

MIL-L-25866B(USAF)

24 Oct 1969

SUPERSEDING

MIL-L-25866A(USAF)

22 January 1958

MILITARY SPECIFICATION

LIGHT, EMERGENCY EXIT, AIRCRAFT LEU-1/A

1. SCOPE

1.1 This specification covers one type of emergency exit light for cargo-type aircraft, designated LEU-1/A.

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

QQ-P-416
PPP-B-601
PPP-B-636

Plating, Cadmium (Electrodeposited)
Boxes, Wood, Cleated-Plywood
Box, Fiberboard

Military

MIL-B-18
MIL-P-116
MIL-D-1000

MIL-E-5272

MIL-C-5541

MIL-A-8625

MIL-L-10547

Batteries, Dry
Preservation, Methods Of
Drawings, Engineering And Associated
Lists
Environmental Testing, Aeronautical And
Associated Equipment, General
Specification For
Chemical Films And Chemical Film
Materials For Aluminum And Aluminum
Alloys
Anodic Coatings, For Aluminum And
Aluminum Alloys
Liners, Case, And Sheet, Overwrap:
Water-Vaporproof Or Waterproof, Flexible

STANDARDS

Military

MIL-STD-129
MIL-STD-130

Marking For Shipment And Storage
Identification Marking Of US Military
Property

FSC 6220

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MIL-STD-143

MS35059

Specifications And Standards Order Of
Precedence For The Selection Of
Switch, Toggle, Two Pole, Sealed Toggle

(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.)

3. REQUIREMENTS

3.1 Preproduction. This specification makes provisions for preproduction testing.

3.2 Components. The light shall consist of:

<u>Item No.</u>	<u>Quantity</u>	<u>Description</u>	<u>See Requirement</u>
1	1	Housing	3.7
2	1	Base Plate	3.8
3	1	Reflector	3.9
4	1	Lens	3.10
5	1	Lamp	3.11
6	1	Manual Switch	3.12
7	1	Inertia Switch	3.13
8	1	Power Failure Relay	3.14
9	4	Batteries	3.15

* 3.3 Selection of specifications and standards. Specifications and standards for necessary commodities and services not specified herein shall be selected in accordance with MIL-STD-143 except as provided in 3.3.1 and 3.3.2.

3.3.1 Commercial parts. Commercial parts having suitable properties may be used where, on the date of invitation for bids, there are not suitable standard parts. In any case, commercial utility parts, such as screws, bolts, nuts, and cotter pins, having suitable properties may be used provided:

a. They can be replaced by the standard parts (MS or AN) without alteration.

b. The corresponding standard part numbers are referenced in the parts list and, if practical, on the contractor's drawings.

3.3.2 Standard parts. With the exception in 3.3.1, MS and AN standard parts shall be used where they suit the purpose. They shall be identified on the drawings by their part numbers.

3.4 Materials.

3.4.1 Fungus-proof materials. Materials that are nutrients for fungi shall not be used where it is practical to avoid them. Where used and not hermetically sealed, they shall be treated with a fungicidal agent acceptable to the

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procuring activity. However, if they will be used in a hermetically sealed enclosure, fungicidal treatment will not be necessary.

3.5 Design and construction. The light shall be designed and constructed so that no parts will work loose in service. It shall be built to withstand the strain, vibrations, and other conditions incident to shipping, storage, installation, and service.

3.5.1 The light shall be so constructed that adjustment and repairs (including replacement of lamp and batteries) can be made easily by the personnel of operating units, with tools normally available commercially.

* 3.5.2 Installation. The light shall be designed for installation near each exit of the aircraft cabin so that the light beam will be directed to illuminate the exit in an efficient manner. All parts shall be suitably enclosed to prevent tampering or damage.

* 3.5.3 Portability. The light shall be so designed that it can be easily and quickly removed from its mounting position. The device used to secure the light in its mounting position shall hold the light in place during the conditions specified in 3.6.

* 3.5.3.1 Handle. A handle shall be provided for carrying the light. The configuration of the handle to be provided shall be subject to approval by the procuring activity.

3.5.4 Lights of different construction. Lights of slightly different construction will be considered to be in accordance with the requirements, provided the specified and limiting dimensions, mounting holes, connections, and all other requirements specified herein are met and the design is approved by the procuring activity.

* 3.6 Performance. Unless otherwise specified, the light shall be capable of operating satisfactorily under the following conditions:

a. Temperatures ranging from -54° to +71° Centigrade (C) (except for reduction in battery capacity).

b. Pressures ranging from 30 inches Mercury down to 13.7 inches Mercury (approximately an altitude of 20,000 feet).

c. Relative humidity up to 95 percent including conditions wherein condensation takes place in the form of both water and frost.

d. Sand and dust particles as will be encountered in desert areas.

e. Exposure to salt-sea atmosphere.

f. Operation in an explosive vapor within or surrounding the equipment.

g. Vibration incident to service use.

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h. Acceleration and shock forces as anticipated.

i. Underwater operation.

- * 3.6.1 Illumination (photometric). The light shall be designed in such a manner as to provide the following illumination. When properly installed and operated at rated lamp voltage, the candlepower distribution in any plane containing an axis which passes through the light center and is perpendicular to the mounting plate (0 degree axis) shall equal or exceed the values in Table I.

TABLE I

Candlepower Distribution

Candlepower	Minimum Width With Respect to 0° Axis
7	-5° to +5°
5	-10° to +10°
3	-15° to +15°

3.7 Housing. The housing shall be designed in such a manner as to support the light and it may utilize as much of the base plate area as required. If the housing obstructs the mounting holes, the light shall be so designed that the mounting holes are readily accessible when the cover of the housing is removed.

- * 3.8 Base plate. The design of the light shall incorporate a plate to provide a supporting base for the housing. The light shall be such that it may be attached directly to the cabin structural members or to a suitable bracket by means of the mounting holes in the base plate. The mounting holes and a hole to accommodate the electrical receptacle mounted on the housing shall be located as shown on Figure 1.

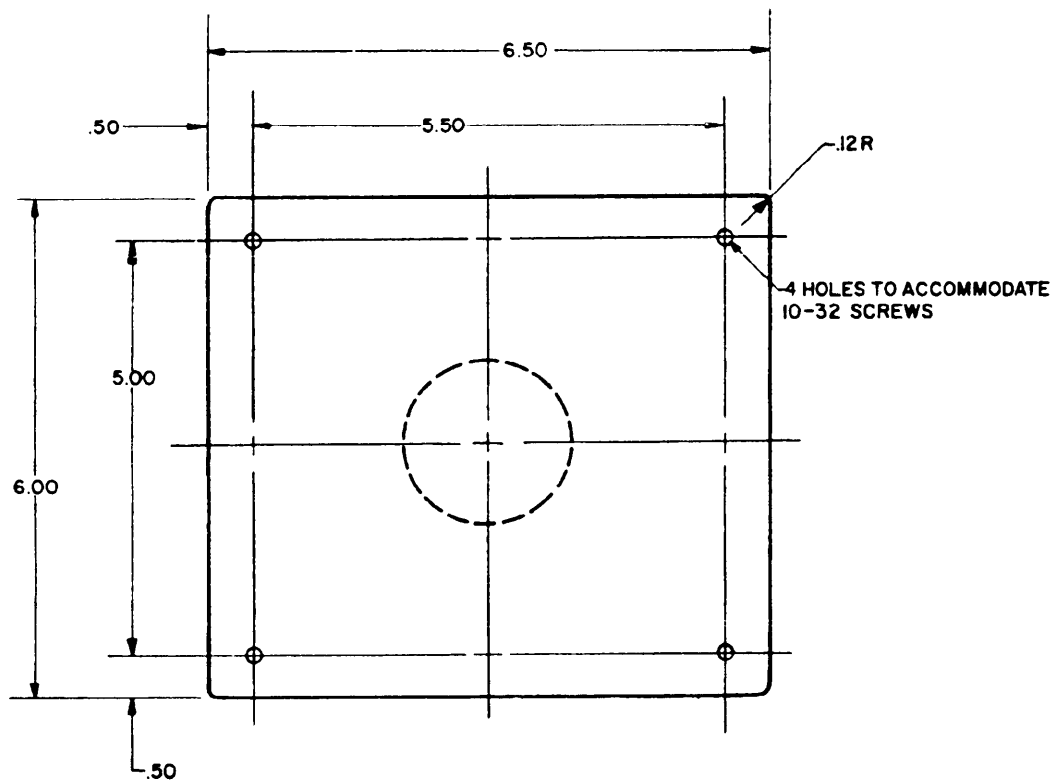
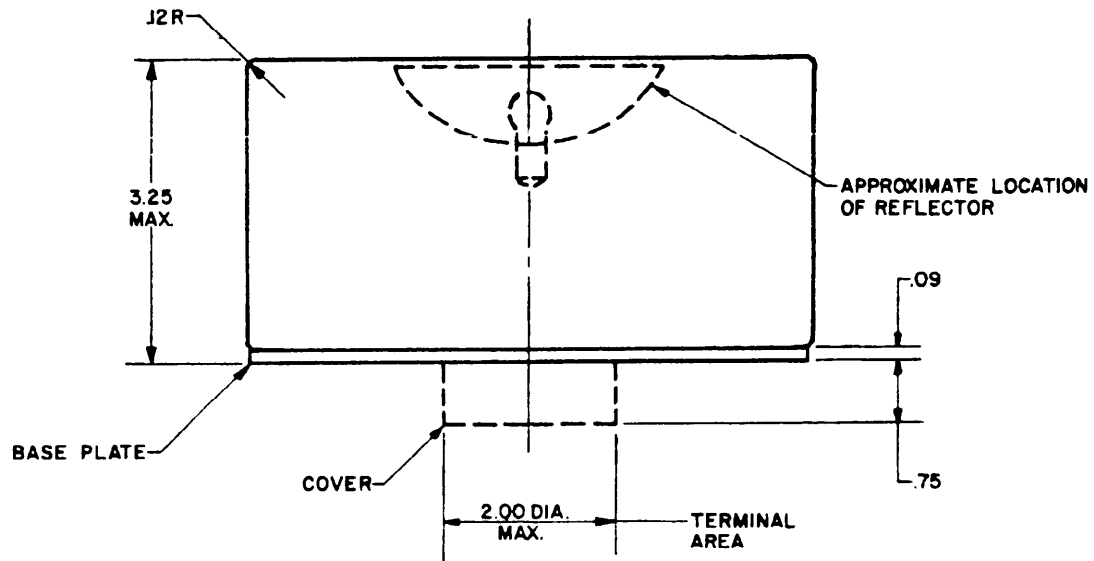
- * 3.8.1 Flight axis. The base plate shall be marked to indicate the proper positioning alignment of the light with the flight axis of the aircraft. The light shall be indexed with respect to the base plate.

3.9 Reflector. The light shall be provided with a suitable polished-aluminum reflector.

3.10 Lens. The light shall be provided with a white-plastic diffusing lens.

- * 3.11 Lamp. The light shall be furnished with a single-contact miniature-flanged base, B-3 1/2 bulb, 2.38 volts, 0.50 ampere, commercial, PR-2 flashlight lamp. The light shall be provided with a spare lamp complete with lampholder to be mounted conveniently inside the housing. If lamp is type requiring continuous recharge of batteries from ship power source, a pilot light shall indicate when power is on and recharging batteries.

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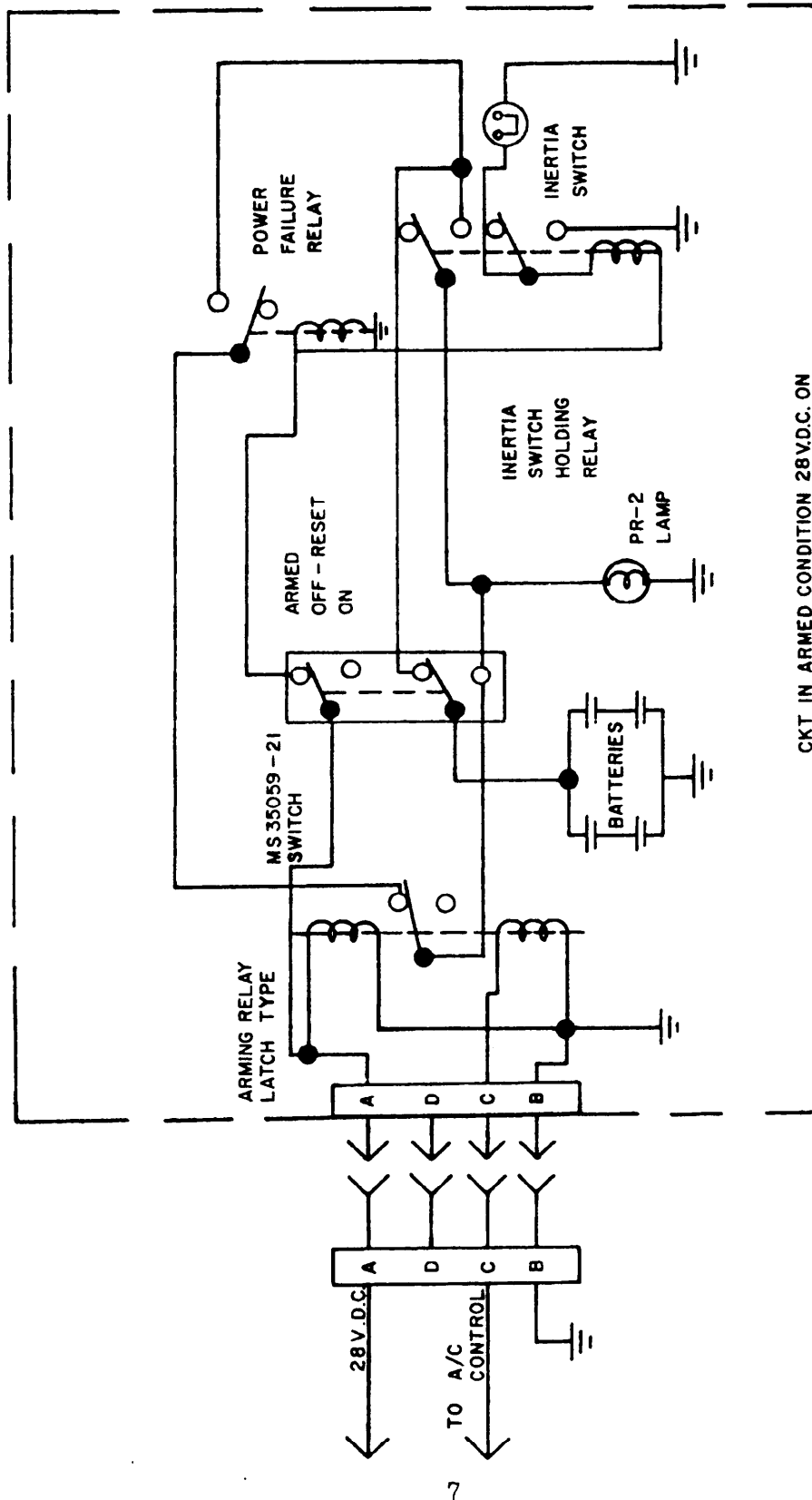
DIMENSIONS IN INCHES
TOLERANCES:
DECIMALS ± 0.002

FIGURE 1 HOUSING AND BASE PLATE

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- * 3.12 Manual switch. The light shall be provided with an MS35059-21 switch. The positive terminal of the self-contained battery power supply shall be attached to the center (OFF) terminal of this switch. One of the ON terminals shall be connected directly to the lamp. The circuit from the second ON terminal shall pass through the set of normally closed contacts of the power failure relay, and thence to the lamp. When the switch is in this second ON position, the light shall then be armed for automatic operation by the power failure relay. The switch shall be located either in the light housing or external to the housing.
- * 3.13 Inertia switch. The light shall be provided with an inertia switch which will automatically energize the light when subjected to a deceleration of $2 \pm 1/2$ g. The direction of maximum sensitivity (minimum impact force required to energize the light) shall be as marked on the base plate. The inertia switch shall be so designed that the light will not come on when subjected to incident vibration as encountered in aircraft. If the inertia switch is of the maintained contact type, it shall incorporate a push button, mechanical reset device so that the light may quickly be rearmed for automatic operation. If the inertia switch is comprised of a momentary contact device in conjunction with a holding relay, a single circuit, normally closed push-type switch may be utilized as a means of breaking the circuit of the holding relay in order to rearm the light for automatic operation. The switch shall be located either in the light housing or external to the housing.
- * 3.14 Power failure relay. The light shall be provided with an approved relay which has a set of normally closed contacts. The coil of the relay shall be energized in the armed position from the aircraft electrical power circuits (28 volts direct current (DC)). The operation of the relay shall be such that whenever the aircraft electrical power fails or is turned off, the contacts will be closed and the lamp will be automatically energized from the self-contained battery power supply.
- * 3.14.1 Rearming circuit. The light shall be so designed that it can be rearmed by the light switch, and remotely rearmed if so connected. Figure 2 illustrates a circuit by which this requirement may be obtained. Other circuits will be acceptable providing the requirements are met. If the light is to be de-energized and rearmed remotely, the control switch shall be connected to terminal C.
- * 3.14.2 Electrical connections. Four 8-32 screw-type terminals shall be provided to connect the power and control circuits (if applicable) to the light. The terminals shall be marked A, B, C, and D. Terminal A shall connect to the +28 volt DC circuit and terminal B shall connect to ground (-28 volt DC circuit). Terminal C is provided for remote de-energization and rearming of the light if required.
- * 3.14.3 Light turn-on feature. Provisions shall be incorporated so that upon removal of the light from its mounting plate, the light will automatically energize in the ON position. This may be accomplished either physically or electrically.

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SCHEMATIC LIGHT CIRCUIT FOR TYPE LEU-I/A
FIGURE 2

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3.15 Batteries. The light shall be powered by four standard BA-30 cells conforming to MIL-B-18. The batteries shall be arranged in series parallel, so as to provide a nominal open-circuit voltage of 3 volts. The batteries shall be used only to provide power for the lamp and under no conditions shall be used as a power source for any other component part of the light such as a relay or other device. Unless otherwise specified, the batteries shall not be furnished with the light.

- * 3.16 Interchangeability. All parts having the same manufacturer's part number shall be functionally and dimensionally interchangeable. The drawing number requirements of MIL-D-1000 shall govern changes in the manufacturer's part numbers.

3.17 Dimensions. The dimensions of the light shall remain within the envelope specified in Figure 1.

- * 3.18 Weight. The weight of the light with lamp and batteries installed shall be not more than 3-1/2 pounds.

3.19 Finishes and protective coatings.

- * 3.19.1 Aluminum-alloy parts. Aluminum-alloy parts shall be covered with an anodic film in accordance with MIL-A-8625, except as follows:

- a. Small holes need not be anodized.
- b. Aluminum alloys which do not anodize satisfactorily shall be coated with a chemical film in accordance with MIL-C-5541.
- c. Where the primary purpose of the treatment is to afford a suitable paint base, chemical treatments in accordance with MIL-C-5541 may be used in lieu of anodizing.
- d. Castings containing nonaluminum-alloy integral inserts may be treated with a chemical film in accordance with MIL-C-5541.
- e. When abrasion resistance is a factor, chemical films in accordance with MIL-C-5541 shall not be used in lieu of anodizing.

3.19.2 Steel parts. Steel parts shall be cadmium plated, where practicable, in accordance with QQ-P-416, type II or III, and of a class that is adequate to achieve the degree of protection required.

3.20 Operating instructions. Instruction plates containing operating instructions such as ON, OFF, RESET, et cetera, shall be permanently affixed to the light. The lettering shall be clearly legible and permanently marked.

3.21 Wiring diagram. A circuit diagram with a legend describing the electrical components of the light shall be permanently attached to the interior of the housing or other surface where practicable. The diagram shall be legible and protected against destruction by any of the tests specified in Section 4. Proper method for inserting the batteries shall be indicated.

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3.22 Identification of product. Equipment, assemblies, and parts shall be marked for identification in accordance with MIL-STD-130, except that serial numbers are not required.

3.23 Workmanship. The light, including all parts and accessories, shall be fabricated in a thorough and workmanlike manner. Particular attention shall be given to freedom from blemishes, defects, burrs, and sharp edges; accuracy of dimensions, radii of fillets, and marking of parts and assemblies; thoroughness of soldering, welding, brazing, painting, wiring, and riveting; alignment of parts and tightness of assembly screws, and bolts, et cetera.

3.23.1 Riveting. Riveting operations shall be carefully performed to insure that the rivets are tight and satisfactorily headed.

3.23.2 Cleaning. The light shall be thoroughly cleaned. Excess solder, metal chips, and other foreign material shall be removed during and after final assembly.

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. Quality conformance inspection See 4.3
- b. Preproduction testing See 4.6

* 4.3 Quality conformance inspection. Quality conformance inspection shall consist of the individual test.

* 4.3.1 Individual test. Each light shall be subjected to examination of product described in 4.5.1 and 4.5.1.1.

4.4 Test conditions.

* 4.4.1 Atmospheric conditions. Unless otherwise specified, the tests shall be made at an atmospheric pressure of approximately 29.92 inches mercury and at room temperature of approximately 25°C. Where tests are made with pressure or temperature differing materially from these values, proper allowance shall be made for the difference from the specified condition.

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- * 4.4.2 The test specimen shall be equipped with a PR-2 flashlight lamp, batteries, and unless otherwise specified, 28 volts DC shall be applied to the power-failure relay when the light is subjected to tests which require functional operation of the light.

4.5 Test methods.

4.5.1 Examination of product. The light shall be inspected to determine compliance with the requirements specified herein with respect to materials, workmanship, dimensions, and marking.

4.5.1.1 The light, with lamp and batteries installed, shall be inspected for functional operation of inertia switch and reset, manual switch, and for the proper operation of the relay or other device which energizes the light when aircraft electrical power is off.

4.5.2 Environmental tests. Unless otherwise specified, environmental tests shall be conducted in accordance with the specified procedures of MIL-F-5272.

4.5.2.1 High temperature. The complete light with batteries installed shall be subjected to high temperature in accordance with procedure I at a temperature of $+71^{\circ} \pm 2^{\circ}\text{C}$ dry heat for a period of 4 hours. At the end of the test, the light shall be removed from the test chamber. The light shall be compared with the untested sample for dimensional stability, crazing, and other defects. The light shall be in full working condition after this test.

4.5.2.2 Low temperature. The complete light with batteries installed shall be subjected to low temperature in accordance with procedure I at a temperature of $-54^{\circ} \pm 2^{\circ}\text{C}$ for a period of 4 hours. At the end of the tests the light shall be removed from the test chamber and examined. There shall be no crazing, dimensional changes, or other defects. The light shall be returned to room temperature and checked for proper operation.

4.5.2.3 Altitude. The assembly shall be subjected to 20,000-feet altitude for a period of 4 hours, at 0°C . At the conclusion of the test, the light shall be checked for proper functional operation of the various switching devices.

- * 4.5.2.4 Humidity. The light shall be subjected to the humidity test in accordance with procedure III, except that the test conditions shall be maintained only for a 72-hour period. The assembly shall not be adversely affected by the test. The lamp shall not be turned on during the soak period, but shall be turned on during the tests to check proper operation.

4.5.2.5 Sand and dust. The light shall be subjected to the sand and dust test in accordance with procedure II, except that the test shall be of 4 hours duration. At the conclusion of the test, the assembly shall not be adversely affected by the test.

4.5.2.6 Salt spray. The light shall be subjected to the salt spray test in accordance with procedure I for a period of 50 hours. At the end of the test, the assembly shall operate satisfactorily, and there shall be no evidence of excessive corrosion or failure of any part to function properly.

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4.5.2.7 Explosion proof. The light shall be subjected to an explosion-proof test in accordance with procedure I.

- * 4.5.3 Illumination (photometric). The light shall be subjected to a photometric test to determine compliance with the light distribution specified in 3.6.1. The test shall be conducted with the lamp operated at rated voltage and with the light mounted in normal operating position. The candlepower distribution in a random plane passing through the axis of symmetry of the lamp shall be determined. The test shall then be repeated in order to obtain light distribution data in a plane which intersects the first data plane at an angle of 90 degrees and also passes through the axis of the lamp.

4.5.4 Vibration tests. The test specimen shall be mounted in normal operating position and subjected to vibration cycling in each of three mutually perpendicular planes. The cycling shall be from 10 to 500 cycles per second in 15-minute cycles for a period of 2 hours in each direction at an applied double amplitude of 0.036 inch or an applied acceleration of 10 g, whichever is the limiting value. Suitable instrumentation shall be provided to detect nuisance tripping of the contacts of the inertia switch and unwarranted opening or closing of the contacts of any relays that may be used in the light. No permanent deformation of any of the components of the light shall occur during this test.

- * 4.5.5 Acceleration (functional test). The light shall be mounted on a centrifuge in normal operating position and subjected to acceleration in the horizontal plane. The speed of the centrifuge shall be gradually increased so that the operating point of the inertia switch may be determined. A reading shall be taken in each direction as the light is rotated in 45 degree increments around the axis of the inertia switch. During this test, the light shall not come on at any time before an acceleration of 1-1/2 g is applied and shall not require more than 2-1/2 g to become energized. The light shall remain on when subjected to an acceleration of 10 g.

- * 4.5.6 Shock. The light shall be subjected to a shock test in accordance with MIL-E-5272, procedure V.

- * 4.5.7 Underwater operation. When mounted on a suitable bracket and with new batteries installed, the light shall be turned on manually and then submerged to a depth of 3-1/2 feet in a tank containing a salt-water solution (3.5 percent sodium chloride by weight). While immersed, the light shall operate satisfactorily for a period of 10 minutes. For lights which are considered watertight, satisfactory operation may be construed as meaning that the light produces a visible beam and an inspection shows that no appreciable leakage occurred during the 10-minute period. For lights which are not considered watertight, the voltage at the lamp socket shall be measured continuously during the 10-minute period. If the test specimen provides a visible beam of light and the voltage does not fall below 2.0 volts during the immersion, the operation shall be considered satisfactory.

- * 4.5.8 Portability. The light, in operating condition, shall be mounted on a bracket and oriented in the same manner as it would be over a normal exit in the aircraft. The device holding the light in its mounting position shall be checked to determine that the light can be easily and quickly removed. The disconnect on the terminal box shall operate properly. The light shall be operable after separation occurs.

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4.6 Preproduction testing.

4.6.1 Preproduction test samples. The preproduction test samples shall consist of three lights representative of the production equipment. They shall be tested in a laboratory designated by the procuring activity or, when so stated in the contract, at the contractor's plant under the supervision of the procuring activity.

4.6.2 Preproduction tests. Preproduction tests shall consist of all tests described under 4.4 and shall be tested in the order shown in Table II.

TABLE II
Preproduction Test Sequence

Sample Number 1	Sample Number 2	Sample Number 3
Examination of Product Illumination (Photometric) High Temperature Low Temperature Altitude	Examination of Product Vibration Acceleration Shock Underwater Operation Portability	Examination of Product Humidity Salt Spray Sand and Dust Explosion Proof

* 4.7 Inspection of the preservation, packaging, packing and marking. The preservation, packaging, packing and marking shall be inspected to determine conformance to the requirements of Section 5.

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 individually preserved and packaged Method IIC of MIL-P-1116. Batteries, when provided, shall be packaged Method IC. Each light with batteries when provided, shall be packaged in a fiberboard unit container conforming to PPP-B-636.

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

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

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- * 5.2.1 Level A. Lights preserved and packaged as specified in 5.1 shall be packed in wood, cleated-plywood shipping containers conforming to PPP-B-601, overseas type. Insofar as practicable, shipping containers shall be uniform in shape and size, of minimum cube and tare consistent with the protection required and contain identical quantities. The gross weight of each shipping container shall be limited to approximately 200 pounds. Containers shall be closed and strapped in accordance with the appendix to PPP-B-601. Containers shall be provided with a case liner conforming to MIL-L-10547 and case liner shall be sealed in accordance with the appendix thereto.
- * 5.2.2 Level B. Level B shall be the same as level A, except shipping containers shall conform to domestic type and there shall be no requirement for providing case liners.
- * 5.2.3 Level C. Lights preserved and packaged as specified in 5.1 shall be packed in a manner which will afford 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 suppliers commercial practice when such meets the requirements of this level.
- * 5.3 Marking. In addition to any special marking required by the contract or order, interior packages and exterior shipping containers shall be marked in accordance with the requirements of MIL-STD-129.

6. NOTES

6.1 Intended use. The LEU-1/A light covered by this specification is intended for use in automatically illuminating the exits of cargo-type aircraft immediately after a crash landing.

- * 6.2 Ordering data. Procurement documents should specify the following:
 - a. Title, number, and date of specification.
 - b. When batteries are required (see 3.15).
 - c. Unit quantities required (see 5.1.1).
 - d. Selection of applicable level of packaging and packing required (see 5.1 and 5.2).

6.2.1 Preproduction tests. Three lights will be required as preproduction samples to be subjected to the requirements of this specification. The point of inspection for these tests will be specified.

- * 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

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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.

Custodian:
Air Force - 82

Review Activity:
Air Force - 82

Preparing Activity:
Air Force - 82

Project No. 6220-F192

SPECIFICATION ANALYSIS SHEET		Form Approved Budget Bureau No. 22-R255
INSTRUCTIONS: This sheet is to be filled out by personnel, either Government or contractor, involved in the use of the specification in procurement of products for ultimate use by the Department of Defense. This sheet is provided for obtaining information on the use of this specification which will insure that suitable products can be procured with a minimum amount of delay and at the least cost. Comments and the return of this form will be appreciated. Fold on lines on reverse side, staple in corner, and send to preparing activity. Comments and suggestions submitted on this form do not constitute or imply authorization to waive any portion of the referenced document(s) or serve to amend contractual requirements.		
SPECIFICATION		
ORGANIZATION		
CITY AND STATE	CONTRACT NUMBER	
MATERIAL PROCURED UNDER A <input type="checkbox"/> DIRECT GOVERNMENT CONTRACT <input type="checkbox"/> SUBCONTRACT		
1. HAS ANY PART OF THE SPECIFICATION CREATED PROBLEMS OR REQUIRED INTERPRETATION IN PROCUREMENT USE? A. GIVE PARAGRAPH NUMBER AND WORDING.		
B. RECOMMENDATIONS FOR CORRECTING THE DEFICIENCIES		
2. COMMENTS ON ANY SPECIFICATION REQUIREMENT CONSIDERED TOO RIGID		
3. IS THE SPECIFICATION RESTRICTIVE? <input type="checkbox"/> YES <input type="checkbox"/> NO (If "yes", in what way?)		
4. REMARKS (Attach any pertinent data which may be of use in improving this specification. If there are additional papers, attach to form and place both in an envelope addressed to preparing activity)		
SUBMITTED BY (Printed or typed name and activity - Optional)		DATE

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