

Notification of a Proposal to issue a Certification Memorandum

Compliance with CS 27/29.952 (a) (4) for Helicopter external installations

EASA CM No.: Proposed CM–S-011 Issue 02 issued 12 March 2021

Regulatory requirements: CS 27/29.865, CS 27/29.952

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EASA Certification Memoranda are living documents into which either additional criteria or additional issues can be incorporated as soon as a need is identified by EASA.

Log of issues

| Issue | Issue date | Change description |
|-------|------------|---|
| 01 | 16/07/2017 | First issue (consulted but not adopted) |
| 02 | 12/03/2021 | Content reviewed to further clarify the importance of a crash resistance fuel bladder. The title is simplified, and the scope is limited to design changes. |

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1. Introduction

1.1. Purpose and scope

The purpose of this Certification Memorandum is to provide specific guidance for the compliance of design changes with CS 27/29.952 (a) (4) [Ref. 3 and 4] for external helicopter installations in the vicinity of fuel tanks. It is also applicable to external loads that are certified in accordance with CS 27/29.865 [Ref. 1 and 2]

1.2. References

It is intended that the following reference material is used in conjunction with this Certification Memorandum (when applicable to the Rotorcraft Certification Basis):

| Reference | Title | Code | Issue | Date |
|-----------|---|----------|---|--------------|
| 1 | CS 27.865-External loads | CS-27 | Initial Issue and all subsequent amendments | 14 /11/2003 |
| 2 | CS 29.865-External loads | CS-29 | Initial Issue and all subsequent amendments | 14/11/ 2003 |
| 3 | CS 27.952-Fuel system crash resistance | CS-27 | Initial Issue and all subsequent amendments | 14 /11/ 2003 |
| 4 | CS 29.952-Fuel system crash resistance | CS-29 | Initial Issue and all subsequent amendments | 14 /11/ 2003 |
| 5 | AC 27.952-d1(i)-Fuel system crash resistance | AC 27-1B | Change 7 and all subsequent amendments | 04/02/ 2016 |
| 6 | AC 29.952-d1(i)-Fuel system crash resistance | AC 29-2C | Change 7 and all subsequent amendments | 04 /02/ 2016 |
| 7 | CM-CS-005-Helicopter External Loads Personnel Carrying Device System | --- | 001 | 08/12/2014 |
| 8 | AMC 27.865- External loads | CS-27 | Issue 6 | 17/12/2018 |
| 9 | AMC 29.865- External loads | CS-29 | Issue 6 | 17/12/2018 |
| 10 | EASA CM-21.A-D-002-External Installations on Helicopters | --- | Issue 01 | 27/09/2019 |
| 11 | ROPWG -task 6- Final analysis report to the aviation rulemaking advisory committee (ARAC) | --- | Issue 1 | 27/09/2018 |

1.3. Abbreviations

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|-------|--|
| AC | FAA Advisory Circular |
| AMC | Accepted Means of Compliance |
| CFR | Code of Federal Regulations |
| CM | Certification Memorandum |
| CS | Certification Specification |
| CRFS | Crash Resistance Fuel System |
| DAH | Design Approval Holder |
| EASA | European Union Aviation Safety Agency |
| FAA | Federal Aviation Agency |
| FAR | Federal Aviation Regulation |
| HEC | Human External Cargo |
| ROPWG | Rotorcraft Occupant Protection Working Group |
| RTC | Restricted Type Certificate |
| STC | Supplement Type Certificate |
| STCH | Supplement Type Certificate Holder |
| TC | Type Certificate |
| TCH | Type Certificate Holder |

1.4. Definitions

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|-------------------------------|--|
| External installations | Refers to external fixtures and external load attaching means. |
| External fixture | A structure external to and in addition to the basic airframe that does not have true jettison capability and has no significant payload capability in addition to its own weight. An example is an agricultural spray boom. These configurations are not approvable as 'External Loads' under CS 29.865 (see AMC 27/29.865 Amendment 6 and all subsequent amendments) |
| External load attaching means | Design feature in addition to the basic airframe related to the carriage of external loads. The related attachment means has a true jettison capability (see definition AMC No 1 to 29.865 §(b)(20)) and is approved under CS 27/29.865 External Loads. |

2. Background

Rotorcraft are operated in a wide range of uses including:

- External cargo operations
- Fire Fighting
- Power line inspection
- News gathering and live event transmission.
- Scientific measurement

For the purpose of the above uses, the installation of externally attached fixtures/loads (storage systems, water tank, external loads attaching means, massive hooks, steps, spray boom, etc.) is common practice.

The related external installations are mainly located under the rotorcraft fuselage, close to the centre of gravity and are often in the vicinity of fuel tanks (generally located below the passenger floor level and/or in the rear fuselage).

For rotorcraft that include the provisions of CS 27/ 29.952 in their certification basis, compliance with CS 27/29.952 (a) (4) - Fuel systems crash resistance, is potentially affected by these external installations.

The installation of a crash resistance fuel bladder has been shown to be the most significant element of an effective craft resistant CRFS [Ref. 11].

EASA also considers that a crash resistance fuel bladder fundamentally contributes to the crashworthiness capability of a rotorcraft. The material of a fuel bladder is typically qualified according to ETSO-C80 Flexible fuel and oil cell material, which ensures that the minimum performance requirements (including a minimum puncture resistance) are achieved.

The purpose of this CM is to clarify to applicants and DAHs of the need to consider potential effect design changes for external installations on the compliance of the design with CS 27/29.952 (a) (4) and provide further guidance on the interpretation of these requirements and their acceptable means of compliance.

3. EASA Certification Policy

3.1. EASA Policy

CS 27/29.952 (a) (4) is applicable to the certification of external installations in the vicinity of fuel tanks.

Each application for a design change should be examined to identify if there are any external installations (such as: equipment, non-jettisonable external load attaching means, hooks, etc., including the associated structural reinforcement) in the vicinity of the fuel tank that could be a contributing hazard to the integrity of the fuel tank in the event of an impact as a result of a crash.

CS 27/29.952 (a) (4) requires the fuel tank to be tested and states that it:

“(…) must be enclosed in a surrounding structure representative of the installation unless it can be established that the surrounding structure is free of projections or other design features likely to contribute to rupture of the tank”.

EASA considers that any external installations [Ref. 7, 8, 9, 10] in the vicinity of a fuel tank are part of the rotorcraft surrounding structure as defined in the CS 27/29 952(a)(4) and therefore can be considered to be a contributing hazard to the fuel tank in the event of a crash. In the case of jettisonable cargo or Human External Cargo (HEC) external loads operations, all parts of the external load attaching means that remain attached to the rotorcraft should be evaluated for compliance with CS 27/29.952(a)(4). This should be conducted despite the fact that CS 27/29.865 on External loads and the related AMC 27/29.865 and AC 27/29.865 (Amendment 27-36/29-43-External load attaching means) do not contain a reference to CS 27/29.952 (a)(4).

FAA AC 27/29.952 d1(i) [Ref. 5 and 6] (which through AMC 27 General and AMC 29 General are considered to be AMC to CS 27/29.952) provides guidance on how to evaluate if the design change constitutes a hazard

to the integrity of the fuel tank when compared to the surrounding structure that is tested in the rotorcraft reference drop test. In addition, the surrounding structure definition in the AC should also be considered to include any equipment that is installed in the vicinity of the fuel tank (above and underneath) for certification.

The guidance for compliance demonstration that is provided in paragraph 3.2 of this CM is considered to be acceptable for EASA.

3.2. Guidance for compliance demonstration

EASA considers that the crash-resistant fuel bladder is the most significant element of an effective CRFS.

For rotorcraft that have been certified with CS 27/29.952 in their certification basis, EASA recommends that for design changes the risk of interaction between the fuel tank and external installations should be minimised. The applicant should consider the following design precautions as necessary:

- Applicants should either install external fixtures/loads out of the boundaries of the fuel tank when possible; or
- Applicants should take benefit from the installation or inclusion of shield and/or fuel tank protection features.

With such design precautions, applicants should be capable of showing that the surrounding structure that is representative of the installation is *“free of projections or other design features likely to contribute to rupture of the tank”* (CS 27/29.952 (a) (4)) without the need for additional compliance demonstration through testing.

In the absence of such design precautions, an additional compliance demonstration will be necessary to evaluate if the design change constitutes an additional hazard to the fuel tank when compared to the surrounding structure used in the rotorcraft reference drop test (see FAA AC 27/29.952 d1(i)).

EASA supports the use of dynamic simulation that is correlated with the certification drop test for this purpose. However, it is not acceptable for dynamic simulation to be used for direct compliance with CS 27/29.952.

3.3. Whom this Certification Memorandum affects

This Certification Memorandum affects all applicants (TC holders, STC holders) who incorporate an external installation in the vicinity of a fuel tank in a rotorcraft type design that was demonstrated to be compliant with CS 27/29.952, or a similar requirement in the applicable airworthiness code (e.g. JAR 27.952, JAR 29.952, FAR 27.952, FAR 29.952, etc.), according to its Certification Basis.

4. Remarks

1. This EASA Proposed Certification Memorandum will be closed for public consultation on the **12th of April 2021**. Comments received after the indicated closing date for consultation might not be taken into account.
2. Suggestions for amendment(s) to this EASA Certification Memorandum should be referred to the Certification Policy and Safety Information Department, Certification Directorate, EASA. E-mail CM@easa.europa.eu.
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