

Equivalent Safety Finding

Passenger doors locking visual inspection by fibre-optic light

Doc. No.: ESF-D29.783-01

Issue : 1

Date : 06 APR 2021

Proposed \boxtimes Final \square Deadline for comments: 27 APR 2021

SUBJECT : Passenger doors locking visual inspection by fibre-optic light

REQUIREMENTS incl. Amdt. : CS 29.783 (e) Amdt. 2

ASSOCIATED IM/MoC : Yes□ / No ☒

ADVISORY MATERIAL : AC 29-2C

INTRODUCTORY NOTE:

The following Equivalent Safety Finding (ESF) has been classified as important and as such shall be 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."

IDENTIFICATION OF ISSUE:

A request for an Equivalent Safety Finding (ESF) to CS-29 paragraph 29.783 (e) at Amdt.2 was submitted to EASA for a large helicopter design change modifying the basic cabin configuration.

In the original Type Certification design, four inspection holes are present on the helicopter passenger doors, in order to allow direct inspection of the locks and evaluate the state of the door locking system. This provides indication to the crew member that the door is fully locked. The locking system is ensured by four pins engaged on the receptacle on the fuselage and indicated via visible markers inside the inspection holes.

The design change includes the installation of a door liner frame, which covers the inspection holes, thus preventing direct visual inspection of the locking system.

In order to restore the possibility to perform the visual check, four devices, utilizing fibre-optic technology, are located inside the door liners, to restore a visual mean of the actual door engagement.

According to the requirement CS 29.783 subparagraph (e):

"There must be means for direct visual inspection of the locking mechanism by crew members to determine whether the external doors (including passenger, crew, service, and cargo doors) are fully locked. There must be visual means to signal to appropriate crew members when normally used external doors are closed and fully locked."

The fibre-optic light provides a visual signal to indicate whether the door is closed and locked. However, the propose design solution does not allow a direct visual inspection of the locking mechanism (as required by CS 29.783(e)). Nevertheless, according to point 21.8.80(a)(2) of Part-21 (Annex I to Regulation (EU) No 748/2012), it is possible to demonstrate that any airworthiness provisions not complied with are compensated for by factors that provide an equivalent level of safety.





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EASA considers that the proposed design does not directly comply with CS 29.783(e) and compensating factors to support an Equivalent Safety Finding for this Certification Specification need to be demonstrated along the following principles:

- 1. An adequate definition of the actions to be taken by the flight crew in case of an unlocked indication, considering that the flight crew display is not in itself adequate compensation to allow the dispatch of the aircraft
- 2. A full investigation to ensure that there are no mechanical means (e.g. wear, tolerance etc) which would allow the fibre-optic beam to pass through and give a "false-positive" indication that the door is locked when it is not.
- 3. An adequate demonstration that the light remains easy to see, for example in bright sunlight and/or when the indicator is not viewed directly (accepting that the inability to see the light should necessitate further investigations being performed).

Considering all the above, the following Equivalent Safety Finding to CS 29.783 (e) at Amdt. 2 is proposed in Appendix A.



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Appendix A

Equivalent Safety Finding to CS 29.783 (e) Amdt 2

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The following compensating factors must be demonstrated to provide an equivalent level of safety:

- 1. Systems Interface The fibre-optic light system is fully independent from the visual means provided by the Primary Flight Display (PFD) to signal to the flight crew members "when normally used external doors are closed and fully locked". The system is designed so that no mechanical contact can impair the door locking mechanism function.
- 2. Improved Human-Machine Interface The fibre-optic light system facilitates the check by the flight crew of the correct operation of the door locking mechanism. This can be achieved if the light beams are conveyed from the different door positions to a single panel located on the door in a clearly visible location. Thus the occupants can detect a door potentially being unlocked even in case the visual system that is available to the flight crew on the PFD is misleadingly providing the indication that the door is closed and fully locked .
- 3. Operational aspects The Rotorcraft Flight Manual Supplement describes the way the system is intended to function. The procedures in the Rotorcraft Flight Manual Supplement indicate that the helicopter shall not be dispatched in case of:
 - a. Discrepant signals between the door panel and the rotorcraft PFD indication are provided.
 - b. The door panel provides indication that one or more pins are not engaged (door potentially not locked)
- 4. System criticality and related reliability The design reliability has been verified to be commensurate with the criticality level of the failure conditions determined at helicopter and system levels (e.g. door). Failure conditions that are evaluated shall also consider the effects of moisture, temperature, vibrations, and the partial or full part detaching of components from the complete door locking system including deformation of such components.
- 5. Ground test A ground test has been performed to ensure that there is no passenger and crew position in the cabin that might lead to a misleading indication of the door being locked whilst the door is still open. This evaluation shall consider the most detrimental light conditions.
- 6. System installation and maintenance The system installation and consequent maintenance activity have been verified to not be prone to any human error by providing check points over the installation phases. This includes a functional check at the end of the installation, in order to cross-check the correct signal versus the actual door position.