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25 SEPTEMBER

SUPERSEDING

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21 March 1973

and

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## MILITARY SPECIFICATION

### LIGHT, MARKER DISTRESS

This specification is mandatory for use by all Departments and Agencies of the Department of Defense.

#### 1. SCOPE

1.1 Scope. This specification covers the requirements for a waterproof, battery powered distress marker light.

- \* 1.2 Classification. Distress marker lights covered by this specification shall be of the following types and classes as specified (see 6.2).

Type I - Light with mercury battery

Class 1 - with fabric attachment case (represents Air Force Type SDU-5/E - see 3.8)

Class 2 - without fabric attachment case

Class 3 - with velcro tape, without fabric attachment case

Type II - Light without mercury battery, with fabric attachment case

Type III - Light with alkaline battery

Class 1 - with modified fabric attachment case

Class 2 - without modified fabric attachment case

Type IV - Light without alkaline battery

Class 1 - with modified fabric attachment case

Class 2 - without modified fabric attachment case

#### 2. APPLICABLE DOCUMENTS

- \* 2.1 The following documents of the issue in effect on date of invitation for bids or request for proposal, form a part of the specification to the extent specified herein.

#### SPECIFICATIONS

##### Federal

PPP-B-566

PPP-B-636

PPP-B-676

Boxes, Folding, Paperboard

Boxes, Shipping, Fiberboard

Boxes, Set Up, Paperboard

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## Military

|             |                                     |
|-------------|-------------------------------------|
| MIL-P-116   | Preservation-Packaging, Methods Of  |
| MIL-B-121   | Barrier Material, Greaseproofed,    |
|             | Waterproofed, Flexible              |
| MIL-L-40065 | Leather, Cattlehide Chrome-Tanned,  |
|             | Cold Climate                        |
| MIL-C-5040  | Cord, Nylon                         |
| MIL-A-5540  | Adhesive, Polychlorophrene          |
| MIL-F-21840 | Fastener Tape, Hook And Pile, Nylon |

## STANDARDS

## Federal

|             |                      |
|-------------|----------------------|
| FED-STD-151 | Metals; Test Methods |
| FED-STD-595 | Colors               |

## Military

|              |  |
|--------------|--|
| MIL-STD-105  | Sampling Procedures And Tables For     |
|              | Inspection By Attributes               |
| MIL-STD-129  | Marking For Shipment And Storage       |
| MIL-STD-130  | Identification Marking Of US Military  |
|              | Property                               |
| MIL-STD-202  | Test Methods For Electronic And        |
|              | Electrical Component Parts             |
| MIL-STD-781  | Reliability Test Exponential           |
|              | Distribution                           |
| MIL-STD-831  | Test Reports, Preparation Of           |
| MIL-STD-1458 | Radioactive Materials: Marking And     |
|              | Labeling Of Items, Packages And        |
|              | Shipping Containers For Identification |
|              | In Use, Storage And Transportation     |

## DRAWINGS

## Air Force

|         |                                      |
|---------|--------------------------------------|
| 64B2074 | Mercury Battery - Light, Marker,     |
|         | Distress SDU-5/E, Assembly Of        |
| 64C2084 | Case - Light Marker Distress SDU-5/E |
| 64D2094 | Light, Marker, Distress SDU-5/E,     |
|         | Assembly Of                          |
| 64D2095 | Case, Attachment - Light, Marker,    |
|         | Distress SDU-5/E, Assembly Of        |
| 64A2099 | Guard, Switch - Light, Marker,       |
|         | Distress SDU-5/E                     |

(Copies of specifications, standards, drawings, and publications required by suppliers in connection with specific procurement functions should be obtained from the procuring activity or as directed by the contracting officer.)

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### 3. REQUIREMENTS

- 3.1 First article. Unless otherwise specified the distress marker lights furnished under this specification shall be a product which has been inspected and has passed the first article inspection specified in Section 4.
- 3.2 Materials and components. Materials and components not covered by applicable specifications or not specifically described herein shall be of the best quality, of the lightest practicable weight, and entirely suitable for the purpose intended. If materials susceptible to deterioration when exposed to climatic and environmental conditions likely to occur during service usage are used, they shall be protected against such deterioration in a manner that will in no way prevent compliance with the performance requirements of this specification. The use of any protective coating that will crack, chip, or scale with age or extremes of climatic and environmental conditions shall be avoided. All elastomeric materials used in the construction of the lights shall have been manufactured not more than 12 months prior to the date of delivery of the lights. The batteries and lamps shall be new (never used). Batteries shall be not more than six months old.
  - 3.2.1 Radiation. Individually or assembled, the components of the distress marker light shall produce radiation of less than 0.1 millirem per hour at a distance of 1 inch. Any item containing radioactive material in excess of that listed in Table I of MIL-STD-1458 shall be marked or labeled as illustrated in Figure 1 of MIL-STD-1458 (see 4.6.18). The use of radium in any form is prohibited.
- 3.3 Design. The design of the light shall conform to Drawing 64D2094. The light shall be a waterproof unit consisting of an opaque case, battery, flashtube, lens, and switch. When specified by type and class, a fabric case shall be provided for attaching the unit to personal equipment. The end of a nylon cord on the attachment case shall be attached to one of the attachment loops on the side of Type I (except for class 4) and Type II lights by means of two half hitches. The ends of the cord (after tying the two half hitches) shall be stitched to the cord for a distance of approximately 1/3 inch above the double half hitch, using a zig-zag stitch. The minimum length of the cord between the attachment case and the attachment loop on the light shall be 3 feet after knots are tied and stitched. Type I, class 4 lights shall be provided with hook tape cemented on one side of the light. (See 3.4.8)
  - 3.3.1 Reliability. The light shall have a minimum mean time between failures (MTBF) of 120 hours to be proven in accordance with test plan II, test level F of MIL-STD-781.
    - 3.3.1.1 Longevity. The light shall have an operating life span (equipment longevity as defined in MIL-STD-781) of not less than 300 hours before wear out failures occur or the equipment consistently fails to meet the specified MTBF index. Except for the batteries, the lamps and the capacitors, all parts requiring replacement within this period and the normal operating period for parts shall be reported by the contractor to the procuring activity.
- 3.4 Construction. The construction of the light shall conform to Drawing 64D2094.

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- \* 3.4.1 Case. The case shall conform to Drawing 64C2084. The case shall be fabricated of high impact resistant opaque thermoplastic material impervious to light with provisions in the bottom end for receiving the battery. The case shall also have provisions at the bottom for the switch and at the top for the lens. The battery port shall be completely watertight when the battery is installed. A suitable cover or plug shall be provided for the battery port for lights packed without the battery installed.
- \* 3.4.2 Battery. The battery shall conform to Drawing 64B2074. The light shall be powered by a mercury-type battery, except Type II, that meets the performance requirements specified herein. The battery shall require no soldered connections and shall permit easy removal for inspection and replacement without the use of tools.
  - \* 3.4.2.1 For Type III use. The light shall be powered by an alkaline-type battery (see Figure 1) that meets the performance requirements specified herein. The battery shall require no soldered connections and shall permit easy removal for inspection and replacement without the use of tools.
- \* 3.4.3 Flashtube. A suitable capacitor-discharge flashtube shall provide intermittent flashes of light and shall be compatible with the lens so that light is emitted over a 180 degree angle, measured on a plane perpendicular to the long axis of the lens. The surface underneath the flashtube shall be a highly polished reflective material. The flashtube shall be capable of operating in complete darkness.
- \* 3.4.4 Lens. The lens shall be constructed of a high-shock-resistance transparent material arranged compatibly with the flashtube to provide the necessary beam coverage.
- \* 3.4.5 Switch. The light shall have a positive action push-on, push-off type switch that can be switched on or off with one hand. Positive action is defined to mean that the mechanical detent which causes the switch to remain on is actuated at the same time electrical contact is made. The switch shall be protected against accidental activation and shall be the only moving part of the light. A transparent plastic guard conforming to 64A2099 shall be installed over the switch prior to inserting the light in the attachment case or prior to shipment.
- \* 3.4.6 Attachment loops. Type I, except class 4, and Type II lights shall have a cord that is 3 feet long and conforms to type I of MIL-C-5040, and shall have two loops for attaching the cord.
- \* 3.4.7 Attachment case for Type I except for class 4 and Type II. A dot snap-fastener type case shall attach to personal equipment. The Type I except class 4 case shall conform to Drawing 64D2095. The Type II case shall be as shown in Figure 1.
- \* 3.4.8 Hook tape. Type I, class 4 lights shall have hook tape Type I of MIL-F-21640 cemented on one side. The cement or adhesive used shall be class 2 of MIL-A-5540. The hook tape shall be approximately three inches long by two inches in width. The color of the hook tape shall be olive green 106, cemented to the side opposite the decal.
- \* 3.4.9 Surface. The outer surface of the light, including the lens, shall be smooth and all corners shall be rounded and free from sharp edges.

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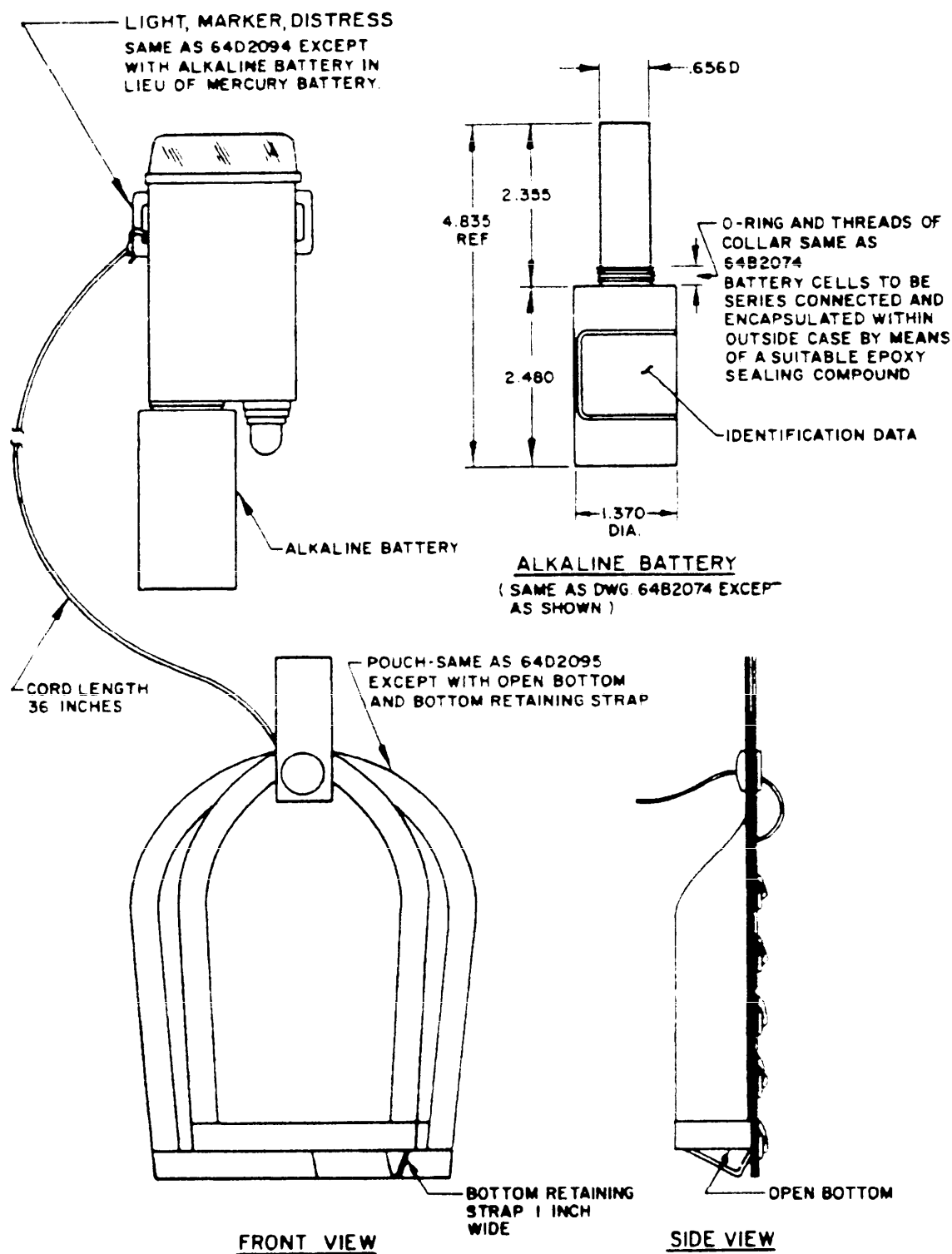


FIGURE I. LIGHT MARKER DISTRESS SDU 5/E TYPE II

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### 3.5 Performance.

- 3.5.1 Light intensity and flash rate. The light shall emit intermittent flashes of light at a frequency of 50 (plus or minus 10) flashes per minute in total darkness and any condition of ambient lighting. The flash rate shall be steady and uniform. The flash duration (pulse width) shall be 13 (plus or minus 2) micro seconds minimum. The light shall have the minimum angular beam coverage light intensity specified in Table I when tested as specified in 4.6.2.
- 3.5.1.1 Beam width. The light shall have a beam coverage of not less than 180 degrees on a plane perpendicular to both axes of the lens (see 4.6.2.1).
- 3.5.2 Underwater operation. The light shall not leak when placed in water and subjected to an altitude of 50,000 feet for 5 minutes (see 4.6.3).
- 3.5.3 Switch activation. When the switch is activated a minimum of 10 times in the head-on direction, it shall operate the light as specified in 4.6.4.
- 3.5.4 Room temperature operation. The light shall emit intermittent flashes of light at an initial frequency of 50  $\pm$  10 flashes per minute. After 2 hours of continuous operation, the frequency shall be not less than 40 flashes per minute, and the minimum angular beam coverage light intensity shall be as specified in Table II (see 4.6.5).
- 3.5.5 Intermittent operation at room temperature. After 18 hours of intermittent operation as specified in 4.6.6, the light frequency shall not be less than 30 flashes per minute and the minimum angular beam coverage light intensity shall be as specified in Table III.
- 3.5.6 Altitude. The light shall not increase in volume, burst, crack, or distort when tested in accordance with 4.6.7. After the altitude test (4.6.7), the light shall meet the light intensity and flash rate requirements of 3.5.1 and the underwater operation requirements of 3.5.2.
- 3.5.7 High temperature exposure. The light shall not crack when subjected to temperatures of 160°  $\pm$  2° Fahrenheit for 8 hours and 120°  $\pm$  2° Fahrenheit for 8 hours. After subjection to these temperatures, the light shall have a frequency of not less than 40 flashes per minute. When the temperature of the light returns to room temperature, there shall be no distortion except in the lens. Permanent distortion of the lens shall not exceed 3/32 inch in any direction (see 4.6.8). After the high temperature exposure test (4.6.8), the light shall meet the light intensity and flash rate requirements of 3.5.1 and the underwater operation requirements of 3.5.2.
- 3.5.8 Low temperature exposure. The light shall withstand a temperature of -65°  $\pm$  2° Fahrenheit for a period of 8 hours without cracking, distortion, or separation at the seams (see 4.6.9). After the low temperature exposure test of 4.6.9, the light shall meet the light intensity and flash rate requirements of 3.5.1 and the underwater operation requirements of 3.5.2.
- 3.5.9 Shock. The light shall withstand shock forces of 25g when tested as specified in 4.6.10. After the shock test (4.6.10), the light shall meet the light intensity and flash rate requirements of 3.5.1 and the underwater operation requirements of 3.5.2.

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TABLE I - Minimum Angular Beam Coverage Light Intensity  
(Light Intensity and Flash Rate)

| Angular Beam Coverage<br>(Long and Short Axis of Lens) | Effective Intensity<br>(Candles) |
|--|----------------------------------|
| 40° (20° each side of lens zenith)                     | 1.80                             |
| 110° (55° each side of lens zenith)                    | 0.95                             |
| 150° (75° each side of lens zenith<br>on short axis)   | 0.65                             |
| 180° (90° each side of lens zenith<br>on long axis)    | 0.65                             |
| Head-on intensity                                      | 1.80                             |

TABLE II - Minimum Angular Beam Coverage Light Intensity  
(Room Temperature Operation)

| Angular Beam Coverage<br>(Long and Short Axis of Lens) | Effective Intensity<br>(Candles) |
|--|----------------------------------|
| 40° (20° each side of lens zenith)                     | 1.10                             |
| 110° (55° each side of lens zenith)                    | 0.58                             |
| 150° (75° each side of lens zenith<br>on short axis)   | 0.39                             |
| 180° (90° each side of lens zenith<br>on long axis)    | 0.39                             |
| Head-on intensity                                      | 1.10                             |

TABLE III - Minimum Angular Beam Coverage Light Intensity  
(Intermittent Operation at Room Temperature)

| Angular Beam Coverage<br>(Long and Short Axis of Lens) | Effective Intensity<br>(Candles) |
|--|----------------------------------|
| 40° (20° each side of lens zenith)                     | 0.72                             |
| 110° (55° each side of lens zenith)                    | 0.38                             |
| 150° (75° each side of lens zenith<br>on short axis)   | 0.26                             |
| 180° (90° each side of lens zenith<br>on long axis)    | 0.26                             |
| Head-on intensity                                      | 0.72                             |

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- \* 3.5.10 Battery.
- \* 3.5.10.1 Voltage check. Immediately after subjection to a load of 100 milliamperes, the battery shall have a minimum voltage of 4.8 volts (see 4.6.11.1).
- \* 3.5.10.2 Waterproof check. When the sealed end of the battery is submerged in tap water, the voltage shall be zero (see 4.6.11.2).
- \* 3.5.10.3 Service life. After immersion in tap water for a period of 12 hours and at the end of the 9-hour test period specified in 4.6.11.3, the voltage shall be not less than 2.0 volts and the current drain shall not be less than 41.5 milliamperes.
- \* 3.5.11 Attachment loops. The attachment loops shall withstand a minimum load of 50 pounds (see 4.6.12).
- \* 3.5.12 Temperature cycling. The light shall show no sign of separation at the seams or cracking when tested in accordance with 4.6.13. When the temperature of the light returns to room temperature there shall be no distortion except in the lens. Permanent distortion of the lens shall not exceed 3/32 inch in any direction (see 4.6.13). After the temperature cycling test of 4.6.13, the light shall meet the light intensity and flash rate requirements of 3.5.1 and the underwater operation requirements of 3.5.2.
- \* 3.5.13 Compression. The light shall not be damaged in any manner when subjected to a 50-pound weight on any plane surface over an area of 1 inch by 3 inches (see 4.6.14).
- \* 3.5.14 Vibration. The light shall withstand vibration at a double amplitude of 0.03 to 0.06 inch at frequencies ranging from 10 to 55 cycles per second under the conditions specified in 4.6.15. After the vibration test of 4.6.15, the light shall meet the light intensity and flash rate requirements of 3.5.1 and the underwater operation requirements of 3.5.2.
- \* 3.5.15 Switch life test. When the switch is activated a minimum of 200 times, it shall operate the light as specified in 4.6.16.
- \* 3.5.16 Salt spray. The light shall withstand salt spray for 96 hours when tested as specified herein. The lens shall not become discolored, cracked, or checked, and the light markings shall not be affected by the salt spray (see 4.6.17). After the salt spray test of 4.6.17, the light shall meet the light intensity and flash rate requirements of 3.5.1 and the underwater operation requirements of 3.5.2.
- \* 3.6 Weight. The weight of the complete unit, except Type II, excluding the attachment case, shall not exceed 8 ounces.
- 4.6.1 Type II. The weight of the complete Type II unit, excluding the attachment case, shall not exceed one pound.
- 3.7 Color. The color of the exterior surface of the light, excluding the lens base plate and the switch, shall be orange color No. 12127 as specified in FPL-STD-505.



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- \* 3.8 Identification of product. The light marker shall be marked for identification in accordance with MIL-STD-130. The marking shall include the following specific nomenclature: LIGHT, MARKER, DISTRESS, Type I or Type II and class, contract number, Federal Stock Number, name of manufacturer and date of assembly. For Air Force procurements, Type I, Class 1 light should be identified as SDU-5/E.
- \* 3.9 Workmanship. The light marker shall not be misaligned, deformed, nor contain any rough surface, nicks, burrs, sharp edges, cracks, embedded foreign matter, detached components, or loose particles. The light shall be uniform in quality and shall be free from mechanical, electrical, or other irregularities or defects which could adversely affect performance, reliability or durability. The lights shall conform to the quality and grade of product established by this specification.
- \* 3.9.1 Screw assembly. Assembly screws and bolts shall be tight. The word tight means that the screw or bolt cannot be appreciably tightened further without damage or injury to the screw, bolt, or threads.

#### 4. QUALITY ASSURANCE PROVISIONS

- \* 4.1 Responsibility for inspection. Unless otherwise specified in the contract or purchase order, the supplier is responsible for the performance of all inspection requirements as specified herein. Except as otherwise specified in the contract or order, the supplier may use his own or any other facilities suitable for the performance of the inspection requirements specified herein, unless disapproved by the Government. The Government reserves the right to perform any of the inspections set forth in the specification where such inspections are deemed necessary to assure supplies and services conform to prescribed requirements.
- \* 4.2 Classification of tests. The inspection and testing of the light shall be classified as follows:
  - a. First article inspection (see 4.4)
  - b. Acceptance tests (see 4.5)
- 4.3 Test conditions.
  - 4.3.1 Atmospheric condition. Unless otherwise specified, all tests shall be made at an atmospheric pressure of 28 to 30 inches mercury, at a temperature of 77° ±18° Fahrenheit, and at a relative humidity of 90 percent or less.
  - 4.3.2 Battery replacement. When required, batteries may be replaced at the completion of a test.
  - \* 4.3.3 Presence of light. Flash rate and light intensity testing shall be performed in total darkness to demonstrate that the intensity and flash rate parameters are not adversely affected by any conditions of ambient light.
- \* 4.4 First article inspection.
  - \* 4.4.1 First article inspection samples. Light sample lights of each type specified (see 3.8), shall be subjected to the first article tests specified in 4.4.3.

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- 4.4.2 First article test reports. Along with the samples specified in 4.4.1, the contractor shall submit a test report prepared in accordance with MIL-STD-883I. The report shall include the results of all tests with a detailed statement of compliance or noncompliance with each requirement of this specification identified by paragraph number.
- 4.4.3 First article tests. First article test methods shall consist of all of the tests described under 4.4.4 and 4.6.
- 4.4.4 Reliability tests. Two or more of the eight preproduction samples of equipment shall be tested by the contractor for a minimum mean time between failure (MTBF) of 120 hours in accordance with MIL-STD-781, Test Plan II, Test Level B. At least two of the samples must experience a test time without failure equal to three times the minimum MTBF required. Time accumulated during first article testing may be counted toward reliability test time providing that all failures are counted in the accept-reject decision. Failure shall be any damage or obstruction that causes the light to operate at a frequency of less than 30 flashes per minute and an effective intensity in accordance with 4.6.1, except that if a battery fails, the light shall not be counted as a failure in the accept-reject decision. Batteries shall be replaced after 9 hours of continuous light operating time. In lieu of batteries, a power supply which simulates the batteries may be used.
- 4.5 Acceptance tests. Acceptance tests shall consist of:
  - a. Individual tests (see 4.5.1)
  - b. Acceptance reliability tests (see 4.5.2)
  - c. Quality conformance test (see 4.5.3)
- 4.6.1 Individual tests. Each light shall be subjected to the following tests as described under 4.6. All defective units shall be rejected.
  - a. Examination of product (see 4.6.1)
  - b. Light intensity (measured in total darkness) (see 4.6.2)
  - c. Underwater operation (see 4.6.3)
  - d. Switch activation (see 4.6.4)
  - e. Voltage check specified in 4.6.11.1 (applicable only to the battery)
  - f. Waterproof check specified in 4.6.11.6 (applicable only to the battery)
  - g. Radiation test specified in 4.6.18.
- 4.5.2 Acceptance reliability tests. Three items from each lot of 500 items, or fraction thereof, shall be selected at random and shall be subjected to the reliability tests of 4.4.4.
- 4.5.3 Quality conformance test. The quality conformance sampling tests shall consist of the following:

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- \* 4.5.3.1 Lot size. An inspection lot size shall be expressed in units of one light, with battery, made essentially under the same conditions and from the same materials and components. The sample unit shall be one light with battery not installed.
- \* 4.5.3.2 Sampling for quality conformance tests. The acceptance criteria and tests required for the light shall be as specified in Table IV. Sampling and inspection levels shall conform to MIL-STD-105. The sample size shall be based on the applicable sample size code letter corresponding to inspection levels of MIL-STD-105. The tests shall be performed in the sequence shown in Table IV. Sample units for tests 1 and 2 shall be randomly selected from the lot. Sample units for tests 3 to 6 shall be randomly selected from units which have completed tests 1 and 2.
- \* 4.5.3.3 Batteries. Five batteries selected at random from each lot of 500, or fraction thereof, shall be subjected to the test specified in 4.6.11.3. Batteries which have been used in conjunction with any test (4.4 or 4.6) shall not be offered to the Government for acceptance.
- \* 4.6 Test methods.
  - \* 4.6.1 Examination and tests. The light shall be examined to determine conformance to the requirements specified herein with respect to workmanship, material, dimensions, and marking.
  - \* 4.6.2 Light intensity test. The effective candle power of the light shall be determined by the effective intensity photometric method. For the individual light intensity specified in 4.5.1b, only the frequency and the head-on intensity test shall be conducted. The light intensity measurements shall be performed in total darkness. While production test methods may correlate with the above measurement methods, there shall be no deviation from the above in either method or equipment when testing for effective intensity during the first article or preproduction phase.
    - 4.6.2.1 Beam width examination. The light shall be examined for beam coverage which shall be not less than 180 degrees on a plane perpendicular to both axes of the lens.
  - 4.6.3 Underwater operation test. The light shall be placed in water in an altitude chamber and subjected to an altitude of 50,000 feet for 5 minutes. If bubbles are apparent, the light shall be rejected.
  - 4.6.4 Switch activation test. The switch shall be activated a minimum of ten times by a plunger conforming to the requirements specified in 4.6.16. These activations shall be conducted at a head-on direction. Each activation shall operate the light.
  - \* 4.6.5 Room temperature operation test. At room temperature the light shall be turned on and shall operate continuously for a minimum of 2 hours. The frequency and the effective intensity shall then be checked. Frequency and effective intensity not in accordance with 3.3.4 shall be cause for rejection of the light. In addition, the switch activation test of 4.6.4 shall be performed after completion of this test.

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TABLE IV  
SAMPLE SIZE, ACCEPTANCE CRITERIA, TESTS, AND INSPECTIONS

| Inspection                                 | Classification of Characteristic | Paragraph   |        | Inspection Level | AQL |
|--|----------------------------------|-------------|--------|------------------|-----|
|  |                                  | Requirement | Method |                  |     |
| Room Temperature Operation                 | Critical                         | 3.5.4       | 4.6.5  | II               | 2.5 |
| Intermittent Operation at Room Temperature | Critical                         | 3.5.5       | 4.6.6  | II               | 2.5 |
| Altitude                                   | Critical                         | 3.5.6       | 4.6.7  | S-2              | 2.5 |
| High Temperature Exposure                  | Critical                         | 3.5.7       | 4.6.8  | S-2              | 2.5 |
| Low Temperature Exposure                   | Critical                         | 3.5.8       | 4.6.9  | S-2              | 2.5 |
| Shock                                      | Critical                         | 3.5.9       | 4.6.10 | S-2              | 2.5 |

- \* 4.6.6 Intermittent operation at room temperature test. The light shall be subjected to 18 hours of operation consisting of alternating 15 minute operating periods with 15 minute nonoperating periods. At the end of the 18 hour period, the frequency shall be not less than 30 flashes per minute and the angular beam coverage light intensity shall be as specified in Table III. Frequency and effective intensity not in accordance with 3.5.5 shall be cause for rejection of the light. In addition, the switch activation test of 4.6.4 shall be performed after completion of this test.
- \* 4.6.7 Altitude test. The light shall be placed in a test chamber and subjected to an altitude of 80,000  $\pm$  500 feet for a period of not less than 1 hour. The light shall then be subjected to explosive decompression conditions based on a pressure differential of 10.3 pounds per square inch in 0.5 second. The light shall be removed and exposed to atmospheric conditions for not more than 5 minutes, it shall then meet the requirements specified in 3.5.1 and 3.5.2. In addition, the switch activation test of 4.6.4 shall be performed after completion of this test.
- \* 4.6.8 High temperature exposure test. The light shall be placed in a test chamber with the internal temperature maintained at 160  $\pm$  2° Fahrenheit for a period of 8 hours. At the end of the 8 hour period, the light shall be subjected to a temperature of 120  $\pm$  2° Fahrenheit for a maximum of 6 hours. At the end of the 6 hour period, the light shall be turned on and shall have a frequency of not less than 40 flashes per minute. The light shall be removed from the test chamber and shall meet the requirements specified in 3.5.1 and 3.5.2. In addition, the switch activation test of 4.6.4 shall be performed after completion of this test.

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- \* 4.6.9 Low temperature exposure test. The light shall be placed in a test chamber with the internal temperature maintained at  $-65 \pm 2^{\circ}$  Fahrenheit for an 8 hour period. After this 8 hour period the light shall be subjected to room temperature a maximum period of 6 hours. At the end of the 6 hour period the light shall meet the requirements specified in 3.5.1 and 3.5.2. The cracking of battery knobs as a result of this test is not considered cause for rejection. In addition, the switch activation test of 4.6.4 shall be performed after completion of this test.
- \* 4.6.10 Shock test. The light shall be subjected to impact shocks of 25g in accordance with method 2001 of MIL-STD-2000. The shock shall be applied in the following directions:

- a. Horizontally, major axis (three shocks each direction for a total of six shocks).
- b. Horizontally, minor axis (three shocks each direction for a total of six shocks).
- c. Vertically (three shocks each direction for a total of six shocks).

Upon completion of these shock applications, the lens surface of the light shall be dropped on a seasoned concrete slab from a height of 4 feet. The light shall then be checked for compliance with 3.5.1 and 3.5.2. In addition, the switch activation test of 4.6.4 shall be performed after completion of this test.

#### 4.6.11 Battery test.

4.6.11.1 Voltage check. Prior to sealing of battery, it shall be subjected to a voltage check by applying a load of 100 milliamperes and immediately determining the voltage which shall be not less than 4.6 volts.

4.6.11.2 Waterproof check. The sealed end of the battery shall be submerged in tap water and a voltage meter check shall be made between the battery ground and the water. Zero voltage shall be recorded.

4.6.11.3 Service life. The battery shall be completely immersed in tap water for 10 hours. After removal from the water, the no-load voltage of the battery shall be determined at ambient temperature and shall be not less than 5.3 volts. A load of 100 milliamperes shall be applied to the battery and the voltage shall be not less than 4.7 volts. The battery shall then be allowed to discharge for a period of 9 hours. At the end of the 9 hour period the voltage shall be not less than 7.1 volts and the current drain (load) shall be not less than 410 milliamperes.

4.6.12 Attachment loop. A minimum load of 50 pounds shall be suspended from the attachment loops in each of the following three directions. Perpendicular to the loop connection, parallel to the loop connection at the top position of the loop, and parallel to the loop connection at the bottom portion of the loop. There shall be no failure of the loops.

- \* 4.6.13 Temperature cycling. The light shall be subjected to a minimum of five temperature cycles consisting of 2 hours at each of the following temperature (in the sequence listed):  $-60 \pm 2^{\circ}$  Fahrenheit, room temperature and  $+125 \pm 2^{\circ}$  Fahrenheit, room temperature. At the completion of this temperature

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cycling, the light shall be subjected to room temperature for 8 hours and then checked for compliance with 3.5.1 and 3.5.2. In addition, the switch activation test of 4.6.4 shall be performed after completion of this test.

- 4.6.14 Compression. The light shall be subjected to a 50 pound weight on any plane surface over an area of 1 inch by 3 inches. After the weight is removed, the light shall be checked for compliance with 3.5.1 and 3.5.2. In addition, the switch activation test of 4.6.4 shall be performed after completion of this test.

4.6.15 Vibration. The light shall be mounted on a vibration test stand and vibrated at a double amplitude of  $0.03 \pm 0.001$  inch. The frequency shall be varied uniformly from 10 to 55 cycles per second and returned to 10 cycles per second in approximately 1 minute cycles. The vibration shall be applied for a period of 1 hour in each of three mutually perpendicular planes. Upon completion of the vibration, the light shall be examined for loose or damaged parts and then checked for compliance with 3.5.1 and 3.5.2. Loose or damaged parts or noncompliance with 3.5.1 and 3.5.2 shall be cause for rejection.

4.6.16 Switch life test. The switch shall be activated a minimum of 200 times. The light shall operate during each activation of the switch. The switch shall be activated by a plunger that has a 1 inch diameter leather knob at one end. The leather for the knob shall be 1/8 inch thick and shall conform to MIL-L-40069. The first 100 actuations shall be conducted at a head-on direction and 25 each operations shall be conducted at a 15 degree angle to the head-on position at 90 degrees, 180 degrees, 270 degrees, and 340 degrees.

- 4.6.17 Salt spray. The light shall be subjected to a salt spray test in accordance with method 811 of FEL-STD-151 for a period of 96 hours. Upon completion of this test, the light shall meet the requirements of 3.5.1. In addition, the switch activation test of 4.6.4 shall be performed after completion of this test.
- 4.6.18 Radiation test. Measurements for compliance with 3.2.1 shall be taken with a Radiac Set AN/PDR-27 (Series) or an instrument of equivalent sensitivity with the detector end window open. Measurements shall be made on all lights and failure to comply with the specified limit shall be cause for rejection of the individual light.
- 4.7 Inspection of the preservation, packaging, packing and marking for shipment and storage. Sample items or packs and the inspection of the preservation, packaging, packing and marking for shipment and storage shall be in accordance with the requirements of Section 5, or the documents specified therein, and Table V.

## 5. PREPARATION FOR DELIVERY

- 5.1 Preservation and packaging. Preservation and packaging shall be level A or C as specified (see 6.2).
  - 5.1.1 Level A. Each light shall be packaged in accordance with method III of MIL-P-116. The battery shall be wrapped separately with barrier material conforming to MIL-B-121, grade A. Each light, with battery, shall be packaged in a unit container conforming to PPP-B-566 or PPP-B-676.

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TABLE V

## List of Defects for Preparation for Delivery

| Item                                    | Defect  |
|---|---|
| Exterior and interior markings          | Missing, incorrect, incomplete, illegible; of improper size, location, sequence, or method of application; markings not the same on the interior and exterior containers.       |
| Packaging and packing materials         | Any nonconforming component; any component missing, damaged or otherwise defective.   |
| Workmanship                             | Inadequate application of the components such as incomplete closure of the unit package, container flaps, loose strappings, et cetera; bulging or distortion of the containers. |
| Exterior and interior weight or content | Number per container is more or less than specified, light and batteries packaged separately.   |
| Packaging of the battery                | Battery not wrapped separately from the light.  |

5.1.1.1 Intermediate packaging. A quantity of lights packaged as specified in 5.1.1 shall be intermediately packaged in a snug fitting container conforming to PPF-B-636, class domestic. Intermediate container size and weight shall be limited to approximately 750 cubic inches and 10 pounds, respectively.

5.1.2 Level C. Lights shall be packaged in a manner which affords adequate protection against deterioration and physical damage during shipment from supply source to the first receiving activity for immediate use. This level may conform to the supplier's commercial practice when such meets the requirements of this level.

5.1 Packing. Packing shall be level A, B, or C as specified (see 6.2).

5.2.1 Level A. Unless otherwise specified, lights packaged as specified in 5.1 shall be packed in fiberoptic shipping containers conforming to PPF-B-636, class weather resistant. Gross weight of containers shall be limited to the special requirements of the container specification. As far as practicable, containers shall be uniform in shape and size, and contain identical quantities. Container closure and sealing shall be in accordance with the appendix to PPF-B-636.

5.2.2 Level B. Level B shall be the same as Level A except shipping containers shall conform to PPF-B-636, class domestic.

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- \* 5.2.3 Level C. Lights packaged as specified in 5.1 shall be packed in a manner which affords adequate protection against damage during direct shipment from the supply source to the first receiving activity for immediate use. This level shall conform to applicable carrier rules and regulations and may be the supplier's commercial practice, provided the latter meets the requirements of this level.
- \* 5.3 Marking. In addition to any special marking required in the contract or order the unit packages, intermediate packages, and shipping containers shall be marked in accordance with MIL-STD-129.

## 6. NOTES

- \* 6.1 Intended use (for other than Type II use). The light covered by this specification is intended for equipping aircraft markers with a high-intensity visual distress signal for use in the event of unscheduled abandonment of aircraft in isolated regions during all conditions of weather and ambient lighting including total darkness.
- \* 6.1.1 Intended use (for Type II use only). The light is intended for equipping ship-board personnel with a high intensity visual distress signal for use in the event of man overboard.
- \* 6.2 Ordering data. Procurement documents should specify the following:
  - a. Title, number, and date of this specification.
  - b. Type and class (see 1.4).
  - c. Selection of applicable levels of preservation, packaging and packing (see 5.1 and 5.2).
- \* 6.3 The margins of this specification are marked with an asterisk to indicate where changes (additions, modifications, corrections, deletions) from the previous issue were made. This was done as a convenience only and the Government assumes no liability whatsoever for any inaccuracies in these notations. Bidders and contractors are cautioned to evaluate the requirements of this document based on the entire content irrespective of the marginal notations and relationship to the last previous issue.

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Project No. 6230-0095



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