



AEROSPACE RECOMMENDED PRACTICE

ARP991™

REV. D

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Superseding ARP991C

Position and Anticollision Lights - Fixed-Wing Aircraft

RATIONALE

To provide technical update as part of the Five-Year Review process.

FOREWORD

This SAE Aerospace Recommended Practice (ARP) provides recommendations for a standard for aircraft navigation position lights and anticollision lights which have intensities, redundancy, and are of a configuration commensurate with the vital role these lights play in collision avoidance during nighttime and darkened sky conditions. Since, in some countries, the term "navigation" lights is used and in others, the term "position" lights is used, in this document, the term "navigation position" lights will be used to avoid confusion.

The two lighting systems serve a combined function. The higher intensity of the flashing anticollision lights serves to attract attention to the traffic. The steady-burning navigation position lights can better show position of the aircraft and direction of flight. While the color of the navigation position lights will indicate to the observer the sector observed, the apparent motion of the light in the observing pilot's windshield is used as primary assessment of a collision threat.

The intensities listed in this document are initial intensities for new light assemblies. These intensities are much higher than the intensities necessary for regulatory requirements and/or service performance requirements. One advantage gained by utilizing the intensities specified in this document is longer operating times at intensities above minimum service performance requirements. Increased intensity does marginally increase visibility distance under reduced visibility conditions, and under lower contrast conditions such as in metropolitan areas or in twilight or dawn conditions. These intensities are considerably higher than threshold levels for clear atmospheric conditions, are visible at very long distances, and include substantial allowances for atmospheric factors which may reduce the conspicuity of the lights. The electrical systems on the aircraft should be designed to produce the operating voltages required by the lights covered by this document to meet the design intensity requirements when new and under normal operating conditions. Extremely high position navigation light intensities can result in issues such as not being able to dim the lights sufficiently to allow for refueling operations without blinding the boom operator. Legacy incandescent lights naturally have their peak intensity directed directly forward in the horizontal plane. LED lights often have a higher peak intensity, and it is often located in a different angular location. Since the CFR requirements have no maximum values, this does not violate regulations. The maximum intensity levels recommended in this document will encourage consideration of the peak intensity levels and locations. For LED-based lighting technology, the loss of selected individual and strings of LEDs needs to be considered when designing minimum intensity levels.

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Compensation for other factors which may cause the intensities of the lights to degrade in service are also included in the initial intensities. These include exterior dirt, interior contamination, lamp or flashtube degradation, and degradation of reflectors, capacitors, and other components. For LED-based lighting technology, the loss of selected individual LEDs also needs to be taken into account when designing minimum intensity levels.

The initial intensities recommended in this document are not intended to be utilized as regulatory requirements nor to imply any need for new regulatory requirements.

Acceptable service performance requirements need to be defined. It is recognized that the accurate measurement of the photometric quantities included in this document is extremely difficult and that large errors can occur. Test conditions such as test geometry, ambient temperature, lens temperature, ambient illumination, and reflections can be controlled in the laboratory but not in field tests. The result is that field measurements usually have much higher uncertainties than laboratory measurements.

1. SCOPE

This document covers the recommended lighting performance and design criteria for:

- a. Left Forward Navigation Position Lights (Red)
- b. Right Forward Navigation Position Lights (Green)
- c. Rear Navigation Position Lights (White)
- d. Anticollision Lights. AS8017 provides for the following classes: Class I Rotorcraft, Class II Fixed Wing, and Class III Fixed Wing and Rotorcraft. Possible design requires include but are not limited to:
 1. Red Flashing Lights Top and Bottom Fuselage
 2. White Flashing Strobe Lights Wing Tips and/or Tail
 3. Red Flashing Beacon Light on Top of Vertical Tail

1.1 Purpose

This document recommends design objectives for navigation, position, and anticollision light systems for visual detection and collision avoidance between aircraft in flight and on the ground. Customers for new aircraft or lighting components and designers or manufacturers may take advantage of this document in specifying the initial requirements that, in most cases, significantly exceed the applicable minimum intensities as shown in the Code of Federal Regulations as well provide better stability, longer life, and lower operating costs.