



AEROSPACE RECOMMENDED PRACTICE

ARP1798™**REV. B**Issued 2007-04
Revised 2020-07

Superseding ARP1798A

Portable Emergency Lighting Systems for Flight Crew Members

RATIONALE

This document is being updated to correct typos and provide additional recommendations on batteries.

1. SCOPE

- 1.1 The purpose of this SAE Aerospace Recommended Practice (ARP) is to recommend general design and performance characteristics for hand-held portable, emergency lighting systems (note: the portable portion of this system that contains the lamp and reflector will be identified throughout the remainder of this document simply as a "flashlight") intended for use by crew members of commercial aircraft during any emergency situation, within or outside of the aircraft cabin, where emergency lighting is required.
- 1.2 It is not the intention of this document to recommend specific designs, materials, or technology to meet the recommendations contained herein, but rather to establish general guidelines in these areas. Where specificity is apparent, such may be overruled in the design when it can be demonstrated that the intent of the recommendation has been met with an equivalent level of performance.

2. APPLICABLE DOCUMENTS

The following publications form a part of this document to the extent specified herein. The latest issue of SAE publications shall apply. The applicable issue of other publications shall be the issue in effect on the date of the purchase order. In the event of conflict between the text of this document and references cited herein, the text of this document takes precedence. Nothing in this document, however, supersedes applicable laws and regulations unless a specific exemption has been obtained.

2.1 FAA Publications

Available from Federal Aviation Administration, 800 Independence Avenue, SW, Washington, DC 20591, Tel: 866-835-5322, www.faa.gov.

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| 14 CFR Part 25 | Airworthiness Standards: Transport Category Airplanes, Code of Federal Regulations |
| AC 20-115 | Airborne Software Development Assurance Using EUROCAE ED-12() and RTCA DO-178() |
| AC 20-168 | FAA Advisory Circular, Certification Guidance for Installation of Non-Essential, Non-Required Aircraft Cabin Systems & Equipment (CS&E) |

2.2 RTCA Publications

Available from RTCA, Inc., 1150 18th Street, NW, Suite 910, Washington, DC 20036, Tel: 202-833-9339, www.rtca.org.

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Documents

Document Sharing Hub

RTCA/DO-160	Environmental Conditions and Test Procedures for Airborne Equipment
RTCA/DO-227	Minimum Operational Performance Standards for Lithium Batteries
RTCA/DO-311	Minimum Operational Performance Standards for Rechargeable Lithium Batteries and Battery Systems
RTCA/DO-293	Minimum Operational Performance Standards (MOPS) for Nickel-Cadmium, Nickel Metal-Hydride and Lead-Acid Batteries

2.3 U.S. Government Publications

Copies of these documents are available online at <https://quicksearch.dla.mil>.

MIL-HDBK-217	Reliability Prediction of Electronic Equipment
MIL-STD-810	Environmental Engineering Considerations And Test Methods

3. GENERAL DESCRIPTION

Equipment intended to comply with the requirements of this document shall conform to the following design standards and provide the proper performance under the environmental test conditions specified.

Requirements include applicable 14 CFR Part 25 Federal Aviation Regulations as referenced in later sections. As a guide, Advisory Circulars AC 20-168 should be consulted regarding the use of lithium batteries, flammability for small parts, glass in the cabin, etc. Specific sections of this document are referenced to in later sections of this document.

The design/construction of equipment should incorporate features that allow the equipment to be operated safely. Testing should be conducted to verify compliance with the applicable performance standards in this document.

- 3.1 The portable emergency lighting system for flight crew members is intended to be classified the same as the other cabin emergency equipment, and should be accorded the same emphasis in its design, performance, reliability, maintenance, handling, installation, and use.
- 3.2 The flashlight should provide the portability and ease of use typical of designs based on standard D-cell batteries, without necessarily having to conform to that particular type of package design.
- 3.3 The flashlight should be designed to provide a high degree of reliability in an aircraft cabin environment, which can exhibit extreme temperature fluctuations, vibration/shock, and abusive handling.
- 3.4 The flashlight should provide a high-intensity, directional beam both as general illumination and as a directional indicator.

4. SPECIFIC RECOMMENDATIONS

4.1 General Configuration

- 4.1.1 The flashlight, as configured for use after removal from its retention system, should be easily and comfortably held and controlled by a single hand.
- 4.1.2 The flashlight grip or handle should provide for both utility and security. The grip or handle should be at least 10 cm (3.94 inches) long and have an overall circumference between 7.85 cm (3.14 inches) and 15.7 cm (6.28 inches).

- 4.1.3 A flashlight with the head mounted on other than either of its two ends should be designed to minimize the probability of injury to the user, should the device be allowed to rotate in the holding hand.
- 4.1.4 The flashlight, as configured for use after removal from its retention device, should weigh less than 0.9 kg (1.98 pounds).
- 4.1.5 The flashlight should incorporate a wrist lanyard which can be used to secure the flashlight to the user's wrist while the flashlight is in use. The lanyard should be secure enough to retain the flashlight if inadvertently dropped, while still designed to break-away without injuring the wrist when the flashlight is intentionally released or forcibly separated from the user.
- 4.1.6 The flashlight and its retention device should not have sharp edges or protrusions that could result in injury to the user or others.
- 4.1.7 Switching to activate the flashlight may either be automatic (upon removal of the flashlight from its retention device) or manual. A manual switch must be capable of being operated by the holding hand while the hand is on the handle or grip.
- 4.1.8 If the flashlight design includes software, the design should follow the guidance of AC 20-115.

4.2 Material

- 4.2.1 The material used in the flashlight and its retention device shall meet the applicable requirements for aircraft cabin material specified in 14 CFR Part 25.853.
- 4.2.2 Material used in construction of the flashlight should minimize the absorption and conduction of radiated heat, so as to minimize the probability of injury to the user when the flashlight is operated in an environment of extreme heat and/or fire.
- 4.2.3 The material and chemistry of the integral battery shall be such that amounts and/or relative toxicity of vented gases do not pose a hazard to occupants, equipment, or aircraft. The material, cell chemistry, and battery construction shall also be such that explosive venting of these gases is not possible when exposed to any of the environmental conditions described in this document.
- 4.2.4 The lamp lens should not cloud or degrade such that the intensity of the light emitted by the flashlight is reduced from exposure to the environmental conditions outlined in the subsequent sections. Glass used in the lens should have high impact resistance.

NOTE: The meaning elsewhere herein of "no significant lighting degradation" or "no significant change(s) in illumination" (including flickering) means that any loss of intensity does not result in a perceptible reduction in intensity.

4.2.5 Flammable Materials

- 4.2.5.1 All nonmetallic/metallic composite materials should meet 14 CFR Part 25.853, except that the hard wall surface of the equipment that contains the battery shall be free of fragments/debris that could be liberated by an explosion of the battery. Refer to AC 20-168, paragraph 6.d.
- 4.2.5.2 No explosive or toxic gasses emitted by any battery during normal operation or as the result of any failure of the battery charging or monitoring system (unless the system's probability of failure per MIL-HDBK-217 is shown to be $\leq 1E-5$) may accumulate in hazardous quantities within the aircraft. In addition, no flammable fluids that may escape from any battery may accumulate in hazardous quantities in the aircraft. Further, corrosive fluids or gases that may escape from any battery should not damage surrounding airplane structure or any adjacent essential equipment.

NOTE: These potential failure modes should be considered when products are tested per the methods shown in Table 1. Refer to AC 20-168, paragraph 6.c.(2)(a), regarding the use of lithium batteries.