



Notification of a Proposal to issue a Certification Memorandum

Compliance to CS 27/29.952 a(4) for changes affecting surrounding structure (including external installations)

EASA Proposed CM No.: Proposed CM–S-011 Issue 01 issued 06 July 2017

Regulatory requirement(s): CS 27/29.865, CS 27/29.952

In accordance with the EASA Certification Memorandum procedural guideline, the European Aviation Safety Agency proposes to issue an EASA Certification Memorandum (CM) on the subject identified above. All interested persons may send their comments, referencing the EASA Proposed CM Number above, to the e-mail address specified in the “Remarks” section, prior to the indicated closing date for consultation.

EASA Certification Memoranda clarify the European Aviation Safety Agency’s general course of action on specific certification items. They are intended to provide guidance on a particular subject and, as non-binding material, may provide complementary information and guidance for compliance demonstration with current standards. Certification Memoranda are provided for information purposes only and must not be misconstrued as formally adopted Acceptable Means of Compliance (AMC) or as Guidance Material (GM). Certification Memoranda are not intended to introduce new certification requirements or to modify existing certification requirements and do not constitute any legal obligation.

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
001	06.07.2017	First issue.

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1. Introduction

1.1. Purpose and scope

This Certification Memorandum provides further clarification on the need for the verification of compliance to CS 27/29.952 a(4) for external installations in the vicinity of rotorcraft fuel tanks.

1.2. References

It is intended that the following reference materials be used in conjunction with this Certification Memorandum (*when applicable):

Reference	Title	Code	Issue	Date
CS 27.865	External loads	CS-27	---	---
CS 29.865	External loads	CS-29	---	---
CS 27.952a(4)	Fuel system crash resistance	CS-27	---	---
CS 29.952a(4)	Fuel system crash resistance	CS-29	---	---
AC 27.952-d1(i)	Fuel system crash resistance	AC 27-1B	---	---
AC 29.952-d1(i)	Fuel system crash resistance	AC 29-2C	---	---
CM-CS-005	Helicopter External Loads Personnel Carrying Device System	---	001	08/12/2014

1.3. Abbreviations

AC	Advisory Circular
CM	Certification Memorandum
CS	Certification Specification
DAH	Design Approval Holder
EASA	European Aviation Safety Agency
FAA	Federal Aviation Agency
FAR	Federal Aviation Regulation
HEC	Human External Cargo
NHEC	Non-Human External Cargo
STC	Supplement Type Certificate
STCH	Supplement Type Certificate Holder
TC	Type Certificate



TCH Type Certificate Holder

1.4. Definitions

External installation	Refers to external equipment/ fixture and external load attachment means.
External equipment/ 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. These configurations are not approvable as "External Loads" under CS 27/29.865.
External load attachment means	Design feature in addition to the basic airframe used to attach human and non-human cargo loads external to the rotorcraft. The related attachment mean has a true jettison capability and is approved under CS 27/29.865-External Loads.

2. Background

Rotorcraft are operated in wide-ranging missions. The installation of externally attached design features and/or items of mass (equipment, storage systems, water tank, external loads attachments means, massive hooks, steps, spray boom...) close to the fuel tank boundary is common practice.

EASA has recorded a significant number of TC, modifications and STC applications for external installations to fulfil the following types of mission amongst others:

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

Furthermore the changes are mainly installed under the rotorcraft fuselage, close to the rotorcraft 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).

The related design changes range from the simple antenna installations to the attachment of large items of equipment.

Compliance with the provisions contained in CS 27/29.952(a)(4) - Fuel systems crash resistance, are frequently not re-evaluated by prospective DAHs. The applicability of these provisions is frequently debated for the following reasons:

- The STC or change is considered by the applicant to be a local modification with limited effect at rotorcraft level apart from performance aspects.
- The applicant extends the applicability of the change from a rotorcraft with a certification basis pre-amendment 27-30 (FAR 27) or pre-amendment 29-35 (FAR 29) to a rotorcraft with a post-amendment certification basis and fails to consider the applicability of these provisions.
- The perceived limited benefit when compared to required cost of compliance.
- The applicant considers CS 27/29.952(a)(4) as not being applicable to their change due to a different interpretation of the CS and definitions in the AC27-1B and AC29- 2C.
- CS 27/29.952(a)(4) not being cross-referenced in CS 27/29.865 - External loads requirement or in the corresponding paragraph in the AC 27-1B and AC 29- 2C.



The purpose of this CM is to remind applicants and DAHs of the potential impact of design changes on compliance with CS 27/29.952 and provide clarification on the interpretation of these requirements and their associated means of compliance.

3. EASA Certification Policy

3.1. EASA Policy

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

Each project application should be examined to identify if any external installations (such as; equipment, non-jettisonable external load attachment means, hook, etc., including the associated structural reinforcement) in the vicinity of the fuel tank can be considered to be a contributing hazard to the fuel tank in the event of an impact.

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*”. It is the EASA position that external installations should be considered to be part of the surrounding structure and that their impact on compliance with CS 27/29.952 (a)(4) needs to be evaluated.

FAA AC 27/29.952§ d1(i) is an acceptable means of compliance to evaluate if the design change constitutes a hazard to the fuel tank when compared to the surrounding structure tested in the rotorcraft reference drop test.

For these major changes or STCs¹ identified above, the most critical configuration (compared to rotorcraft reference drop test surrounding structure) and the need for a new drop test have to be evaluated.

For external installations that are in the vicinity of the fuel tank that can be shown to be less critical than the structure and design features that were previously certificated and tested with the fuel tank at the time of TC (reference drop test), no additional drop test is required.

In the case of jettisonable NHEC or HEC external loads operation, all parts of the external load attaching means that remain attached to the rotorcraft have to be evaluated for compliance to CS 27/29.952(a)(4) even if CS 27/29.865 External loads and AC 27/29.865 (Amendment 27-36/29-43-External load attaching means) makes no reference to CS 27/29.952(a)(4).

3.2. Guidance for compliance demonstration

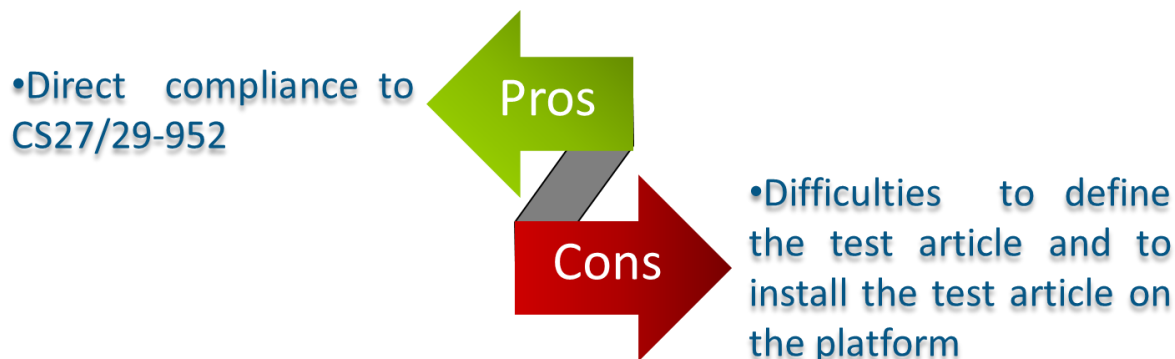
Several alternative/options are offered to demonstrate that the installation is adequately assessed for compliance with CS 27/29.952 and will not constitute a hazard to the fuel tank in the event of an impact.

- Options 1 & 2 would be more feasible for TCHs or STCH supported by TCHs.
- Option 3 may be the best option for STCH when not supported by TCHs.

¹ Applicability remains subject to Commission Regulation (EU) No 748/2012 Part 21.101 criteria as far as the change significance.

3.2.1. Option 1- Dynamic Drop test

The first option is the dynamic drop test showing direct compliance to the CS provisions. The following considerations should be taken into account:



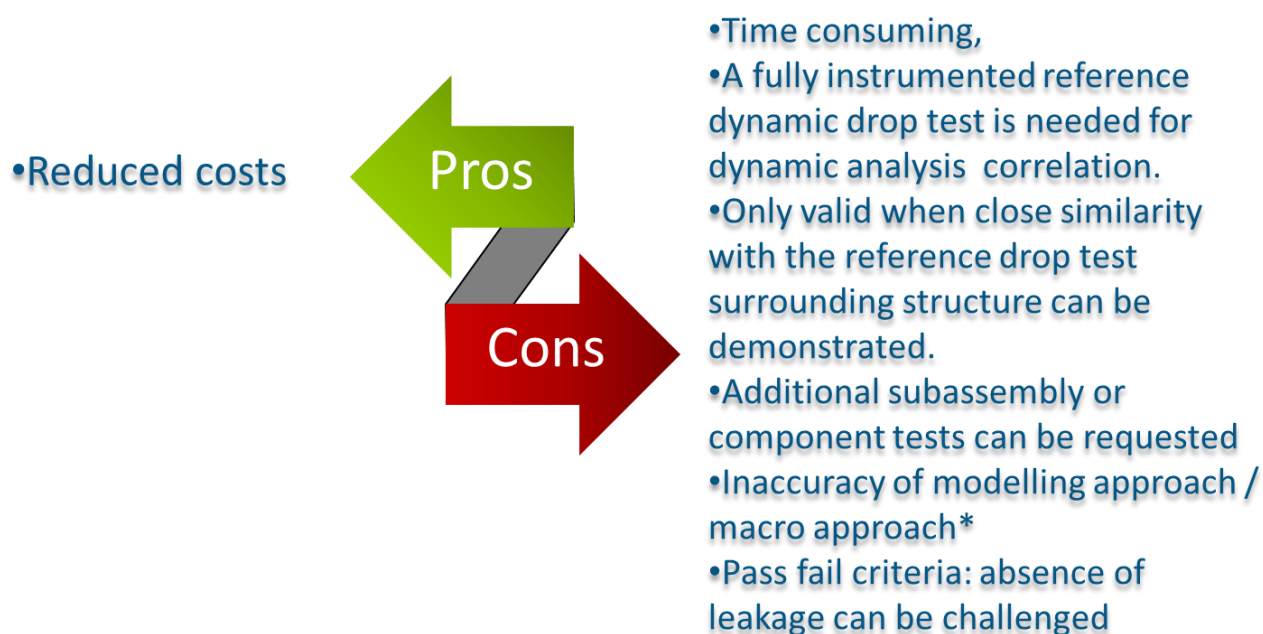
3.2.2. Option 2- Dynamic analysis correlated by a reference dynamic drop test.

The second option is dynamic analysis that is correlated by a reference dynamic drop test.

Indeed, CS 27/29.952 (a) requires a drop test for the most critical fuel tank.

AC 27/29.952 offers the potential to use dynamic analysis in order to show that the added structure does not adversely affect the result of the reference drop test.

In such cases, the following considerations should be taken into account:



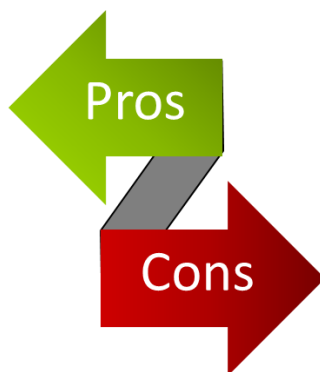
* The ability to determine the consequences of the fracture of composite structure (needles, fibre rupture pattern, local fibre structural properties to puncture a bladder...) on the integrity of the fuel tank. Simulation of fluid dynamics. Correlation of drop speed.

3.2.3. Option 3- Design provisions to minimize the interaction of external equipment with fuel tanks

This option recommends to limit the risk of interaction between the fuel tank and external installations by design (external installations moved out of fuel tank area or installation of fuel tank protections).

In such cases, the following considerations should be taken into account:

•Compliance by design description or partial tests



•Heavy equipment moved away from the fuel tank area usually close to the rotorcraft center of gravity.
•Additional shield/protection features could cause weight penalty.

3.3. Whom this Certification Memorandum affects

This Certification Memorandum affects aircraft types with a certification basis that is derived from:

- JAR 27 and JAR 29
- CS 27 and CS 29
- FAR 27 post-amendment 27-30
- FAR 29 post-amendment 29-35

It also affects changes to rotorcraft with a certification basis after the amendment mentioned above and for which the DAH elects to comply to CS 27/29.952.

4. Remarks

1. This EASA Proposed Certification Memorandum will be closed for public consultation on the **17th of August 2017**. Comments received after the indicated closing date for consultation might not be taken into account.
2. Comments regarding this EASA Proposed Certification Memorandum should be referred to the Certification Policy and Safety Information Department, Certification Directorate, EASA. E-mail CM@easa.europa.eu.
3. For any question concerning the technical content of this EASA Proposed Certification Memorandum, please contact:

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