		Doc. No. :	CPTS-0000438
European Union Aviation Safety Agency	Consultation paper Equivalent Safety Finding	Issue : Date : Proposed ⊠	1 24 JAN 2025 Final comments: 14 EEB 2025
SURIECT	Rotorcraft Photoluminescent En	nergency Exit	Markings

SUBJECT	:	Rotorcraft Photoluminescent Emergency Exit Markings
REQUIREMENTS incl. Amdt.	:	CS 29.811(d), 29.812(e) Amdt. 11
ASSOCIATED IM/MoC	:	Yes 🗆 / No 🖾
ADVISORY MATERIAL	:	

# **Table of Content for Public Consultation**

SUBJECT	1
Table of Content for Public Consultation	1
INTRODUCTORY NOTE:	2
ABBREVIATIONS:	2
IDENTIFICATION OF ISSUE:	2
EASA POSITION:	3
M-TS-0000438	4
1. APPLICABILITY	4
1.1 AFFECTED CS	4
2. STATEMENT OF EQUIVALENT SAFETY FINDING	4
3. COMPENSATING FACTORS	4





# **INTRODUCTORY NOTE:**

The following Equivalent Safety Finding (ESF) has been classified as important and as such is subject to public consultation in accordance with EASA Management Board decision 12/2007 dated 11 September 2007, Article 3 (2.) which states:

"2. Deviations from the applicable airworthiness codes, environmental protection certification specifications and/or acceptable means of compliance with Part 21, as well as important special conditions and equivalent safety findings, shall be submitted to the panel of experts and be subject to a public consultation of at least 3 weeks, except if they have been previously agreed and published in the Official Publication of the Agency. The final decision shall be published in the Official Publication of the Agency."

### **ABBREVIATIONS:**

n/a

### **IDENTIFICATION OF ISSUE:**

CS 29.811(d) requires that: "Each passenger emergency exit marking and each locating sign must have white letters on a red background or a universal emergency exit symbol, of adequate size. These signs must be self or electrically illuminated, and have a minimum luminescence (brightness) of at least 0.51 candela/m<sup>2</sup> (160 microlamberts). The colours of a text-based sign may be reversed if this will increase the emergency illumination of the passenger compartment."

Also, in accordance with CS 29.812(e): "The energy supply to each emergency lighting unit must provide the required level of illumination for at least 10 minutes at the critical ambient conditions after an emergency landing."

Photoluminescence technology does not fully comply with certain parts of CS 29.811(d) and CS 29.812(e).

The non-compliances can be summarised as follows:

1. CS 29.811(d) requires that some of the areas of the sign be white.

The colour of photoluminescent signs appears pale yellow in normal ambient light levels and appears glowing pale green in low ambient light levels.

2. CS 29.811(d) requires that the sign must be self or electrically illuminated.

Photoluminescent is neither self nor electrically illuminated. The photoluminescent material must first be charged by another light source before emitting light.

3. CS 29.811(d) requires that the illuminated sign has a minimum luminescence (brightness) of at least 0.51 candela/m<sup>2</sup> (160 microlamberts).

The initial brightness of fully charged photoluminescent material meets this requirement. However, the initial brightness is dependent on cabin light intensity and charging duration. The brightness level of photoluminescent material will decrease when left in darkness, and therefore the minimum luminescent of 0.51 candela/m<sup>2</sup> is not guaranteed for a long time.

Also, for the universal symbol signs, the green areas are opaque (no light is emitted by the sign). Similarly, for the language-based signs the red areas are opaque.





4. CS 29.812(e) requires that the "energy supply" to the sign "must provide the required level of illumination for at least 10 minutes at the critical ambient conditions after an emergency landing".

Compliance with this requirement is not obvious for a photoluminescent sign that shows a varying brightness level over time.

# EASA POSITION:

The intent of CS 29.811(d) is to provide a sign with a minimum brightness of at least is 0.51 candela/m<sup>2</sup> (160 microlamberts), that will guide the evacuee to the emergency exit.

The output of the photoluminescent signs depends on the charging level which itself depends on the duration and the intensity of the charge. The means to charge the photoluminescent sign is to expose it to ambient light, which is mainly supplied by the cabin lighting. When sufficiently charged, the initial brightness of the photoluminescent sign does meet the minimum brightness requirement. However, the brightness will decrease when left in darkness.

To achieve the required initial brightness, the signs must receive an appropriate amount of charge, based on a combination of light intensity (lux level) and charging duration. Therefore, a pre-installation lighting check must be performed to determine the minimum lux levels at the area of installation of the sign and when combined with an appropriate charging duration, the initial brightness of the photoluminescent sign is to meet the requirement before flight. An acceptable level of luminescence should then be demonstrated for all critical mission durations plus 10 minutes for evacuation following a potential emergency landing.

The intent of CS 29.812(e) regarding the level of brightness to be supplied for at least 10 minutes is to provide egress guidance during at least 10 minutes. The "energy supply" is the ambient light which must provide the charge necessary to comply with the specification.

The sign needs to operate at emergency lighting levels and in normal cabin lighting for situational awareness. Photoluminescent exit signs provide this performance with the glowing areas providing better performance by giving greater uniformity of contrast between the opaque and light emitting areas.

Photoluminescent signs, both the ones with conventional 'EXIT' wording and the ones with the universal symbol, are already used by the industry. Applicants may take credit from test results to substantiate that their design provides the necessary compensating factors for a safe use in rotorcraft. As identified under item 3.e) of the ESF, all limitations/conditions derived from the test results have to be respected.

Considering all the above, the following Equivalent Safety Finding is proposed.





**Equivalent Safety Finding** 

## M-TS-0000438

#### **Equivalent Safety Finding**

#### **Rotorcraft Photoluminescent Emergency Exit Markings**

#### 1. APPLICABILITY

This ESF is applicable to CS-29 rotorcraft with Photoluminescent Emergency Exit Markings installed.

#### 1.1 AFFECTED CS

CS 29.811(d), CS 29.812(e) Amdt. 11

#### 2. STATEMENT OF EQUIVALENT SAFETY FINDING

In lieu of direct compliance with the CS in chapter 1.1, and provided that the below compensating factors are complied with, photoluminescent emergency exit signs may be used to indicate the location of passenger emergency exits.

#### 3. COMPENSATING FACTORS

- a) The photoluminescent emergency exit signs are legible by passengers in the cabin and after initial charging provide guidance to the emergency exits considering all critical mission durations plus at least 10 minutes after a possible emergency landing.
- b) The minimum required charging time and lighting condition to ensure the minimum brightness have to be established in the Rotorcraft Flight Manual normal operating procedures.
- c) The background of the photoluminescent emergency exit sign shall not decrease the legibility of the sign in comparison to a sign that is in direct compliance with CS 29.811(d), CS 29.812(e).
- d) In an emergency evacuation situation, under all expected emergency lighting conditions, the photoluminescent exit signs must be clearly legible from the maximum viewing distance, i.e. the distance between the emergency exit and furthest seat position of any passenger expected to use that emergency exit. In addition, it has already been demonstrated that with no emergency lighting operational (black out), photoluminescent exit signs provide a safety benefit when fully charged.
- e) When credit is taken from photoluminescent sign test results, the following limitations/ conditions derived from the test results must be respected:
  - Minimum lighting conditions and exposure time for the charging of the photoluminescent sign considering also possible MMEL conditions, if any.
  - The photoluminescent signs must be consistent with the existing emergency exit sign design (universal symbol signs / 'EXIT').
  - The photoluminescent signs will be installed in locations where the viewing distance respects the worst case of tested viewing distance considering the maximum distance, i.e. the distance between the emergency exit and furthest seat position of any passenger expected to use that emergency exit.

