	L407
4	D	DL2127874	2127874	1370-089-4337	LA05
4	D, B			1370-089-4338	LA06
4	D, C			1370-089-4339	LA07

NOTES: A - With Suspension Bands
B - Inert
C - Sectionalized
D - Assembled with Drogue Tray

6-2-7. Flare, Aircraft, Parachute, M26A1.

NOTE: This flare is obsolete and should not be in the supply system. If any are found in the system, they should be returned to an ammunition depot for appropriate disposition.

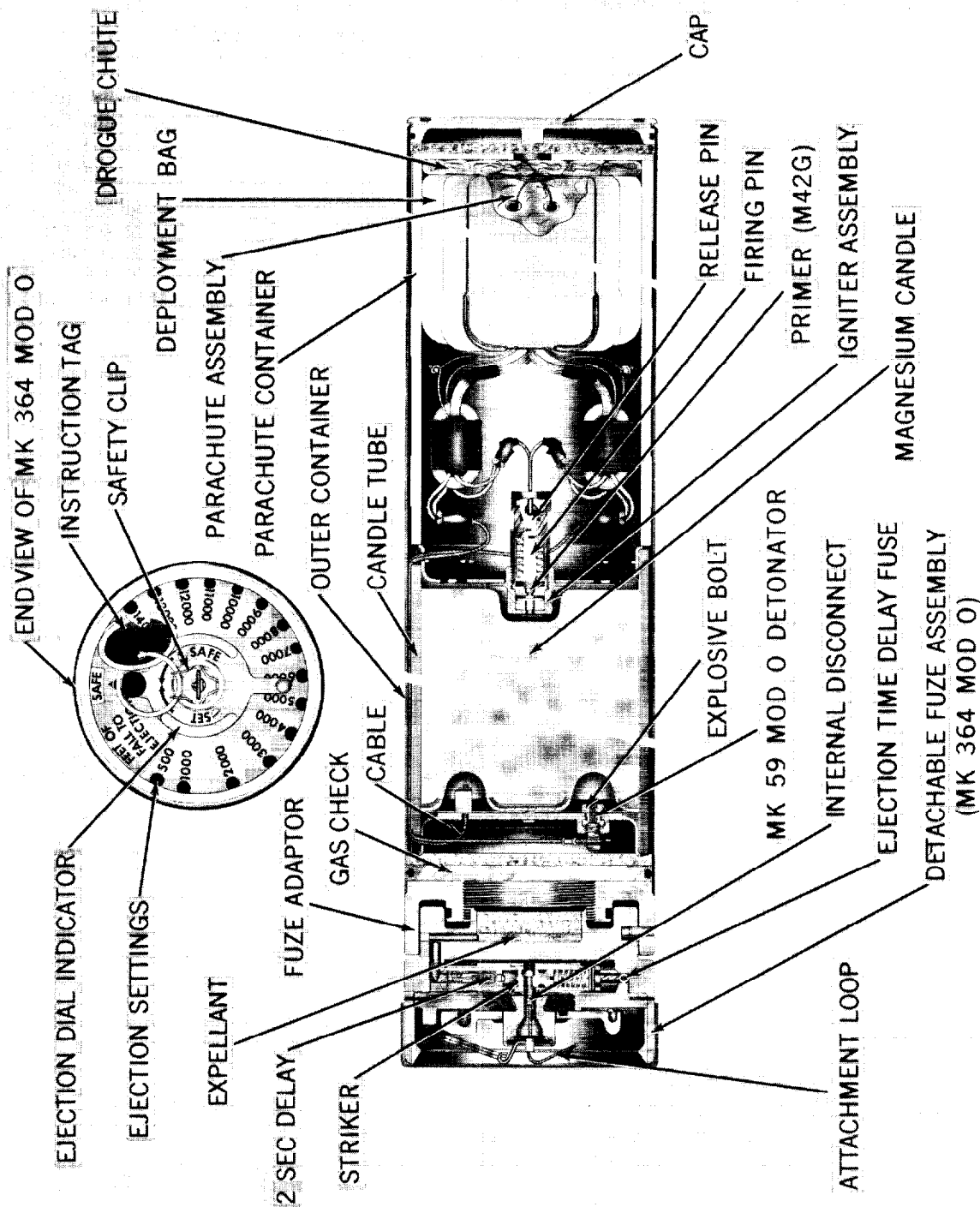


Figure 6.2.8 Aircraft Parachute Flare, Mk 45 Mod 0, Cross Section

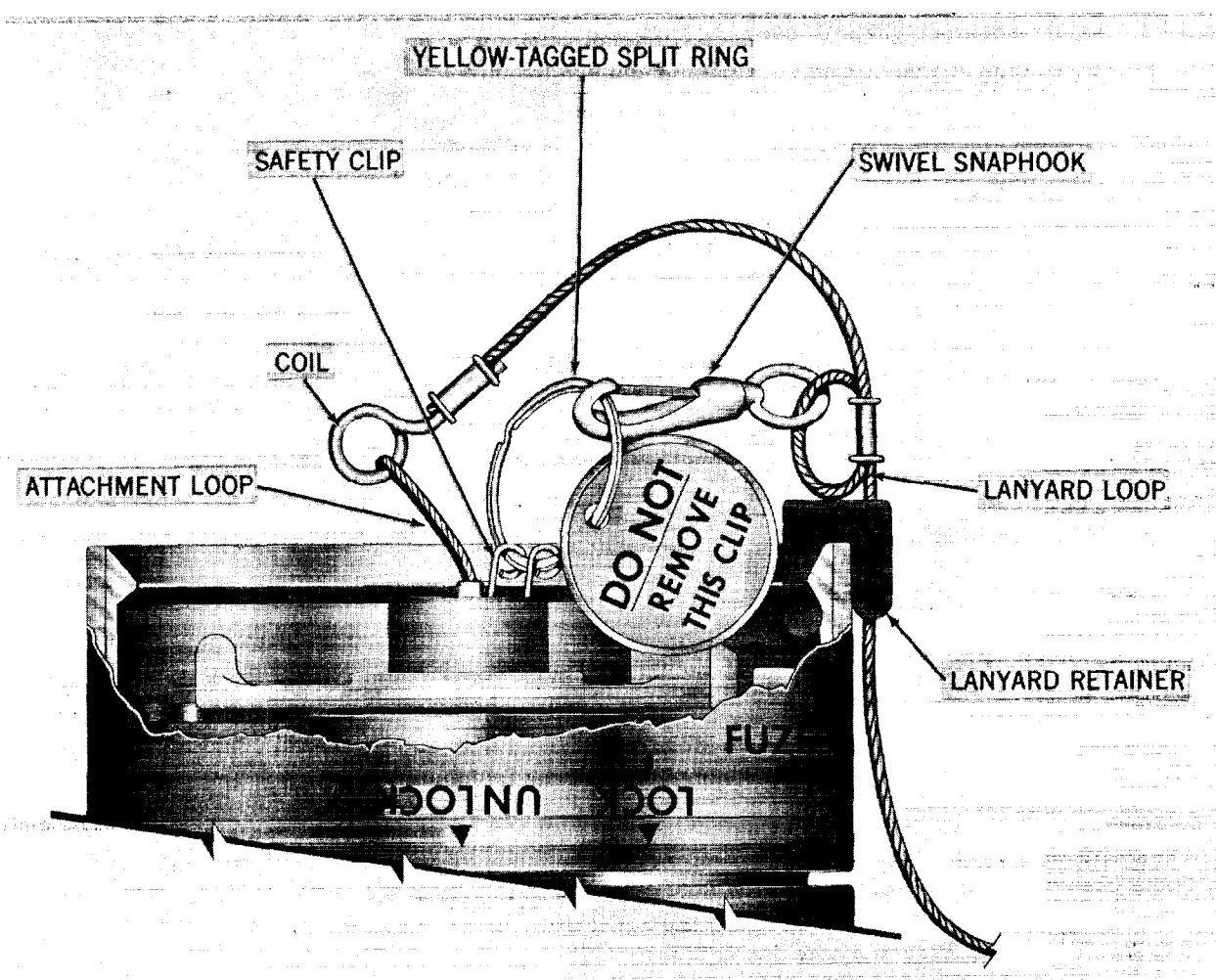


Figure 6.2.9 Aircraft Parachute Flare Mk 45 Mod 0, Fuze Mechanism with Lanyard Attached

6-2-8. Flare, Aircraft, Parachute, Mk 45 Mod 0

6-2-8-1. Intended Use. This aircraft-launched flare is used for nighttime illumination of surface areas in search and attack operations. It was designed to replace Aircraft Parachute Flare, Mk 24 Mods, which is described in paragraph 6-2-6.

6-2-8-2. Overall Description. Aircraft Parachute Flare, Mk 45 Mod 0 (see Figures

6.2.8 and 6.2.9) is encased in a cylindrical aluminum body approximately 34 inches long and 4.9 inches in diameter. Total length, including the plastic fuze assembly, is approximately 36 inches. When manufactured and shipped, the device is complete with candle, parachute assembly, and fuze. The fuze end of assembled flare is covered by a plastic shipping cap. A label or decal on the flare body gives fuze setting and

safing information. Beneath the shipping cap, in the space over the fuze-setting dial, is a steel wire lanyard which is attached at the time of manufacture to the attachment loop. The attachment loop is integral with a brass toggle that is held firmly within a cylindrical aluminum housing in the center of the fuze mechanism by a spring safety clip. A split key ring is attached to both upward-protruding legs of the spring safety clip, and a circular yellow tag is affixed to the key ring. The tag instructs users not to remove the safety clip. **THIS CLIP IS TO BE REMOVED ONLY BY LANYARD ACTION AT THE TIME THE FLARE IS LAUNCHED** (see paragraph 6-2-8-4). Approximately 4 1/2 inches from the joined end of the lanyard is a loop to which is permanently attached the swivel end of a spring snaphook. **THIS SNAPHOOK IS TO BE ATTACHED TO THE KEY RING ONLY AS THE LAST POSSIBLE STEP BEFORE LAUNCHING THE FLARE** (see step (8) in paragraph 6-2-8-6). Affixed to the lanyard, immediately adjacent to the loop and on the side of the loop away from the joined end (see Figure 6.2.9) is a black plastic retainer which must be snapped onto the rim of the fuze body as described in step (4) of paragraph 6-2-8-6 before the fuze is set. The fuze face, which is more fully described in paragraph 6-2-8-3, consists essentially of a yellow plastic pointer and 15 setting positions ranging counterclockwise from 500 to 14,000 feet.

WARNING

In all operations involving this flare, extreme care must be exercised to avoid accidental fuze functioning. After fuze is set, if lanyard is pulled with safety clip not in place, the parachute and 18-pound flare candle eject from the flare case violently. If the flare case is not held firmly in some type of launching device at the time of ejection, the case is a serious missile hazard at distances up to 150 feet.

6-2-8-3. Fuze Description. The Mk 364 Mod 0 Fuze (see Figure 6.2.8) is shipped with this flare for the sole purpose of controlling the altitude of flare ejection in relation to launch altitude. It does not directly control candle ignition. In this flare, the candle is ignited by the force exerted by the parachute as it opens (see paragraph 6-2-8-4). The fuze has fifteen functional settings and one "safe" setting. Functional settings are at 1000-foot intervals from 1000 to 14,000 except that one minimum setting of 500 feet is provided. These settings control the approximate feet of fall between launch and ejection of the candle and parachute assembly from the outer case. The table at the end of this paragraph should be used to determine proper fuze settings and release altitudes for maximum flare effectiveness. The fuze-setting mechanism consists of a single yellow dial indicator which is easily turned by hand, clockwise for setting and counterclockwise for safing. Black figures, the black pointed end of the dial indicator, and the black setting points on the fuze face facilitate visual setting operations in dim light; raised projections at "safe" and at each setting make it possible to set or safe the fuze in total darkness. A spring-loaded detent tends to hold the dial indicator at a selected setting or at "safe" and prevents accidental changing of setting by vibration forces. It also contributes to setting the fuze in darkness since engagement of the detent can easily be felt.

WARNING

The spring safety clip must not be removed from its position over the lanyard toggle. It is to be removed **ONLY** by lanyard action at the time of launching the flare. Under no circumstances shall the snaphook be attached to the split key ring except as the **LAST STEP** before aircraft take-off. In external carriage applications, this means after **ALL** other make-ready steps have been completed and the aircraft is fully ready for take-off.

APPROXIMATE RELEASE ALTITUDES FOR EJECTION AT 2500 FT. A. G. L.
(Altitudes - In Thousands - Are at Mean Sea Level)

Fuze Settings	Ground Elevation							
	0	1.0	2.0	3.0	4.0	5.0	6.0	7.0
500	3.0	4.0	4.9	6.0	7.1	8.1	9.1	10.1
1,000	3.4	4.5	5.5	6.5	7.6	8.6	9.7	10.7
2,000	4.5	5.6	6.7	7.7	8.8	10.0	11.0	12.2
3,000	5.6	6.7	7.8	9.0	10.1	11.3	12.5	13.6
4,000	6.5	7.7	8.9	10.1	11.3	12.5	13.8	15.1
5,000	7.4	8.6	9.9	11.1	12.4	13.6	15.0	16.4
6,000	8.2	9.5	10.8	12.1	13.5	14.8	16.2	17.5
7,000	9.1	10.4	11.8	13.1	14.5	15.9	17.4	19.0
8,000	10.0	11.4	12.8	14.3	15.6	17.1	18.8	20.4
9,000	10.9	12.4	13.8	15.3	16.8	18.4	20.1	
10,000	11.8	13.3	14.9	16.4	18.1	19.8		
11,000	12.9	14.4	16.0	17.7	19.4			
12,000	13.9	15.5	17.3	19.0				
13,000	15.0	16.7	18.5	20.5				
14,000	16.2	18.0	20.0					

6-2-8-4. Functioning. When the flare is launched, the lanyard (1) either removes or rips through the plastic retainer, (2) snaps the safety clip from its position over the toggle, and (3) exerts a pull on the attachment loop to which its end is joined. A force of 18 to 35 pounds pulls the internal disconnect completely out of the fuze mechanism. Removal of the disconnect frees the spring-loaded striker (see Figure 6.2.8) to strike a primer in the base of the plunger. This primer ignites the fixed 2-second delay element and drives the perforated sharp end of the plunger into the ejection time-delay fuse at a point determined by the selected setting. After 2 seconds, the delay element ignites black powder in the plunger, and this ignition is transferred through the perforated point to the time-delay fuse. At the expiration of the preset delay, the fuse ignites the expellant which exerts pressure against the gas check to force off the aluminum end cap and to expel the candle and the parachute assembly from the flare case with considerable force (see warning preceding paragraph 6-2-8-3). The drogue chute deploys to separate the main parachute from its deployment bag.

On opening, the main parachute exerts a pull on the cables of the suspension/ignition system. The shorter of the cables pulls the release pin from the igniter assembly, cocking and releasing the firing pin so that it strikes the primer. The primer ignites an ignition pellet which, in turn, ignites the magnesium candle. The burning candle is then suspended on the fully deployed main parachute. When the candle approaches the end of its burning time, heat generated by its burning activates the explosive bolt to which are attached 10 of the 18 parachute shroud lines. Release of these shroud lines causes the parachute to collapse and flutter to the ground.

6-2-8-5. Launching Methods and Limitations. This flare may be dispensed from any type of presently available external launching system, including practice multiple bomb racks (PMBR) and generally any 14-inch suspension rack on naval aircraft, or it may be launched from an aircraft by hand. Make-ready procedures, installation methods, station limitations, jettisoning requirements, and down-loading operations

in relation to this flare shall be in strict conformance with specifications set forth in the Conventional Weapons Manual/Check List for the particular aircraft being employed. For external carriage, separately requisitioned suspension bands (FSN 1370-111-0530, DOD Code L105) are used. Figure 6.2.10 shows an application of these suspension bands for one type of external carriage.

6-2-8-6. Preparing to Launch. The following steps shall be taken in preparing a Mk 45 Mod 0 Aircraft Parachute Flare for launching by hand or from wing racks:

(1) Remove flare from shipping container and inspect for dents or damage of any kind. Segregate damaged flares for disposition as required by Chapter 2 of this pamphlet.

(2) Remove plastic shipping cap from fuze end of flare.

(3) Carefully uncoil lanyard from fuze cavity and check to be SURE that yellow dial indicator is at "safe."

(4) Snap black plastic lanyard retainer over rim of fuze body as shown in Figure 6.2.9.

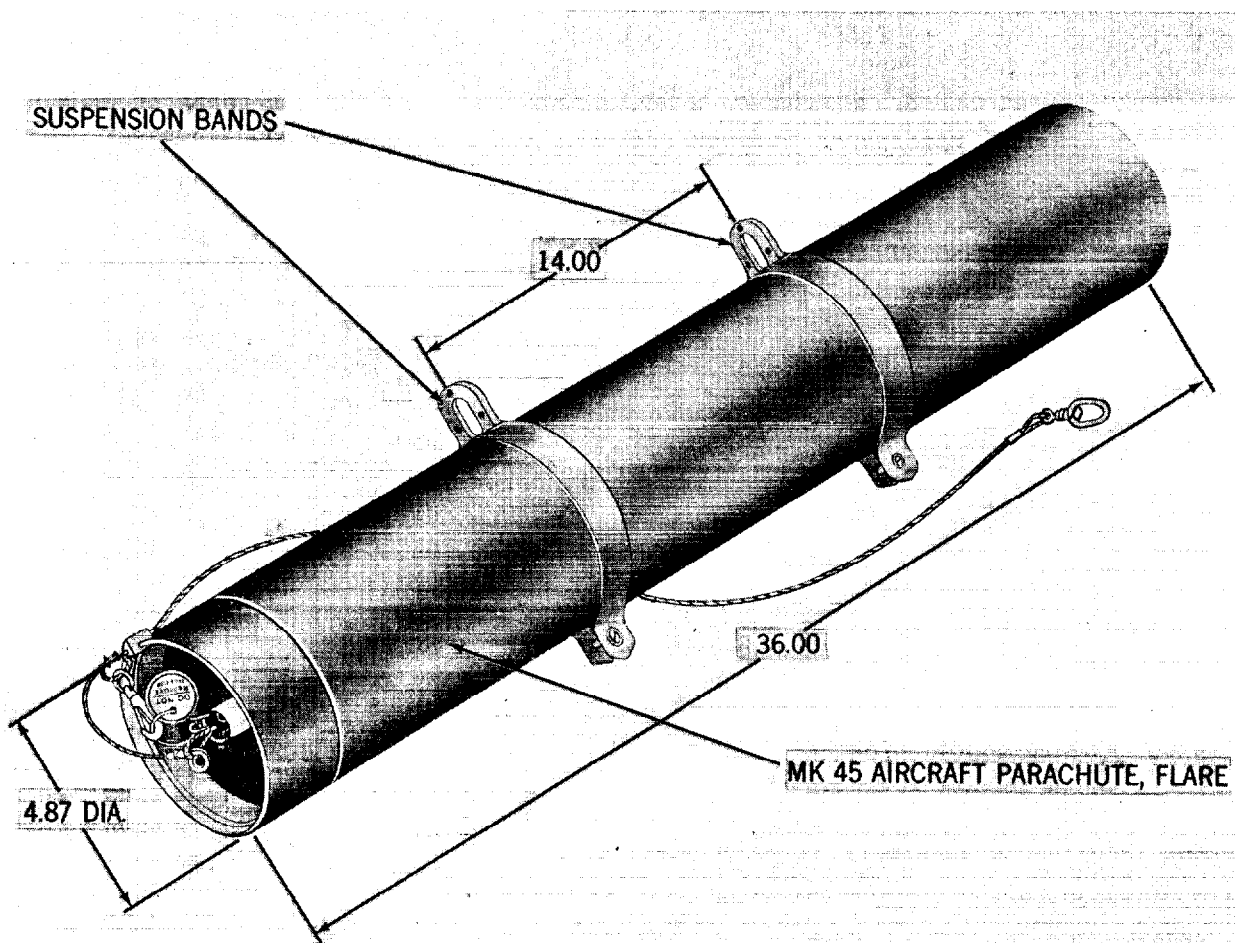


Figure 6.2.10. Suspension Bands Used for External Carriage with Aircraft Parachute Flare Mk 45 Mod 0

NOTE: Lanyard retainer was placed on lanyard at time of manufacture but may have slipped off during shipment. If found loose in fuze cavity, it must be placed on lanyard so that positioning on rim as shown in Figure 6.2.9 is possible. Slot in retainer must be toward fuze center, and loop to which snaphook is to be fastened must be snugged against counterbore at top of slot.

(5) If flare is to be launched from any type of wing rack in external carriage, attach suspension bands (or band) as shown in Figure 6.2.10, tape lanyard to prevent flailing, and attach lanyard swivel in accordance with procedures set forth in the Conventional Weapons Manual/Check List for the particular aircraft being used.

(6) Turn fuze dial indicator clockwise to desired setting as determined using the table in paragraph 6-2-8.3.

(7) Slide black plastic lanyard retainer around rim of fuze body until it is directly adjacent to yellow-tagged key ring.

(8) In all external carriage applications as a final step before aircraft take-off; that is, after ALL OTHER PREPARATORY STEPS HAVE BEEN COMPLETED, very carefully attach snaphook on lanyard to yellow-tagged key ring, being SURE not to unseat safety clip.

WARNING

In hand launching this flare or in any type of launching from the interior of the aircraft, the snaphook MUST NOT be attached to the yellow-tagged key ring except as the VERY LAST STEP before launching the flare.

WARNING

If flares are returned unlaunched to an air strip or carrier, the

dial indicator must first be returned to "safe" and the snaphook must be disconnected from the key ring before any down-loading steps are taken. If for any reason the dial indicator cannot be turned to "safe," the snaphook must be disconnected and the flare must be down-loaded and disposed of by jet-tisoning or other approved methods.

6-2-8-7. Safing the Fuze. To return the Mk 45 Mod 0 Flare fuze to "safe," the following steps shall be taken:

(1) Check to be certain that the safety clip is securely in place.

(2) Turn the dial indicator counterclockwise to "safe."

(3) Carefully detach snaphook from yellow-tagged key ring.

6-2-8-8. Use with Drogue Tray. Some Mk 45 Mod 0 Flares are manufactured and shipped assembled in drogue trays (see Figure 6.2.11) for launching exclusively with the SUU-40/A or SUU-44/A Parachute Flare Dispenser. All handling and loading of such assemblies shall be in accordance with NAVAIR Manuals 11-75AA-39 and 11-155UU-44/A-1. The lanyard used with this assembly is 8 inches long. It is attached, at time of manufacture, to the lanyard attachment tab on the tray and to the fuze mechanism. This lanyard is not equipped with a lanyard retainer nor does it employ a snaphook for joining to the yellow-tagged key ring of the fuze mechanism.

6-2-8-9. Tray Functioning. When a trayed flare is launched from the SUU-40/A or SUU-44/A Parachute Flare Dispenser, the windstream catches the tray and separates it from the flare case. The force of this separation is exerted on the lanyard which pulls the safety clip from its position over the toggle and then exerts a pull on the

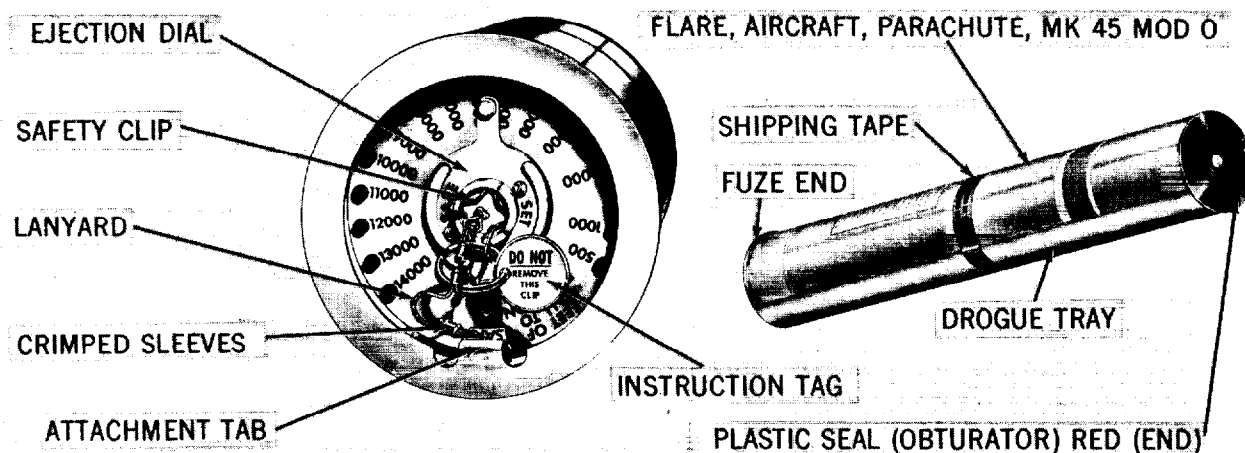


Figure 6.2.11. Aircraft Parachute Flare Mk 45 Mod 0
Assembled with Drogue Tray

attachment loop so as to remove the internal disconnect from the fuze and thus initiate fuze action as explained fully in paragraph 6-2-8-4.

6-2-8-10. Drogue Tray Accessories. Shipping containers in which trayed flares are packaged include a plastic bag containing two full-length (38-inch) lanyards complete with plastic retainers and spring snaphooks, and four shear pins for the SUU-40/A or SUU-44/A Flare Dispenser.

6-2-8-11. Removing Drogue Trays. If conditions arise that positively demand removal of an attached drogue tray so that the flare can be launched by other means, the following steps shall be taken:

- (1) Check to be sure that ejection dial indicator is set at "safe."
- (2) Detach lanyard loop from split key ring, being extremely careful not to unseat safety clip from its position over the toggle.
- (3) Detach coil at end of lanyard from attachment loop at top of toggle.

WARNING

Extreme care must be exercised during these operations to avoid

unseating the safety clip. If the safety clip is unseated, it must be resecured in the toggle housing groove before proceeding, and no pull of any kind is to be exerted on the lanyard or the attachment loop while the clip is out.

- (4) Remove shipping tape from flare and tray.
- (5) Remove flare from tray and retain tray for future use.
- (6) Remove 38-inch lanyard from plastic bag in shipping container.
- (7) Insert small coil at end of 38-inch lanyard through attachment loop in center of toggle and work loop fully into center of coil, being SURE that safety clip is not disturbed.
- (8) If flare is to be used immediately, and if black plastic retainer is not already on lanyard, slip lanyard into slot in retainer, snap retainer over rim of fuze body as shown in Figure 6.2.10, and load flare thus prepared onto selected rack in accordance with Conventional Weapons Manual/Check List for the aircraft being used.

NOTE: If flare is not to be used immediately, do not snap retainer over fuze body rim, but coil lanyard into fuze cavity, secure it with tape, and place flare in ready-service locker at flight deck level where it is subject to immediate jettisoning in case of fire in the vicinity.

NOTE: Plastic bag from which 38-inch lanyards were removed contains four shear pins for the SUU-40/A or SUU-44/A Dispenser. Be SURE to package this bag with removed trays for later use if needed. If only one trayed flare in a shipping container is detrayed, this plastic bag will also contain a second 38-inch lanyard (see paragraph 6-2-8-10).

(9) After flare is fully loaded on wing rack, turn fuze dial indicator clockwise to desired setting as determined using the table in paragraph 6-2-8-3.

(10) Slide black plastic lanyard retainer around rim of fuze body until it is directly adjacent to yellow-tagged key ring.

(11) As LAST STEP before aircraft take-off, carefully attach snaphook to yellow-tagged key ring, being very SURE not to unseat safety clip.

6-2-8-12. Retraying After Removal of Tray. In the event that it is desired to attach a removed drogue tray to a Mk 45 Flare, the following steps shall be taken:

NOTE: If flare to be trayed was previously in a tray, its 38-inch lanyard will be secured in fuze cavity with tape as in note following step (8) of paragraph 6-2-8-11. If flare was not previously trayed, lanyard will be coiled under shipping cap as described in paragraph 6-2-8-2.

(1) Remove flare and tray from their separate storage conditions.

(2) Inspect both items for dents or damage of any kind. Do not use damaged flares or trays.

(3) Remove shipping cap from fuze end of previously untrayed flare and retain. Remove tape from previously trayed flare.

(4) Check to be SURE that ejection dial indicator is at "safe" and that safety clip is securely in place.

(5) Very carefully disconnect 38-inch lanyard from attachment loop over toggle, being SURE not to disturb safety clip. Retain lanyard for possible future use.

(6) Position flare in drogue tray so that "safe" setting is toward lanyard attachment tab of tray.

(7) Using cloth ordnance tape (PPP-T-60), one inch wide, wrap once around center of tray and flare. Fold back 1/2 inch of tape end for ease of removal.

(8) Insert small coil at end of short lanyard through attachment loop over brass toggle and work loop fully into center of coil, being SURE that safety clip is not disturbed.

(9) Carefully attach lanyard loop to yellow-tagged split key ring.

(10) If retrayed flare is not to be used immediately, store in ready-service locker in accordance with provisions of paragraph 6-2-8-13.

(11) If flare is to be used immediately, load into SUU-40/A or SUU-44/A Parachute Flare Dispenser in accordance with NAVAIR 11-75AA-39.

6-2-8-13. Handling and Storage. This flare contains a magnesium-oxidant composition that burns to produce very high temperatures. In all handling and storage operations, extreme care must be taken to avoid damage that might cause accidental fuze functioning. The following steps apply

specifically and exclusively to operations at sea:

(1) Mk 45 Mod 0 Flares complete with fuzes shall be stored in separate below-decks pyrotechnic flare magazines in fully packaged condition as received. Such magazines should be equipped for deluging.

(2) Only the number of flares needed for one night's planned operations shall be removed from primary storage magazines.

(3) Since flare ignition is caused by parachute action, work involved in securing lanyards and setting fuzes should be accomplished in areas shielded as much as possible from wind forces.

(4) Flares shall not be returned to primary storage magazines after fuzes have been set. Instead, after positively safing all fuzes and disconnecting snaphooks from yellow-tagged key rings, they must be stored in flare lockers located in outboard sponsons or in segregated areas at flight deck level, subject to immediate jettisoning in case of fire in the vicinity.

(5) If ready-service lockers containing Mk 45 Aircraft Parachute Flares are to be emptied prior to entering port (or for any other reason), the Mk 45 Flares are to be thrown over the side. Such flares shall not be returned to primary, below-decks storage except at the discretion of the Commanding Officer. If the Commanding Officer orders retention of such flares, the following action must be taken before the flares are moved to the below-decks magazine area: All Mk 45 Flares shall be checked to ensure that their fuzes are set on "safe", the snaphooks of all untrayed Mk 45 Flares shall be checked to ensure that they are disconnected from corresponding yellow-tagged key rings, all trayed Mk 45 Flares shall be carefully inspected to ensure that the tape binding the drogue tray to the flare is adequate,

and all Mk 45 Flares shall be securely packaged in their original shipping containers or equivalent boxes.

WARNING

If the safety clip is removed accidentally, extreme care must be exercised to avoid a pull of any kind on the lanyard. An 18- to 35-pound pull will cause the fuze to become permanently inoperable if the fuze is set on "safe". If fuze is set at any variable-delay setting, such a pull on the lanyard will cause the fuze to function so that the outer case and candle separate violently.

(6) Great care must be taken during all handling and storage operations to assure that the safety clip in the fuze mechanism is not unseated. If it is pulled loose in handling, it must be restored to its position over the toggle, and no pull or pressure is to be applied to the lanyard while the clip is not in place.

WARNING

If a flare is accidentally ejected on the ground or deck, a wind force of 35 knots will cause the drogue chute to remove the deployment bag from the main parachute and open the main parachute. The parachute must, if possible, be kept from opening and all shroud lines should be cut, after which the candle tube should be jettisoned or disposed of in accordance with other approved methods. If it is not possible to keep the main chute from opening, no effort should be made to hole the candle tube against the pull of the parachute since a 50-pound pull on the shroud lines may actuate

the candle igniter. The parachute will drag the unrestrained candle tube without causing ignition. Hold the parachute, not the candle.

(7) Flares that have been prepared for launching but which are not launched must not be placed in any kind of storage until they have been carefully inspected to assure that the safety clip is securely in place, that the snaphook has been disconnected from the yellow-tagged key ring, and that the ejection dial indicator is at "safe."

6-2-8-14. Safety Precautions. The following special safety precautions must be observed in handling the Mk 45 Mod 0 Flare:

(1) Before commencing fuze-setting operations, check to be sure that the ejection dial indicator is at the "safe" position.

(2) The safety clip must not be removed from the fuze mechanism. It is to be removed only by lanyard action at launching. If accidentally removed, it must be replaced immediately, and care must be taken to avoid any pull or pressure on the lanyard while the clip is out.

(3) To the greatest extent possible, fuzes should be set and lanyards secured only in areas shielded from wind forces. In the event of accidental ejection, a billowing parachute may ignite the flare candle.

(4) If externally carried flares are returned from a mission unlaunched, the ejection dial indicator **MUST FIRST** be turned counterclockwise to "safe" and then the snaphook must be carefully disconnected from the yellow-tagged key ring before any down-loading steps are taken. Returned trayed flares shall be safed and off-loaded

in accordance with NAVAIR Manuals 11-75AA-39 and 11-15SUU-44/A-1".

(5) If the fuze is actuated when the flare case is not firmly secured in a launcher or on a wing rack, personnel must move away from the longitudinal axis of the flare to avoid being struck by either the candle or the aluminum outer case. Ejection action is violent. The aluminum case is a missile hazard at distances up to 150 feet.

6-2-8-15. Reporting Accidents and Incidents. The provisions of Chapter 2 of this pamphlet shall be adhered to in the event of any accident, incident, or malfunction involving this flare.

6-2-8-16. Disposition. Dented, cracked, or otherwise damaged and unserviceable Mk 45 Mod 0 Flares shall be disposed of in accordance with Chapter 3 of this pamphlet.

6-2-8-17. Shipping Containers. This flare is packaged two to a polystyrene container, the filled weight of which is approximately 60 pounds.

6-2-8-18. Identification Data. The following table applies:

FLARE, AIRCRAFT, PARACHUTE, MK 45 MOD 0
(Specification AS 1178)

	Assy. Dwg.	FSN	DOD Code
Flare and Mk 364 Fuze	2141527	1370-088-5658	L473
Complete Flare with			
Drogue Tray	2127899	1370-783-5180	L416
Inert with Tray	2127923	1370-783-5181	L418
Inert w/o Tray	2127922	1370-783-5182	L417

6-2-8-19. Explosive/Pyrotechnic Weight. The aggregate weight of the principal explosive and/or burning components of this flare is approximately 18 pounds.

6-3. GUN-LAUNCHED ILLUMINATING DEVICES.

The pyrotechnics in this section are essentially component parts of projectiles which are fired from conventional guns of various sizes, as indicated in Table 6-1 preceding. Initiation of the illuminating action and hence location of the flare is determined by the setting of the projectile fuze. All of these various projectile loads are intended to cast bright light over a target or area for any desired tactical or training purpose.

6-3-1. Projectile Load, Illuminating, Mk 4 Mods 3, 4, 5, 6, and 7.

(Illustration top of page 6-14)

6-3-1-1. Intended Use. This projectile load (see Figure 6.3.1) is used with projectiles as indicated in Table 6-1 to produce a parachute-suspended light for target illumination.

6-3-1-2. Functional Description. The mechanical time fuze in the projectile ignites the expelling charge which ignites and expels the illuminating composition and its parachute. The parachute opens to support the burning candle during its descent thus providing the

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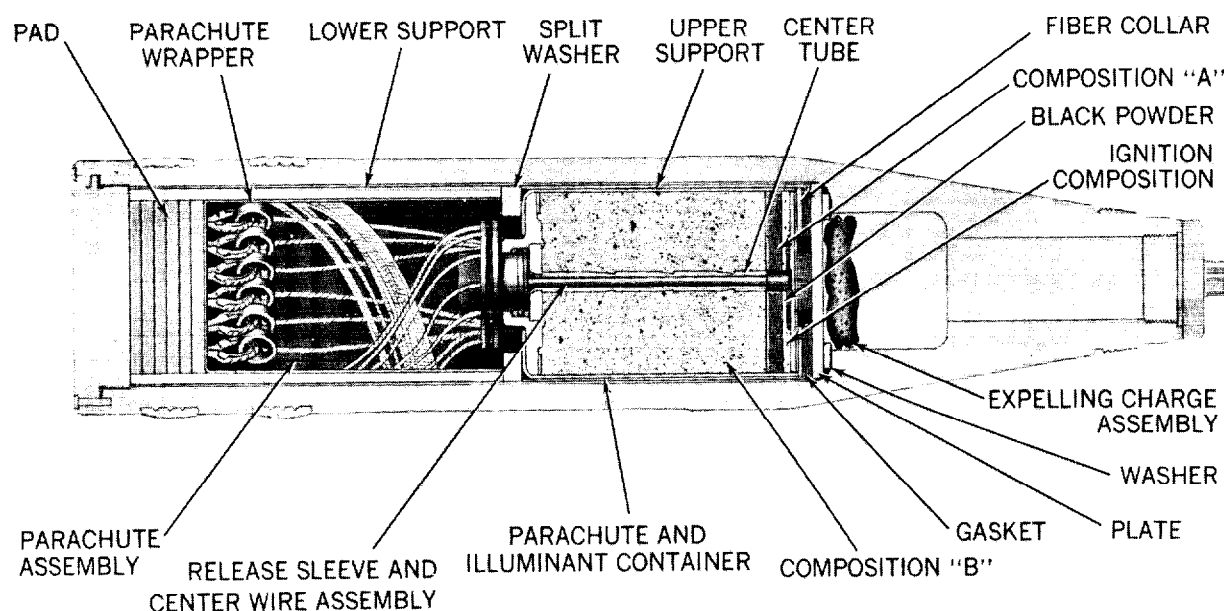


Figure 6.3.1 Illuminating Projectile Load, Mk 4

desired illumination.

6-3-1-3. Handling and Storage. This projectile load shall be handled and stored in accordance with paragraph 6-1-2 of this chapter.

6-3-1-4. Safety Precautions. The general safety precautions of paragraph 6-1-3 of this chapter apply.

6-3-1-5. Shipping Containers. Pyrotechnic projectile loads are not obtainable separately. They are integral parts of associated illuminating projectiles.

6-3-1-6. Specific Data. The following table supplies certain specific data in respect to this projectile load:

PROJECTILE LOAD, ILLUMINATING,
MK 4 MODS 3, 4, 5, 6, AND 7

Mods	3	4	5	6	7
Parachute (Inches)	15.25	23.25	37.00	43.00	37.00
Pyro Comp. (Grams)	275	790	1420	2100	1420
Primer Comp. (Grams)	32	60	140	200	140
Ignition Comp. (Grams)	16	30	76	100	76
Expelling Chg. (Grams)	10.60	28.35	70.00	106.22	85.00

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6-3-2. Projectile Load, Illuminating, Mk 7 Mod 0 (Illustration top of page 6-15)

6-3-2-1. General Description. This device (see Figure 6.3.2) is used with 6"/47 caliber illuminating projectiles (see Table 6-1). In respect to use, functional description, handling and storage requirements, safety precautions, etc., it is the same as the Projectile Load, Illuminating, Mk 4 Mods described in paragraph 6-3-1 preceding.

6-3-2-2. Specific Data. The following table provides certain specific data respecting this device:

PROJECTILE LOAD, ILLUMINATING, MK 7

Comp. "A"	200 Grams
Comp. "B"	2100 Grams
Ignition Comp.	100 Grams
Expelling Comp.	106.2 Grams
Parachute Diameter	43 Inches

6-3-3. Projectile Load, Illuminating, Mk 9 Mods 0 and 1.

(Illustration bottom of page 6-15)

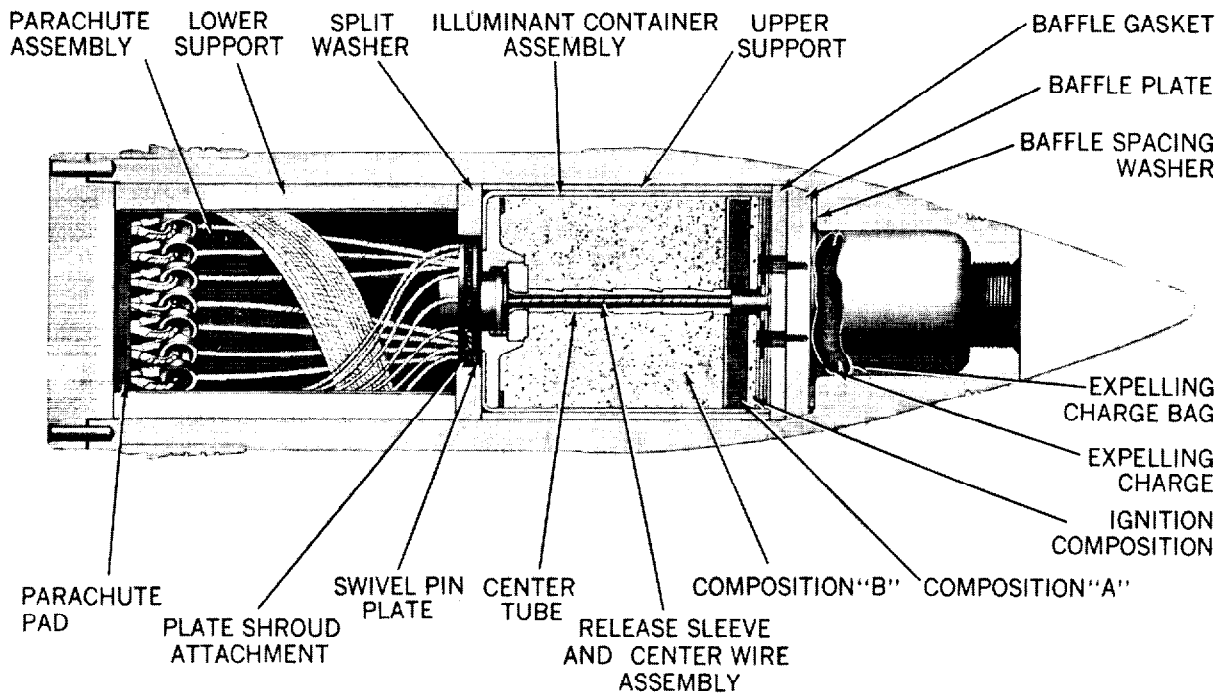


Figure 6.3.2 Illuminating Projectile Load, Mk 7

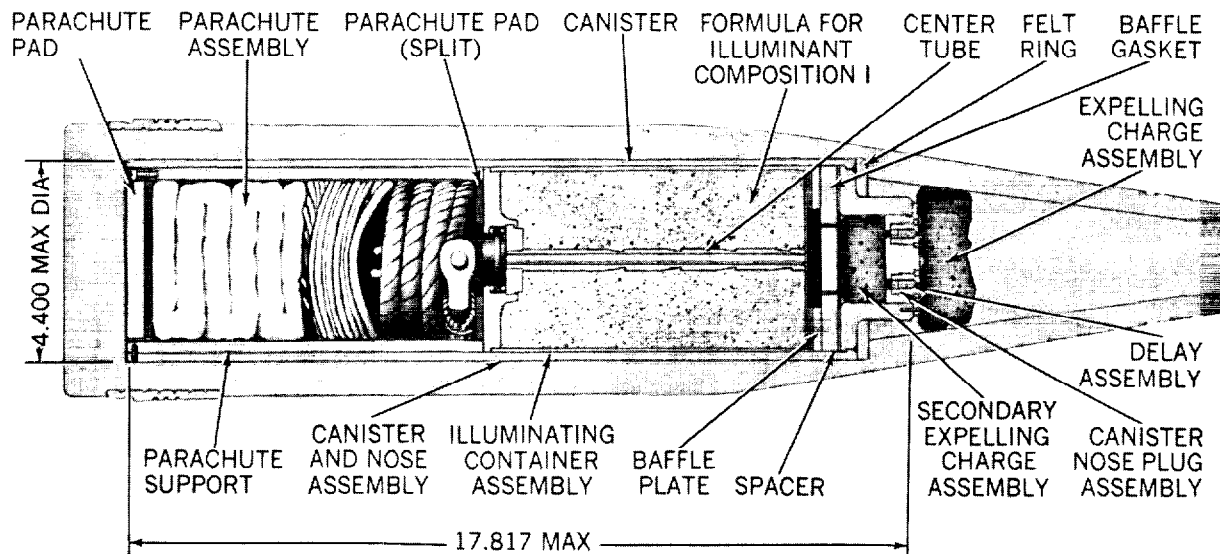


Figure 6.3.3 Illuminating Projectile Load, Mk 9

6-3-3-1. General Description. This device (see Figure 6.3.3) is also used with 6"/47 illuminating projectiles. For candlepower ratings and burning time, see Table 6-1. It consists of a cylindrical metal canister containing a parachute, an illuminant container, an expelling charge, and a secondary expelling charge.

6-3-3-2. Functional Description. The time fuze ignites the expelling charge which forces the projectile base and canister out of the projectile and ignites the delay composition. The delay element initiates the secondary expelling charge which ignites the illuminant composi-

Mk 4 Mods (see paragraph 6-3-1 preceding).

6-3-3-4. Specific Data. The following table provides certain specific data respecting this device:

PROJECTILE LOAD, ILLUMINATING, MK 9 MODS

Length	17.017 Inches
Diameter	4.4 Inches
Expelling Charge	5 Ounces
Sec. Expelling Charge	1.3 Ounces
Illuminant Comp.	82 Ounces
Parachute Size	32.5 Inches
Rate of Fall	40 Ft/Sec

6-3-4. Projectile Load, Illuminating, Mk 11 Mod 0

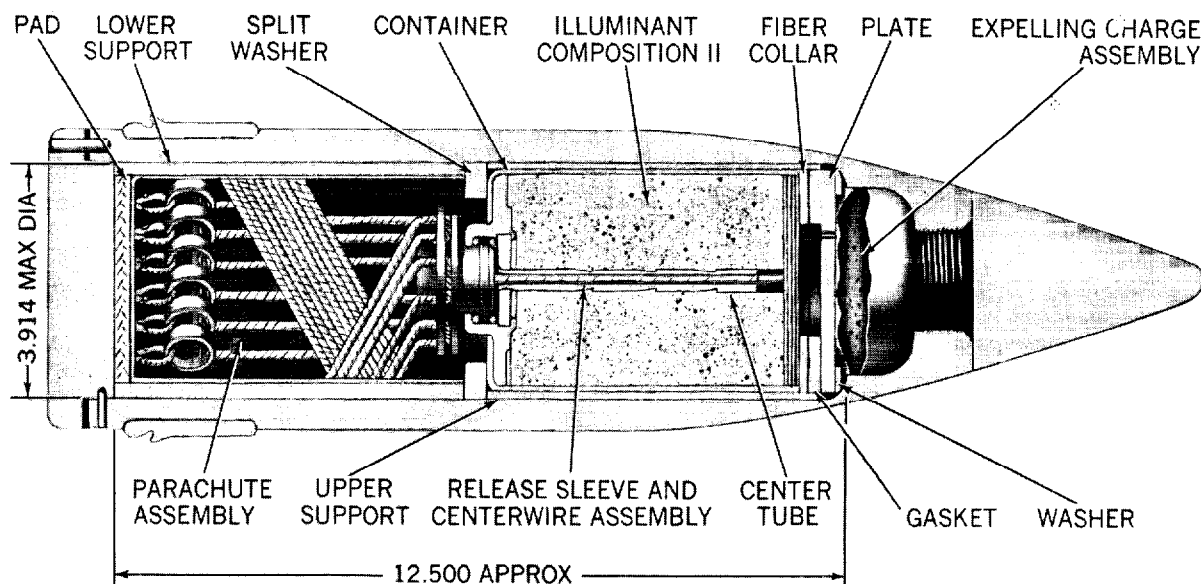


Figure 6.3.4 Illuminating Projectile Load, Mk 11

tion and forces the end closure plate, the parachute, and the illuminant container out of the canister assembly. When the canister assembly is clear, the parachute supports fall away allowing the parachute to open and support the pyrotechnic candle. Full suspension after fuze action requires 5 seconds for Mod 0 and 11 seconds for Mod 1.

6-3-3-3. Handling and Safety Provisions. Provisions relating to handling, storage, safety precautions, and shipping methods are the same as for the Projectile Load, Illuminating,

6-3-4-1. Intended Use. This projectile load (see Figure 6.3.4) is designed to be used with 5"/38 Caliber Projectile, Mk 44; 5"/38 Caliber Projectile, Mk 30; 5"/54 Caliber Projectile, Mk 48; and 5"/38 Caliber Projectile, Illuminating, Mk 50, for the purpose of illuminating an area or a target (see Table 6-1).

6-3-4-2. External Features. This device consists of a pyrotechnic candle attached to a parachute through a swivel assembly. It is assembled within a projectile using one baffle plate, two split upper and lower supports, a

split washer, and felt pads to maintain stability in the projectile.

6-3-4-3. Functional Description. When the load is expelled from the projectile, the expelling charge ignites the first-fire composition which initiates the primer composition. This, in turn, ignites the illuminant composition. The expelling charge also forces the illuminant and its attached parachute out of the projectile body. The upper and lower supports, the split

provides certain specific data respecting this device:

PROJECTILE LOAD, ILLUMINATING, MK 11

Length	12.5 Inches
Diameter	4 Inches
First-Fire Comp.	25 Grams
Primer Comp.	50 Grams
Illuminant Comp.	1355 Grams
Parachute Size	37 Inches

6-3-5. Projectile Load, Illuminating, Mk 12 Mod 0

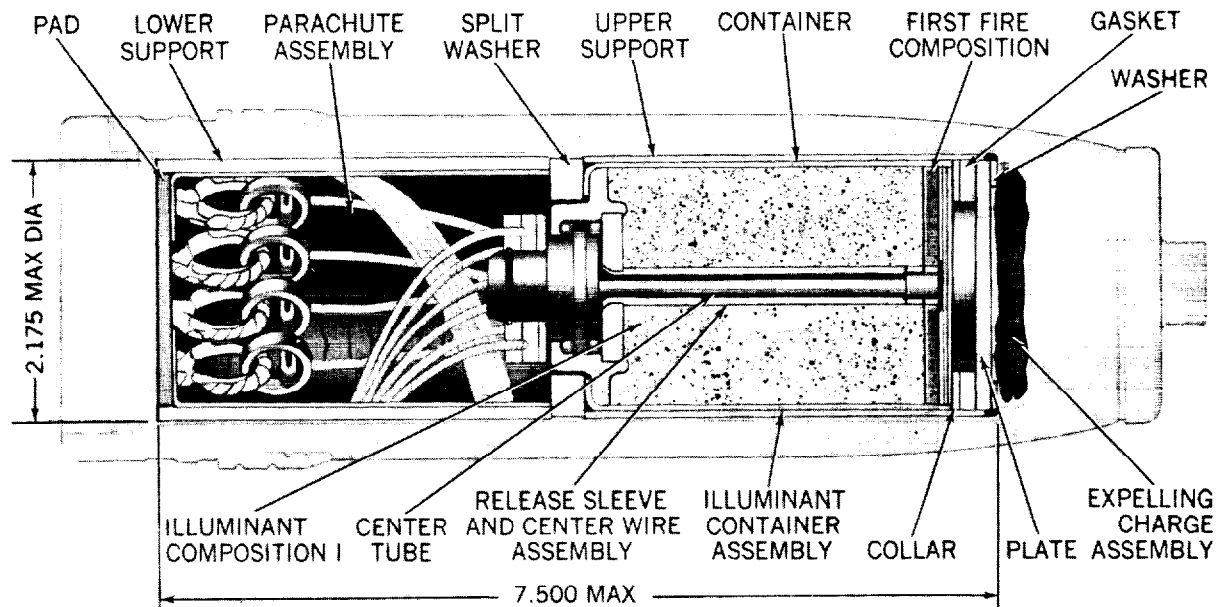


Figure 6.3.5 Illuminating Projectile Load, Mk 12

washer, and the felts fall free, and the center wire release allows the parachute to open fully and suspend the burning candle.

6-3-4-4. Handling and Safety Provisions. Provisions relating to handling, storage, safety precautions, and shipping methods are the same as for the Projectile Load, Illuminating, Mk 4 Mods (see paragraph 6-3-1 preceding).

6-3-4-5. Specific Data. The following table

6-3-5-1. Intended Use and Description. This projectile load (see Figure 6.3.5) is designed to be used in the same way and for the same purposes as the Projectile Load, Illuminating, Mk 11, which is described in the preceding paragraph 6-3-4, except that it is expelled from a 3"/50 caliber illuminating projectile. For candlepower ratings, burning times, etc., see Table 6-1. All of its operational and functional characteristics are the same, except as indicated in paragraph 6-3-5-4 following.

6-3-5-2. Handling, Storage, and Safety Rules. This device shall be handled and stored in accordance with paragraph 6-1-2 of this chapter. The safety rules of paragraph 6-1-3 apply.

6-3-5-3. Shipping Containers. This projectile load is assembled within the 3"/50 caliber illuminating projectile which is shipped in a metal container.

6-3-5-4. Specific Data. The following table provides certain specific data respecting this device:

PROJECTILE LOAD, ILLUMINATING, MK 12

Length	7.5 Inches
Diameter	2.175 Inches
First-Fire Comp.	20 Grams
Expelling Charge	10.65 Grams
Illuminant Comp.	260 Grams
Parachute Size	16.25 Inches

6-4. ILLUMINATING DEVICES LAUNCHED FROM MORTARS OR PROJECTORS.

The devices described in this section are designed to be launched from mortars or from special pyrotechnic ejectors which are placed on the ground or deck.

6-4-1. Flare, Surface, High Altitude, Parachute, Mk 20 Mod 0

of identifying and illuminating seaplane landing areas at night or for illuminating an island base when low ceilings do not permit adequate visibility from normal operational altitudes (see Table 6-1).

6-4-1-2. External Features. The outer case of this device is closed at one end by a copper cup and at the other end by a steel disk. The copper cup contains a propelling charge, a primer, and a time fuse.

6-4-1-3. Functional Description. The flare is inserted into the projector, copper end down, so that it rests on the release pin. The release pin is pulled from the projector by a lanyard, so that the flare falls to the bottom of the tube where a steel firing pin strikes the primer. The primer sets off the propelling charge and ignites the delay fuse. Expanding gases force the copper cup away from the flare and propel the flare to an altitude of approximately 1000 feet, at which point the delay fuse ignites the expelling charge. The expelling charge ignites the pyrotechnic candle and expels the candle and the parachute.

6-4-1-4. Handling and Storage. This flare shall be handled and stored in accordance with paragraph 6-1-2 of this chapter.

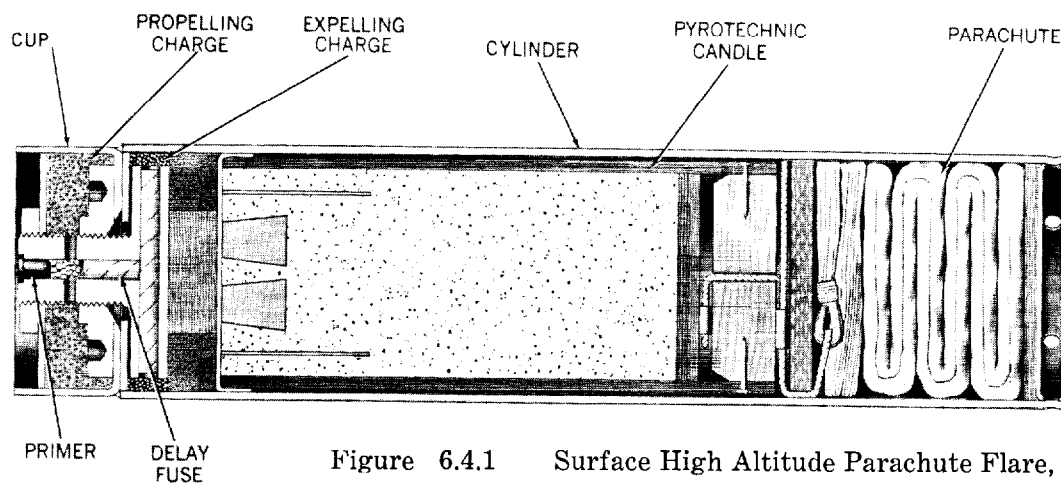


Figure 6.4.1 Surface High Altitude Parachute Flare, Mk 20

6-4-1-1. Intended Use. This surface-launched flare (see Figure 6.4.1) is designed to be fired from a Pyrotechnic Projector, Mk 13 (see Chapter 4 of this pamphlet) for the purpose

WARNING

This device is propelled with considerable force. It must be pro-

jected from behind a barrier. The full length of the projector lanyard must be used, and all personnel must wear steel helmets and be on the alert for burning particles and the empty case which falls free.

6-4-1-5. Safety Precautions. In addition to the general precautions of paragraph 6-1-3, the following special rules apply:

(1) In case of a misfire, at least 3 minutes must elapse before the projector is to be approached.

(2) All misfires, and all damaged flares must be carefully segregated for disposition as provided for in Chapter 3 of this pamphlet.

(3) After removing a misfire from the projector, both the barrel and the projector base must be thoroughly inspected and cleaned.

6-4-1-6. Shipping Containers. These flares are packaged in individual cylindricalterneplate cans with lids secured by tape. Twenty-five such cans are packed in a wooden box, the filled weight of which is approximately 118 pounds.

6-4-1-7. Identification Data. This flare is listed under Dwg. No. 421958, FSN 1370-092-9957, and DOD Code No. L450.

6-4-1-8. Specific Data. The following table provides certain specific data respecting this device:

FLARE, SURFACE, HIGH
ALTITUDE, PARACHUTE, MK 20

Weight	3.35 Pounds
Burning Time	60 Sec. (Min.)
Candlepower	80,000 (Avg.)
Length	10.75 Inches
Diameter	2.4 Inches
Flare Composition	23 Ounces
Rate of Fall	16 Ft/Sec

6-4-2. Cartridge, 60MM, Illuminating, M83A2. (Formerly Shell, Illuminating, M83A2) (Illustration top of page 6-20)

6-4-2-1. Intended Use. This cartridge (see Figure 6.4.2) is designed to be used in conjunction with 60MM mortars in night missions which require illumination for purposes of observation (see Table 6-1).

6-4-2-2. External Features. The body of this device is a thin-walled steel tubing to the front end of which is welded a steel adapter or collar threaded internally to seat the fuze. The base end is closed by the tail assembly which is a lightweight metal cone. This cone is fitted at its front end with a coupling held in the body tube by four shear pins. The base end of the cone is fitted with an adapter holding the pins, the ignition cartridge, and the primer.

6-4-2-3. Functional Description. The illuminant assembly consists of a quick-

match, a black powder expelling charge, a first-fire composition, and the pyrotechnic composition held in a boxboard casing. The casing is attached to the parachute by an 18-inch suspension wire. When fired, the safety fuse (after a 14-second delay) ignites the quickmatch. The quickmatch ignites the expelling charge which expels the parachute and the illuminant, at same time igniting the illuminant.

6-4-2-4. Handling and Storage. This device shall be handled and stored in accordance with paragraph 6-1-2 of this chapter.

6-4-2-5. Safety Precautions. The general safety rules in paragraph 6-1-3 of this chapter apply.

6-4-2-6. Shipping Containers. This device is packaged 1 round per fiberboard container, 8 containers to a wooden box (Dwg. No. 75-1-143-2).

6-4-2-7. Identification Data. This cartridge is listed under FSN 1310-028-4936 and DOD Code No. B627.

6-4-2-8. Specific Data. The following table provides certain specific data respecting this cartridge:

CARTRIDGE, 60MM, ILLUMINATING,
M83A2

Weight	3.77 Pounds
Length	14.28 Inches
Range	1100 Yards
Burning Time	25 Seconds (Min.)
Candlepower	145,000
Rate of Fall	10 Ft/Sec

6-4-3. Cartridge, 81MM, Illuminating, M301A2.
(Illustration top of page 6-21)

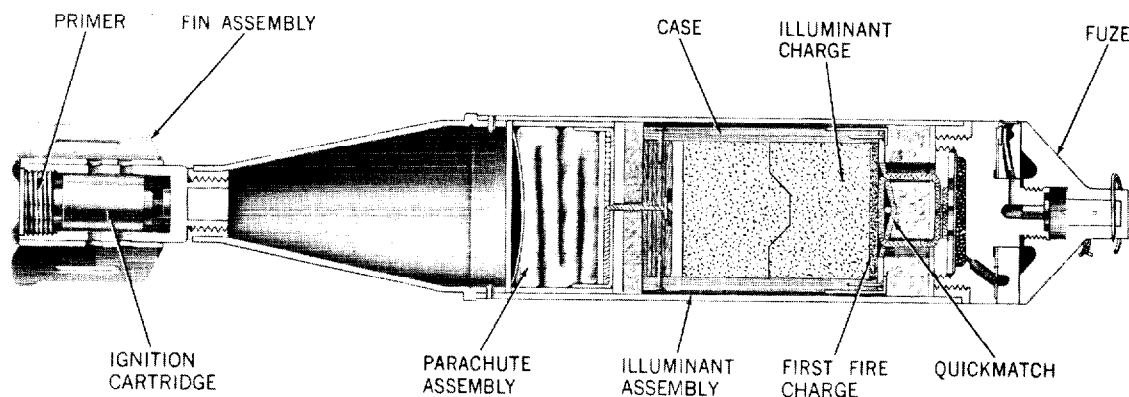


Figure 6.4.2 Illuminating Cartridge, 60 MM, M83A2

6-4-3-1. Intended Use. This cartridge (see Figure 6.4.3) is designed to be fired from 81-MM smoothbore, muzzle-loading weapons. It is intended primarily for illuminating targets and areas in support of infantry operations (see Table 6-1).

6-4-3-2. External Features. The body of this device is a thin-walled steel tube with an M84 fuze threaded into the forward end. The tail assembly is a lightweight steel cone inserted into the body tube and held by four equally spaced shear pins. The base end of the cone is fitted with an M4 or an M4A1 fin assembly which holds the ignition cartridge and a percussion-type primer. Four increments of sheet powder sealed in cellophane are clipped to the tail assembly.

6-4-3-3. Functional Description. When the round is dropped into the mortar tube, the firing pin in the base of the mortar strikes the percussion primer which initiates the ignition cartridge. This, in turn, ignites the sheet powder clipped to the tail assembly. Pressure generated in the tube by this combustion projects the device to the target area. At a pre-determined setting up to 25 seconds, the fuze functions to ignite the fuze expelling charge which ejects the parachute and the attached illuminant assembly from the base of the cartridge, at the same time igniting the quick-

match. The quickmatch ignites the primary charge which ignites the first-fire composition and the illuminant. The parachute suspends the illuminant.

6-4-3-4. Handling and Storage. This device is designed to withstand conditions normally encountered in the field. It is packaged in moisture-resistant containers and suitable packing boxes to protect it during shipment and storage. Care must be exercised to prevent breaking or otherwise damaging the containers and boxes. The explosive elements in the primer and the fuze are sensitive to undue shock and high temperature. The general rules for handling and storage found in paragraph 6-1-2 of this chapter must be followed in respect to this device.

6-4-3-5. Safety Precautions. The safety rules in paragraph 6-1-3 of this chapter apply to this device. In addition, the following special precautions must be observed:

- (1) Do not lift this device by the fuze safety pin.
- (2) Keep the sheet powder away from heat and flame.
- (3) Do not remove the round from its individual container until ready for use.

6-4-3-6. Shipping Containers. This device is packaged in individual, moisture-resistant metal containers.

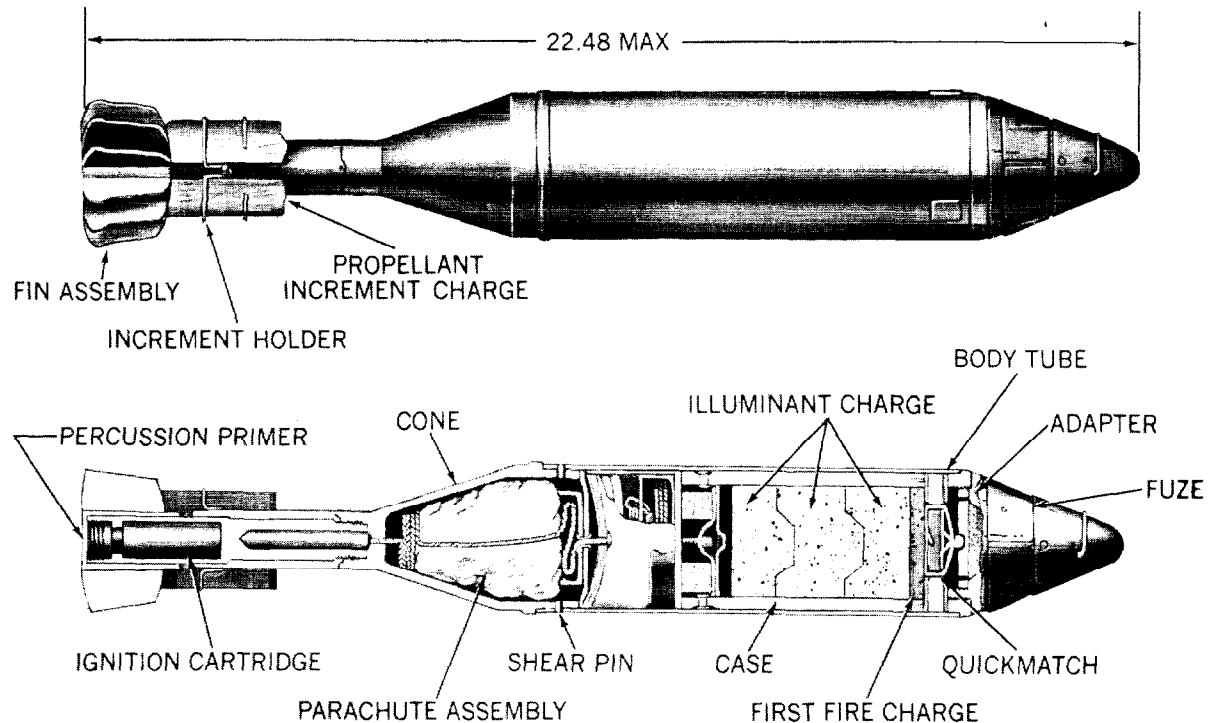


Figure 6.4.3 Illuminating Cartridge, 81 MM, M301A2

6-4-3-7. Identification Data. This cartridge is listed under specification MIL-S-13197, FSN 1315-028-4964, and DOD Code No. C226.

6-4-3-8. Specific Data. The following table provides certain specific data respecting this cartridge:

CARTRIDGE, 81MM, ILLUMINATING, M301A2	
Weight	10.71 Pounds
Length	22.48 Inches
Range	100-2200 Yards
Burning Time	55 Seconds (Min.)

6-5. TRIPPED ILLUMINATING DEVICES.

The pyrotechnic devices described in this section are equipped with trip wires designed to be actuated by marauding enemy troops in operations on land. These are essentially booby traps which serve to warn of the enemy's approach and also to light up his immediate vicinity so that he can be effectively fired upon.

6-5-1. Flare, Surface, Mk 1 Mod 0 (Illustration top of page 6-22)

6-5-1-1. Intended Use. This illuminating flare (see Figure 6.5.1) is designed to be strapped to a tree or post to reveal the approach of enemy troops. It produces a yellow flame which burns for a maximum of 65 seconds (see Table 6-1).

6-5-1-2. External Features. This surface flare consists of a steel tube with a firing mechanism extending as a smaller tube down one side from a protruding segment at the top. A guide for retaining the holding strap is located just below the firing mechanism. Both ends of the main body of the flare are fitted with closing disks.

6-5-1-3. Associated Equipment. The Surface Flare, Mk 1, is shipped with 80 feet of trip wire, 2 screw eyes, and a belt for attaching the device to a tree or post.

6-5-1-4. Make-Ready Procedures. This device is in the nature of a booby trap. For this reason, a high degree of ingenuity is called for in

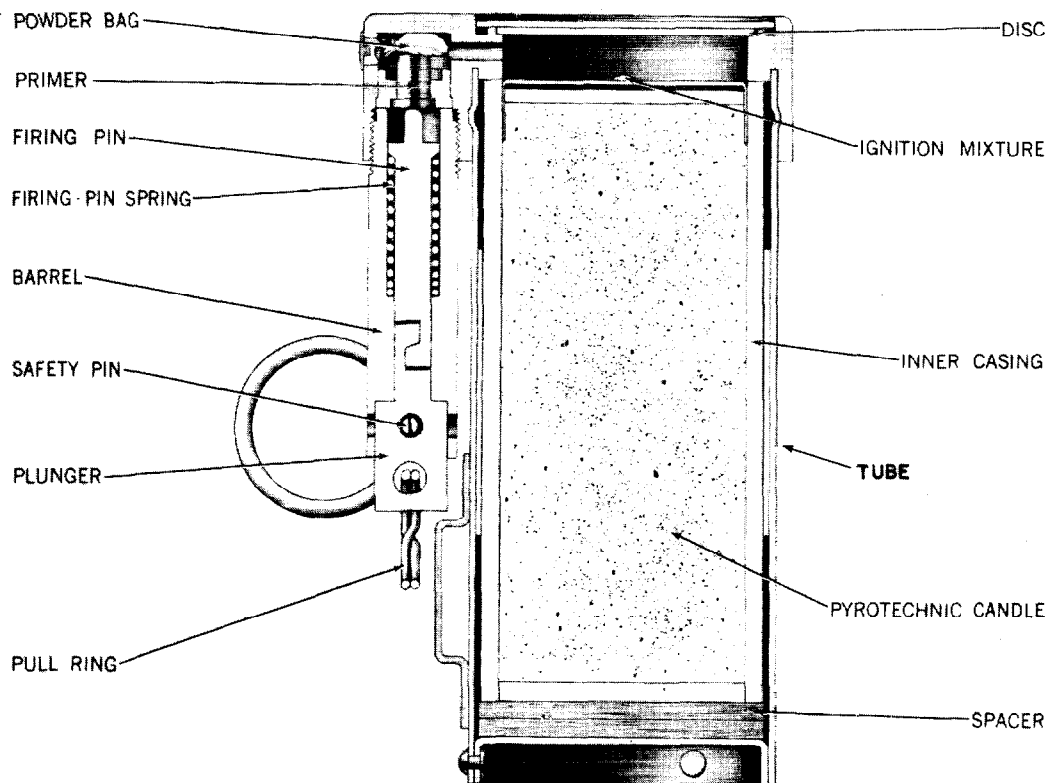


Figure 6.5.1 Surface Flare, Mk 1

making it ready for use. The device itself should be concealed as much as possible from enemy eyes, and the trip wire should be placed so as to be as inconspicuous and as effective as possible. The following steps must be followed in setting up this device:

(1) Remove the flare and its accessory equipment from the shipping container.

(2) Reeve the belt through the guide below the firing mechanism, extending the two ends of the belt to the rear of the flare body.

(3) Strap the belt around a tree or a post about 3 feet above the ground, preferably in a position at least partially concealed by weeds or undergrowth.

(4) Attach one of the screw eyes to the tree or post about 6 inches from the ground and directly below the flare body.

NOTE: The trip wire should be run parallel to the enemy lines. The entire 80

feet may be run in one direction or it may be cut into any desired lengths and run in several directions.

(5) Pass one end (or ends if cut into more than one length) of the trip wire(s) upward through the screw eye at the base of the tree or post and secure it temporarily to some part of the flare body or to the belt. **Do not attach the trip wire to the pull ring at this time.**

(6) Attach the other end (or ends) of the trip wire(s) securely to another tree, stump, or post, approximately 6 inches above ground.

(7) Remove temporarily secured flare end of the trip wire (step 5 above) and attach it to the pull ring on the end of the plunger. The wire should not be so taut that the plunger is pulled out; it should, however, sag very little.

(8) Arm the flare by pressing up on the plunger and carefully removing the safety pin. Release the plunger slowly, noting its down-

ward travel — which should not be more than $\frac{1}{4}$ inch. If further downward pressure is felt, return the plunger to its up position and replace the safety pin. Adjust the trip wire to allow more slack.

(9) Repeat step 8 until there is proper tension on the trip wire. The trip wire tension should not pull the plunger down more than $\frac{1}{8}$ inch.

(10) Free the plunger of any paint or other substance by rotating it 90 degrees after the flare is set.

6-5-1-5. Removal Procedures. The following steps shall be followed if a flare is to be removed:

(1) Push the plunger to its full up position and carefully reinsert the safety pin.

(2) Detach the trip wire from the pull ring.

(3) Retrieve the trip wire from distant point or points of attachment.

(4) Return the flare and its associated equipment to its original waterproof shipping container.

6-5-1-6. Functional Description. When pressure is exerted against the extended trip wire as by a marauder tripping over it, the resultant tension pulls the plunger down until it disengages from the firing pin, thereby allowing the spring to drive the firing pin upward into the primer. The primer ignites the bag of black powder, which ignites the impregnated muslin disk. This, in turn, sets off the pyrotechnic candle, and expanding gases force off the top closing disk.

6-5-1-7. Handling and Storage. This flare shall be handled and stored in accordance with paragraph 6-1-2 of this chapter.

6-5-1-8. Safety Precautions. In addition to the general safety rules contained in paragraph 6-1-3 of this chapter, the following special precautions must be observed:

(1) Inspect safety pin to assure that it is not rusted, bent, or otherwise damaged. Flares containing defective safety pins must be disposed of by trained disposal personnel in accordance with Chapter 3 of this pamphlet.

(2) Remove the safety pin only when the flare and trip wire are completely installed in accordance with paragraph 6-5-1-4 preceding.

6-5-1-9. Shipping Containers. This device is packaged in a waterproof individual container, 10 containers to a wooden box. The weight of a filled wooden box is approximately 70 pounds.

6-5-1-10. Identification Data. This flare is listed under Dwg. No. 344540, Specification MIL-F-18903, FSN 1370-038-5074, and DOD Code No. L493.

6-5-1-11. Specific Data. The following table provides certain specific data respecting this flare:

FLARE, SURFACE, MK 1

Weight	3.75 Pounds
Length	5.38 Inches
Diameter	2.38 Inches
Candlepower	75,000
Burning Time	65 Seconds (Max.)

6-5-2. Flare, Surface, M48.

(Illustration top of page 6-24)

6-5-2-1. Intended Use. This surface flare (see Figure 6.5.2) is designed to project a parachute-suspended pyrotechnic candle for the purpose of disclosing the presence of infiltrating enemy troops. It is actuated either by pressure on its prongs or by a pulling force on its trip wire (see Table 6-1).

6-5-2-2. External Features. This flare consists of a hollowed steel base, to which are attached two steel tubes, both extending upward. The larger tube, closed at its upper end by a metal cap, is 7.3 inches high and approximately 2.5 inches in diameter. The smaller tube, $\frac{3}{8}$ inch in diameter and roughly 5 inches high, is closed, during shipment and storage, by a knurled screw cap. It is threaded to accommodate a Mine Fuze, M6A1, which is shipped with the flare.

6-5-2-3. Fuze Description. The Mine Fuze, M6A1, has three prongs on its head. Normally, it should turn freely after installation. There are two safety pins in the fuze assembly — one passes through the visible end of the firing pin in the center of the three prongs; the second

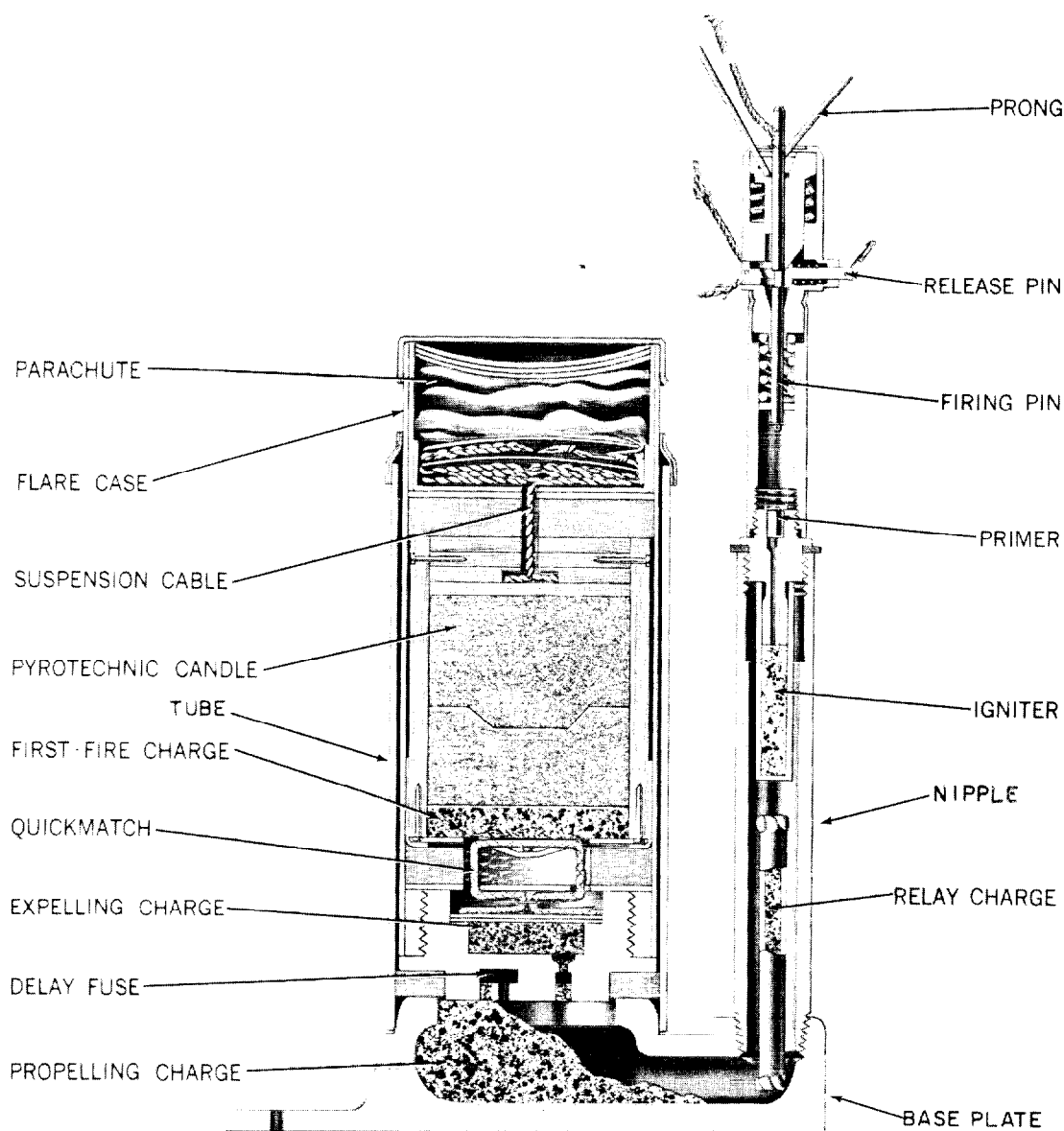


Figure 6.5.2 Surface Flare, M48

locks the release pin. The fuze is actuated in either of two ways: (1) by a pressure of 10 to 12 pounds on the prongs, or (2) by a pull of 6 to 10 pounds on the release pin. In either case, the spring-loaded firing pin is released to strike the primer.

6-5-2-4. Functional Description. When the firing pin hits the primer, flame is transmitted

downward to the igniter which sets off the relay charge. The relay charge carries flame to the propelling charge which propels the flare assembly upward and simultaneously ignites the 3-second delay fuse. When the delay fuse burns through, it ignites the expelling charge which expels the flare and parachute and, at the same time, ignites the quickmatch. The

quickmatch ignites the priming charge which sets off the first-fire composition. The first-fire composition finally ignites the pyrotechnic candle which is then suspended by the parachute.

6-5-2-5. Installation and Make-Ready Procedures. The following steps shall be taken to prepare this flare for firing:

- (1) Remove the knurled shipping cap from the smaller tube.
- (2) Insert the Mine Fuze into the top of the smaller tube.
- (3) Place the flare in a hole so that the top of the fuze is flush with the ground surface.
- (4) Arrange the cords of the safety pins so that they will not be buried when the flare is covered.
- (5) Tamp dirt around the device up to the top of the larger tube.
- (6) Attach one end of the trip wire (or wires) to a stake or similar object and run the wire(s) along the ground to the flare.
- (7) Attach the trip wire (or wires) to the release-pin ring, being sure that there is no tension on the trip wire(s).
- (8) Remove the safety pin which holds the release pin.
- (9) Test the upper firing-pin safety pin (between the prongs) to be sure that it does not bind. If it binds, there is tension on the trip wire or the fuze is defective. If there is binding, replace the release-pin safety pin and correct the defect either by loosening the trip wire or replacing the fuze. If the firing-pin safety pin does not bind, leave it in place and cover the flare completely with untamped soil. The ground should now be at its original level.
- (10) Gently withdraw the firing-pin safety pin by pulling on its cord.
- (11) Carefully cover the ground with leaves so as to hide evidence of its having been disturbed, being extremely careful not to exert pressure on the trip wire(s) or the prongs.

WARNING

Keep clear of the flare to avoid injury from accidental discharge.

- (12) Record the location of the flare.

6-5-2-6. Removal Procedures. If it is desired to remove the flare after it has been set in the ground, the following steps shall be taken:

- (1) Carefully remove the leaves and dirt from the fuze, being very careful not to disturb the trip wire(s) or the prongs.
- (2) Reinsert the firing-pin safety pin at the top between the prongs.
- (3) Reinsert the release-pin safety pin.
- (4) Remove the trip wire(s) from the release-pin ring.
- (5) Unscrew and remove the fuze assembly.
- (6) Install the knurled shipping cap.
- (7) Retrieve extended trip wire (or wires).
- (8) Return the flare, wire, and Mine Fuze to original shipping container.

6-5-2-7. Handling and Storage. This flare is to be handled and stored in accordance with general instructions contained in paragraph 6-1-2 of this chapter.

6-5-2-8. Safety Precautions. In addition to the general safety rules in paragraph 6-1-3 of this chapter, the following special precautions must be observed:

- (1) Personnel must not approach within 6 feet of any installed flare or its trip wire(s).
- (2) Each flare used in training will be fenced or otherwise guarded.
- (3) Fuzes shall be carefully inspected for rusty safety pins. Fuzes containing rusted or otherwise damaged safety pins shall be disposed of in accordance with Chapter 3 of this pamphlet.
- (4) Flares shall be planted so that earth, rocks, or fragments of the flare casing will not endanger friendly personnel and so that its functioning will not disclose defense positions.
- (5) Flares shall be carefully examined for tight joints before use. They shall not be planted in wet locations since moisture could cause a malfunction.

6-5-2-9. Shipping Containers. This device is packed and shipped in wooden boxes, four rounds to the box. The weight of a filled box is approximately 41 pounds.

6-5-2-10. Identification Data. This flare is listed under Dwg. No. 78-0-45, Specification MIL-F-20343, FSN 1370-529-8545, and DOD Code No. L494.

6-5-2-11. Specific Data. The following table provides certain specific data respecting this flare:

FLARE, SURFACE, M48

Weight	5 Pounds
Overall Length	7.3 Inches
Candlepower	110,000
Burning Time	20 Seconds
Effective Radius	300 Yards
Functioning Altitude	250-400 Feet

6-5-3. Flare, Surface, M49.

6-5-3-2. External Features. This flare somewhat resembles a hand grenade in size, shape, and method of initiation except that it is fitted with a metal bracket for attaching it to a tree or post and a spring-loaded trigger which releases the safety lever. The body is made from laminated paper and is closed at both ends by metal caps. The upper cap has tape-covered holes near the sides and a threaded center hole into which a Trip Fuze, M12, is screwed. Attached to the base cap are the mounting bracket and the trigger mechanism. The trigger has a narrow tongue for holding the safety lever in place.

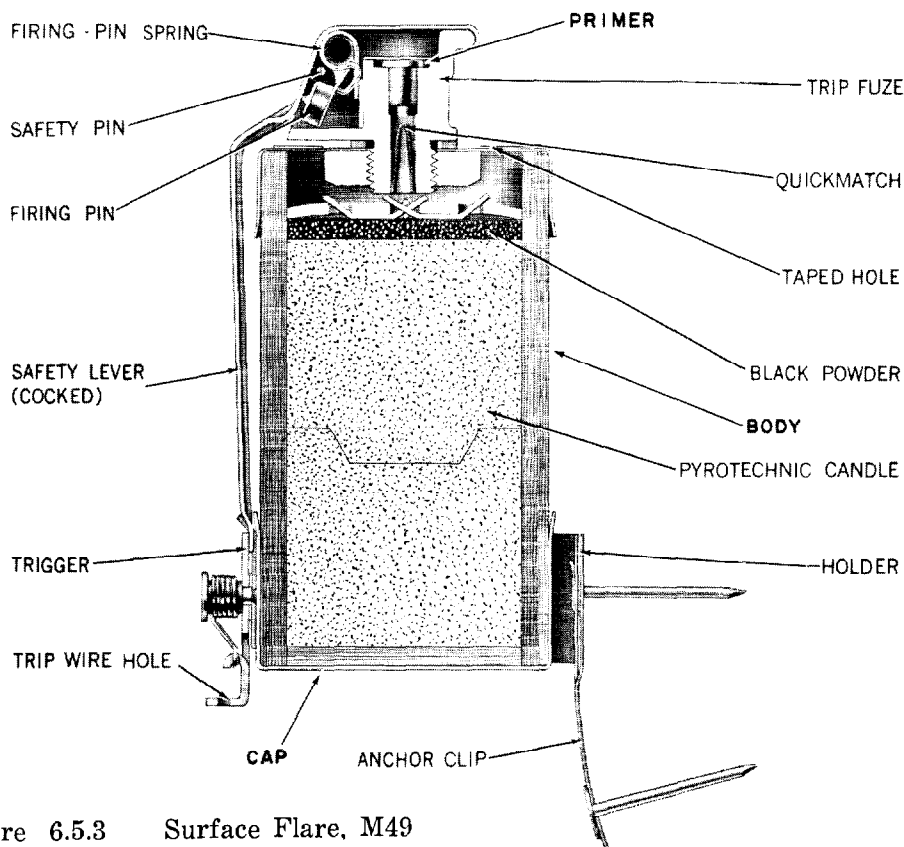


Figure 6.5.3 Surface Flare, M49

6-5-3-1. Intended Use. This ground illuminating flare (see Figure 6.5.3) is similar in purpose to the Flare, Surface, Mk 1, which is described in paragraph 6-5-1 preceding (see Table 6-1).

6-5-3-3. Functional Description. When the trip wire which is attached to a hole in the lower end of the trigger is pulled or severed, the trigger will move counterclockwise or

clockwise, depending upon the type of force exerted. This movement releases the safety lever which is forced upward by the firing pin spring. The firing pin spring causes the firing pin to rotate so that it strikes the primer. The primer ignites the quickmatch, and flame is transmitted to the black powder which ignites the pyrotechnic candle. Expanding gases blow off the fuze cap, allowing the pyrotechnic composition to burn and to illuminate the surrounding area.

6-5-3-4. Make-Ready Procedures. This flare is prepared for firing in the following manner:

- (1) Choose a location to the right (looking toward the enemy) of the area to be illuminated so that the trip wire will run parallel to the enemy lines; that is, to the right of the flare when facing the trigger.

- (2) Nail the plate holder on the enemy side of a stake or other suitable support with the ends of the two tabs upward. The plate holder may be attached at any height desired for the trip wire (usually 15 to 18 inches above the ground).

- (3) Mount the flare by sliding the square holes of the anchor clip over the mating tabs on the holder. Press the flare downward until it is locked in position. A third nail may be used to secure the lower end of the anchor clip.

- (4) Fasten one end of the trip wire to a tree or another stake at the desired distance from the flare and to the right of the flare when facing the trigger.

- (5) Press the fuze lever down with one hand. Rotate the trigger counterclockwise a quarter turn bringing the hole in its lower end to the 6 o'clock position. Be certain that the lower end of the safety lever is behind the upper end of the trigger.

- (6) Pull the trip wire taut and fasten it securely to the hole in the bottom of the trigger. Since the safety lever must hold the trigger after the safety pin is withdrawn, the trigger must be vertical and the safety lever must be securely behind its upper end.

- (7) Hold the safety lever firmly with one hand and carefully withdraw the safety pin at the top of the safety lever.

- (8) Slowly release pressure on the safety lever, making sure that the trigger is holding it in place.

6-5-3-5. Alternate Methods of Operation. This flare may also be armed (after mounting as in steps (1) through (4) in the preceding paragraph) by attaching the trip wire to the safety pin ring. In this method, the trigger is not used. The flare may also be launched by hand.

6-5-3-6. Removal Procedures. If it is desired to remove an installed flare before it has functioned, the following steps should be taken:

- (1) Depress the safety lever so as to align the holes in the upper part of the lever with the holes in the fuze, and insert the safety pin.

- (2) Detach the trip wire from the trigger.

- (3) Hold the safety lever firmly against the flare body and rotate the trigger to its original position.

- (4) Remove the nail from the lower point of the anchor clip and lift the flare out of the holder plate.

- (5) Remove the nails holding the holder plate to the stake or other support.

- (6) Retrieve the trip wire from its distant attachment.

- (7) Return the flare, holder plate, and trip wire to the original shipping container.

6-5-3-7. Handling and Storage. This device shall be handled and stored in accordance with the provisions of paragraph 6-1-2 of this chapter.

6-5-3-8. Safety Precautions. The general safety rules of paragraph 6-1-3 of this chapter are applicable to this flare. In addition, the following special rules must be carefully observed:

- (1) Inspect safety pins for rust or other damage. Flares with damaged or deteriorated safety pins must be disposed of by properly trained personnel in accordance with the provisions of Chapter 3 of this pamphlet.

- (2) The safety pin must be removed ONLY when the flare has been installed and adjusted as required by paragraph 6-5-3-4 preceding, or when the flare is being used as a hand grenade.

6-5-3-9. Shipping Containers. This device is packaged in a wooden box, 16 rounds to the box. A filled box weighs approximately 45 pounds.

6-5-3-10. Identification Data. This flare is listed under Dwg. No. 78-0-43, MIL-F-20420, FSN 1370-554-1147, and DOD Code No. L495.

6-5-3-11. Specific Data. The following table provides certain specific data respecting this flare:

FLARE, SURFACE, M49

Weight	1.44 Pounds
Length	6 Inches
Diameter	3 Inches
Candlepower	40,000
Burning Time	55 Seconds

6-6. HAND-THROWN ILLUMINATING DEVICES.

The pyrotechnics described in this section are similar in appearance and in their method of arming, fuzing, and launching to hand grenades which are used for lethal combat purposes. They are designed, however, only to cast illumination over and around an area in ground operations.

6-6-1. Grenade, Hand, Illuminating, Mk 1 Mods 1 and 2

6-6-1-1. Intended Use. This device (see Figure 6.6.1) is used for illuminating near-by areas in night operations (see Table 6-1). It may be launched either by hand or by rifle provided the rifle is equipped with Grenade Projection Adapter, M1 (see paragraph 6-6-1-4).

WARNING

This device burns for a considerable time and develops intense heat. It must be handled carefully to avoid accidental initiation.

6-6-1-2. External Features. This device consists of two steel cups force-fitted and sealed together. Each mod contains a fuze which is equipped with a release lever held in place by a safety cotter pin. Except for slight differences in lever and fuze configuration and the elimination of the warning tag in Mod 2, the two mods are identical in appearance.

NOTE: Drawings of the Mod 1 have been retired. It will therefore no longer be produced. It is described here only because there may be some Mod 1 Grenades still available in the supply system. Its use is not restricted.

6-6-1-3. Functional Description. In both mods, when the safety cotter pin has been removed and the lever is released, the spring-loaded striker rotates about its hinge pin and strikes the primer. In the Mod 1, the primer ignites a quickmatch which activates a 7-second delay fuse. The delay fuse, near the end of its burning, ignites a second quickmatch which sets off an igniting charge. This charge is in direct contact with first-fire composition which is pressed across the top of the illuminating composition. The igniting charge fires the first-fire composition, which, in turn, ignites the illuminating composition. As a redundancy feature, the Mod 1 fuze also contains a short section of firecracker fuse, the purpose of which is to transfer ignition from the delay fuse to the igniting charge in the event that the normal quickmatch firing train fails. The Mk 372 Mod 0 Hand Grenade Fuze in the Mod 2 eliminates these several ignition transfers. In the Mod 2, the primer ignites a 4- to 6-second delay composition directly, and the delay composition ignites the black powder coating over the first-fire composition. The first-fire composition then ignites the illuminating composition. In both mods, pressure resulting from combustion bursts the outer case. Average burning time for Mod 1 is 25 seconds. Mod 2 burns 5 to 10 seconds longer.

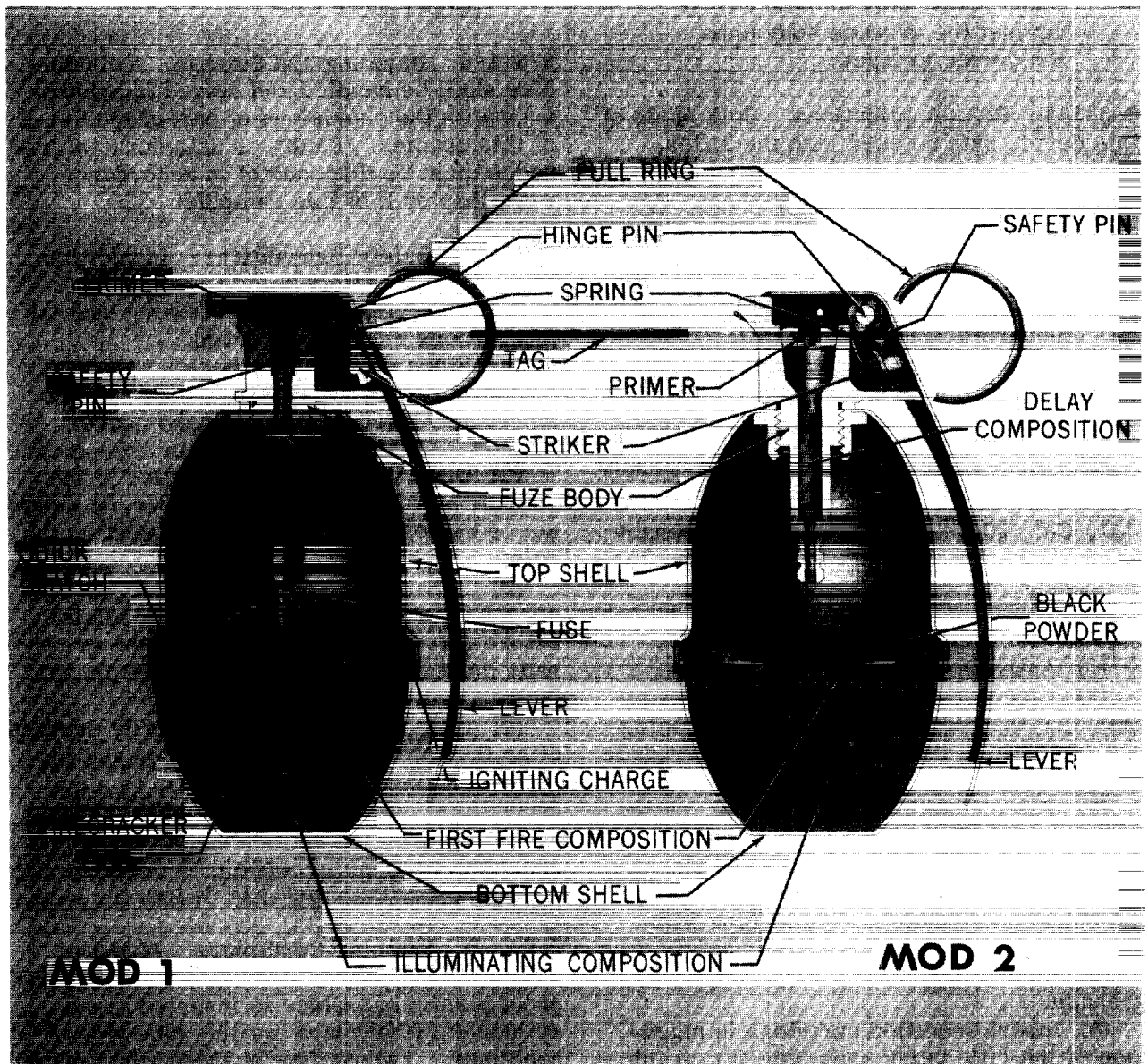


Figure 6. 6. 1 Illuminating Hand Grenade, Mk 1

WARNING

The safety cotter pin must not be removed except in actual preparation for launching. The release lever must be held firmly against the grenade body until the device is thrown.

6-6-1-4. Rifle Applications. Both mods of this device may be used with the rifles, launchers, and cartridges as indicated in the following table:

Rifle	Grenade Launcher	Cartridge
M1 (converted to 7.62 MM)	M7 Series	Rifle, Grenade, M64, 7.62 MM
M14, 7.62 MM	M76	Rifle, Grenade, M64, 7.62 MM
M1, Cal. 30	M7 Series	Rifle, Grenade, M3, Cal. 30

6-6-1-5. Launching Procedures. In launching, the following steps shall be taken:

- (1) Activate rifle safety lock device.
- (2) Place grenade in the M1 Adapter by inserting the release lever into the arming cup and forcing the joint bead of the grenade between the claws of the adapter.
- (3) Place adapter, with grenade, on the launcher and position it in accordance with desired range.
- (4) Rotate adapter on the launcher so that the release lever does not interfere with sighting the rifle.
- (5) Remove safety cotter pin from the grenade.
- (6) Insert specified cartridge in magazine of the rifle being used (see paragraph 6-6-1-4).
- (7) Close the bolt and elevate barrel to an angle of 45 degrees.
- (8) Release rifle safety lock.
- (9) Place rifle butt on the ground. Do not fire from the shoulder since recoil is considerable.

WARNING

Do not point rifle toward friendly personnel, equipment, or material when loading, unloading, or preparing to fire.

6-6-1-6. Handling and Storage. This device shall be handled and stored in accordance with the provisions of paragraph 6-1-2 of this chapter. Faulty or deteriorated grenades must be disposed of in accordance with Chapter 3 of this pamphlet.

6-6-1-7. Safety Precautions. In addition to the general safety rules in paragraph 6-1-3 of this chapter, the following special precautions must be observed:

(1) Since this grenade bursts with considerable force, it must be aimed so as to function at least 30 feet from the nearest friendly personnel, material, or equipment.

(2) Once this device is installed in the adapter of a rifle grenade launcher, it must not be removed without first reinserting the safety cotter pin.

(3) In hand-launching, the safety cotter pin must not be removed until immediately before throwing the grenade, and the grenade must be thrown as soon as the pin has been pulled.

(4) If this grenade is accidentally dropped after the safety pin has been pulled and the lever released, the best policy is to move away as far and as fast as possible. This grenade should not be picked up and thrown. Judgment as to action should be based on the 4-second minimum delay built into the fuze.

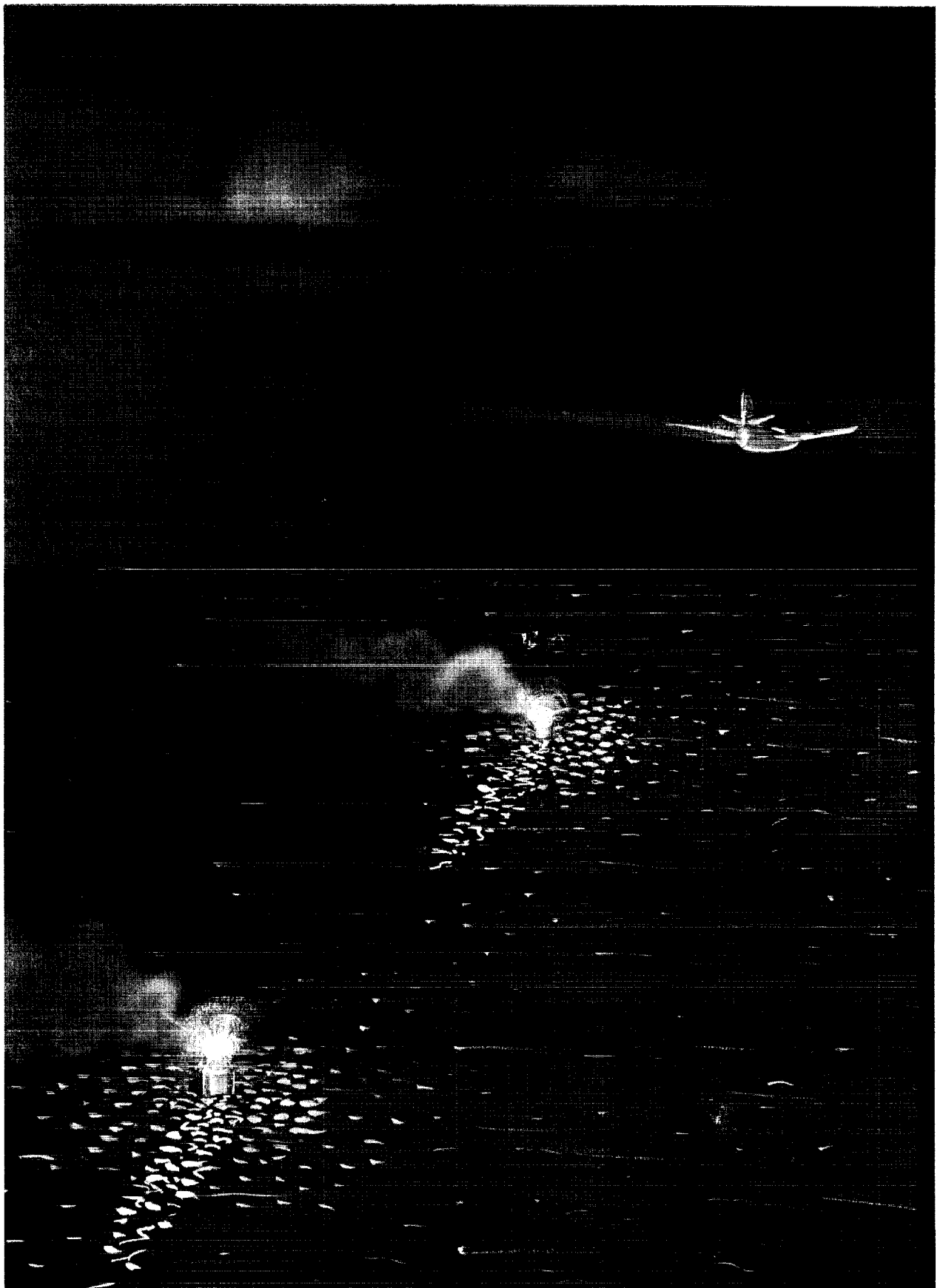
6-6-1-8. Shipping Containers. Mod 1 of this device is packed in an individual water-proof plastic bag which is inserted into a cylindrical fiberboard mailing tube type of container. Twenty-five of these containers are packaged in a wooden box. Mod 2 is packed in an individual metal screw-top can, 24 such cans to a wooden box.

6-6-1-9. Identification Data. The following table applies:

GRENADE, HAND, ILLUMINATING,
MK 1 MODS
(Specification - WS 3015)

	Mod 1*	Mod 2
Assembly Dwg. No.	1212589	2113315
FSN	1330-309-5013	1330-000-5003
DOD Code No.	G-895	G-895

*Mod 1 should not be requisitioned. See
note following paragraph 6-6-1-2.



Mk 25 Marine Location Markers in ASW Operations

CHAPTER 7

AIRCRAFT-LAUNCHED SMOKE AND/OR FLAME MARKING DEVICES

7-1. INTRODUCTION

This chapter provides information on pyrotechnic devices which are dropped on the ground or on the water's surface to emit smoke and/or flame. (Markers which employ dye to produce a "slick" on the water are covered in Chapter 9 of this pamphlet.) Reference points established by these devices serve a variety of purposes. They may determine wind direction and approximate velocity, mark the location of the surface for emergency night landings, establish an initial contact point for continued search for a submarine, or locate target areas in antisubmarine warfare. While these devices are designed to be launched from aircraft, some of them may be, and frequently are, launched from surface ships. Submarine-launched marking devices are described in Chapter 8 of this pamphlet.

7-1.1. Handling and Storage. The pyrotechnic devices described in this chapter shall be handled and stored in accordance with the general rules contained in Section 1-6 of Chapter 1 of this pamphlet.

7-1.2. Safety Precautions. The general safety requirements of Section 1-8 of Chapter 1 must be observed. Most marking devices which produce simultaneous smoke and flame displays burn compositions containing red phosphorus. Only Marine Location Marker, Mk 2 Mods, described in Paragraph 7-2-1 following, does not rely on phosphorus as a burning agent. The Mk 2 Marker produces no smoke. Red phosphorus is easily ignited by friction. In the process of combustion, some of the red phosphorus is converted to white phosphorus which spontaneously re-ignites upon contact with air. Special care must be exercised in all

handling, storage, transportation, and operations involving these devices. Extreme caution must be taken when discarding or retrieving spent phosphorus candles. Storage areas containing these marking devices must be inspected periodically for the presence of gas.

7-1.3. Firefighting. In the event of a fire involving marking devices which contain phosphorus compounds, the area should be flooded with water and thoroughly scrubbed, using trisodium phosphate or copper sulfate solution, until all traces of white phosphorus have entirely disappeared. Dented, cracked, or otherwise damaged smoke and flame marking devices must be carefully segregated for appropriate disposition in accordance with Chapter 3 of this pamphlet.

(See Table 7-1)

7-2. ITEM DESCRIPTIONS

This section contains individual descriptions of the devices covered by this chapter.

7-2.1. Marker, Location, Marine, Mk 2 Mods 0 and 1.

(Formerly Depth Charge Marker, Mk 2, Mods 0 and 1)

7-2-1.1. Intended Use. This marker (see Figure 7.2.1) is intended to be hand-launched from surface or aircraft for nighttime marking purposes at sea.

7-2-1.2. Differences Between Mods. The Mod 1 differs from the Mod 0 only in minor manufacturing details which in no way affect functioning or handling.

7-2-1.3. External Features. This device consists of a cylindrical steel can, approxi-

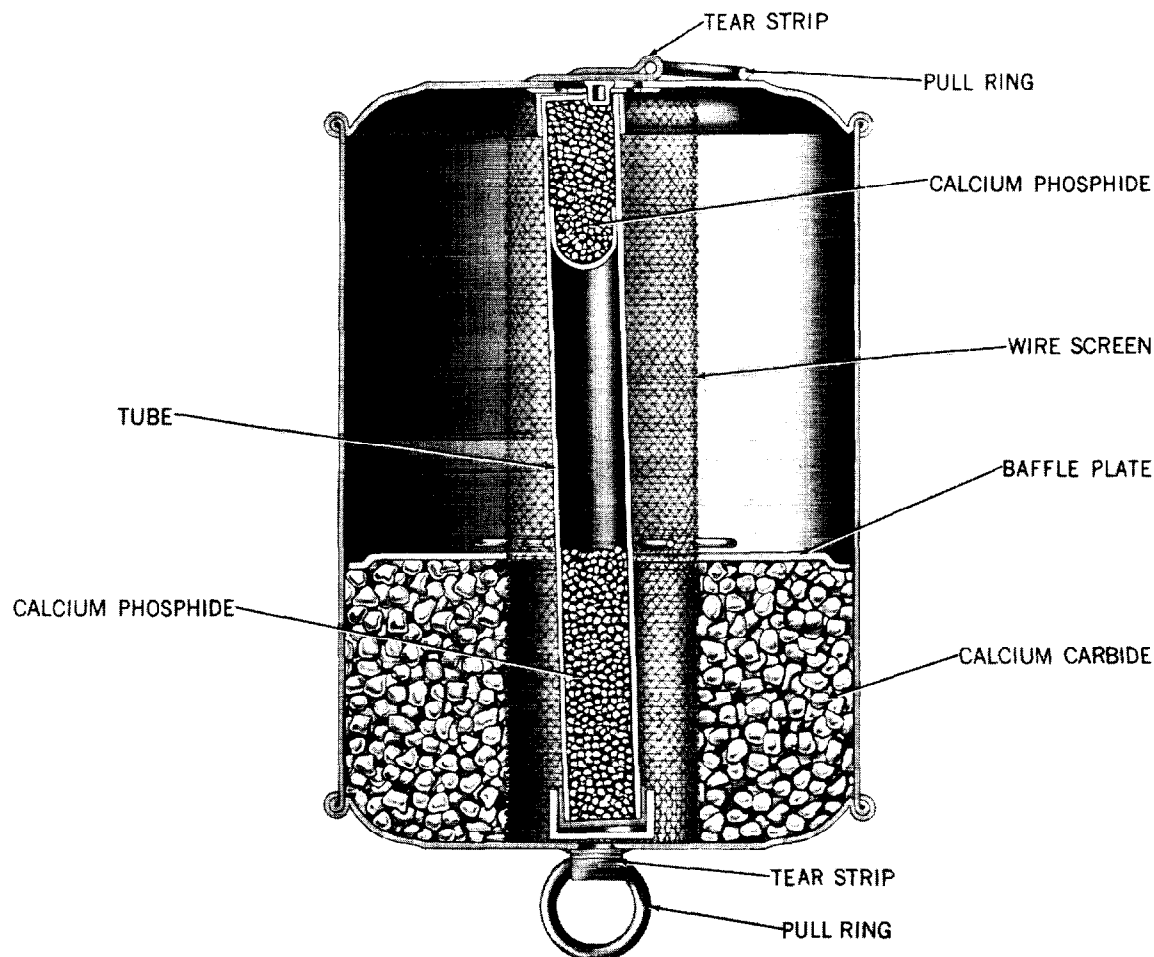


Figure 7.2.1 Marine Location Marker, Mk 2

TABLE 7-1
SMOKE AND/OR FLAME MARKING DEVICES SUMMARY

Item	Paragraph	Burn Time Minutes (Min-Max)	Approx. Length (Inches)	Approx. Diameter (Inches)	Approx. Weight (Pounds)
Marker, Location, Marine Mk 2 Mods 0 & 1	7-2-1	45-55	7	5	3
Signal, Smoke and Illum., Aircraft, Mk 5 Mod 3 & 4	7-2-2	10-20	19	3	3.6
Signal, Smoke and Illum., Aircraft, Mk 6 Mods	7-2-3	40-60	20	5 (Sq.)	15
Marker, Location, Marine Mk 7 Mods 2 & 3	7-2-4	12-17	18.54	2.92	3
Marker, Location, Marine Mk 9 Mod 0	7-2-5	30-35	20.8	2.92	3.6
Marker, Location, Marine Mk 25 Mods 0, 1, 2, & 3	7-2-6	13½-18½	18.5	3	3.7
Marker, Location, Marine Mk 58 Mod 0	7-2-7	40-55	21.5	4.85	12.75
Signal, Smoke, Aircraft Mk 89 Mod 0	7-2-8	1½-2½	5	4	.75

mately 7 inches long and 5 inches in diameter. Each end is sealed with a tear strip to which is attached a pull ring. The tear strips cover small holes in the can ends.

7-2-1-4. Functional Description. Both mods of this marker contain calcium carbide as a main charge. Calcium phosphide is contained within a centered tube. When the tear strips are removed and the device is submerged, sea water reacts with these chemical compounds to produce acetyline and phosphine. The latter ignites spontaneously within usually no more than 90 seconds and ignites the acetyline as it emits from the

upper hole in the can. The smokeless flame produced is approximately 9 inches in height and persists for 45 to 55 minutes. It will re-ignite if extinguished by wave action. In extremely cold weather, ignition time may slightly exceed 90 seconds.

7-2-1-5. Handling and Storage. This device must never be lifted or carried by its pull rings. In all storage and handling operations, the tear strips must be protected from damage or accidental removal. If tear strips are damaged or removed inadvertently, or if the outer case is damaged or punctured, the marker must be kept

AIRCRAFT-LAUNCHED SMOKE AND/OR FLAME MARKING DEVICES

away from water pending disposition. Periodic inspections as in paragraph 7-2-1-8 following are mandatory. If possible, storage of these markers should be separate from other pyrotechnics in dry spaces which are not sprinkler-equipped.

7-2-1-6. Safety Precautions. This marker is functioned only through contact with water. In addition to the general safety rules in Section 1-8 of Chapter 1 of this pamphlet, the following special precautions must be observed.

(1) Tear strips must be kept intact until immediately before launching the marker.

(2) Storage areas must be dry and well ventilated to prevent formation and concentrations of flammable gases in the event of leakage.

(3) Fires in areas where these markers are stored must not be fought with water.

WARNING

Phosphine gas which is produced by contact of this marker with water ignites spontaneously and is toxic.

7-2-1-7. Shipping Containers. These markers are packaged in corrugated fiberboard cartons, 15 to the carton, with separators conforming to the requirements of Specification JAN-P-108, W5C.

7-2-1-8. Inspection for Damage and Repackaging. All Marine Location Markers, Mk 2 Mods 0 and 1, shall be examined to determine if their outer cases have been punctured. If nail holes or other punctures are discovered, the markers shall be disposed of without delay by removing both tear strips and throwing them overboard at sea. The marker should be weighted to prevent its burning on the surface. Undamaged and serviceable markers may be repackaged in wooden boxes. If such boxes are used, the lids shall be secured with two 1/2-inch metal bands in lieu of nails, the bands to be centrally located around both length and girth circumferences of the box.

7-2-1-9. Identification Data. The following table applies:

MARINE LOCATION MARKER, MK 2 MODS
(Specification MIL-M-18598)

Mod	BUWEPS LD	Dwg. No.	FSN	DOD Code
0	102927	344505	1370-038-4961	L565
1	295710	1379405	1370-540-4566	L565

7-2-2. Signal, Smoke and Illumination, Aircraft, Mk 5 Mods 3 and 4.
(Formerly Night Drift Signal, Mk 5 Mods)

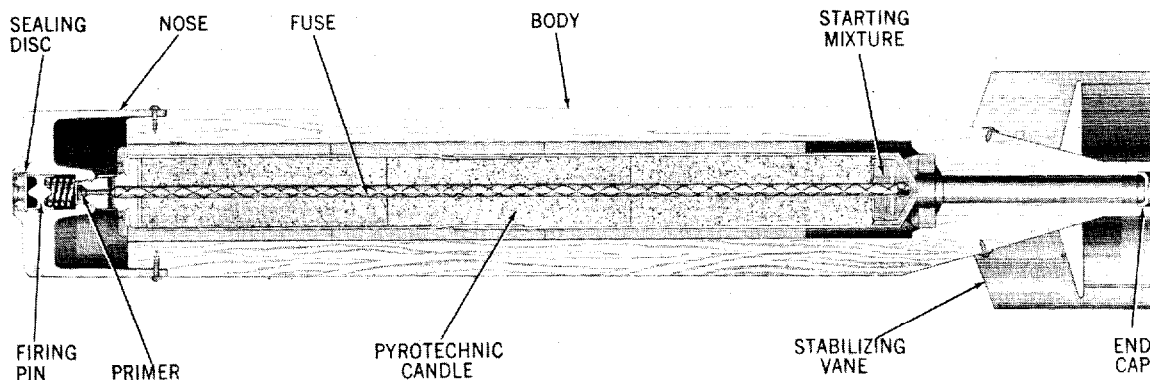


Figure 7.2.2 Aircraft Smoke & Illumination Signal, Mk 5

7-2-2-1. Intended Use. This device (see figure 7.2.2) was designed to be hand-launched from relatively slow-moving aircraft for day or night marking purposes. Mod 4 may be launched from surface craft or from low-flying blimps and helicopters if the firing device described in paragraph 7-2-2-4 following is used. Mod 3 will function if dropped from 150 to 1,000 feet at 125 KIAS or faster; Mod 4 (without Firing Device, Mk 21) will function if dropped from 50 to 1,000 feet at any speed. Marine Location Marker, Mk 25 (paragraph 7-2-6) has largely replaced this device.

(Illustration on page 7-4A)

7-2-2-2. External Features. This device consists of a flat-faced metal nose, a wooden body tapered at its tail end, and sheet-metal stabilizing vanes. The nose contains a water-impact, pressure-activated, spring-loaded firing pin and primer, and is sealed with a lead sealing disk. The stabilizing vanes cause the marking device to strike the surface of the water in the correct attitude.

7-2-2-3. Functional Description. When this device is launched without the Mk 21 Firing Device described in the following paragraph, water impact breaks the sealing disk and drives the firing pin into the primer. The primer ignites a 9-second delay fuse which ignites the starting mixture. The starting mixture then ignites the pyrotechnic candle. Gases from this combustion blow out the end cap, and smoke and flame are emitted. The delay fuse assures that the device has resurfaced before functioning takes place.

7-2-2-4. Associated Equipment. To provide for safe hand-launching of this device and Marine Location Marker, Mk 7 Mods, (paragraph 7-2-4 following), from low-flying helicopters and blimps in ASWS and search operations, Mechanical Firing Device, Mk 21 Mod 0 (See Figure 7.2.2A) has been developed. To use this firing device, the following steps must be taken:

(1) Using a spanner wrench or any appropriate tool, remove the brass plug from the nose of the signal.

(2) Remove lead sealing disk, firing pin, and

spring from nose cavity.

(3) Insert Firing Device, Mk 21 Mod 0, and turn clockwise until tightly seated in cavity.

CAUTION

Safety cotter pin must be securely in place during insertion of this firing device. This pin is not to be removed until immediately before launching the Aircraft Smoke and Illumination Signal, Mk 5 or Marine Location Marker, Mk 7.

7-2-2-5. Operation of Mechanical Firing Device. The Mk 21 Mod 0 Mechanical Firing Device is equipped with a nylon lanyard approximately 60 inches long, to the end of which is tied a snap hook for attachment to a fixed position within the launching vehicle. When the pyrotechnic signal fitted with this firing device is launched, the force exerted by the downward movement of the signal triggers and releases the spring-loaded firing pin so that it strikes the primer and ignites the signal.

WARNING

Lanyard is 60 inches long. Attachment to helicopters and other aircraft must be such that it will not flail into rotors or controls after signal is released.

7-2-2-6 Differences Between Mods. The two mods of this marking device are identical except that the Mod 4 has a more sensitive fuze for extremely low level (50 feet) drops.

7-2-2-7. Handling and Storage. This device shall be handled and stored in accordance with general provisions contained in Chapter 1 of this pamphlet.

7-2-2-8. Safety Precautions. The general safety precautions contained in Paragraph 7-1-2 of this chapter apply.

7-2-2-9. Shipping Containers. This device is packaged 8, 20, or 25 rounds to the wooden box. Such filled boxes weigh approximately 60, 110, and 125 pounds respectively.

7-2-2-10. Identification Data. Both mods of this marking device are listed under Specification MIL-S-18535 and DOD Code No. L292.

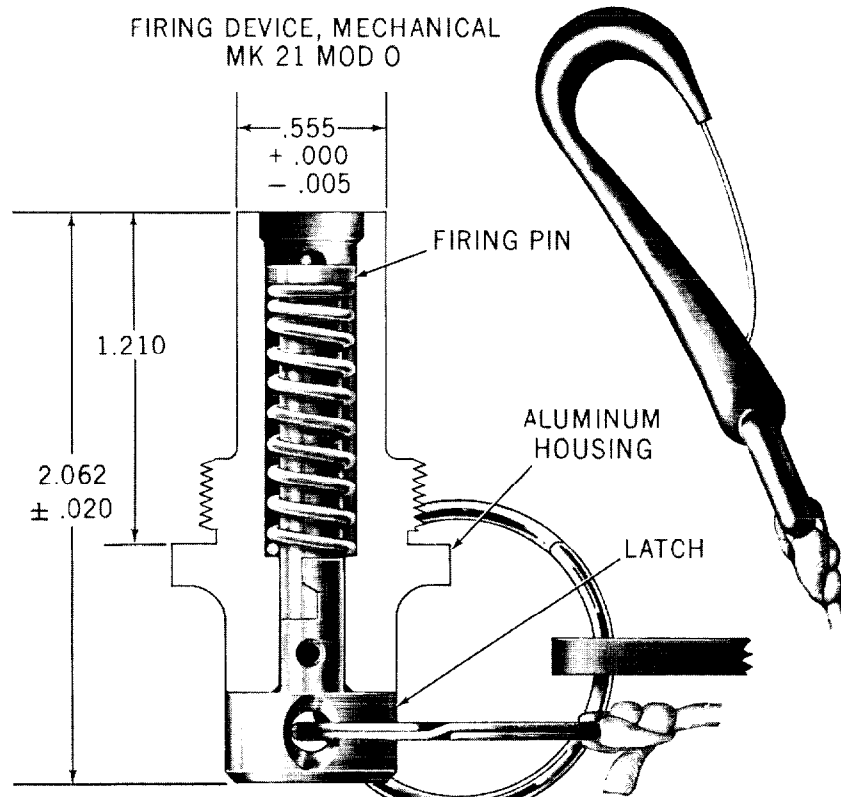


Figure 7.2.2A Mechanical Firing Device, Mk 21

Drawing Numbers and Federal Stock Numbers are as follows: Mod 3: Dwg. No. 344551, FSN 1370-092-9921; Mod 4: Dwg. No. 982534, FSN 1370-092-9922. Mechanical Firing Device, Mk 21 Mod 0 is listed under BUWEPS LD 299470 and Specification OS 7691. No FSN or DOD Code has as yet been assigned.

7-2-3. Signal, Smoke and Illumination, Aircraft, Mk 6 Mod 3 (Formerly Aircraft Float Light, Mk 6)

7-2-3-1. Intended Use. This pyrotechnic device (see Figure 7.2.3) is launched from surface craft to produce a day or night floating reference point. One of its principal uses is as a man-overboard marker. Previously, it was approved for launching from low-performance aircraft as a long-burning marker but it has been replaced for these purposes by Marine Location Marker, Mk 58, which is described in paragraph 7-2-7.

7-2-3-2. External Features. This device consists of a wooden body with a flat, die-cast metal plate affixed to one end to protect it from water damage and to maintain it in the correct floating attitude. There are four flame-and-

smoke emission holes in the opposite end, each capped and sealed with tape. The pull wire ring, also at the emission end, is covered with tape.

7-2-3-3. Functional Description. This device has a direct-firing ignition system. Ignition results from pulling the pull ring. The pull ring is pulled by hand, and the device is thrown into the water immediately. The pull wire ignites a 90-second delay fuse which ignites the quickmatch at the top of the first of four candles. The quickmatch ignites the first candle starting mix which, in turn, initiates burning of that candle. Expanding gases of combustion force the cap and tape from the emission hole, allowing smoke and flame to be emitted. When the first candle is nearly burned out, a transfer fuse carries the ignition to the quickmatch of the next candle in series. This process continues until all four candles have burned. The yellow flame and gray-white smoke are produced for a minimum of 40 minutes.

7-2-3-4. Handling and Storage. This device shall be handled and stored in accordance with the general provisions of Section 1-6 of Chapter 1 of this pamphlet as long as it is kept undisturbed in its original, hermetically sealed

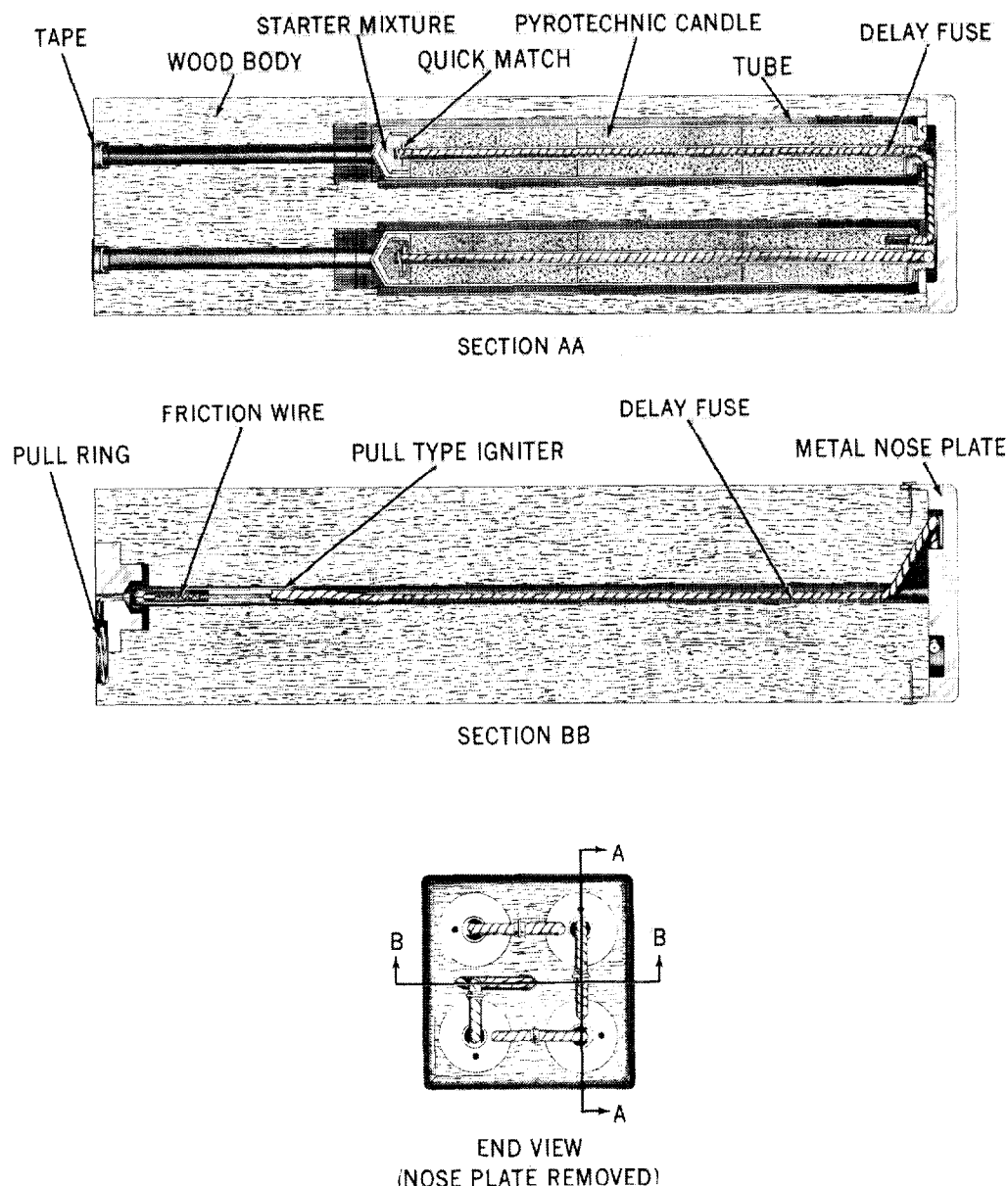


Figure 7.2.3 Aircraft Smoke and Illumination Signal, Mk 6

metal shipping container. After the tear strip on the shipping container has been removed, however, the following rules shall apply:

(1) The tape over the pull ring shall not be disturbed until immediately before hand-launching the signal. This tape prevents an accidental pull on the pull ring and protects the igniter assembly from moisture which might render the signal useless.

WARNING

This signal is initiated by the physical movement of a friction wire through ignition compound.

Extreme care must be taken to prevent tension on the pull ring during all handling operations.

(2) If this device is prepared for launching and is not launched, the pull ring must be securely retaped into position at the top of the signal without exerting any pulling force on the pull-wire igniter.

(3) Under no circumstances shall these signals be stowed or restowed with their pull rings exposed or with any wires, strings, or other material of any kind joined to their pull rings.

7-2-3-5. Safety Precautions. The safety

precautions of paragraph 7-1-2 of this chapter shall be observed. In addition, the following specific rules apply:

(1) Do not remove the tape over the pull ring until immediately before launching.

(2) The Mk 6 Signal must be thrown over the side immediately after pulling the pull ring. This device contains a maximum 90-second delay element between initiation and candle ignition.

(3) In all handling, extreme care must be taken to avoid pulling on the pull ring. Any slightest movement of the friction igniter may start the ignition train.

7-2-3-6. Firefighting. For instructions on fighting fires involving these and other red phosphorus-containing pyrotechnics, see paragraph 7-1-3.

7-2-3-7. Special Off-Loading Instructions. Because of accidental ignition of some of these signals during handling - especially during off-loading operations - the following special procedures apply to all fleet-return Aircraft Smoke and Illumination Signals, Mk 6.

(1) In preparing for off-loading, ship's personnel shall assure that all pull rings of all Mk 6 Signals that are not in their original, unopened shipping containers are securely covered with tape and that there are no wires or strings of any kind attached to the pull rings.

(2) All Mk 6 Signals that are out of their containers, and those which are in opened containers, shall be piled on deck apart from packaged signals and other ammunition.

(3) The officer in charge of shore station personnel who are off-loading the ship shall inspect the unpacked Mk 6 Signals and shall permit their being moved only when the pull rings are safed as in subparagraph (1) preceding.

(4) During off-loading operations, both ship's personnel and shore station personnel shall take special precautions while handling and moving unpacked Mk 6 Signals to assure that the tape over the pull ring is not disturbed.

(5) Shore station personnel shall segregate all Mk 6 Signals that are not in shipping containers as well as those that are in their shipping containers if there is any evidence that the shipping container has been opened. These signals shall be disposed of in accordance with Chapter 3 of this pamphlet.

(6) Shore stations shall store for reissue only those Mk 6 Signals that are fully packaged in their hermetically sealed metal containers, the tear strips of which have not been disturbed.

7-2-3-8. Shipping Containers. This device is individually packaged in a hermetically sealed metal container. Six such containers are packed in a wooden shipping box.

7-2-3-9. Identification Data. The Mk 6 Mod 3 Signal is listed under Dwg. No. 1438455, FSN 1370-725-7849, and DOD Code No. L525.

7-2-4. Marker, Location, Marine, Mk 7 Mods 2 and 3.

7-2-4-1. Intended Use. This marker (see Figure 7.2.4) is identical to Aircraft Smoke and Illumination Signal, Mk 5 Mod 3 (paragraph 7-2-2 preceding) except that it has no

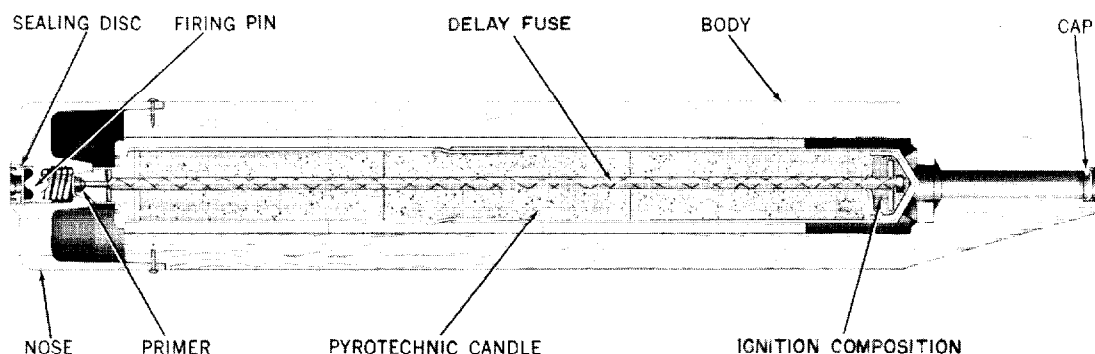


Figure 7.2.4 Marine Location Marker, Mk 7

stabilizing vanes. Its design makes launching from pneumatic dispensers possible, in which case, air pressure from the launcher breaks the lead sealing disk and forces the firing pin against the primer. This marker may also be hand launched, its heavy nose assuring correct water entry in most instances. Its maximum release altitude is 500 feet as against 1,000 feet for the Mk 5 Signal. This marker may likewise be fitted with Mechanical Firing

Device, Mk 21 Mod 0 (see paragraphs 7-2-2-4 and 7-2-2-5 preceding), thereby permitting it to be dropped from helicopters or blimps at altitudes lower than 75 feet in ASW and search operations. Marine Location Marker, Mk 25 (paragraph 7-2-6 following) was designed to replace this marker.

7-2-4-2. Shipping Containers. This device is

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packed either 8 or 20 to a wooden box. Filled boxes weigh approximately 60 and 95 pounds respectively.

7-2-4-3. Requisitioning Data. Both mods of this marker are listed under Specification MIL-M-18572 and DOD Code No. L526. Drawing Numbers and Federal Stock Numbers are as follows: Mod 2: Dwg. No. 1379386, FSN 1370-203-4221 (8/Box), FSN 1370-725-7847 (20/Box); Mod 3: Dwg. No. 1332010, FSN 1370-907-1266.

7-2-5. Marker, Location, Marine, Mk 9 Mod 0

MIL-S-18535, FSN 1370-038-4916, and DOD Code No. L572.

7-2-6. Marker, Location, Marine, Mk 25 Mods 0, 1, 2, and 3

(Illustration on page 7-8)

7-2-6-1. Intended Use. This marker (see Figure 7.2.6) is designed primarily for day or night use in antisubmarine warfare operations but is suitable for any and all sea surface reference point marking purposes which call for smoke and flame devices in the 10- to 20-minute range. Because of its improved design and

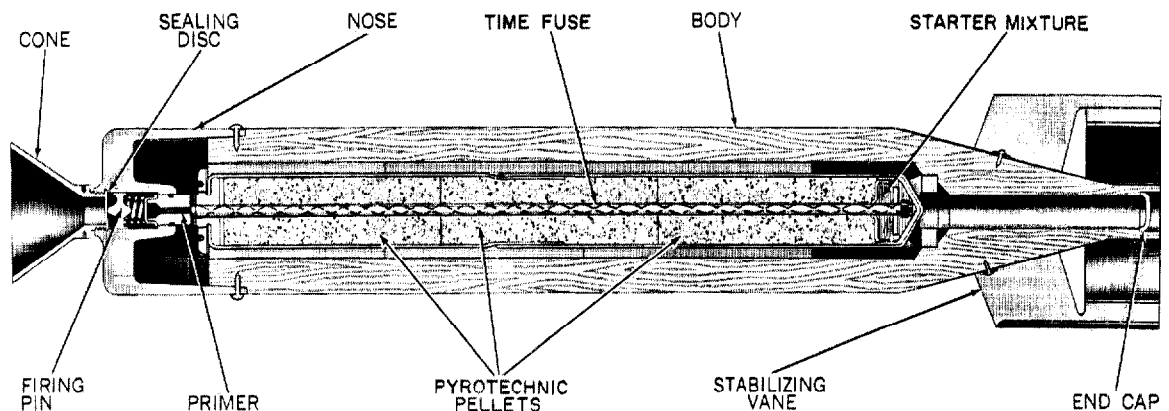


Figure 7.2.5 Marine Location Marker, Mk 9

7-2-5-1. Intended Use. This marker (see Figure 7.2.5) is identical in all descriptive respects to the Signal, Smoke and Illumination, Aircraft, Mk 5, described in Paragraph 7-2-2 preceding, except that it is equipped with a funnel-shaped nose piece which increases water impact pressure on the sealing disk and permits launching from 75-ft. minimum altitudes. It should be used by lighter-than-air aircraft and helicopters in lieu of the Mk 5 signal. It is strongly recommended, however, that Marine Location Marker, Mk 25 (Paragraph 7-2-6 following) be used in place of this device, where practicable.

7-2-5-2. Shipping Containers. This device is packaged six rounds to a wooden box. A filled box weighs approximately 70 pounds.

7-2-5-3. Identification Data. This marker is listed under Dwg. No. 1378499, Specification

construction, its capability of being launched at greater aircraft speeds, its increased reliability, and its lower cost of manufacture, this marker will, for most purposes, replace the marking devices described in Paragraph 7-2-2, 7-2-4, and 7-2-5 preceding. The Mk 25 Marker is to be attached to and used from aircraft only in accordance with the flight manual for the particular aircraft being employed. Launching speeds and altitudes are also set forth in the flight manuals. In certain applications, this marker must be fitted with the Adapter Kit, Marine Marker, Mk 34 Mod 0 (see Paragraph 7-2-6-6 following). It may also be launched by hand.

7-2-6-2. Difference Among Mods. All mods of this marker function, to all intents and purposes, identically. The differences are as follows: (1) The Mod 0 only has an instruction

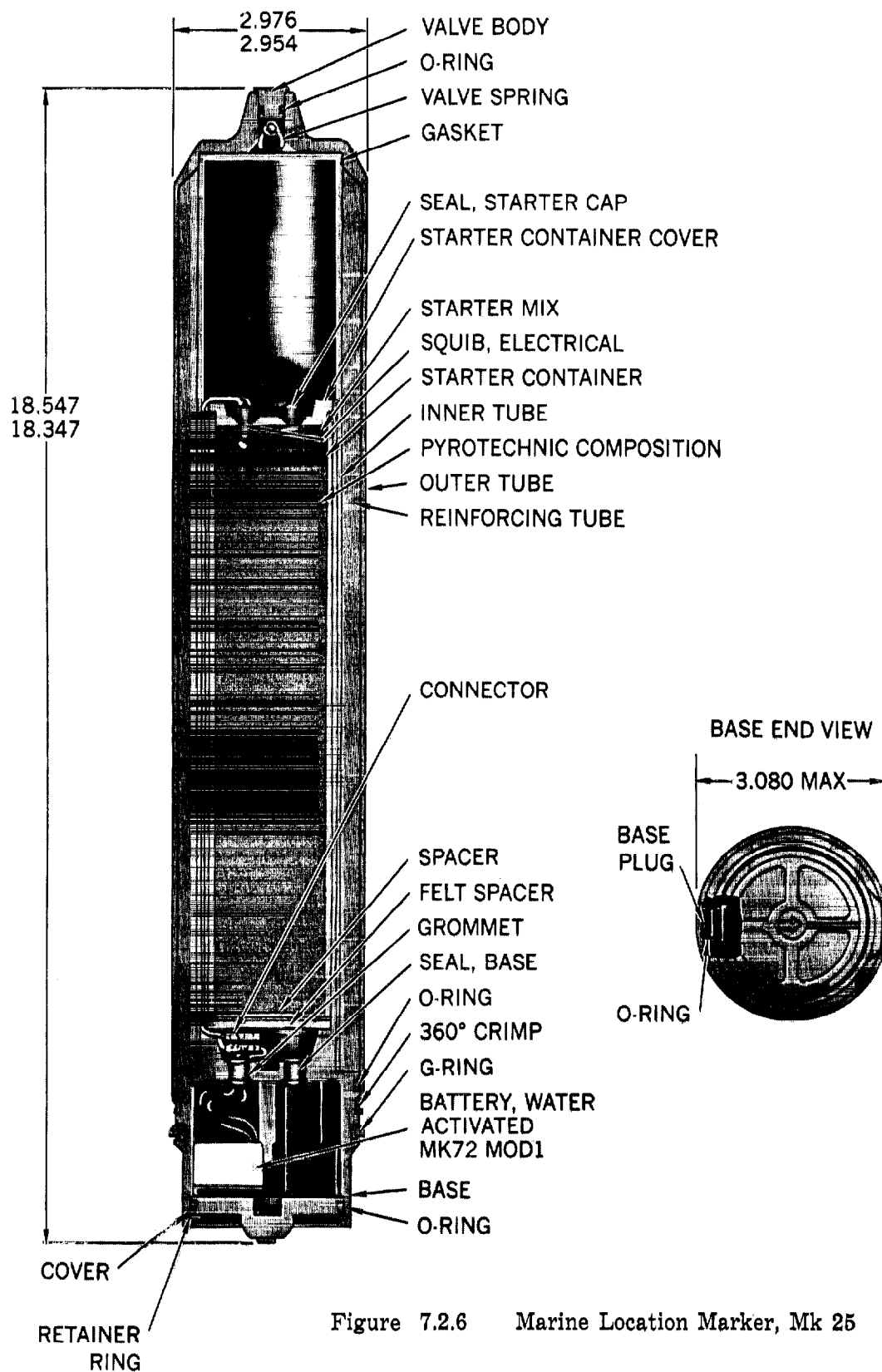


Figure 7.2.6 Marine Location Marker, Mk 25

tag attached to its fuze end; arming instructions for all other mods are adhered to the outer case. (2) The Mods 0, 1, and 2 contain two water-activated batteries and two electric squibs; the Mod 3 contains only one battery and a single squib. (3) Mods 1, 2, and 3 have improved starter container design.

7-2-6-3. External Features. The Mk 25 Marine Location Marker consists of a sealed aluminum outer tube with a projecting valve assembly at its nose end and a heavier aluminum base assembly at the other end to which the outer tube is crimped. Two base plugs are located on opposite sides of the base assembly, and a ridged arming plate is recessed into the base end. The words "safe" and "armed" are stamped into one side of the rim of the base end. In the Mods 2 and 3, a notch has been cut into the rim of the base to facilitate arming at night. A black rubber gas-check ring (G-ring) encircles the base assembly approximately 1/4 inch below the 360° crimp.

7-2-6-4. Functional Description. Ignition in this marker is accomplished by current supplied by a sea-water-activated battery (two batteries in Mods 0, 1, and 2; one in Mod 3). When sea water enters the battery cavity in the base assembly through the base plug holes, it acts as an electrolyte in the battery causing it to produce sufficient electrical current to initiate the electric squib. The squib(s) ignite the starter mix which sets off the pyrotechnic composition. Gases of combustion force the valve body out of the nose, allowing yellow flame and white smoke to be emitted for 13½ to 18½ minutes.

7-2-6-5. Use in Fresh Water. If it is desired to use this marker in fresh water (non-salt), the following procedure is necessary:

(1) Obtain table salt (Fed. Spec. SS-S-31); retainer ring pliers (Fed. Spec. GGG-P-480, Type 1, Class 1, Size 5); and, depending on the mod of the markers being used, Assy. Dwg. 1331938 (for Mod 0), 1331956 (for Mod 1), 1332017 (for Mod 2), or 1332145 (for Mod 3).

(2) Using retainer ring pliers, remove retainer ring from the marker (MS9014-45 or

MS16625-1244 as applicable to each Mod).

(3) Remove cover (1212760 or 1212922 as applicable to each mod) by pulling out.

(4) Add 1/2 to 3/4 ounces of table salt to battery cavity.

CAUTION

Be sure that salt is not exposed to moisture before and during conversion process. Moist salt may cause marker functioning.

(5) Replace cover and retaining ring.

WARNING

Converted markers must be used within 24 hours after adding salt. They must not be returned to storage. If not used, they must be disposed of in accordance with Chapter 3 of this pamphlet.

NOTE: Converted markers will not perform as reliably in fresh water as unconverted markers in sea water.

7-2-6-6. Associated Equipment. The Adapter Kit, Marine Marker, Mk 34, is used with this device to seal the base plug holes while the marker is in certain types of dispensers. It also makes it possible to re-store markers that have had their base plugs pushed in. The inert Adapter Kit is manufactured under List of Drawings No. LD 282828, Specification No. OS 8782. It is listed for requisitioning under FSN 1370-893-0134 and DOD Code No. X013. It is packaged in a wooden box (LD 282830), 72 adapters to the box.

7-2-6-7. Launching Procedures. This marker shall be used with and launched from aircraft only in accordance with the flight manual for the particular aircraft being employed.

7-2-6-8. Handling and Storage. The Marine Location Marker, Mk 25, shall be handled and stored in accordance with general instructions given in Section 1-6 of Chapter 1 of this pamphlet. This device is considered to be a sealed unit until its base plugs (one or both) have been pushed in or after the adapter kit has been properly installed. It must not be returned to storage with the base plugs pushed in unless an

adapter kit has been installed. The marker is a fire and smoke hazard.

WARNING

This marker contains 784 grams of red phosphorus which produces smoke that is a caustic irritant to the skin and mucous membranes.

Mods 2 and 3 are packaged 8 to a polystyrene container (Dwg. No. 1332115 for Mod 2; Dwg. No. 1332144 for Mod 3). The filled polystyrene container weighs approximately 31½ pounds.

7-2-6-12. Identification Data. The following table applies to the Marine Location Marker, Mk 25 Mods:

	Mod 0	Mod 1	Mod 2	Mod 3
List of Drawings	282799	282843	282857	615141
Assy. Dwg. Nos.	1331938	1331956	1332017	1332145
Specification	OS 8738	OS 8738	OS 8738	OS 8738
Fed. Stock Nos.	1370-715-2408	1370-862-9525	1370-804-3561	1370-690-1458
DOD Code Nos.	L554	L554	L554	L554

WARNING

The nose end of this marker must be kept out-of-line with the body and with other personnel at all times. If the marker is initiated, the nose plug is expelled with considerable force, creating a missile hazard.

7-2-6-9. Disposition. Damaged or otherwise unserviceable Mk 25 Marine Location Markers shall be disposed of in accordance with the provisions of Chapter 3 of this pamphlet.

7-2-6-10. Safety Precautions. In addition to the safety precautions in Paragraph 7-1-2 of this chapter, the following special precautions must be observed:

- (1) Base plugs or adapter kits must be securely and properly in position.
- (2) Under no circumstances shall these markers be stored without base plugs in place or adapter kits installed.
- (3) If the marker has been converted for fresh water use, it must not be returned to storage.
- (4) The base end of this marker must be kept dry, particularly if there is any chance that the base plugs have been pushed in.

7-2-6-11. Shipping Containers. Mods 0 and 1 are packaged 8 to a wooden box (Dwg. No. 1305702), weight: approximately 42 pounds.

7-2-7. Marker, Location, Marine, Mk 58 Mod 0
(Illustration on page 7-11)

7-2-7-1. Intended Use. This marker (see Figure 7.2.7) is designed for day or night use in any condition calling for long-burning, smoke and flame reference point marking on the ocean's surface. It produces yellow flame and white smoke for a minimum of 45 minutes and a maximum of 55 minutes which is visible for at least 3 miles under normal ASW operating conditions. It is intended that this device replace the Signal, Smoke and Illumination, Aircraft, Mk 6 Mod 3 (formerly Aircraft Float Light, Mk 6), as described in Paragraph 7-2-3 preceding.

7-2-7-2. External and Visible Features. This device consists of a cylindrical "tin" or terne-plate can, approximately 21½ inches long and 4⅞ inches in diameter. Each end is hermetically sealed. A twist key for removing the tear strip is soldered to the bottom of the can. The outer case is stencilled to show the nomenclature, the mark and mod designation, the manufacturer's symbol, and the date of manufacture. Stencilling also shows the points at which dual suspension bands are to be attached.

7-2-7-3. Functional Description. This device contains two phosphorus pyrotechnic candles supported within the marker body by foamed-in-place polyurethane. The first of these candles is ignited by an electric squib initiated by a sea-water-activated battery, Mk 72 Mod 1. When the marker is launched, the pull ring

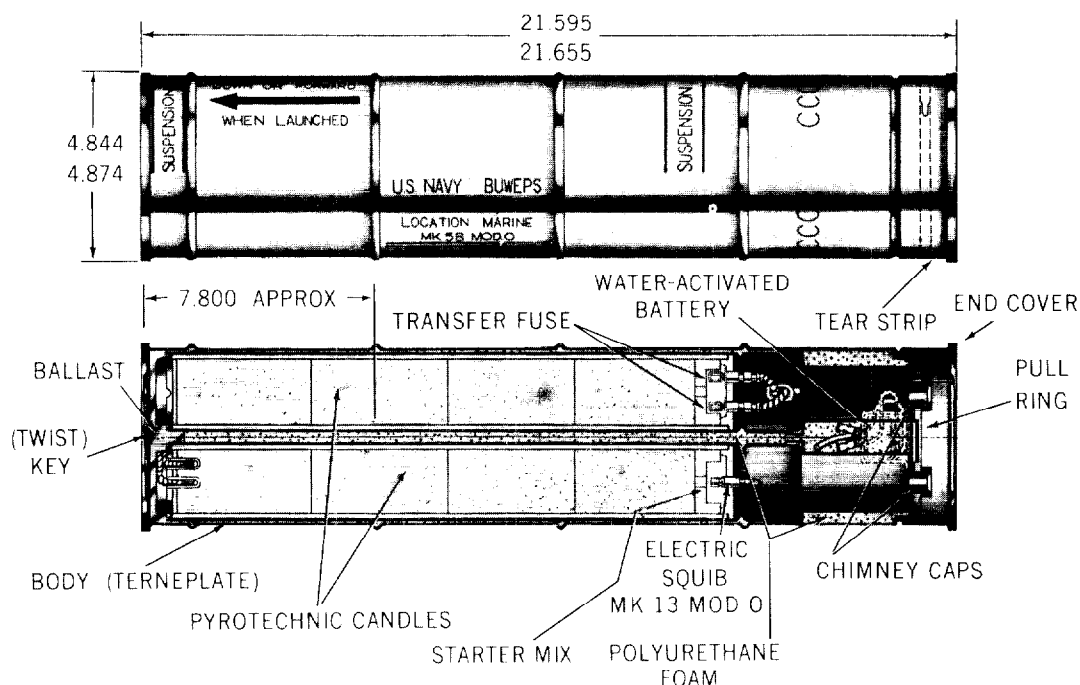


Figure 7.2.7 Marine Location Marker, Mk 58

rips off the aluminum-backed tape which covers the battery cavity hole, thus exposing the battery to the entrance of sea water which serves as an electrolyte to activate the battery. Current from the battery initiates the electric squib which ignites the starter mix of the first pyrotechnic candle. The starter mix, in turn, ignites the first candle. When the first candle is nearly burned out, its heat ignites the transfer time fuse which carries ignition to the second candle starter mix. This starter mix initiates final burning. Each of the two candles burns for a minimum of 20 minutes.

7-2-7-4. **Launching.** This marker may be launched from either surface craft or aircraft. Surface launching, usually by hand, requires only removal of tear strip, end cover, and battery-cavity tape before throwing marker into water. Aircraft carriage and release must be within limits specified in applicable NATOPS handbooks. Break-away suspension bands (Dwg. 2112974, FSN 1370-866-9782, LA02) must be used in external carriage. A foam plastic spacer (FSN 1370-866-9783) provides compatibility for sonobuoy launchers. Bands and spacers are ordered separately.

7-2-7-5. **Installation and Make-Ready Procedures.** The installation and make-ready procedures for this device shall be as specified herein and as specified for the equipment used as the launching device.

7-2-7-6. **Preparation for Launching.**

- (1) Ascertain that the device has been approved for use in the intended application.
- (2) Remove the marker from the container.
- (3) Expose the pull ring of the marker by removing the uppermost portion of the can. This is accomplished by using the twist key provided at the base of the "can" to open the body in a similar manner to opening a "coffee can."

CAUTION

After the tear strip is removed, care must be taken to avoid cutting the hands on the sharp edge of the can.

(4) Attach suspension bands (or band) if wing rack or multiple stores dispensing is to be accomplished. The band locations for 14-inch wing racks are indicated on the marker body. The location for the single suspension band would be as specified by the operational manual for the multiple stores dispenser being utilized and would, in general, be at the center of gravity of the marker.

CAUTION

Only break-away suspension bands as provided herein shall be used. The additional weight of permanent bands would sink the markers.

(5) The only additional operations necessary are the attachment of the marker to the wing rack or dispenser and the attachment of a lanyard or an arming wire between the pull ring of the marker and the launching mechanism. These operations are to be performed in accordance with appropriate flight manual instructions.

WARNING

A pull on the marker pull ring exposes the battery cavity. Entrance of sea water in this cavity will immediately activate the marker. This pull ring must not be pulled until launching is accomplished.

CAUTION

The sea battery cavity must be opened by a proper pull on the marker pull ring to assure removal of the aluminum-backed tape from the top of the battery cavity. Failure to open this battery cavity will result in failure of the marker.

7-2-7-7. Handling and Storage. This device will withstand normal handling and will not ignite unless sea water is admitted to the battery cavity. As long as the tear strip is undisturbed and the case is not cracked or punctured, this marker is hermetically sealed. Its sealed outer case must be handled so as to pre-

vent damage. If the tear strip and end cover are removed preparatory to launching and the order to launch is rescinded, care should be taken in all subsequent handling and storage operations to protect the tape over the battery cavity hole, and the marker should be stored so as to be the first in line for use. In circumstances of this kind, the chimney caps which seal the emission holes over the pyrotechnic candles must be protected from damage. In addition, the general rules of Section 1-6 of Chapter 1 of this pamphlet apply.

7-2-7-8. Safety Precautions. This marker is far safer to handle and to operate than most comparable devices. However, in addition to the general safety rules of Section 1-8 of Chapter 1, the following special safety precautions must be observed.

(1) **Toxicity.** The red phosphorus composition in this marker produces smoke which is highly caustic to moist tissues of the nose and throat. Breathing of this smoke must be guarded against.

(2) **Removal of Tear Strip.** The tear strip must not be removed except as part of actual preparations for launching. Removal of this strip destroys the sealed character of the marker and contributes to its possible deterioration and to the possibility of accidental ignition through the introduction of sea water to the battery.

(3) **Removal of Pull Ring and Tape.** The tape which covers the battery cavity hole must not be removed except as part of the launching procedure. After this tape is removed (in the event that there is a delay before launching) great care must be taken to keep sea water away from the marker until the tape can be restored to its original position.

7-2-7-9. Disposition. Dented, split, cracked, punctured, or otherwise damaged and unserviceable Mk 58 Markers shall be carefully segregated in a completely dry storage location for return to a shore station for appropriate disposal in accordance with Chapter 3 of this pamphlet. If, in the Commanding Officer's judgment, there is a possibility of accidental ignition through wetting by sea water, un-

AIRCRAFT-LAUNCHED SMOKE AND/OR FLAME MARKING DEVICES

serviceable markers may be disposed of by functioning them in a normal manner. If functioning is undesirable, they may be placed in a sealed, weighted container and disposed of by dumping at sea. In all cases of such emergency disposition, the Bureau of Naval Weapons shall be promptly notified as to the circumstances.

7-2-7-10. Shipping Containers. This device is packaged for shipment in a polystyrene container, two markers to the container. A filled container weighs approximately 28 pounds.

7-2-7-11. Identification Data. This marker is listed under Dwg. No. LD 615161, Specification WS 4618, FSN 1370-794-4594, and DOD Code No. L585.

7-2-8. Signal, Smoke, Aircraft, Mk 89 Mod 0

areas. Its purpose is to provide visual information as to the direction and approximate velocity of the wind on the surface to facilitate landing of the helicopter.

7-2-8-2. Description. This $\frac{3}{4}$ -pound signal is approximately 5 inches in overall length. It consists of a 2-inch-diameter aluminum cylinder with a foamed polystyrene flotation ring flared around its upper half. The diameter of this ring at its top is approximately 4 inches. The bottom of the cylinder is permanently closed. A plastic nose assembly is crimped onto the top of the cylinder. The firing device housing protrudes upward from the nose assembly, and the smoke-emitting orifice, sealed with a nose valve and O-ring, is located to one side of the firing device. A plunger in the firing device housing is held in position by a spring safety

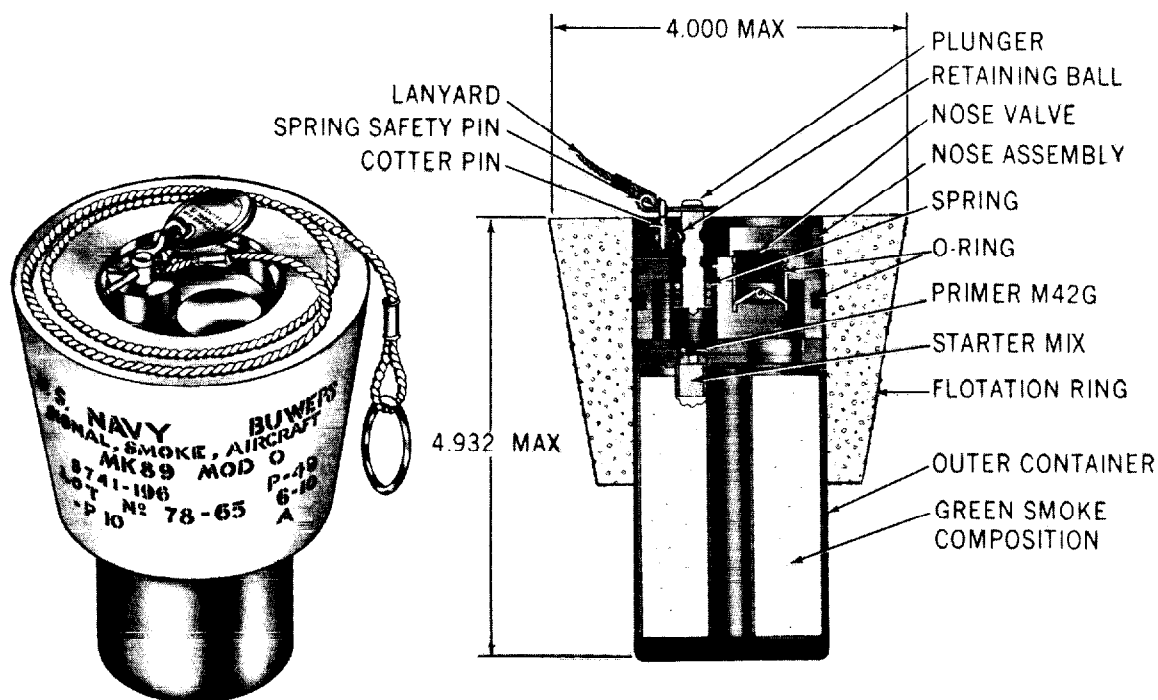


Figure 7.2.8 Aircraft Smoke Signal, Mk 89

7-2-8-1. Intended Use. This device (see Figure 7.2.8) is designed to be hand-launched at relatively slow speeds from helicopters at any altitude up to 2000 feet over water or land

pin. This pin also passes through the eye of a cotter pin to which is attached a woven steel lanyard. A pull ring is attached to the loose

end of the lanyard.

7-2-8-3. Operation. After the safety pin is removed, the cotter pin is free to be pulled by the lanyard. The cotter pin holds a retaining ball in a groove around the circumference of the spring-loaded plunger. The firing pin is at the bottom of the plunger. Before launching, the pull ring is attached within the helicopter, and the signal is then thrown overboard. The restrained lanyard removes the cotter pin, and the retaining ball moves out of the groove, permitting the firing pin to strike the primer. The primer ignites the starter mix which, in turn, ignites the smoke composition. Combustion gases force the nose valve from the emission orifice. Green smoke is produced for an average of 120 seconds.

7-2-8-4. Handling and Storage. This device shall be handled and stored in accordance with the general rules contained in Section 1-6 of Chapter 1 of this pamphlet.

7-2-8-5. Safety Precautions. The safety precautions set forth in Section 1-8 of Chapter 1 of this pamphlet apply. The pyrotechnic composition of this device is designed to give off smoke only; under some conditions, however, flame may be produced to create a fire hazard on the ground. Care must be taken to avoid disturbing the spring safety pin until just before launching. If this pin is removed and launching is to be delayed, it should be reinserted through the plunger and the eye of the cotter pin to prevent accidental ignition.

7-2-8-6. Shipping Containers. This signal is packaged four to a foamed polystyrene container. A filled container weighs approximately 3½ pounds.

7-2-8-7. Identification Data. This device is listed under BUWEPS LD 615170, Dwg. No. 1332180, Specification WS 4621, FSN 1370-907-4924, and DOD Code No. L169.



Submarine Launching Mk 66 Marine Smoke & Illumination Signal

CHAPTER 8

SUBMARINE-LAUNCHED PYROTECHNICS

8-1. INTRODUCTION

This chapter contains descriptions, information, and technical instructions relative to pyrotechnics which are launched or ejected from submerged submarines for signaling and marking purposes.

8-1-1. Arrangement of Material in this Chapter. This chapter is subdivided into sections according to the type of initiation system employed in the devices described. Section 8-2 covers devices that are initiated by mechanical activation of a firing pin against a percussion-type primer; Section 8-3 covers devices that are electrically initiated by sea-water-activated batteries.

8-1-2. Handling and Storage. In addition to the general instructions for handling and storing pyrotechnics as contained in Section 1-6 of Chapter 1 of this pamphlet, the following special rules apply:

8-1-2-1. Damaged Devices. All submarine pyrotechnics are launched through ejectors either by compressed air or by handramming. No attempt shall be made to load a dented or otherwise damaged signal or marker into the ejector since deformation of any kind could cause the device to bind or possibly to function prematurely. Care must be taken in all storage and handling operations to prevent damage to submarine pyrotechnics.

8-1-2-2. Tripping Levers, Latches, and Cotter Pins. Submarine pyrotechnics are distinguished by a tripping lever or latch that protrudes laterally from the after or fuze end of the device. Very special care must be given during handling and storage operations to prevent striking this lever or latch. A sharp blow on the latch mechanism can deform or bend the safety cotter pin sufficiently to permit the signal or marker to become armed pre-

maturely and therefore dangerous.

WARNING

Safety cotter pins in submarine pyrotechnics shall not be struck, pulled, tampered with, or bent, nor shall they be removed from the latch assembly except as a part of the make-ready procedures preceding launching. If it should become necessary to replace any of these pins, the replacement must be identical to the original in dimensions and material.

8-1-2-3. Inspections. Submarine pyrotechnics in storage must be periodically and carefully inspected for damage of any kind. The Signals, Smoke and Illumination, Marine, Mks 51, 52, and 53 (see Paragraph 8-2-12 following) are armed and fired by varying pressures. Increasing and decreasing pressure in the submarine will not affect these signals as long as the guide shoe is holding the valve to the hydrostatic fuze securely closed. The signals or markers which are initiated by electricity from sea-water-activated batteries cannot function as long as the batteries are kept dry (see Section 8-3 following). Inspections should verify positively that safety cotter pins, guide shoes, and valves are properly in position.

8-1-3. Make-Ready Procedures. For the most part, make-ready procedures are the same for all submarine pyrotechnics. There are, however, slight differences as between percussion-initiated devices and those which are initiated by sea-water-activated batteries. Since some of these differences are critical to proper functioning, full make-ready procedures are included as part of the introductory material in Sections 8-2 and 8-3 of this chapter.

TABLE 8-1
SUBMARINE PYROTECHNICS SUMMARY

Item	Para-graph	Display	Burn Time (Seconds)	Delay ¹ (Seconds)	Length ² (Inches)	Weight (Pounds)
Signal, Smoke, Marine (Submarine), Mk 2 (Signal, Float, Submarine)	8-2-8	Red, Black, Green, or Yellow Smoke on Surface	15	30-46	18½	3.0
Signal, Illum., Marine, Mk 3 (Subm. Emerg. Ident. Signal)	8-2-9	Red, Yellow, or Green Para- chute-susp. Star, 300 Ft. Altitude	R&Y: 25 Green: 35	54-70	18½	3.15
Marker, Location, Marine, Mk 26 (Marker, Location, Submarine)	8-2-10	Yellow Flame and White Smoke on Surface	180-300	130-165	18½	3.3
Signal, Illum., Marine Mks 41, 45, and 46	8-2-11	Red, Yellow, or Green Para- chute-susp. Star, 350 Ft. Altitude	25	100-140	24	4.36
Signal, Smoke & Illum., Marine, Mks 51, 52, & 53	8-2-12	These signals are unserviceable.				
Marker, Location, Subm., Mks 21, 22, 23, & 24	8-3-9	Red, Yellow, Green, or Black Smoke on Surface	15-45	None	18½	3.4
Signal, Smoke & Illum., Marine, Mks 66, 67, & 68	8-3-10	Red, Green, or Yellow Smoke and Para-Susp. Star, 400 Ft. Altitude	Smoke: 15 Star: 23	None	36	6.8
Marker, Location, Marine, Mk 28	8-3-11	Yellow-Green Fluorescent Slick on Surface	Slick Per- sists 90 Minutes	None	36	7.5

- (1) Mechanically initiated devices have built-in delays as indicated from latch tripping to functioning; electrically initiated devices function as soon as the batteries are wet with sea water.
- (2) Diameter, All Submarine Pyro — 3 inches.

8-1-4. Removal Procedures. Once loaded into the ejector and prepared for firing, submarine pyrotechnics may be removed only when expressly authorized by the Commanding Officer and then only in accordance with the procedural steps set forth in Sections 8-2 and 8-3 following.

8-1-5. Safety Precautions. In addition to the general safety precautions covering all pyrotechnics which are set forth in Section 1-6 of Chapter 1 of this pamphlet, the following special precautions must be observed:

8-1-5-1. Missile Hazard. Neither end of submarine pyrotechnics must be pointed toward the handler's body or toward other personnel. If the device is initiated, the nose separates with considerable force. This is especially true of signaling devices which propel pyrotechnic candles, parachutes, etc., to an altitude of as much as 600 feet into the air upon surfacing.

8-1-5-2. Fire, Smoke, and Toxic Hazards. All submarine pyrotechnic devices contain chemical compositions that burn to produce flame, smoke, or combinations thereof. This combustion is relatively long-lasting and hot and is difficult to extinguish. The smoke produced is dense and can be dangerously toxic in confined spaces. Extreme care must be exercised to prevent accidental ignition of these devices.

8-1-5-3. Safety Cotter Pins. All submarine pyrotechnic devices are equipped with a safety cotter pin, or pins, which are intended to prevent accidental movement of the tripping lever or latch. Under no circumstances shall any cotter pin be removed except as provided for in the make-ready procedures as set forth in this pamphlet. In some cases, the safety cotter pin may be deformed by a sharp blow on the tripping lever or latch. Extreme care must be taken to avoid striking the tripping lever or latch during storage, handling, make-ready,

and removal operations. When cotter pins are removed preparatory to launching, they must be retained until after launching is accomplished. These pins must be reinserted if pyrotechnic device is not launched and is removed from ejector.

8-1-5-4. Hydrostatic Fuzes. Some submarine signals and markers utilize water pressure either to arm the fuze or to prevent battery activation until a desired lesser depth is reached by the surfacing pyrotechnic device. The sealing valve in the fuze of such devices must be kept securely closed during storage and handling operations (see Paragraph 8-1-2-3 preceding and Section 8-3 following). Special care must be taken to keep devices which contain sea-water-activated batteries away from possible wetting by sea water if the sealing valve to the battery cavity has been disturbed or displaced. If the guide shoe is found in a raised position and can be closed, reposition it to normal position and store in a dry area pending disposition. If the guide shoe cannot be repositioned, treat the device as potentially dangerous, seal it in a totally waterproof, weighted container, and keep it segregated from other pyrotechnics. Dispose of such unserviceable items in accordance with applicable instructions as soon as possible. If the guide shoe of a sea-water-activated signal or marker is raised, the electrical circuit is completed between the batteries and the electric squib initiating device (see Section 8-3 following).

8-1-6. Disposition. Because of the possible dangers involved in handling damaged or defective pyrotechnics aboard submerged submarines and because of the different disposal procedures demanded by different arming methods, unserviceable submarine pyrotechnics shall be disposed of in accordance with the disposition instructions contained in Sections 8-2 and 8-3 of this chapter.

8-2. PERCUSSION-INITIATED DEVICES

The submarine signals and markers described in this section depend for their operation upon some mechanical means to cause a firing pin

to come into contact with a percussion-type primer which initiates fuze action. These devices are characterized by having a mechanical initiation as opposed to the electrical initiation of the devices described in Section 8-3 following.

8-2-1. Operating Characteristics. All of the signals and markers in this section except the Signal, Smoke and Illumination, Marine, Mk 51, 52, and 53 (Paragraph 8-2-12 following) contain a direct-firing ignition system. When the signal or marker is launched from the ejector, the tripping lever rides in the ejector groove and is tripped when the end of the groove is reached — about 9 inches from the muzzle door. Movement of the tripping lever pulls the firing pin lever toward the after end of the signal or marker and releases it so that the firing pin strikes the primer which ignites a delay fuse. The fuse burns for the time necessary for the signal or marker to reach the surface from maximum operational depth whereupon it initiates the pyrotechnic system.

8-2-2. Make-Ready Procedures. The steps required for making ready all of the signals and markers in this section are identical. For this reason, this paragraph is referred to in each individual item description which follows in this section. These steps shall be followed in preparing all percussion-initiated pyrotechnic signals or markers for launching. Personnel carrying out these procedures shall comply with all safety precautions and operating instructions specified for the submarine ejector being used.

8-2-2-1. Examine the signal or marker to see that its case is not dented or otherwise damaged; that its tripping lever has not been forced, bent, struck, or pulled; that its cotter pin is properly in place; and that its nose seal, if any, is intact.

NOTE: Percussion - initiated pyrotechnics that show signs of damage shall be carefully segregated and disposed of at the earliest practicable time in accordance with instructions contained in Paragraph 8-2-7 following.

8-2-2-2. Carefully attach the snap hook of a lanyard to the pull ring of the safety cotter pin.

WARNING

The safety cotter pin must not be removed from the signal or marker until the signal or marker has been fully inserted in the ejector barrel.

8-2-2-3. Using long-nose pliers, straighten the ends of the safety cotter pin, but **DO NOT REMOVE** it at this time.

8-2-2-4. Insert the signal or marker into the ejector, nose first, and push it gently toward the muzzle until the spring-loaded detent in the ejector barrel drops behind the base end, being sure that the guide and tripping lever are riding in the groove of the ejector barrel.

CAUTION

Do not force the signal or marker against any obstruction. If difficulty is encountered and if there is no apparent cause, it must be assumed that the signal or marker is defective and unserviceable.

8-2-2-5. After the signal or marker is seated beyond the detent, remove the safety cotter pin by applying a steady pull on the lanyard.

WARNING

The safety cotter pin must not be removed by any means other than the lanyard. Personnel must not be in line with the ejector barrel while this pin is being removed.

8-2-2-6. Close the breech door immediately and secure it in closed position.

8-2-2-7. Open the muzzle door and proceed with launching procedures as given for the ejector, using ejection pressures as follows:

Submarine Classes	Ejection Pressures
All prior to SS563 plus SSR572 & SSR573	200 psi above sea pressure
SS563 and all later classes except SSR572 & SSR573	250 psi above sea pressure

NOTE: Signal, Smoke, Marine, Mk 2 Mods and Signal, Illumination Marine, Mk 3 Mods should be launched with pressures no greater than 100 psi above sea pressure.

8-2-3. Removal Procedures - Recommended Method. If a submarine signal or marker that has been loaded into an ejector fails to eject after an attempt has been made to launch it, it may be removed through the breech **ONLY** as a last resort and then only by express direction of the Commanding Officer (see paragraph 8-2-4 following). Instead of removing a pyrotechnic device through the breech, it is strongly recommended that the following steps be taken to clear the ejector barrel:

8-2-3-1. Make repeated attempts to launch the device, using maximum allowable impulse pressure.

8-2-3-2. If the device remains in the ejector, leave the muzzle door open for at least 10 minutes after the last attempt to fire.

8-2-3-3. Prepare the hand ram for use.

8-2-3-4. Close the muzzle door and drain the ejector.

NOTE: If the signal or marker is partially ejected so that the muzzle door cannot be closed, reduce submarine speed and make additional attempts to launch using maximum impulse pressure. If the device still cannot be dislodged, lock the breech and secure the ejector until the submarine is surfaced, at which time the offending signal or marker can be removed from the outside.

WARNING

Submarine pyrotechnics are armed by tripping a latch or tripping lever near the muzzle end of the ejector groove. Devices removed through the muzzle are therefore armed and dangerous to handle. They must be removed and handled only by fully trained E. O. D. personnel.

8-2-3-5. If the muzzle door can be closed, open the breech door and install the hand ram. Secure the breech door immediately, flood the ejector, and reopen the muzzle door.

8-2-3-6. Operate the hand ram, forcing the signal or marker from the ejector barrel. Be sure that the ram is cycled through its full travel.

NOTE: The hand ram, by design, is several inches longer than the ejector barrel. If the ram is fully cycled, the bore of the ejector is clear.

8-2-3-7. Retract the ram, close the muzzle door, drain the ejector, open the breech, and remove the hand ram from the ejector.

8-2-3-8. Secure the ejector or prepare for launching another signal or marker, as appropriate to needs.

8-2-4. **Alternate Removal Procedures.** Submarine signals or markers that are not launched after being placed in an ejector may be removed through the breech only as a last resort (see paragraph 8-2-3 preceding). If such removal is directed by the Commanding Officer, the following steps shall be taken:

8-2-4-1. Close the muzzle door, drain the ejector, and open the breech in accordance with instructions for the ejector being used.

8-2-4-2. Keeping the body out of line with the ejector barrel, depress the spring-loaded detent and slip the signal or marker out **ONLY** far enough to replace the cotter pin in the tripping lever mechanism.

8-2-4-3. Carefully replace the safety cotter pin in the tripping lever mechanism.

8-2-4-4. Pull the signal or marker **SLOWLY** from the ejector barrel.

8-2-4-5. Examine for dents or other signs of damage. If there are any signs of damage, even though no attempt was made to eject, the signal or marker must be segregated and tagged for earliest disposition in accordance with Paragraph 8-2-7 following.

NOTE: Any signal or marker that fails to eject shall be considered defective and shall be disposed of as dangerous and unserviceable.

8-2-4-6. Tag and return to store for future use all pyrotechnic devices which are not to be disposed of in accordance with any of the preceding rules and warnings.

8-2-5. **Handling and Storage.** The instructions for handling and storage as set forth in Paragraph 8-1-2 of this chapter apply to all percussion-initiated submarine pyrotechnics.

8-2-6. **Safety Precautions.** The safety precautions contained in Paragraph 8-1-5 of this chapter are pertinent to percussion-initiated pyrotechnics and must be carefully observed.

8-2-7. **Disposition.** All damaged or otherwise unserviceable percussion-initiated signals and markers, including those that have failed to launch normally, shall be disposed of in accordance with current applicable instructions.

8-2-8. **Signal, Smoke, Marine (Submarine), Mk 2 Mods 0, 1, and 2.**

(Formerly Signal, Float, Submarine, Mk 2 Mods)

(Illustration top of page 8-6)

8-2-8-1. **Intended Use.** This signaling device (see Figure 8.2.1) was designed to be launched at a maximum depth of 285 feet to produce a red, black, green, or yellow smoke display on the surface. This signal has been replaced by the Marker, Location, Submarine, Mk 21, 22, 23, and 24 described in Paragraph 8-3-9 following (see Table 8-1 for specific data).

8-2-8-2. **External Features.** This signal consists of a cylindrical aluminum tube which is closed at one end by a rounded nose cap with a concave center into which the blow-out valve is fitted. At the base end is the firing mechanism described in Paragraph 8-2-1 preceding. The case is stenciled to show the color of the smoke emitted.

8-2-8-3. **Functional Description.** The initiating mechanism of this signal functions as explained in Paragraph 8-2-1 preceding. The signal contains a delay fuse which ignites the

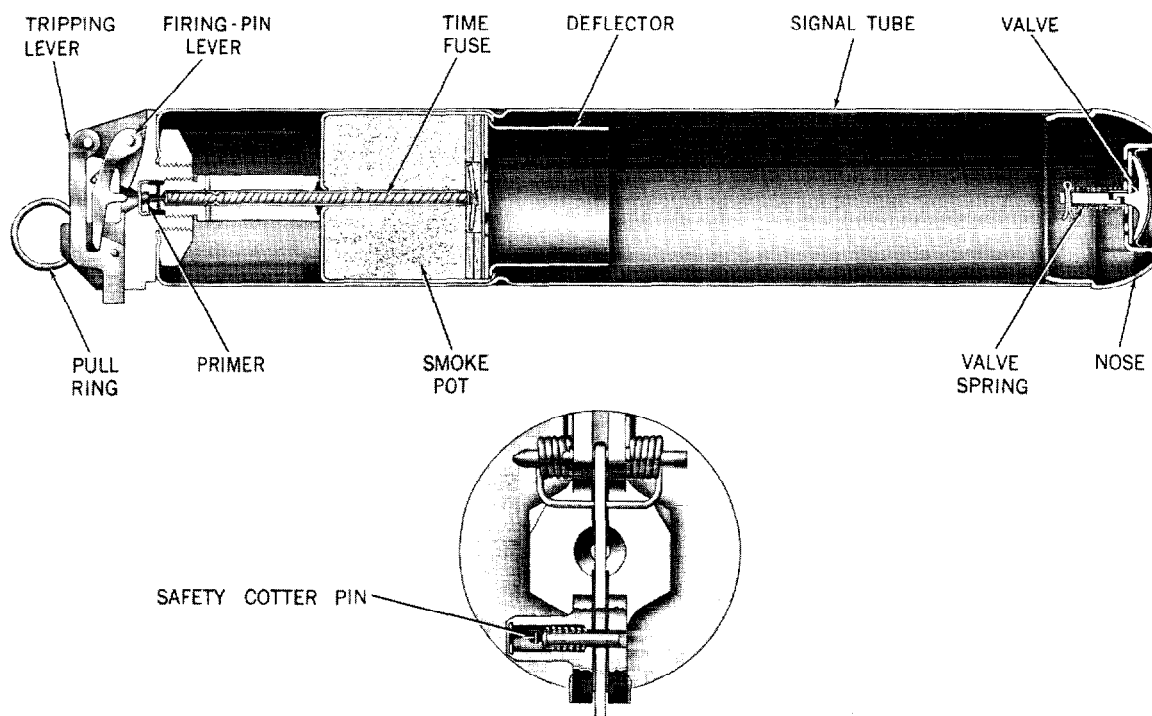


Figure 8.2.1 Marine Smoke Signal, Mk 2

smoke composition 30 to 46 seconds after initiation. Pressure generated by the burning smoke composition blows out the nose valve, and the colored smoke is emitted for approximately 15 seconds. The burned-out signal ships water and soon sinks.

8-2-8-4. Make-Ready Procedures. This signal shall be prepared for launching in accordance with the procedures set forth in Paragraph 8-2-2 of this section.

8-2-8-5. Handling and Storage. This pyrotechnic signal shall be handled and stored in accordance with the provisions contained in Paragraph 8-1-2 of this chapter.

8-2-8-6. Safety Precautions. The safety pre-

cautions of Paragraph 8-1-5 of this chapter are applicable to this signal as are the general safety precautions contained in Section 1-8 of Chapter 1 of this pamphlet.

8-2-8-7. Shipping Containers. This device is packaged 25 to a wooden box weighing approximately 100 pounds, or 6 to a Mk 8 metal box weighing approximately 37 pounds. This metal box also serves as a ready stowage box on submarines.

8-2-8-8. Identification Data. All mods of this signal are listed under BUWEPS LD 282715 and Specification MIL-S-18736. Assembly Drawing Numbers, Federal Stock Numbers, and DOD Code Numbers are as follows:

SUBMARINE-LAUNCHED PYROTECHNICS

SIGNAL, SMOKE, MARINE, MK 2 MODS

Mod	Display	Assy. Dwg.	FSN	DOD Code No.
0	Black Smoke	344756	1370-038-4996	L214
0	Green Smoke	344756	1370-038-4995	L215
0	Yellow Smoke	344756	1370-555-7067	L216
1	Black Smoke	1305679	1370-038-5002	L214
1	Green Smoke	1305679	1370-038-5008	L215
1	Yellow Smoke	1305679	1370-038-5005	L216
2	Black Smoke	1305679	1370-529-8435	L214
2	Green Smoke	1305679	1370-529-8432	L215
2	Red Smoke	1305679	1370-907-3473	None
2	Yellow Smoke	1305679	1370-529-8451	L216

8-2-8-9. **Disposition.** Damaged or otherwise Unserviceable Marine Smoke Signals, Mk 2, shall be disposed of in accordance with Paragraph 8-2-7 of this section.

WARNING

This signal contains a 30- to 46-second delay fuse. If damage is such that the signal may have become ignited or if the safety

cotter pin has been pulled and the tripping lever struck before loading into the ejector, disposition must be accomplished before the expiration of the delay period.

8-2-9. **Signal, Illumination, Marine, Mk 3**
Mds 1, 2, and 3
 (Formerly Submarine Emergency Identification Signal Mk 3 Mods)

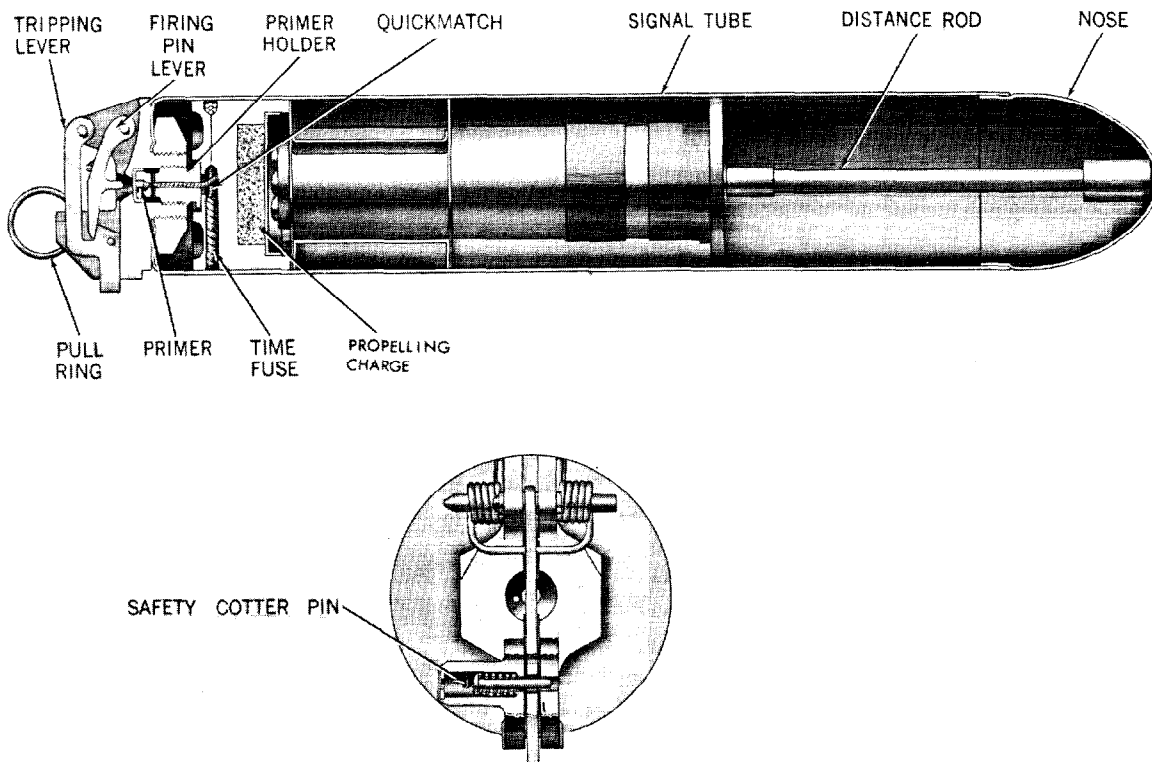


Figure 8.2.2 Marine Illumination Signal, Mk 3

8-2-9-1. Intended Use. This signal (see Figure 8.2.2) is designed to be launched at a maximum depth of 285 feet to produce a parachute-suspended, red, yellow, or green star display (see Paragraph 8-2-9-8) at an altitude of approximately 300 feet above the surface. (See Table 8-1 for specific data.) The Marine Illumination Signal, Mk 41, 45, and 46 (see Paragraph 8-2-11 following) was developed to replace this device in service use, but there may be some Mk 3 Signals still in the supply system.

8-2-9-2. External Features. This signal consists of a cylindrical aluminum tube closed at one end by an ogival nose cap. The base end contains the firing mechanism assembly described in Paragraph 8-2-1 preceding. The color of the display is stenciled on the case.

8-2-9-3. Functional Description. The initiating mechanism of this device functions as explained in Paragraph 8-2-1 preceding. The signal contains a delay fuse which ignites the propelling charge after 54 to 70 seconds. The propelling charge ignites a secondary delay element and propels the inner tube containing the pyrotechnic candle and parachute assembly to a height of approximately 300 feet. Recoil sinks the outer case. Upon reaching altitude, the secondary delay element ignites the expelling charge which ignites and ejects the pyrotechnic candle. The parachute opens to suspend the candle which burns for approximately 25 seconds (red and yellow) or 35 seconds (green).

8-2-9-4. Make-Ready Procedures. The procedure set forth in Paragraph 8-2-2 of this

section shall be followed in preparing this signal for launching.

8-2-9-5. Handling and Storage. These signals shall be handled and stored in accordance with Paragraph 8-1-2 of this chapter.

8-3-9-6. Safety Precautions. The safety precautions set forth in Paragraph 8-1-5 of this chapter apply. This signal contains a black powder charge of sufficient potency to propel the candle and parachute assembly to a considerable height above the surface. If accidental ignition occurs, the signal must be ejected or disposed of before the expiration of the delay time (see Paragraph 8-2-9-9 following).

WARNING

Do not remove the safety cotter pin except as a part of the make-ready procedures. Do not strike the tripping lever while handling, storing, loading, or removing this signal.

8-2-9-7. Shipping Containers. These signals are packaged either 25 rounds to a wooden box or 6 rounds to a Mk 8 Metal box. Filled boxes weigh approximately 101 and 37 pounds respectively.

8-2-9-8. Identification Data. All mods of this signal are listed under BUWEPS LD 282714 and Specification MIL-S-18922. Assembly Drawing Numbers, Federal Stock Numbers, and DOD Code Numbers are as follows:

SIGNAL, ILLUMINATION, MARINE, MK 3 MODS

Mod	Display	Assy. Dwg.	FSN	DOD Code No.
1	Green Star	398960	1370-038-5016	L357
1	Yellow Star	398960	1370-038-5020	L356
2	Green Star	490274	1370-038-5024	L357
2	Yellow Star	490274	1370-038-5029	L356
3	Green Star	1331797	1370-620-3396	L357
3	Red Star	1331797	1370-038-5034	L355
3	Yellow Star	1331797	1370-038-5035	L356

8-2-9-9. Disposition. Damaged or otherwise unserviceable Marine Illumination Signals, Mk 3 shall be disposed of in accordance with Paragraph 8-2-7 of this section.

WARNING

This device contains a 54- to 70-second delay fuse. If damage is such that the signal may have become ignited or if the cotter pin has been pulled and the tripping lever struck before loading into the ejector, disposition must be accomplished before the expiration of the delay period.

8-2-10. Marker, Location, Marine, Mk 26 Mod 0

(Formerly Marker, Location, Submarine, Mk 26 Mod 0)

8-2-10-1. Intended Use. This marker (see Figure 8.2.3) is designed to be launched from submerged submarines to indicate submerged position to surface and air units in accordance with the limits for depth and speeds as set forth in Confidential OP 3227, Subj: Launching Information for Submarine Pyrotechnics. It produces a yellow flame and white smoke display on the ocean's surface for day or night use. (See Table 8-1 for specific data.)

8-2-10-2. External Features. This device consists of a cylindrical aluminum tube with an ogival nose in the center of which is a nose plug. Its base end is closed by the firing mechanism described in Paragraph 8-2-1 preceding.

8-2-10-3. Functional Description. The initiating mechanism of this device functions as

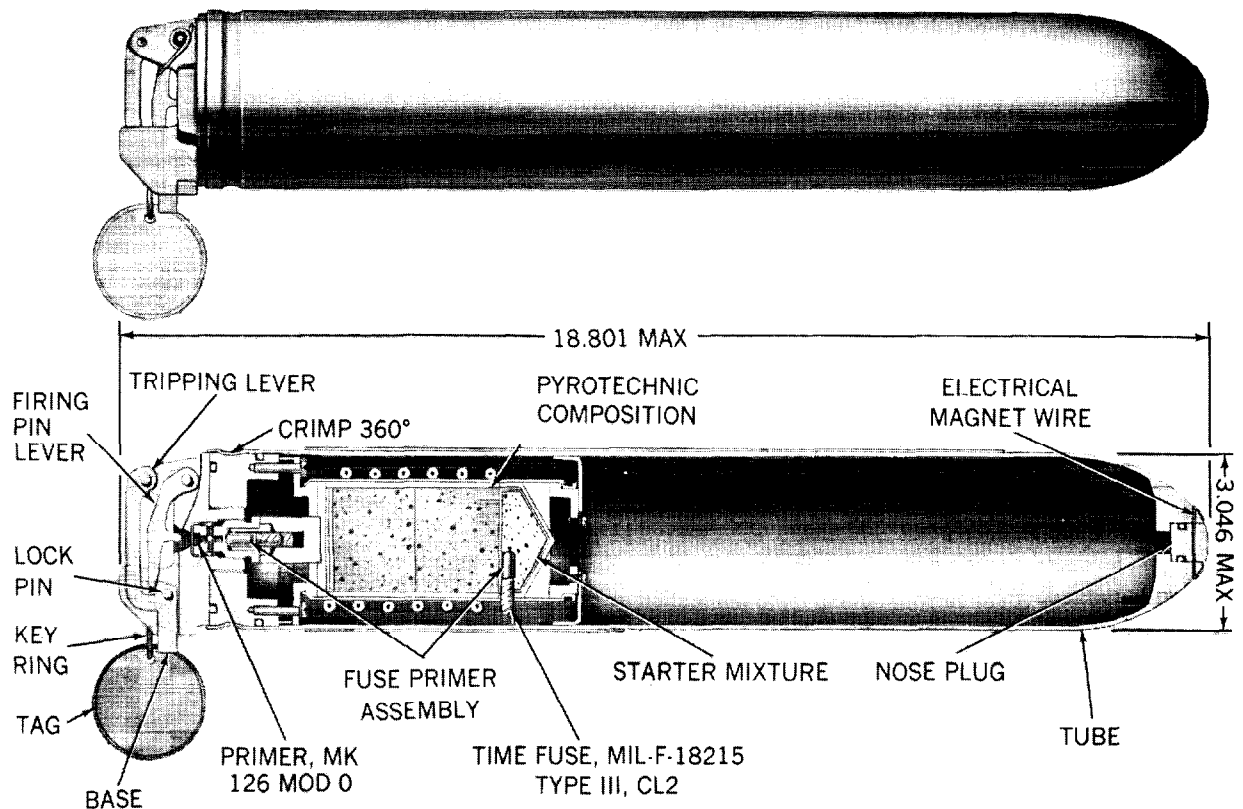


Figure 8.2.3 Marine Location Marker, Mk 26

explained in Paragraph 8-2-1 preceding. The device contains a 130- to 165-second delay fuse which burns while the marker rises to the surface. The delay fuse then ignites the starter mixture which, in turn, ignites the pyrotechnic composition. Combustion pressure blows out the nose plug, allowing the flame and smoke to be emitted. The burned-out outer case ships water and sinks.

8-2-10-4. Make-Ready Procedures. This marker shall be prepared for launching in accordance with the procedures set forth in Paragraph 8-2-2 of this section.

8-2-10-5. Handling and Storage. This marker shall be handled and stored in accordance with the provisions of Paragraph 8-1-2 of this chapter.

8-2-10-6. Safety Precautions. The safety precautions contained in Paragraph 8-1-5 of this chapter are applicable.

WARNING

Do not remove the safety cotter except as a part of the make-ready procedures. Do not strike the tripping lever while handling, storing, loading, or removing this device.

8-2-10-7. Shipping Containers. This marker is packaged in a metal container, six rounds to the container. A filled box weighs approximately 35 pounds.

8-2-10-8. Identification Data. This marker is listed under BUWEPS LD 299348, Assembly Dwg. No. 1475496, Specification MIL-M-23052, FSN 1370-033-8010, and DOD Code No. L578.

8-2-10-9. Disposition. Damaged or otherwise unserviceable Marine Location Markers, Mk 26, shall be disposed of in accordance with Paragraph 8-2-7 of this section.

WARNING

This marker contains a 130- to 165-second delay fuse. If damage is such that the marker may have become ignited or if the cotter pin has been pulled and the tripping lever struck before loading into the ejector, disposition must be accomplished before the expiration of the delay period.

8-2-11. Signal, Illumination, Marine, Mks 41, 45, and 46 Mods 0

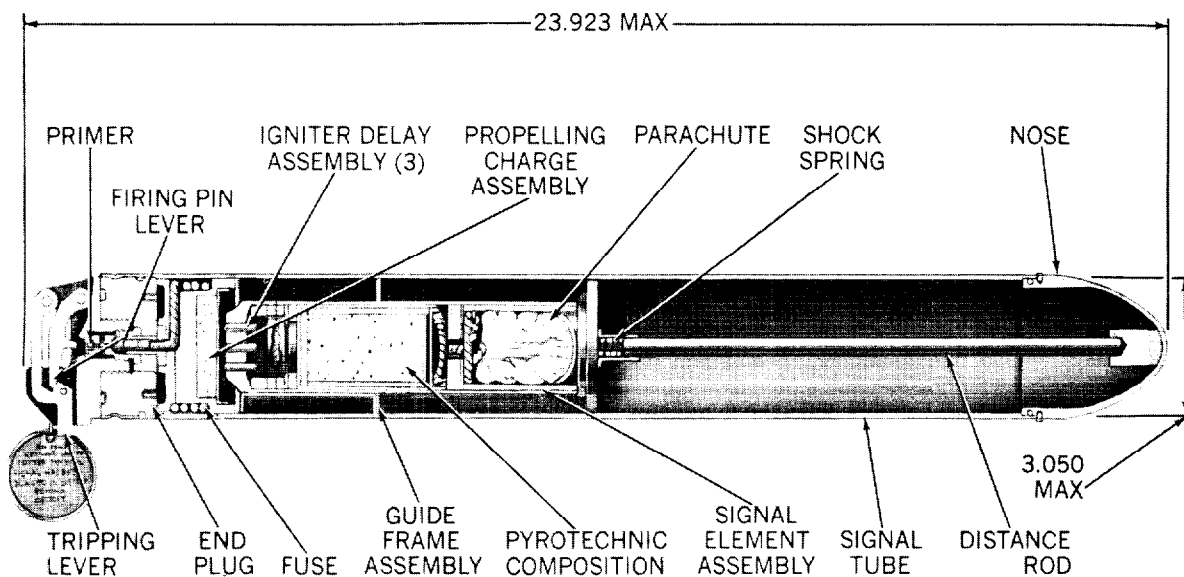


Figure 8.2.4 Marine Illumination Signal, Mks 41, 45, & 46

8-2-11-1. Intended Use. This signal (see Figure 8.2.4) produces a yellow (Mk 41), green (Mk 45), or red (Mk 46) star which is used for either day or night identification of submerged submarines. (For launching speeds and depths, see Confidential OP 3227, Subj: Launching Information for Submarine Pyrotechnics). (See Table 8-1 for specific details.) This device was designed to replace the Marine Illumination Signal, Mk 3, described in Paragraph 8-2-9 preceding.

8-2-11-2. External Features. This signal consists of an aluminum outer tube closed at its forward end with an ogival nose cap. Its after end contains the firing mechanism described in Paragraph 8-2-1 preceding. The display color is indicated by appropriate marking on the signal body.

8-2-11-3. Functional Description. The initiating mechanism of this signal functions as explained in Paragraph 8-2-1 preceding. The

8-2-11-6. Safety Precautions. The safety precautions as set forth in Paragraph 8-1-5 of this chapter apply. The inner tube of this signal, which contains the pyrotechnic composition and parachute, is propelled out of the outer casing with enough force to lift it to an altitude of 350 feet.

WARNING

Do not remove the safety cotter pin except as a part of the make-ready procedures. Do not strike the tripping lever while handling, storing, loading, or removing this device.

8-2-11-7. Shipping Containers. This signal is packaged 6 rounds to a metal container. A filled container weighs approximately 44 pounds.

8-2-11-8. Identification Data. This signal is listed as follows:

SIGNAL, ILLUMINATION, MARINE, MKS 41, 45, AND 46
(Specification: OS 8726)

MK	Display	LD	FSN	DOD Code No.
41	Yellow Star	282768	1370-707-0583	L205
45	Green Star	282770	1370-707-0582	L206
46	Red Star	282769	1370-707-0581	L207

signal contains a delay fuse which ignites the propelling charge and the igniter delay element after 100 to 140 seconds. The propelling charge projects the inner tube containing the pyrotechnic star composition and parachute to an approximate altitude of 350 feet. Near the peak of the trajectory, a secondary delay element ignites the star composition and the expelling charge which ejects the star composition and the parachute. The candle burns for approximately 25 seconds.

8-2-11-4. Make-Ready Procedures. This signal shall be prepared for launching in accordance with the procedures contained in Paragraph 8-2-2 of this section.

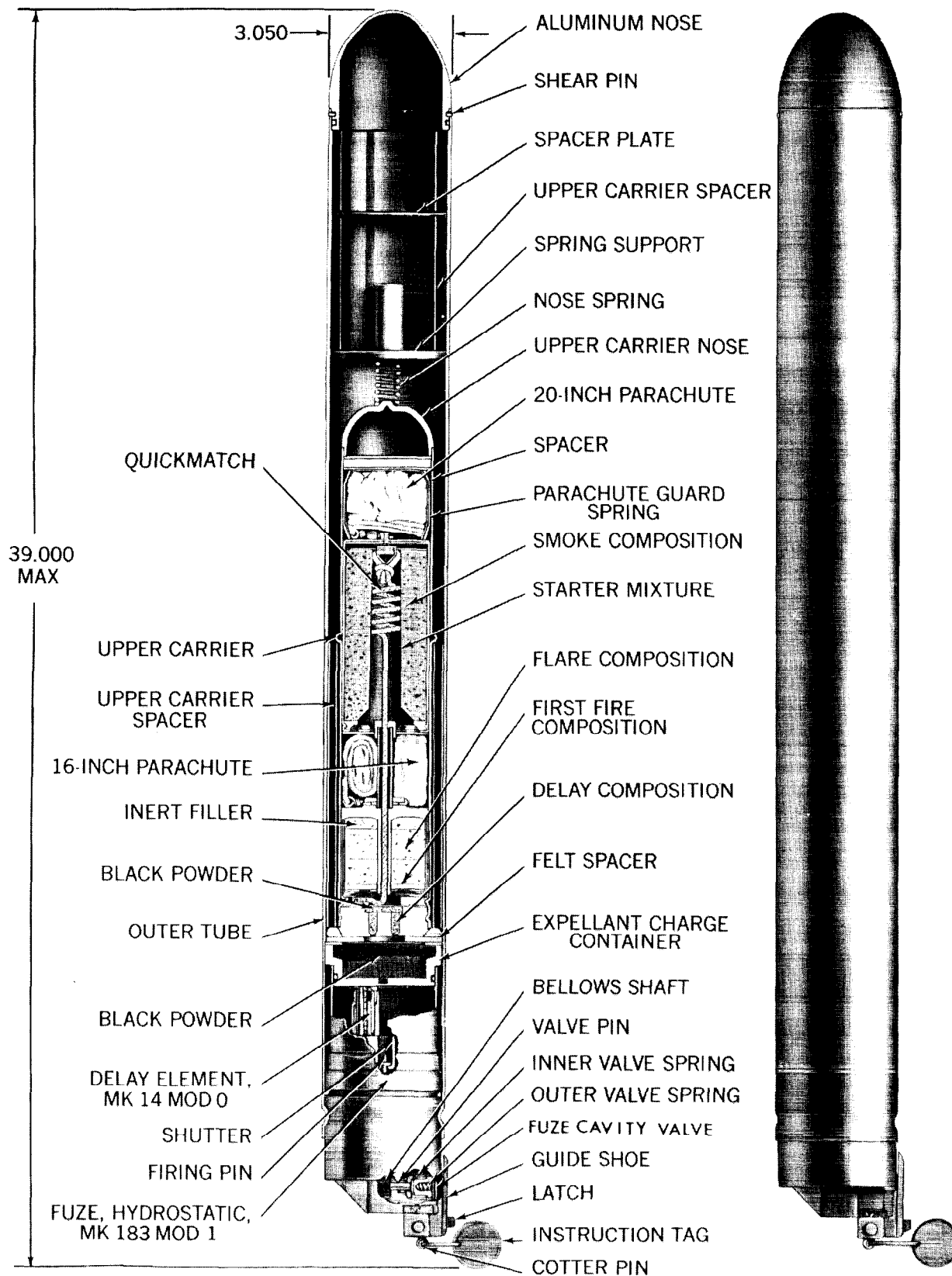
8-2-11-5. Handling and Storage. This signal shall be handled and stored in accordance with Paragraph 8-1-2 of this chapter.

8-2-11-9. Disposition. Damaged or otherwise unserviceable Marine Illumination Signals, Mk 41, 45, and 46 shall be disposed of in accordance with Paragraph 8-2-7 of this section.

WARNING

This device contains a 100- to 140-second delay fuse. If damage is such that the signal may have become ignited or if the cotter pin has been pulled and the tripping lever struck before loading into the ejector, disposition must be accomplished before the expiration of the delay period.

8-2-12. Signal, Smoke and Illumination, Marine, Mk 51, 52, and 53 Mods 0
(Formerly Signal, Smoke and Illumination, Submarine, Mk 51, 52, and 53)
(Illustration on page 8-12)



NOTE: All stocks of these submarine signaling devices are declared unserviceable by NAVORD OD 17190, 4th Revision, Change 1 of 1 February 1968. If any of these signals are found in the supply system, they must be carefully segregated for appropriate disposition action. If aboard ship, they **MUST NOT BE USED**, and they must not be thrown over the side. Instead, they should be returned, at the earliest practicable time, to a shore station for disposal.

8-2-12-1. **Intended Use.** This signal (see Figure 8.2.5) is designed to replace Marine Illumination Signal, Mk 3, and Marine Illumination Signal, Mks 41, 45, and 56, as described in paragraphs 8-2-9 and 8-2-11, respectively. The three marks (51, 52, and 53) differ from one another only in the colors of their displays; each produce separate flame-and-smoke displays (Mk 51 - red, Mk 52 - green, and Mk 53 - yellow) at an altitude of approximately 600 feet above the surface of the water. They are intended for any type of day or night signaling from a submerged position. They had very limited production, however, and have been replaced by Marine Smoke and Illumination Signal, Mks 66, 67, and 68, which is described in paragraph 8-3-10.

8-2-12-2. **External Features.** This signal consists of an aluminum cylinder with an ogival nose cap. The fuze assembly is crimped to the base end. The fuze assembly consists of a guide shoe, latch, safety cotter pin, and instruction tag. The case is appropriately stenciled to indicate the color of the display produced.

8-2-12-3. **Functional Description.** This signal is initiated by Hydrostatic Fuze, Mk 183 Mod 1. The latch is tripped when the signal is launched, freeing the guide shoe which is rotated to the rear of the signal by movement through the water. Water pressure at depths greater than 100 feet holds the fuze cavity valve shut. At a depth of from 100 to 50 feet, the valve spring overcomes water pressure and allows water to enter the fuze cavity. This pressure contracts the bellows and arms the fuze. As the signal continues to rise, the reduced pressure near the surface allows the bellows to expand, thus releasing the firing pin which initiates the delay element. This delay ensures surfacing and stabilization before the expellant charge is

ignited. The expelling charge ignites the secondary delays in the upper carrier and propels the upper carrier containing smoke and star compositions to a height of approximately 600 feet. The secondary delays then ignite the expelling charge which ejects and initiates the smoke and star compositions as they are deployed on individual parachutes.

8-2-12-4. **Make-Ready Procedures.** This signal is not to be used (see NOTE preceding paragraph 8-2-12-1).

8-2-12-5. **Handling and Storage.** This signal shall be handled and stored in accordance with paragraph 8-1-2 of this chapter.

8-2-12-6. **Safety Precautions.** The general safety precautions of paragraph 8-1-5 of this chapter are applicable. In addition, particular attention is directed to the fact that fuze arming and the release of the firing pin in this device depend upon contraction and expansion of a bellows. The bellows can be activated by air as well as by water pressure. Therefore, the sealing valve to the fuze cavity **MUST** be securely closed at all times. Periodic inspections as required by paragraph 8-1-2-3 of this chapter must include determination that the guide shoe is firmly in place holding the fuze cavity valve securely shut and that the safety cotter pin is properly in place. Raising and lowering the pressure in the submarine has been known to ignite this signal in storage. This cannot happen if the guide shoe is holding the fuze cavity valve tightly sealed.

WARNING

This signal was designed to propel its pyrotechnic compositions 600 feet into the air. Extreme care must be taken to avoid striking the latch and otherwise mishandling this device so as to cause premature ignition.

8-2-12-7. **Shipping Containers.** This signal is packaged eight rounds to a wooden box. A filled box weighs approximately 107 pounds.

8-2-12-8. **Identification Data.** No requisitioning action should be initiated for this signal. The Signal, Smoke and Illumination, Marine, Mks 66, 67, and 68, described in paragraph 8-3-10 following, should be requisitioned instead.

NAVWEPS OP 2213 (FIRST REVISION)

SIGNAL, SMOKE AND ILLUMINATION, MARINE, MKS 51, 52, AND 53 MODS 0

MK	Display	LD	Assy. Dwg.	FSN	DOD Code
51	Red Smoke & Star	282776	1331852	1370-907-3473	X257
52	Green Smoke & Star	282778	1331854	1370-907-3474	X258
53	Yellow Smoke & Star	282777	1331853	1370-907-3475	X259

8-2-12-9. Disposition. If this signal is damaged so that it cannot be launched by means of the submarine ejector, it must be disposed of in accordance with current applicable instructions.

8-3. SEA-WATER-BATTERY-INITIATED DEVICES

The submarine signals and markers described in this section are electrically ignited. Current used to fire the squib, or squibs, is supplied by batteries which function only when sea water is introduced as an electrolyte. These pyrotechnics are by far the safest and most reliable submarine signaling and marking devices yet developed. For this reason, it is intended that they replace the percussion-initiated pyrotechnic devices described in Section 8-2 preceding.

NOTE: To provide an additional margin of safety, a second, yellow-tagged cotter pin has been added to the latch mechanism of these devices. All lots of these devices produced or reworked after July 1964 have this additional yellow-tagged cotter pin.

8-3-1. Operating Characteristics. When the signals and markers described in this section are launched, the latch rides in the groove of the ejector and is tripped approximately 9 inches from the muzzle door. This frees the guide shoe which is raised by the outer valve spring. When the signal or marker clears the ejector, its movement through the water rotates the guide shoe to the rear, opening the shunt between the batteries and the squib(s). Pressure at depth holds the battery cavity valve shut. At a depth of 5 to 6 feet below the sur-

face, the inner valve spring overcomes the hydrostatic pressure and unseats the valve, thus permitting sea water to enter the cavity and energize the batteries, the electrical output of which ignites the squibs. Before the signal or marker is loaded into the ejector, the guide shoe serves to hold the shunt across the electrical circuits and to secure the battery cavity against water entry. The latch, in its cotter-pin-locked forward position, secures the guide shoe, and the safety cotter pin (two pins in all lots since July 1964 — see note preceding this paragraph) is designed to prevent accidental tripping of the latch.

WARNING

Cotter pins in submarine pyrotechnics hold the latch or tripping lever and prevent accidental ignition. These pins must not be struck, bent, or tampered with, nor shall they be removed except as a part of normal make-ready procedures preparatory to ejecting. If it should become necessary to replace any of these pins, the replacement must be identical to the original in dimensions and material.

8-3-2. Special Precautions. In all operations involving the pyrotechnics described in this section, two particular, major precautions must be emphasized: (1) The guide shoe must hold the valve securely so as to seal the battery compartment from water entry and to hold the shunting plate across the wires from the batteries to the squib. (2) The batteries must be positively shielded from all possible contact with water if the guide shoe is released. In spite of these precautions, however, it should

be understood that, even though the guide shoe is released, thereby exposing the batteries and opening the shunt, these devices are completely safe to handle UNLESS water is admitted to the battery compartment. There is no delay element in these fuzes. If sea water comes into contact with the batteries while the shunt is open, the device will function within one to ten seconds. Therefore, it is extremely important to reposition an accidentally released guide shoe as quickly as possible and to keep the device away from any possible contact with water while the value is open.

WARNING

Any sea-water - battery-initiated submarine pyrotechnic device the batteries of which have been exposed by an accidentally released guide shoe must be considered potentially hazardous and unserviceable even though the guide shoe is restored to its down position. Such a device must be disposed of at the earliest practicable time in accordance with the following paragraph.

8-3-3. Disposition. Any sea-water-battery-initiated signal or marker which is judged to be defective or for any cause unserviceable shall be handled as follows:

8-3-3-1. If the guide shoe is in its normally locked position and the safety cotter pins (one or both) are in place, the device may be returned to port and turned over to an EOD team for disposal.

8-3-3-2. If the guide shoe is released, or has been released, thus exposing the battery compartment and opening the electrical shunt, the following steps must be taken:

(1) Make every effort to restore the guide shoe to its secured position, being very sure to keep the device away from water.

(2) Seal the device in a totally waterproof container and keep it segregated from other pyrotechnics. Dispose of the unserviceable signal or marker in accordance with current applicable instructions as soon as practicable.

8-3-4. Make-Ready Procedures. The steps required for making ready all of the pyrotechnics in this section are identical. For this reason, this paragraph is referred to in each individual item description in this section. These steps shall be followed in preparing all sea-water-battery initiated pyrotechnic signals and markers for launching. Personnel carrying out these procedures shall comply with all safety precautions and operating instructions specified for the ejector being used.

8-3-4-1. Examine the signal or marker to see that its case is not dented or otherwise damaged; that its latch has not been forced, bent, struck, or pulled; that its guide shoe is firmly seated; that its cotter pins (or pin) are properly in place; and that its nose seal, if any, is intact.

NOTE: Battery-initiated pyrotechnics that show any signs of damage shall be carefully segregated and disposed of at the earliest practicable time in accordance with instructions in Paragraph 8-3-3 preceding.

8-3-4-2. Carefully attach the snap hook of a lanyard to the pull ring which it attached to the RED-TAGGED safety cotter pin.

WARNING

The RED-TAGGED cotter pin must not be removed from the signal or marker until the signal or marker has been fully inserted into the ejector barrel.

8-3-4-3. Using long-nose pliers, squeeze together the ends of the yellow-tagged cotter pin, if present, and remove the yellow-tagged cotter pin from the latch assembly. Also straighten the ends of the red-tagged cotter pin but DO NOT REMOVE it.

8-3-4-4. Insert the signal or marker into the ejector, nose first, and push it gently toward the muzzle until the spring-loaded detent in the ejector barrel drops behind the base end of the signal or marker, being careful not to foul the lanyard and being sure that the guide shoe and

latch are riding in the groove of the ejector barrel.

CAUTION

Do not force the signal or marker against any obstruction. If difficulty is encountered, and if there is no apparent cause, it must be assumed that the signal or marker is defective and unserviceable.

8-3-4-5. After the signal or marker is seated beyond the detent, remove the red-tagged safety cotter pin by applying a steady pull on the lanyard.

WARNING

The red-tagged cotter pin must not be removed by any other means than the lanyard. Personnel must NOT be in line with the ejector barrel while this pin is being removed.

8-3-4-6. Close the breech door immediately and secure it in closed position.

8-3-4-7. Open the muzzle door and proceed with launching procedures as given for the ejector, using launching pressures as in Paragraph 8-2-2-7 preceding.

8-3-5. **Removal Procedures.** The recommended removal procedures set forth in Paragraph 8-2-3 are applicable to sea-water-battery-initiated pyrotechnic devices.

8-3-6. **Alternate Removal Procedures.** If the Commanding Officer directs that a sea-water-battery-initiated signal or marker be removed through the breech after it has been prepared for launching, the following steps shall be taken:

8-3-6-1. Close the muzzle door, drain the ejector, and open the breech in accordance with instructions for the ejector being used.

WARNING

Keep the body out of line with the ejector barrel during removal operations.

8-3-6-2. Depress the spring-loaded detent and slip the signal or marker out ONLY far enough to permit reinsertion of the red-tagged cotter

pin, being extremely careful not to strike or exert pressure on the latch.

WARNING

If the latch is struck so that the guide shoe is released to a raised position, the disposition procedures of Paragraph 8-3-3-2 must be followed.

8-3-6-3. Carefully reinsert the red-tagged safety cotter pin.

8-3-6-4. Slowly pull the signal or marker out of the ejector barrel.

8-3-6-5. Reinsert the yellow-tagged cotter pin, if any, in the latch mechanism of the signal or marker.

8-3-6-6. Using long-nose pliers, bend the ends of both safety cotter pins slightly so as to prevent their slipping out.

8-3-6-7. Examine the signal or marker for dents and other damage. If there are any signs of damage, the signal or marker must be handled in accordance with Paragraph 8-3-3 preceding.

NOTE: Any signal or marker that has failed to eject after an effort has been made to eject it shall be considered defective and shall be disposed of as unserviceable in accordance with Paragraph 8-3-3 of this chapter.

8-3-6-8. Tag and return to store for future use all signals or markers which are not to be disposed of in accordance with any of the preceding.

8-3-7. **Handling and Storage.** The instructions for handling and storage as set forth in Paragraph 8-1-2 of this chapter apply to all sea-water-battery-initiated submarine pyrotechnics.

8-3-8. **Safety Precautions.** The safety precautions set forth in Paragraph 8-1-5 of this chapter apply.

8-3-9. **Marker, Location, Submarine, Mk 21, 21, 22, 23, and 24 Mods 0**
(Illustration top of page 8-17)

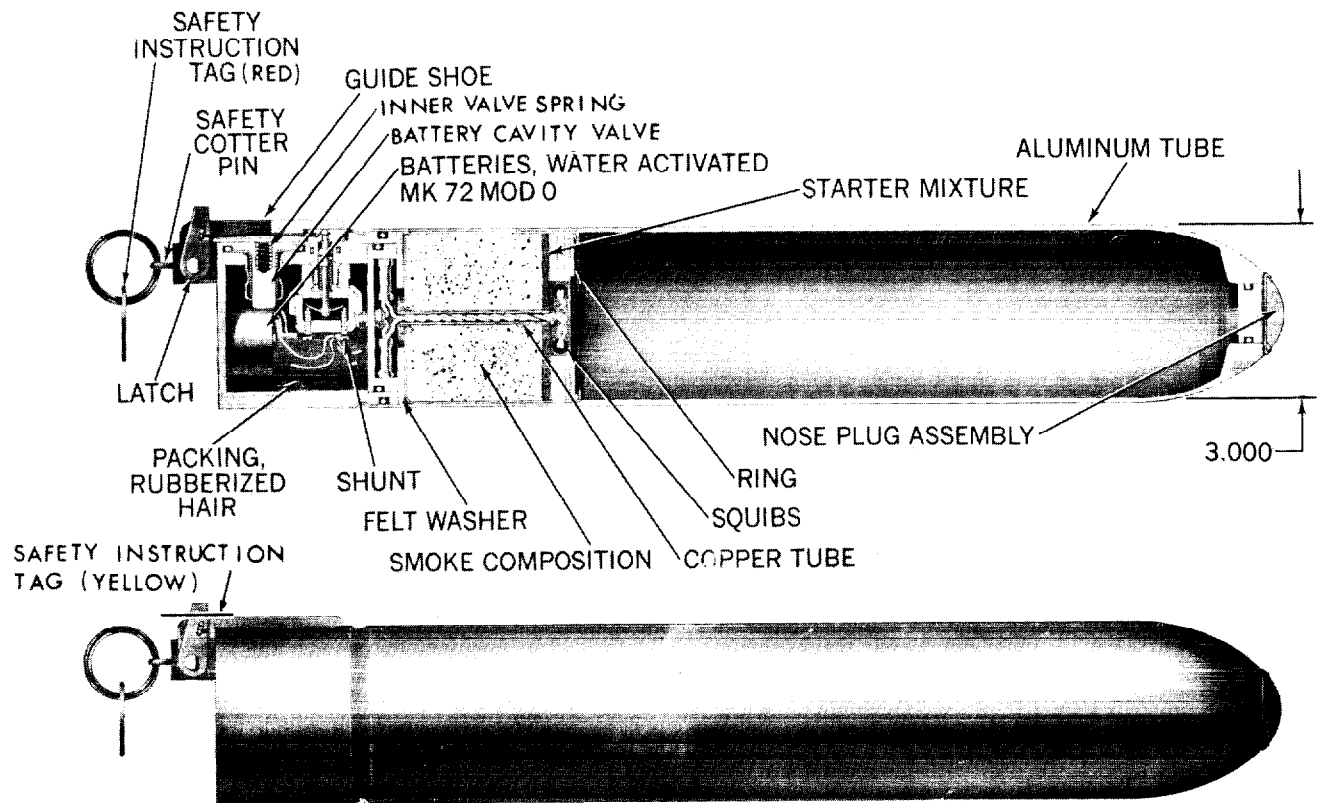


Figure 8.3.1 Submarine Location Marker, Mks 21, 22, 23, & 24

8-3-9-1. Intended Use. This marker (see Figure 8.3.1) is designed to replace the Signal, Smoke, Marine, Mk 2, which is described in Paragraph 8-2-8 preceding. It produces a red, yellow, green, or black smoke display on the surface for any desired type of signaling or marking purpose. (See Table 8-1 for specific data.) (See Confidential OP 3227, Subj: Launching Information for Submarine Pyro-

(Mk 8 Mod 0, LD 261138). A filled container weighs approximately 36 pounds. A recently developed polystyrene package for these markers will hold five rounds. Such a container, when filled, will weigh approximately 18 pounds.

8-3-9-8. Identification Data. This marker is listed as follows:

MARKER, LOCATION, SUBMARINE, MKS 21, 22, 23, AND 24
(Specification MIL-S-23185)

MKS	Display	LD	FSN	DOD Code No.
21	Red Smoke	282817	1370-715-2412	L213
22	Yellow Smoke	282816	1370-715-2409	L212
23	Green Smoke	282815	1370-715-2411	L211
24	Black Smoke	282818	1370-715-2410	L210

technics, for launching depths and speeds.)

8-3-9-2. External Features. This marker consists of a cylindrical aluminum tube. Its forward end is fitted with a nose plug. A hydrostatic fuze assembly is crimped to its after end. The outer case is stenciled to indicate smoke color.

8-3-9-3. Functional Description. The fuze operation of this device is described in Paragraph 8-3-1 preceding. After the marker has reached the surface, the squibs fire to ignite the starter mixture. This, in turn, ignites the smoke composition, and gases of combustion force out the nose plug, permitting the smoke to be emitted.

8-3-9-4. Make-Ready Procedures. This device shall be prepared for launching in accordance with the provisions of Paragraph 8-3-4 preceding.

8-3-9-5. Handling and Storage. The handling and storage provisions of Paragraph 8-1-2 of this chapter shall be observed in respect to this device.

8-3-9-6. Safety Precautions. The safety precautions contained in Paragraph 8-1-5 of this chapter apply.

8-3-9-7. Shipping Containers. This marker is packaged six rounds to a metal container

8-3-10. Signal, Smoke and Illumination, Marine, Mks 66, 67, and 68 Mod 0
(Formerly Signal, Smoke and Illumination, Submarine Mks 66, 67, and 68)
(Illustration top of page 8-19)

8-3-10-1. Intended Use. This signal (see Figure 8.3.2) produces a parachute-suspended red, green, or yellow smoke and star display for any kind of signaling between the submarine and surface or air units (see Table 8-1 for specific data). (See Confidential OP 3227, Subj: Launching Information for Submarine Pyrotechnics, for launching depths and speeds.) This signal is expressly designed to replace the Signal, Smoke and Illumination, Marine, Mks 51, 52, and 53, which is described in Paragraph 8-2-12 preceding.

8-3-10-2. External Features. This signal consists of a cylindrical aluminum tube. The ogival nose is secured to the forward end of the tube with four shear pins and is sealed with an "O"ring. The base end of the tube is crimped to the same hydrostatic fuze assembly as is used with the device described in the preceding Paragraph 8-2-9.

8-3-10-3. Functional Description. Functioning of the fuze of this device is described in Paragraph 8-3-1 of this section. Upon surfacing, the squibs ignite the expelling charge

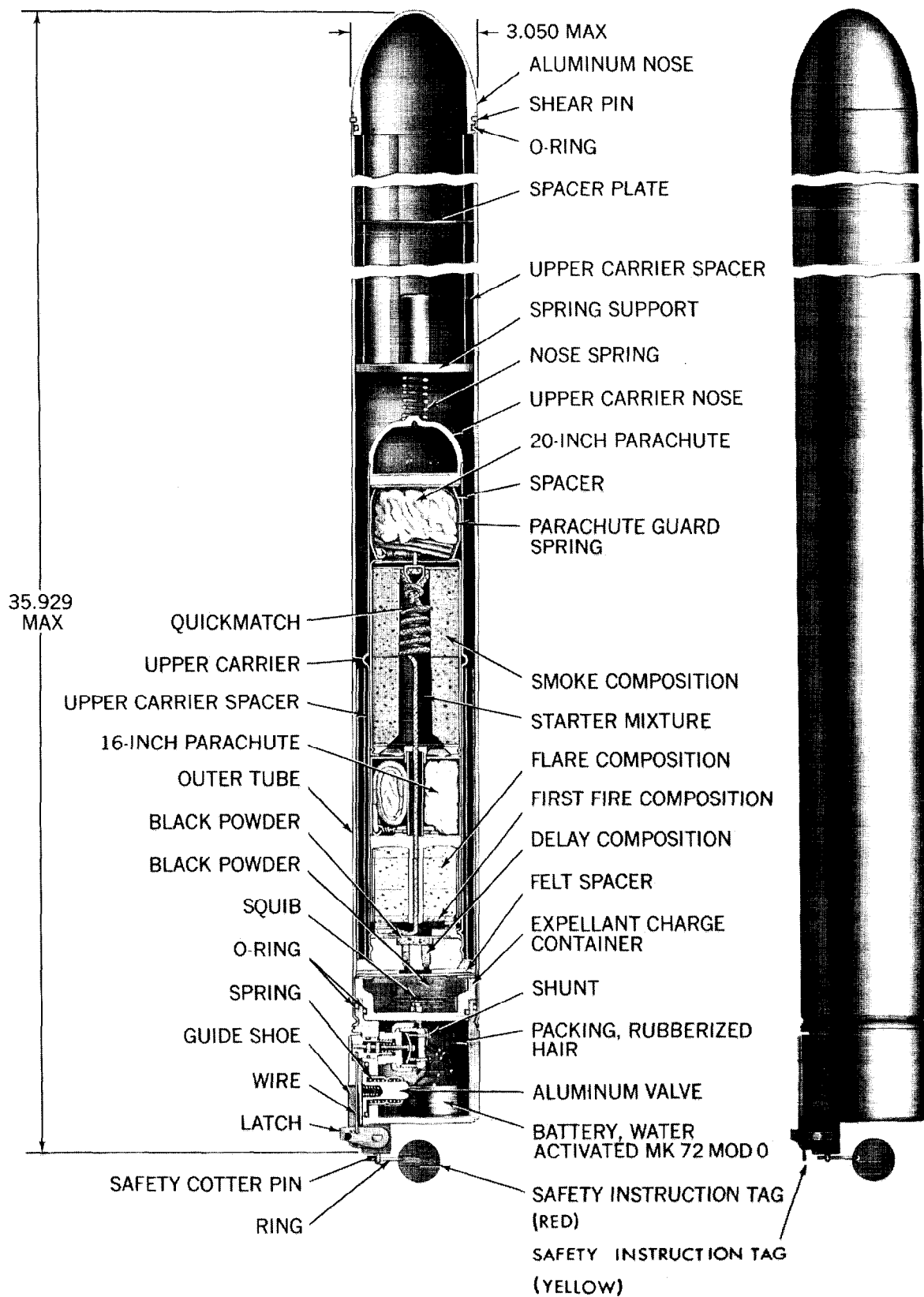


Figure 8.3.2 Marine Smoke & Illumination Signal, Mk 66, 67, & 68

which ignites the delay composition and propels the upper carrier assembly to an altitude of approximately 400 feet, where the smoke and star candles are ignited and deployed on individual parachutes.

8-3-10-4. Make-Ready Procedures. This signal shall be prepared for launching using the procedure outlined in Paragraph 8-3-4 of this section.

8-3-10-5. Handling and Storage. This signal shall be handled and stored in accordance with Paragraph 8-1-2 of this chapter.

8-3-10-6. Safety Precautions. The safety precautions set forth in Paragraph 8-1-5 of this chapter apply.

8-3-10-7. Shipping Containers. These signals are packaged eight rounds to a wooden box. A filled box weighs approximately 105 pounds. A recently developed polystyrene container for this device holds five rounds and weighs 38 pounds when filled.

8-3-10-8. Identification Data. This signal is listed as follows:

the tube by a 360° crimp and is sealed with an "O" ring. The base end of the tube is crimped to the same hydrostatic fuze assembly as is used with the device described in Paragraph 8-3-9 preceding.

8-3-11-3. Functional Description. Functioning of the fuze of this device is described in Paragraph 8-3-1 of this section. Upon surfacing, the squibs ignite the expelling charge which separates the hydrostatic fuze from the aluminum tube and the expellant charge container from the piston. The piston is then free to fall away allowing the fluorescein dye to spill into the water and produce a yellow-green fluorescein slick.

8-3-11-4. Make-Ready Procedures. This marker shall be prepared for launching using the procedures outlined in Paragraph 8-3-4 of this section.

8-3-11-5. Handling and Storage. This marker shall be handled and stored in accordance with

SIGNAL, SMOKE AND ILLUMINATION, MARINE MKS 66, 67, AND 68
(Confidential Specification WS 1884)

MK	Display	LD	Assy. Dwg.	FSN	DOD Code No.
66	Red Smoke & Flame	282846	1332012	1370-960-0450	L266
67	Green Smoke & Flame	282847	1331987	1370-960-0451	L267
68	Yellow Smoke & Flame	282848	1332028	1370-960-0452	L268

8-3-11. Marker, Location, Marine, Mk 28 Mod 0
(Illustration top of page 8-21)

8-3-11-1. Intended Use. This marker (see Figure 8.3.3) produces a persistent yellow-green fluorescent slick on the surface to indicate submerged position to surface or air units (see Table 8-1 for Specific data.) (See Confidential OP 3227, Subj: Launching Information for Submarine Pyrotechnics, for launching depths and speeds.)

8-3-11-2. External Features. This marker consists of a cylindrical aluminum tube. The ogival nose is secured to the forward end of

Paragraph 8-1-2 of this chapter.

8-3-11-6. Safety Precautions. The safety precautions set forth in Paragraph 8-1-5 of this chapter apply.

8-3-11-7. Shipping Containers. These markers are packaged five rounds to a polystyrene box. A filled box weighs approximately 42 pounds.

8-3-11-8. Identification Data. This marker is listed under BUWEPS LD 282881, Dwg. No. 1332061, Specification WS-1902, FSN 1370-225-5340, and DOD Code No. L568.

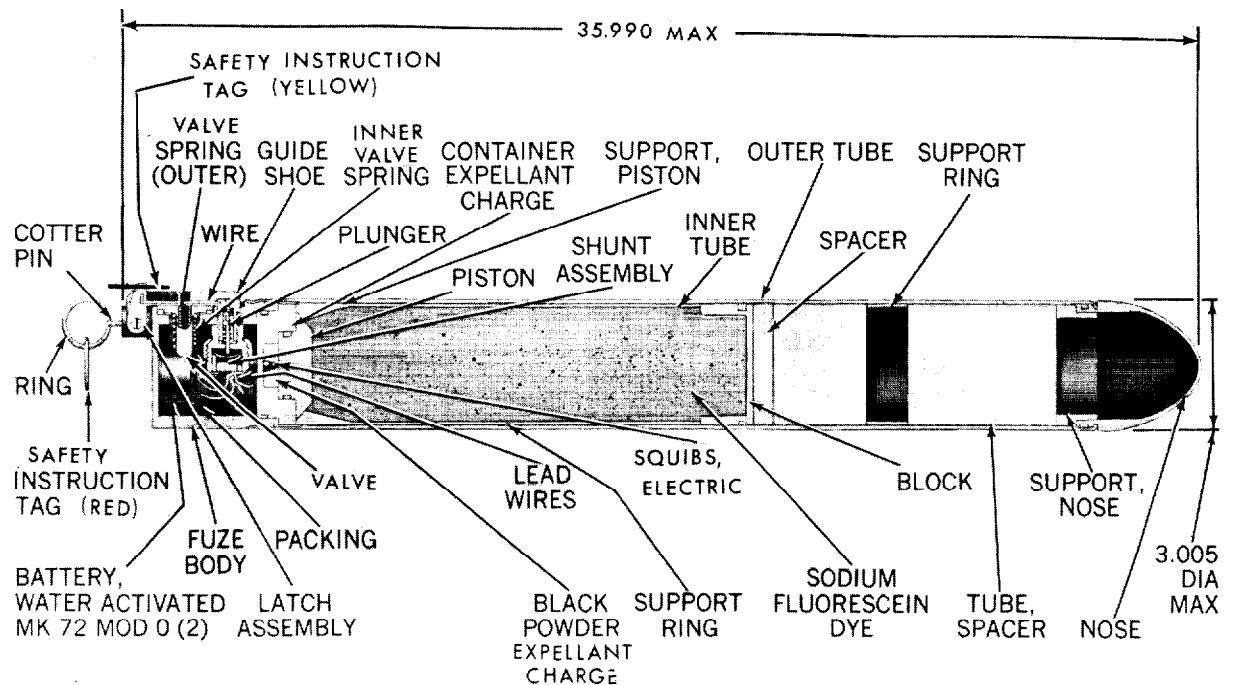


Figure 8.3.3 Marine Location Marker, Mk 28

CHAPTER 9

AIR- AND SURFACE-LAUNCHED DYE MARKING DEVICES AND MATERIALS

9-1. INTRODUCTION

This chapter relates to devices and materials that produce colored chemical displays in or on water. Strictly speaking, none of the devices covered by this chapter are pyrotechnics; their displays are not produced by burning pyrotechnic compositions as is true with the marking devices treated in Chapter 7 preceding. Some of these dye devices do, however, contain explosive charges which serve to burst the outer container, thus spreading the dye particles on the water. Others are broken open simply by impact. All are expressly intended for making visible reference points for any daytime situation that calls for a relatively stable and long-lasting mark.

9-1.1. Arrangement of Material in this Chapter. The devices in this chapter are subdivided into sections solely on the basis of their containment or noncontainment of explosive components.

9-1.2. Sea-Marking Materials. The following dye marking materials are presently available for fleet use:

9-1.2.1. Green fluorescein dye as contained in Marine Location Marker, Mk 1 Mod 2, and chrome yellow pigment as contained in Marine Location Marker, Mk 1 Mod 3 (paragraph 9-2-2 following).

9-1.2.2. Rhodamine BXP red fluorescent dye which is packaged in 1-ounce soluble bags, eight bags to a hermetically sealed can (FSN 1370-070-7039, X174) or in Mk 91 VT Fuze Containers (FSN 6820-038-5062, X174).

9-1.2.3. Uranine green fluorescent dye

packaged in 1-ounce soluble bags, four bags in a hermetically sealed can (FSN 1370-986-7522, X177) or in Mk 91 VT Fuze Containers (FSN 6820-038-5057, X175).

9-1.2.4. Dye mix, fluorescein packaged in 1/2-pound cans (FSN 6820-707-0576).

9-1.3. General Discussion. Dye marking materials are of two types: Pigments that float on the surface of the water, and soluble dyes that permeate the water. Floating pigments are visible both from the air and the surface and are therefore suitable for either use. Surface reflection of light at acute angles reduces the color contrast of dye markers when viewed from the surface but not when viewed from the air. For this reason, dye markers are more visible from aircraft than from surface craft.

9-1.4. Recommended Uses. The following uses are recommended for dye marking devices and materials:

9-1.4.1. Marine Location Marker (formerly Depth Charge Marker) Mk 1 Mods 2 and 3, for general purpose marking for observation from the air or from the surface.

9-1.4.2. Pigments and dyes packaged separately as in paragraphs 9-1-2-2, 9-1-2-3, and 9-1-2-4 preceding:

(1) When observation only from the air is needed for general purposes and when Marine Location Marker, Mk 1 is not available.

(2) When small quantities of marking materials will suffice.

(3) When marking materials are required to be mixed with other materials or placed in special dispensers or packages.

9-1.5. Special Instructions. Uranine green

fluorescent dye is widely used as a distress signal and in search and rescue operations at sea. It should not be used for other than emergency purposes when any other sea-marking material is available.

9-1-6. Handling and Storage. Handling of the devices covered by this chapter calls for considerable care since some are very fragile and easily broken. Most dye materials deteriorate upon contact with moisture and therefore must be stored in dry compartments which are not equipped with sprinkler systems. They must be shielded from rain and sea water at all times. Storage areas in which these devices are kept must be inspected periodically for broken and damaged containers, leaks, and loosened tear strips.

9-1-7. Safety Precautions. The general safety precautions contained in Section 1-8 of Chapter 1 of this pamphlet are to be observed, as appropriate, in respect to these devices and materials. In addition, when these devices are carried on aircraft, they must be firmly secured to prevent damage to themselves and the aircraft.

9-1-8. Disposition. Unserviceable, punctured, dented, corroded, leaking, or otherwise damaged marking devices and con-

tainers of sea-marking materials shall be disposed of in accordance with applicable provisions of Chapter 3 of this pamphlet.

9-2. DYE DEVICES CONTAINING EXPLOSIVE ELEMENTS

The dye marking devices in this section contain some form of explosive charge in the ignition train and in the final expelling force which spreads the dye or pigment on the water.

9-2-1. Marker, Location, Marine, AN-Mk 1 Mods 0 and 1.

(Formerly Cartridge, Slick Marker AN-Mk 1 Mods 0 and 1)

(Illustration on page 9-3)

9-2-1-1. Intended Use. This marker (see Figure 9.2.1) is fired from Pyrotechnic Pistol, AN-M8 (Paragraph 4-2-3, Chapter 4) for any daytime use for which a green dye slick on the water's surface is desired (see Table 9-1).

9-2-1-2. External Features. This device has a paper case (Mod 0) or an aluminum case (Mod 1) with a rimmed base to fit the pistol ejector. The base contains a percussion primer. Descriptive marking is stenciled on the case, and a 1/4-inch green band is

TABLE 9-1
DYE MARKING DEVICES SUMMARY

Item	Para-graph	Launching Method	Display	Display Time (Min.)	Length (In.)	Diam. (In.)	Weight
Marker, Location, Marine, AN-Mk 1 Mods	9-2-1	Pyro Pistol, AN-M8	Green Dye (Fluorescein)	30	3.85	1.68	4 Oz.
Marker, Location, Marine, Mk 1 Mod 2	9-2-2	Hand-Launched from Surface or Aircraft	Green Dye (Fluorescein)	45	11.87	3.5	3.7 Lb.
Marker, Location, Marine, Mk 1 Mod 3	9-2-2	Hand-Launched from Surface or Aircraft	Lemon Yellow (Stearated Chrome)	45	11.87	3.5	3.7 Lb.
Marker, Location, Marine, Mk 8 Mod 0	9-3-1	Hand-Dropped from Surface Craft	Lemon Yellow (Stearated Chrome)	60	7.25	3.5 Max. (Sq.)	31 Oz.
Marker, Location, Marine, AN-M59 (Obsolete)	9-3-2	Hand-Launched from Aircraft	Green Dye (Fluorescein)	120	10.5	3.0	2.9 Lb.

painted around the circumference near the firing end to indicate dye color.

9-2-1-3. Functional Description. Firing should be at no more than 150 knots from an altitude of less than 500 feet. At higher altitudes, the aluminum inner case will burst in the air and spread the dye ineffectually. The pistol should be aimed aft, 45° below the horizontal; this will result in an almost vertical drop of the device. When fired, the primer ignites the propelling charge which projects the inner case and ignites the 10-second delay fuse. The inner case floats in the water and the delay fuse ignites the expelling charge, bursting the inner case and spreading the bright green fluorescein dye over the surface of the water.

9-2-1-4. Handling and Storage. This device shall be handled and stored in accordance with general rules contained in Paragraph 9-1-2 of this chapter.

WARNING

Percussion primers are ignited by a sharp blow. These cartridges must not be dropped or handled in a rough manner.

WARNING

The pyrotechnic pistol is cocked at all times when the breech is closed.

9-2-1-5. Safety Precautions. The safety precautions in Paragraph 9-1-3 of this chapter apply. This device contains black powder both in its propelling charge and in its expelling charge.

9-2-1-6. Shipping Containers. These devices are shipped in a metal container, 200 rounds to the container. A full container weighs approximately 83.5 pounds.

9-2-1-7. Identification Data. The following table applies:

MARKER, LOCATION, MARINE, AN-MK 1 MODS
(Specification MIL-C-18539)

Mod	Dwg. No.	FSN	DOD Code
0	344620	1370-092-9958	L555
1	1212630	1370-075-5850	L555

9-2-2. Marker, Location, Marine, Mk 1 Mods 2 and 3.

(Formerly Depth Charge Marker, Mk 1 Mods 2 and 3)
(Illustration on page 9-4)

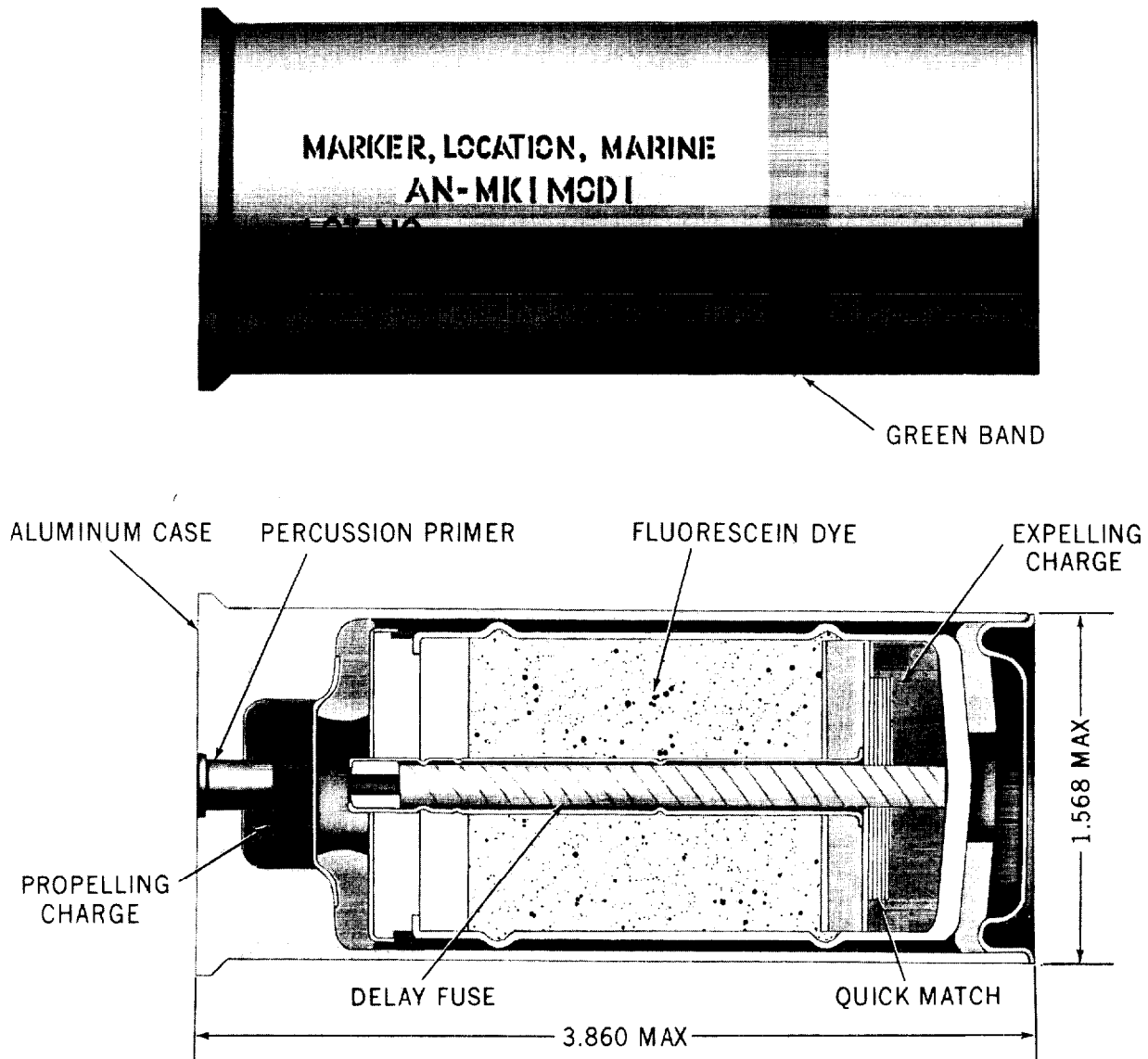


Figure 9.2.1 Marine Location Marker, AN-Mk 1 Mod 1

9-2-2-1. Intended Use. This marker (see Figure 9.2.2) is designed to be hand-launched either from surface craft or aircraft to produce a daylight reference point on the ocean's surface in the form of a dye slick which is used in antisubmarine warfare or as a distress signal in search and rescue operations (see

Table 9-1 for detailed information).

9-2-2-2. External Features. This device consists of two bakelite-lacquered, kraft-paper tubes joined at their inner ends by a wooden block on which is mounted a grenade-type firing mechanism.

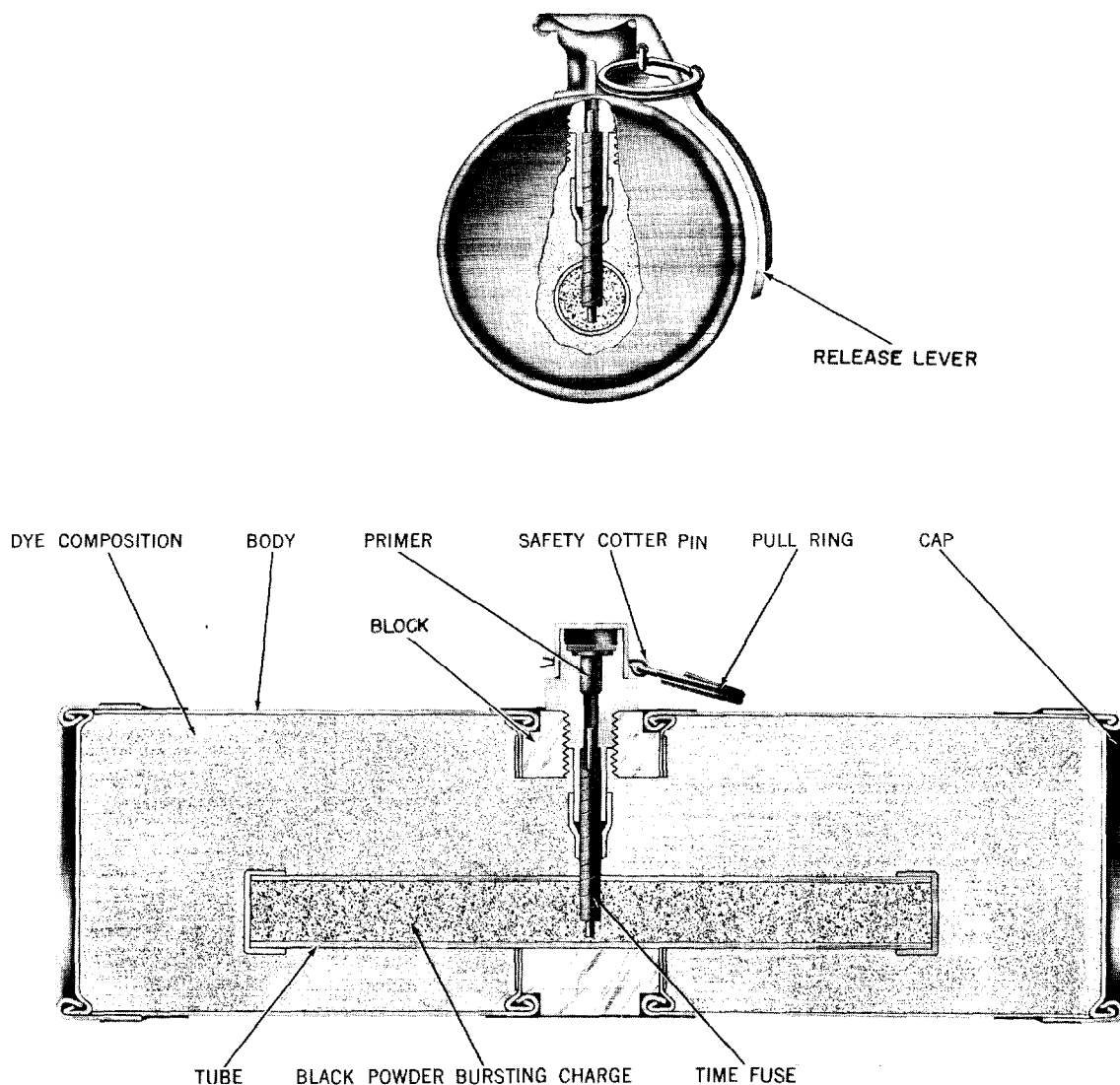


Figure 9.2.2 Marine Location Marker, Mk 1

9-2-2-3. Functional Description. This device has a direct firing system. Once the safety cotter pin has been removed, the marker must be launched. When launching, grasp the device firmly in one hand, holding the release lever snug against the body of the device. Remove the safety cotter pin by pulling the safety ring, and immediately throw the device into the water. When the lever is released, it is forced off by the striker which turns about its hinge pin and hits the primer. The primer ignites the 15-second-delay time fuse which, in turn, sets off the black powder bursting charge. Expanding gases break open the paper tubes

and spread the dye on the water. If this device is to be dropped from aircraft at greater than 1000 ft. altitude, it need not be armed by removing the cotter pin; impact with the water will burst the dye containers and produce the desired results.

9-2-2-4. Handling and Storage. The general handling and storage rules in Paragraph 9-1-2 of this chapter shall be followed. Care must be taken not to puncture the kraft-paper tubes.

9-2-2-5. Safety Precautions. General safety rules in Paragraph 9-1-3 of this chapter apply.

9-2-2-6. Shipping Containers. These marking

devices are shipped 10 rounds to the wooden box. A filled box weighs approximately 68 pounds.

9-2-2-7. Identification Data. The following table applies:

MARKER, LOCATION, MARINE, MK 1 MODS
(Specification MIL-M-18541)

Mod	Dwg. No.	FSN	DOD Code No
2	344487	1370-038-4962	L560
3	1211714	1370-038-4921	L561

9-3. DYE DEVICES CONTAINING NO EXPLOSIVE CHARGE

The markers covered in this section contain no ignition or expelling charge of any kind. They are activated to spread their contents on the surface of the water by simple mechanical breakage of their fragile bodies upon impact with the water.

9-3-1. Marker, Location, Marine, Mk 8 Mod 0
(Formerly Marine Marker, Mk 8 Mod 0)

9-3-1-1. Intended Use. This marker (see Figure 9.3.1) is designed to be used, during daylight only, to produce a chrome yellow slick on the water's surface.

9-3-1-2. External Features. The Mk 8 Marker consists of a ceramic body with a sealed filling hole at the top (see Table 9-1 for specific data).

9-3-1-3. Functional Description. This device is hand-dropped into the water. The ceramic body shatters upon impact. The insoluble steared chrome pigment is spread on the surface.

9-3-1-4. Handling and Storage. This device shall be handled and stored in accordance with Paragraph 9-1-2 of this chapter. Extreme care must be exercised in all handling to avoid breakage of the ceramic body.

9-3-1-5. Safety Precautions. Since this marker contains no explosive or burning components, no special safety precautions are

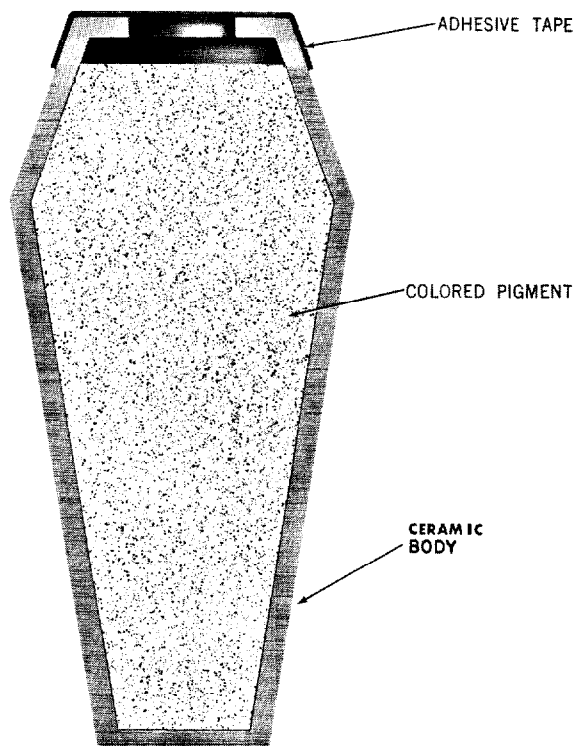


Figure 9.3.1 Marine Location Marker, Mk 8

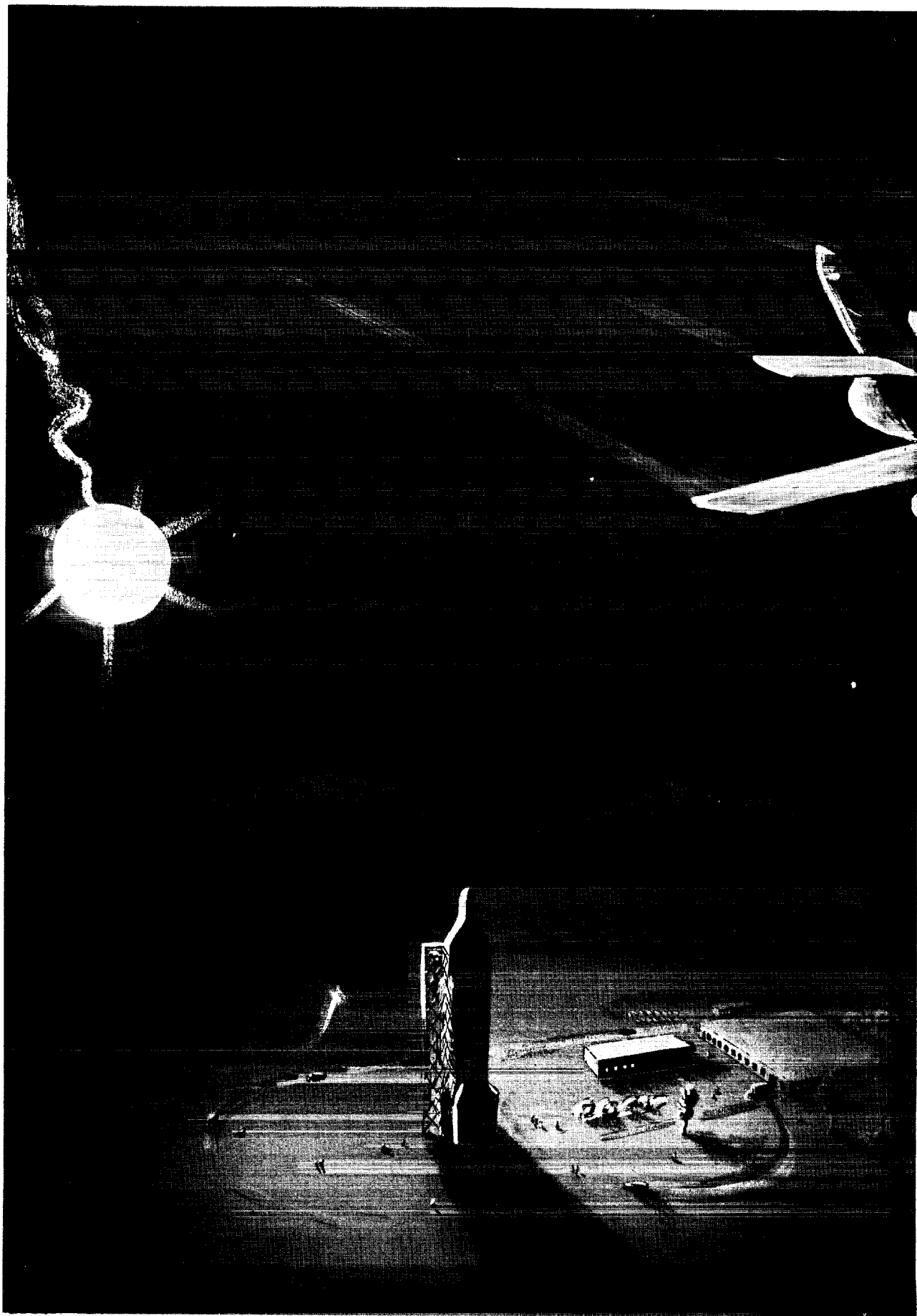
necessary. The dye material is nontoxic but may cause discomfort if ingested.

9-3-1-6. Shipping Containers. This device is packed six rounds to a fiberboard box which weighs roughly 48 pounds filled.

9-3-1-7. Identification Data. This marker is listed under Dwg. No. 1369957, FSN 1370-038-4915, and DOD Code No. L571.

9-3-2. Marker, Location, Marine AN-M59
(Formerly Slick Marker, AN-M59)

NOTE: This marker is disposable and should not be in the supply system. If any are found in the system, they should be returned to an ammunition depot for appropriate disposition.



Photoflash Bomb Provides Light for Night Photography

CHAPTER 10

DEVICES USED FOR NIGHT PHOTOGRAPHY

10-1. INTRODUCTION

This chapter provides information relative to those pyrotechnic items which produce an instantaneous, high-candlepower flash of light for night photographic purposes. While these devices quite obviously are designed to illuminate an area or a target, they must not be confused with those covered in Chapter 6 of this pamphlet, which are used for much dimmer illumination lasting up to 3 minutes.

10-1-1. Arrangement of Material in this Chapter. This chapter is subdivided on the basis of the type of device; i.e., bomb or cartridge, which carries the pyrotechnic flash element to the desired point of activation.

10-1-2. Handling and Storage. Photoflash bombs, bursters, and fuzes, as well as photoflash cartridges, must be handled with particular care at all times. The following specific rules apply:

10-1-2-1. Disposal of Loose Photoflash Powder. Loose photoflash powder from damaged bombs or cartridges should be gently taken up with an oily cloth and the powder covered completely with Number 10 motor oil. The oil-covered powder and the oily rag should be burned in a safe location in accordance with general instructions in OP 5, Ammunition Ashore.

10-1-2-2. Storage. Photoflash bombs, bursters, and fuzes, as well as photoflash cartridges, should be stored in a dry, well-ventilated place out of the direct rays of the sun, and protected against excessive or variable temperatures. Because of the violence of the explosion of photoflash compositions, bombs and cartridges must be stored separately in high explosive magazines in which no other type of ammunition, pyrotechnics, or explosives are

stored. Bombs must not be stored in the same magazine with bursters.

10-1-3. Safety Precautions. Photoflash bombs and cartridges must be handled with the same care as black powder since they explode with great violence and extreme heat. Protective and safety devices must not be removed from fuzes, nor shall any attempt be made to disassemble fuzes. Bombs and cartridges must not be subjected to damage which might cut or dent their cases. Loose photoflash powder may be ignited by a small amount of friction. Personnel are cautioned not to look directly at the explosion of a photoflash bomb or cartridge since the brilliant light may be damaging to vision. The general safety rules of Section 1-8 of Chapter 1 of this pamphlet are applicable.

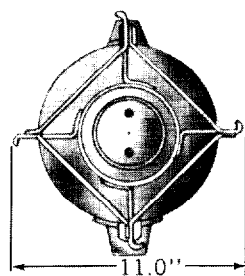
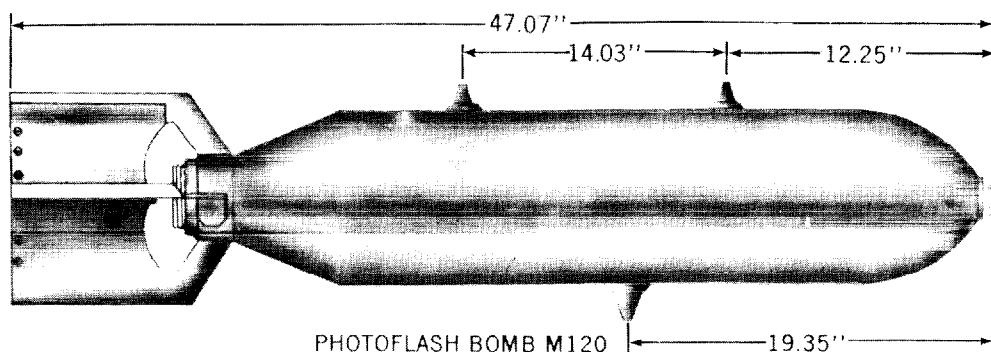
10-1-4. Disposition. Damaged or otherwise unserviceable photoflash devices are to be disposed of in accordance with OP 5, Ammunition Ashore, and Chapter 3 of this pamphlet.

(Table 10-1 on page 10-3)

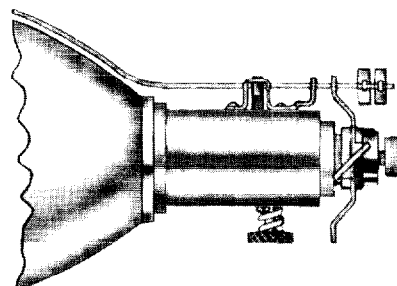
10-2. PHOTOFLASH BOMBS

The pyrotechnic devices in this section resemble standard bombs in outward configuration, ignition, and launching method. Their bodies are typically composed of relatively thin sheet metal, and they may be attached to aircraft wing racks or bomb racks either by suspension lugs fastened directly to the body or by suspension bands which must be installed on them. All photoflash bombs described in this chapter may be launched from any bomb rack now in use by the fleet. These bombs are fitted with tail fins to stabilize their flight.

10-2-1. Bombs, Photoflash, M120 and M120A1



FIN ASSEMBLY M125A1
USED ON PHOTOFLASH BOMB M120



VIEW SHOWING FUZE INSTALLED

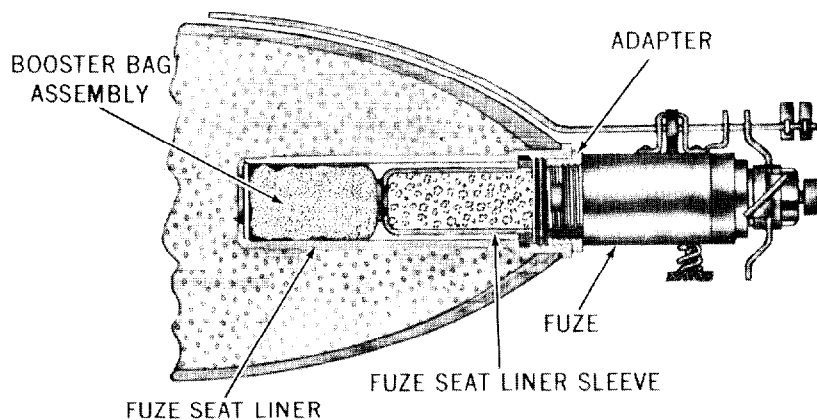
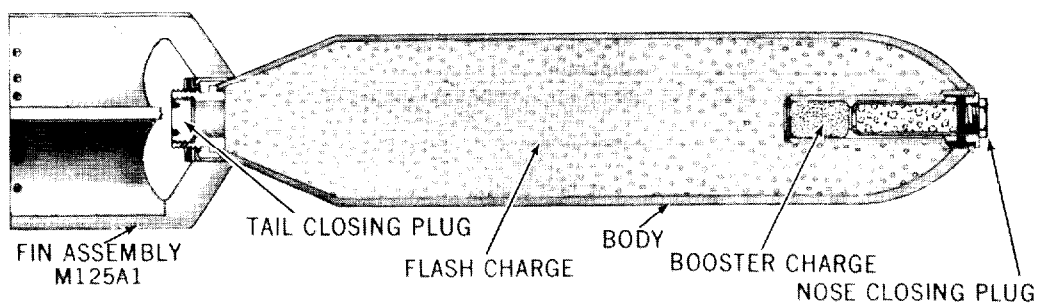


Figure 10.2.1 Photoflash Bomb, M120 & M120A1

DEVICES USED FOR NIGHT PHOTOGRAPHY

TABLE 10-1
NIGHT PHOTOGRAPHIC DEVICES SUMMARY

Item	Para-graph	Flash Comp. Weight	Peak Candle-Power Intensity	Time To Peak (Sec.)	Burn Time (Sec.)	Effect Cp/Secs.	Fuze	Delay (Sec.)	Length (In.)	Diam. (In.)	Weight (Lb.)
Bomb, Photoflash, M120	10-2-1	69 Lb.	3.4 Billion	0.005	0.170	72 (1) Million	M146A1	0.2	39.66	8	152
Bomb, Photoflash, M120A1	10-2-1	82 Lb.	4.25 Billion	0.005	0.180	92 (1) Million	M146A1	0.2	39.66	8	165
Bomb, Photoflash, M122	10-2-2	This bomb is obsolete and must not be used.									
Cartridge, Photoflash, M112A1	10-3-1	7 Oz.	110 Million	0.0015 to 0.003	0.040	1.4 Million	—	1-4 (2)	7.73	1.57	1.47
Cartridge, Photoflash, M123A1	10-3-3	1.75 Lb.	260 Million	0.004	0.040	5.5 Million	—	2-6 (2)	8.45	2.88	4.3

(1) Within first 0.04 Sec.

(2) $\pm$ 10 Percent.

10-2-1-1. Intended Use. These bombs (see Figure 10.2.1) are used to provide instantaneous (0.005 second) light for night photographic missions. The M120A1 differs from the M120 by having larger particles of some of the ingredients in the photoflash powder. This increases the weight of the powder in the loaded bomb. They replaced the Photoflash Bomb AN-M46 because of their greater candlepower and more effective resistance to bullet and flak penetration (see Table 10-1).

10-2-1-2. External Features. Both of these bombs are cylindrical, 39.66 inches long, exclusive of fin and fuze, and approximately 8 inches in diameter. The average wall thickness is 0.19 inch. As shipped, the loaded M120 bomb weighs 152 pounds and contains 69 pounds of photoflash powder; the M120A1 bomb weighs 165 pounds and contains 82 pounds of photoflash powder.

10-2-1-3. Fin Assemblies and Other Associated Equipment. The Fin Assembly, M125A1, is used with both bombs. It is a modified AN-M103A1 box-type fin. The modification consists of three holes on each side of the fin box which permit assembly of the trail plate. Trail Plate Kit M42A1 or M42A2 is normally provided with this assembly. Both bombs use Mechanical Time Fuze, AN-M146A1, which is a

detonator-safe, long-arming, long-range type of fuze. Trail Plate Kit M42A1 (or M42A2) contains an 8-inch square trail plate, an 8-inch circular spoiler ring, and four screws (M42A1) or two nuts and bolts (M42A2) for attaching it to the bomb fin. When the spoiler ring is used, it is held in place by the fuze. The trail plate and the spoiler ring may be used to produce drag necessary to obtain desired trajectory. The M6A2 Arming Wire, a single branch wire 57 inches long and 0.064 inch in diameter, is authorized for use with the M120 and M120A1 Photoflash Bombs.

10-2-1-4. Functional Description. Upon release from the aircraft, the time fuze is actuated by expulsion of the arming pin which is released by the arming wire. The bomb explodes after the preset delay.

10-2-1-5. Handling and Storage. These photoflash bombs shall be handled and stored in accordance with the general provisions of Paragraph 10-1-2 of this chapter. These bombs explode violently giving off intense heat. They are, therefore, missile and fire hazards and should be handled in the same way as bombs used for demolition purposes.

10-2-1-6. Safety Precautions. The safety precautions set forth in Paragraph 10-1-3 of this chapter apply. Protective and safety devices

on the bomb and the fuze must not be removed until just before use.

10-2-1-7. Disposition. Damaged or otherwise defective or unserviceable photoflash bombs shall be disposed of in accordance with applicable instructions in OP 5, Ammunition Ashore, and in Chapter 3 of this pamphlet.

WARNING

These bombs contain large quantities of photoflash powder. The brilliance of the flash produced may be injurious to the eyes. Personnel must not look in the direction of the flash.

10-2-1-8. Identification Data. The following table applies:

Item	Dwg. No.	FSN	DOD Code No.
Bomb, Photoflash, M120	78-2-536-2	1325-028-5344	E926
Bomb, Photoflash, M120A1	-----	1325-028-5345	E926
Fuze, Bomb, Mech, Time, AN-M146A1, M146E3	73-8-328	1325-217-2330	F824
Fin Assembly, Bomb, M125	-----	1325-555-7079	F603
Fin Assembly, Bomb, M125A1	-----	1325-028-5707	F603
Trail Kit, Bomb, M42A1	82-3-765-0	1325-028-5676	E935
Trail Kit, Bomb, M42A2	82-3-765-1	1325-028-5677	E936
Arming Wire Assy., M6A2	82-3-234VB	1325-028-5791	F431

10-2-2. Bomb, Photoflash, M122
(Illustration top of page 10-5)

NOTE: Photoflash Bomb, M122, has been declared obsolete by NAVAIRSYSCOM msg. of 29 April 1968. All M122 Photoflash Bombs found in the supply system should be segregated for appropriate disposal.

10-2-2-1. Intended Use. This bomb (see Figure 10.2.2) is used to provide instantaneous (0.0046 second) light of approximately 1.3 billion candlepower intensity for night photographic missions. It is especially resistant to detonation by bullets or fragment penetration except in the event of a direct hit on its burster. Its pyrotechnic composition is 75 pounds of Mg-A1 (65/35) alloy powder (see Table 10-1).

10-2-2-2. External Features. This bomb is a metal cylinder rounded at its forward end and

tapered at its after end. It has a nose plug fitted into its fuze cavity forward, and stabilizing fins permanently attached aft. Its length, including closing plug and fins, is 49.88 inches. It is approximately 8 inches in diameter.

10-2-2-3. Associated Equipment. The Photoflash Bomb, M122, requires a Mechanical Time Fuze, M147A1. The arming wire issued with the bomb is a single branch wire about 34 inches long and 0.064 inch in diameter. The use of a safety Fahnestock clip is optional when the bomb is carried internally in aircraft with rated cruising speed of not more than 300 knots. When the bomb is carried on an external bomb rack or on an internal bomb rack of aircraft with a rated cruising speed of more than 300 knots, one Fahnestock clip must be used on the arming wire. Trail Plate Kits, M42A1 or M42A2, may be used to modify the fin assembly.

The use of a trail plate depends upon the desired release attitude, aircraft speed, trail angle, and height of burst. These Trail Plate Kits consist of an 8-inch square trail plate, an 8-inch circular spoiler ring, and four screws in the M42A1 Kit or two nuts and bolts in the M42A2 for attaching them to the fin assembly. The spoiler ring, when used, is held in place by the fuze. Thus, the trail plate can be used alone or in conjunction with the spoiler ring to produce drag necessary to obtain the desired trajectory of the bomb.

10-2-2-4. Functional Description. Upon release from the aircraft, the time fuze is actuated by withdrawal of the arming wire from the fuze. The fuze arms within a few seconds and then operates at the time determined by the setting. The fuze booster ignites, setting off the adapter booster charge which then ignites the photoflash powder.

10-2-2-5. Handling and Storage. This photoflash bomb shall be handled and stored in ac-

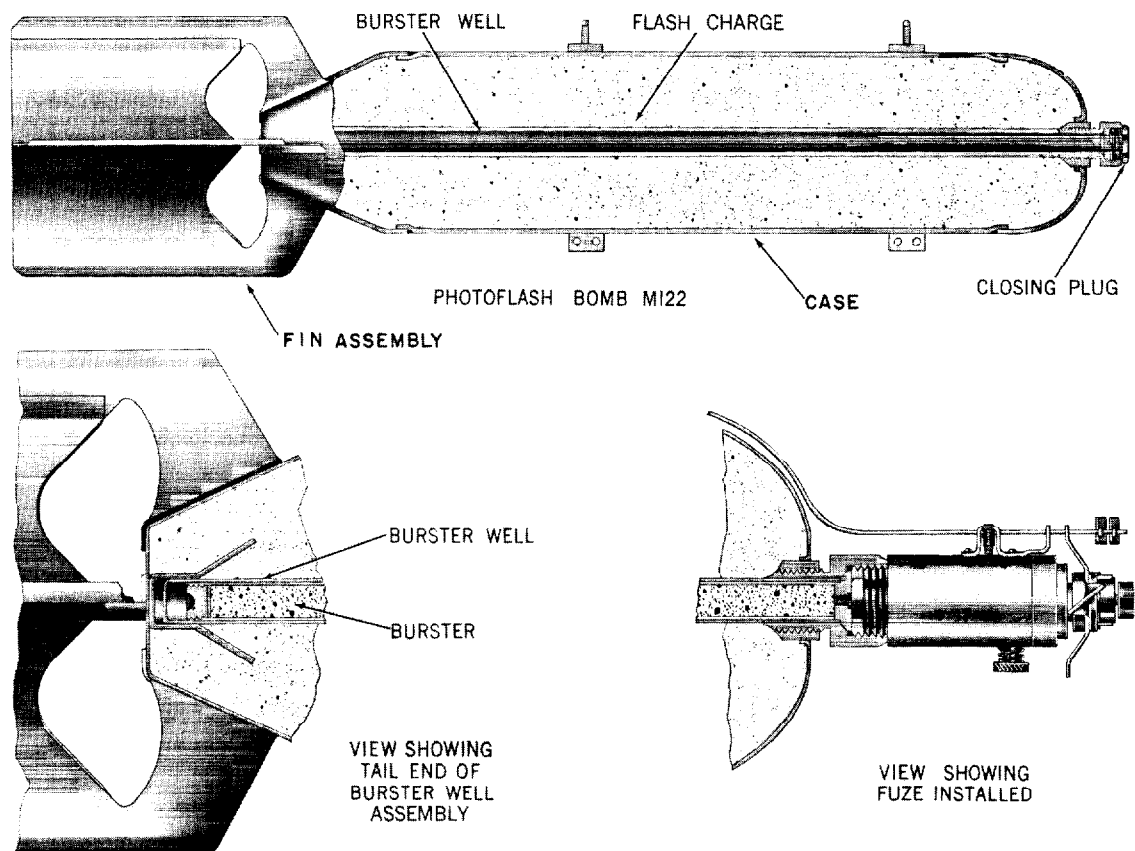


Figure 10.2.2 Photoflash Bomb, M122

cordance with Paragraph 10-1-2 of this chapter. This bomb is an explosive and fire hazard and must be handled accordingly.

10-2-2-6. Disposition. Damaged or otherwise defective or unserviceable photoflash bombs shall be disposed of in accordance with applicable instructions in OP 5, Ammunition Ashore, and in Chapter 3 of this pamphlet. To accomplish destruction by demolition, four $\frac{1}{2}$ -pound TNT blocks are required.

WARNING

Destruction of these bombs shall not be by burning because of the violent explosion and heat generated.

10-2-2-7. Safety Precautions. The safety precautions set forth in Paragraph 10-1-3 of this chapter apply to this bomb.

10-2-2-8. Shipping Containers. Packing data for the components comprising the Bomb,

Photoflash, M122, and trail plates authorized for use therewith are shown in the table on page 10-6.

10-2-2-9. Identification Data. This bomb is obsolete and is not to be requisitioned.

10-3. PHOTOFLASH CARTRIDGES

The pyrotechnic cartridges described in this section are used for low altitude aerial photographic reconnaissance missions. Altitude limitations are determined by the type of aircraft and photographic equipment being used and by the illumination required for satisfactory pictures.

10-3-1. Cartridge, Photoflash, M112A1 Series (Illustration top of page 10-7)

10-3-1-1. Intended Use. This cartridge (see Figure 10.3.1) is initiated electrically at speeds up to mach 0.95 from a multibarreled ejector,

TABLE 10-2-2-8

Components	Packing	Dimensions (in.)	Volume (cu ft)	Weight (lbs)	ASRS Code
Bomb, Photoflash M122 w/ariming wire (w/o burster and w/o fuze)	1 per wooden box	55-5/8 x 10-5/8 x 11-5/8	3.9	150.	11180-B
Burster, M26	20 per wooden box	42-1/2 x 8 x 7-7/8	1.5	79.9	11190-B
Fuze, Bomb, nose mechanical time, AN-M147A1	1 per metal container, 15 containers per wooden box	20-5/8 x 12-1/4 x 9-1/4	1.3	48.0	11450-B
Kit, Trail, Plate, M42A2	1 per carton, 15 cartons per wooden box		2.1		20120-B

Type A6, the firing circuit of which includes an intervalometer that fires the cartridges at 1/2-second intervals, or greater intervals as desired (see Table 10-1).

10-3-1-2. External Features. This cartridge consists of a rimmed aluminum case with an M59 Electric Primer which is covered by a shunt clip. This clip short-circuits the primer, thereby protecting it against accidental ignition. The end of the cartridge opposite the primer is closed with a steel cap. Cartridges in this series differ from each other only in respect to their delay times. They are marked to show a 1-, 2-, or 4-second delay.

WARNING

Because of age and tendency to fire prematurely, all cartridges without A1 in their nomenclature are to be destroyed.

NOTE: During storage, cartridge primers tend to become coated with thread sealant, bits of packaging material, or corrosion which causes faulty electrical conduction and misfires. All primers that exhibit any slightest evidence of such coating must be thoroughly wiped with a clean dry cotton cloth before being used. Such cleaning shall be done in an area of known low electromagnetic field strength and never on the flight line.

WARNING

Cleaning with wool or nylon cloths is prohibited because these materials generate static electricity. No metal tool or metallic substance of any kind is to be used, because of the danger of accidental ignition. Use clean dry cotton cloths only.

10-3-1-3. Special Provisions. All M112A1 Photoflash Cartridge manufactured in calendar year 1955 or later which have been subjected to radiographic inspection and no defects found are considered safe for use. The following special provisions apply:

(1) Each cartridge shall be checked for word "X-rayed" marked thereon.

(2) Loads of these cartridges will not be salvaged except under emergency flight conditions.

10-3-1-4. Functional Description. Electric current, controlled by an intervalometer in the aircraft, fires the primer. The primer ignites the propelling charge which expels the charge case containing photoflash powder and ignites the delay pellet which is held within the charge case. When the delay pellet has burned to the end, it ignites the 7 ounces of photoflash powder which explodes the cartridge and produces

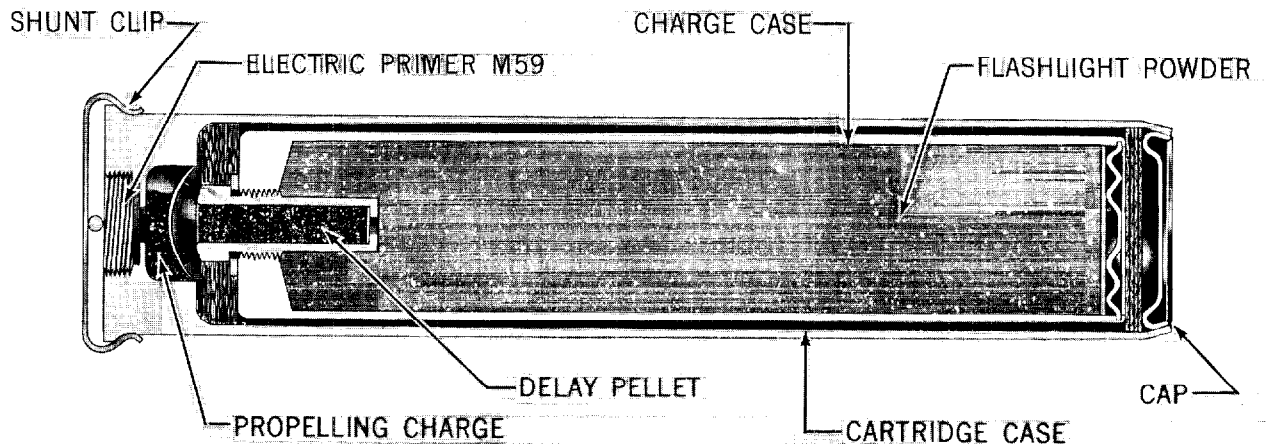


Figure 10.3.1 Photoflash Cartridge, M112A1

the desired flash of light.

10-3-1-5. Handling and Storage. This cartridge shall be handled and stored in accordance with general provisions set forth in Paragraph 10-1-2 of this chapter. Care must be taken not

Item	Delay
Cartridge, Photoflash, M112A1	1-Sec.
Cartridge, Photoflash, M112A1	2-Sec.
Cartridge, Photoflash, M112A1	4-Sec.

to remove the shunt clip over the primer during handling.

10-3-1-6. Safety Precautions. The safety precautions set forth in Paragraph 10-1-3 of this chapter shall be observed. In addition, the following specific rules apply:

(1) The primer shunt clip shall not be removed until just prior to loading the cartridge into the ejector.

(2) No attempt shall be made to disassemble or to alter this cartridge in any way.

10-3-1-7. Shipping Containers. These cart-
CHANGE 17

ridges are shipped 40 rounds to a wooden box. A filled box weighs approximately 75 pounds.

10-3-1-8. Identification Data. This cartridge is listed under BUWEPS Drawing No. 8848546 and Specification MIL-C-11233. FSN and DOD Code Numbers are as follows:

FSN	DOD Code No.
1370-028-5923	L135
1370-028-5924	L136
1370-028-5925	L137

10-3-2. Cartridge, Photoflash, Practice, M121

NOTE: This device is disposable and should not be in the supply system. If any are found in the system, they should be returned to an ammunition depot for appropriate disposition.

10-3-3. Cartridge, Photoflash, M123A1 Series

(Illustration top of page 10-8)

10-3-3-1. Intended Use. This cartridge (see Figure 10.3.2) is designed to be fired from an outer-case type projector for aerial photo-

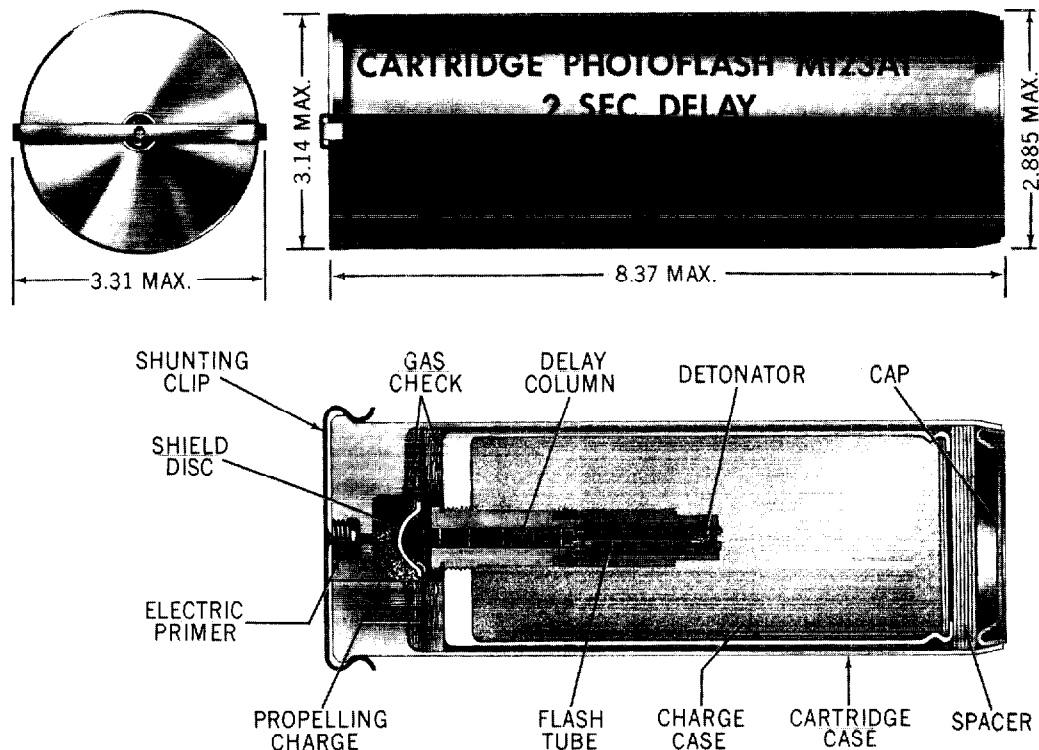


Figure 10.3.2 Photoflash Cartridge, M123A1

graphy during night reconnaissance missions. It contains 1.75 pounds of photoflash powder which provides 260 million candlepower for 0.040 second. The three series differ only in respect to delay times (see Table 10-1 and Paragraph 10-3-3-6 following).

10-3-3-2. External Features. The cartridge consists of a rimmed aluminum case in the base end of which is an M59 Electric Primer. The rimmed end is equipped with a shunt clip which prevents accidental ignition; the other end is closed with a steel cap.

WARNING

Any cartridges found in the system without A1 in their nomenclature shall be destroyed.

NOTE: The primers of these cartridges tend to become coated, during storage, with thread sealant, bits of packaging material, and/or corrosion. All such coating must be carefully removed by rubbing with a clean dry cotton cloth before the cartridge is used. Such cleaning shall be done in an area of low electromagnetic field strength and never on the flight line.

WARNING

Wool or nylon cloths must never be used in cleaning primers since rubbing with these materials generates static electricity. No metal tool or metallic substance of any kind is to be used, because of the danger of accidental ignition. Use clean dry cotton cloths only.

10-3-3-3. Functional Description. This series of cartridges functions in the same way as the M112A series (see Paragraph 10-3-1 preceding). The same handling, storage, and safety rules and warnings apply.

10-3-3-4. Disposition. Unserviceable photoflash cartridges shall be disposed of in accordance with OP 5, Ammunition Ashore, and Chapter 3 of this pamphlet.

10-3-3-5. Shipping Containers. These cartridges are packaged three to a cardboard container, four such containers (12 cartridges) to a wooden box, the gross (filled) weight of which is approximately 74.5 pounds.

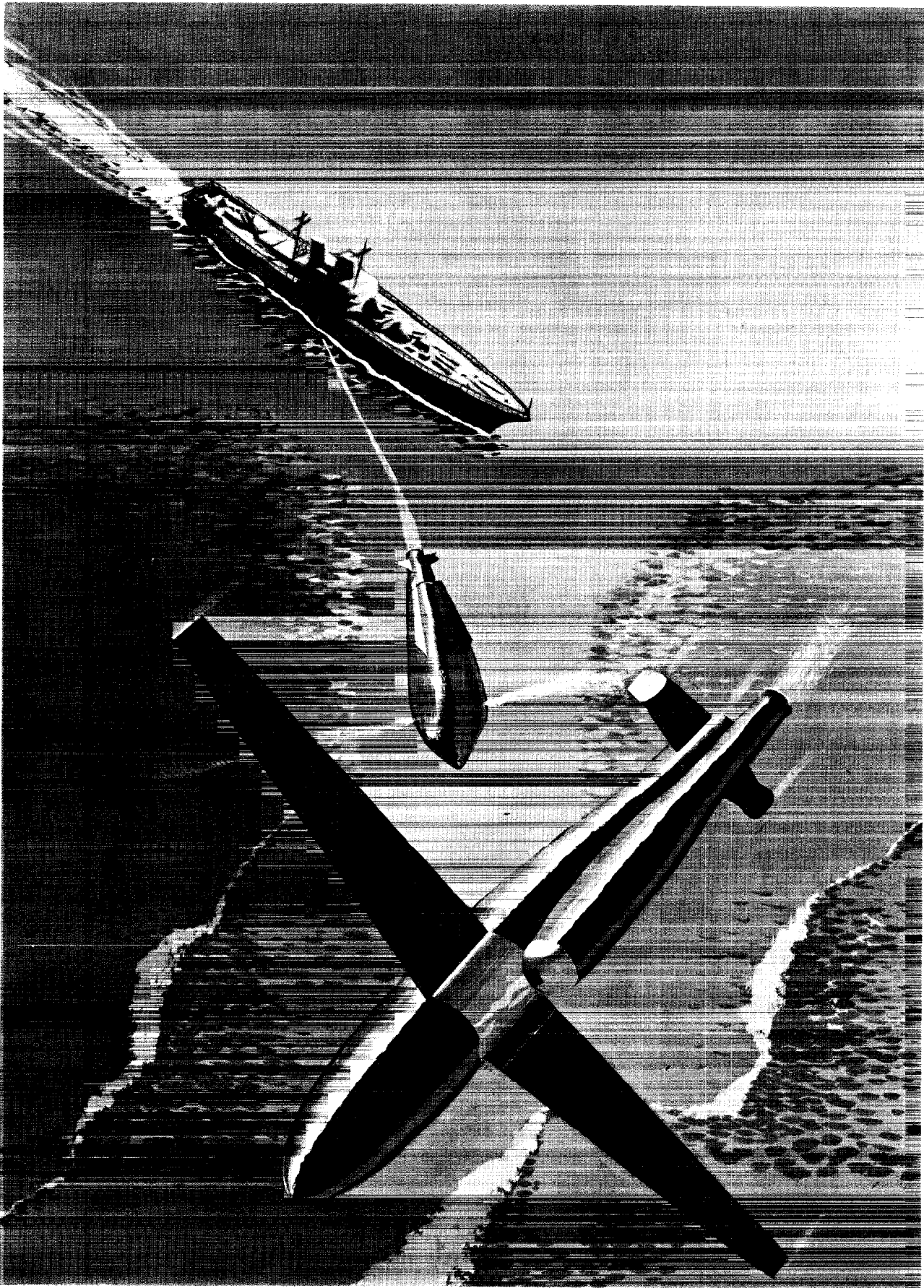
10-3-3-6. Identification Data. This cartridge is listed under Dwg. No. 78-0-134 and Specification MIL-C-12910. FSN and DOD Code Numbers are as follows:

Item	Delay	FSN	DOD Code No.
Cartridge, Photoflash, M123A1	2-Sec.	1370-028-5927	L139
Cartridge, Photoflash, M123A1	4-Sec.	1370-028-5926	L140
Cartridge, Photoflash, M123A1	6-Sec.	1370-028-5928	L141

10-3-4. Cartridge, Photoflash, Practice, M124

NOTE: This cartridge is disposable and should not be in the supply system. If

any are found in the system, they should be returned to an ammunition depot for appropriate disposition.



Pyrotechnics Show Time and Place of Missile Fuze Action

CHAPTER 11

IMPACT AND FUZE ACTION INDICATORS

11-1. INTRODUCTION

This chapter covers those pyrotechnic devices which give a visible, audible, or otherwise detectable indication of the time and place of impact or fuze action in practice weapons.

11-1-1. Handling and Storage. The general handling and storage requirements set forth in Chapter 1 of this pamphlet apply to all of the devices in this chapter. In addition, individual item descriptions contain, as necessary, any special handling and storage rules that are peculiar to the devices being described.

11-1-2. Safety Precautions. The general safety precautions of Section 1-8 of Chapter 1 of this pamphlet apply to the devices in this chapter. Individual item descriptions contain special safety precautions as appropriate.

11-1-3. Disposition. Damaged or otherwise unserviceable impact and fuze action indicating pyrotechnics shall be disposed of in accordance with Chapter 3 of this pamphlet.

(Table 11-1 on page 11-2)

11-2. BOMB IMPACT INDICATORS

The devices described in this section are installed in practice bombs to provide indication of bombing accuracy. These pyrotechnics produce a flash of light and a puff of smoke to show the point of bomb impact.

11-2-1. Cartridge, Signal, Practice Bomb, Mk 4 Mods 3 and 4
(Formerly Signal, Practice Bomb, Mk 4 Mods 3 and 4)
(Illustration top of page 11-3)

11-2-1-1. Intended Use. This device (see Figure 11.2.1) is used in various practice bombs which are launched from aircraft to indicate

the point of bomb impact. The Mod 3 burns red phosphorus to produce a flash of light and a puff of white smoke; the Mod 4 contains an inert marker load of zinc oxide. Except for this difference in filler composition, the mods are essentially identical. The device is not reliable when dropped in water or on any easily penetrated surface from high altitudes or at high speeds. The Practice Bomb Signal Cartridge, Mk 111 Mod O, described in Paragraph 11-2-2 following, should be used in training exercises over such surfaces.

11-2-1-2. Description. This cartridge consists of a cylindrical aluminum case approximately 5 inches long and .85 inch in diameter. The case is closed at its forward end with an aluminum cover. The other end is rimmed and contains a percussion primer, Mk 119.

11-2-1-3. Operation. This device is fitted into the signal cavity of the practice bomb in accordance with instructions covering the bomb being used. When the bomb is dropped, impact forces the firing pin against the signal primer, igniting the expelling charge. The expelling charge (3.2 grams of smokeless powder) ignites and expels the phosphorus composition of the Mod 3; it simply expels a cloud of zinc oxide powder in the case of the Mod 4.

11-2-1-4. Installation and Assembly. This cartridge shall be installed in accordance with instructions covering the particular practice bomb being used.

11-2-1-5. Disposition. Dented, deformed, or otherwise unserviceable cartridges shall not be used but shall be disposed of in accordance with Chapter 3 of this pamphlet.

WARNING

The primer must not extend beyond the face of the cartridge

TABLE 11-1
IMPACT AND FUZE ACTION INDICATORS SUMMARY

Item	Para-graph	Display	Burning Time	Delay	Used With	Approx. Length (Inches)	Approx. Diam. (Inches)	Approx. Weight (Lbs.)
Cartridge, Signal, Practice Bomb, Mk 4 Mods 3 and 4	11-2-1	Flash of Light and Puff of White Smoke	Not Applicable	None	Various Practice Bombs	6	0.85	0.11
Cartridge, Signal, Practice Bomb, Mk 111 Mod 0	11-2-2	Yellow Flash & White Smoke	Not Applicable	None	Various Practice Bombs	4.7	0.85	0.38
Marker, Location, Marine, Mk 38	11-3-1	Green Smoke & Green Flame	Smoke: 50-90 Sec. Flame: 45-72 Sec.	15-25 Sec.	Practice Demolition Device Mk 37 Mod 0	4.8	2.3	1.00
Signal Assembly, Mk 25 Mod 2	11-4-1	White Smoke & Yellow Flame	3-5 Minutes	Hydrostatic	Drill Mines, Mks 25, 36, 52, 55, 56	9.0	4.0	--
Signal Assembly, Mk 26 Mods 1 & 2	11-4-2	White Smoke & Yellow Flame	2-6 Minutes	25-85 Sec.	Drill Mines, Mks 6, 10, 49 and Mk 51 Mod 1	10.56	2.42	--
Signal Assembly, Mks 39, 40, 43 and 44	11-4-3	Mks 39 & 40: Green Smoke & Flame Mks 43 & 44: Red Smoke & Flame	Smoke: 70 Sec. (Avg) Flame: 45 Sec.	38-72 Sec.	Drill Mines, Mks 18, 25, 36, 52, & 56	9.5	4.0	2.67
Signal, Smoke & Illumination, Marine, Mk 55	11-4-4	White Smoke & Yellow Flame	90-135 Sec.	3-12 Sec.	Drill Mines, Mks 56 & 57	4.0	4.0	3.50
Signal, Flash, Guided Missile, Mk 33 Mods 0 and 1	11-5-1	Flash of Light	30 ± 10 Ms	None	Talos (RIM-8)	5.4	1.8	0.75
Signal, Flash, Guided Missile, Mk 37 Mods 0 and 1	11-5-2	Flash of Light	0.010 Sec. (Min.)	None	Sparrow III (AIM-7)	2.3	2.0	0.5
Signal, Flash, Guided Missile, Mk 42 Mod 0	11-5-3	Flash of Light	0.015 Sec. (Min.)	None	Sparrow III (AIM-7)	2.3	1.35	1.0
Signal Kit, Flash, Mk 47 Mod 0	11-5-4	Flash of Light	0.010 Sec. (Min.)	None	Tartar (RIM-24)	4.5	1.65	--
Signal, Flash, Guided Missile, Mk 49 Mod 0	11-5-5	Flash of Light	0.010 Sec.	None	Terrier (BT-3)	3.0	3.0	--
Unit, Color Burst, Mk 1	11-6-1	Colored Smoke, Gray	--	--	3"/50 Cal.	3.17	1.83	--
Unit, Color Burst, Mk 2	11-6-1	Colored Smoke, Gray	--	--	5"/38 Cal.	8.24	1.85	--
Unit, Color Burst, Mk 3 Mods 0 & 1	11-6-2	Mod 0 - Red Dye Mod 1 - Yellow Dye	--	--	5"/38 Cal.	8.42	2.22	--
Unit, Color Burst, Mk 5 Mod 0	11-6-3	Red Dye	--	--	3"/50 Cal.	7.5	2.3	2.59
Unit, Color Burst, Mk 6 Mod 0	11-6-3	Yellow Dye	--	--	3"/50 Cal.	7.5	2.3	2.59
Unit, Color Burst Mk 7 Mod 0	11-6-3	Blue Dye	--	--	3"/50 Cal.	7.5	2.3	2.52
Marker Kit, Location, Mk 19 Mod 0	11-7-1	Orange Smoke	4 Minutes	Hydrostatic	Torpedo Mk 45 Mod 0	--	--	--
Signal, Float, Torpedo, Mk 21 Mod 1	11-7-2	Yellow Flame & White Smoke	--	--	Various Torpedoes	11.5	2.5	--

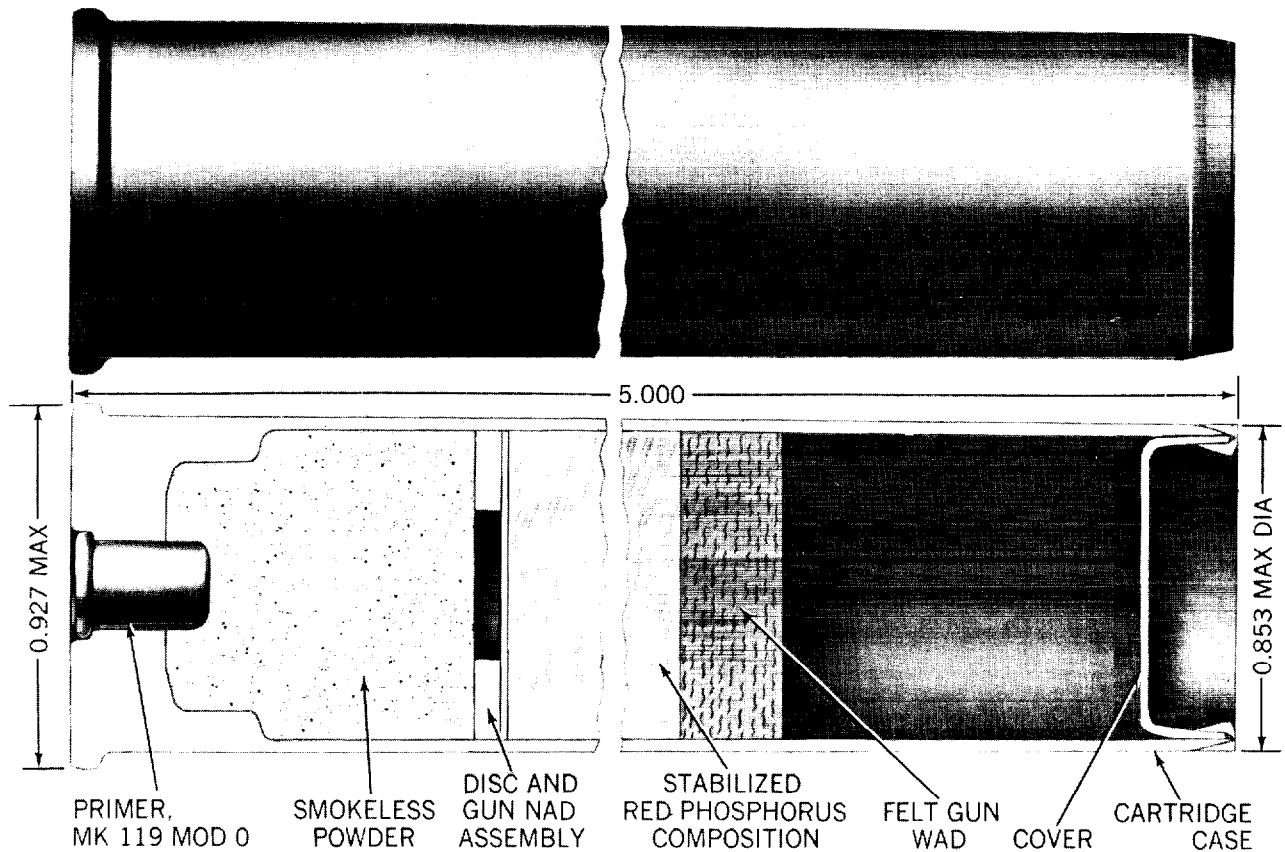


Figure 11.2.1 Practice Bomb Signal Cartridge, Mk 4

case. Do not permit the cartridge primer to strike any hard object since it could cause the cartridge to function.

11-2-1-6. Handling and Storage. This device shall be handled and stored in accordance with the general rules set forth in Chapter 1 of this pamphlet.

11-2-1-7. Safety Precautions. The general safety precautions of Section 1-8 of Chapter 1 of this pamphlet apply.

11-2-1-8. Shipping Containers. This device is shipped in a wooden box, 500 rounds to the box.

11-2-1-9. Identification Data. The following table is applicable to this device:

Cartridge, Signal, Practice Bomb, Mk 4 Mods

	Mod 3	Mod 4
Dwg. or LD No.	BUWEPS LD 166560	BUWEPS LD 256093
Specification	MIL-S-18538	MIL-S-18538
Federal Stock No.	1325-038-4638	1325-038-4640
DOD Code No.	F562	F563

11-2-2. Cartridge, Signal, Practice Bomb, Mk 111 Mod 0

(Formerly Signal, Practice Bomb, Mk 18 Mod 0)

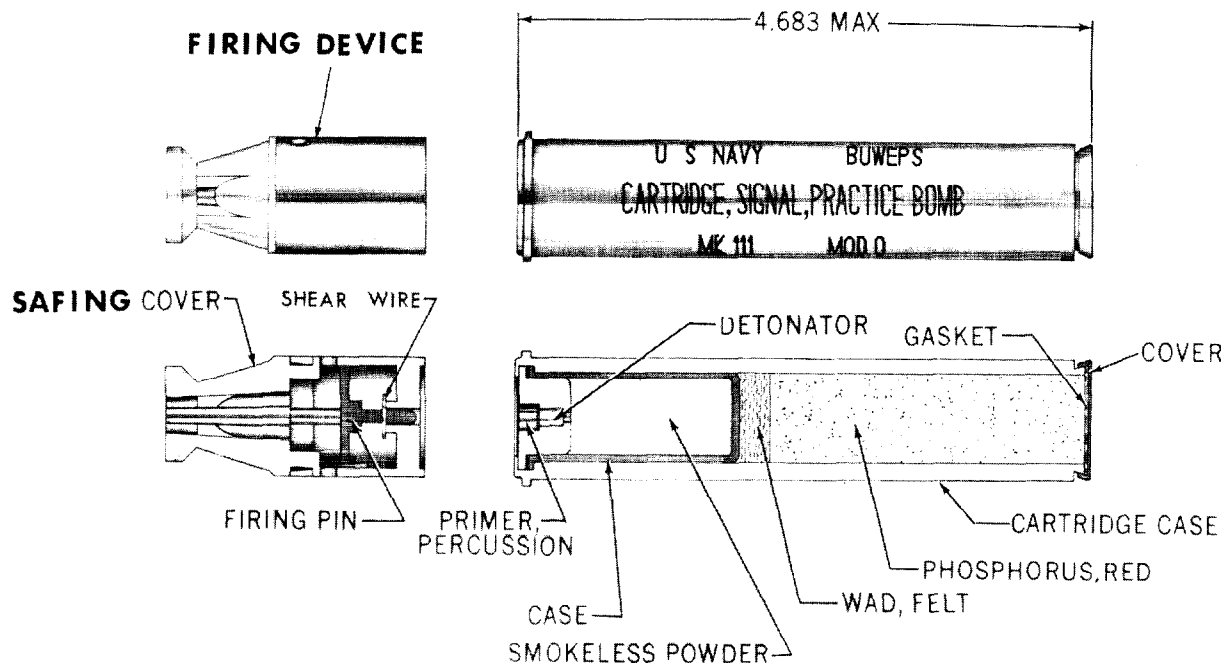


Figure 11.2.2 Practice Bomb Signal Cartridge, Mk 111

11-2-2-1. Intended Use. This device (see Figure 11.2.2) is used with various practice bombs to produce visual impact indications in high-speed, high-altitude aircrew training exercises, particularly over water and other easily penetrated surfaces. It is activated upon impact to produce a yellow flash and a white smoke cloud approximately 5 feet in diameter. It was designed to supplement Practice Bomb Signal Cartridge, Mk 4 Mod 3, which does not function reliably in high-speed, high-altitude exercises on soft surfaces.

11-2-2-2. Description. This device consists of a cylindrical steel cartridge case with a percussion-type primer centered and recessed in its rimmed base. Its firing device, which is separate from the cartridge, consists of an aluminum housing enclosing a firing pin. A plastic safing cover is fitted on the firing device and prevents movement of the firing pin during loading of the cartridge into a practice bomb.

11-2-2-3. Operation. When the practice bomb in which this cartridge and its firing device have been installed strikes any easily penetrated surface, impact forces the firing pin against the primer. The primer ignites the detonator which initiates very rapid burning of the smokeless powder ejection charge. The ejection charge ignites and ejects the red phosphorus composition through an opening toward the tail of the bomb.

NOTE: The firing device of this cartridge normally does not function reliably on hard surfaces. The Mk 4 Cartridge should be used on such surfaces.

11-2-2-4. Installation and Assembly. This cartridge shall be installed in accordance with instructions covering the particular practice bomb being used.

11-2-2-5. Disposition. Dented, deformed, or otherwise unserviceable cartridges must not be

used but must be disposed of in accordance with Chapter 3 of this pamphlet.

WARNING

The primer must not extend beyond the face of the cartridge case. Do not permit cartridge primer to strike any hard object since it could cause cartridge to function.

WARNING

Under no circumstances shall this cartridge be used with the Firing Pin, Mk 1 Mod 0 which is shipped with practice bombs.

11-2-2-6. Handling and Storage. This cartridge and its firing device have been designed to withstand normal handling. Rough and careless handling could easily ignite the primer. The cartridges must not be removed from storage or unpacked in advance of requirements. If unpacked and not used, they should be returned to original storage condition. Storage and handling must be in accordance with the general rules set forth in Chapter 1 of this pamphlet.

11-2-2-7. Safety Precautions. The general precautions of Section 1-8 of Chapter 1 of this pamphlet are pertinent to this device and shall be observed. In addition, the following special safety rules apply particularly to this device:

(1) Dented, punctured, deformed, or otherwise damaged cartridges shall not be loaded into practice bombs.

(2) Percussion primers must not extend beyond the face of the cartridge case.

WARNING

This cartridge is ignited by a blow on its primer. Ignition and expulsion actions of this device are extremely violent. When not confined within a practice bomb, the cartridge case will fragment upon initiation of the detonator and create a serious shrapnel hazard. Also combustion fumes are toxic.

(3) This cartridge is to be used only with the firing device with which it is shipped, unless bomb instructions specify otherwise.

(4) The plastic safing cover must always be used in inserting the firing device of this cartridge into a practice bomb. It prevents the firing pin from being forced against the primer.

11-2-2-8. Shipping Containers. This cartridge and its firing device are shipped 25 to a polystyrene inner container, eight such containers to the metal Mk 2 Ammunition Component Box.

11-2-2-9. Identification Data. This cartridge is listed under BUWEPS LD 615169 and Specification WS 1897, FSN 1325-916-3203, and DOD Code No. F570.

11-3. DEMOLITION CHARGE FUZE ACTION INDICATORS

The devices described in this section indicate the time and place of the activation of associated demolition charge fuzes.

11-3-1. Marker, Location, Marine, Mk 38 Mod 0

(Illustration top of page 11-6)

11-3-1-1. Intended Use. This device (see Figure 11.3.1) is the pyrotechnic component of a practice demolition device described in OP 2212, Vol. 2 (Confidential), Subj: Demolition Materials. The marker produces green smoke and a green flame to indicate time and place of fuze action.

11-3-1-2. Description. This device consists of a cylindrical aluminum body approximately 4.8 inches long and 2.3 inches in diameter. One end is closed with a flanged base plate and an O-ring. A centered hole in the base contains gasless ignition powder. The opposite end has a blow-out seal assembly in its center which seals the 1/2-inch diameter display emission hole.

11-3-1-3. Associated Equipment. A complete description of the associated equipment used with this device is contained in OP 2212, Vol. 2 (Confidential), Subj: Demolition Materials.

11-3-1-4. Operation. The associated firing device activates the ignition powder which

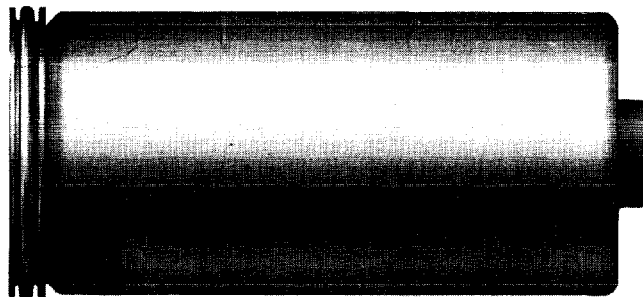
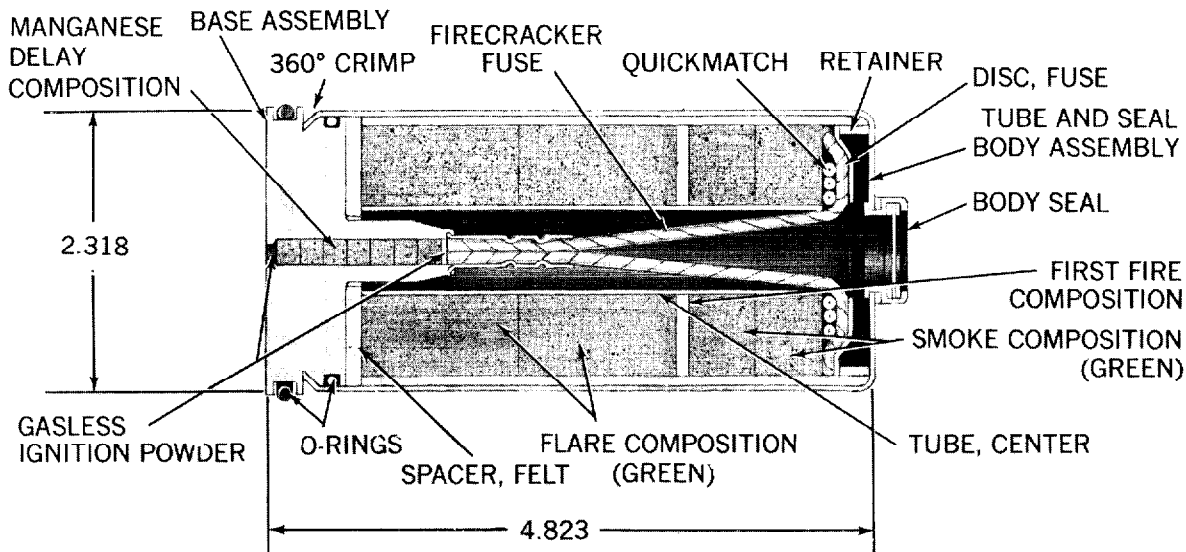


Figure 11.3.1 Marine Location Marker, Mk 38

ignites the 15-second (minimum) delay composition. The delay composition permits surfacing of the marker before smoke is produced. Upon completion of its burning, the delay composition ignites a firecracker fuse which ignites a quickmatch and a cellulose nitrate fuse disk which combine to ignite the smoke composition. Gases force out the emission hole seal. Near the completion of its burning, the smoke composition ignites a first-fire composition which ignites the flame composition. It emits green smoke for a period of 50 to 90 seconds followed by green flame for a period of 45 to 73 seconds.

11-3-1-5. Handling and Storage and Safety Precautions. The rules on handling and safety as set forth in Chapter 1 of this pamphlet are applicable to this device.

11-3-1-6. Shipping Containers. This marker

is packaged in an individual hermetically sealed can, 32 such cans to the outer container. The gross weight of a filled container is approximately 72 pounds.

11-3-1-7. Identification Data. This device is listed under BUWEPS List of Drawings 615129, Dwg. No. 2112818, Specification WS 1900, FSN 1370-866-9787, and DOD Code No. L583.

11-4. MINE FUZE ACTION INDICATORS

The devices in this section show the time and place of fuze action in various drill mines.

11-4-1. Signal Assembly, Mk 25 Mod 2.
(Formerly Signal, Drill Mine, Mk 25)
(Illustration top of page 11-7)

11-4-1-1. Intended Use. This device (see Figure 11.4.1) is a buoyant, flame- and smoke-

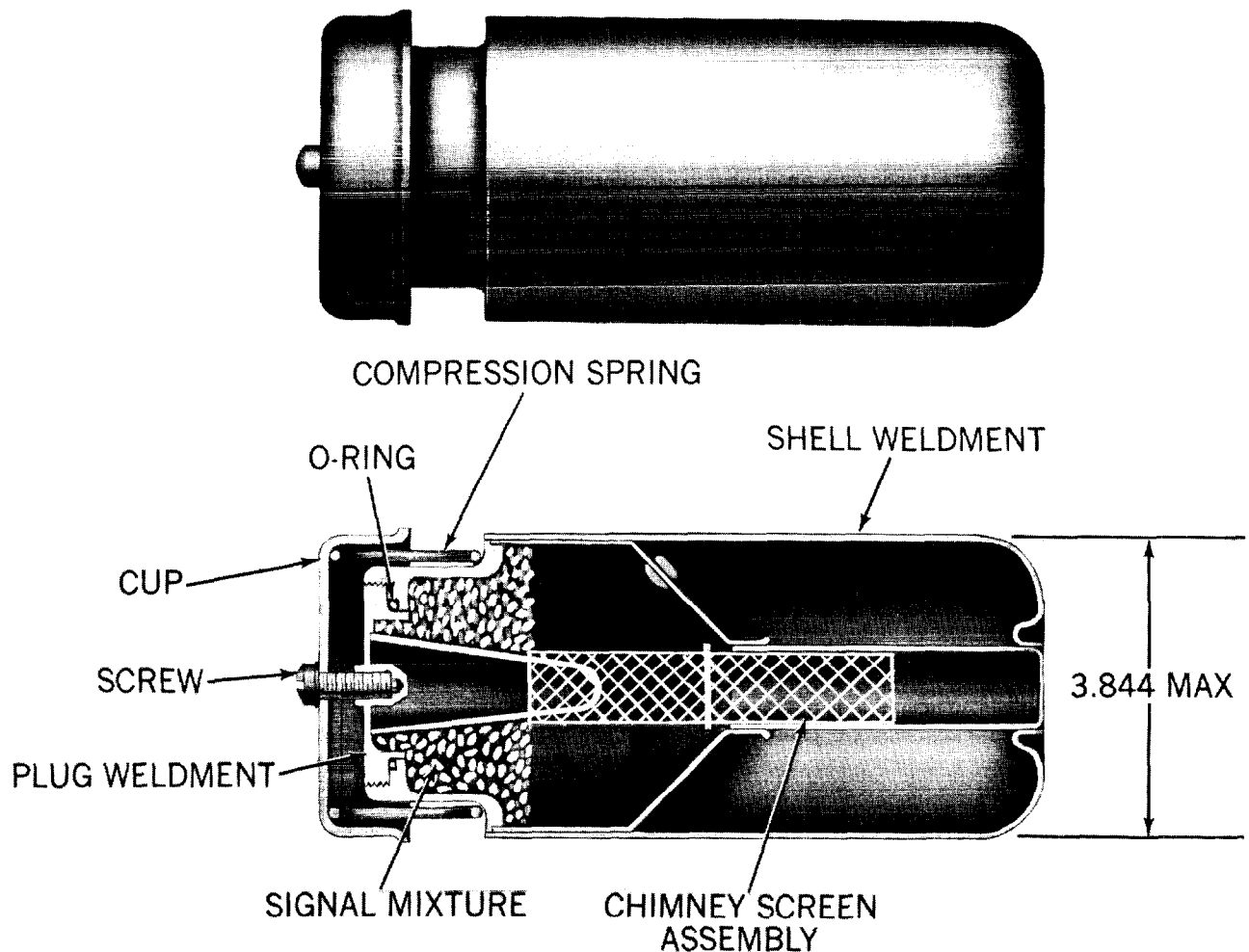


Figure 11.4.1 Signal Assembly, Mk 25

producing pyrotechnic element which is used in conjunction with the Drill Mines, Mks 25, 36, 52, 55, and 56, to indicate the time and place of fuze action. It produces a dense, white smoke and yellow flame which lasts for three to five minutes.

11-4-1-2. Description. This signal consists of an aluminum cylinder approximately 9 inches long and 3.8 inches in diameter. The top of the cylinder is rounded with an indentation in its center to accommodate a sealed chimney which projects through the indentation. Approximately 2 inches of the cylinder at the base end is of a smaller diameter than the main body to provide a bearing surface for the coil spring which helps to force the signal out of the well. The base of the cylinder is sealed by a circular cup which is screwed and staked

into place.

11-4-1-3. Operation. This device is internally divided into two compartments. The upper compartment is buoyant and causes the signal to rise to the surface in the proper attitude for functioning. The lower compartment contains 250 grams of a mixture of calcium phosphide and magnesium aluminum phosphide. In the presence of water, these chemicals react to produce the desired smoke and flame. When current is received from the mine firing circuit, an explosive fitting fires and forces the signal against the punch cap with sufficient force to shear the rivets which hold the punch cap in place and also to puncture a hole in the sealed chimney. This force also causes shearing action at the signal base thus opening the chimney tube arrangement. A phosphor bronze

spring on the signal base exerts pressure to complete the expulsion of the signal from the well. Water entering through the chimney top or base flows into the signal and reacts with the phosphide chemicals. Smoke and flame emit through the punctured chimney when the signal reaches the surface.

11-4-1-4. Installation and Make-Ready Procedures. This signal shall be installed and prepared for its intended use in accordance with the procedures set forth in NAVWEPS OP 956.

11-4-1-5. Handling and Storage. This signal assembly shall be handled and stored in accordance with the general provisions of Section 1-6 of Chapter 1 of this pamphlet.

11-4-1-6. Safety Precautions. The safety precautions set forth in Section 1-8 of Chapter 1 of this pamphlet apply to this device.

11-4-1-7. Identification Data. This device is listed under BUWEPS LD 515881, Specifica-

tion OS 8732, FSN 1351-979-6087, and DOD Code No. X132.

NOTE: Mods 0 and 1 of this assembly are obsolete and should not be in the supply system. If any are found in the system, they should be returned to an ammunition depot for appropriate disposition.

11-4-2. Signal Assembly, Mk 26 Mods 0 and 1 (Formerly Signal, Drill Mine, Mk 26)

11-4-2-1. Intended Use. This device (see figure 11-4.2) is used to indicate the time and place of fuze functioning in Drill Mines, Mk 6 Mod 0; Mk 10 Mod 3; Mk 49 Mods 0, 1, and 2; and Mk 51 Mod 1. It is used with the Projector, Mk 18 Mod 0 (FSN 1350-038-7381, DOD Code No. R537) to produce white smoke and yellow flame for 2 to 6 minutes on the surface.

11-4-2-2. Description. This signal consists

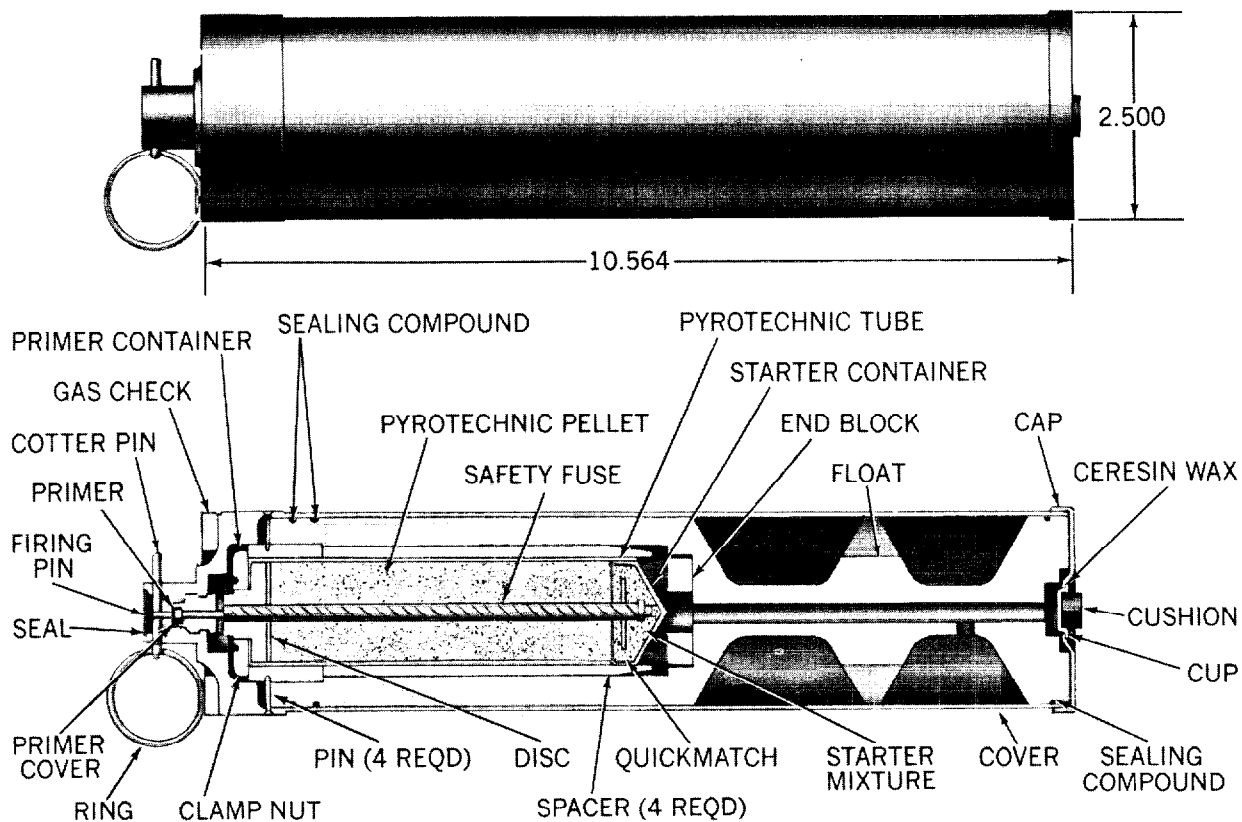


Figure 11.4.2 Signal Assembly, Mk 26

of a buoyant, closed cylinder approximately 11.50 inches in length and 2.50 inches in diameter. The wooden body, or float, is encased in a fiberglass cover. A cap which contains the firing pin and primer extends from the base end of the float, and there is a felt gas check on the base for use in the projector. The Ejector, Flare, Mk 1 Mod 0 (Explosive Loaded), is for assembly and use with the projector. Either of the two mods of this signal may be used since the differences are relatively insignificant.

11-4-2.3. Operation. When this device is installed with the ejector in the Projector, Mk 18, the ejector actuates the firing pin which strikes and initiates the primer. Pressure generated by blackpowder propels the signal out of the projector. The signal is expelled from the projector and rises toward the surface. During the signal's rise at the rate of 3 feet per second, the primer ignites the time fuse which, after a delay of from 25 to 85 seconds, ignites the starter mix. The starter mix, in turn, ignites the pyrotechnic pellet. Combustion pressure forces off the tin cup seal, the felt cushion, and the aluminum cap, and the flame and smoke are emitted.

11-4-2.4. Associated Equipment and Materials. The equipment and materials associated with this device are listed in NAVWEPS OP 1878.

11-4-2.5. Installation and Make-Ready Procedures. This signal shall be installed and made ready for use in accordance with the procedures contained in NAVWEPS OP 1878.

11-4-2.6. Handling and Storage. This device shall be handled and stored in accordance with the general rules in Section 1-6 of Chapter 1 of this pamphlet.

11-4-2.7. Safety Precautions. The general safety precautions in Section 1-8 of Chapter 1 of this pamphlet apply. In addition, the following special precautions must be observed:

(1) Since the pyrotechnic mixture in the device contains phosphorus, care must be exercised to avoid fumes of its combustion, these fumes are moderately toxic if inhaled

in the open; in closed areas, the toxic hazard would be severe.

(2) In burning, portions of red phosphorus are converted to white phosphorus which ignites spontaneously and re-ignites on contact with air after being extinguished.

11-4-2.8. Shipping Containers. This device is packaged individually in moisture-resistant cartons (LD 291078). Fourteen such cartons are shipped in an outer container (LD 291042).

11-4-2.9. Identification Data. The following table is applicable to this device:

Signal, Assembly, Mk 26 Mods

	Mod 0	Mod 1
List of Drawings	LD 284882	LD 496406
Specification	MIL-S-81004	MIL-S-81004
Federal Stock No.	1351-038-7383	1350-672-0340
DOD Code No.	R 812	R 598

11-4-3. Signal Assembly, Mks 39, 40, 43, and 44 Mod 0

(Formerly Signal, Drill Mine, Mks 39, 40, 43, and 44)

NOTE: Signal Assembly, Mks 40 and 43 have been indicated as obsolete by SPCC. If these two items are found in the stores of any ships or stations, they should be returned to an ammunition depot for appropriate disposition action.

11-4-3.1. Intended Use. This device (see Figure 11.4.3) is employed as the pyrotechnic element in the Mk 15 Mod 0 Float to produce colored smoke and flame which indicates fuze action of Drill Mines, Mks 18, 25, 36, 52, 55, and 56, as in OD 6678, during training exercises. The various marks of this signal assembly are identical in all outward characteristics. They differ principally in the colors of their displays and in their delay times (see Paragraph 11-4-3-8 following).

11-4-3.2. Description. This signal is a cylindrical aluminum shell approximately

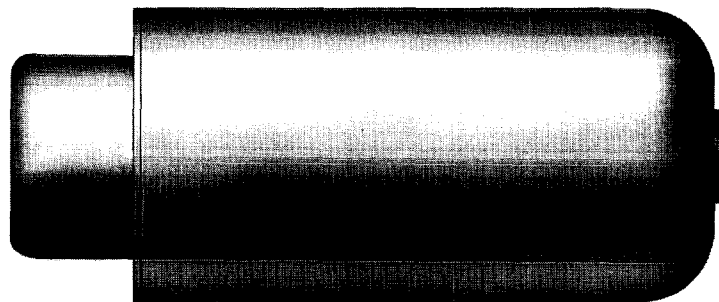
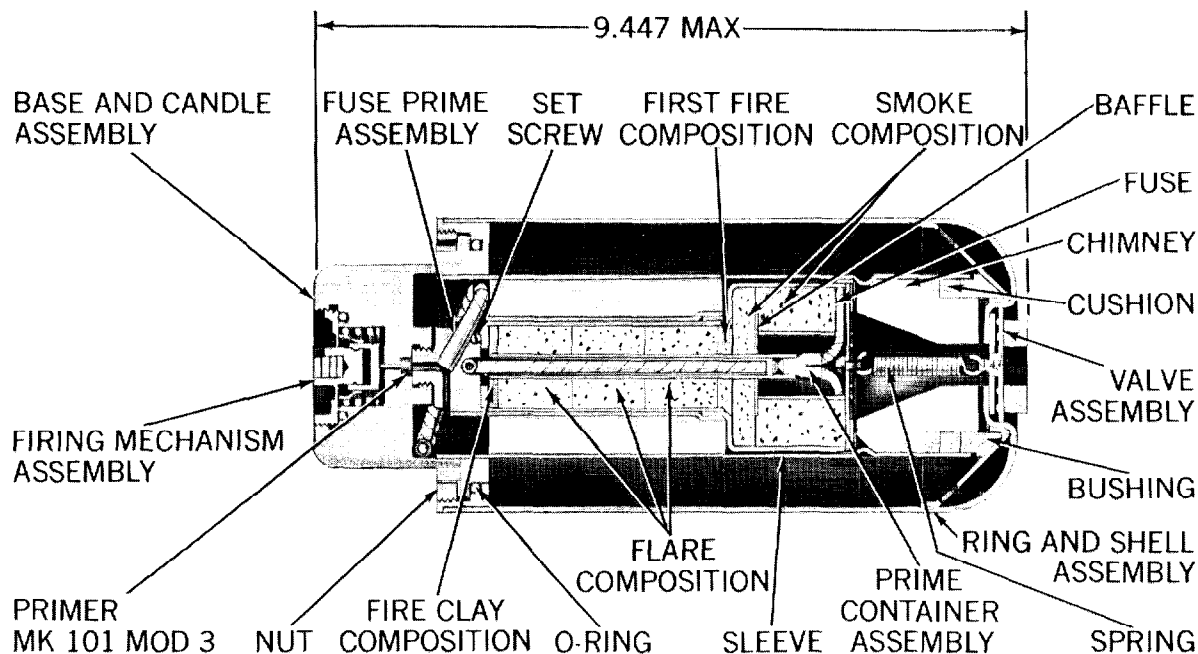


Figure 11.4.3 Signal Assembly, Mk 39, 40, 43, & 44

9.5 inches in length and 4 inches in diameter. Its upper end is recessed with a vent hole in its center which is sealed with a spring-held valve assembly. The diameter of the base end of the cylinder is smaller than that of the main body to permit its insertion into the float. The base contains a ball-locked, spring-loaded firing pin and a primer. The various marks are painted with "Day-Lite," a fluorescent paint, red or green, to indicate the display color.

11-4-3-3. Operation. When the signal is installed in the Float, Mk 15 Mod 0, an explosive charge in the base of the fitting fires and drives the signal upward to strike the cap. This force, together with that of the compressed coil spring, drives the signal

forward and shears the rivets holding the cap. Continued pressure against the signal pushes the cap off, permitting the signal to float to the surface. The percussion primer, Mk 101 Mod 3, fires when the signal is ejected from the tube and ignites the delay fuse. In approximately 38 to 72 seconds (depending upon the signal used), the fuse ignites the smoke composition. Smoke burning time ranges from 20 to 70 seconds (45 seconds average). When the smoke composition burning nears its end, the flare composition is ignited. The flame continues to burn for a maximum of 2 minutes.

11-4-3-4. Installation and Make-Ready Procedures. This signal shall be installed in the

IMPACT AND FUZE ACTION INDICATORS

float and made ready in accordance with instructions contained in NAVWEPS OP 1816, Volume 1 (Second Revision).

11-4-3-5. Handling and Storage. This device shall be handled and stored in accordance with the general rules in Section 1-6 of Chapter 1 of this pamphlet.

11-4-3-6. Safety Precautions. The general safety precautions appearing in Section 1-8 of this pamphlet are applicable to this signal.

11-4-3-7. Shipping Containers. This pyrotechnic device is packaged 12 rounds to a wooden box (LD 480105). A filled box weighs approximately 95 pounds.

11-4-3-8. Variances Among Marks. Signal Assemblies, Mk 39, 40, 43, and 44 differ in the following specific respects:

	Mk 39	Mk 40	Mk 43	Mk 44
Release Depth (Ft.)	160	80	80	160
Delay Time (Max. Sec.)	72	38	38	72
Smoke Comp. (Grams)	59	59	104	104
Smoke Color	Green	Green	Red	Red
Flame Comp. (Grams)	102	102	93	93
Flame Color	Green	Green	Red	Red

11-4-3-9. Identification Data. The following table is applicable to this device:

Signal, Assembly, Mk 39, 40, 43, and 44

	Mk 39	Mk 40	Mk 43	Mk 44
List of Drawings	LD 299576	LD 480069	LD 480068	LD 299447
Specification	WS 4359	WS 4359	WS 4359	WS 4359
Federal Stock No.	1351-707-0609	1351-707-0607	1351-886-1768	1351-707-0608
DOD Code No.	R 813	R 814	U 838	R 815

11-4-4. Signal, Smoke and Illumination, Marine, Mk 55 Mod 0
(Illustration top of page 11-12)

11-4-4-1. Intended Use. This drill mine fuze indicator (see Figure 11.4.4) is used in connection with Drill Mine Mk 57. It produces white smoke and yellow flame on the surface of the water within 3 to 12 seconds after initiation for a period of 90 to 135 seconds.

CHANGE 17

11-4-4-2. Description. This signal weighs approximately 3.5 pounds and consists of a cylindrical aluminum housing approximately 4 inches in diameter and 2.5 inches from top to bottom. A stem 1.25 inches in length and approximately .75 inch in diameter, is affixed to the center of the base. This projecting stem contains a percussion primer, Mk 126 Mod 0. The main body is closed at the top with a lead disk and an aluminum cap which is crimped in place.

11-4-4-3. Operation. Contained within the aluminum body are a firecracker fuse, a 170-gram starter composition, and the 450-gram pyrotechnic composition. When the Mk 16-type float into which this signal has been installed is released from the drill mine, the shear pin in the release hook and shroud ring is broken. This arms the firing mechanism in the float; however, water pressure holds the firing mechanism in a non-firing position. As the float nears the surface and water pressure is reduced, the firing pin is released to strike the percussion primer of the signal. The primer ignites the firecracker fuse which ignites the starter composition which, in turn, ignites the pyrotechnic composition. Combustion pressure blows out the lead disc in the cover, allowing emission of the smoke and flame.

11-4-4-4. Associated Equipment. Three replacement washers and a chimney assembly which are needed for assembling this signal into its float are listed in the general requisition for Drill Mine, Mk 57, loose parts in mine assembly.

11-4-4-5. Installation and Make-Ready Procedures. This signal is installed and made ready for its intended use in accordance with instruc-

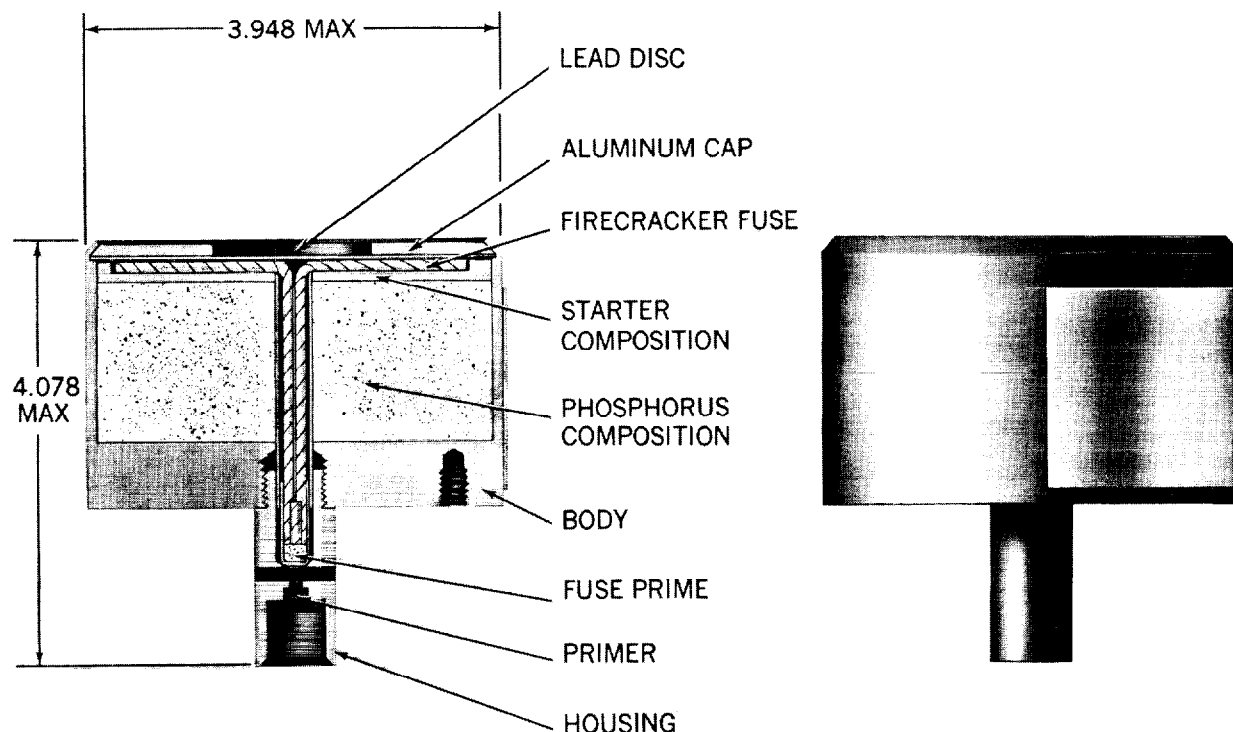


Figure 11.4.4 Marine Smoke & Illumination Signal, Mk 55

tions issued with the Float, Mk 16 with which it is used.

11-4-4-6. Handling and Storage. This pyrotechnic device shall be handled and stored in accordance with the general rules contained in Section 1-6 of Chapter 1 of this pamphlet. In addition, users are cautioned not to remove the signal from its sealed shipping container until ready to install it in its float.

11-4-4-7. Safety Precautions. The general safety precautions of Section 1-8 of Chapter 1 of this pamphlet apply. In addition, the following special precautions must be observed.

(1) Since the pyrotechnic mixture in this device contains phosphorus, care must be exercised to avoid fumes of its combustion. These fumes are moderately toxic if inhaled in the open; in closed areas the toxic hazard would be severe.

(2) In burning, portions of red phosphorus are converted to white phosphorus which ignites spontaneously and re-ignites on contact

with air after being extinguished.

(3) Care must be taken not to strike the percussion primer of this device. It is initiated by a sharp blow.

(4) After the signal has been installed in the float, the wire and tag holding the vent plug in the cover must be removed. If the shear pin in the release hook has been broken in handling, removal of the wire and tag permits blow-out of the vent plug and prevents build-up of pressure which might explode the float.

11-4-4-8. Shipping Containers. This signal is packaged in an hermetically sealed metal container which is opened with a tear strip (Dwg. No. 1800511; LD 486302). These metal containers are shipped 18 to a wooden box. A filled box weighs approximately 80 pounds.

11-4-4-9. Identification Data. This signal is listed under BUWEPS LD 480182, Drawing No. 1635988, Specification OS 8413, FSN 1351-909-7129, and DOD Code No. X482.

11-5. GUIDED MISSILE FUZE ACTION INDICATORS

The pyrotechnic devices described in this section indicate the time and place of guided missile fuze action. They are used in tests and in training exercises with inert-loaded guided missiles. Their display is normally in the form of a very short duration, high-candlepower flash of light which may be perceived visually or detected by photocell pick-up and assessed photographically.

11-5-1. Signal, Flash, Guided Missile, Mk 33, Mods 0 and 1 (Formerly Signal, Flash, Mk 33)

be scanned by photocell pick-up and instrumented to give precise functioning time after launch.

11-5-1-2. Description. This device consists of a steel flash body and an aluminum primer body. It contains a primer and a safety and arming device. On one end is a receptacle assembly to facilitate joining with the missile.

11-5-1-3. Operation. When fired with a missile, the signal is armed mechanically by acceleration of 7 to 9 g's within 5 seconds maximum. The signal is electrically initiated and

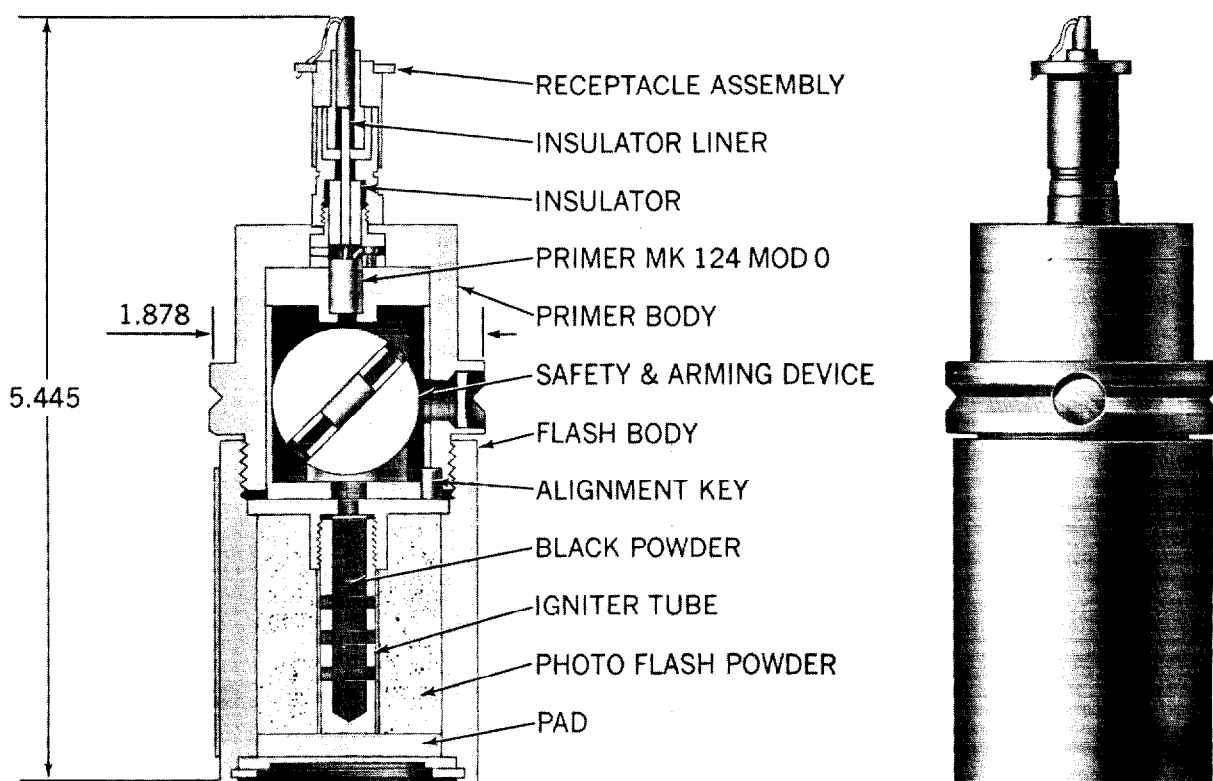


Figure 11.5.1 Guided Missile Flash Signal, Mk 33

11-5-1-1. Intended Use. This device (see Figure 11.5.1) is used with the TALOS Guided Missile (RIM-8) in telemetered flights to show fuze action where visible indication of such action is needed. It produces a flash of light which can be assessed photographically to determine miss distance. The flash can also

produces a minimum peak of 18 million candlepower with a sustained intensity of one million candlepower for 30 ± 10 milliseconds.

11-5-1-4. Handling and Storage. Handling and storage will be in accordance with Paragraph 1-6 of Chapter 1 of this pamphlet.

11-5-1-5. Safety Precautions. The safety precautions of Section 1-8 of Chapter 1 of this pamphlet apply. This device contains 96 grams of photoflash powder. The igniter tube contains black powder.

WARNING

The inspection window shall show "s" on a green background indicating that the signal is in an unarmed condition.

WARNING

Care must be taken to assure that the electric primer is shunted when in storage and before installation.

11-5-1-6. Shipping Containers. This device is packaged for shipment, seven signals to the container, in accordance with BUWEPS Dwg. No. 2061606.

11-5-1-7. Identification Data. The following table is applicable to this device:

Signal, Flash, Guided Missile, Mk 33 Mods

	Mod 0	Mod 1
List of Drawings	LD 498046	LD 282800
Specification	OS 8740	OS 8775
Federal Stock No.	1336-653-3620	1336-774-5245
DOD Code No.	None Assigned	None Assigned

**11-5-2. Signal, Flash, Guided Missile, Mk 37
Mods 0 and 1**

(Illustration top of page 11-15)

11-5-2-1. Intended Use. This signal (see Figure 11.5.2) is used in the Sparrow III (AIM-7) Telemetry Head. It is electrically initiated and produces a brilliant flash which can be photographed against any background. The flash gives visual fuze action indication and, when photographically assessed, may be used to measure missile miss distance.

11-5-2-2. Description. This device has a flash holder plate approximately 5.3 by 3.9 inches in size which is used for missile installation. The signal proper extends approximately 2.3 inches below this plate. It is slightly more than 2 inches in diameter and consists of a

heavy metal canister closed at its upper end with a fusible alloy injection seal, an aluminum retaining disk, and a pad. A retainer nut protrudes from the opposite end. An arming pin equipped with a pull ring extends downward from the top and engages a lever which, when permitted to rise, closes an electrical circuit. The two mods differ principally in the quantity of flash mixture employed.

11-5-2-3. Operation. When the arming pin is removed, the arming lever rotates and permits the electrical circuit to close. This permits firing of the electric primer and the black powder igniter tube which, in turn, ignites the flash mixture. This device produces a minimum peak intensity of 20 million candlepower, with a retained minimum intensity of 1 million candlepower for not less than 10 milliseconds.

11-5-2-4. Handling and Storage. Handling and storage shall be in accordance with the general provisions of Chapter 1 of this pamphlet.

11-5-2-5. Safety Precautions. The general safety precautions of Section 1-8 of Chapter 1 of this pamphlet apply. In addition, the following special precautions must be observed:

(1) This signal must not be installed until the missile power supply has positively been determined to be shunted.

(2) The arming pin must not be removed until installation has been accomplished and the signal is ready for use.

11-5-2-6. Shipping Containers. These signals are packaged in accordance with Method IId of Specification MIL-P-116, two signals to the package.

11-5-2-7. Identification Data. The following table is applicable to this device:

(Table bottom of page 11-15)

**11-5-3. Signal, Flash, Guided Missile, Mk 42
Mod 0**

(Illustration top of page 11-16)

11-5-3-1. Intended Use. This signal (see Figure 11.5.3) is one of a pair used with the Sparrow III (AIM-7) Exercise Head, Mk 4

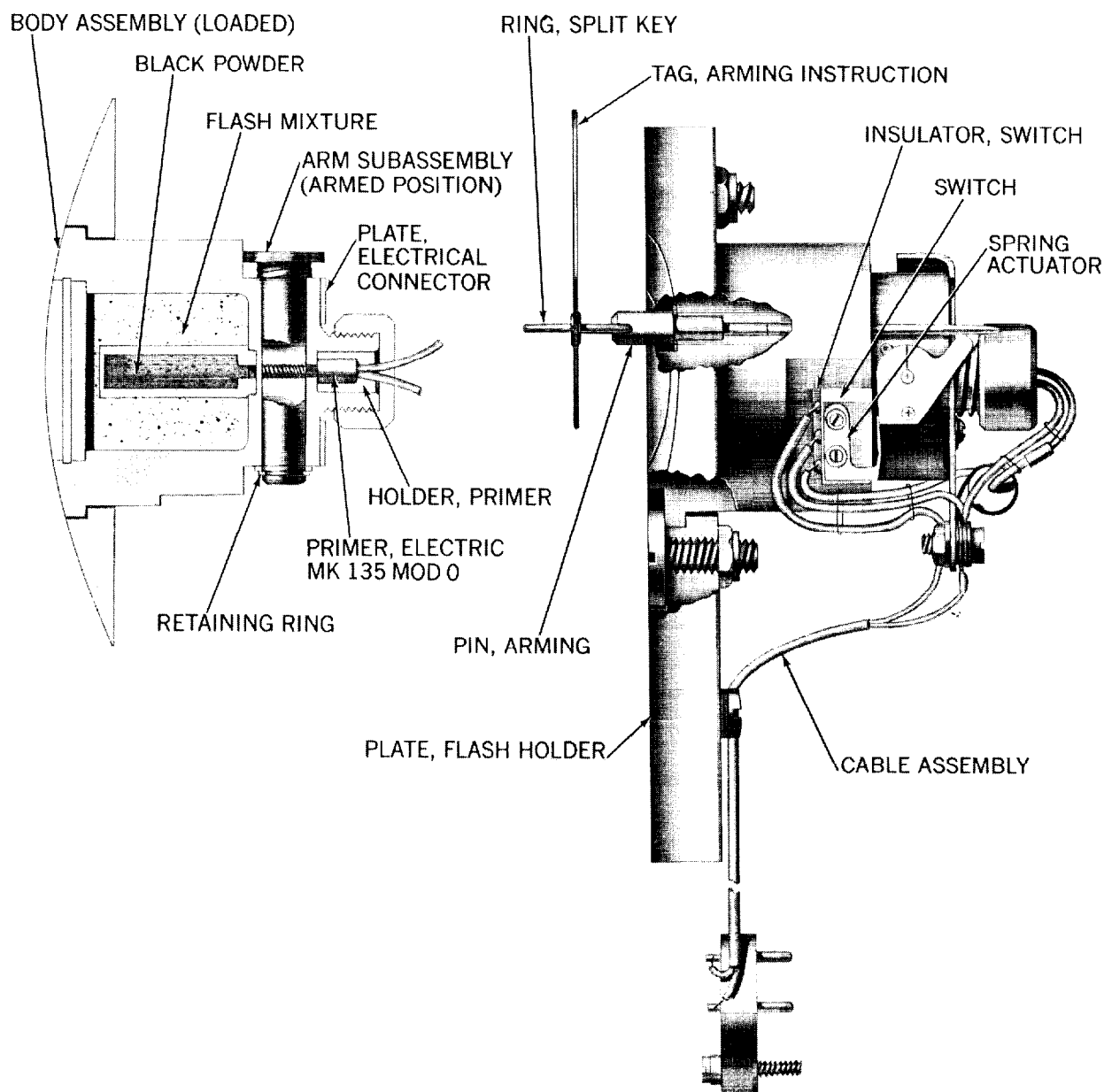


Figure 11.5.2 Guided Missile Flash Signal, Mk 37

Signal, Flash, Guided Missile, Mk 37 Mods

	Mod 0	Mod 1
List of Drawings	BUWEPS LD 267958	BUWEPS LD 268120
Specification	NOTS XS-145	NOTS XS-145
Federal Stock No.	None Assigned	None Assigned
DOD Code No.	None Assigned	None Assigned

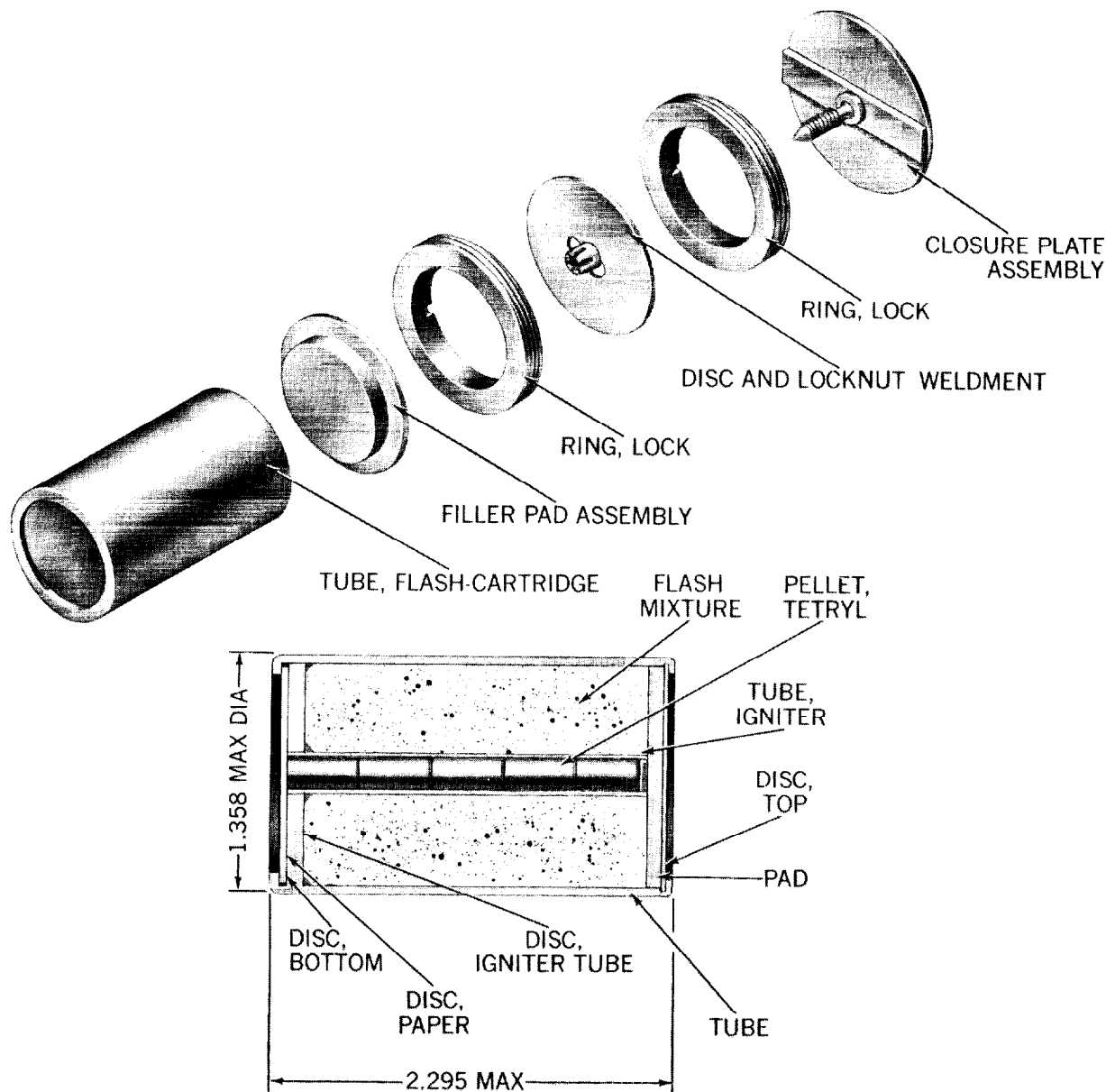


Figure 11.5.3 Guided Missile Flash Signal, Mk 42

Mod 0, to produce a visible and photographically assessable flash which indicates time and place of fuze action in telemetered flights.

11-5-3-2. Description. This 1-pound device consists of an aluminum flash cartridge tube 2.3 inches long and approximately 1.3 inches in diameter. Its outer end is closed with a filler pad assembly, two lock rings, and a closure plate assembly. A thin aluminum disc

closes its inner end, that is, the end that abuts the booster charge of the missile safety and arming device.

11-5-3-3. Operation. When the booster charge of the safety and arming device is ignited, its fire punctures the thin aluminum disc closing the inner end of the signal and ignites the tetryl pellets which are housed in the center of the signal. These pellets, in turn, ignite

the 68-gram flash mix consisting of atomized aluminum and barium nitrate. The force generated by the burning of the flash mix shears off the top disc and the disc and lock nut assembly and expels the closure plate assembly. The flash mix produces a minimum peak of 3.5 million candlepower. The delay from initiation to emission of 1 million candlepower is 2 milliseconds maximum. Candlepower exceeds 1 million for a minimum of 15 milliseconds.

11-5-3-4. Handling and Storage. This device shall be handled and stored in accordance with Chapter 1 of this pamphlet.

11-5-3-5. Safety Precautions. The safety precautions of Section 1-8 of Chapter 1 of this pamphlet apply.

11-5-3-6. Shipping Containers. This device is packaged two signals to an hermetically sealed container. Twenty-one of these containers are packed for shipment in a 20MM Ammunition Component Box, the gross (filled) weight of which is approximately 75 pounds.

11-5-3-7. Identification Data. This signal is listed under BUWEPS List of Drawings LD 268011, Specification OS 8780, FSN 1336-706-9506, and DOD Code No. V090.

11-5-4. Signal Kit, Flash, Mk 47 Mod 0
(Illustration on page 11-18)

11-5-4-1. Intended Use. This kit (see Figure 11.5.4) is used with TARTAR (RIM-24) Exercise Head, Mk 7 Mod 0 in telemetered missile flights to give visual indication of fuze action.

11-5-4-2. Description. The kit consists of two Flash Signals, Mk 34 Mod 0 and one Flash Signal Extender, Mk 17 Mod 0. Each signal is encased in a steel cylinder approximately 4.5 inches long and 1.7 inches in diameter. The extender is approximately 6.7 inches long and 2 inches in diameter. The extender is encased in an aluminum body.

11-5-4-3. Operation. An electrical impulse from the safety and arming device of the exercise head initiates a booster charge which exerts force on the extender firing pin so that

the series of detonators in the base of the extender and in the signals is ignited. Each signal detonator ignites a black powder train which carries ignition to the expelling charge. The forward end of the pyrotechnic container is knife-edged. The expelling charge forces this knife edge to cut through the outer skin of the exercise head and to extend the pyrotechnic container to the outside. The expelling charge also ignites the black powder which then ignites the photoflash powder to produce the desired flash.

11-5-4-4. Handling and Storage. Handling and storage shall be in accordance with the general provisions of Section 1-6 of Chapter 1 of this pamphlet.

11-5-4-5. Safety Precautions. The general safety precautions in Section 1-8 of Chapter 1 of this pamphlet apply to this kit.

11-5-4-6. Identification Data. This kit is listed under BUWEPS Dwg. No 282793, Specification OS 8736, FSN 1336-829-5384, and DOD Code No. X785.

11-5-5. Signal, Flash, Guided Missile, Mk 49 Mod 0
(Formerly Signal, Flash, Mk 49 Mod 0)
(Illustration top of page 11-19)

11-5-5-1. Intended Use. This signal (see Figure 11.5.5) is one of a pair used with the TERRIER Missile (RIM-2) to produce a visible and photographically assessable flash which indicates time and place of fuze action in telemetered flights.

11-5-5-2. Description. This device consists of an aluminum body closed at one end with a plastic cover and at the other with a primer holder. An instruction tag is attached to its arming pin pull ring. One round-head machine screw is packed in a mailing bag which is secured to a split key ring. This screw is used to replace the arming pin after removal.

11-5-5-3. Operation. An electrical impulse from the missile safety and arming device fires an electric primer, Mk 135 Mod 0. The primer ignites a detonator, Mk 37 Mod 0 which

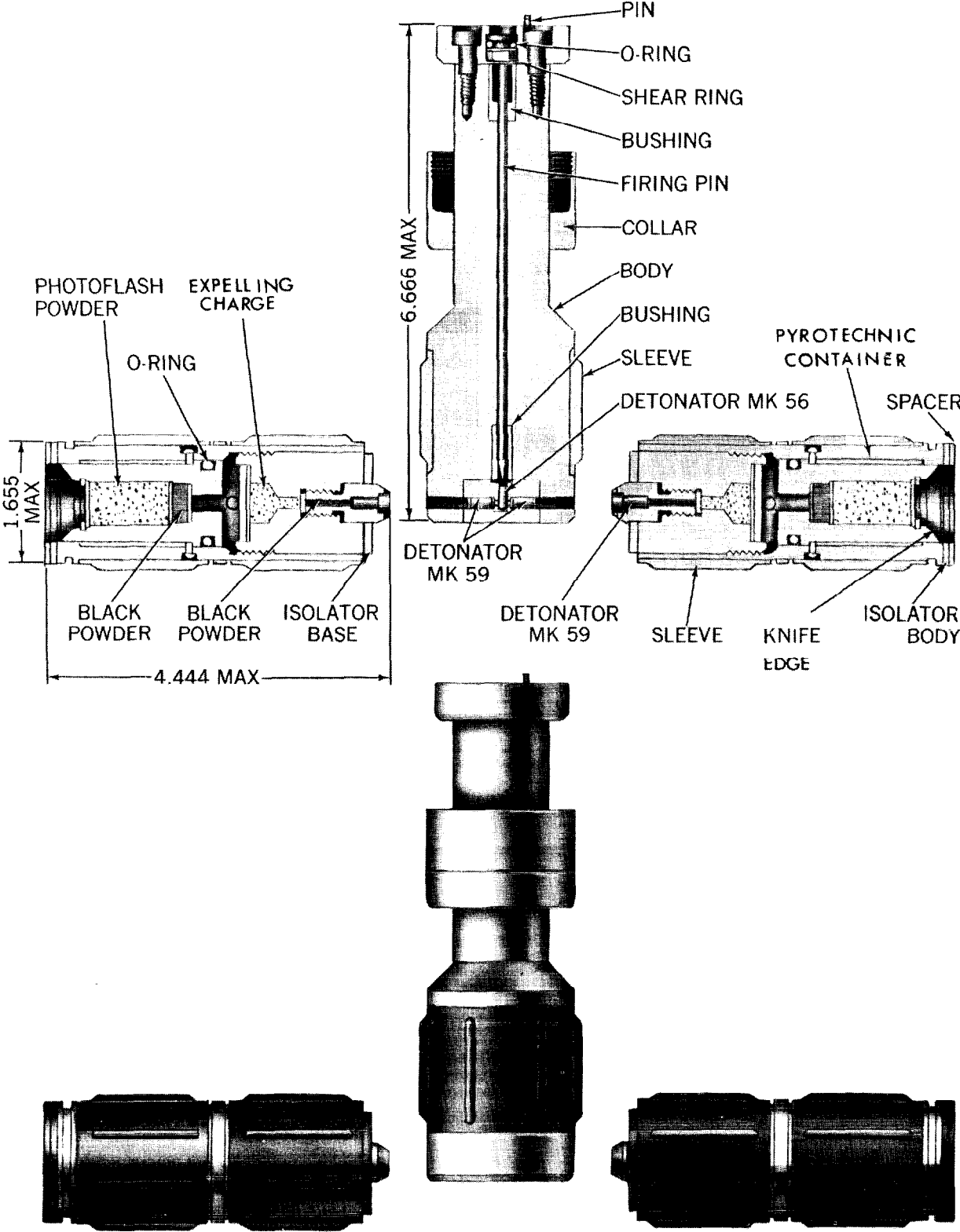


Figure 11.5.4 Flash Signal Kit, Mk 47

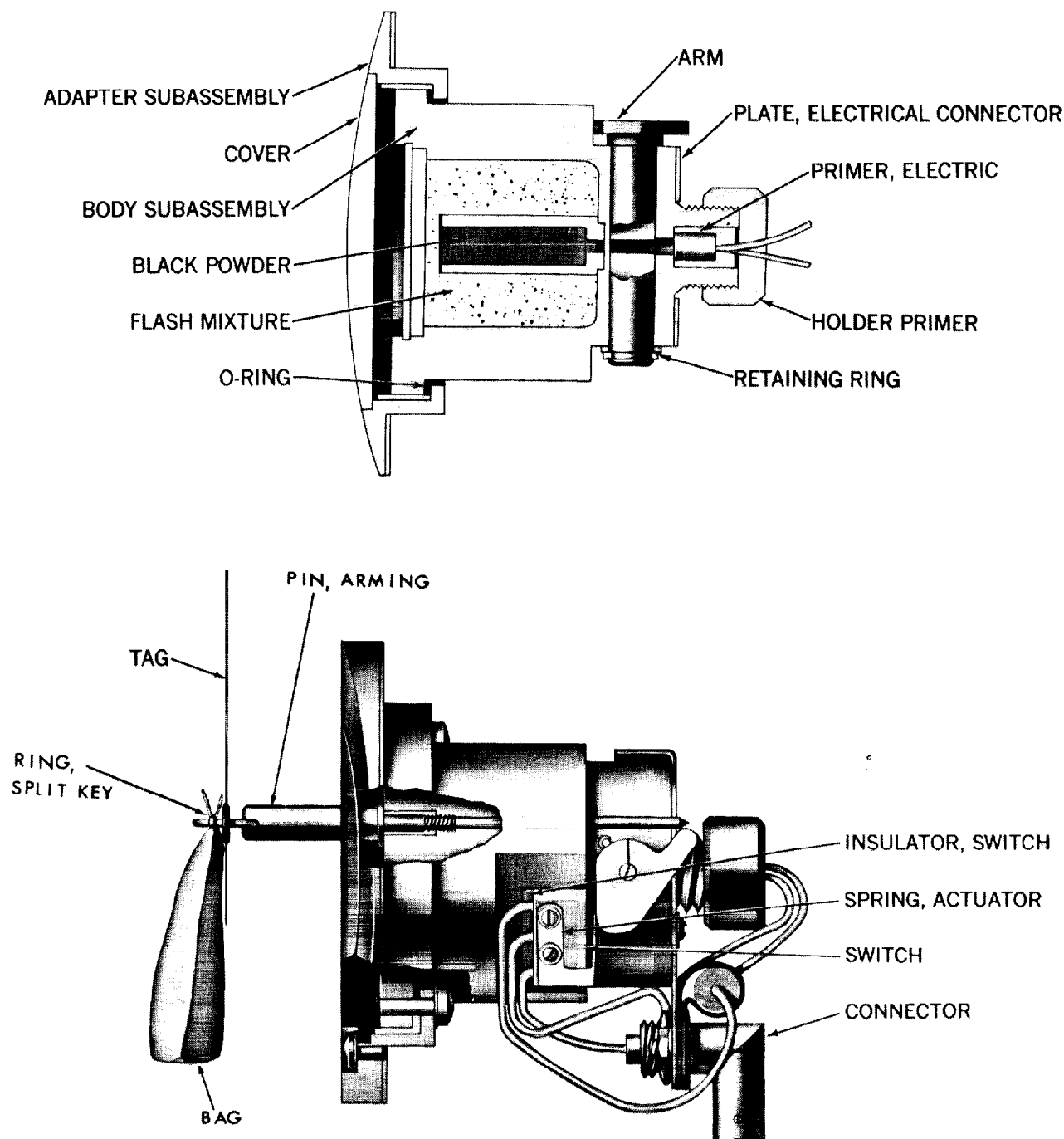


Figure 11.5.5 Guided Missile Flash Signal, Mk 49

initiates the black powder in the igniter tube. The black powder ignites the 30 grams of flash mix which produces a minimum of 1 million candlepower within 2 milliseconds after initiation. Its minimum peak intensity is 1 million candlepower which is sustained for not less

than 10 milliseconds.

11-5-5-4. Handling and Storage. Handling and storage of this device shall be in accordance with Section 1-6 of Chapter 1 of this pamphlet.

11-5-5-5. Safety Precautions. The general safety precautions of Section 1-8 of Chapter 1 of this pamphlet apply.

11-5-5-6. Identification Data. This device is listed under BUWEPS List of Drawings LD 268056, Specification XS-195, and FSN 1336-658-9693. No DOD Code Number has been assigned.

11-6 PROJECTILE FUZE ACTION INDICATORS

The devices in this section are used in various practice projectiles as indicated to show time and place of fuze action.

11-6-1. Unit, Color Burst, Mk 1 Mod 0 and Mk 2 Mod 0

11-6-1-1. Intended Use. The Color Burst Unit, Mk 1 Mod 0 (see Figure 11.6.1.) is used in 3"/50 and 3"/70 caliber practice projectiles. The Color Burst Unit, Mk 2 Mod 0 is used in 5"/38 and 5"/54 caliber practice rounds. Both indicate the time and place of fuze action.

11-6-1-2. Description. These units are cylindrical in shape. They are wrapped in a bristol board inner wrapper and a grease-proof barrier material outer wrapper. The Mk 1 Mod 0, which contains one tracer and two black powder pellets, is 3.17 inches long and 1.83 inches in diameter. The Mk 2 Mod 0, which contains four tracers and four black powder pellets, is 8.24 inches long and 1.85 inches in diameter.

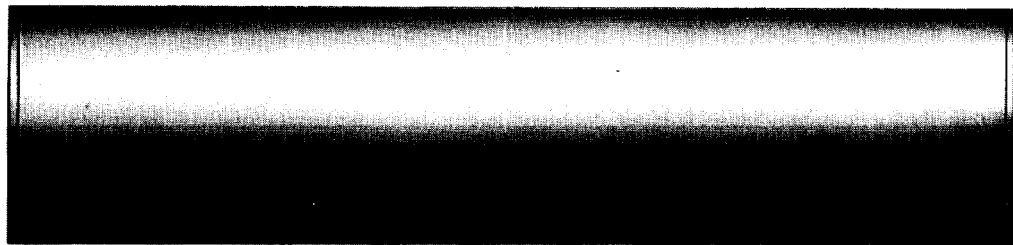
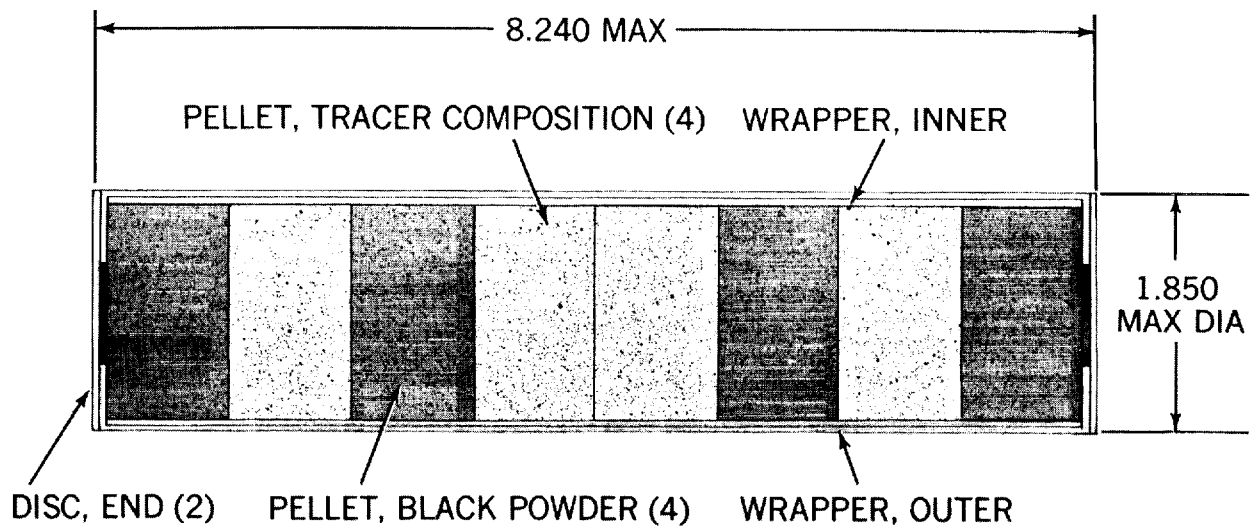


Figure 11. 6. 1 Color Burst Unit, Mk 2

IMPACT AND FUZE ACTION INDICATORS

11-6-1-3. Operation. The signals are assembled in their respective projectiles. When the projectile is fired, using the standard service charge, normal fuze action ignites the unit to produce the desired colored smoke display.

11-6-1-4. Handling and Storage. Section 1-6

11-6-1-7. Identification Data. The following table is applicable to this device:

	Mk 1 Mod 0	Mk 2 Mod 0
Drawing No.	584284	584291
Specification	OS 8733	OS 8733
Federal Stock No.	1370-039-0437	1370-039-0438

11-6-2. Unit, Color Burst, Mk 3 Mods 0 & 1

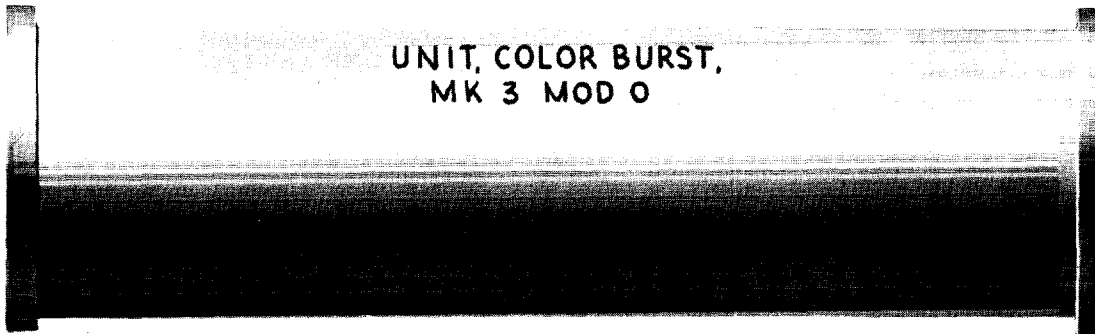
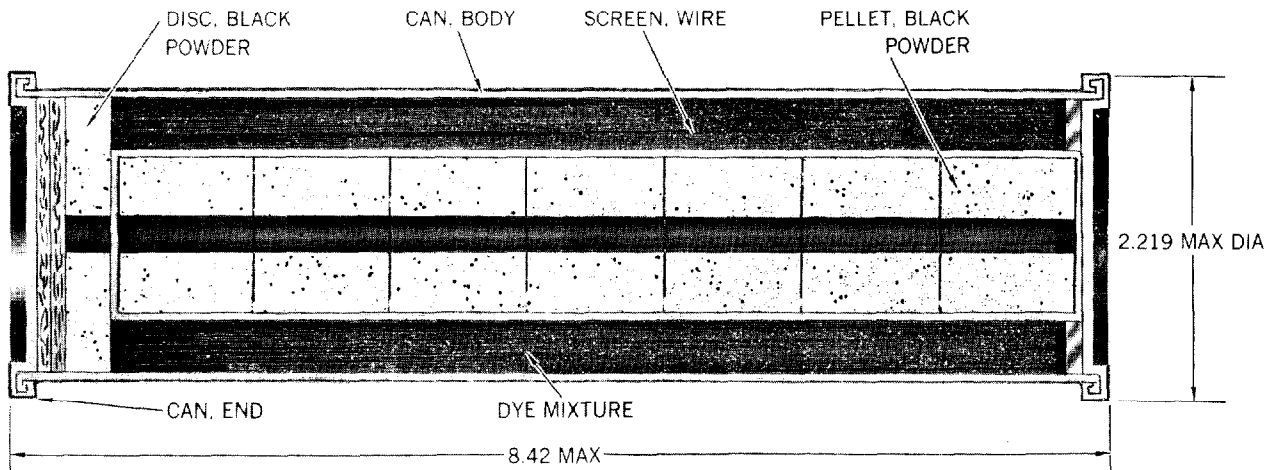


Figure 11.6.2 Color Burst Unit, Mk 3

of Chapter 1 of this pamphlet applies.

11-6-1-5. Safety Precautions. The safety precautions of Section 1-8 of Chapter 1 of this pamphlet apply.

11-6-1-6. Shipping Containers. Mk 1 Mod 0 is packaged 100 to a wooden box; gross weight — 79 pounds.

11-6-2-1. Intended Use. This device (see Figure 11.6.2) is used with 5"/38 Caliber target-type, nonfragmenting antiaircraft projectiles as a fuze action indicator.

11-6-2-2. Description. The unit consists of metal cylinder approximately 8.42 inches long and 2.22 inches in diameter which is closed at

both ends by double seaming. It contains a dye mixture, seven black powder pellets, and a black powder disk. Mod 0 contains 165 grams of red dye mixture; Mod 1, 130 grams of yellow dye mixture.

11-6-2-3. Operation. This unit is ignited by the projectile fuze. The explosive force of the black powder expels the dye mixture to form the color display.

11-6-2-4. Handling and Storage. Section 1-6 of Chapter 1 of this pamphlet applies.

11-6-2-5. Safety Precautions. Section 1-8 of Chapter 1 of this pamphlet applies.

11-6-2-6. Shipping Containers. This device is packaged 50 units to a wooden box the gross weight of which is approximately 85 pounds.

11-6-2-7. Identification Data. The following table applies to this device:

	Mod 0	Mod 1
Dwg. No.	587536	587537
Specification	MIL-C-18735	MIL-C-18735
Federal Stock No.	1370-039-0439	1370-039-0440
DOD Code No.	None	None

11-6-3. Unit, Color Burst, Mk 5 Mod 0, Mk 6 Mod 0, and Mk 7 Mod 0.

11-6-3-1. Intended Use. Color Burst Units Mk 5 Mod 0 (Red), Mk 6 Mod 0 (Yellow), and Mk 7 Mod 0 (Blue) (see Figure 11.6.3) are used with 3-inch, 50 caliber target-type, nonfragmenting antiaircraft projectiles to indicate the time and place of projectile fuze action.

11-6-3-2. Description. These units (see Figure 11.6.3) are identical in all respects except for the color of the dye employed. The unit consists of a cylindrical steel support tube approximately 7.4 inches long and 2.3 inches in diameter; one end is closed with a steel disc crimped in place, and the other

end is closed approximately 2.7 inches from tube end with an internal steel cup.

11-6-3-3. Functional Description. These units are assembled in Mk 36 Mod 0 Projectiles (Illuminating) which are fired from 3"/50 caliber guns, using the standard service charge. The projectiles are equipped with proximity fuzes. Fuze functioning ignites the black powder pellet in the unit. Combustion of the black powder generates heat and pressure within the projectile. When the pressure is released by blowing off of the steel disc in the after end of the unit and the base plug of the projectile, the dye sublimates and is expelled rearward as a cloud of dye vapor to provide the desired visual display. Under ideal conditions of visibility, the colored display can be distinguished from a distance of 4,000 yards.

11-6-3-4. Handling and Storage. Color burst units are normally shipped assembled into loaded and fuzed non-fragmentation projectiles. Handling and storage rules governing such projectiles shall be observed. Separate color burst units that are not immediately loaded into projectiles shall be stored under conditions which do not permit ambient relative humidity to exceed 75 percent.

11-6-3-5. Safety Precautions. The general safety precautions of Section 1-8 of Chapter 1 of this pamphlet apply to these units.

11-6-3-6. Identification Data. The following table is applicable to these units:

	Mk 5 Mod 0	Mk 6 Mod 0	Mk 7 Mod 0
BUWEPS LD Specification	282755 OS 7100	282755 OS 7100	282754 OS 7100
Fed. Stock No.	Not assigned	Not assigned	Not assigned
DOD Code No.	Not assigned	Not assigned	Not assigned

11-7. TORPEDO FUZE ACTION INDICATORS

The devices described in this section are used with torpedoes to indicate the point of "torpedo burst" or fuze action in practice

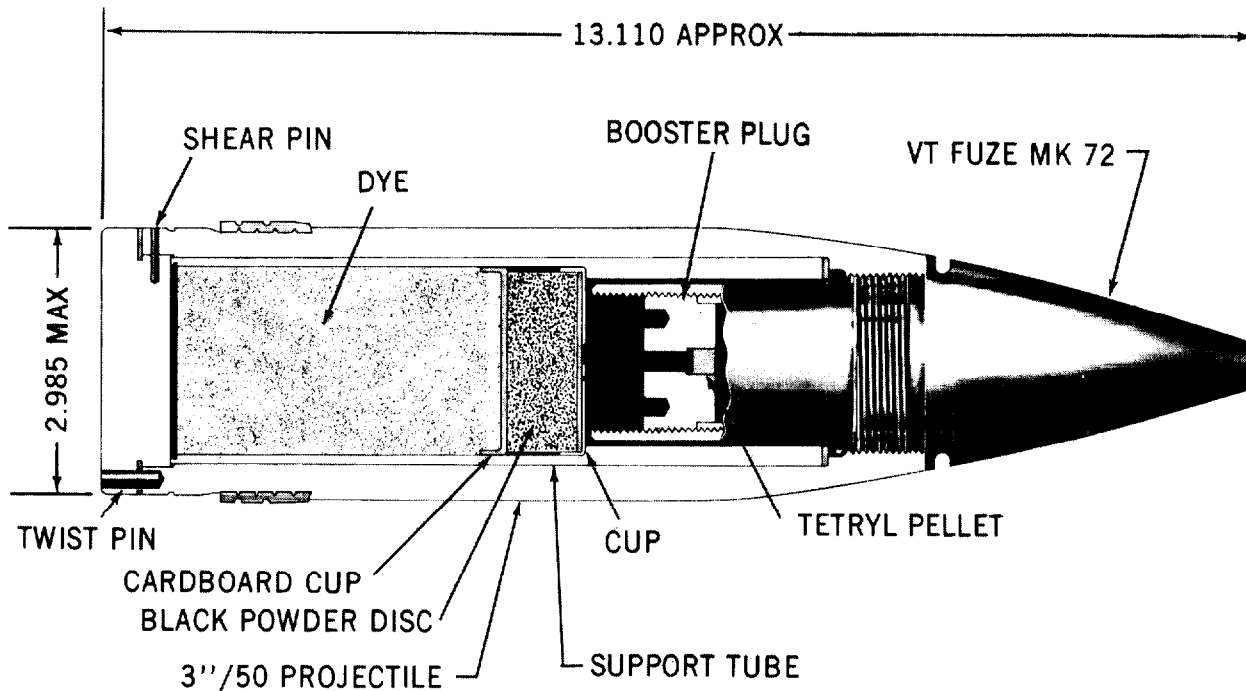


Figure 11.6.3 Color Burst Unit, Mk 5, 6, and 7

runs, and also for determining the general area of the torpedo for recovery purposes.

11-7-1. Marker Kit, Location, Mk 19 Mod 0.
(Illustration on page 11-23)

11-7-1-1. Intended Use. This device (see Figure 11.7.1) is used in the exercise section of Torpedo, Mk 45 Mod 0, to indicate by the emission of orange-colored smoke, the time and place of fuze action and to facilitate torpedo recovery. Its display is produced for approximately 4 minutes.

11-7-1-2. Description. This kit consists of a Projector, Marker, Mk 23 Mod 0, a Marker, Location, Mk 20 Mod 0, a cover assembly, one package containing six screws and a wrench, and another package containing two O-rings and a tube of lubricating grease. The Marker, Projector, Mk 23 Mod 0, is an aluminum tube approximately 3.5 inches in diameter into which the Location Marker, Mk 20 Mod 0 fits. An expelling unit, Mk 1

Mod 0, is contained within the projector base. The exterior of the projector base is shaped to fit the contour of the torpedo as is the nose valve on the opposite end of the kit. Overall length of the assembled kit is approximately 18.7 inches.

11-7-1-3. Operation. When the fuze of the torpedo functions, an electrical impulse activates the expelling unit in the base of the projector, ejecting the marker from the exercise section. Hydrostatic pressure holds the fuze valve in a closed position. When the marker nears the surface, the valve spring overcomes lessened hydrostatic pressure and water is admitted to the battery cavity where it serves as an electrolyte to energize the battery. Electricity thus produced fires two electric squibs which ignite the starter mixture which, in turn, ignites the first-fire mixture. The first-fire mixture ignites the smoke mixture. Combustion gases blow off the nose of the marker permitting the smoke to be emitted.

11-7-1-4. Installation and Removal Procedures. For complete installation and removal procedures, see OP 2686A, Part II (Confidential) covering preparation for use and maintenance of Torpedo, Mk 45 Mod 0.

11-7-1-5. Handling and Storage. This kit shall be handled and stored in accordance with the general provisions of Section 1-6 of Chapter 1 of this pamphlet.

11-7-1-6. Safety Precautions. The general safety precautions of Section 1-8 of Chapter 1 of this pamphlet apply. In addition, the following special precautions must be strictly observed:

(1) Personnel installing or removing this kit shall wear safety glasses for protection in the event of accidental ignition.

(2) At no time shall either end of the marker be pointed toward the body or toward other personnel.

IMPACT AND FUZE ACTION INDICATORS

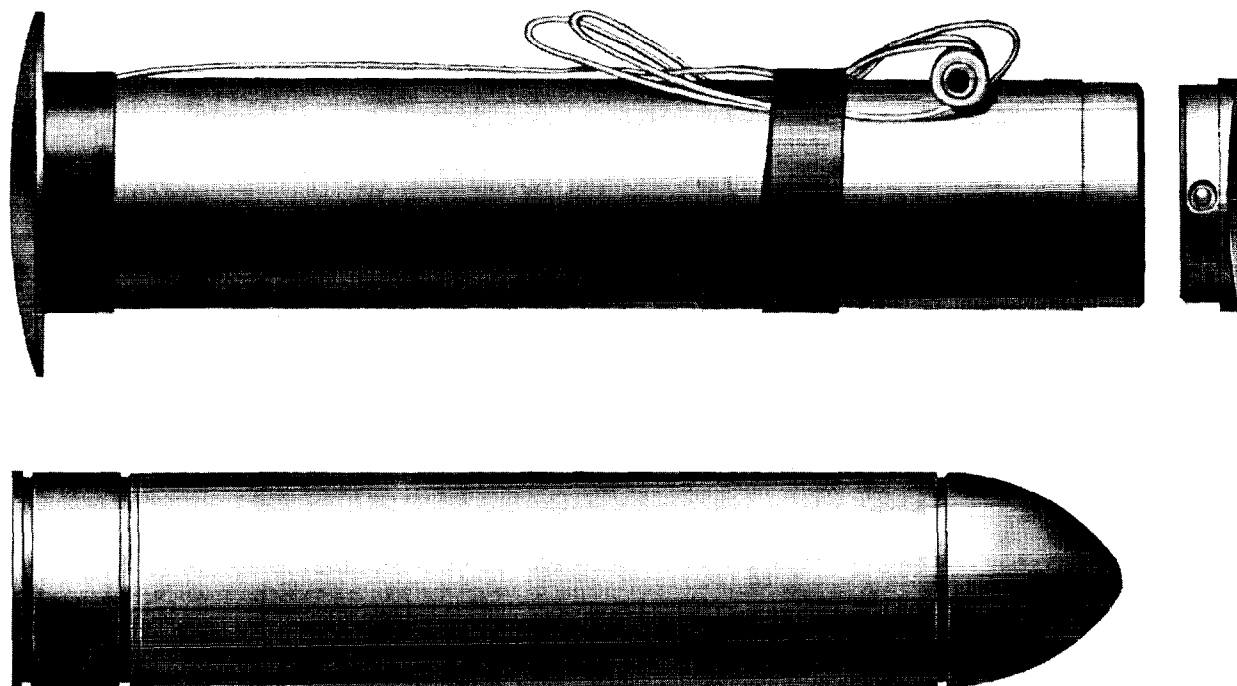
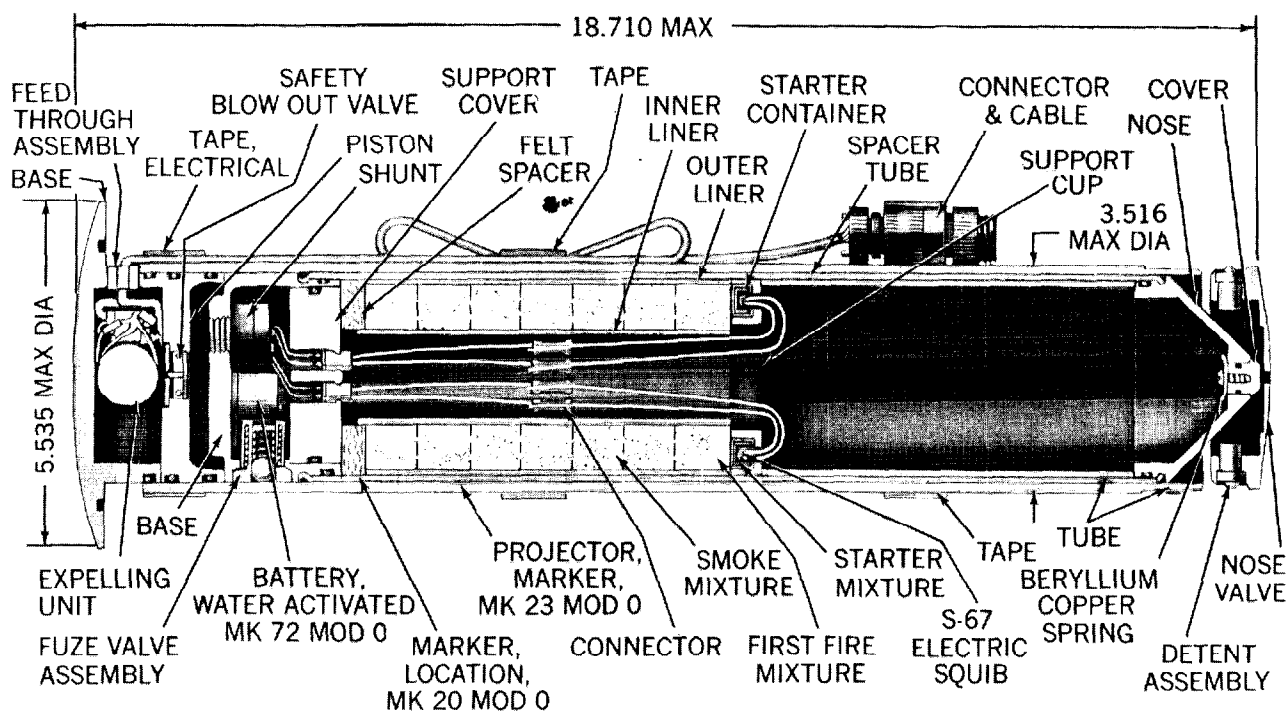


Figure 11.7.1 Location Marker Kit, Mk 19

(3) Torpedo power source must be off before installing or removing the kit from the exercise section.

11-7-1-7. Shipping Containers. This device is packaged two complete kits to the wooden box. The weight of a filled box is approximately 32

pounds.

11-7-1-8. Identification and Requisitioning Data. This kit is listed under BUWEPs LD 282807, Specifications OS 8766 and OS 8747, FSN 1356-895-6936, and DOD Code No. U906.

11-7-2. Signal, Float, Torpedo, Mk 21 Mod 1

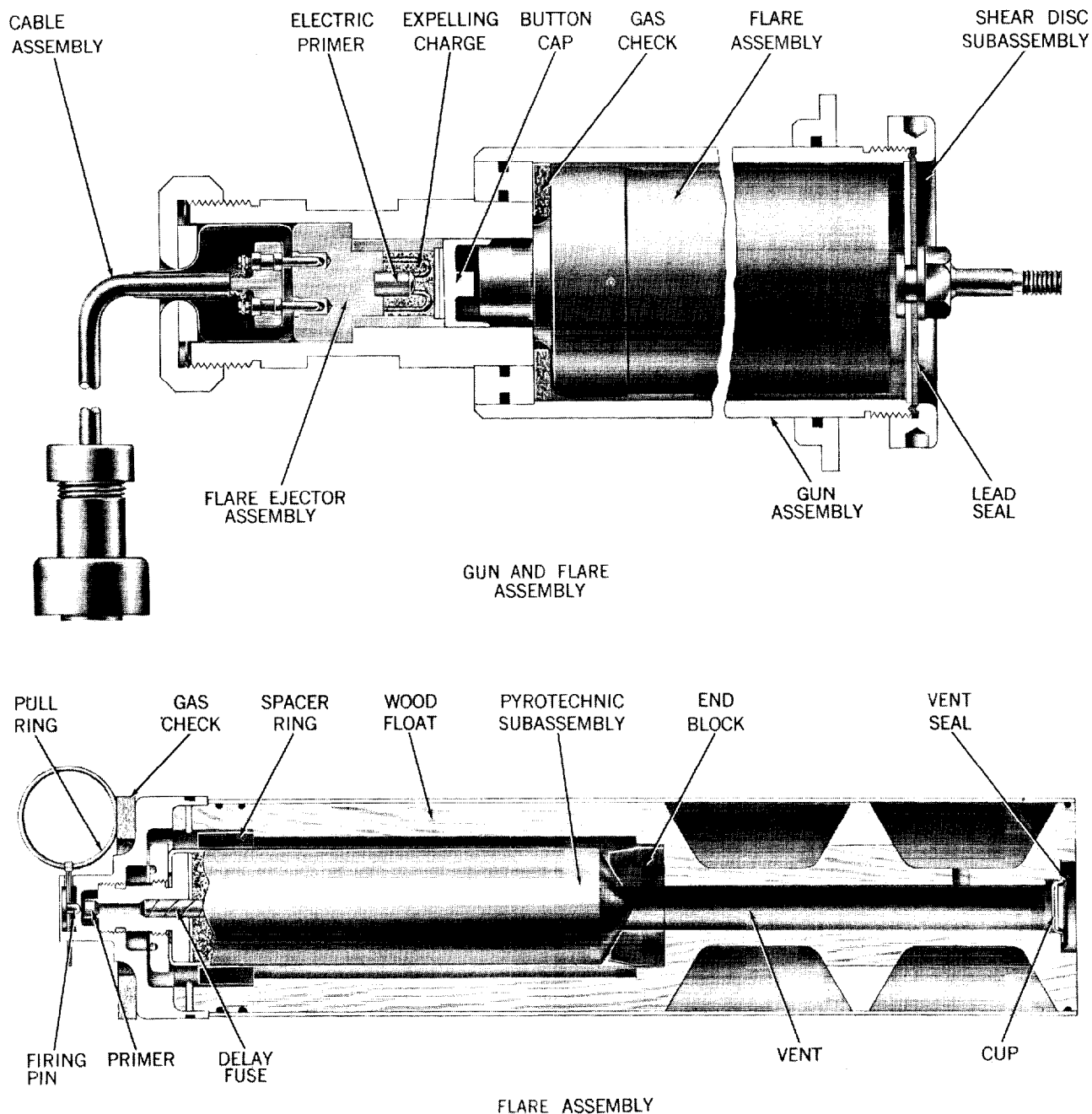


Figure 11.7.2 Torpedo Float Signal, Mk 21

11-7-2-1. Intended Use. This smoke- and flame-producing device (see Figure 11.7.2) is intended for day or night use in locating torpedoes after trial runs. It is fired from a gun-type ejector that is fitted with the exercise head of a torpedo.

11-7-2-2. Description. The signal consists of a wooden cylinder approximately 11 inches long and 2.5 inches in diameter. One end is closed with a plastic cover; a firing mechanism consisting of a firing pin and a percussion primer is attached at the other end. The firing pin is held in an unarmed position by a cotter pin to which is attached a pull ring. A gas-check ring is taped to the firing mechanism end. Tapes securing this ring are removed when the signal is prepared for firing.

11-7-2-3. Operation. A flash hole leads from the primer to a delay fuse in the pyrotechnic subassembly which is supported in the wood float by a spacer ring and an end block. A drilled hole in the end block is aligned with the vent hole in the float. The vent hole is closed by a vent seal. The ejector contains an expelling charge, an electric primer, and necessary electrical cable fittings. It also contains a button cap into which the primer end of the signal fits. Electrical impulse from the torpedo fires the ejector primer which ignites the expelling charge, pushing the button cap against the signal primer and thus igniting the delay fuse. It also forces the signal to shear the lead disk at the end of the ejector, permitting the signal to rise to the surface. The delay fuse ignites the pyrotechnic composition, and expanding gases blow out the vent seal, allowing smoke and flame to be emitted.

11-7-2-4. Handling and Storage. This signal shall be handled and stored in accordance with Section 1-6 of Chapter 1 of this pamphlet.

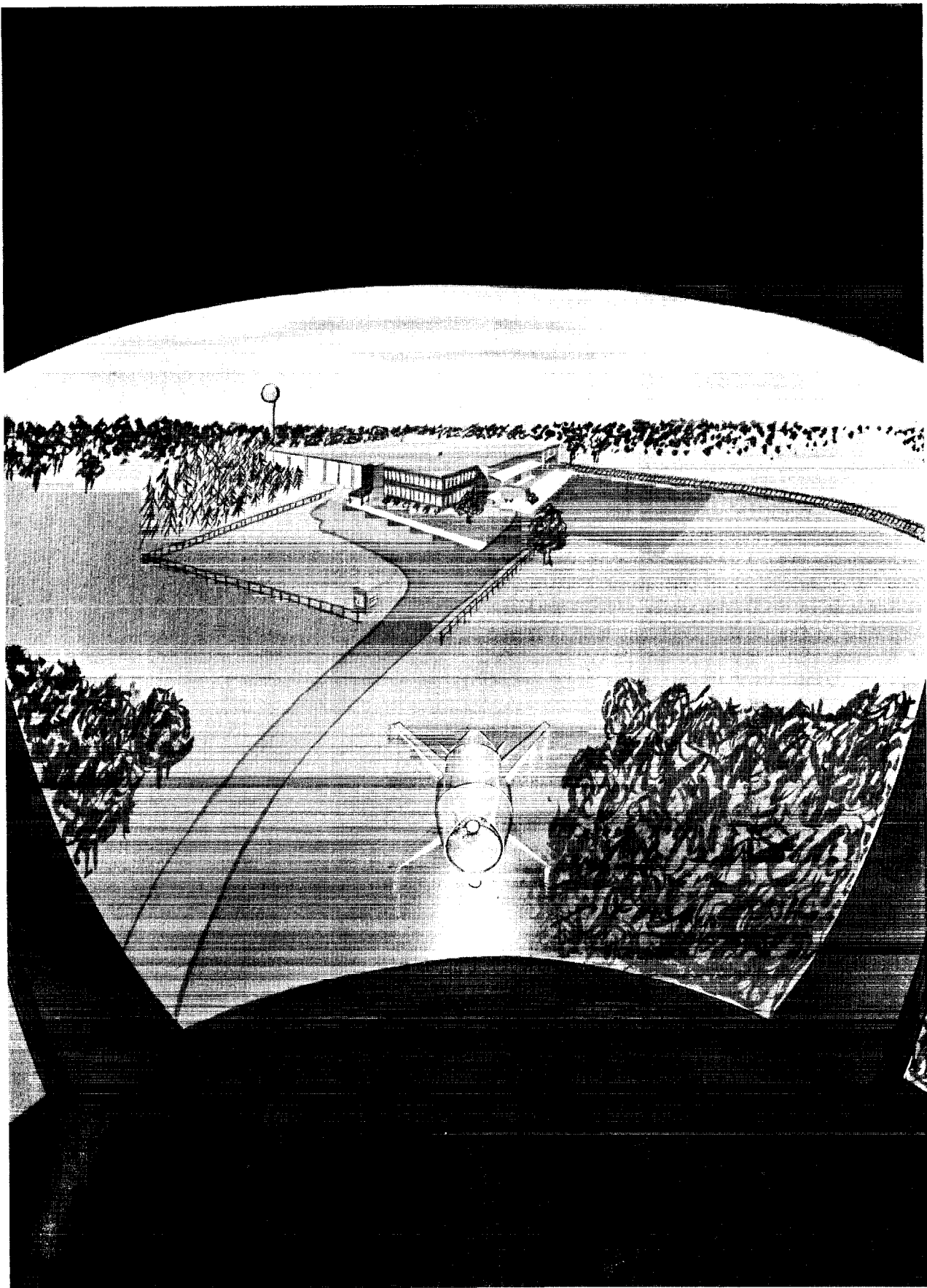
11-7-2-5. Safety Precautions. The safety precautions of Section 1-8 of Chapter 1 of this pamphlet apply to this signal.

(1) Since the pyrotechnic mixture in this device contains phosphorus, care must be exercised to avoid fumes of its combustion. These fumes are moderately toxic if inhaled in the

open; in closed areas, the toxic hazard would be severe.

(2) In burning, portions of red phosphorus are converted to white phosphorus which ignites spontaneously and re-ignites on contact with air after being extinguished.

11-7-2-6. Identification Data. This device is listed under BUWEPS Dwg. No. SK 186486 and Specification OS 5805. No Federal Stock Number or DOD Code Number has been assigned.



Tracking Flares in BULLPUP Tail Facilitate Guidance to Target

CHAPTER 12

TRACKING AND TARGET DEVICES

12-1. INTRODUCTION

This chapter covers pyrotechnic devices which are used with aircraft, rockets, missiles, and aerial targets to provide visual trajectory information or an infrared source.

12-1-1. Handling and Storage. The general handling and storage provisions of Section 1-6 of Chapter 1 of this pamphlet apply to these devices.

12-1-2. Safety Precautions. The safety precautions of Section 1-8 of Chapter 1 of this pamphlet are applicable to these devices. Individual item descriptions contain special precautions that pertain only to the particular devices being described.

12-1-3. Disposition. Damaged or otherwise unserviceable tracking and target devices shall be disposed of in accordance with Chapter 3 of this pamphlet.

12-2. ROCKET AND MISSILE TRACKING DEVICES

The pyrotechnic devices described in this section are those which are attached to rockets or missiles to give a light that may be tracked visually or by camera, showing the trajectory of the weapon.

12-2-1. Tracer, Mk 21 Mod 0 (Illustration top of page 12-2)

12-2-1-1. Intended Use. This tracer (see Figure 12. 2. 1) is used in groups of four on 2". 75 folding fin aircraft rockets (FFAR) in assessment and evaluation of fire control equipment (see Table 12-1).

12-2-1-2. Description. This device is 1.475 inches by 1.433 inches in size. Its upper surface is closed with a concave cap.

12-2-1-3. Operation. Ignition is obtained parasitically from the rocket. Ignition composition of the tracer ignites the first-fire composition which, in turn, ignites the pyrotechnic composition.

12-2-1-4. Handling and Storage and Safety Precautions. The general handling, storage, and safety provisions of Chapter 1 of this pamphlet apply.

12-2-1-5. Identification Data. This device is listed under BUWEPS LD 251296 and Specification NOTS XS-111. FSN and DOD Code Numbers have not been assigned.

TABLE 12-1 TRACKING AND TARGET DEVICES SUMMARY

Item	Para-graph	Min. Burn Time (Seconds)	Average Candlepower	Approx. Length (Inches)	Diam. (In.)	Approx. Weight
Tracer, Mk 21 Mod 0	12-2-1	2.5	25,000	1.475	1.433	14 Grams
Flare, Guided Missile, Mk 21	12-2-2	25	150,000	10	1	.57 Lb.
Flare, Guided Missile, Mk 23	12-2-3	20	70,000	10	1.75	1.35 Lb.
Flare, Guided Missile, Mk 25	12-2-4	195	150,000	15.96	2.5	4.5 Lb.
Flare, Guided Missile, Mk 27	12-2-5	40	140,000	10.87	1.8	1.57 Lb.
Flare, Guided Missile, M 136	12-2-6	75	70,000	10.5	1.75	—
Tracking Device, Smoke, Mk 1	12-3-1	25	Not Applicable	15.8	2	1.75 Lb.
Flare, Target, Mk 28	12-4-1	48	Not Applicable	9.5	1.75	1.75 Lb.
Flare, Decoy, Mk 43	12-4-2		Not Applicable	4.5	—	11.6 Oz.
Flare, Decoy, Mk 47	12-4-3		Not Applicable	5.8	1.43	230 Grams

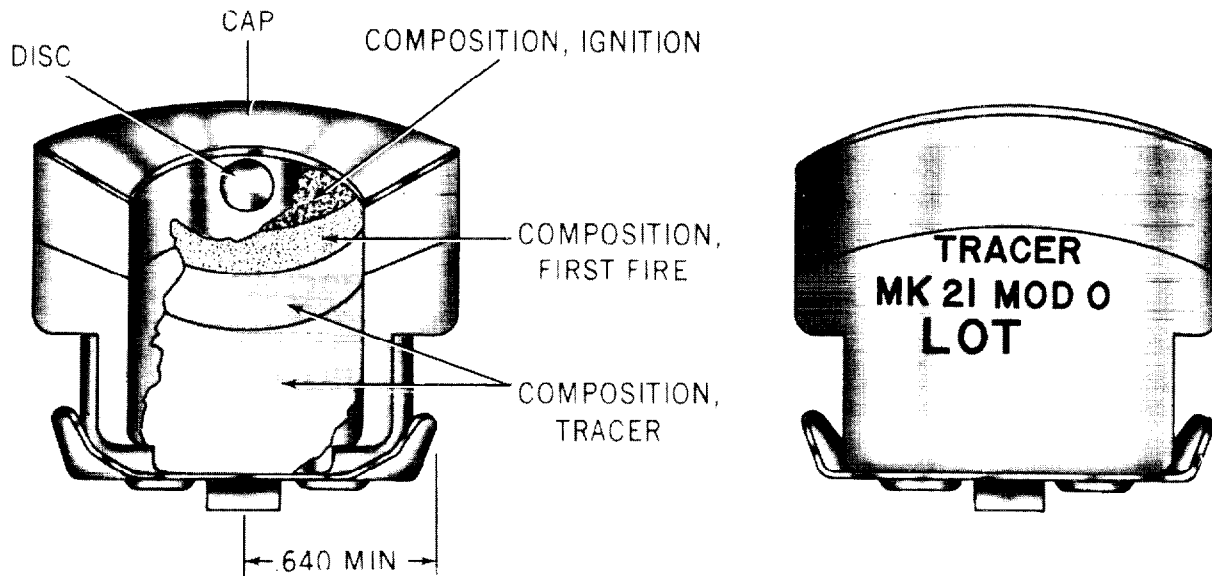


Figure 12.2.1 Tracer, Mk 21

12-2-2. Flare, Guided Missile, Mk 21 Mod 0
(Formerly Flare, Tracking, Mk 21 Mod 0)

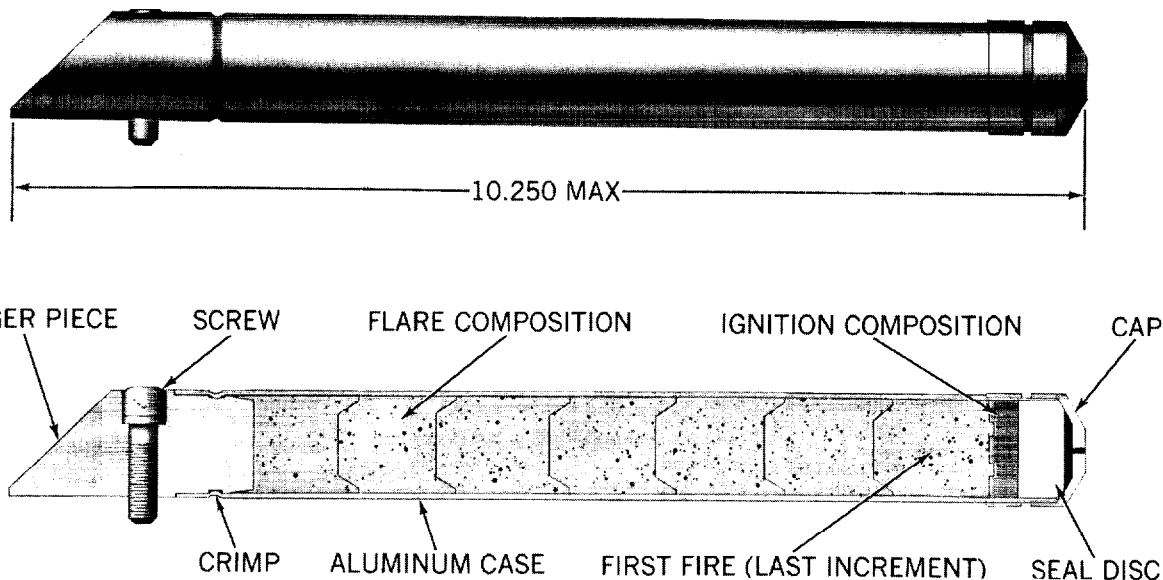


Figure 12.2.2 Guided Missile Flare, Mk 21

12-2-2-1. Intended Use. This device (see Figure 12.2.2) is attached to guided missiles to provide a trajectory-tracking light source and to certain rockets as an infrared target for the SIDEWINDER Missile (see Table 12-1).

12-2-2-2. Description. This device consists of a cylindrical aluminum tube approximately 10 inches long and one inch in diameter. It weighs approximately 260 grams. One end is closed with a plastic cap. A hanger piece is crimped to the other end.

12-2-2-3. Operation. The ignition composition of this device is ignited parasitically approximately one second after the rocket or missile is launched. The ignition composition ignites the first-fire composition which, in turn, ignites the pyrotechnic composition to produce the display.

12-2-2-4. Handling and Storage and Safety Precautions. The general handling, storage, and safety provisions of Chapter 1 of this pamphlet apply.

12-2-2-5. Identification Data. This device is listed under BUWEPS LD 251294, Specification No. NOTS XS-101, FSN 1370-516-5586, and DOD Code No. L488.

12-2-3. Flare, Guided Missile, Mk 23 Mod 0
(Formerly Flare, Tracking, Mk 23 Mod 0)

12-2-3-1. Intended Use. This device (see Figure 12.2.3) is used with BULLPUP Missiles (AGM-12 and ATM-12) to track their trajectories. It cannot be used with liquid fuel versions of the BULLPUP. It requires electrical power to the attachment socket (see Table 12-1).

12-2-3-2. Description. This device consists of a cylindrical steel case approximately 10 inches long and 1.75 inches in diameter. A terneplate and Teflon closing disk seals its emission end. The flare attachment end is closed with a soldered-on conical steel cap containing a shunting disk and appropriate electrical terminals and leads.

12-2-3-3. Operation. This device contains two squibs which are fired electrically. The squibs ignite the quickmatch which ignites the first-fire mixture. The first-fire mixture initiates

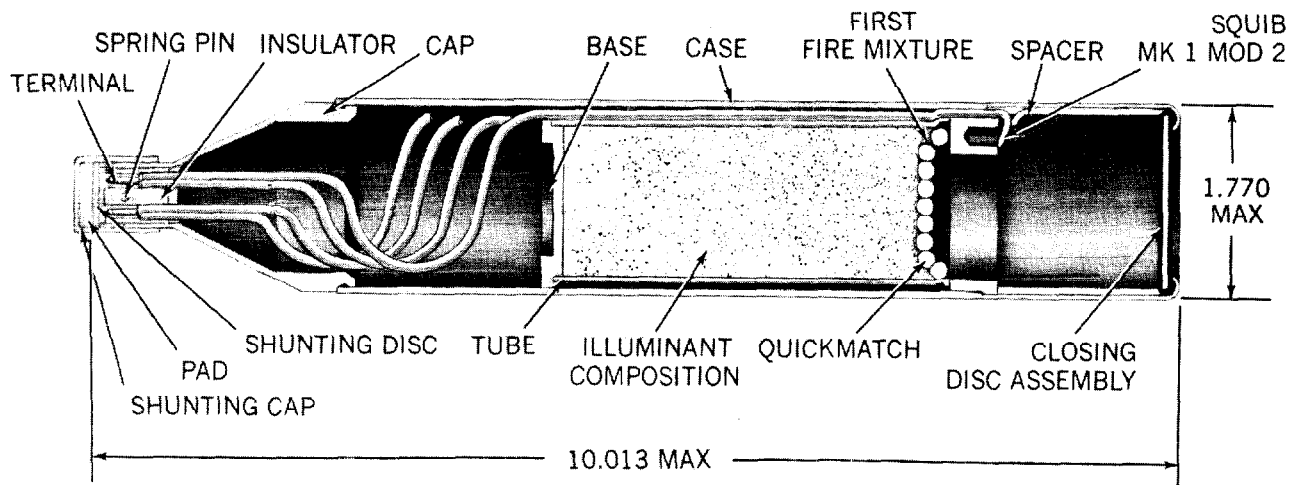


Figure 12.2.3 Guided Missile Flare, Mk 23

burning of the illuminant composition. Combustion gases blow off the cap, and the red display is emitted.

12-2-3-4. Handling and Storage. This device shall be handled and stored in accordance with the provisions of Section 1-6 of Chapter 1 of this pamphlet.

12-2-3-7. Identification Data. This flare is listed under BUWEPS LD 479375, Specification MIL-F-23138, FSN 1370-658-3278, and DOD Code No. L490.

12-2-4. Flare, Guided Missile, Mk 25 Mod 0
(Formerly Flare, Tracking, Mk 25 Mod 0)

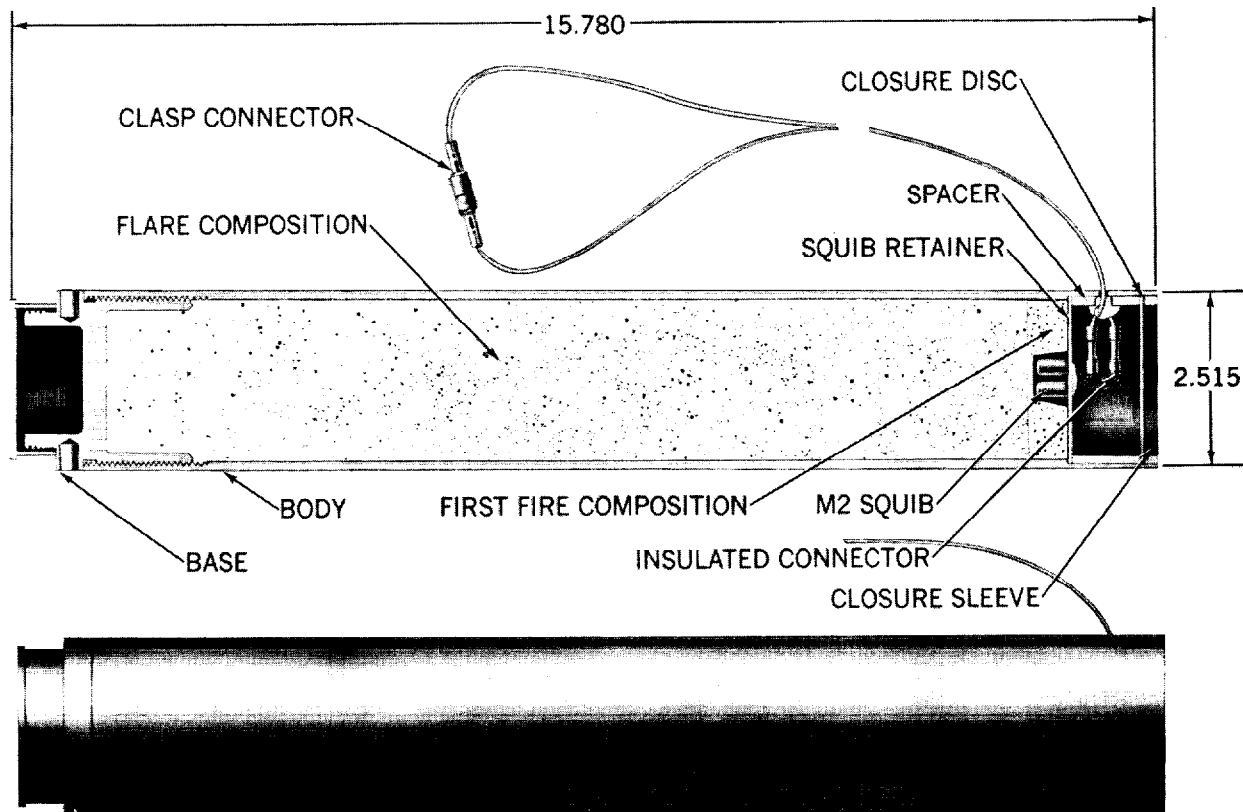


Figure 12.2.4 Guided Missile Flare, Mk 25

12-2-3-5. Safety Precautions. The general safety precautions of Section 1-8 of Chapter 1 of this pamphlet apply. In addition, care must be taken to assure the shunting of the squib circuits during handling and before attachment to the missile.

12-2-3-6. Shipping Containers. This device is packaged in an individual metal container equipped with a tear strip. Twenty-four such containers are packed for shipping in a wooden box, the estimated gross weight of which is 60 pounds.

12-4

12-2-4-1. Intended Use. This flare (see Figure 12.2.4) is used as a visual and photographic aid in tracking the path of the TALOS Guided Missile (RIM-8) (see Table 12-1).

12-2-4-2. Description. This device consists of a phenolic resin cylindrical body closed at its ignition end with an aluminum disk and at its other end with an aluminum base, threaded for attachment to the missile flare support. Ignition leads protrude from the side near the ignition end of the cylinder.

12-2-4-3. Operation. The flare is electrically initiated. Two electric squibs ignite the first-

fire composition which, in turn, ignites the pyrotechnic composition. Initiation of the flare is accomplished within 0.5 second after missile launch.

12-2-4-4. Handling and Storage. The general provisions for handling and storage as set forth in Section 1-6 of Chapter 1 of this pamphlet apply to this device.

12-2-4-5. Safety Precautions. The safety precautions of Section 1-8 of Chapter 1 of this pamphlet must be observed in respect to this device. In addition, the following special precautions apply:

(1) The ignition end of this flare must not be pointed toward the body or toward other personnel during handling and installation. The flare will produce a flame approximately a foot in diameter and 3 feet long with heat exceeding that of an acetylene torch flame.

(2) Personnel installing this device must

wear protective colored eyewear.

(3) Cracked, dented, or otherwise damaged flares shall not be used.

(4) Care must be exercised not to pinch or damage the ignition leads during installation.

(5) If the flare is installed and is not to be used, the ignition lead wires must be disconnected and positively shorted.

12-2-4-6. Installation Procedures. This flare shall be installed in accordance with appropriate current instructions covering operation and use of the TALOS Guided Missile (RIM-8).

12-2-4-7. Identification Data. This device is listed under BUWEPS LD 498044 and Specification OS 8732. FSN and DOD Code Numbers have not been assigned.

12-2-5. Flare, Guided Missile, Mk 27 Mod 0
(Formerly Flare, Tracking, Mk 27 Mod 0)

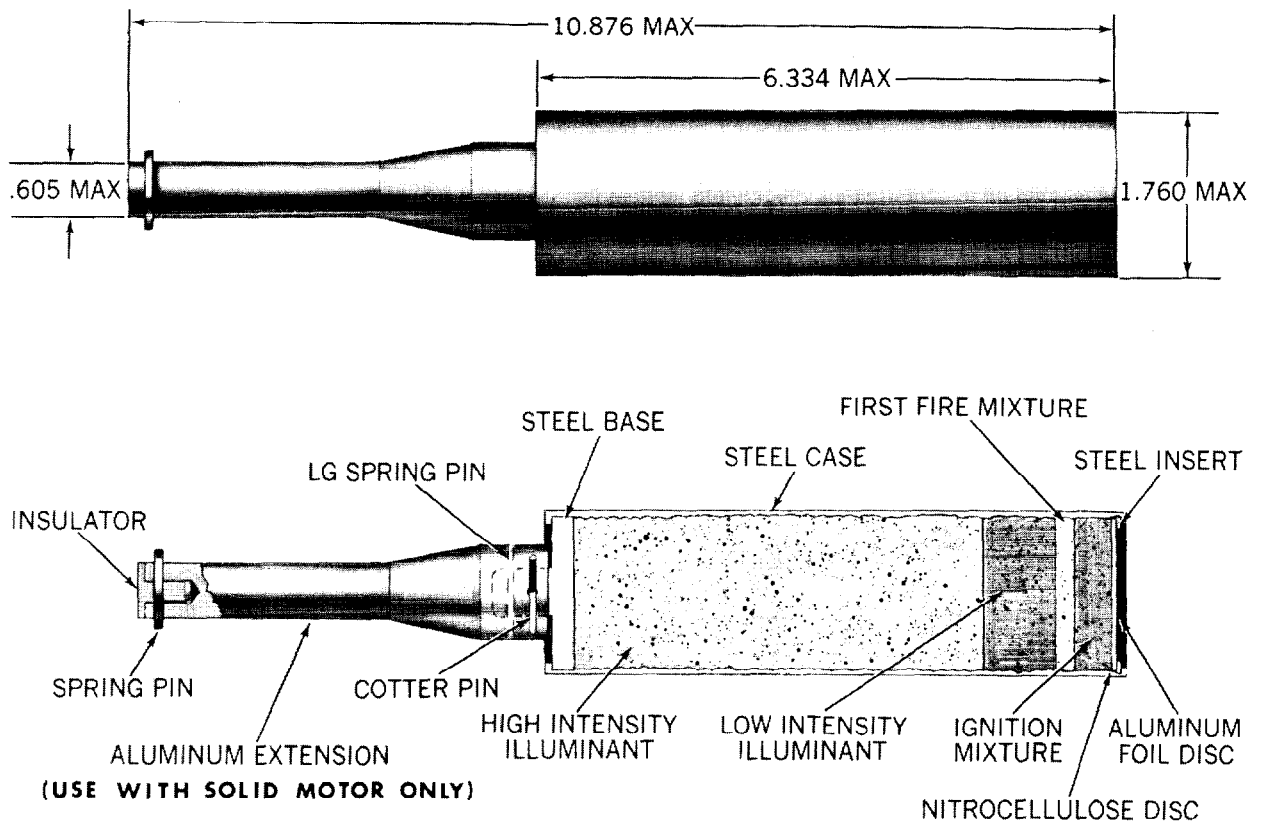


Figure 12.2.5 Guided Missile Flare, Mk 27

12-2-5-1. Intended Use. This device (see Figure 12.2.5) is used with the BULLPUP Guided Missile (AGM-12 and ATM-12) to provide visual observations of the missile's trajectory (see Table 12-1).

12-2-5-2. Description. This device is encased within a steel cylinder approximately 6.3 inches long and 1.8 inches in diameter. At its base end is attached an aluminum extension approximately 4.5 inches long which is secured to the main flare body by a cotter pin. This extension is used for attaching the flare to the missiles with solid motors only. The extension cannot be used with liquid motor missiles.

12-2-5-3. Operation. The missile motor exhaust heats and erodes the flare case exposing the ignition mixture to the intense heat of the exhaust. This ignites the ignition mixture.

The ignition mixture ignites the first-fire mixture which, in turn, ignites the low-intensity illuminant composition. The low-intensity composition burns for approximately 8 seconds, after which ignition is transferred to the high-intensity illuminant composition which burns for a minimum of 40 seconds.

12-2-5-4. Handling and Storage and Safety Precautions. The handling and storage and general safety provisions of Chapter 1 of this pamphlet are applicable to this device.

12-2-5-5. Identification Data. This device is listed under BUWEPS LD 282821, Specification OS 8779, FSN 1370-787-2788, and DOD Code No. L491.

12-2-6. Flare, Guided Missile, M136
(Formerly Tracer, Guided Missile, M136)

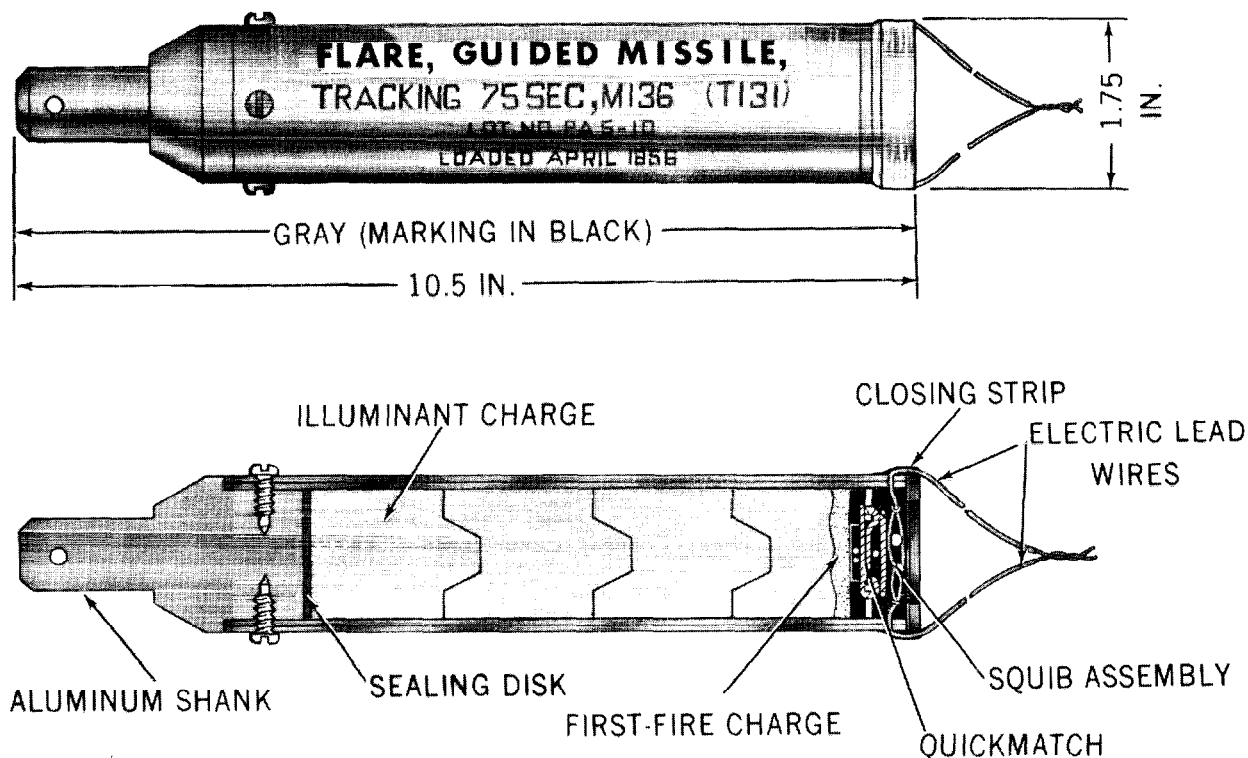


Figure 12.2.6 Guided Missile Flare, M136

12-2-6-1. Intended Use. This device (see Figure 12.2.6) is used in tracking ground-launched guided missiles. It functions prior to or at the time of missile ignition (see Table 12-1).

12-2-6-2. Description. The illuminant charge is encased within a tube approximately 7.75 inches long and 1.75 inches in diameter. Electric lead wires extend through holes near the ignition end of the tube, and are firmly secured with tape. An aluminum attachment shank is attached to the other end of the tube with screws.

12-2-6-3. Operation. This device is activated by electrical energy from the missile power source. Two electric squibs ignite the quick-match which initiates burning of the first-fire charge. The first-fire charge, in turn, ignites the illuminant charge. Gases of combustion blow off the closing cover to emit the display.

12-2-6-4. Handling and Storage. The general handling and storage provisions of Section 1-6 of Chapter 1 of this pamphlet apply.

12-2-6-5. Safety Precautions. In addition to the safety precautions set forth in Section 1-8 of Chapter 1 of this pamphlet, the following special precautions must be observed:

(1) The bare ends of the electric lead wires of this device must be kept twisted together and thus shorted out until the flare is installed in the missile.

(2) Before connecting the lead wires to the missile power supply, it must be determined that the power supply is off.

12-2-6-6. Shipping Containers. This device is packaged in an individual metal container. Twenty such individual containers are packed for shipment in a wooden box.

12-2-6-7. Identification Data. This device is listed under Dwg. No. 8836055, Specification No. MIL-T-13688, FSN 1370-611-4383, and DOD Code No. L482.

12-3. BOMB TRACKING DEVICES The devices described in this section are designed to provide visual displays to assist ground observers in tracking the flight paths of bombs.

12-3-1. Tracking Device, Smoke, Mk 1 Mod 0.

12-3-1-1. Intended Use. This device (see Figure 12.3.1) is attached in pairs by specially designed clamps to 250-pound Mk 86, 500-pound Mk 87, and 1000-pound Mk 88 low-drag bombs to provide a violet-colored smoke display from which ground observers are able to follow the trajectory or flight path of the bomb.

12-3-1-2. Description. Smoke Tracking Device, Mk 1 Mod 0 consists of an aluminum cylindrical case, approximately 11 inches long and 2 inches in diameter, to one end of which is crimped a plastic nose. A firing pin extends through the plastic nose and is threaded on its exposed end. There is a hole in the end of the firing pin for insertion of an arming wire. A wing nut is screwed onto the end of the firing pin. Overall length of the device is approximately 15.8 inches. The end opposite the firing pin is closed by a centered blow-out cap. A safety cotter pin, to which is attached an instruction tag, is inserted through the plastic nose near its greatest diameter. The outer case is marked to show the correct location for attachment of the clamp with which the device is affixed to the bomb.

12-3-1-3. Preparation for Use. This device is received with its safety cotter pin in place and its wing nut securely screwed onto the protruding end of the firing pin. The following steps shall be taken in preparing it for use:

(1) Remove two Smoke Tracking Devices, Mk 1 Mod 0 and one clamp (see paragraph 12-3-1-8 following) from their respective shipping containers.

(2) Carefully inspect both the tracking devices and the clamp for any signs of damage, corrosion, or deterioration. Be sure

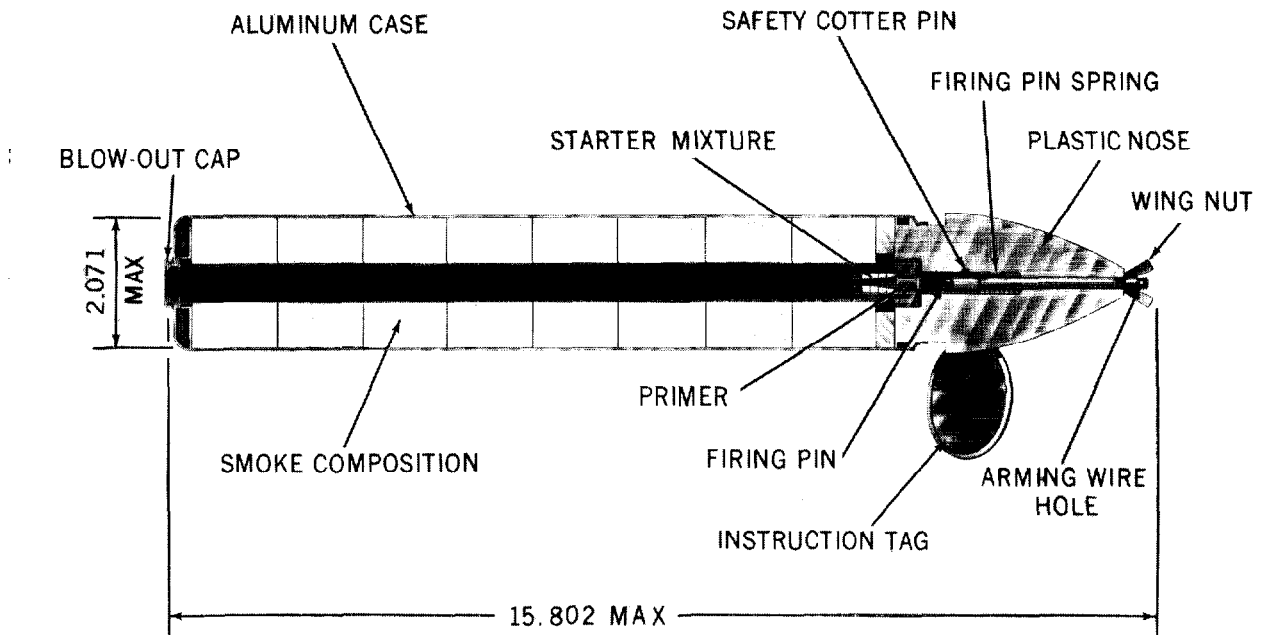


Figure 12.3.1 Smoke Tracking Device, Mk 1 Mod 0

that the safety cotter pin and wing nut are properly in position on each tracking device.

WARNING

Dented or otherwise damaged Smoke Tracking Devices and associated clamps shall not be used; they must be segregated for appropriate disposition. If a safety cotter pin is not securely in place or if a wing nut is missing, the device must be disposed of as unserviceable.

(3) Using the clamp provided, attach two Smoke Tracking Devices to the bomb, plastic nose end forward.

(4) After rechecking to be sure that the safety cotter pins are securely in place, remove wing nuts by turning counterclockwise.

(5) Cut two pieces of arming wire (.064-inch minimum diameter) of sufficient length to reach from the arming solenoid of the bomb rack to the exposed end of the firing pin of each tracking device.

(6) Insert end of arming wire into hole near end of each firing pin.

(7) Remove safety cotter pins from both tracking devices.

12-3-1.4. Operation. Release of the bomb from the bomb rack removes the arming wire from the hole in the threaded end of the firing pin, allowing the spring-loaded firing pin to strike the primer. The primer

ignites the starter mix which, in turn, ignites the smoke composition. The violet-colored smoke display is produced for a minimum of 25 seconds and a maximum of 52 seconds.

12-3-1-5. Handling and Storage. This device includes two safety features: the wing nut which is affixed to the exposed end of the firing pin, and the safety cotter pin to which is attached a red-colored instruction tag. In all handling and storage operations, care must be exercised to assure that both the wing nut and the cotter pin are securely in place. The tracking devices should not be removed from their shipping containers until immediately before they are to be used. If removed and not used, a careful check must be made to assure that the safety cotter pin and the wing nut are securely in place before they are returned to their metal shipping container. The devices shall never be placed in storage except in the shipping container in which they were received. The general handling and storage rules of Section 1-6 of Chapter 1 of this pamphlet apply and must be observed.

12-3-1-6. Safety Precautions. This device has a direct firing train. The spring-loaded firing pin will initiate burning once it is released. Under no circumstances is the safety cotter pin to be removed until an arming wire is securely fastened to the end of the firing pin. The general safety precautions of Section 1-8 of Chapter 1 of this pamphlet apply to this tracking device.

12-3-1-7. Shipping Containers. Smoke Tracking Device, Mk 1 Mod 0 is packaged 16 to a cylindrical metal shipping container the gross weight of which is approximately 38.5 pounds. Clamps suitable for the particular bomb being employed are packaged and shipped separately.

12-3-1-8. Identification Data. Smoke Tracking Device, Mk 1 Mod 0 is listed under BUWEPS LD 282889, Assembly Dwg. No. 1332076, Specification WS 1895, FSN 1370-

225-5339, and DOD Code No. X826. Clamps for attachment to bombs are listed as follows:

	250 Lb. Mk 86	500 Lb. Mk 87	1000 Lb. Mk 88
LD	615125	615126	615127
Drawing	1332081-1	1332081-2	1332081-3
FSN	1370-570-6172	1370-570-6173	1370-570-6174
DOD Code No.	X827	X828	X829

12-4. TARGET DEVICES

The devices described in this section are designed to be attached to powered or towed aerial targets for the purpose of providing a means whereby a missile or other weapon is attracted to the target.

12-4-1. Flare, Target, Mk 28 Mods 2 and 3.

12-4-1-1. Intended Use. This device (see Figure 12.4.1) is used on powered or towed airborne targets as a heat source in practice operations involving guided missiles which are equipped with infrared homing capabilities. It functions for a minimum of 48 seconds at any altitude up to 35,000 feet (see Table 12-1).

NOTE: Mod 2 of this target flare is disposable and should not be in the supply system. If any are found in the system, they should be returned to an ammunition depot for appropriate disposition.

12-4-1-2. Description. This device is housed in a plastic (paper-base phenolic resin) tubular case, approximately 9.5 inches long and 1.75 inches in diameter, which is sealed at one end with a closure disk covered with plastic steel (Devcon B). The base is closed with laminated plastic. A bayonet-type electrical connector protrudes from the center of the base. A spring-loaded shunting socket assembly is fitted over the connector. The mods differ only in the chemical make-up of the flare composition, in the quantity of ignition composition, and in the burn end closure configuration; the Mod 2 burn end

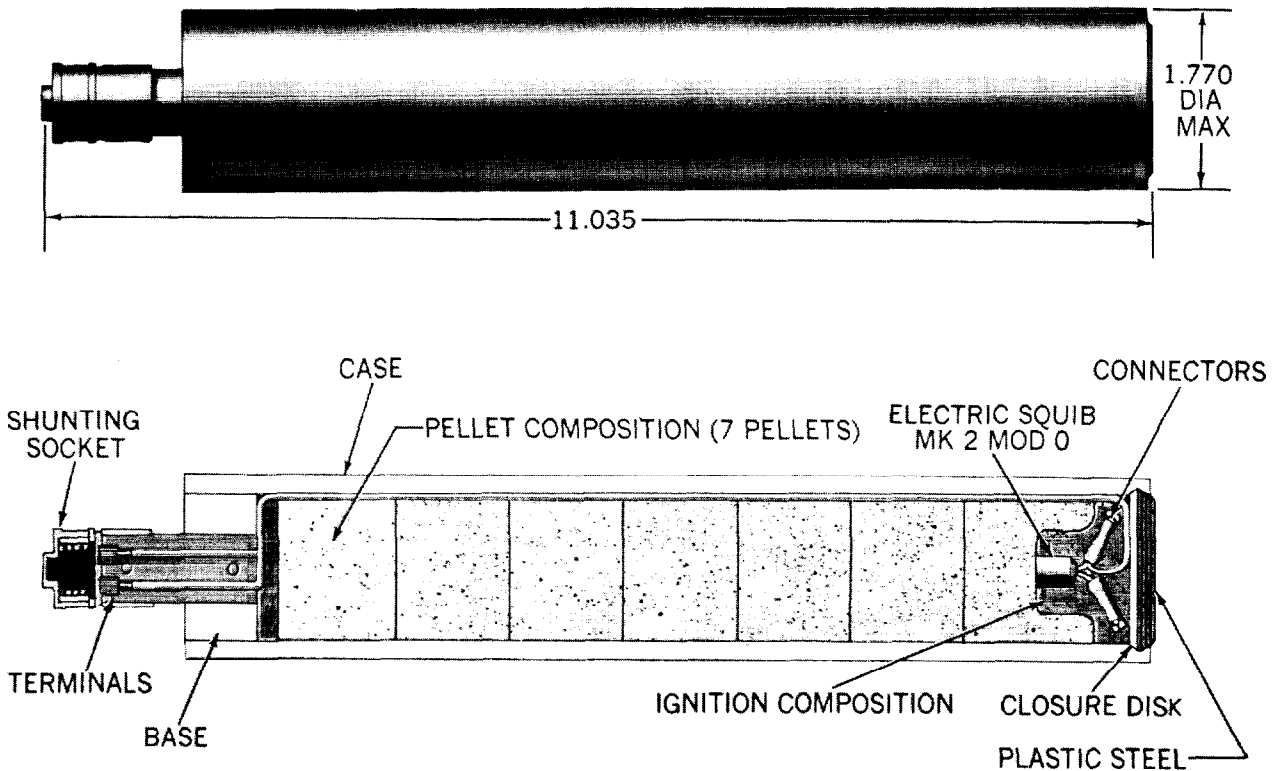


Figure 12.4.1 Target Flare, Mk 28

is deeply indented.

12-4-1-3. Operation. This flare is initiated by electricity from the batteries in the target, which fires the electric squib, Mk 2 Mod 0, located in the ignition end of the tube. The squib ignites the ignition composition which ignites the pyrotechnic pellets. The burning pellets provide a heat source which can be detected by heat-seeking guidance systems. For complete information as to radiation output characteristics of this device, see NAVWEPS OS 8781 (Confidential).

12-4-1-4. Installation Procedures. The following steps shall be taken in installing this flare in targets:

- (1) Ascertain that the device has been approved for the intended application.
- (2) Remove the flare from its shipping container.
- (3) Carefully inspect the flare for any

signs of damage.

- (4) Determine positively that the power source of the target is in shunted or "safe" position.

WARNING

The power source of the target must be in "safe" or off position before installing the flare to avoid premature ignition.

- (5) Remove the shunting socket assembly from the bayonet-type connector of the flare and inspect the two contact points for corrosion or dirt.

WARNING

Do not stand directly behind flare or hold hands over its end while installing.

(6) Insert the bayonet-type connector of the flare into the mating socket of the target. Depress and rotate the flare clockwise until it cannot be rotated further and release. Check its secure locking in the socket by exerting a slight pull on the flare.

(7) Proceed with installation in accordance with instruction for the particular target being used.

12-4-1-5. Removal Procedure. The following steps shall be taken in removing this device from a target:

(1) Determine positively that the power source of the target is in shunted or "safe" position.

(2) Loosen mechanical attachments in accordance with instructions for the particular target being used.

WARNING

Do not stand directly behind the flare or hold hands over its end while removing it from the target.

(3) Apply a slight pushing force to the flare and rotate it counterclockwise until it cannot be rotated further.

(4) Remove the flare by pulling the connector from the mating socket.

(5) Replace the shunting socket assembly on the flare connector.

(6) Return the flare to its original storage condition.

CAUTION

Care must be taken to avoid damaging flares and their connectors

during removal operations. Damaged flares must be disposed of in accordance with Chapter 3 of this pamphlet.

12-4-1-6. Handling and Storage. This device shall be handled and stored in accordance with the provisions of Section 1-6 of Chapter 1 of this pamphlet.

12-4-1-7. Safety Precautions. In addition to the general safety precautions of Section 1-8 of Chapter 1 of this pamphlet, the following special precautions shall be observed:

(1) The flare shall not be removed from its shipping container until immediately prior to its installation for use.

(2) The shunting socket must be kept in place until immediately prior to installation in the target.

(3) The fumes produced by burning this flare are highly toxic.

(4) Before installing this flare in or removing it from the target, a careful check must be made to assure that the power source is off.

(5) Do not stand directly behind the flare or hold the hands over its end when installing in or removing from the target.

(6) Damaged flares shall not be installed in targets. They must be disposed of in accordance with Chapter 3 of this pamphlet.

12-4-1-8. Shipping Containers. This device is packaged twenty to a sealed metal container.

12-4-1-9. Identification and Requisitioning Data. The following table applies to this device:

Flare, Target, Mk 28 Mods

	Mod 3	Mod 2*
BUWEPS Dwg. or LD Nos.	282868	282826
Specification No.	OS 878ID	OS 8718D
Federal Stock Nos.	1370-866-6676	1370-907-1265
DOD Code Nos.	X463	X463

* See Note Following Paragraph 12-4-1-1

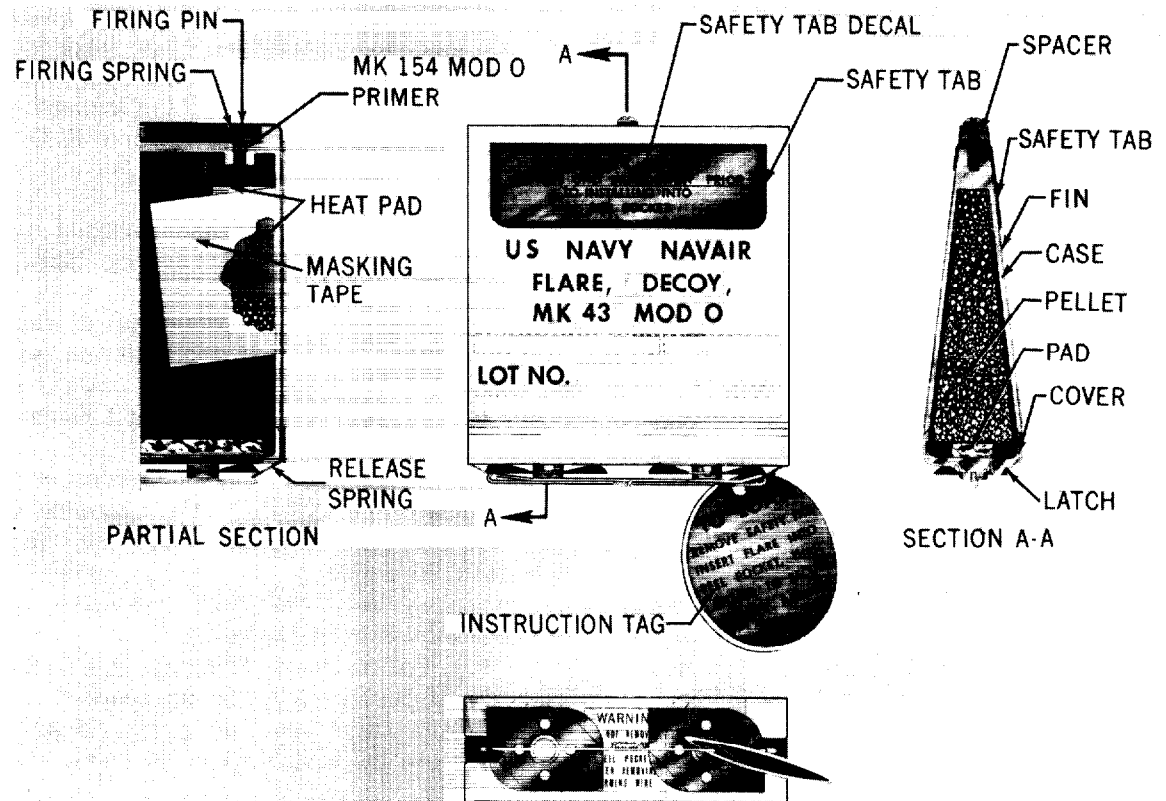


Figure 12.4.2. Decoy Flare, Mk 43 Mod 0

12-4-2. Flare, Decoy, Mk 43 Mod 0

12-4-2-1. Intended Use. This flare (see Figure 12.4.2) is launched from the AN/ALE-18 dispenser for purposes as set forth in Confidential NAVAIR 11-15-4. All rules respecting use and maintenance of the AN/ALE-18 dispenser are contained in NAVAIR 16-30ALE-18-1 and must be carefully followed to assure safe and reliable flare performance.

12-4-2-2. Description. This device consists of a wedge-shaped pyrotechnic pellet contained wholly within a plastic outer case. Fins also of plastic material, are bonded to each of the two larger flat surfaces of the outer case near its broad base. These fins

serve as obturators to accelerate launching from the dispenser reel by compressed air. Two stab-type primers are located on the narrow end of the flare. A metal safety tab is inserted through slots in the fins near the narrow end so that it forms a positive barrier between the primers and the firing pins to prevent accidental initiation. A firing pin is located near each end of a leaf spring which is attached at its center to the narrow end of the wedge. Also attached at the center of the narrow end is a wrap-around release spring, the purpose of which is to cock and release the firing pins at the time of launching. In the under surface of the release spring are two small catches that engage the ends of the firing pin spring. When the release spring is freed at launch-

ing, these catches raise the firing pin spring to an angle of approximately 30 degrees before allowing the firing pins to snap back and strike the primers. The two arms of the release spring extend around both sides of the wedge and terminate approximately 1/2 inch around the corners of the base where they are tied together and locked firmly in position by an arming wire. An instruction tag is attached to the arming wire. On the base of the flare case, beneath the arming wire, are two metal latches which are turned 90 degrees counterclockwise to secure the flare in one of the 24 pockets of the dispenser reel (see NAVAIR 16-30ALE-18-1, Handbook of Operation, Service and Overhaul Instructions for dispensing sets, AN/ALE-18 (Confidential)).

WARNING

The safety tab must not be removed until immediately before installing the flare in the dispenser reel.

WARNING

The arming wires must not be twisted, cut, tampered with, or removed until all flares are fully installed and locked into the dispenser reel.

12-4-2-3. Installation. The following steps shall be taken in installing the Mk 43 Decoy Flare in the AN/ALE-18 dispenser:

(1) Remove reel from dispenser and carefully inspect pockets for foreign material.

(2) Take reel to designated loading area.

(3) Remove single flare from shipping container, gripping the wedge sides with thumb and fingers so as to hold the release spring firmly against the flare case.

(4) Carefully examine the flare for any signs of damage, particularly for broken or cracked release spring, arming wire, and outer case, being sure to hold release spring against outer case while inspecting.

WARNING

If cracked or broken release spring, arming wire, or flare case is found during inspection, flare must be segregated for immediate disposition by fully trained E. O. D. personnel.

(5) Still holding release spring securely with thumb and fingers of one hand, carefully remove safety tab.

(6) Insert flare into pocket of dispenser reel. Be sure that the release spring is held firmly against sides of flare case during this operation and until flare is fully within dispenser reel.

(7) Using needle-nose pliers or similar tool, insert points into the opposite holes in each flare latch successively and turn each latch 90 degrees counterclockwise. Check to be certain that latch ends are securely under tabs in reel pocket.

(8) Follow steps (3) through (7) above for each separate flare to be loaded. Remove only one flare from shipping container and complete its installation before removing another.

(9) After all flares to be loaded are fully installed in dispenser reel, cut and remove arming wires.

WARNING

Flares are not to be removed from reels after they are installed. If they are not to be launched, the reel is to be removed from the dispenser, belted as below, and placed in storage intact.

(10) Load dispenser reel into AN/ALE-18 dispenser in accordance with paragraph 4-9 of NAVAIR 16-30ALE-18-1.

12-4-2-4. Removing Loaded Reel from Dispenser. In the event that all or some of the flares installed in dispensers are not launched and are returned to an airstrip or flight deck, the following steps shall be followed:

WARNING

Under no circumstances shall loaded or partially loaded dispenser reels be left in dispensers after an aircraft has returned from a mission.

(1) Check to be sure that all flare latches are securely under tabs in reel pockets. If any are not firmly in place, the reel must be removed only by fully trained E. O. D. personnel.

(2) If all flares are securely locked in reel, proceed to remove reel from dispenser in accordance with paragraph 4-9 of NAVAIR 16-30ALE-18-1.

(3) Place web belt (standard Navy wearing apparel) about circumference of reel at centers of flare cases and secure tightly. This will prevent flares from slipping out and igniting in the event that the reel is dropped.

(4) Place loaded (or partially loaded) reel in ready-service storage locker or other designated space.

12-4-2-5. Operation. When a Mk 43 Mod 0 Decoy Flare is launched, the release spring is freed from its position against the sides of the outer case so that it raises the firing pin spring. At an angle of approximately 30 degrees, the ends of the firing pin spring slip from beneath the small catches, permitting the firing pins to snap downward against the primers. The primers ignite Z-2 heat paper which is adhered to the pellet in such a way that the entire outer surface of the pellet is ignited almost simultaneously. There is no delay of any kind in the firing train of this device.

12-4-2-6. Handling and Storage. Before removal from the shipping container in which it is received, this flare may be handled and stored in the same manner as any other pyrotechnic as set forth in Section 1-6 of Chapter 1 of this pamphlet. After removal from its packaged condition, however, the following special rules are vitally important and must be strictly adhered to:

(1) During all handling between removal from shipping container and installation in a dispenser reel, the release spring should be held securely against the sides of the outer case with thumb and fingers.

(2) The safety tab is not to be removed until immediately prior to loading the flare into a dispenser reel.

(3) Arming wires must not be disturbed until the reel is fully loaded and until inspection has determined positively that all flares are properly installed and securely locked in the dispenser reel.

(4) Once installed in a dispenser reel, a flare must not be removed from the reel under any circumstances. If any flares are not launched, the reel must be detached from the dispenser as in paragraph 12-4-2-4 preceding, secured with a web belt, and stored intact.

(5) Extreme care must be taken in all handling operations to avoid dropping a flare or a filled or partially filled dispenser reel, since damage from dropping could free the release spring and cause instantaneous ignition of the pellet.

(6) Flares removed from primary storage shall not, under any conditions, be returned to such storage if their shipping containers have been opened. If the shipping container has been opened, storage shall be in ready-service lockers, segregated from other pyrotechnics and explosives.

(7) Flares that have been removed from their original packaged condition must be installed in dispenser reels. They must never be stored except in reels, and such storage shall be above decks subject to immediate jettisoning in case of fire in the vicinity.

12-4-2-7. Safety Precautions. All of the rules in the preceding paragraph relate to safety and must be strictly observed. This device has no delay in its firing train. It is therefore of paramount importance that extreme caution be exercised to prevent freeing of the release spring. The arming wire must be kept securely in place, locking the ends of the release spring until the flare is fully

installed in a dispenser reel and until a careful check has determined positively that the flare latches are properly in position under the reel tabs. A filled or partially filled dispenser reel shall not be removed from a dispenser until it is positively determined that all flares in the reel are securely locked in position, and the reel must be belted, as specified in paragraph 12-4-2-4 (3) preceding, as soon as possible after it is taken out of the dispenser.

12-4-2-8. Shipping Containers. The Decoy Flare, Mk 43 Mod 0 is packaged 24 to a polystyrene tray, 3 trays (72 flares) to a Mk 2 Mod 0 Ammunition Components Box. The gross weight of a filled box is approximately 74 pounds.

12-4-2-9. Identification Data. This device is listed under DL 2127773, Assembly Dwg. No. 2127773, Specification No. AS 1180, FSN 1370-089-7206, and DOD Code No. LA09.

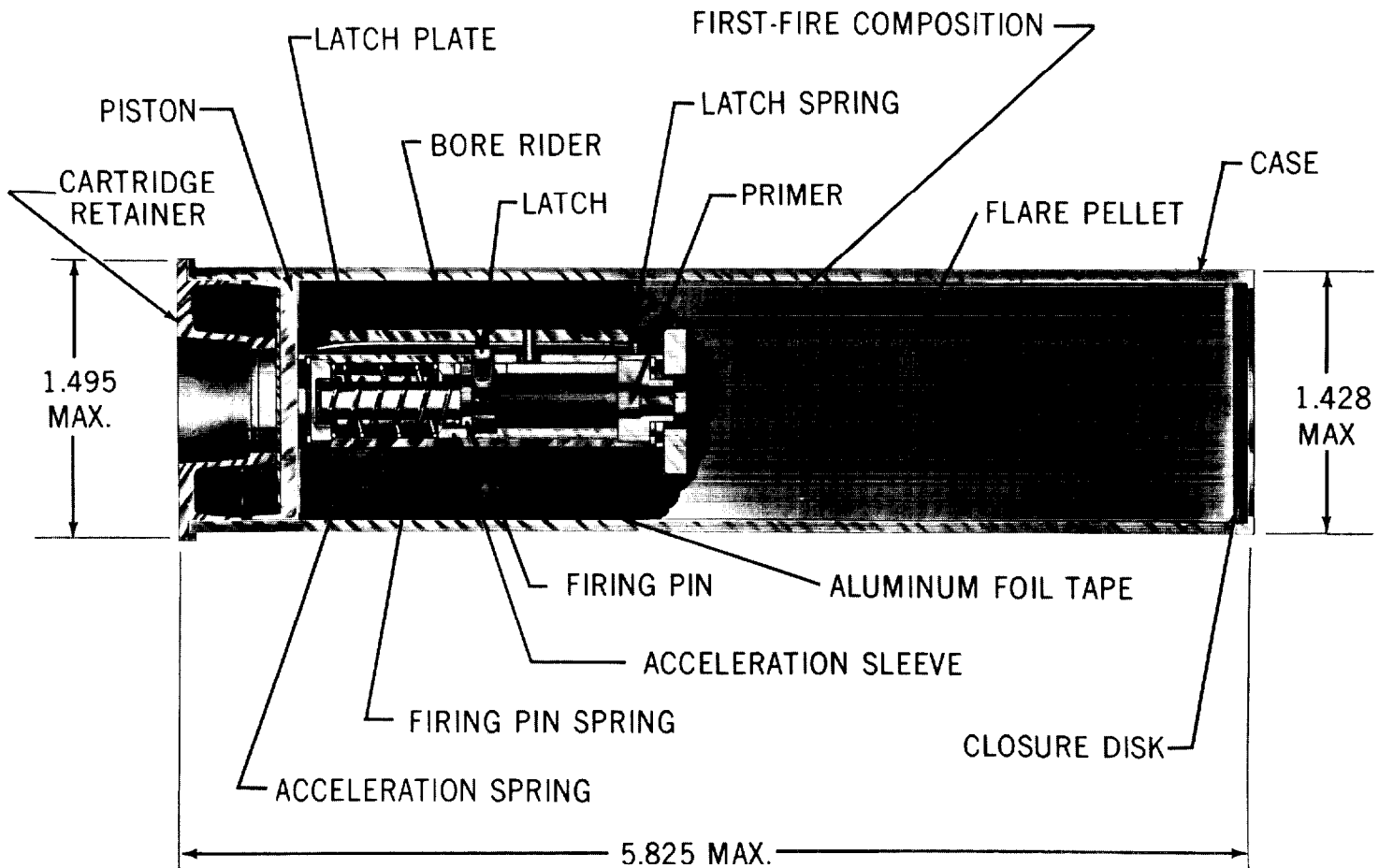


Figure 12.4.3 Decoy Flare Mk 47 Mod 0

12-4-3. Flare, Decoy Mk 47 Mod 0

12-4-3-1. Intended Use. This flare (see Figure 12.4.3) is launched from the AN/ALE-29A Dispensing Set for purposes as set forth in confidential NAVAIR 11-15-4. All rules respecting use and maintenance of the AN/ALE-29A Dispensing Set, including information on loading and downloading these flares, are contained in NAVAIR 16-30ALE29-3, Technical Manual, Operation and Maintenance Instructions with Illustrated Parts Breakdown. These rules and instructions must be carefully followed to assure safe and reliable flare performance.

12-4-3-2. Description. This Decoy Flare consists of a cylindrical molded plastic outer case, approximately 5.8 inches long and 1.4 inches in diameter. The base of the cylinder is flanged to a maximum diameter of 1.495 inches to fit the counter-bore in the ejector tube of the dispenser. There are 30 such tubes in each AN/ALE-29A Dispenser. The end of the flare case opposite the flanged base is closed with a plastic closure disk. The case piston is fitted approximately 1/2 inch into the flanged end of the flare case, abutting the after end of the inertia firing device. A plastic cartridge retainer may or may not be in the base cavity at the time of

receipt; if not present, it must be inserted against the piston during the loading operation.

12-4-3-3. Inertial Firing Device. The firing device of this flare consists of a spring-loaded firing pin which is kept in a safe position away from the percussion primer by a latch. This latch is securely locked in its holding position by two means, namely: (1) it is integral with the latch plate which is held in a depressed condition by the bore rider, and (2) it (the latch) fits into a slot in the acceleration sleeve that is shaped so as to prevent its release until an acceleration force of at least 10 G's is applied.

12-4-3-4. Associated Equipment. This flare is used with plastic cartridge retainers (which may or may not be in the base cavity at time of receipt) and Impulse Cartridges, Mk 131 Mod 0, which make it compatible with the AN/ALE-29A Dispenser Set.

12-4-3-5. Operation. When properly installed in the AN/ALE-29A Dispensing Set, the cavity in the base of each cartridge retainer fits snugly over the end of a corresponding impulse cartridge. When a cartridge is fired, expanding gases, acting through the cartridge retainer against the case piston, eject the inertia firing device and the flare pellet from the outer case at a velocity of from 70 to 140 feet per second. Acceleration forces set back the acceleration sleeve in the firing device. With the sleeve thus moved back, the latch is freed so that it can move away from its position blocking the firing pin. When the bore rider clears the end of the flare case, the latch spring raises the latch plate which is integral with the latch, and pulls the latch up and away from the firing pin. This frees the firing pin so that its spring forces it against the percussion primer. The primer ignites the first-fire composition, in turn, ignites the flare pellet.

12-4-3-6. Safing Features. There are no external safing mechanisms such as cotter pins on this flare. The firing pin is secured in safe position by the two means as explained in

paragraph 12-4-3-3 preceding. The latch which blocks the firing pin is removed from its blocking position only when two conditions occur simultaneously. The bore rider must be out of the flare case at the same time that acceleration forces equal or exceed 10 G's. The firing pin cannot be released and therefore the flare pellet cannot be ignited if only one of these conditions exists at a given time.

12-4-3-7. Installation. Mk 47 Mod 0 Decoy Flares shall be installed in AN/ALE-29A Dispenser Sets in strict accordance with Section V. Paragraphs 5-6 and 5-8 of NAVAIR 16-30ALE29-3.

NOTE: For purposes of this Ordnance Pamphlet, all references in NAVAIR 16-30ALE29-3 to "Payload Packages," "Packages," and "Payload Units" shall be construed to mean Decoy Flares, Mk 47 Mod 0.

12-4-3-8. Unloading a Dispenser. These flares shall be down-loaded from AN/ALE-29A Dispenser Sets in accordance with Section V, paragraphs 5-10 and 5-12 of NAVAIR 16-30ALE29-3 and in accordance with NAVAIR 11-75AA-42 Handbook, Operation, Handling, Safety and Storage Instructions, MIL-F-81545 (AS), Flare, Decoy, Mk 47 Mod 0.

12-4-3-9. Handling and Storage. In all handling and storage operations relating to these flares, the following rules apply:

(1) Shipping containers in which these flares are boxed shall be protected at all times from excessive temperatures in storage. They must not be stored near radiators or other heat sources.

(2) If a shipping container has been opened and only partially emptied, the remaining flares shall be secured in the container with an appropriate type of packaging material or fillers that will positively prevent jostling.

(3) All flares in storage must be in their individual mailing tubes.

(4) Only one shipping container is to be opened at a time.

(5) The loading of flares into a dispenser shall be accomplished one at a time.

(6) Flares must not be dropped, rolled, or otherwise handled in a rough or careless manner.

(7) Flares that exhibit any signs of visible damage, or that have been dropped or otherwise subjected to rough handling, shall not be loaded into a dispenser. They must be segregated for disposition in accordance with the provisions of Chapter 3 of this pamphlet.

(8) Dispensers loaded with these flares must be handled with extreme care to avoid striking or dropping. The plastic material of which the dispenser is made will crack or split under some types of impact. Dispensers that have been dropped or roughly handled shall be unloaded and replaced. All flares that were in such a dispenser should likewise be replaced by flares that have not been subjected to rough handling.

12-4-3-10. Safety Precautions. The following special safety precautions apply:

(1) Before commencing operations leading to the installation of these flares in a dispenser, a careful check must be made to assure that all electric power to the dispenser system has been turned off.

(2) Flares shall not be dropped, thrown, or otherwise mishandled.

(3) Flares shall be kept away from all fires and excessively high temperatures.

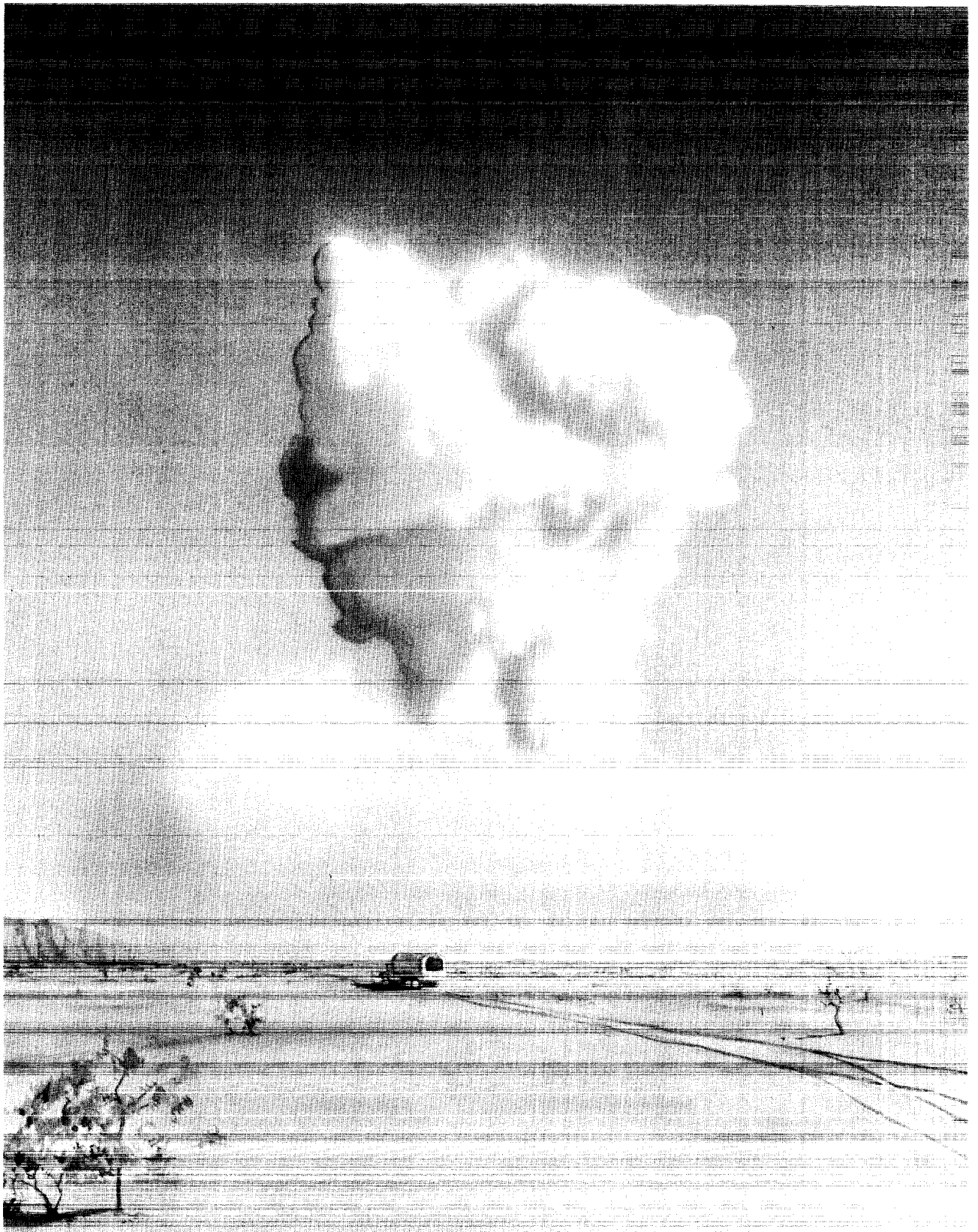
(4) Under no circumstances shall a flare be hammered or forced into a dispenser tube; hand pressure is adequate for seating.

(5) Impulse cartridges used in conjunction with these flares must be handled with extreme care. Each cartridge generates a gas pressure of as much as 140 psi and temperature approaching 400° C (752° F).

12-4-3-11. Reporting Accidents and Incidents. Any explosive accident or incident, as defined in paragraph 2-1-1 of Chapter 2 of this pamphlet, and any malfunction involving these flares shall be reported in accordance with the provisions of Chapter 2.

12-4-3-12. Shipping Containers. Decoy Flare, Mk 47 Mod 0 is packaged in an individual cardboard shipping tube, thirty such tubes to a reusable cylindrical metal container. Four of these containers (120 flares) are packaged in a wooden box, the filled weight of which is approximately 125 pounds.

12-4-3-13. Identification Data. The Mk 47 Mod 0 Decoy Flare is listed under NAVAIR DL67A310D1, Confidential Specification MIL-F-81545(AS), FSN 1370-077-6401 and DOD Code No. LA10. Impulse Cartridge, Mk 131 Mod 0 used with this device is listed under FSN 1377-999-7462 and DOD Code No. M197.



Pyrotechnic Simulator Adds Realism to Training Exercises

CHAPTER 13

BATTLE EFFECTS SIMULATORS

13-1. INTRODUCTION

This chapter contains descriptive and other essential information in respect to pyrotechnic devices that produce effects designed to simulate the appearance and/or sound of combat weaponry. Primarily, these pyrotechnics are used in conjunction with training exercises to familiarize unseasoned troops with battle conditions without exposing them to the dangers inherent in using lethal ammunition. Some of these devices, however, are suitable for use in actual combat situations to mislead or confuse the enemy.

13-1-1. Arrangement of Material in This Chapter. This chapter is subdivided on the basis of display location; i. e., on the surface or in the air.

13-1-2. Handling and Storage. Since many of the devices covered by this chapter contain relatively large quantities of explosives, they must be handled and stored as lethal ammunition. The general requirements of Section 1-6 of Chapter 1 of this pamphlet must be observed as must any and all special handling and storage rules set forth in individual item descriptions that follow.

TABLE 13-1
SIMULATORS SUMMARY

Item	Para.	Display	Burn Time	Length (in.)	Diam. (in.)	Weight
Simulator, Detonation, Explosive, Mk 2	13-2-2	Flash, Smoke, & Sound	Inst.	2	0.60	—
Simulator, Detonation, Explosive, M80	13-2-3	Flash, Smoke, & Sound	Inst.	1.563	0.69	—
Simulator, Flash Artillery, M110	13-2-4	Flash, Smoke, & Sound	Inst.	7.8	1.9	0.66 lb.
Simulator, Projectile, Ground Burst, M115A2	13-2-5	Flash, Whistle, & Report	2-4 sec.	7.13	2.25	0.30 lb.
Simulator, Booby Trap, Flash, M117	13-2-6	Flash & Report	Inst.	3.90	0.98	0.14 lb.
Simulator, Booby Trap, Illuminating, M118	13-2-7	Flame	30 sec.	3.90	0.98	0.14 lb.
Simulator, Booby Trap, Whistling, M119	13-2-8	Whistle	3-4 sec.	4.02	0.98	0.15 lb.
Simulator, Projectile, Air Burst, M27A1B1	13-3-1	Flash, Smoke, & Report	Inst.	8.92	1.88	0.58 lb.
Simulator, Projectile, Air Burst, M74A1	13-3-2	Flash & Report	Inst.	3.85	1.57	0.34 lb.

13-1-3. Safety Precautions. Some of the item descriptions in this chapter contain special safety precautions that apply exclusively to the particular device being discussed. In addition to these special rules, the general safety precautions of Section 1-8 of Chapter 1 of this pamphlet shall be strictly observed in respect to the pyrotechnics covered by this chapter.

13-1-4. Disposition. Because of the relatively violent explosive characteristics of some of these devices, disposition of defective or otherwise unserviceable simulators should, when conditions permit, be accomplished only by trained E. O. D. personnel. In all cases, disposition shall accord with the provisions of Chapter 3 of this pamphlet.

13-1-5. Reporting Accidents, Incidents, and Malfunctions. All explosive accidents, explosive incidents, and malfunctions involving simulators shall be reported in accordance with Chapter 2 of this pamphlet.

13-2. SURFACE-DISPLAY SIMULATORS

The devices in this section produce smoke, flame, and sound approximating that produced by actual weapons used in military operations in a ground or surface environment.

13-2-1. Simulator, Detonation, Explosive Mk 1 Mod 0 (Formerly Fire-cracker, Mk 1 Mod 0)

NOTE: This simulator is disposable and should not be in the supply system. If any are found in the system, they should be turned in to an ammunition depot for appropriate disposition.

13-2-2. Simulator, Detonation, Explosive Mk 2 Mod 0 (Formerly Fire-cracker, Mk 2 Mod 0) (See illustration on page 13-2A)

13-2-2-1. Intended Use. This device (see Figure 13.2.1) is used for training purposes to simulate booby traps. Upon detonation, it produces a loud report, a bright flash, and considerable smoke.

13-2-2-2. External Features. The outer cardboard cylindrical body of this device is approximately 2 inches long and 0.60 inch in diameter. It is fitted over an inner cardboard cylinder which is filled with black powder. The outer cylinder is closed at its base end. The opposite end extends beyond the inner cylinder, forming a cavity approximately 3/8 inch deep. There are four holes in the outer cylinder spaced 90 degrees apart around the circumference and approximately one third of the distance from the base end. The end of the inner cylinder toward the cavity has a wax-filled hole in its center.

13-2-2-3. Functional Description. This simulator is normally used with a standard firing device such as Firing Device, Pressure Type, M1A1, or its equivalent. The cavity end of the simulator is pushed against the coupling base of the firing device and rotated clockwise until at least two threads of the coupling base are within the cavity. In this condition, the nipple of the coupling base protrudes through the wax-filled hole into the black powder filler of the inner cylinder. When the firing pin of the firing device is released and strikes the primer, flame shoots through the nipple and ignites the black powder which produces the desired flash and sound.

13-2-2-4. Handling and Storage. Although this device is coated with a waterproofing material, it should be kept dry in storage. Flame and excessive heat must be carefully guarded against.

WARNING

In attaching the simulator to its firing device, be sure that all

safety devices, such as safety forks and safety cotter pins, are firmly in place.

13-2-2-5. Safety Precautions. The general safety precautions set forth in Section 1-8 of Chapter 1 of this pamphlet apply. In addition, the following special precautions must be observed:

- (1) Do not remove the safety pin in the firing device until installation is complete.
- (2) Always remove the safety pin from a safe distance, using a strong cord or a length of wire for the purpose.
- (3) Be sure that the firing device is securely attached to a firm, flat platform before installing simulator.

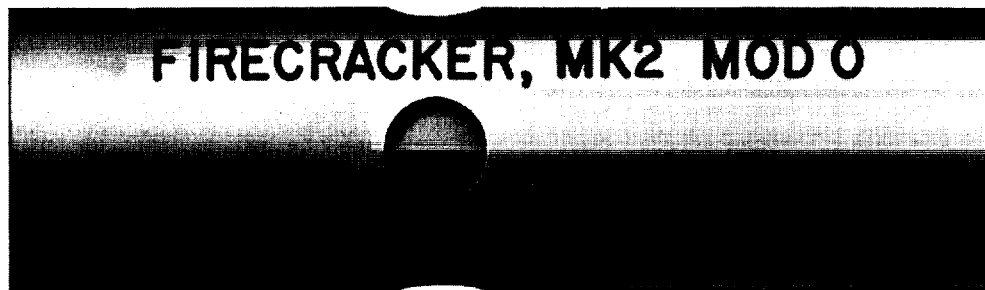
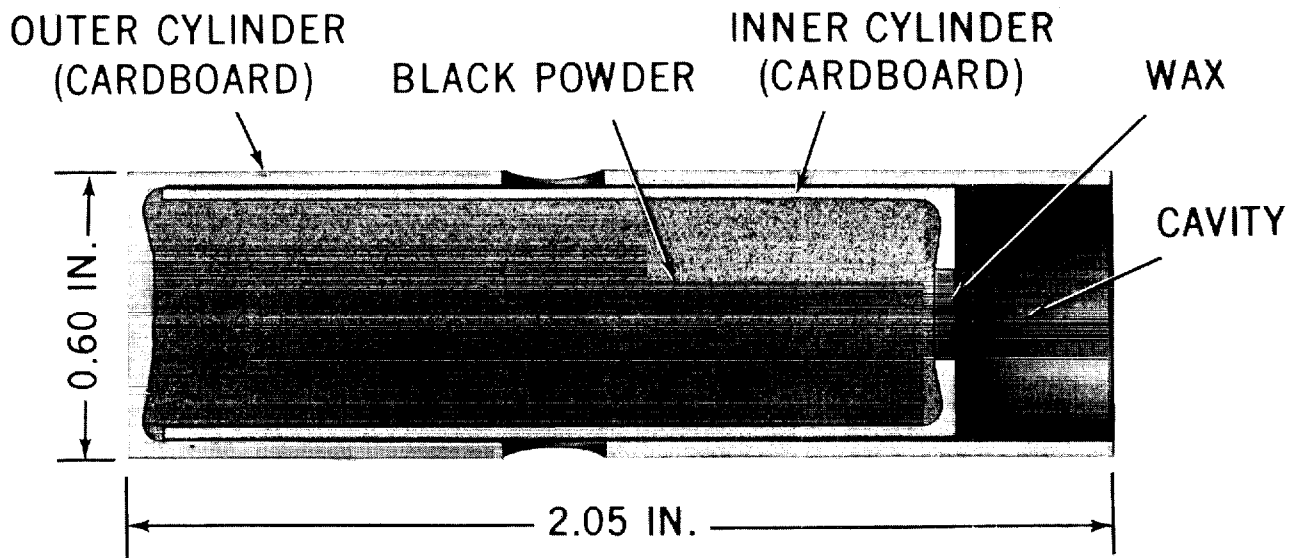


Figure 13.2.1 Explosive Detonation Simulator, Mk 2 Mod 0

13-2-2-6. Shipping Containers. This simulator is packaged 1000 units to a wooden box, the gross (filled) weight of which is approximately 34 pounds.

13-2-2-7. Identification Data. This device is listed under BUWEPS LD 416852, FSN 1370-093-0110, and DOD Code No. L377.

13-2-3. Simulator, Detonation, Explosive M80 (Formerly Firecracker, M80)

13-2-3-1. Intended Use. The M80 Explosive Detonation Simulator (see Figure 13.2.2) is used in training exercises to simulate explosive charges in booby traps, hand grenades, and land mines, or rifle or artillery fire.

13-2-3-2. Description. This small device consists of a kraft paper cylinder approxi-

mately 1.563 inches long and 0.69 inch in diameter. It contains 3 grams of pyrotechnic composition (potassium perchlorate, aluminum powder, sulfur, and antimony sulfide) which is held in place by chipboard cups at each end of the cylinder. A chipboard disk is inserted between one cup and the composition. A 2-inch length of commercial firecracker fuse is inserted into one side of the paper cylinder at or near the center point. The fuse burns from 3 to 7 seconds.

WARNING

This simulator must not be ignited with friction-type blasting fuse igniter, M1, or with weatherproof blasting fuse igniter, M2.

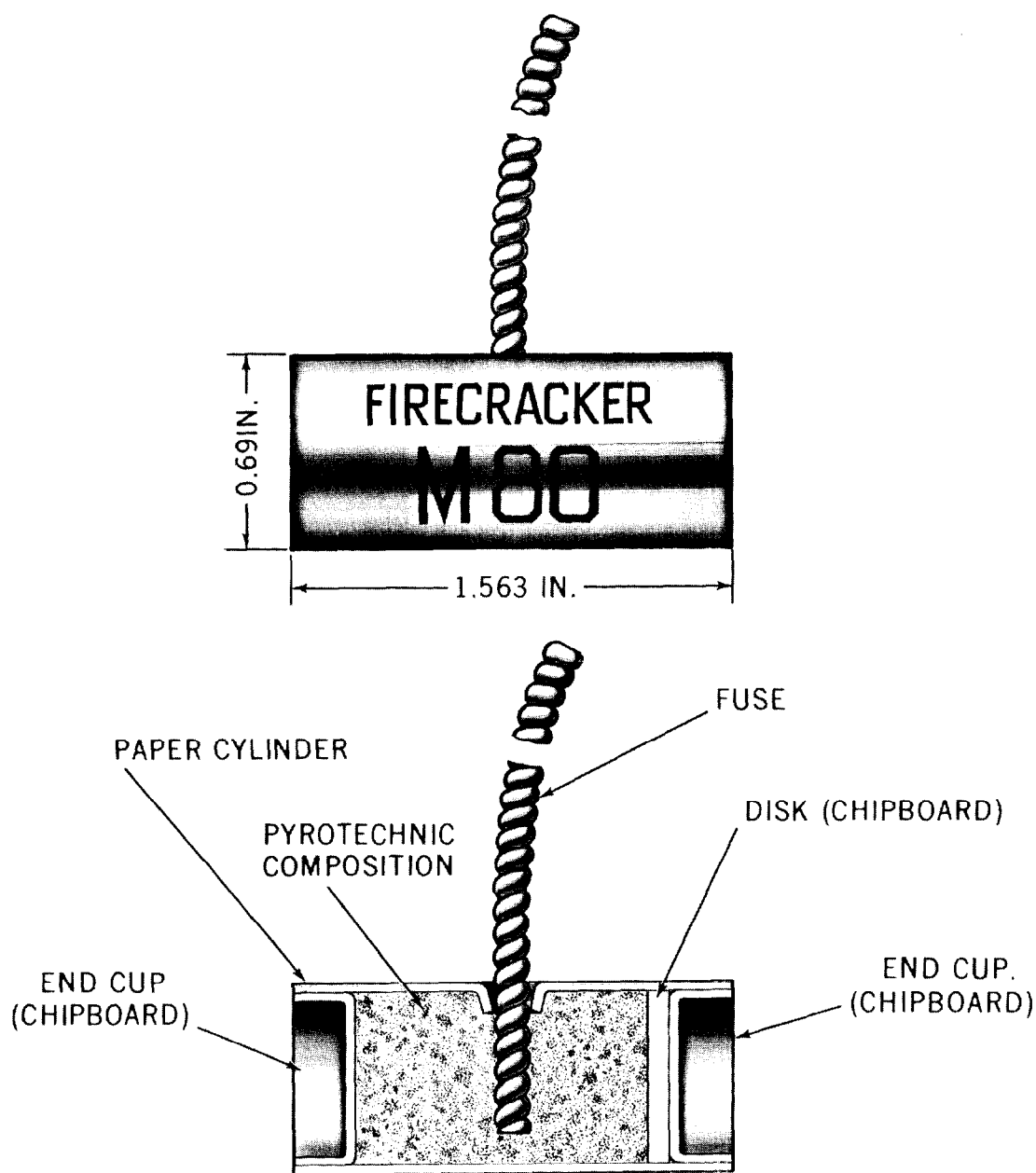


Figure 13. 2. 2. Explosive Detonation Simulator, M80

13-2-3-3. Operation. The fuse of this device is ignited by an ordinary match or similar flame source. When used to simulate booby traps or land mines, a pull-type, pull-release-type, or pressure-type firing device may be substituted for the fuse, in which case the firing device coupling base nipple is inserted into the fuse hole in the side of the simulator.

13-2-3-4. Handling and Storage. This device is to be handled and stored in accordance with Section 1-6 of Chapter 1 of this pamphlet.

13-2-3-5. Safety Precautions. In spite of its small size, this device detonates with considerable violence. Fragments of the relatively heavy paper case and the

chipboard cups and disk may cause injury, particularly to the eyes. Before the fuse is ignited, personnel must be warned to stand clear. Under no circumstances shall this simulator be used other than for carefully supervised training purposes.

13-2-3-6. Shipping Containers. These simulators are packaged 50 per waterproofed wax-dipped chipboard carton, 50 such cartons to the wooden box.

13-2-3-7. Identification Data. This device is listed under Dwg.No. 78-0-97, FSN 1370-028-5252, and DOD Code No. L378.

flash resembles that of a 90MM gun or a 155MM Howitzer, the chief difference being that its flash is slightly longer in duration, that it produces a larger smoke cloud, and that its noise is somewhat less than that of the weapon it simulates.

13-2-4-2. External Features. This device consists of a hollow black plastic cylinder, approximately 7.8 inches long and 1.9 inches in diameter. The top of the cylinder has a 1/2-inch threaded hole into which is screwed a red plastic filling plug. The bottom end of the outer cylinder is form-fitted to a protruding shoulder of an inner

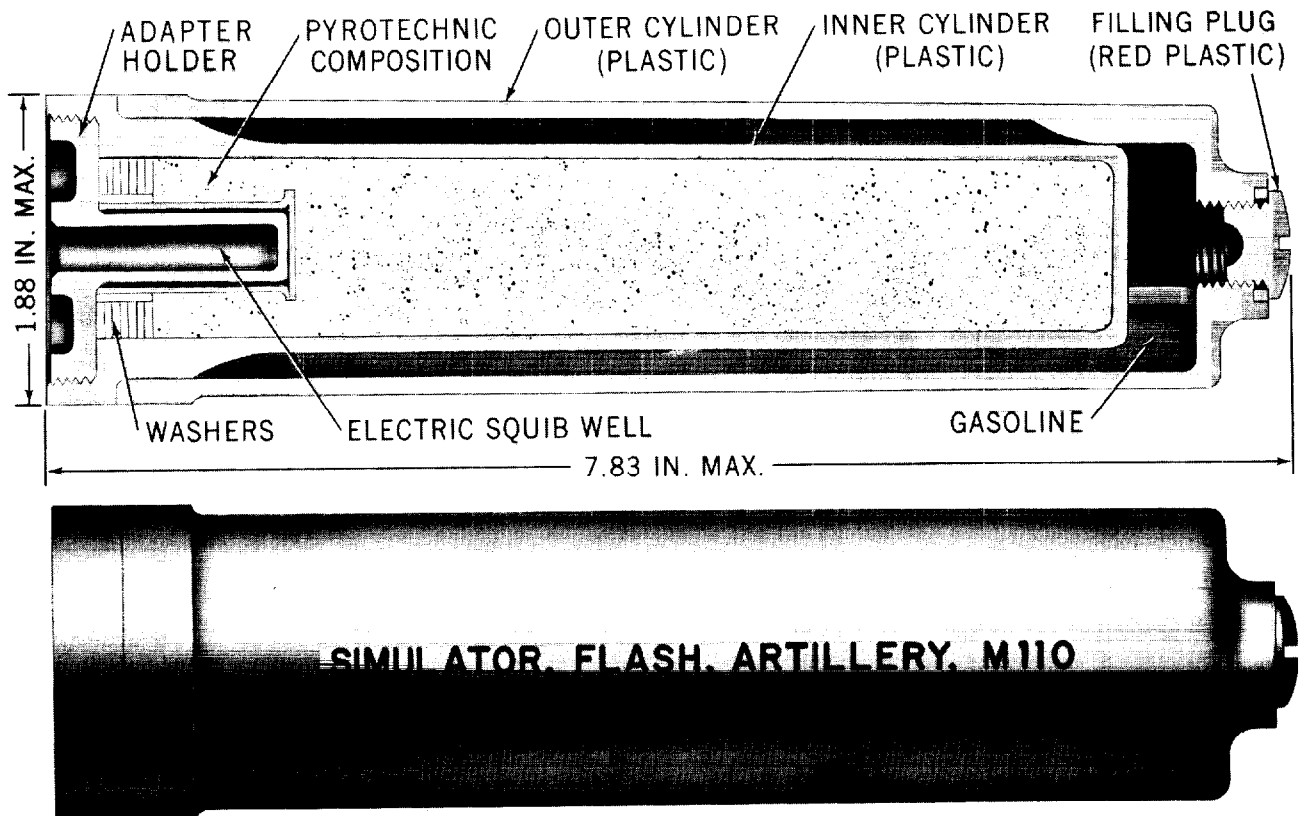


Figure 13.2.3. Artillery Flash Simulator, M110

13-2-4. Simulator, Flash, Artillery, M110

13-2-4-1. Intended Use. This device (see Figure 13.2.3) is used in training artillery observers and in simulating battle conditions. It may also be used as a decoy. Its

cylinder, also a black plastic, which contains the pyrotechnic composition. A slot in the filling plug permits turning with a screwdriver. A plastic adapter holder, with a center well for an electric squib,

is externally threaded and is screwed into the base of the inner cylinder. The space between the two cylinders has a volume of approximately 70 cubic centimeters.

13-2-4-3. Operation. This simulator is used with a 7/32-inch steel firing tube, 10 inches long, the outer diameter of which is 3 inches. Its bottom end is welded closed with a steel disk, 3 inches in diameter and $\frac{3}{4}$ inch thick. If such firing tubes are not available, they can be manufactured to the above dimensions. The following steps shall be taken in preparing the simulator for operation:

(1) Imbed the firing tube into the ground or in a double thickness of sandbags, pointed at an elevation of 60 degrees, and with approximately 4 inches of the tube protruding from the ground or sandbags.

(2) Remove simulator from its shipping container and inspect for dents, breaks, cracks, or other evidence of damage.

CAUTION

Damaged simulators must not be used. Any which show breaks, cracks, loose or uncemented joints, or evidence of having been filled with gasoline and subsequently emptied shall be segregated and disposed of in accordance with Chapter 3 of this pamphlet.

(3) Unscrew red plastic filling plug and pour in approximately $\frac{1}{8}$ pint of gasoline (at least 80 octane). Gasoline should reach bottom of threads inside filling hole.

(4) Replace filling plug and screw down tightly.

WARNING

Gasoline must be handled carefully. All filling operations shall be in well-ventilated spaces devoid of open flames and spark-producing equipment. Only as many simulators as will be fired in a day's training shall be filled. Any that are filled and not used shall be destroyed; they must not

be returned to storage. Emptying a simulator of gasoline and installing the filling plug is strictly prohibited.

(5) Immediately prior to firing, insert squib in center hole of the adapter. Place cork behind squib, inserting cork into the adapter so that the distance from the top of the cork to the lip of the adapter is at least $\frac{1}{4}$ inch.

(6) Carry squib lead wires across bottom of simulator and upward along its body toward filling plug. Fasten wires to simulator body with adhesive tape or string.

(7) Place simulator, filling plug up, in firing tube so that lead wires emerge through space between simulator and tube.

WARNING

Before proceeding, be sure that electrical circuit switch is in open position.

(8) Connect lead to unconnected extension wires.

(9) Connect free ends of extension wires to battery or blasting machine at least 50 yards away from firing tube. A current of $\frac{1}{2}$ ampere is needed.

(10) Be sure that all personnel are under cover at least 50 yards away from the simulator before closing electrical circuit.

13-2-4-4. Special Safety Precautions. The following precautions must be strictly observed:

(1) This simulator must not be disassembled except for adding gasoline.

(2) If simulator misfires, lead wires must be disconnected at power source.

(3) In case of misfire or hangfire, wait at least 5 minutes before approaching.

(4) Personnel must not approach closer than 10 feet during removal operations.

13-2-4-5. Removing a Misfire. The following steps shall be taken in removing a simulator that has failed to function:

(1) Avoiding open end of firing tube, remove tube, with simulator inside, from earth or sandbags, using a rope, pole, or other suit-

able means. Keep open end of tube up and place tube gently on ground.

(2) Using long pole, turn tube upside down and permit simulator to slide out onto ground.

(3) If possible, above operations and subsequent disposition should be accomplished by fully trained E.O.D. personnel.

13-2-4-6. Malfunction Characteristics. All malfunctions shall be reported in accordance with Chapter 2 of this pamphlet. Excessive sparking from the simulator upon ignition is considered a malfunction. Slight sparking is to be expected. In daylight, dull red sparks visible to 100 yards, two or three large white sparks, or a cluster of small white sparks visible at 500 yards are considered normal. A prominent display of large white sparks at time of ignition must be reported as a malfunction.

13-2-4-7. Shipping Containers. This simulator is packaged in individual fiberboard containers, 24 or 30 such containers to a wooden box. The box also contains corresponding quantities of commercial S72 squibs and corks.

13-2-4-8. Identification Data. This device is listed under Dwg. No. 78-0-115 and DOD Code No. L596. Federal Stock Numbers are as follows:

Packed 24 to box	1370-028-5113
Packed 30 to box	1370-028-5114

13-2-5. Simulator, Projectile, Ground Burst, M115A2

13-2-5-1. Intended Use. This simulator (see Figure 13.2.4) provides battle noises and other effects during troop maneuvers. It produces a high-pitched whistle and a flash of light followed by a loud report.

13-2-5-2. External Description. The body of this device consists of a closed paper cylinder containing approximately 2 ounces of photo-flash powder. A whistle assembly, to one side of which is attached a safety fuse, protrudes from one end. Its overall length is 7.13 inches, and its diameter is approximately 2.25 inches. A Fuse Lighter, M3A1, is taped along the side of the body and is connected to the safety fuse. The whistle assembly is a paper tube containing slow-burning powder. The fuse lighter consists of a double pull cord, a cellulose nitrate coating on a phosphorus-coated friction wire, and ignition composition.

13-2-5-3. Functional Description. A pull on the cord moves the friction wire through the ignition composition and ignites it. The ignition composition ignites the safety fuse which burns 6 to 10 seconds before it ignites the powder in the whistle assembly. The whistle assembly produces a whistling sound for 2 to 4 seconds, after which it ignites the photoflash powder to produce the flash and noise.

13-2-5-4. Operating Instructions. This device is operated as follows:

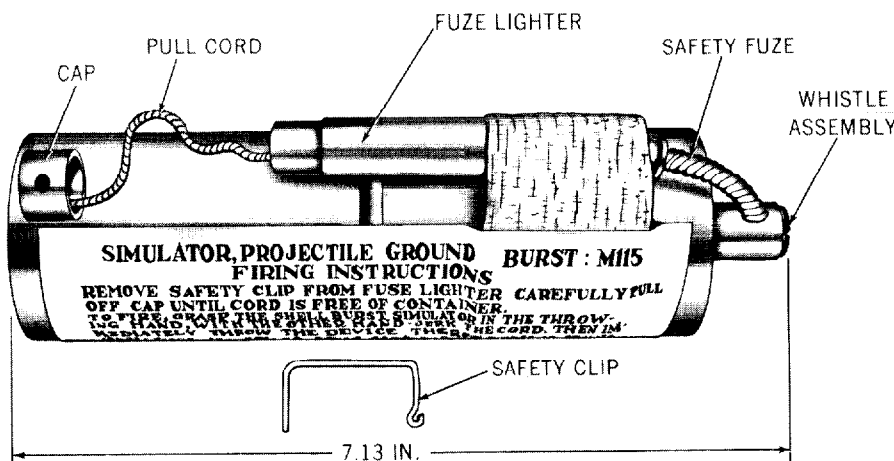


Figure 13.2.4 Projectile Ground Burst Simulator, M115A2

- (1) Remove cover from packing box and carefully open waterproof lining.
- (2) Take out desired number of simulators.
- (3) Refold waterproof lining and replace packing box cover.
- (4) Read instructions and warnings on simulator label.
- (5) Remove safety clip from fuse lighter.
- (6) Remove cap from fuse lighter and extend cord fully.
- (7) Grasp simulator body firmly in throwing hand.
- (8) Jerk pull cord with other hand and throw simulator immediately.

WARNING

There is a 6- to 10-second delay after cord is jerked. Simulator must be thrown at least 10 yards from nearest personnel. This device must not be activated in loose gravel, sticks, or other materials that are subject to projection, nor should it be thrown into dry leaves, grass, or other flammables.

13-2-5-5. Deactivating Procedure. If this simulator is prepared for firing but is not fired, the following steps shall be taken:

- (1) Carefully restore pull cord in fuse lighter.
- (2) Replace cap on fuse lighter and replace safety clip.
- (3) Return simulator to original packing condition and reseal box.

13-2-5-6. Handling and Storage. This device shall be handled and stored in accordance with the provisions of Section 1-6 of Chapter 1 of this pamphlet.

13-2-5-7. Safety Precautions. In addition to the general safety precautions set forth in Section 1-8 of Chapter 1 of this pamphlet, the following special precautions apply and must be observed:

- (1) Do not remove safety clip or cap until just before activating the simulator.

- (2) Do not exert pull on pull cord until ready to fire.

- (3) In the event of a dud, wait at least 15 minutes before approaching.

- (4) Immerse duds in motor oil or water to deactivate the igniter.

- (5) Duds must be kept immersed in oil or water for at least 2 hours.

- (6) All duds must be destroyed by burning, one at a time, in an isolated location, preferably by trained E.O.D. personnel.

13-2-5-8. Shipping Containers. This device is packaged five per waterproof container, 20 such containers to a wooden box.

13-2-5-9. Identification Data. This device is listed under Dwg. No. 7549246, FSN 1370-752-8126, and DOD Code No. L594.

13-2-6. Simulator, Booby Trap, Flash, M117 (Illustration on page 13-9)

13-2-6-1. Intended Use. This device (see Figure 13.2.5) is used during maneuvers and in training exercises to indoctrinate troops in the installation of booby traps as well as to assist them in avoiding traps set by the enemy. It produces a bright flash of light and a loud report when activated.

13-2-6-2. External Features. The Flash Simulator, M117, consists of a cylindrical outer tube 0.98 inch in diameter and 2.25 inches in length, from one end of which protrudes a flat metal nailing bracket. The nailing bracket increases the overall length to 3.90 inches. Its end opposite the bracket is covered with a paper cap held on by tape. Included with this device, as issued, are a spool of wire for use as a trip wire, an extension spring, two nails, and four staples (see Figure 13.2.6).

(Illustration on page 13-10)

13-2-6-3. Description. Within the body of this device is an inner tube, slightly more than one inch long, that contains the flash composition. The initiating assembly is in the space between the outer and inner tubes. This assembly consists of a strip of paper coated with friction-sensitive composition, folded so that its coated surfaces face each other. This folded

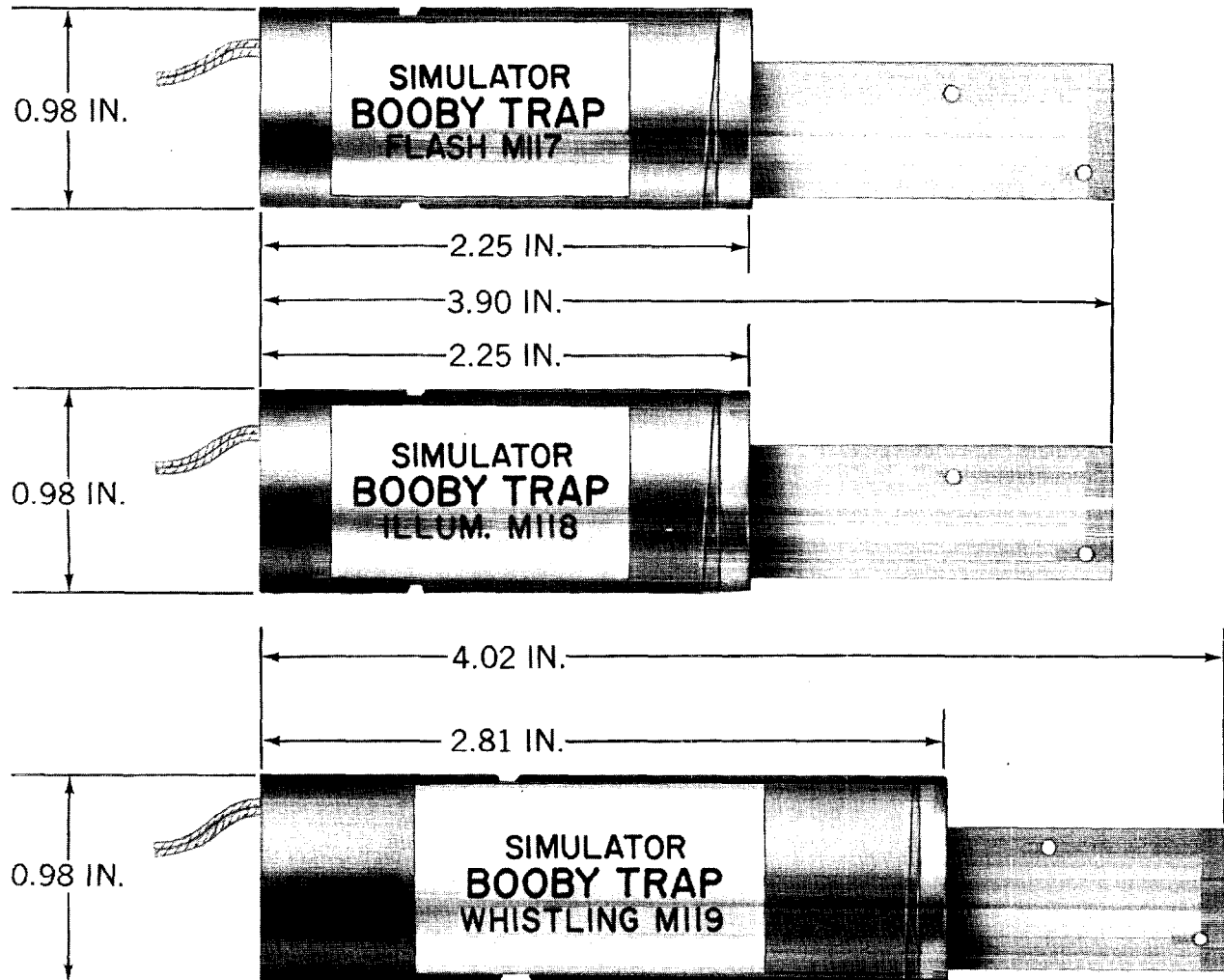


Figure 13.2.5 Booby Trap Simulators, M117, M118, and M119

paper is attached to the inner tube, and over its top is a strip of felt held in place, under slight pressure, by adhesive tape which is wrapped around the inner tube. A pull cord runs between the friction-sensitive surfaces of the folded paper. The inner end of the pull cord is covered with friction composition; the other end is coiled under the cap.

13-2-6-4. Make-Ready Procedures. This simulator is prepared for use as follows:

(1) Remove cover from shipping container and carefully break open waterproof inner lining.

(2) Remove desired number of simulators.

(3) Remove instruction sheet which is packaged with simulators.

(4) Carefully refold waterproof inner lining and replace box cover.

(5) Install simulator in accordance with instruction sheet.

(6) Be sure to return instruction sheet to shipping container.

13-2-6-5. Disarming and Removal Procedures. In the event that this device is installed and not fired, it should be disarmed and removed as follows:

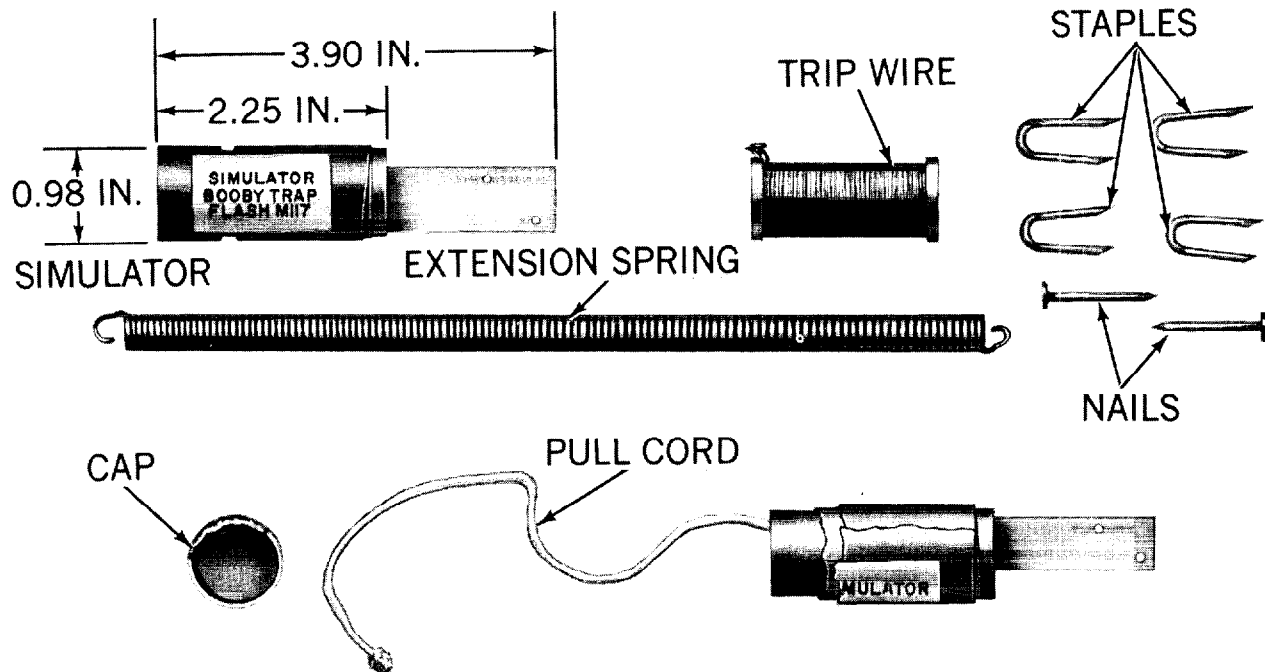


Figure 13.2.6 Associated Equipment for Booby Trap Simulators

(1) Without touching trip wire or spring, cut pull cord close to trip wire.

(2) Coil pull cord and place in cavity of simulator.

(3) Replace cap on simulator and seal it with tape.

(4) Remove nails from nailing bracket, thus freeing simulator.

(5) Remove trip wire from spring, being careful to release spring tension slowly.

(6) Remove trip wire from anchored position and rewind it onto spool.

(7) Remove spring from its anchored position.

(8) Restore simulator, coil of wire, spring, staples, and nails to original packing condition for future use.

13-2-6-6. Functioning. When this device is installed in accordance with instructions outlined in the instruction sheet, the trip wire, whether stepped on, tripped over, or cut, will move the pull cord through the friction-sensitive material, thus igniting the charge composition and producing the flash and sound.

13-2-6-7. Handling and Storage. The general handling and storage rules of Section 1-6 of Chapter 1 of this pamphlet are applicable to this device. Boxes containing these simulators must be opened only as needed. If only a portion of the simulators in a box are used, the waterproof inner seal must be carefully refolded and the box lid replaced as securely as possible to prevent damage from moisture penetration during storage and transportation.

13-2-6-8. Safety Precautions. In addition to the general precautions set forth in Section 1-8 of Chapter 1 of this pamphlet, the following special rules apply:

(1) The end cap must not be removed until immediately prior to attaching the pull cord to the fully installed trip wire.

(2) In tying the pull cord to the trip wire, extreme caution must be exercised to prevent a pull that would ignite the flash composition.

(3) Before the pull cord is tied to the trip wire, a check must be made to assure that the trip wire and spring are securely fastened.

(4) This simulator must be set up so that

friendly personnel cannot approach closer than 6 feet. If this distance cannot be assured, either the Illuminating Booby Trap Simulator, M118, or the Whistling Booby Trap Simulator, M119 (Paragraphs 13-2-7 and 13-2-8 following), should be used in its stead.

WARNING

Do not attempt to install or use this device unless the procedures and hazards set forth in the instruction sheet are fully and clearly understood.

(5) The pull cord sometimes adheres to the inside of the end cap. The cap must therefore be removed with extreme care to avoid pulling the pull cord and thus igniting the flash composition.

13-2-6-9. Shipping Containers. This simulator, together with its associated equipment (trip wire, spring, nails, and staples), is packaged in an individual carton, 25 cartons per cardboard container. An instruction sheet is packed with each cardboard container. Six of these cardboard containers are wrapped and sealed in waterproof kraft paper and packaged in a wooden box.

13-2-6-10. Identification Data. This simulator is listed under Dwg. No. 78-0-120, FSN 1370-028-5256, and DOD Code No. L598.

13-2-7. Simulator, Booby Trap, Illuminating, M118

13-2-7-1. Intended Use. This simulator (see Figure 13.2.5) is used for essentially the same purposes as the Flash Booby Trap Simulator, M117, which is described in Paragraph 13-2-6 preceding. It differs only in the effect produced.

13-2-7-2. Description. Simulator, M118, is the same size and shape as Simulator, M117. It contains a pyrotechnic composition which, when ignited by the pull cord, produces a flame that burns for approximately 30 seconds, (see Figure 13.2.6 for associated equipment).

13-2-7-3. Safety Precautions. This device is considered safe for personnel as long as direct contact with the flame is avoided. Care should

be exercised to prevent accidental ignition of the wooden support to which the simulator is attached. Otherwise, the precautions set forth in Paragraph 13-2-6-8 preceding apply, as do the handling and storage requirements of Paragraph 13-2-6-7.

13-2-7-4. Shipping Containers. This simulator is packaged for shipment in the same way as is Booby Trap Flash Simulator, M117.

13-2-7-5. Identification Data. Booby Trap Illuminating Simulator, M118, is listed under Dwg. No. 78-0-122, FSN 1370-028-5257, and DOD Code No. L599.

13-2-8. Simulator, Booby Trap, Whistling, M119

13-2-8-1. Intended Use. This device (see Figure 13.2.5) is another variation of Booby Trap Flash Simulator, M117, which is described in Paragraph 13-2-6 preceding. It differs from that device principally in its overall length and in the effect produced.

13-2-8-2. Description. The body of this simulator is 2.81 inches long; its overall length, including the nailing bracket, is 4.02 inches. It contains a slow-burning composition which, when ignited by the pull cord, produces a shrill whistling sound for 3 to 4 seconds (see Figure 13.2.6 for associated equipment).

13-2-8-3. Handling, Storage, and Safety Precautions. This device is considered safe as long as direct contact during its functioning is avoided. Otherwise, the handling and storage provisions and safety precautions set forth in Paragraph 13-2-6-7 and 13-2-6-8 preceding are pertinent.

13-2-8-4. Shipping Containers. This simulator is packaged for shipment either in the same way as is Booby Trap Flash Simulator, M117 (Paragraph 13-2-6-9) or 100 to a wooden box without associated equipment.

13-2-8-5. Identification Data. This device is listed under Dwg. No. 78-0-124 and DOD Code No. L600. Federal Stock Numbers are as follows:

100/Wdn Box	(w/o assoc. equip.)	1370-301-2023
25/Wdn Box	(with assoc. equip.)	1370-028-5255

13-3. AIR BURST SIMULATORS

This section covers those devices which are designed to simulate the burst of artillery projectiles above the surface of the ground.

13-3-1. Simulator, Projectile Air Burst, M27A1B1

sisting of 9 grains of smokeless powder, propels the simulator to a minimum height of 550 feet.

13-3-1-3. Operation. The time train ring ignites the smoke charge directly. At the top

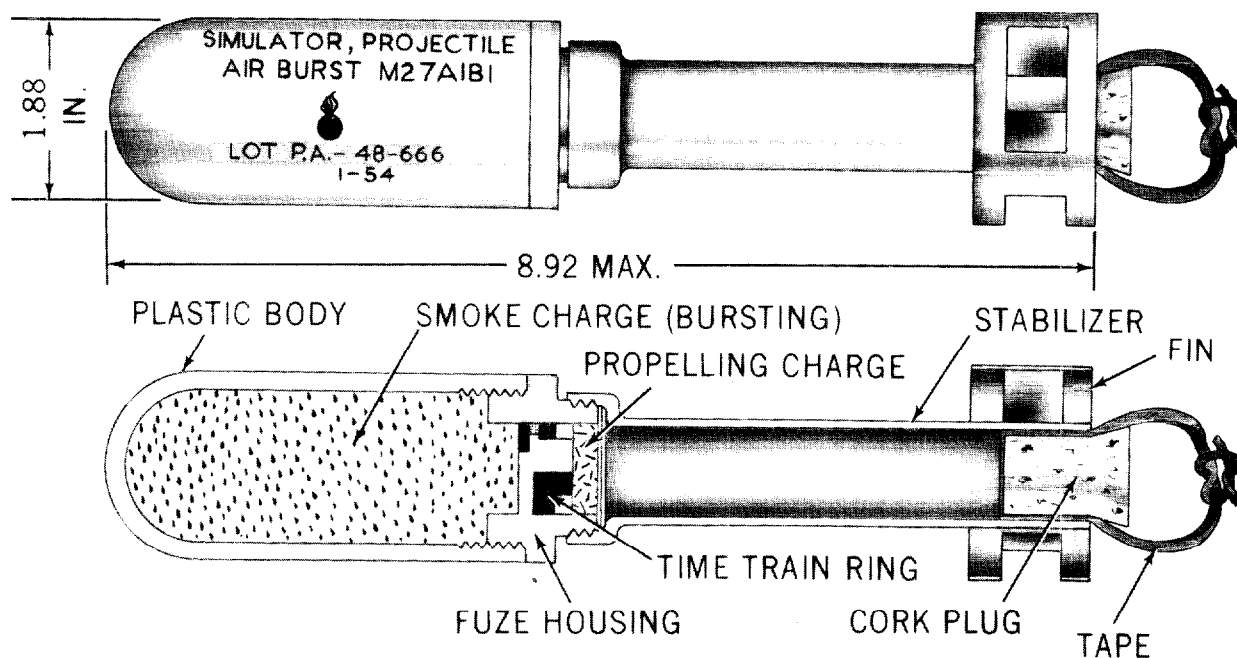


Figure 13.3.1 Projectile Air Burst Simulator, M27A1B1

13-3-1-1. Intended Use. This device (see Figure 13.3.1) is used to simulate the functioning of an artillery projectile for high-burst ranging practice. It is projected from rifle grenade launchers of the M7 series.

13-3-1-2. Description. This device consists of a plastic body 1.88 inches in diameter. It weighs 0.58 pound. The forward end of the plastic body is rounded. The after end screws into an aluminum fuze housing which is exteriorly threaded for attachment of the stabilizer. The stabilizer is a hollow tube with a circular fin at its after end. A cork plug, fitted with a tape for removing it, closes the finned end of the stabilizer. The overall length, less protruding cork plug and pull tape, is 8.92 inches. The propelling charge, con-

sisting of 9 grains of smokeless powder, propels the simulator to a minimum height of 550 feet.

13-3-1-4. Handling and Storage. This device shall be handled and stored in accordance with the general rules for pyrotechnics as set forth in Section 1-6 of Chapter 1 of this pamphlet.

13-3-1-5. Safety Precautions. In addition to the general safety precautions of Section 1-8 of Chapter 1 of this pamphlet, the following special precautions must be observed:

(1) This simulator must not be used with other launchers than those in the M7 series.

(2) Steel helmets or other adequate cover

must be available to protect ground personnel against falling fragments of the case and the stabilizer.

13-3-1-6. Shipping Containers. These simulators are packaged nine to a carton, four cartons to a wooden box. Included in each box are 40 grenade cartridges, M3.

13-3-1-7. Identification Data. This device is listed under Dwg. No. 78-0-63, FSN 1370-028-6003, and DOD Code No. L351.

13-3-2. Simulator, Projectile Air Burst, M74A1

(Illustration on page 13-14)

13-3-2-1. Intended Use. This device (see Figure 13.3.2) is intended primarily for umpires to simulate air burst of artillery fire for training troops. It is fired from Pyrotechnic Pistol, AN-M8 (see Paragraph 4-2-3 of Chapter 4 of this pamphlet).

13-3-2-2. Description. This device consists of a one-piece aluminum outer case, a black powder propelling charge, an aluminum cylindrical inner case containing a delay fuse, an igniter charge, and a pyrotechnic composition which, upon bursting, produces the desired flash and sound. A Percussion Primer, M39A1, extends from the base of the outer case into the propelling charge. The delay fuse also extends into the propelling charge.

13-3-2-3. Operation. The primer, when struck by the pistol firing pin, ignites the propelling charge which, in turn, ignites the delay fuse. The propelling charge also propels the inner case out of the outer case. After 2 to 3 seconds, the delay fuse ignites the igniter charge which causes the bursting charge to detonate, producing the desired flash of light and loud report.

13-3-2-4. Handling, Storage, and Safety Precautions. This cartridge-like device shall be handled and stored in accordance with Section 1-6 of Chapter 1 of this pamphlet. Care must be taken not to permit its percussion primer to be struck on any hard object. The following special safety precautions apply:

- (1) When fired over the heads of personnel,

the pistol should be aimed at an angle of elevation of not less than 45 degrees to insure safe height of burst (approximately 100 feet).

- (2) The pyrotechnic pistol is cocked at all times. It must not be pointed toward friendly troops or equipment. If loaded and not fired, it must be unloaded immediately.

- (3) Helmets should be worn by personnel exposed to the flash and sound of this simulator.

13-3-2-5. Shipping Containers. This device is packaged 10 per wax-dipped waterproof carton, eight such cartons (80 simulators) per wooden box.

13-3-2-6. Identification Data. This simulator is listed under Dwg. No. 78-0-96, FSN 1370-028-6007, and DOD Code No. L366.

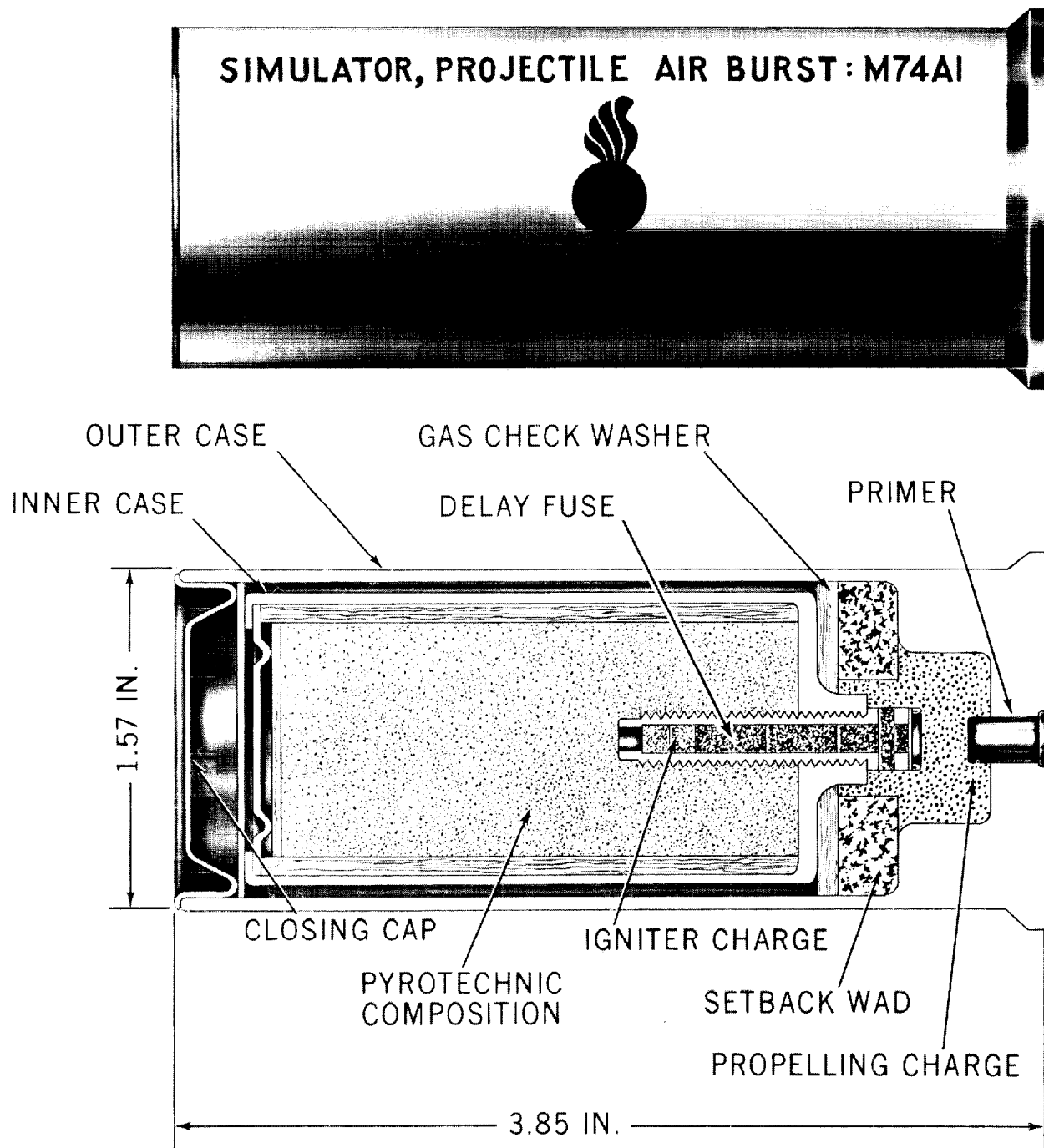
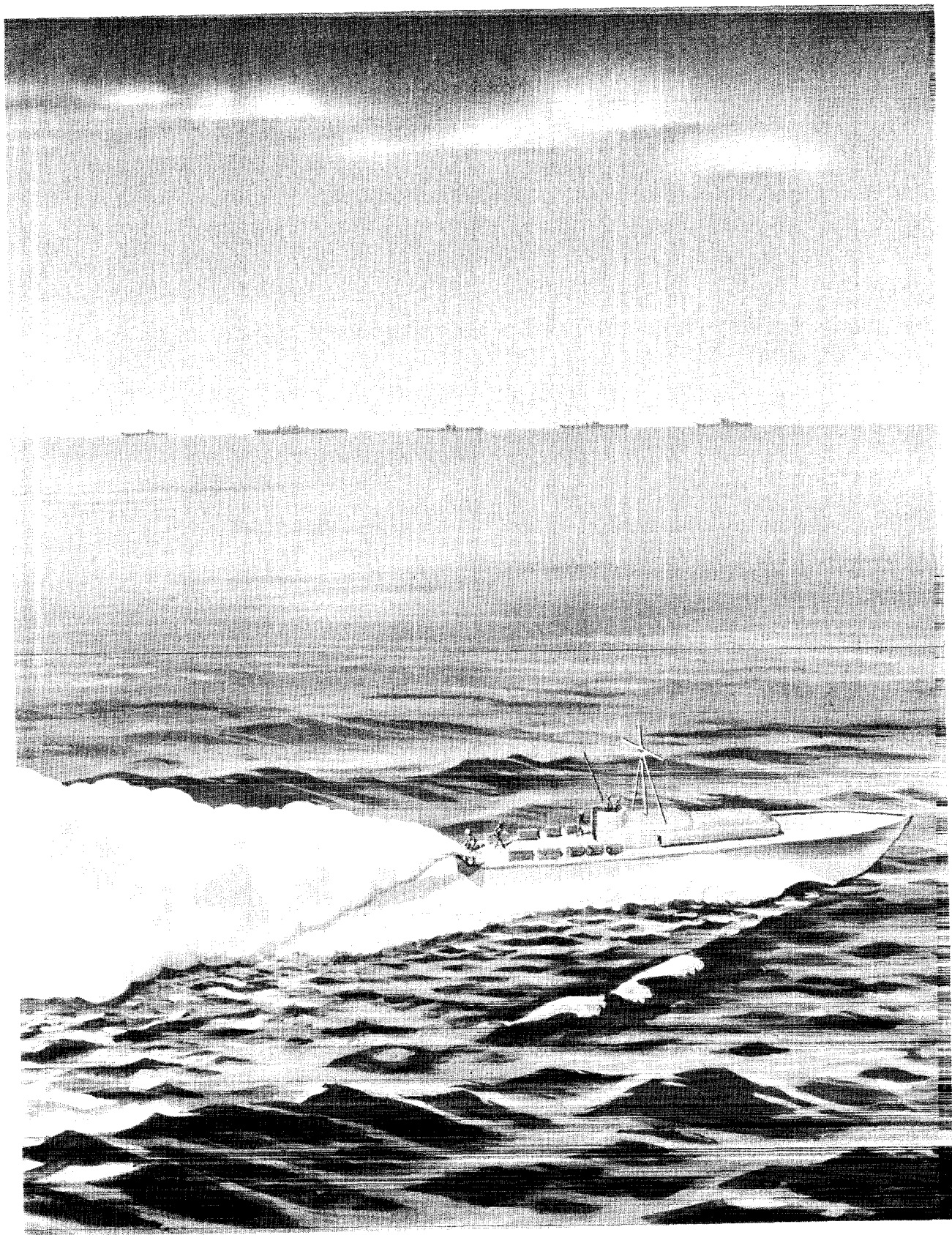


Figure 13.3.2 Projectile Air Burst Simulator, M74A1



One Method of Laying a Smoke Screen at Sea

CHAPTER 14

SCREENING AGENTS AND DEVICES

14-1. INTRODUCTION

This chapter describes agents and devices used in the production and laying of smoke screens and provides information as to their effective and safe operation, handling, and storage.

who use these agents, and prescribed precautions must be strictly observed.

14-1-2. Handling and Storage. Special handling and storage procedures are included in the

TABLE 14-1
SCREENING DEVICES SUMMARY

Item	Para	Filler	Filler Weight	Delay (Sec)	Length (in.)	Diam. (in.)	Weight (lb)
Smoke Pot, HC, Mk 3-0	14-3-1	HC	32 lb	None	9.5	8.5	34
Smoke Pot, SGF2, AN-M7 and AN-M7A1	14-3-3	SGF Oil	10.5 lb	8-20	13.75	12.5	37
Grenade, Hand, Smoke, HC, AN-M8	14-4-2	HC	19 oz	2	4.5	2.5	1.80
Grenade, Hand, Smoke, WP, M15	14-4-3	WP	16 oz	4-5	4.5	2.38	1.90
Grenade, Rifle, Smoke, WP, M19A1	14-4-4	WP	8.48 oz	None	11.25	2.0	1.49
Grenade, Hand or Rifle, Smoke, WP, M34	14-4-5	WP	15 oz	4-5	5.5	2.37	1.50
Smoke Pot, M6 (Formerly Oil Smoke Candle, M6)	14-5-1	SGF Oil	0.22 lb	2	5.5	2.5	1.82
Projectile, 5"/38 Cal. WP, Mk 30 Mods	14-6-1	WP	7.1 lb	N. A.	20	5	54.4
Projectile, 5"/38 Cal. WP, Mk 44 Mod 1	14-6-2	WP	7.1 lb	N. A.	20	5	54.4
Cartridge, 81 MM, Smoke, WP, M57 & M57A1	14-6-3	WP	4.06 lb	N. A.	23	3.19	11.4
Cartridge, 81 MM, Smoke, WP, M370	14-6-4	WP	1.6 lb	N. A.	20.76	3.18	9.34
Rocket, 3.5-inch, Smoke, WP, M30	14-7-2	WP	2.33 lb	N. A.	23.55	3.5	8.90
Warhead, 5-inch Rocket, Smoke, PWP, Mk 4	14-7-3	PWP	19.65 lb	N. A.	36.67	5	50.84

14-1-1. Toxicity. Screening smoke is generally considered to be nontoxic. Certain circumstances, however, such as prolonged exposure or excessively heavy concentrations, particularly in confined spaces, may produce toxic or even fatal results. For this reason, the various agents described in Section 14-2 following must be understood by all personnel

separate descriptions in this chapter, as appropriate. The general rules of Section 1-6 of Chapter 1 of this pamphlet apply to screening devices and accessories. Particular attention is called to the fact that some screening agents spontaneously ignite upon contact with moisture or air to create a serious fire and/or smoke

hazard. Inspection of magazines and other storage areas must include careful examination of outer containers to assure that there are no cracks or punctures that would destroy their watertight and airtight integrity. OP 4, Ammunition Afloat, and OP 5, Ammunition Ashore, contain additional information relative to proper and safe handling of screening agents and devices.

14-1-3. Safety Precautions. Individual item descriptions in this chapter include special precautions, as necessary, for the safe handling and operation of these devices and agents.

14-1-4. Fire Fighting. The following rules shall prevail in fighting fires involving screening agents and devices:

14-1-4-1. All personnel other than fire fighters must be evacuated from the area.

14-1-4-2. Fire fighters should confine their efforts to preventing spreading of the fire.

14-1-4-3. White phosphorus and plasticized white phosphorus fires, once extinguished, will re-ignite upon contact with air. Devices containing these agents should be totally immersed in water or continually sprayed with water to prevent such re-ignition.

14-1-4-4. Personnel with portable fire extinguishers shall not be permitted within magazines or other enclosed spaces in which these agents or devices are burning unless they are equipped with lifelines to prevent their becoming lost in the resulting dense smoke.

14-1-4-5. If hexachlorethane (HC) is involved in an out-of-doors fire, the fire should be deluged with large quantities of water since small volumes of water are ineffective and may increase the danger. Sand may be used to smother small outdoor fires involving HC and other readily flammable mixtures.

14-1-5. Disposition. The general rules set forth in Chapter 3 of this pamphlet apply to screening devices. Any deviations from those rules must be approved by the Commanding Officer or his authorized representative.

14-1-6. Color Coding. The base color of older production lots of screening devices is ocean

gray with markings in yellow. Most lots manufactured since the early 1960's are color coded in accordance with MIL-STD-709; that is, they are painted light green or they have a light green band with black-letter stenciling to show symbol-smoke (Example: HC-Smoke). Exception: Later production lots of WP and PWP munitions are stenciled in light red letters on the light green base color or band.

14-1-7. Symbols. Certain arbitrary symbols, or codes, are used throughout this chapter in the interest of brevity. These letter codes must not be confused with established chemical symbols or formulas. The principal codes used, together with the complete names of their corresponding chemical agents, are as follows:

HC	Mixture of hexachlorethane, zinc oxide, and aluminum.
WP	White phosphorus.
PWP	Plasticized white phosphorus.
SGF Oils	Smoke Generator Fog Oils.

14-1-8. Reporting Accidents and Incidents. All explosive accidents and incidents and all malfunctions involving screening agents and/or devices shall be reported in accordance with the provisions of Chapter 2 of this pamphlet.

14-2. CHEMICAL AGENTS

This section contains descriptions of the various chemicals and chemical mixtures that are used in producing smoke for screening purposes.

14-2-1. Hexachlorethane Mixture (HC)

14-2-1-1. Specific Data. The following specific information relates to this smoke-producing chemical agent:

Stability	Generally stable but may decompose or spontaneously ignite if moisture content exceeds 0.6% or if exposed to either salt water or fresh water during storage or transportation.
Chemical Reaction	When heated, self-propagating reaction forms cloud of carbon and zinc chloride particles.
Formulation	Mixture of hexachlorethane, zinc oxide, and aluminum.
Odor	Slightly acrid

14-2-1-2. Description. HC smoke mixture is a gray-colored powder which can be pressed

into a solid for use in smoke pots, floats, and grenades to produce screening smoke. Less frequently, it is employed in signaling. HC-filled munitions contain a quantity of starter mix which is ignited by a fuze. The starter mixture, in turn, ignites the HC mixture. As the HC burns, generating an intense heat (above 1000°F), a very dense, persistent grayish white cloud is produced. This cloud consists mainly of zinc chloride particles which have absorbed atmospheric moisture to form particles of effective size. The heat causes the cloud to rise or "pillar."

14-2-1-3. Physiological Effects. As normally encountered, HC smoke has no physiological effect. In high concentrations or on long exposure, it is irritating to the nose and throat and may be dangerous when inhaled. Exposure to high concentrations causes an immediate sense of suffocation with accompanying irritation of the nose, throat, and eyes and severe coughing and sneezing.

14-2-1-4. First Aid and Medical Treatment. All persons in the vicinity of burning HC munitions should carry gas masks. The masks must be put on at once in any concentration of HC smoke that causes the slightest coughing or irritation of the nose, throat, or eyes. Masks must be worn in any concentration if exposure exceeds 30 minutes. If nausea, vomiting, or difficulty in breathing develops, treatment must be supervised by medical personnel.

14-2-1-5. Protective Equipment. HC-filled munitions may be safely handled without special protective equipment other than gas masks which must be readily available. Standard military field masks or any mask approved by the Bureau of Mines will provide adequate protection in low or moderate concentrations and in long exposures to low concentrations. For exposure to high concentrations, an air-supplied mask must be used.

14-2-1-6. Handling. HC munitions must be handled so as to avoid damage that would affect their watertight integrity since HC may ignite spontaneously upon exposure to moisture. Leaking or otherwise unserviceable HC munitions must be segregated. If the HC filler has

leaked, it must be swept up and removed from the storage area to a place where it can safely be disposed of by burning. If such leakage occurs at sea, the defective munitions must be barricaded from other ammunition, pyrotechnics, and explosives, preferably with sandbags, until they can be dumped over the side.

CAUTION

Shipboard storage of HC munitions must be away from ventilation intakes which would draw smoke into the ship in case of accidental ignition.

14-2-1-7. Storage. HC munitions ashore must be stored separately in magazines away from other munitions. Aboard ship, storage should be topside convenient for jettisoning and protected from rain and direct sunlight. Large cargo loads may be stored below deck but must be accessible for fire fighting with ample aisle space provided. Such cargo loads may be stored in the same hold with small arms ammunition, mechanical time fuzes (without boosters), point-detonating projectile fuzes, minor caliber base-detonating projectile fuzes, tracer fuzes, anti-tank mine fuzes (nonchemical), pyrotechnics, WP or PWP munitions, thickened fuel-filled incendiary munitions, and FM or FS munitions provided the latter are bottom-stowed.

14-2-1-8. Fire Fighting. The rules of Paragraph 14-1-4 preceding apply insofar as they relate to HC mixtures and munitions. Foamite, CO₂ extinguishers, and fog nozzles are not effective since HC combustion is self-supporting. Such extinguishing devices may, however, be used on dunnage or packing materials in the vicinity of an HC fire. The primary efforts of fire fighters should be confined to preventing the spreading of fires in magazines. Normally, water is not used to fight fires involving HC mixtures except where an extremely large volume of water relative to the volume of the burning munitions is available and can be used.

14-2-1-9. Shipping Containers. HC smoke mixtures are obtainable only as fillers already contained within screening devices.

14-2-2. WP — White Phosphorus and PWP — Plasticized White Phosphorus

14-2-2-1. Specific Data. The following specific information relates to these smoke-producing chemical agents:

Action on Metal	None.
Boiling Point	554°F.
Decontaminants	None. Water extinguishes WP and PWP fires; copper sulfate prevents re-ignition.
Formula	P ₄ .
Melting Point	111°F.
Odor	Similar to matches.
Oxidation Products	Phosphorus pentoxide (P ₂ O ₅) which reacts with water to form phosphoric acid (H ₃ PO ₄).
Specific Gravity	1.83 at 68°F.

14-2-2-2. Description. WP is a yellow solid at ordinary temperatures. It is the "white" form of phosphorus which spontaneously reacts with air to form a dense cloud of phosphorus pentoxide. Intense heat generated by its burning causes "pillaring." The tendency of WP to break into very small pieces which burn rapidly, together with its low melting point which sometimes caused melting in storage, led to coating WP with synthetic rubber. This coated product, called PWP, is a very thick rubbery paste at room temperature with a yellow-brown or tan color. It does not break into such small pieces, and it thus burns more slowly, lessening the "pillaring" effect. Neither WP nor PWP reacts with water.

14-2-2-3. Toxicity. WP and PWP smoke is poisonous upon prolonged or repeated inhalation, particularly in confined space. Normal concentrations in open air are not likely to be harmful. Gas masks give complete protection in any concentration but tend to become clogged and should not be worn except where serious exposure is involved.

14-2-2-4. Handling. WP munitions must be handled so as to avoid damage that could cause leaks. WP and PWP ignite upon contact with air. Damaged WP or PWP munitions must be immediately immersed in water pending repair or disposal.

14-2-2-5. Disposition. WP or PWP munitions ashore which are damaged so that their contents might come into contact with air shall be completely covered with water until they have been removed to an isolated location. There the device can be activated in the normal manner from a remote position, or in some way the device can be ruptured so that the contents will totally burn out. At sea, such a damaged device shall be kept immersed until it can be thrown over the side. In all cases of disposal at sea, negative buoyancy as required by Chapter 3 of this pamphlet must be assured.

14-2-2-6. Storage. WP and PWP munitions must be given positive protection from all conditions that might cause leakage or the admittance of air. At sea, topside storage that facilitates jettisoning of leakers is preferred. All storage areas for WP or PWP should have sprinkler systems. If WP or PWP is stored below deck, the space must be suitable for total flooding. These munitions should be segregated in storage from rocket heads and other types of ammunition. The storage area should not be connected with the ship's ventilation system. If this is not possible, the space must be such that it can be isolated in the event of a leaker. Topside storage must not be near ventilation intakes. All WP-loaded devices must be stowed base down to prevent disturbing the center of gravity if temperature variations melt and resolidify the WP contents. Frequent inspections of WP and PWP storage areas are mandatory. If leakers are found, they shall be handled as in Paragraph 14-2-2-5 preceding.

14-2-2-7. First Aid for WP/PWP Burns. These agents cause flesh burns that heal slowly and are very painful. All particles of WP or PWP must be removed from the affected area as quickly as possible. To avoid more serious consequences, the following steps are prescribed:

- (1) Douse the burn with clean cold water.
- (2) Obtain copper sulfate pad from first aid kit and wet with water.
- (3) Press pad directly onto WP/PWP particles and squeeze liquid into burned area.

(As an alternative, wash affected area with soda solution followed by a 5 percent copper sulfate solution.)

(4) Using knife, stick, or the wet copper sulfate pad, remove particles of WP/PWP from the burn. If pad is used, rub *gently* with circular motion.

(5) Discard pad. Do not use it as a dressing; it will re-infect burn.

(6) Do not use grease or ointments on WP/PWP burns; poisoning may result.

(7) If WP/PWP is splashed in eyes, wash with large quantities of clean cold water for at least 15 minutes. Hold lids apart to assure water contact with all eye and lid tissue surfaces. Call medical personnel immediately.

14-2-2-8. Fire Fighting. Fires involving WP/PWP shall be fought with water under low pressure and in abundant quantities. WP and PWP fires can be extinguished with water but will re-ignite upon drying. These agents must be kept wet until disposed of as in Paragraph 14-2-2-5 preceding.

14-2-3. SGF Oils — Smoke Generator Fog Oils

14-2-3-1. Description. SGF oil smokes are produced by mechanical smoke generators (see Section 14-3 following) which yield a mixture of oil and water. The water is not a part of the final smoke; it serves only to keep the oil-vaporizing coil clean by reducing carbon formation during operation and by purging the coil when operations are stopped. The combination of water-vapor and oil-vapor pressure produces small oil droplets which scatter light rays to form a cloud of white "smoke." These droplets are produced by the passage of vaporized oil through the nozzle and the cooling effect of surrounding air. The persistency of the cloud depends almost entirely upon prevailing atmospheric conditions.

14-2-3-2. Types of SGF Oils. These oils are ordinary low-viscosity petroleum. There are two types: SGF1 and SGF2. SGF1 Oil has the higher viscosity of the two. Atmospheric conditions as follows determine which type should be used:

Temperature Range	Oil Used
Above 90°F.	SGF1
Between 0° and 90°F.	SGF2
Between -25°F and 0°F.	Three parts SGF2 plus one part wax-free kerosene.
Between -40°F and -25°F.	Equal parts SGF2 and wax-free kerosene.

14-2-3-3. Toxicity. Normal screening concentrations of SGF oils are harmless regardless of length of exposure. High concentrations for extended periods may cause chest pains. Oil in the lungs may contribute to pneumonia and other respiratory illnesses. Any personnel so affected must be given medical attention. Gas masks should be worn in prolonged exposures to high concentrations of SGF oil smokes.

14-2-3-4. Handling and Storage. SGF oils are classed as readily flammable mixtures. They are normally shipped in steel drums and may be stored in the open or in warehouses used for flammables. They may be stored with unfuzed munitions if conditions require.

14-2-3-5. Identification Data. SGF2 is listed under FSN 1365-038-5210 and DOD Code No. X284. No FSN or DOD Codes are available for SGF1 Oil.

14-3. SMOKE POTS AND SMOKE GENERATORS

Most smoke-generating equipment is attached to the sterns of surface craft, usually in an easily jettisonable manner, for the laying of smoke screens which are intended to conceal vessels or shore installations from visually aimed enemy gunfire. Some float in the water to accomplish the same purpose. This section contains descriptions of ship-borne and floating equipment designed for the fulfillment of that purpose.

14-3-1. Smoke Pot, HC, Mk 3 Mod 0 (Illustration on page 14-6)

14-3-1-1. Description. This device (see Figure 14.3.1) consists of a waterproof steel cylinder approximately 9.5 inches in height and 8.5 inches in diameter. It is filled with HC (Paragraph 14-2-1), and is designed for use

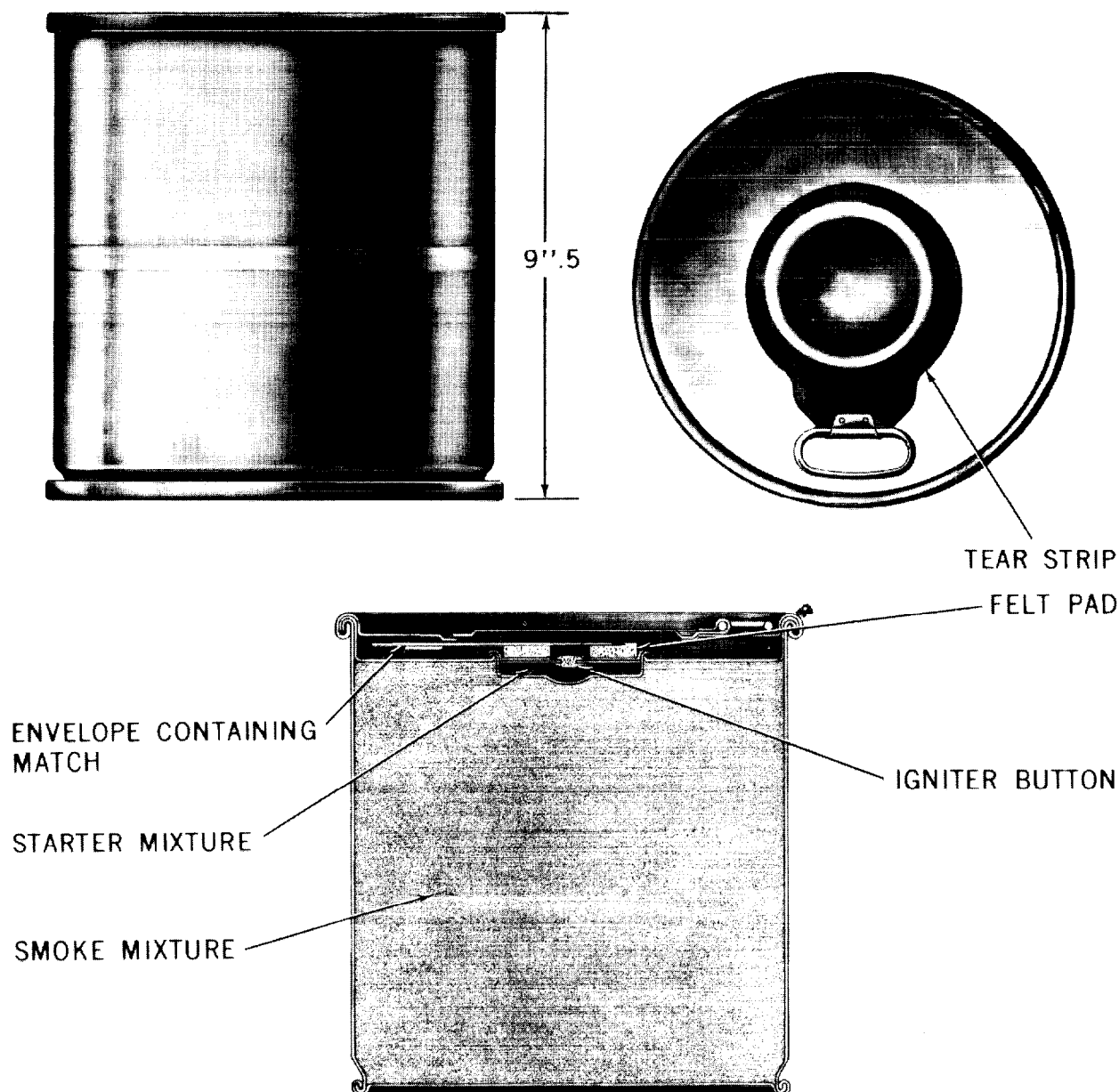


Figure 14.3.1 Smoke Pot, HC, Mk 3 Mod 0

with Smoke Screen Generator, Mk 3 Mod 0 (Paragraph 14-3-2). On its top is a handle attached to a tear strip. Beneath the tear strip is an igniter button and a spring clip which holds an envelope containing an ignition match (see Table 14-1 for specific data).

14-3-1-2. Operation. The following steps are necessary in the operation of this device:

(1) Exert a quick pull on the handle and remove the tear strip, thus exposing the envelope containing the ignition match.

(2) Remove the ignition match from its envelope.

(3) Scratch ignition match across igniter button. This ignites the starter mixture which burns through the zinc cup in which it is con-

tained. The starter mixture ignites the HC filler. Smoke emits through the opened top of the pot.

14-3-1-6. Identification Data. This device is listed under Dwg. No. 344501, FSN 1365-542-0464, and DOD Code No. K874.

14-3-2. Smoke Screen Generator, Mk 3 Mod 0

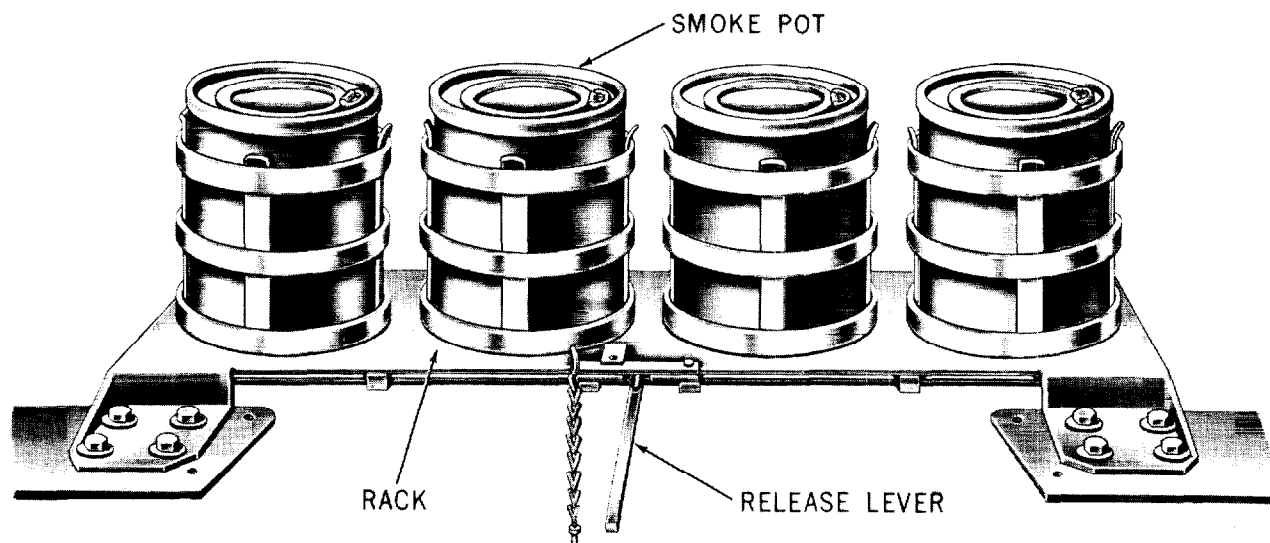


Figure 14.3.2 Smoke Screen Generator, Mk 3 Mod 0

14-3-1-3. Handling and Storage. This device must be handled carefully so as not to damage its watertightness. It must never be lifted by its tear strip handle. The tear strip must not be disturbed until immediately before use of the pot. Separate storage in magazines away from other munitions is mandatory. On shipboard, storage should be topside away from ventilation intakes.

14-3-1-4. Toxicity. The filler in this device produces smoke that is toxic in high concentrations.

14-3-1-5. Safety Precautions. The following precautions must be observed:

- (1) Do not remove tear strip until immediately before activating the pot.
- (2) Do not lift the pot by its tear strip handle.
- (3) Exercise care to prevent puncturing or otherwise damaging the pot during handling and storage.

14-3-2-1. Description. This device (see Figure 14.3.2) consists of four Smoke Pots, Mk 3 (Paragraph 14-3-1 preceding) and a Smoke Screen Rack, Mk 1. It is designed to be mounted on sterns of small craft so that it extends aft over the water. A release lever permits jettisoning all four pots in an emergency. The cold-rolled steel rack has four equally spaced holes. The pots are held over these holes by steel "cages" and are bottom-supported by arms extending from a discharge shaft. This shaft is operated by the release lever which is secured by a safety latch.

14-3-2-2. Installation. Mounting must permit free fall of the pots into the water. Normally, the two mounting pads are permanently attached to the stern deck. The rack pads may then be bolted to the mounting pads, allowing easy removal. If the shape of the stern prevents free fall of the pots, 2 x 4 channels may be secured to the deck with steel brackets so that the rack clears the stern.

14-3-2-3. Operation. The following steps are taken in operating this device:

- (1) Pull the release lever down and place the latch in "safe" position.
- (2) Place four Smoke Pots, Mk 3, in the cages.
- (3) On command, grasp the pot handles and remove the tear strips.
- (4) Remove envelopes from clips and take out ignition matches.
- (5) Ignite pots from right to left or from left to right. An effort should be made to have all pots ignited before the first starts emitting smoke.

14-3-2-4. Controlling Smoke Density. Smoke density, less than maximum, can be obtained by using one, two, or three pots instead of four.

14-3-2-5. Jettisoning. To jettison the pots, remove safety latch from "safe," releasing the discharge shaft and the bottom pot supports. Pots will fall into the water if installation has been in accordance with Paragraph 14-3-2-2 preceding.

14-3-2-6. Identification Data. This device is listed under List of Drawings No. SR 102921, Genl. Arrangement Dwg. No. 344498, FSN 1040-038-5212, and DOD Code No. X566.

14-3-3. Smoke Pot, SGF2, AN-M7 and AN-M7A1

(Formerly Smoke Pot, Mk 5
Mods 2 and 3)

(Illustration on page 14-9)

14-3-3-1. Intended Use. This device (see Figure 14.3.3) is used to conceal landings on enemy-held beaches. It may also be used on the ground as a static smoke source (see Table 14-1 for specific data).

14-3-3-2. External Features. This cylindrical device is approximately 14 inches high and 12.5 inches in diameter. Its cover is secured by a locking strap. An oil filler hole, closed by a screw plug, is on the side near the bottom. Under the outer cover is a dish-shaped inner cover equipped with a carrying handle. The fuze holder is centered in the inner cover, and

three exhaust vents are equally spaced about it. During shipment, these vents are sealed with tape, and a plastic plug is screwed into the fuze holder.

14-3-3-3. Internal Description. An air chamber occupies the upper third of the pot. Three 1/8-inch sink holes, sealed with low-melting-point solder, are in the sides of the air chamber. The oil chamber is separated from the air chamber by a metal partition. The fuel chamber, centered within the oil chamber, is attached to the pot bottom. A venturi tube, a pressure tube, and an oil spray tube complete the fuel chamber assembly. The slow-burning fuel supply is topped by a fast-burning starter mixture. The venturi tube extends from the top of the fuel chamber, through the oil chamber, into the air chamber. The oil spray tube, the lower end of which is screened, runs from the side of the venturi tube to the bottom of the oil chamber. Low-melting-point solder seals the opening of the oil spray tube into the venturi tube. The pressure tube extends from the top of the fuel chamber to a point above the oil surface in the oil chamber. Its top is also sealed with low-melting-point solder.

14-3-3-4. Filling the Pot. This device is normally shipped uncrated, unfilled, and unfuzed. SGF oil and fuzes are shipped separately. Normally, filling and fuzing immediately precede use. (See Paragraph 14-2-3-2 for recommended fillings at different temperatures.) The pot is filled as follows:

- (1) Leave outer cover securely in place.
- (2) Lay pot on its side, filler hole up, and chock to prevent rolling.
- (3) Remove filler-hole plug and gasket — keep gasket on plug to prevent loss.
- (4) Fill oil chamber to bottom of filling hole (approximately 13½ lbs. of oil).
- (5) Replace and tighten plug and gasket in filling hole.

14-3-3-5. Fuzing. The following steps shall be taken in fuzing this device:

- (1) Remove locking strap and outer cover.
- (2) Unscrew plastic plug from fuze holder.
- (3) Insert Fuze M208 or M209 (Paragraph

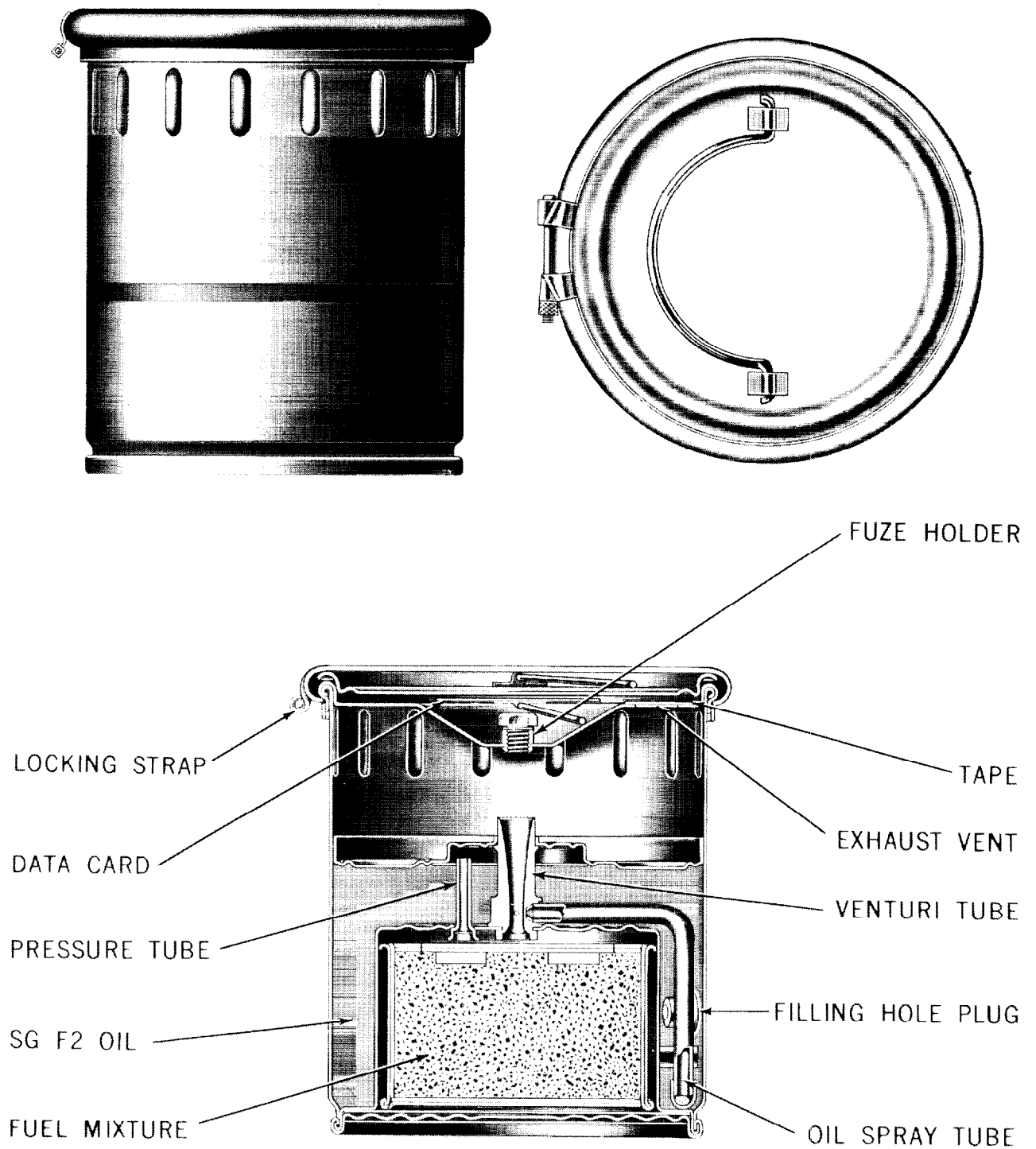


Figure 14.3.3 Smoke Pot, SGF2, AN-M7A1

14-8-1) into fuze holder and screw down until hand tight.

WARNING

Do not lift smoke pot by pull ring of fuze.

Do not remove tape over vent holes of smoke pot.

14-3-3-6. Ignition. To ignite manually, hold M208 Fuze safety lever firmly against fuze body and withdraw safety pin. Lift smoke pot by its handle, drop into water, releasing safety

and empty pots may be stored together. If stored in open, they should be suitably protected from weather.

14-3-3-9. Differences Between Models. Floating Smoke Pot, AN-M7A1 differs from the AN-M7 model only in that it is provided with an improved fuel block, rust-resistant metal parts, and a removable cover for the fuel block chamber. In all other respects, these models are identical.

14-3-3-10. Identification Data. This device is listed as follows:

Model	Shipping Condition	Dwg. No.	FSN	DOD Code
AN-M7	Complete w/oil & fuze	D36-1-110	1365-025-3268	K869
AN-M7	With oil but w/o fuze	D36-1-111	1365-833-1712	K870
AN-M7	Without oil or fuze	—	1365-025-3284	K873
AN-M7A1	With oil but w/o fuze	D36-1-118	1365-973-2429	K861

lever. To ignite electrically, connect leads from M209 Fuze to power source and close circuit.

14-3-3-7. Functioning. Flame from the fuze passes downward through the venturi tube and ignites the starter mixture which ignites the fuel mixture, causing hot gases to pass upward through the venturi tube into the air chamber. This heat melts the solder in both the venturi tube and the pressure tube. Gas pressure on the oil surface forces oil upward through the oil spray tube into the venturi tube where it is vaporized before entering the air chamber. Pressure in the air chamber blows off the exhaust vent tapes, and heat melts the solder in the sink holes. Escaping vaporized oil condenses to form a thick white cloud 8 to 20 seconds after ignition. Smoke continues for 8 to 13 minutes. Pressure in the air chamber prevents entrance of water through the sink holes. When the fuel is consumed, the pressure drops, water enters, and the pot sinks.

14-3-3-8. Handling and Storage. This device is normally stored with only the fuel mixture in place and the oil and fuzes stored separately. The ammonium nitrate fuel block is a minor fire hazard, and the pots should not, therefore, be stored with other flammables. Oil-filled

14-4. SMOKE GRENADES

This section describes grenade-type munitions that are used for screening purposes.

14-4-1. Special Safety Precautions. The following precautions apply especially to the devices described in this section.

14-4-1-1. Wind direction must be taken into account; smoke and heat must be carried away from friendly troops and installations.

14-4-1-2. The device must be positively identified before it is used.

14-4-1-3. A grenade must never be lifted by its safety pin pull ring.

14-4-1-4. The safety pin must not be pulled until immediately before throwing.

14-4-1-5. The safety lever must be held firmly against the body of the grenade while pulling the safety pin and until the grenade is thrown or emplaced.

14-4-1-6. The grenade must be thrown a minimum distance of 20 feet.

14-4-1-7. If a WP grenade leaks, it must be submerged in water until it can be safely disposed of. WP ignites and re-ignites upon exposure to air.

14-4-1-8. If a WP grenade is dropped or if its

safety lever comes off during handling, throw it and take cover. A grenade can be thrown farther and faster than a person can run.

14-4-2. Grenade, Hand, Smoke, HC, AN-M8

14-4-2-1. Description. This device is fully described in Paragraph 5-6-4 of Chapter 5 of this pamphlet.

14-4-3. Grenade, Hand, Smoke, WP, M15

14-4-3-1. Intended Use. This grenade (see Figure 14.4.1) is used primarily for screening, incendiary, and casualty effect (see Table 14-1 for specific data).

14-4-3-2. Description. This device consists of a steel cylinder, 4.5 inches long and 2.38 inches in diameter. A steel cap is brazed to its top. A burster well, $\frac{1}{2}$ inch in diameter, is screwed

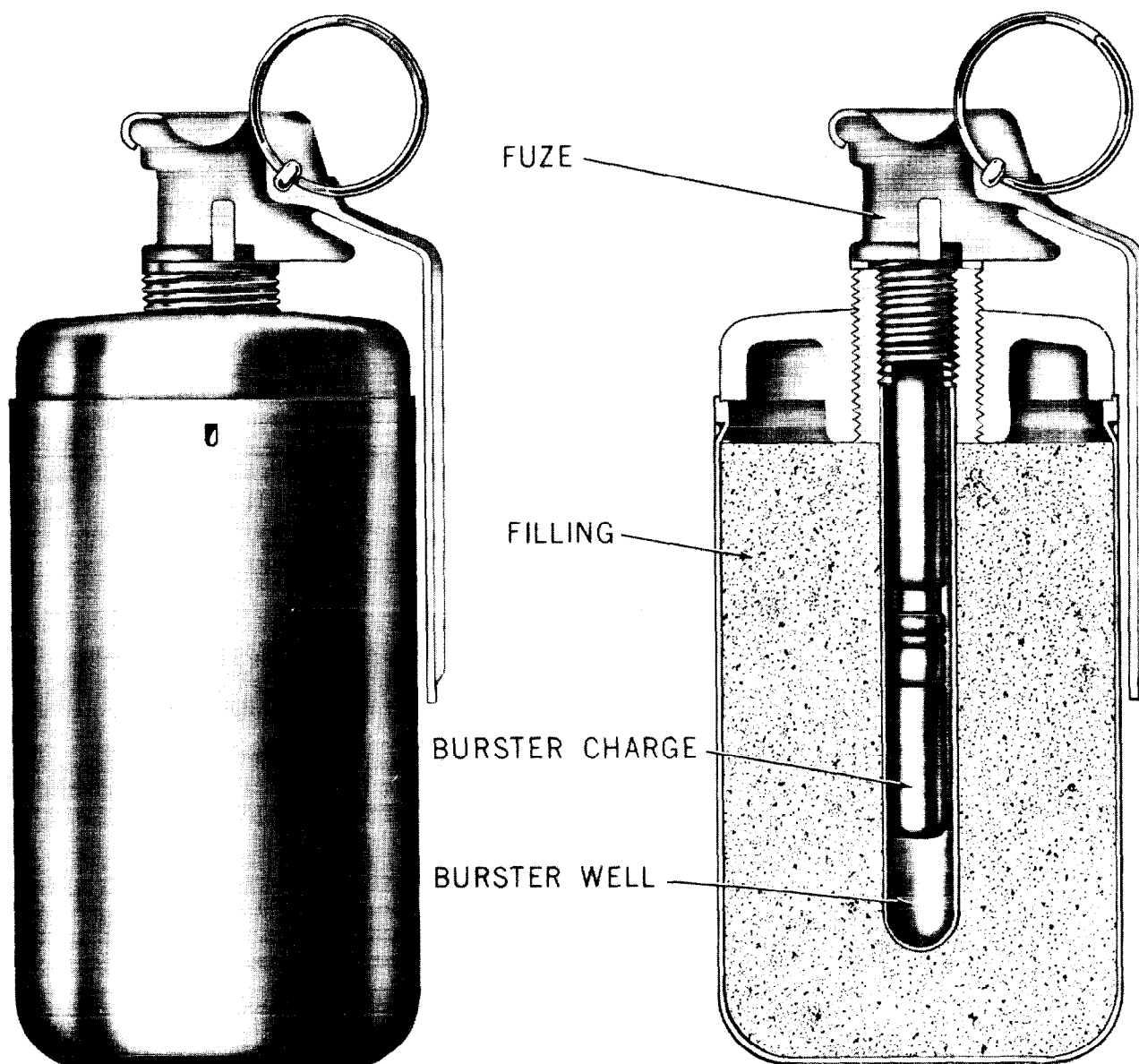


Figure 14.4.1 WP Smoke Hand Grenade, M15

into its top and extends to within 3/4 inch of its bottom. The filler is WP. The fuze screws into the burster well head. The 4- to 5-second delay element extends into the tetryl burster charge.

14-4-3-3. Handling and Storage. Since WP ignites on contact with air, this device must be protected from damage (see Paragraph 14-2-2-6 preceding).

14-4-3-4. Safety Precautions. The safety pin must not be removed until ready to launch. The safety lever must be held firmly against the grenade body until the grenade is thrown. The WP in this device burns for approximately one minute and will ignite any flammable materials on contact. For first aid instructions, see Paragraph 14-2-2-7 preceding.

14-4-3-5. Operation. When the safety lever is released and the striker hits the primer, the 4- to 5-second delay element is ignited. The delay element ignites the burster charge which bursts the grenade body and scatters WP over a radius of approximately 20 yards. The WP ignites spontaneously upon contact with air to produce a dense white smoke for approximately 60 seconds.

14-4-3-6. Shipping Containers. This device is packaged individually in a hermetically sealed tear strip metal can, 16 such cans to a wooden box. It is equipped with different fuzes before packing and shipping as indicated in paragraph 14-4-3-7 following.

14-4-3-7. Identification Data. This grenade is listed under Drawing No. C13-19-17, Specification 196-111-56, and DOD Code No. G935. Federal Stock Numbers are as follows: With fuze M6A3, M6A3B1, M6A4C, or M6A4D - 1330-529-8544; with fuze M206A1 or M206A2 - 1330-219-8510.

14-4-4. Grenade, Rifle, Smoke, WP, M19A1
(Illustration on page 14-13)

14-4-4-1. Intended Use. This device (see Figure 14.4.2) is used as a screening, incendiary, or casualty munition (see Table 14-1 for specific data.)

14-4-4-2. Description. This device has a straight-walled body with a flat base to which

is attached a stabilizer assembly. Its nose is hemispherical. Its burster well extends three quarter of the way into its body. It is equipped with an impact-type, base-detonating fuze and a 13-1/2-grain standard blasting cap.

14-4-4-3. Functioning. This grenade is fired either from a launcher-equipped rifle or from a carbine, using M3 or M3 and M7 cartridges (rifle) and M6 or M6 and M7 cartridges (carbine). The M3 rifle cartridge provides a maximum range of 235 yards; the M3 and M7, 310 yards. The M6 carbine cartridge provides a maximum range of 155 yards; the M6 and M7, 215 yards. Upon impact, the firing pin fires the primer which ignites the blasting cap. The blasting cap bursts the grenade body and showers burning WP over a radius of approximately 20 yards.

14-4-4-4. Handling and Storage. See Paragraphs 14-2-2-4 and 14-2-2-6 preceding for rules governing the handling and storage of WP munitions.

14-4-4-5. Safety Precautions. The safety pin must not be removed until this device is fully installed in the rifle or carbine launcher, ready to fire. In firing, the trajectory must be such that the point of impact is at least 35 yards from friendly installations and personnel. If installed and not launched immediately, the safety pin must be reinserted before removing the grenade from the rifle or carbine. Duds are to be approached only by trained EOD personnel. For first aid, see Paragraph 14-2-2-7 preceding.

14-4-4-6. Shipping Containers. This device is packaged in individual fiberboard or metal containers, 10 to a wooden box. Shipping weight is approximately 36 pounds.

14-4-4-7. Identification Data. This grenade is listed under Dwg. No. 82-1-109, Specification 196-131-256, FSN 1330-028-5866, and DOD Code No. H030.

14-4-5. Grenade, Hand or Rifle, Smoke,
WP, M34
(Illustrated on page 14-14)

14-4-5.1. Intended Use. This grenade (see Figure 14.4.3) is used to provide anti-person-

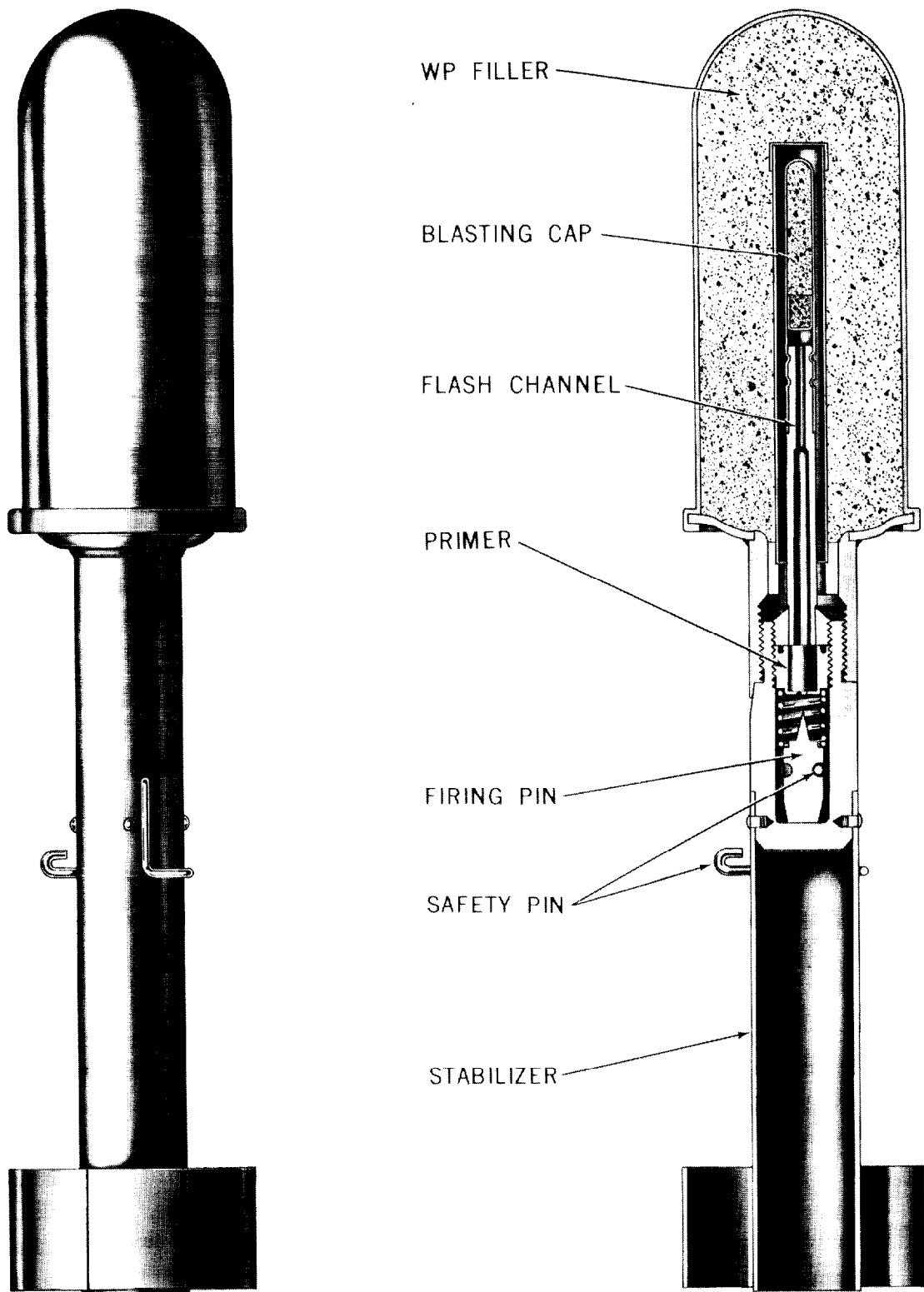


Figure 14.4.2 WP Smoke Rifle Grenade, M19A1

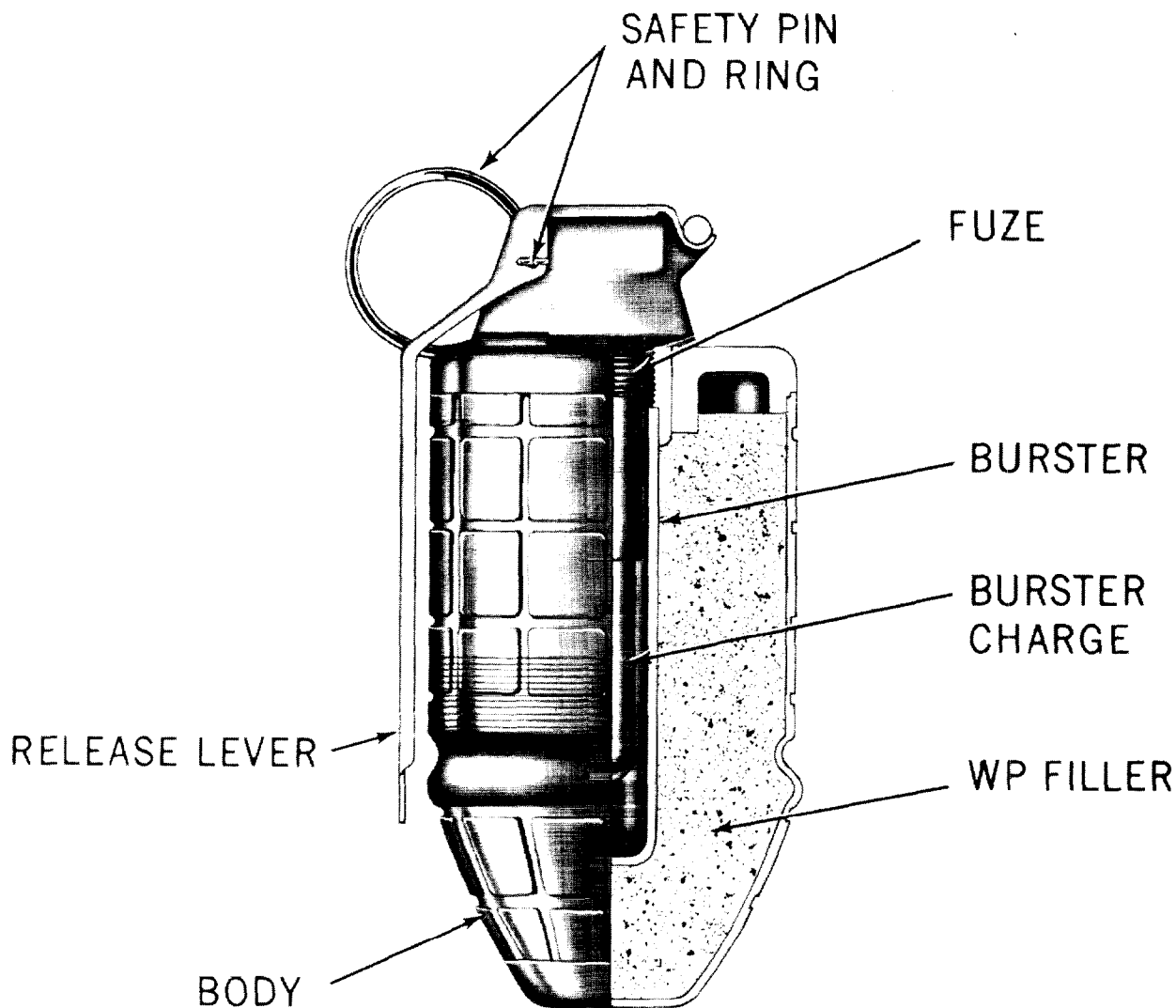


Figure 14.4.3 WP Smoke Hand or Rifle Grenade, M34

nel, smoke screening, and incendiary capabilities. It is a bursting type hand or rifle grenade which has been designed to replace the WP Rifle Smoke Grenade, M19A1, described in Paragraph 14-4-4 preceding (see Table 14-1 for specific data).

14-4-5-2. Description. The steel cylindrical body of this grenade, serrated into 60 segments to facilitate bursting, is tapered at its lower end for fitting into a grenade projection adapter, M1A2. A fuze, M206A2, protrudes from its upper end.

14-4-5-3. Functioning. This grenade can be projected by rifle to a distance approaching 200 yards. It contains a 4- to 5-second delay element. At detonation, the body bursts and scatters fragments of the case. Particles of the WP filler ignite to form the desired smoke cloud.

14-4-5-4. Handling and Storage. This device contains white phosphorus and must therefore be handled with extreme care to prevent damage which might cause leakage of its filler or premature initiation. The rules appearing in

Paragraphs 14-2-2-4 and 14-2-2-6 preceding apply.

14-4-5-5. Safety Precautions. See Paragraph 14-4-1 for special precautions relating to grenade-type munitions. In addition, the safety precautions set forth for Rifle, Smoke Grenade, WP, M19A1, in Paragraph 14-4-4-5 apply equally to this device.

14-4-5-6. Shipping Containers. This grenade is packaged in an individual cardboard container. Sixteen such containers are packed in a wooden box.

14-4-5-7. Identification Data. This grenade is listed under Dwg. No. D13-7-11, FSN 1330-676-2671, and DOD Code No. C234.

14-5. TRAINING DEVICES

This section contains descriptions of devices which are used in the training of personnel in fire fighting procedures and the use of gas masks.

14-5-1. Smoke Pot, M6
(Formerly SGF2 Oil Smoke
Candle, M6)
(Illustration on page 14-15)

14-5-1-1. Intended Use. This device (see Figure 14.5.1) is used chiefly for simulating fires in damage control exercises and related training (see Table 14-1 for specific data).

14-5-1-2. Description. This device resembles a hand grenade. Its cylindrical metal body which is approximately 5.5 inches long and 2.5 inches in diameter is fitted with a Grenade igniting Fuze, M201A1 (Paragraph 14-8-2). It contains 0.22 pound of SGF2 oil in its upper chamber and fuel mixture in its base. A venturi tube extends from directly above the fuel mixture through the oil chamber to the top of the pot. There are small openings, each sealed with low-melting-point solder, in the venturi tube; one into the oil chamber, the other into the space above the oil surface. There are three tape-covered holes in the top of the pot.

14-5-1-3. Functioning. When the fuze ignition mixture ignites the starter mixture at the

lower end of the venturi tube, the fuel mixture starts burning. Heat melts the solder in the venturi tube openings and the oil flows into the venturi tube where it is vaporized. This vapor passes upward and emits through the vent holes in the top of the smoke pot. Upon emission, it condenses to form a dense white cloud.

14-5-1-4. Operation. To operate this smoke pot, proceed as follows:

(1) Hold safety lever firmly against body of smoke pot.

(2) Withdraw safety pin, keeping firm grip around body and lever.

(3) Place smoke pot, base down, in metal bucket or other deep container.

(4) Release safety lever and move at least 20 feet away quickly. (Fuze contains a 2-second delay element — see Paragraph 14-8-2 following).

14-5-1-5. Safety Precautions. The following special safety precautions apply:

(1) Do not lift or handle this device by its safety pin pull ring.

(2) Do not use this device near flammable materials or painted surfaces. The SGF2 oil may ignite or the pressure build-up may explode the pot body.

(3) Because of the possibility of bursting, always place this device in a metal bucket or other deep receptacle before releasing safety lever.

(4) Personnel must wear gas masks in heavy concentrations of SGF2 smoke.

(5) There is no explosive hazard in concentrations of SGF2 oil smoke produced by one M6 Smoke Pot in a volume of 500 cubic feet. In higher concentrations, however, precautions should be taken against sparks or open flames.

14-5-1-6. Handling and Storage. This device must be handled carefully to avoid damage, particularly to its fuze assembly. The pot is considered to be a fire hazard. Storage is authorized with all pyrotechnics except water-activated types in accordance with OP 5, Ammunition Ashore. Storage must not be in direct sunlight or near steam pipes, explosives, or

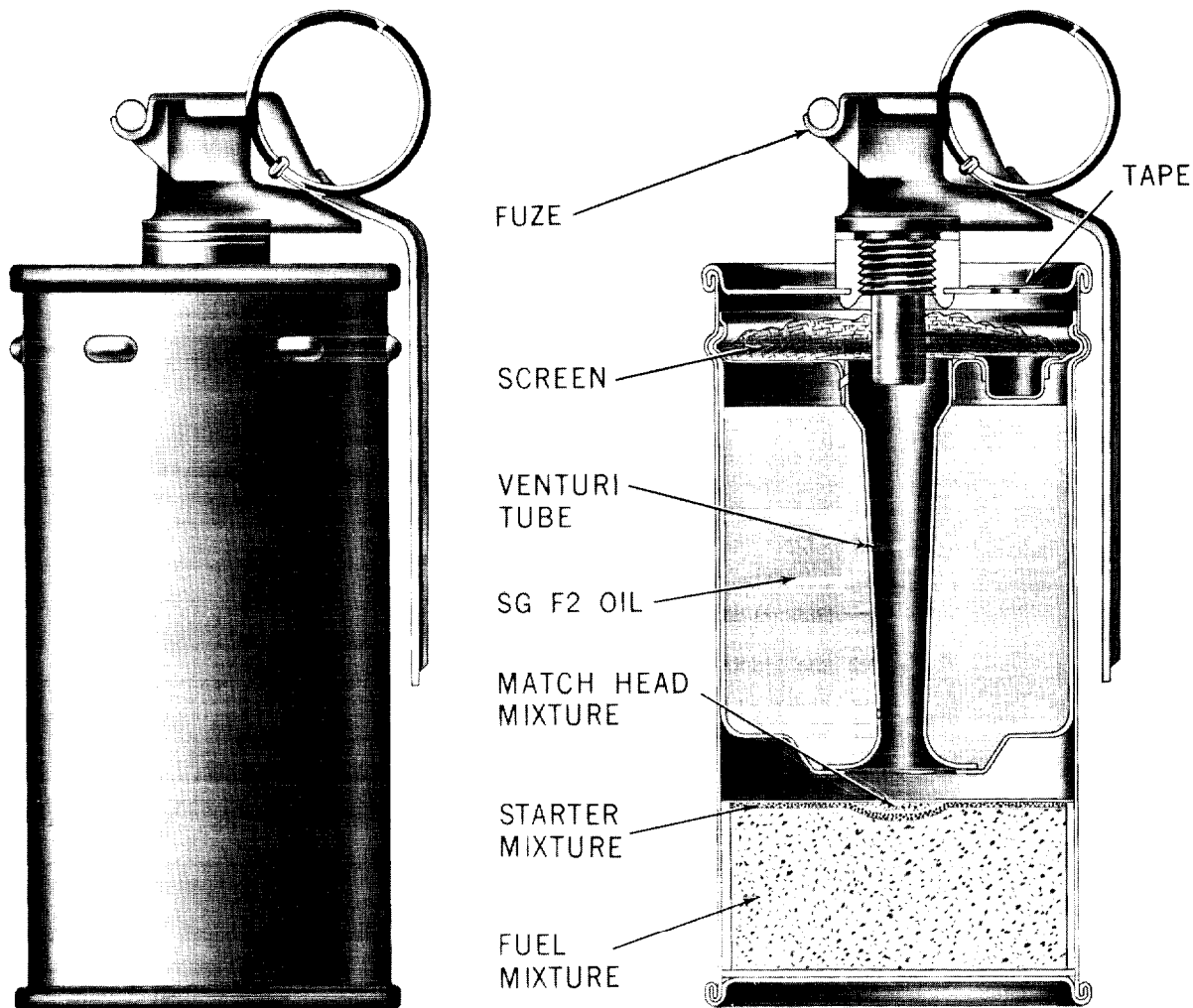


Figure 14.5.1 Smoke Pot, M6

flammable materials. Storage afloat should be topside away from ventilation system intakes.

14-5-1-7. Shipping Containers. This device, fuze, is packed in a sealed, tear-strip metal container, 16 to a wooden box. A filled box weighs 35 pounds and occupies 1.2 cubic feet of space.

14-5-1-8. Identification Data. This smoke pot is listed under Dwg. No. C11-18-3, Specification MIL-C-1141, FSN 1365-383-3886, and DOD Code No. K864.

14-6. GUN- AND MORTAR-PROJECTED SCREENING DEVICES

Devices described in this section are fired from guns or mortars for the purpose of laying distant screens.

14-6-1. Projectile, 5"/38 Cal., WP, Mk 30 Mods
(Illustration on page 14-17)

14-6-1-1. Intended Use. This projectile (see Figure 14.6.1) is fired from a Mk 12 Gun for

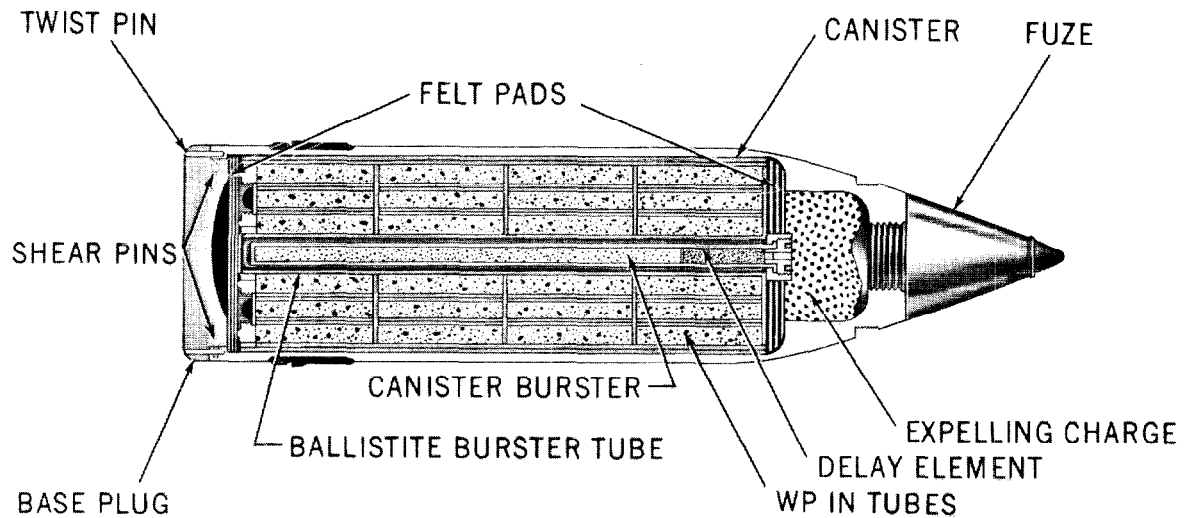


Figure 14.6.1 5"/38 Cal. WP Projectile, Mk 30

spotting, anti-personnel, screening, and limited incendiary effects. It may be used with a Mk 29 Mod 3 Point-detonating Fuze over land areas or with a Mk 50 Mechanical Time Fuze over water (see Table 14-1 for specific data).

14-6-1-2. Description. This projectile is approximately 20 inches in length. The smoke canister, in which the WP tubes are contained, is 12 inches long and 3.9 inches in diameter. This canister is contained within the projectile body immediately behind the expelling charge which is between the canister and the nose fuze. A ballistite-filled burster tube extends through the longitudinal center of the canister. The forward end of the burster tube contains a delay element. The base of the projectile is closed with a base plug secured in place with shear pins.

14-6-1-3. Functioning. After the projectile is fired from a Mk 12 Gun, the fuze ignites the expelling charge which forces off the base plug and expels the smoke canister, at the same time igniting the delay element. Shortly after the canister clears the tail end of the projectile body, the delay element ignites the burster charge which bursts the canister and releases the WP. Upon contact with air, the WP ignites to produce the desired smoke screen.

14-6-1-4. Handling and Storage. This projectile shall be handled and stored in accordance with the provisions of Paragraphs 14-2-2-4 and 14-2-2-6 preceding.

14-6-1-5. Safety Precautions. Since the WP filler is sealed within the projectile case, there is little likelihood of leakage and consequent danger from burns. Normal safety precautions that apply to all live ammunition prevail and must be observed at all times. If the projectile should be damaged so as to cause leakage of WP, the projectile and the leaking filler must be kept immersed in or showered with copious quantities of water until appropriate disposition can be accomplished by trained EOD personnel. If burns result from such leakage, the first aid rules of Paragraph 14-2-2-7 preceding shall be followed.

14-6-1-6. Identification Data. This projectile is listed under Dwg. No D15-11-3 and Assembly Dwg. No. 1305683. FSN and DOD Code Nos. are as follows:

With Mechanical Time Fuze,	
Mk 50	1320-555-7364, D247
With PD Fuze, Mk 29 Mod 3	1320-039-2021, D246

14-6-2. Projectile, 5"/38 Cal., WP,
Mk 44 Mod 1

(Illustration on page 14-18)

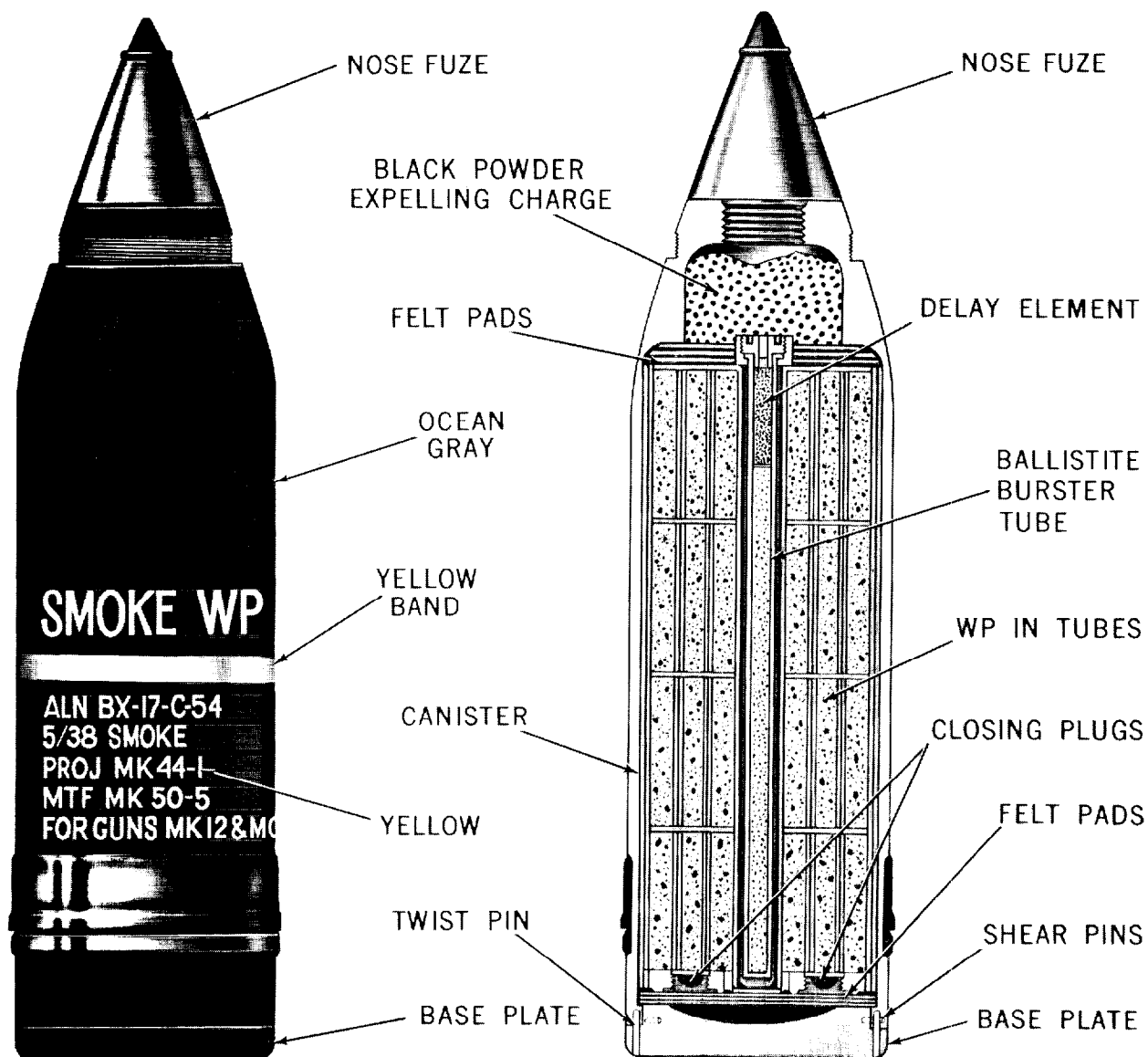


Figure 14.6.2 5"/38 Cal. WP Projectile, Mk 44 Mod 1

14-6-2-1. Intended Use. This device (see Figure 14.6.2) is fired from a 5"/38 cal. rifle as a means of generating distant smoke screens. It combines screening, anti-personnel, and slight incendiary effects. It may be used with a mechanical time fuze over water or with a point-detonating fuze on land surfaces. In relatively still air, the screen is effective for seven minutes or more (see Table 14-1 for specific data).

14-6-2-2. Description. The smoke canister used in this device is a light steel cylinder, approximately 12 inches long and 3.9 inches in diameter. It is fitted with a ballistite burster tube in its center. It is loaded with 168 metal tubes, each filled with white phosphorus. The total WP load is approximately 7.1 pounds. Gross weight of the projectile is approximately 53 pounds.

14-6-2-3. Functioning. When the expelling charge is ignited by the nose fuze, it initiates burning of the delay element and forces off the base plate, ejecting the canister to the rear. When the canister is clear of the projectile case, the delay element ignites the burster charge which bursts the canister and showers the tubes of WP to form a cloud approximately 50 yards in diameter.

14-6-2-4. Handling and Storage. Since the smoke canister is sealed within the projectile, there is little danger of damage or hazard. Any leakage of WP, however, would result in large quantities of smoke and a fire which is difficult to extinguish; for this reason, storage should be in fireproof magazines away from other munitions (see Paragraph 14-2-2-6 preceding).

14-6-2-5. Safety Precautions. In the event of burns from leaking WP, see Paragraph 14-2-2-7 preceding for first aid measures to be taken.

14-6-2-6. Identification Data. This projectile, with a mechanical time fuze, is listed under FSN 1320-039-2113 and DOD Code No. D247. When fitted with a point-detonating fuze, it is listed under FSN 1320-039-2130 and DOD Code No. D246.

14-6-3. Cartridge, 81 MM, Smoke, WP, M57 and M57A1

(Illustration on page 14-20)

14-6-3-1. Intended Use. This cartridge (see Figure 14.6.3) is designed to be used with 81 MM Mortars M1 and M29 for spotting, screening, and anti-personnel effects at ranges up to 7,100 feet.

14-6-3-2. Description. This semi-fixed, fin-stabilized, central-burst round consists of a cylindrical body, a fin assembly, a propelling charge, an ignition cartridge, a primer, an adapter, and a burster. It may be used with point-detonating fuzes in the M52 or the M525 series or with Fuze TSQ M77. The adapter is at the forward end of the body and supports the burster tube and the selected fuze. The adapter also seals the body cavity against

infusion of air which would ignite the WP filler. The thin-walled burster tube extends approximately three quarters of the way into the filler cavity and is press-fitted at its forward end into the adapter.

14-6-3-3. Functioning. Upon firing, the primer ignites the ignition charge which, in turn, ignites the propellant. On impact, the fuze ignites the burster charge which explodes to spread small particles of WP over the desired area. The WP ignites on contact with air to form a dense white cloud.

14-6-3-4. Handling and Storage. This cartridge shall be handled and stored in accordance with the provisions of Paragraphs 14-2-2-4 and 14-2-2-6 preceding.

14-6-3-5. Safety Precautions. Normal safety precautions applicable to all mortar-type ammunition apply equally to this cartridge. In the event that burns result from WP filler which is spilled or caused to leak through damage to the cartridge, first aid rules of Paragraph 14-2-2-7 must be observed.

14-6-3-6. Differences Between Models. The M57 Cartridge differs from the M57A1 only in the fin assemblies employed. Fin Assembly M4 is used with the M57, whereas the M57A1 Cartridge utilizes Fin Assembly M4A1. These assemblies differ from one another only in manufacturing details, and their differences do not materially affect functioning of the round.

14-6-3-7. Ranging. The maximum effective range of this cartridge can be varied by using one to four propellant charge increments. Approximate ranges are as follows:

With ignition cartridge and one increment	---	2,100 feet
With ignition cartridge and two increments	---	3,900 feet
With ignition cartridge and three increments	---	5,400 feet
With ignition cartridge and four increments	---	7,100 feet

14-6-3-8. Packaging and Identification Data. This cartridge is packed in individual fiber-board containers, one or two such containers to an outer box as indicated on page 14-21.

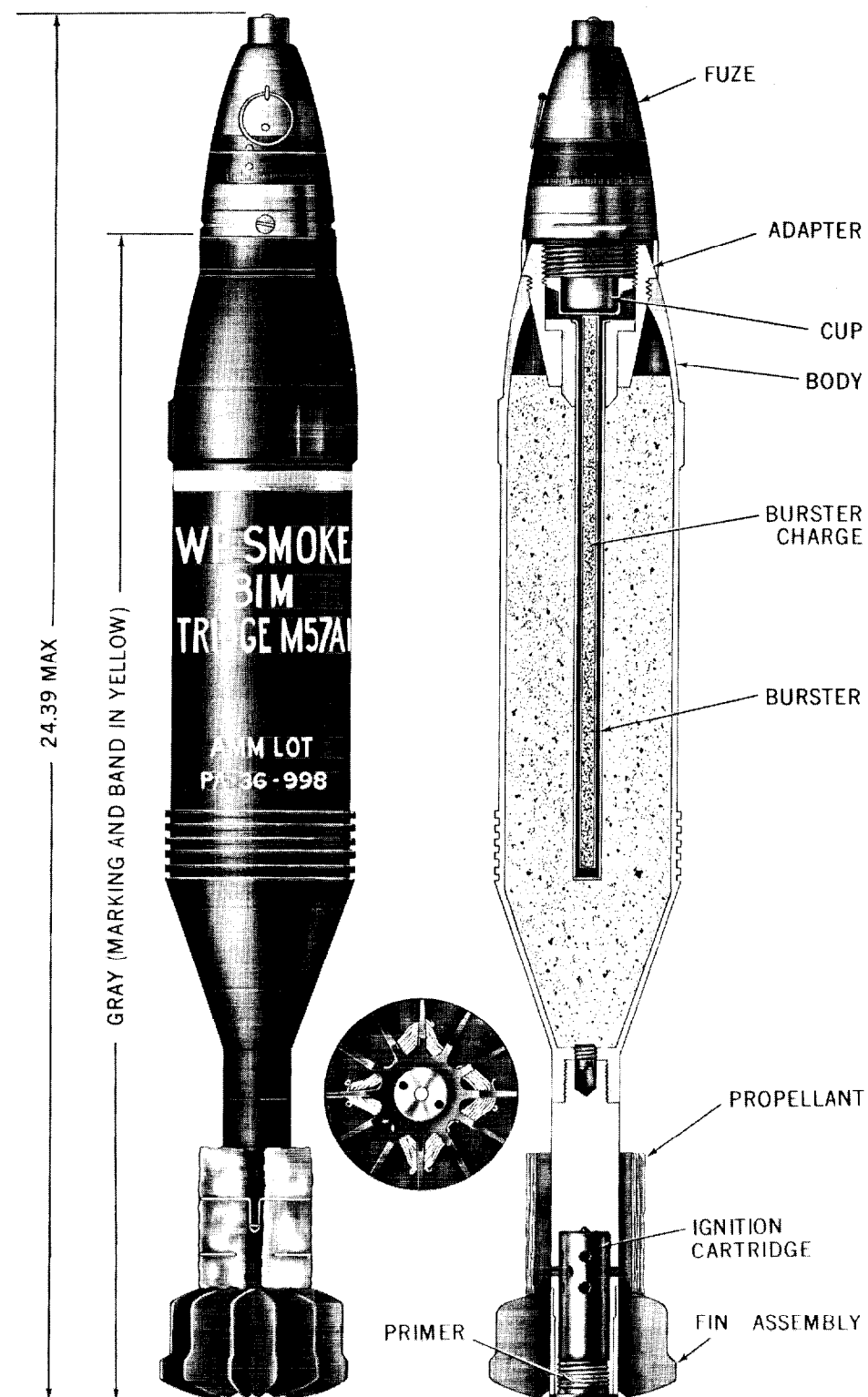


Figure 14.6.3 81 MM WP Smoke Cartridge, M57A1

Model	Fuze	Number in Pkg.	Dwg. No.	FSN	DOD Code
M57	PD,M52A1B1	One	75-1-93	1315-301-1808	C230
M57	PD,M52A2	One	75-1-93	1315-028-4991	C230
M57	PD,M52A2	Two	75-1-93	1315-028-4990	C230
M57	PD,M525A1	Two	75-1-93	1315-585-1740	C230
M57A1	PD,M525	Two	75-1-93	1315-682-4626	C230
M57A1	TSQ M77	Two	75-1-199	1315-028-4989	C231
M57A1	PD,M52A2	One	75-1-93	1315-028-4993	C230
M57A1	PD,M52A2	Two	75-1-93	1315-028-4992	C230
M57A1	PD,M525A1	Two	75-1-93	1315-682-4627	C230

14-6-4. Cartridge, 81 MM, Smoke, WP, M370.

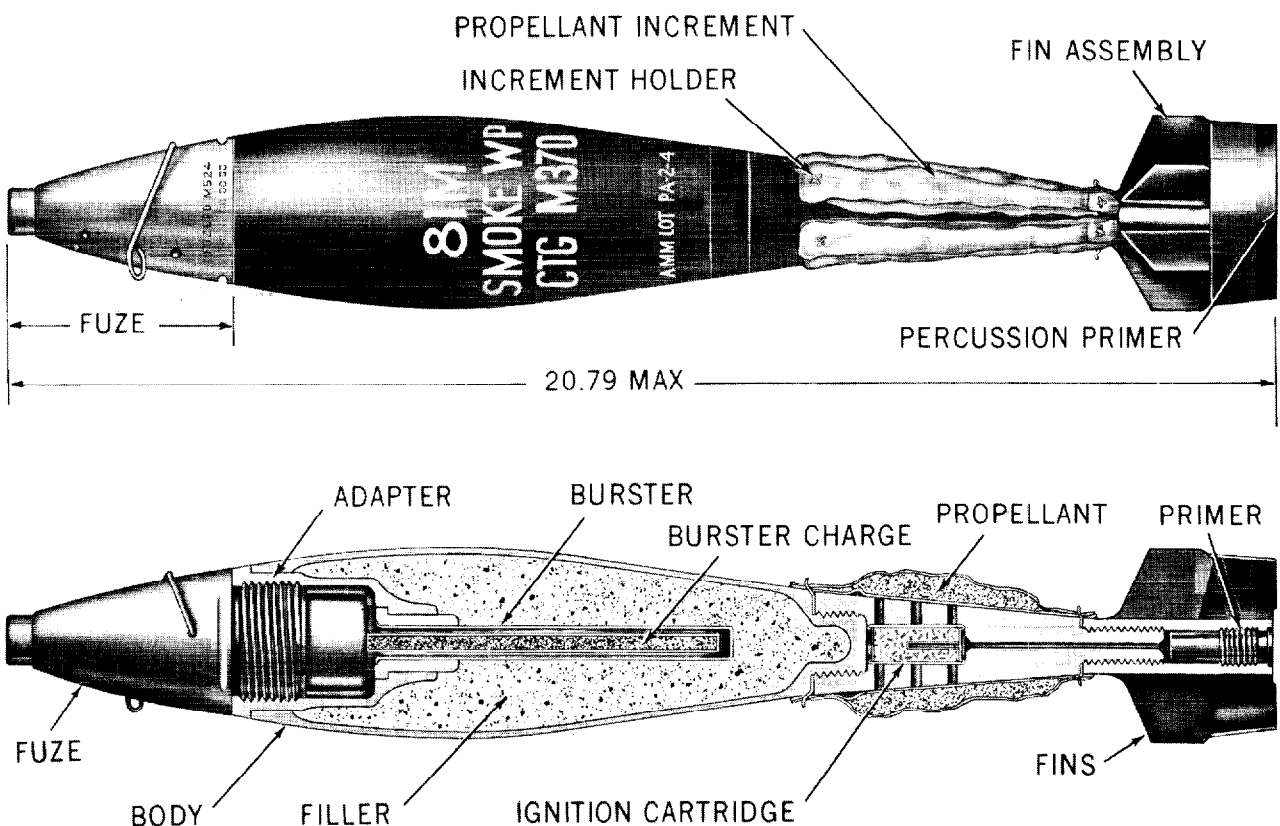


Figure 14.6.4 81 MM WP Smoke Cartridge, M370

14-6-4-1. Intended Use. This cartridge (see Figure 14.6.4) is used with the same mortars and for the same purposes as the cartridge described in Paragraph 14-6-3 preceding except that it has a greater range—approximately 12,000 feet as opposed to 7100 feet for

the M52 and M52A1 Cartridge (see Table 14-1 for specific data).

14-6-4-2. Description. The M370 Cartridge consists of a steel, WP-filled body, a fuze, a

burst, an ignition cartridge, a propellant, a fin assembly, a primer, and an adapter. The adapter fits onto the forward end of the thin-walled burst tube which extends approximately three quarters of the way into the filler cavity. The adapter holds the fuze and seals the cavity. The base of the cartridge body is threaded to receive the fin assembly.

14-6-4-3. Functioning. When this device is dropped into the mortar, the firing pin strikes the primer which ignites the ignition cartridge. The ignition cartridge ignites the propellant. Fins stabilize its flight to target. Upon impact, or at the range and height determined by the fuze setting, the burst functions to spread burning WP.

14-6-4-4. Handling, Storage, and Safety Precautions. The statements in Paragraphs 14-6-3-4 and 14-6-3-5 preceding apply equally to this cartridge.

WARNING

Not more than five propellant charge increments may be used with the ignition cartridge when firing Cartridge M370 in the 81 MM Mortar, M1 (see Paragraph 14-6-4-5 following).

14-6-4-5. Ranging. The maximum effective range of this cartridge can be varied by using different numbers of propellant charge increments. Approximate ranges are as follows:

With ignition cartridge only	900 feet
With ignition cartridge plus 1 increment	2,100 feet
Plus 2 increments	3,900 feet
Plus 3 increments	5,500 feet
Plus 4 increments	7,000 feet
*Plus 5 increments	8,100 feet
Plus 6 increments	9,600 feet
Plus 7 increments	10,800 feet
Plus 8 increments	12,000 feet

* Maximum increments authorized for use with M1 Mortar.

14-6-4-6. Packaging and Identification Data. This cartridge, with Fuze M524, is packaged one to an individual fiberboard container, three such containers to a wooden box. It is listed under Dwg. Nos. 75-1-299 and 8842900, FSN 1315-892-4101, and DOD Code No. C234.

14-22

14-7. ROCKET-PROPELLED SCREENING DEVICES

This section contains descriptions and technical information relative to those devices that are integrated with surface-to-surface and air-to-surface rockets for screening effects.

14-7-1. Precautions in Handling, Storage, and Use. The nature of rockets and rocket propellants requires that the following special precautions be set forth.

14-7-1-1. General. The following general precautions apply and must be observed:

(1) Rocket shipping containers must not be handled roughly, dropped, slid, tumbled, "walked" on corners, or struck, as in lining up a stack.

(2) Rockets must be protected from high temperature sources such as steam lines and direct sunlight. They must not be stored where temperatures may exceed 160°F for as long as 4 hours a day. If exposed for more than 2 hours to temperature higher than the upper limit as shown on the rocket body, the rocket must be cooled before it is fired.

(3) The moisture-resistant seal on rocket containers must not be broken until just before the rocket is to be used.

(4) Rocket components that are issued separately must not be assembled into complete rounds in advance of requirements. If assembled and not used, they must be restored to their original condition in respect to packaging.

(5) Safety devices must not be removed except as specified in preparation for firing.

(6) Packing will be opened only as required for use or inspection. Partially emptied containers and those that contain rockets that have been repacked will be appropriately marked and resealed. Such items shall be stored so as to assure first use for subsequent requirements.

(7) All damaged outer containers shall be repaired or replaced, and all original markings will be duplicated exactly, without change.

(8) No outer containers for rockets may be opened, repaired, or replaced within 100 feet of any place where explosives are stored.

(9) No rocket or rocket component is to be disassembled except as specifically authorized by the Bureau of Naval Weapons.

14-7-1-2. Storage. All screening rockets and warheads covered by this section shall be stored in accordance with the following special rules:

(1) Storage must be in a dry, cool space, shielded, if possible, from direct rays of the sun.

(2) Rockets must be stored and transported within the temperature limits marked on the rocket body and on their containers.

(3) Separate rocket motors shall be stored as complete rounds, and propellant grains shall be treated as high explosives.

(4) All rockets in store shall point in one direction, preferably nose down or pointing toward a barricade.

(5) Rocket components shall be stored as shipped. If components are shipped separately, they must be stored separately. Exception: heads and motors may be stored together.

(6) The storage rules of OP 5, Vol. I, Chapter 22, apply.

14-7-1-3. Handling and Use. All screening rockets and warheads covered by this section shall be handled and used in accordance with the following:

(1) Except in emergency situations, rockets must not be fired at temperatures outside of the limits stated for the round.

(2) No changes or modifications may be made in rockets or their packaging except by authority of BUWEPS, and the rocket and its packing shall be clearly marked to show all such changes.

(3) Original markings on rockets and containers must not be altered.

(4) Rocket motors and fins must not be dented or bent.

(5) Assembled rockets must not be stood on their tails or bases.

(6) Before making electrical connections to a rocket, it must be positively determined that the power source is "off."

(7) Personnel must not be in line with a rocket during loading into a launcher.

(8) Rocket fuze cavities must be protected from moisture, especially during freezing weather.

(9) Rockets must be protected from accumulations of ice and frost.

(10) Safety bands must not be removed until immediately before firing.

(11) Nose plugs must be kept securely in place until immediately before fuzing, especially in freezing weather.

(12) Rough handling and dropping of rockets must be avoided at all times, particularly at extremely low temperatures.

(13) Electrically functioned igniters and rockets equipped with such igniters must be protected from stray electrical currents.

14-7-2. Rocket, Smoke, 3.5-inch, WP, M30
(Illustration on page 14-24)

14-7-2-1. Intended Use. This rocket (see Figure 14.7.1) is intended to be used with 3.5-inch launchers, M20 and M31, for smoke screening purposes (see Table 14-1 for specific data).

14-7-2-2. Description. The major components of this fixed-fin rocket are the motor assembly, the head assembly, the base-detonating fuze, the burster, the propellant, and the 2.23 pounds of WP filler. The rear of the head is internally threaded to receive the fuze. The burster tube is press-fitted into the forward end of this union, and the steel rocket body is fitted over it. The ogive head and the steel dome which closes the front end of the filler cavity are parts of the body assembly. The fins are affixed to the motor assembly. This rocket is 23.55 inches long. It weighs approximately 9 pounds.

14-7-2-3. Functioning. On impact, the base-detonating fuze ignites the burster which bursts the head, scattering particles of WP filler. The WP spontaneously ignites on contact with air to produce the desired dense smoke screen.

14-7-2-4. Handling, Storage, and Safety Precautions. The precautions set forth in Para-

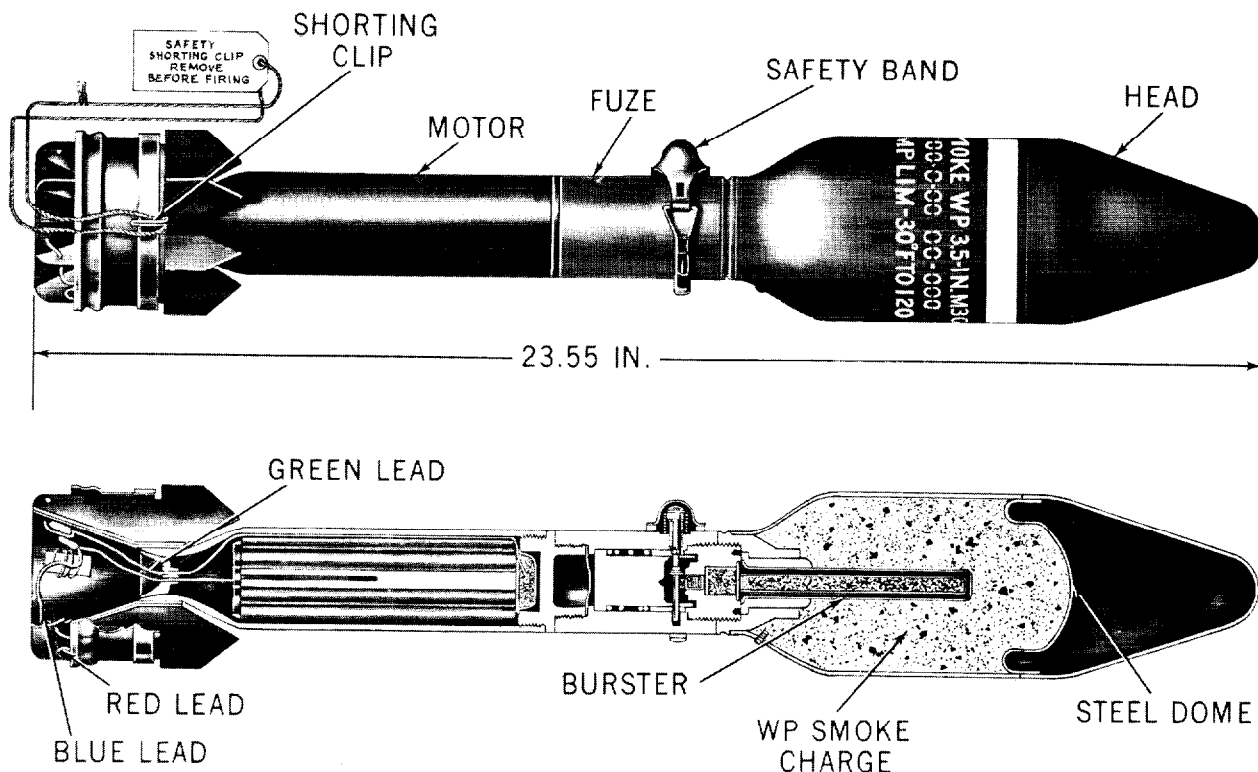


Figure 14.7.1 3.5-inch WP Smoke Rocket, M30

graph 14-7-1 preceding apply to this rocket and must be strictly observed. In addition, the general rules respecting white phosphorus in Paragraph 14-2-2 are pertinent to this device.

14-7-2-5. Shipping Containers. This rocket is packaged in an individual metal can or fiber-board container, three such cans or containers to the wooden box.

14-7-2-6. Identification Data. This rocket is listed under Dwg. No. 82-6-26, FSN 1340-028-6093, and DOD Code No. H602.

14-7-3. Warhead, 5-inch Rocket, Smoke, PWP, Mk 4 Mod 1
(Illustration on page 14-25)

14-7-3-1. Intended Use. This warhead (Figure 14.7.2) is intended to be used with Rocket Motor, Mk 10 Mod 6, to comprise the Smoke Rocket, 5-inch, PWP, HVAR, Mk 36 Mod 0, which is forward-fired from aircraft for sur-

face spotting, screening, anti-personnel, and limited incendiary effects (see Table 14-1 for specific data).

14-7-3-2. Description. This warhead is 36.67 inches long and 5 inches in diameter. Its gross weight is 50.84 pounds, and it contains 19.65 pounds of plasticized white phosphorus (PWP) filler. In addition to the PWP filler, the head contains the nose fuze (Mk 149), the fuze adapter, the burster tube, burster well, burster charge, support, and base closure. The burster tube extends almost the full length of the warhead. The base closure is threaded externally for attachment to the Mk 10 Mod 6 Rocket Motor.

14-7-3-3. Functioning. Upon impact, the fuze ignites the burster charge which causes the body to burst, scattering the PWP filler. On contact with air, the particles of PWP ignite to form the cloud. The range of the Mk 36 Mod 0) Rocket is approximately 11,000 yards.

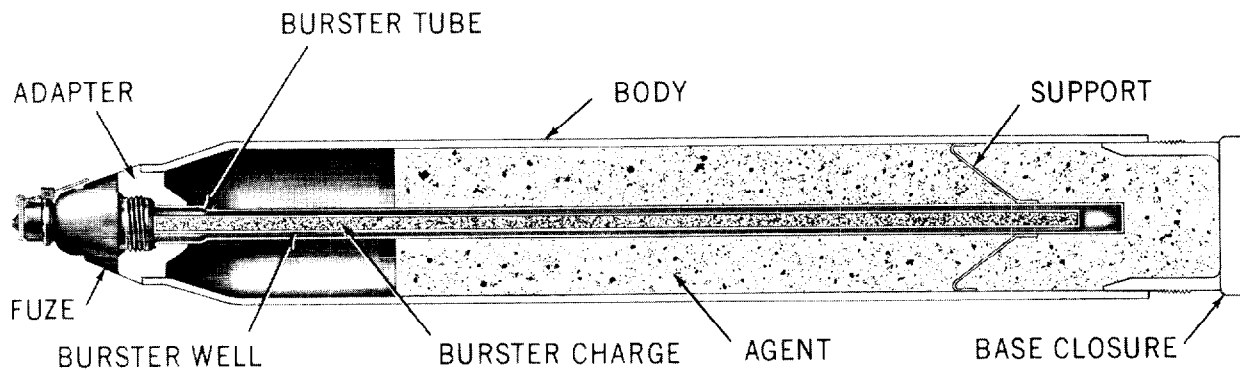


Figure 14.7.2 5-inch Rocket PWP Smoke Warhead, Mk 4 Mod 1

14-7-3-4. Handling, Storage, and Safety Precautions. The provisions of Paragraph 14-7-1 preceding apply in respect to handling, use, and storage of the rocket motor and the complete round. For precautions in respect to WP munitions in general, see Paragraph 14-2-2 of this chapter.

14-7-3-5. Identification Data. This warhead is listed under Dwg. No. 656341, List of Drawings LD 174830, and DOD Code No. H911. It is available with burster tube (FSN 1340-038-8363) or without burster tube (FSN 1340-093-1105).

14-8. SMOKE POT AND GRENADE FUZES

This section contains descriptions of certain fuzes that are used with smoke pots and smoke-producing grenades.

14-8-1. Fuzes, Smoke Pot, M208 (Mech.) and M209 (Elec.)

(Illustrations on pages 14-26 and 14-27)

14-8-1-1. Description. Fuze, M208 (Figure 14.8.1) is approximately 3 inches long. Its metal parts include a body which is threaded to fit Smoke Pot, SGF2, AN-M7 (Paragraph 14-3-3), a striker, a safety lever, and a safety

pin to which is attached a pull ring. Its functioning elements consist of a primer, a first-fire charge, a delay charge, and an ignition charge. Fuze M209 (Figure 14.8.2) is 2.75 inches long. It is likewise threaded to fit Smoke Pot, SGF2, AN-M7. It contains an electric squib and an ignition charge. Two lead wires extend from its top.

14-8-1-2. Functioning. The M208 Fuze functions as does any grenade-type fuze. The striker ignites the primer which ignites the first-fire charge which, in turn, ignites the ignition charge. Flame travels downward through the venturi tube of the smoke pot to initiate functioning as explained in Paragraph 14-3-3-7 preceding. Action of the M209 Fuze is similar except that an electric current is used to fire the squib which ignites the ignition charge.

14-8-1-3. Handling and Storage. These fuzes must be handled carefully to avoid damage. The safety pin in the M208 Fuze must not be removed until ready to fire the smoke pot. Fuze or detonator lockers are not required for storage. Storage may be in metal containers in small arms magazines but must be isolated from other ammunition and pyrotechnics.

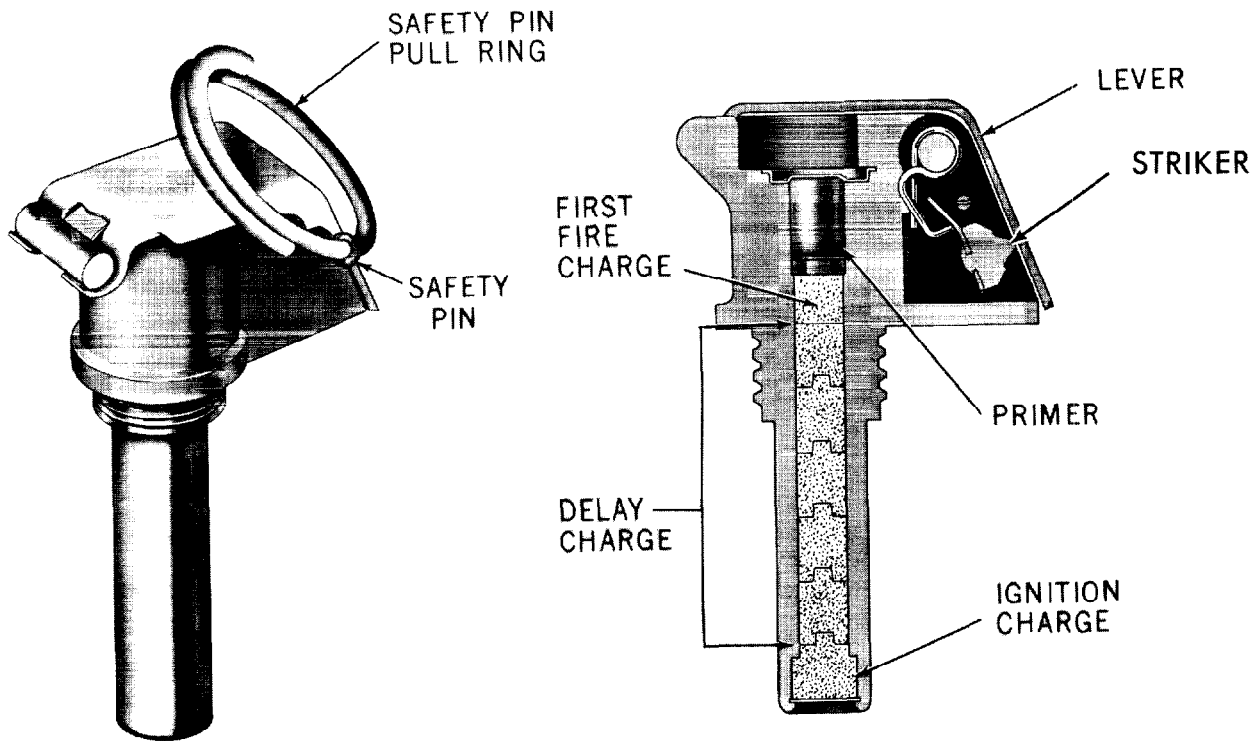


Figure 14.8.1 Smoke Pot Fuze, M208 (Mech.)

14-8-1-4. Shipping Containers. Fuzes M208 are packed in metal containers, 10 fuzes to the container. Twenty such containers are shipped in a wooden box. No information is available on packaging methods used for the M209 Fuze.

14-8-1-5. Identification Data. Fuze M208 is listed under Dwg. No. C36-7-9, FSN 1365-025-3279, and DOD Code No. K885. Fuze M209 is listed under Dwg. No. C36-7-25, FSN 1365-025-3280, and DOD Code No. K886.

**14-8-2. Fuze, Grenade, Igniting,
M201 and M201A1**

(Illustration on page 14-28)

14-8-2-1. Description. This fuze (Figure 14.8.3) consists of a body, a striker, a safety lever, and a safety pin to which is attached a pull ring. The cylindrical body, which is threaded for assembly to the grenade, contains a primer, a 2-second delay element, and an ignition cup filled with ignition mixture. The safety lever, held in place by the safety pin,

extends over the top of the fuze. The safety lever prevents movement of the spring-loaded striker.

14-8-2-2. Operation. Removal of the safety pin releases the safety lever. This permits the striker to rotate about its hinge pin so that it strikes the primer. The primer ignites the delay element which burns through to the ignition mixture. The ignition mixture burns through its cup and ignites the grenade starter mixture which finally ignites the filler composition.

14-8-2-3. Maintenance. These fuzes are subject to deterioration. Frequent inspections are necessary to assure serviceability. Fuzes shall not be removed from grenades and replaced without approval of the Bureau of Naval Weapons. OP 5, Ammunition Ashore, Vol. I, provides information on safe handling and storage of these fuzes.

14-8-2-4. Availability. This fuze is issued

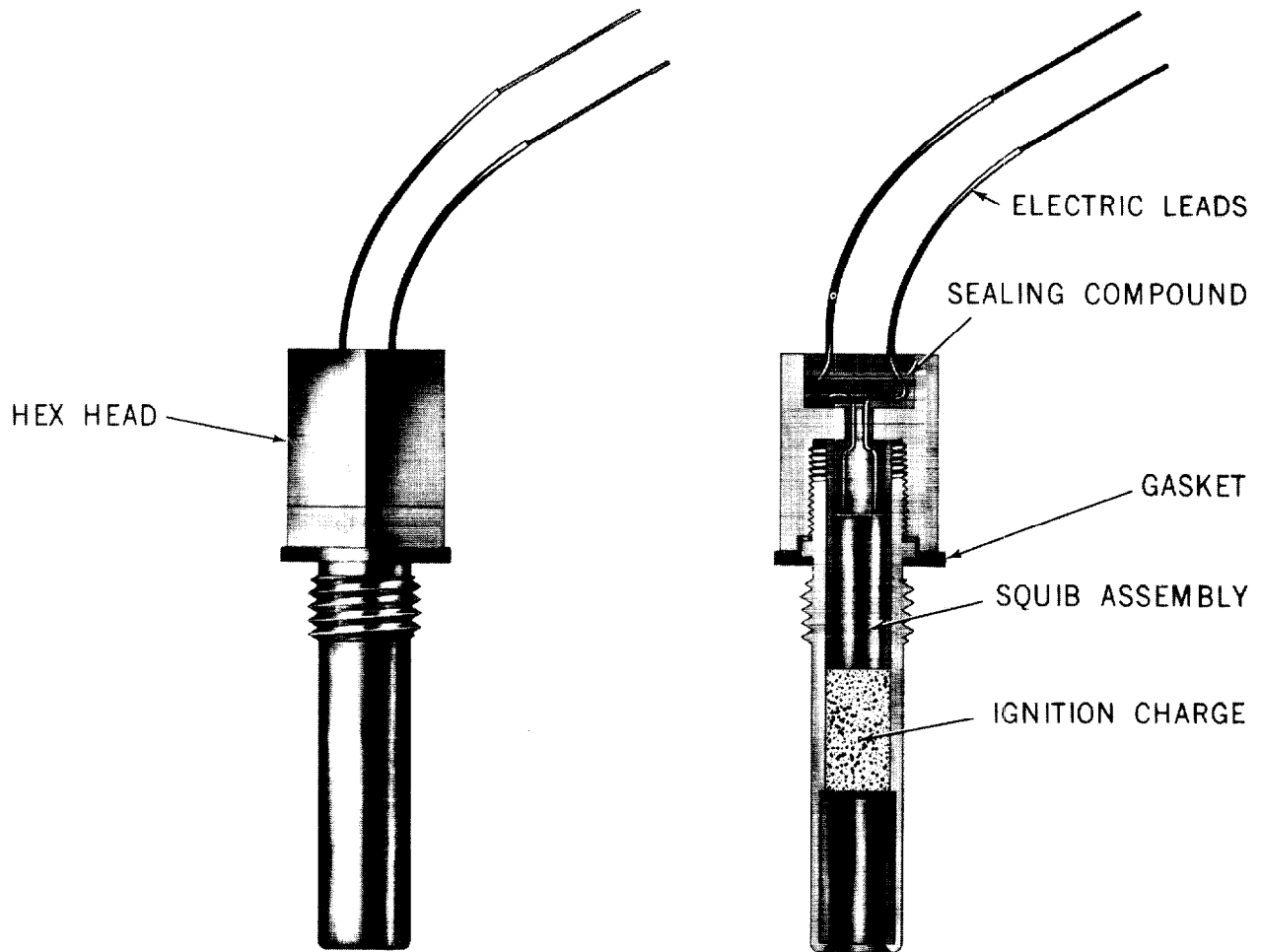


Figure 14.8.2 Smoke Pot Fuze, M209 (Elec.)

assembled to the grenade with which it is used. It is not available separately.

14-8-3. Fuze, Hand Grenade, M206A1

(Illustration on page 14-29)

14-8-3-1. Description. This fuze (Figure 14.8.4) is similar to the fuze described in the preceding Paragraph 14-8-2 except that it has a $4\frac{1}{2}$ -second delay and that it includes a bursting charge consisting of PETN and lead azide.

14-8-3-2. Operation. Mechanically, this fuze is the same as that described in Paragraph 14-8-2 except that its striking action is almost silent. Its explosive operation is, however, more violent because of the burster charge.

14-8-3-3. Maintenance. The provisions of Paragraph 14-8-2-3 preceding apply equally to this fuze.

14-8-3-4. Shipping Containers. This fuze is packaged 25 to a carton, eight cartons (200 fuzes) to a wooden box.

14-8-3-5. Identification Data. This fuze is listed under Dwg. No. 82-1-87K, FSN 1330-028-5853, and DOD Code No. G872.

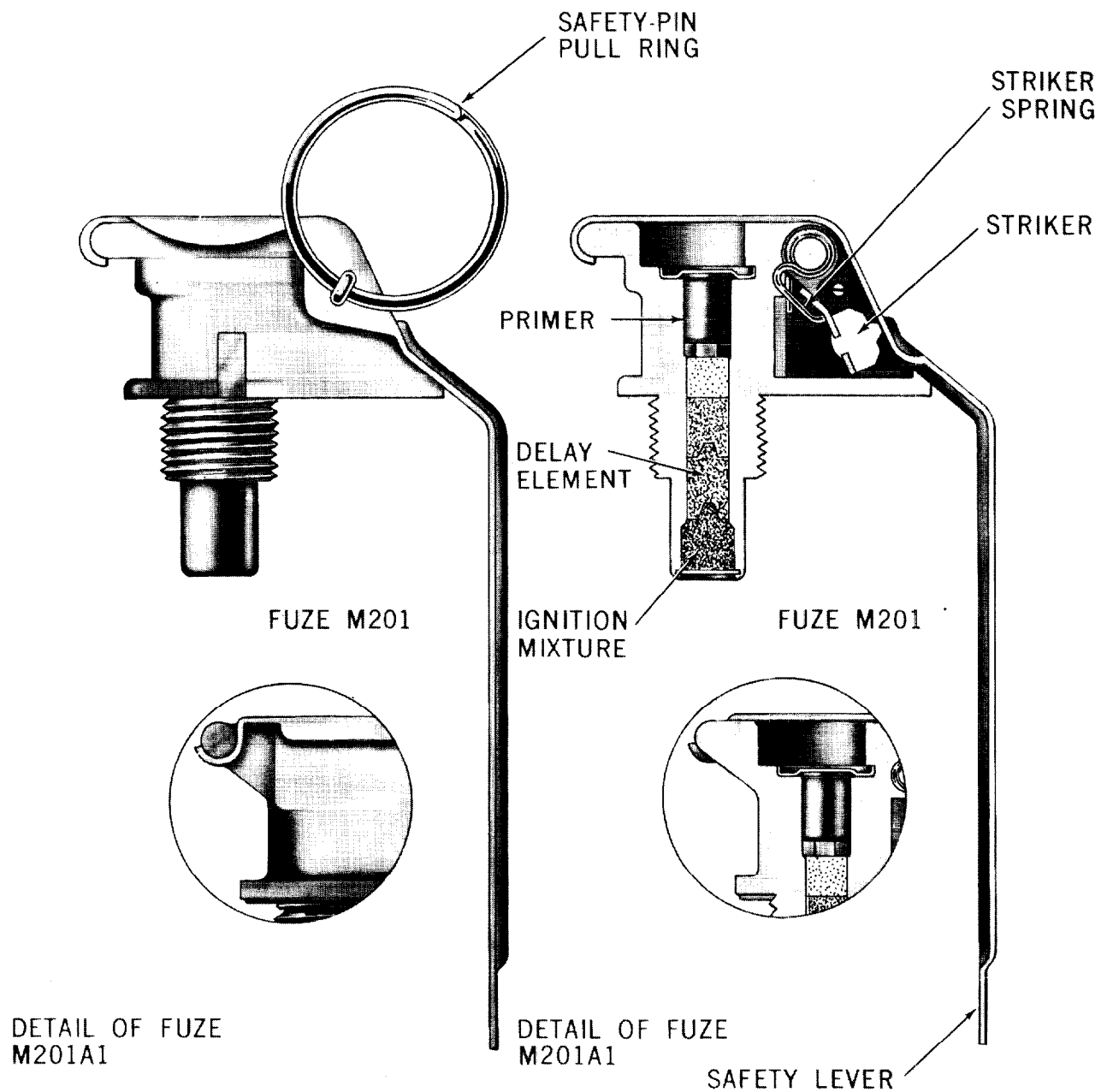


Figure 14.8.3 Grenade Igniting Fuze, M201

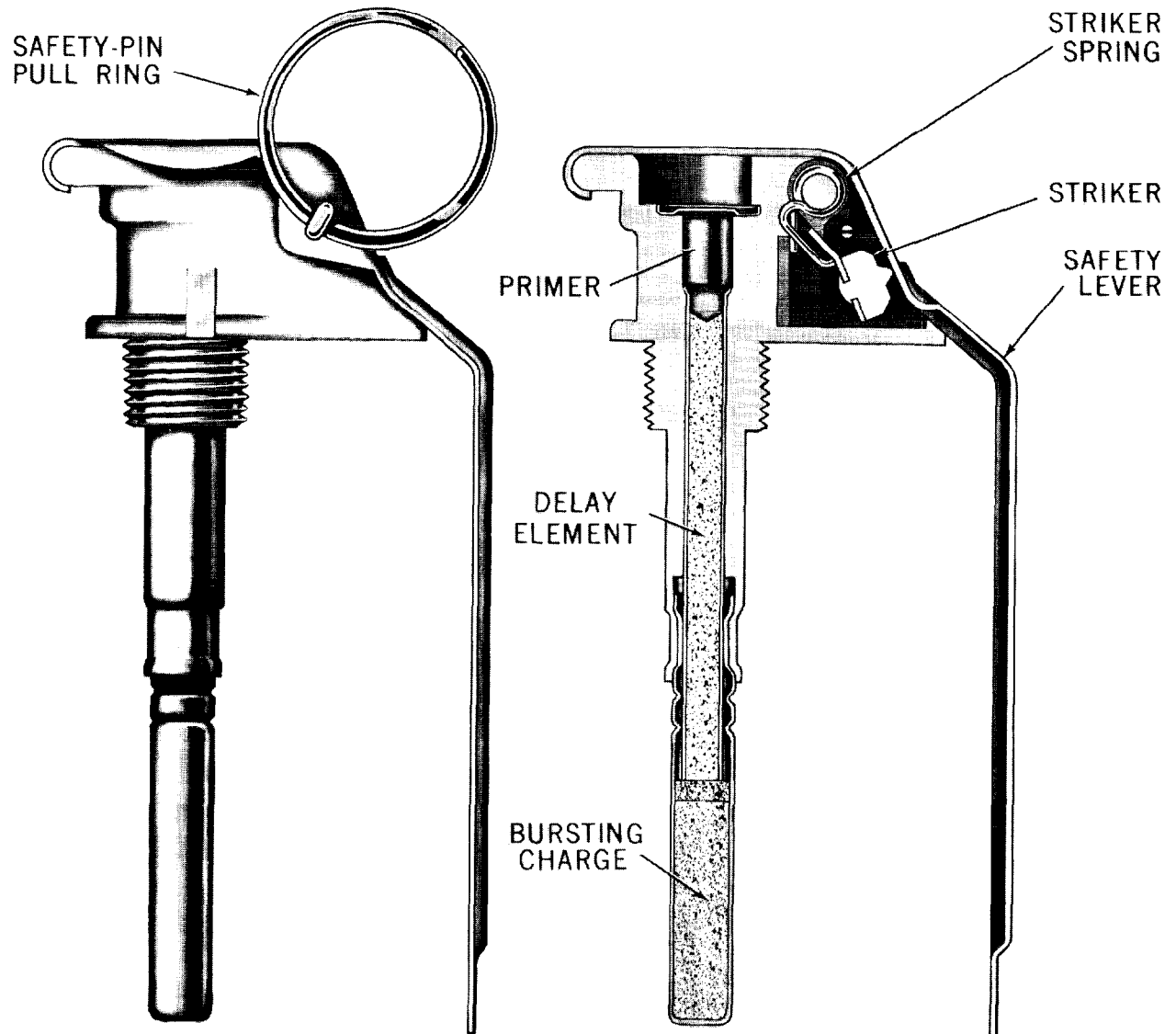


Figure 14.8.4 Hand Grenade Fuze, M206A1

CHAPTER 15

MISCELLANEOUS PYROTECHNIC DEVICES

15-1. INTRODUCTION

This chapter provides technical, operational, handling, storage, precautionary, and other information on a certain relatively few devices and mechanisms which fall, by virtue of their primary functional characteristics, into the field of pyrotechnics but which do not fit logically into any of the earlier chapters of this pamphlet. The devices covered by this chapter may, therefore, be totally unrelated one to another except that each depends upon the burning of a pyrotechnic composition for the accomplishment of its particular and unique purpose.

15-1-1. Handling and Storage. Because of the nonrelationship among the diverse devices herein described, there can be no one set of rules applicable across the board. In general, the handling and storage provisions of Section 1-6 of Chapter 1 of this pamphlet apply. Peculiar characteristics of a particular device may demand that special handling and storage is necessary, in which case such special provisions are included in the individual description for that device.

15-1-2. Safety Precautions. Again, diversity renders broad safety rules impossible. Individual descriptions contain special precautions that apply peculiarly to the device under discussion.

15-2. ITEM DESCRIPTIONS

This section contains individual descriptions of the various devices covered by this chapter.

15-2-1. Cartridge, Igniter, Turbo-Jet Engine, Mk 243 Mod 2

(Illustration on page 15-2)

15-2-1-1. Intended Use. This pyrotechnic cartridge (see Figure 15.2.2) is used for air-

start relighting of a Model J48 jet engine when the normal air-starting ignition system fails during flight.

15-2-1-2. Description. This cartridge has a shell-type case with an integrally formed head, the end of which is crimped. An internal tube, one end of which contains a No. 68 percussion-type primer, is formed as an integral part of the base. The primer is sealed in the base with lacquer. The base diameter is 0.758 inch. The case proper is 0.679 inch in diameter, and the overall cartridge length is 2.563 inches.

15-2-1-3. Location in Aircraft. Two cartridges are installed in breech mechanisms outside of the combustion chambers of the J48 jet engine. One is on combustion chamber No. 4, the other on combustion chamber No. 7 (see Figure 15.2.1).

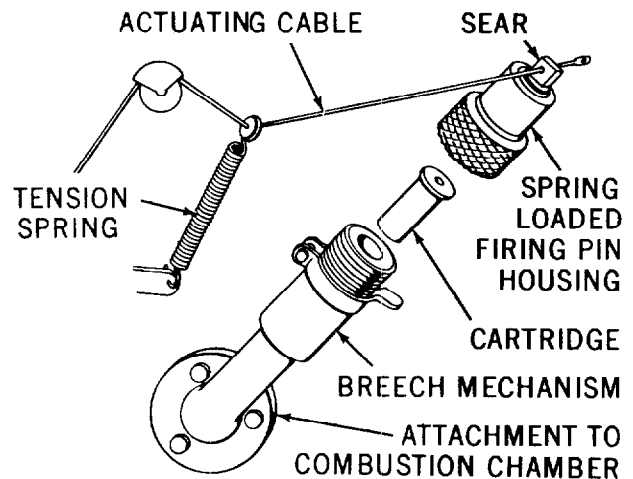


Figure 15.2.1 Cartridge Location in Breech Mechanism

15-2-1-4. Operation. These cartridges are fired manually by means of the pilot's T-handle which is located in the lower left side of the

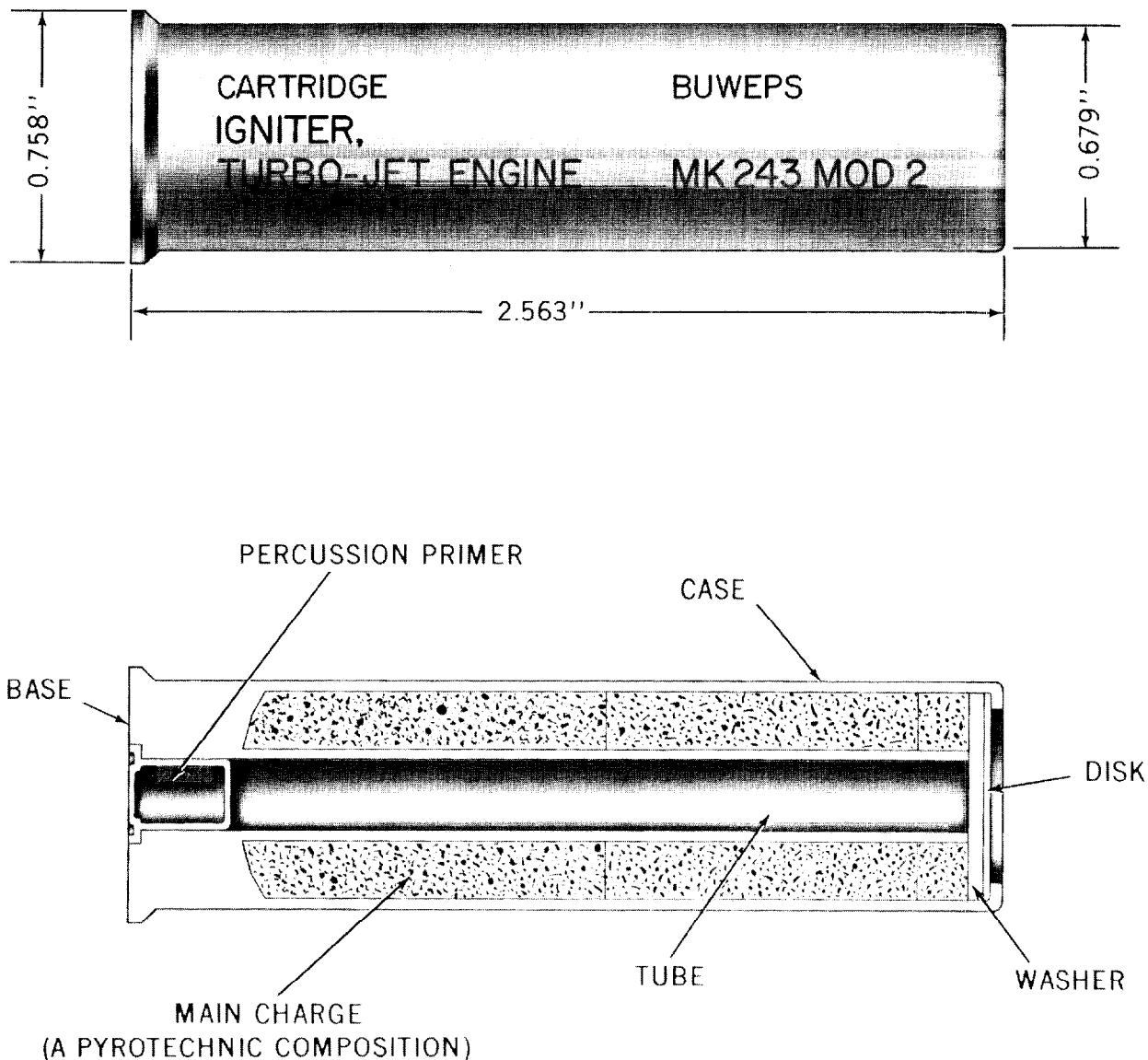


Figure 15.2.2 Turbo-Jet Engine Igniter Cartridge, Mk 243 Mod 2

cockpit instrument panel (see Figure 15.2.3). The handle is safety-wired to the instrument panel with soft copper wire to prevent inadvertent actuation. To fire the first cartridge (on combustion chamber No. 4), the pilot pulls the handle to the first stop. If the first cartridge fails to start the engine, the pilot turns the handle 90 degrees clockwise, and pulls it to the second stop, firing the cartridge in combustion chamber No. 7. When the T-handle

is pulled, a mechanical linkage, consisting of actuating cables and a bridle, pulls out a sear pin at the top of the firing breech, releasing a spring-loaded firing pin which fires the cartridge. Each cartridge burns for approximately 12 seconds, allowing the pilot time to attain a proper fuel-air ratio for restarting the engine. These cartridges will operate satisfactorily within a temperature range of between -65°F and $+160^{\circ}\text{F}$. (Illustration on page 15-3)

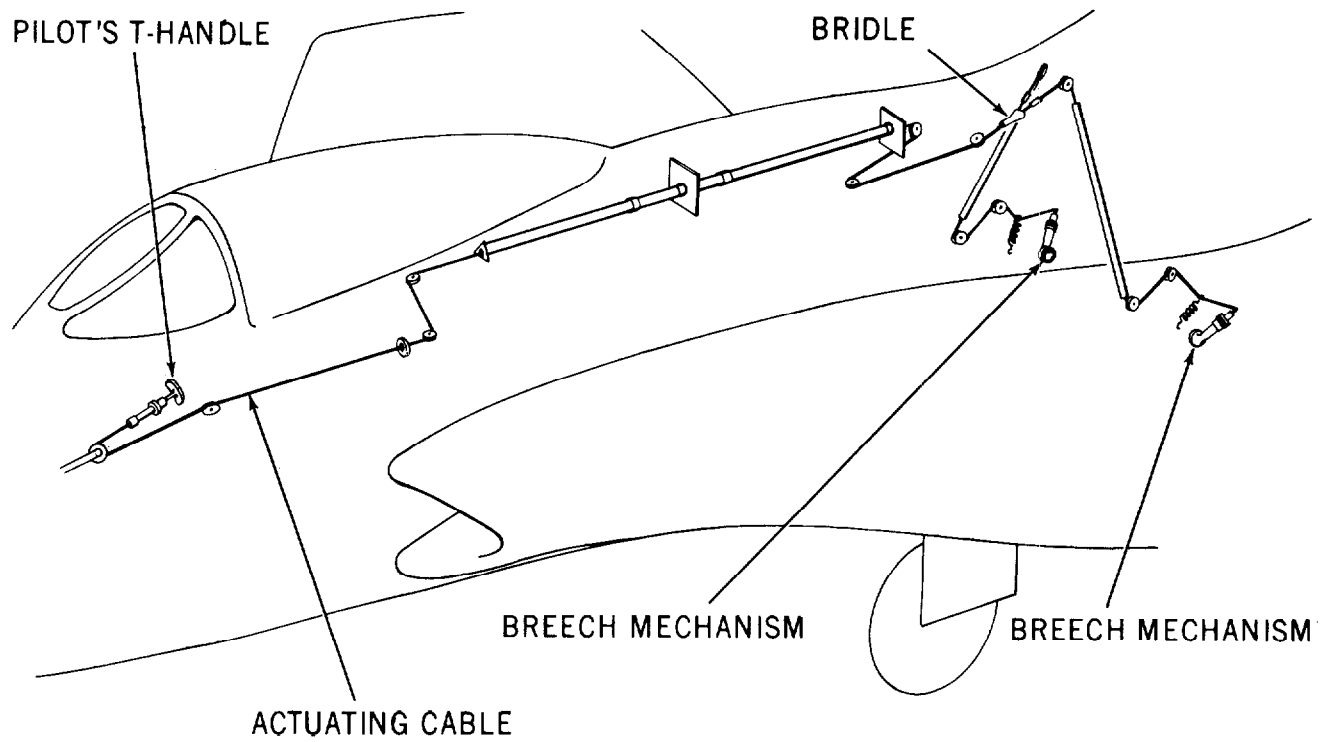


Figure 15.2.3 Engine Restart Operating Mechanism

15-2-1-5. Stenciling. Each cartridge is stenciled to show its nomenclature, mark and mod number, lot number, the month and year of its manufacture, and the depot from which it was shipped. The cardboard box in which cartridges are shipped is stenciled to show nomenclature, the number of cartridges per inner container, the number of containers, the lot number, the depot from which shipped, and the applicable P/O number.

15-2-1-6. Shipping Containers. These cartridges are packaged in cardboard containers, 10 cartridges to the container. Each such container is wrapped and sealed with aluminum foil and fabric. Ten of these containers are shipped in a wooden box.

15-2-1-7. Service Life. Service life for this cartridge is established at six years beginning from the date of manufacture as stenciled on the cartridge and its container. After the aluminum foil is torn or broken, the service life is reduced to a maximum of one year, but in no event shall the cartridge be used after the expiration of the original 6-year period. When the cartridges are exposed by breaking of the aluminum foil, the service life expiration date (day, month, and year) shall be marked or stamped on each cartridge in that container. Installed service life of the cartridge is 60 hours of flight time.

15-2-1-8. Log Entries. Entries shall be made in the aircraft log book of the installation date and the lot designation of both cartridges in the breech mechanisms on the engine.

15-2-1-9. Safety Precautions. Malfunction of the cartridge herein described could result in material damage or loss of equipment and possible serious injury or death to aircraft personnel. Performance of the cartridge depends upon proper handling and installation. The actuation system must be maintained in perfect operating condition. The following safety precautions must be understood and applied:

(1) Corroded, cracked, dented, or otherwise damaged cartridges shall not be installed in the aircraft.

(2) Cartridges that are not positively identifiable shall not be used. They must be

disposed of in accordance with OSO Field Instruction 8010.12 or BUWEPS Instruction 8020.6, whichever applies.

(3) Cartridges shall be handled as little as possible to minimize accidental initiation.

(4) This cartridge is actuated by a percussion primer. It must not be dropped or handled in a rough manner.

(5) Except in emergencies, this cartridge must not be installed in or removed from the aircraft during fueling operations.

(6) The safety wire attached to the pilot's T-handle must not be replaced by substitute materials.

(7) This cartridge must not be installed in any equipment other than that for which it is designed.

(8) If the cartridge does not enter the breech mechanism freely and fully, it must be disposed of as in subparagraph (2) above. Under no circumstances shall grease or oil be applied to this cartridge.

(9) Service life expiration dates as explained in Paragraph 15-2-1-7 preceding must be rigidly adhered to.

(10) Any cartridges suspected of being defective or overage shall be disposed of in accordance with OSO Field Instruction 8010.12 or BUWEPS Instruction 8020.6, whichever is applicable.

(11) These cartridges shall be treated as pyrotechnics. Therefore, the general safety precautions of Section 1-8 of Chapter 1 of this pamphlet apply and shall be observed.

(12) When cartridges are installed in the engine breech mechanisms, a tag with the following information should be attached to the pilot's T-handle:

WARNING

Emergency engine igniter cartridges are installed.

15-2-1-10. Identification Data. This cartridge is listed under BUWEPS LD 282766, FSN 1375-674-4323, and DOD Code No. M374. (Mod 1 of this cartridge (FSN 1375-620-3392) is disposable and should not be requisitioned. If any Mod 1 cartridges are found in the supply system, they should be turned in to an ammunition depot for appropriate disposition.)

15-2-2. Cartridge, Test, Turbo-Jet Engine,
Mk 119 Mod 0

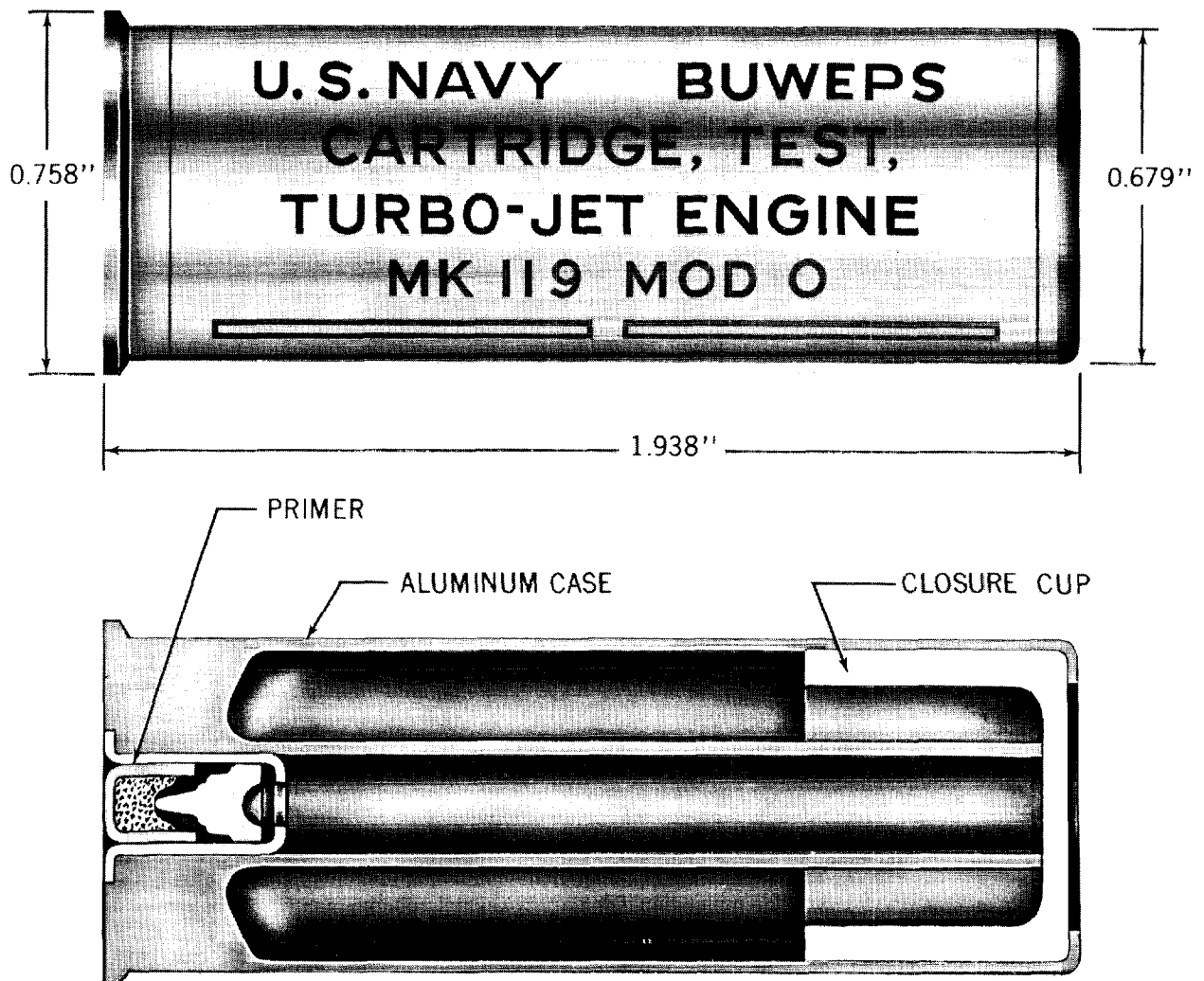


Figure 15.2.4 Cartridge, Test, Turbo-Jet Engine, Mk 119 Mod 0

15-2-2-1. Intended Use. This cartridge (see Figure 15.2.4) is used for testing and determining the operability of the mechanical emergency ignition system of the J-48 Jet Engine, as shown in Figure 15.2.3 preceding.

15-2-2-2. Description. The Mk 119 Mod 0 Test Cartridge consists of an aluminum alloy shell case approximately 2 inches long. The base diameter is 0.748 inch, and the diameter

of the case proper is 0.679 inch. The base is fitted with a Remington 79M primer. The end of the cartridge opposite to the base is closed with a polypropylene cup the inside surface of which is painted yellow. The space between the primer and this closure cup is empty — this device contains no pyrotechnic charge or other components which might eject as particles into the combustion chamber of the engine.

15-2-2-3. Installation and Use. This testing device is installed in the breech mechanisms outside of combustion chambers Nos. 4 and 7 of the J-48 engine in place of and in the same way as is the Mk 243 Igniter Cartridge (see paragraph 15-2-1-3 and Figure 15.2.1 preceding). Each test cartridge is fired manually by means of the pilot's T-Handle. After firing, the cartridges must be removed from the breech mechanisms and examined. If the restart mechanism has functioned properly, some of the yellow-painted inner surface of the closure cup will be visibly discolored by the primer action.

15-2-2-4. Handling and Safety Precautions. Even though this device contains no explosive or burning element other than the 79M primer, it is classed as a Class C explosive and must be handled carefully as small arms ammunition.

15-2-2-5. Shipping Containers. These test cartridges are packed in cardboard containers, 10 cartridges to the container. Each such container is wrapped and sealed with aluminum foil and fabric. Ten containers are shipped in a wooden box.

15-2-2-6. Identification Data. This device is listed under BUWEPS LD 615248, Assembly Drawing No. 2113080, and Specification WS 4631. No Federal Stock Number or DOD Code has been assigned.

CHAPTER 16

CHEMILUMINESCENT DEVICES

16-1. INTRODUCTION

This chapter contains information relating to devices that employ a chemical or chemicals which react to produce a luminescence suitable for various signaling, marking, illuminating, and identification purposes as appropriate to their relatively low intensity. Since uses and applications of these devices are normally classified, such information is published separately in confidential pamphlets (OP's) on specific devices as indicated in individual item descriptions which follow.

16-2. ITEM DESCRIPTIONS

This section contains individual descriptions of the devices covered by this chapter.

16-2-1. Marker, Location, Chemical, Mk 46 Mod 0.

(Illustration on page 16-2)

16-2-1-1. Intended Use and Applications. For information as to the intended use and applications of this device, see confidential NAVWEPS OP 3845.

16-2-1-2. Description. The chemical marking material of this device has the consistency of heavy wax (see Figure 16.2.1). It is contained within a polypropylene cylinder approximately 3½ inches long and 1¼ inches in diameter. One end of the cylinder is closed with a knurled screw-on sealing cap. The other end is closed with a knurled screw which, when turned, forces the illuminating composition partially out of the container for use. Turning the base cap in the opposite direction retracts the material so that the sealing cap can be replaced. The composition reacts with air to produce a greenish yellow glow which persists for up to 35 minutes.

16-2-1-3. Operation. The following simple steps are taken in operating and using this device:

- a. Remove and retain the larger knurled cap.
- b. Turn the knurled base screw clockwise until the marking material protrudes slightly above the rim of the outer case.
- c. Apply the formulation as set forth in NAVWEPS OP 3845.
- d. Turn the knurled base screw counter-clockwise until the formulation is retracted wholly within the outer case.
- e. Replace the upper cap and screw down tightly.

CAUTION

The composition in this device reacts with oxygen in the air to produce its luminescence. The closure cap must be kept tightly in place when this marker is not in use to prevent a gradual loss of effectiveness.

16-2-1-4. Handling and Storage. The storage life of this marker may be shortened by high temperatures. Every effort should be made to maintain temperatures at not more than 100°F since there is a tendency for the wax formulation to exude liquid at higher temperatures. Rough and careless handling must be avoided since the outer case is subject to rupturing or cracking thus admitting oxygen and destroying some of the effectiveness of the marker.

16-2-1-5. Safety Precautions. The oxidation products of this composition are highly volatile, they have an obnoxious odor, and they may cause irritation of mucous linings in the throat, nose, and bronchial tubes. Personnel should assure adequate ventilation while working with this device. Skin and eye contact with

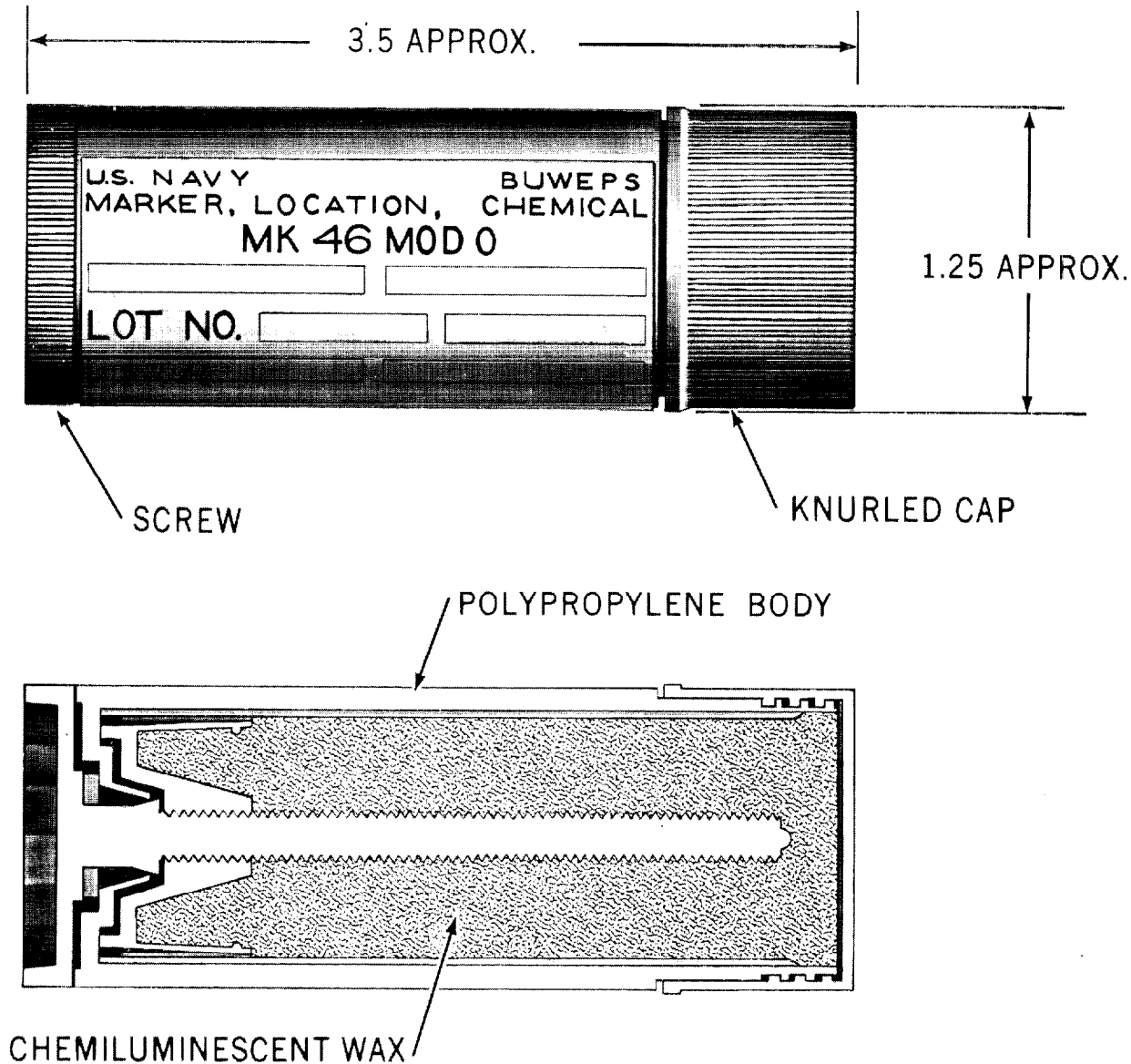


Figure 16.2.1 Chemical Location Marker, Mk 46

the formulation should be guarded against. If skin contact is made, the affected area must be thoroughly washed with soap and water; if eye contact is made, the eyes should be rinsed out with copious quantities of water.

16-2-1-6. Cleaning. The cleaning of objects, utensils, and containers which have been exposed to the formulation of the marker shall be accomplished as follows:

a. Remove as much of the material as

possible with a disposable spatula such as a tongue depressor.

b. Dampen a cloth or disposable tissue with a solvent such as paraffin oil and wipe the surface to be cleaned. Change the cloth or tissue frequently.

c. When only a thin film remains, wipe with a clean cloth or tissue dampened with acetone until the film disappears.

d. Thoroughly rinse the affected area

with acetone.

WARNING

Rags or tissues containing this formulation may spontaneously ignite — the heat of oxidation can cause smoldering of cellulosic materials. Such rags and tissues also have an obnoxious odor. Contaminated, flammable items must be disposed of in vapor-proof containers or subjected to a thorough water or alcohol bath, preferably the latter.

16-2-1-7. Shipping Containers. This Chemical Location Marker is packaged sixty to a Small Arms Ammunition Container, M2A1

16-2-1-8. Identification Data. This device is listed under Drawing No. 2113000, LD 615245, Specification WS 3826, FSN 1370-871-3726, and DOD Code No. LA20.

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