

CS-27 AMENDMENT 3 - CHANGE INFORMATION

Certification Specifications (CS) are used for establishing the certification basis for applications made after the date of entry into force of a CS including any amendments. Since the complete text of a CS, including any amendments to it, is relevant for establishing the certification basis, the Agency has decided to enact and publish all amendments to CS's as consolidated documents instead of enacting and publishing only the amended text.

Consequently, except for a note '[Amdt 27/3]' under the amended paragraph, the consolidated text of CS-27 does not allow readers to see the detailed changes introduced by the new amendment. To allow readers to also see these detailed changes this document has been created. The same format as for publication of Notices of Proposed Amendments has been used to show the changes:

1. deleted text is shown with a strike through: ~~deleted~~
2. new or changed text is highlighted with grey shading: **new**
3. ...
Indicates that remaining text is unchanged in front of or following the reflected amendment.
...

CS-27 BOOK 1 – AIRWORTHINESS CODE

1. Editorial change to Preamble.

The order of the amendments has been changed to place the latest amendment at the top of the page.

2. Editorial change to Book 1 Cover Page

‘Airworthiness Code’ has been changed to read: ‘Certification Specifications’.

3. Editorial change to Contents

‘**BOOK 1 – AIRWORTHINESS CODE**’ has been changed to read:
‘**BOOK 1 – CERTIFICATION SPECIFICATIONS**’

4. Editorial change to JAR 27.2

JARCS 27.2 Special Retroactive Requirements

(a) reserved

(b) For rotorcraft with a certification basis established prior to 1 May 2001

(1) The maximum passenger seat capacity may be increased to eight or nine provided compliance is shown with all the airworthiness requirements **in effect from the** ~~of this~~ initial issue of CS-27.

(2) The maximum weight may be increased to greater than 2 722 kg (6 000 lbs) provided -

(i) The number of passenger seats is not increased above the maximum number previously certificated; or

(ii) Compliance is shown with all of the airworthiness requirements **in effect from the** ~~of this initial~~ issue of CS-27.

5. Editorial Change to CS 27.547.

CS 27.547 Main rotor structure

(a) Each main rotor assembly (including rotor hubs and blades) must be designed as prescribed in this paragraph.

~~(b) (Reserved)~~

(b) The main rotor structure must be designed to withstand the following loads prescribed in CS 27.337 to 27.341:

(1) Critical flight loads.

- (2) Limit loads occurring under normal conditions of autorotation. For this condition, the rotor rpm must be selected to include the effects of altitude.
- (cd) The main rotor structure must be designed to withstand loads simulating:
 - (1) For the rotor blades, hubs, and flapping hinges, the impact force of each blade against its stop during ground operation; and
 - (2) Any other critical condition expected in normal operation.
- (de) The main rotor structure must be designed to withstand the limit torque at any rotational speed, including zero. In addition:
 - (1) The limit torque need not be greater than the torque defined by a torque limiting device (where provided), and may not be less than the greater of:
 - (i) The maximum torque likely to be transmitted to the rotor structure in either direction; and
 - (ii) The limit engine torque specified in CS 27.361.
 - (2) The limit torque must be distributed to the rotor blades in a rational manner.

Book 1 – Subpart A

6. Editorial Change to CS 27.549.

CS 27.549 Fuselage, landing gear, and rotor pylon structures

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(3) The loads prescribed in CS 27.547(c)(2) and (d).

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Book 1 – Subpart C

7. Create CS 27.573.

CS 27.573: Damage Tolerance and Fatigue Evaluation of Composite Rotorcraft Structures

- (a) Composite rotorcraft structure must be evaluated under the damage tolerance requirements of sub-paragraph (d) unless the applicant establishes that a damage tolerance evaluation is impractical within the limits of geometry, inspectability, and good design practice. In such a case, the composite rotorcraft structure must undergo a fatigue evaluation in accordance with sub-paragraph (e).
- (b) Reserved
- (c) Reserved
- (d) Damage Tolerance Evaluation:

- (1) Damage tolerance evaluations of composite structures must show that Catastrophic Failure due to static and fatigue loads is avoided throughout the operational life or prescribed inspection intervals of the rotorcraft.
- (2) The damage tolerance evaluation must include PSEs of the airframe, main and tail rotor drive systems, main and tail rotor blades and hubs, rotor controls, fixed and movable control surfaces, engine and transmission mountings, landing gear, and any other detail design points or parts whose failure or detachment could prevent continued safe flight and landing.
- (3) Each damage tolerance evaluation must include:
 - (i) The identification of the structure being evaluated;
 - (ii) A determination of the structural loads or stresses for all critical conditions throughout the range of limits in CS 27.309 (including altitude effects), supported by in-flight and ground measurements, except that manoeuvring load factors need not exceed the maximum values expected in service;
 - (iii) The loading spectra as severe as those expected in service based on loads or stresses determined under sub-paragraph (d)(3)(ii), including external load operations, if applicable, and other operations including high torque events;
 - (iv) A Threat Assessment for all structure being evaluated that specifies the locations, types, and sizes of damage, considering fatigue, environmental effects, intrinsic and discrete flaws, and impact or other accidental damage (including the discrete source of the accidental damage) that may occur during manufacture or operation;
 - (v) An assessment of the residual strength and fatigue characteristics of all structure being evaluated that supports the replacement times and inspection intervals established under sub-paragraph (d)(4); and
 - (vi) allowances for the detrimental effects of material, fabrication techniques, and process variability.
- (4) Replacement times, inspections, or other procedures must be established to require the repair or replacement of damaged parts to prevent Catastrophic Failure. These replacement times, inspections, or other procedures must be included in the Airworthiness Limitations Section of the Instructions for Continued Airworthiness required by CS 27.1529.
 - (i) Replacement times must be determined by tests, or by analysis supported by tests to show that throughout its life the structure is able to withstand the repeated loads of variable magnitude expected in-service. In establishing these replacement times, the following items must be considered:
 - (A) Damage identified in the Threat Assessment required by sub-paragraph (d)(3)(iv);
 - (B) Maximum acceptable manufacturing defects and in-service damage (i.e., those that do not lower the residual strength below ultimate design loads and those that can be repaired to restore ultimate strength); and
 - (C) Ultimate load strength capability after applying repeated loads.
 - (ii) Inspection intervals must be established to reveal any damage identified in the Threat Assessment required by sub-paragraph (d)(3)(iv) that may occur from fatigue or other in-service causes before such damage has grown to the

extent that the component cannot sustain the required residual strength capability. In establishing these inspection intervals, the following items must be considered:

- (A) The growth rate, including no-growth, of the damage under the repeated loads expected in-service determined by tests or analysis supported by tests; and
 - (B) The required residual strength for the assumed damage established after considering the damage type, inspection interval, detectability of damage, and the techniques adopted for damage detection. The minimum required residual strength is limit load.
- (5) The effects of damage on stiffness, dynamic behaviour, loads and functional performance must be taken into account when substantiating the maximum assumed damage size and inspection interval.

(e) Fatigue Evaluation:

If an applicant establishes that the damage tolerance evaluation described in subparagraph (d) is impractical within the limits of geometry, inspectability, or good design practice, the applicant must do a fatigue evaluation of the particular composite rotorcraft structure and:

- (1) Identify structure considered in the fatigue evaluation;
- (2) Identify the types of damage considered in the fatigue evaluation;
- (3) Establish supplemental procedures to minimise the risk of Catastrophic Failure associated with damage identified in subparagraph (e)(2); and
- (4) Include these supplemental procedures in the Airworthiness Limitations section of the Instructions for Continued Airworthiness required by CS 27.1529.

Book 1 – Subpart D

7. Editorial change to CS 27.865;

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- (f) The fatigue evaluation of CS 27.571 does not apply to rotorcraft-load combinations to be used for non-human external cargo except for the failure of critical structural elements that would result in a hazard to the rotorcraft. For rotorcraft-load combinations to be used for human external cargo, the fatigue evaluation of CS 27.571 applies to the entire quick-release and personnel-carrying device structural systems and their attachments.

Book 1- Subpart G

8. Editorial change to CS 27.1521;

CS 27.1521 Powerplant limitations

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- (e) Turboshaft engine torque. For rotorcraft with main rotors driven by turboshaft engines, and that do not have a torque limiting device in the transmission system, the following apply:
- (1) A limit engine torque must be established if the maximum torque that the engine can

exert is greater than:

- (i) The torque that the rotor drive system is designed to transmit; or
- (ii) The torque that the main rotor assembly is designed to withstand in showing compliance with CS 27.547(de).

(2) ...

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Book 1 - Appendices

9. Amend Appendix A A27.4 as follows;

Appendix A Instructions for continued Airworthiness

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A27.4 Airworthiness Limitations Section

The instructions for continued airworthiness must contain a section titled airworthiness limitations, that is segregated and clearly distinguishable from the rest of the document. This section must set forth each mandatory replacement time, structural inspection interval, and related structural inspection procedure ~~approved under CS 27.571~~ **required for type-certification**. If the instructions for continued airworthiness consist of multiple documents, the section required by this paragraph must be included in the principal manual. This section must contain a legible statement in a prominent location that reads: ‘the airworthiness limitations section is approved and variations must also be approved.’