CS-27 AMENDMENT 2 - 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. 27/2" 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. text not affected by the new amendment remains the same: unchanged
2. deleted text is shown with a strike through: ~~deleted~~
3. new text is highlighted with grey shading: new
4. ....
   Indicates that remaining text is unchanged in front of or following the reflected amendment.
   ....

CS-27 BOOK 1 – AIRWORTHINESS CODE

1. Amend CS 27.1305 to remove reference to AMC 27.1305 (t) and (u).

CS 27.1305 Powerplant instruments

The following are the required powerplant instruments:
…
(t) For rotorcraft for which a 30-second/2-minute OEI power rating is requested, a means must be provided to alert the pilot when the engine is at the 30-second and 2-minute OEI power levels, when the event begins, and when the time interval expires. ~~(See AMC 27.1305 (t) and (u).)~~

(u) For each turbine engine utilising 30-second/2-minute OEI power, a device or system must be provided for use by ground personnel which:

(1) Automatically records each usage and duration of power in the 30-second and 2-minute OEI levels ~~(See AMC 27.1305 (t) and (u).)~~;

(2) …

…

2. Amend Appendix A A27.3(b) to remove reference to AMC Appendix A A27.3.

Appendix A – Instructions for Continued Airworthiness

…

A27.3 Content

(a) …

(b) *Maintenance instructions* ~~(See AMC Appendix A, Paragraph A27.3 (b).)~~

…

3. Amend CS-27 Appendix C to refer to AC 29-2C Change 2 dated 25 April 2006

C27.2 *Applicable CS–29 paragraphs*. The following paragraphs of CS–29 must be met in addition to the specifications of this code:

…

29.547(a) and (b)	–	Main and tail rotor structure.
(29.571	–	Fatigue evaluation of structure.) AC Material only: ~~AC 29-2C Change 1 dated 12 February 2003~~ AC 29-2C Change 2 dated 25 April 2006, Paragraph AC29.571A.b(2).
29.861(a)	–	Fire protection of structure, controls and other parts.
...		
29.1587(a)	–	Performance information.

(See ~~AC 29-2C Change 1 dated 12 February 2003~~ AC 29-2C Change 2 dated 25 April 2006 and AMC material to CS–29)

CS-27 BOOK 2 - ACCEPTABLE MEANS OF COMPLIANCE (AMC)

4. Amend AMC 27 General to refer to AC 27-1B Change 2

AMC 27 General

1. The AMC to CS–27 consists of FAA ~~AC 27-1B Change 1 dated 12 February 2003~~ AC 27-1B Change 2 dated 25 April 2006 with the changes/additions given in this Book 2 of CS–27.

2. The primary reference for each of these AMCs is the CS–27 paragraph. Where there is an appropriate paragraph in FAA AC 27-1B Change 2 dated 25 April 2006 ~~AC 27–1B Change 1 dated 12 February 2003~~ this is added as a secondary reference.

5. Add a new AMC 27.351 to provide additional guidance for compliance with the EASA's interpretation of CS 27.351.

AMC 27.351
Yaw manoeuvre conditions

1. Introduction

This AMC provides further guidance and acceptable means of compliance to supplement FAA AC 27-1B Change 2 (AC 27.351. § 27.351 (Amendment 27-26) YAWING CONDITIONS), to meet the Agency's interpretation of CS 27.351. As such it should be used in conjunction with the FAA AC but take precedence over it, where stipulated, in the showing of compliance.

Specifically, this AMC addresses two areas where the FAA AC has been deemed by the Agency as being unclear or at variance to the Agency's interpretation. These areas are as follows:

a. Aerodynamic Loads

The certification specification CS 27.351 provides a minimum safety standard for the design of rotorcraft structural components that are subjected in flight to critical loads combinations of anti-torque system thrust (e.g. tail rotor), inertia and aerodynamics. A typical example of these structural components is the tailboom.

However, compliance with this standard according to FAA AC 27-1B Change 2 may not necessarily be adequate for the design of rotorcraft structural components that are principally subjected in flight to significant aerodynamic loads (e.g. vertical empennage, fins, cowlings and doors).

For these components and their supporting structure, suitable design criteria should be developed by the Applicant and agreed with the Agency.

In lieu of acceptable design criteria developed by the applicant, a suitable combination of sideslip angle and airspeed for the design of rotorcraft components subjected to aerodynamic loads may be obtained from a simulation of the yaw manoeuvre of CS 27.351, starting from the initial directional control input specified in CS 27.351(b)(1) and (c)(1), until the rotorcraft reaches the maximum overswing sideslip angle resulting from its motion around the yaw axis.

b. Interaction of System and Structure

Maximum displacement of the directional control, except as limited by pilot effort (CS 27.397(a)), is required for the conditions cited in the certification specification. In the load evaluation credit may be taken for consideration of the effects of control system limiting devices.

However, the probability of failure or malfunction of these system(s) should also be considered and if it is shown not to be extremely improbable then further load conditions with the system in the failed state should be evaluated. This evaluation may include Flight Manual

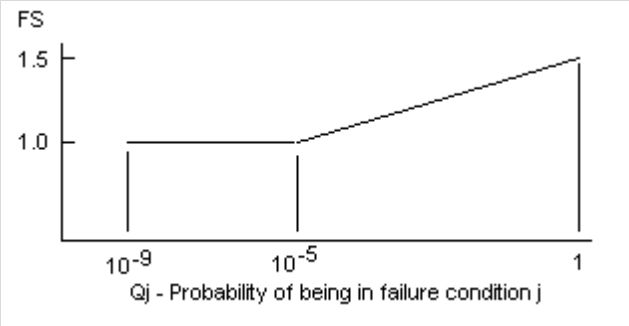
Limitations, if failure of the system is reliably indicated to the crew.

A yaw limiting device is a typical example of a system whose failed condition should be investigated in the assessment of the loads requested by CS 27.351.

An acceptable methodology to investigate the effects of all system failures not shown to be extremely improbable on the loading conditions of CS 27.351 is as follows:

i) With the system in the failed state and considering any appropriate reconfiguration and flight limitations, it should be shown that the rotorcraft structure can withstand without failure the loading conditions of CS 27.351, when the manoeuvre is performed in accordance with the provisions of this AMC.

ii) The factor of safety to apply to the above specified loading conditions to comply with CS 27.305 is defined in the figure below.



$Q_j = (T_j)(P_j)$

where:

T_j = Average flight time spent with a failed limiting system j (in hours)

P_j = Probability of occurrence of failure of control limiting system j (per hour)

Note: If Pj is greater than $1x10^{-3}$ per flight hour then a 1.5 factor of safety should be applied to all limit load conditions evaluated for the system failure under consideration.

6. Remove AMC 27.602: Critical Parts

~~**AMC 27.602**~~
~~**Critical Parts**~~

~~1 Explanation~~

~~The objective of a identifying critical parts is to ensure that critical parts are controlled during design, manufacture and throughout their service life so that the risk of failure in service is minimised by ensuring that the critical parts maintain the critical characteristics on which certification is based. Many rotorcraft manufacturers already have procedures in place within their companies for handling "critical parts". These may be required by their dealings with other customers, frequently military (e.g. US DoD, UK MoD, Italian MoD). Although these programmes may have slightly different definitions of "critical parts" and have sometimes been called "flight safety parts", "critical parts", "vital parts", or "identifiable parts", they have in the past been accepted as meeting the intent of this requirement and providing the expected level of safety.~~

~~2 Procedures~~

~~A Critical Parts Plan should be established. The policies and procedures which constitute that plan should be such as to ensure that –~~

~~a. All critical parts of the rotorcraft are identified by means of a failure assessment and a critical parts list is established. The use of the word "could" in paragraph 27.602(a) of the rule means that this failure assessment should consider the effect of flight regime (i.e. forward flight, hover, etc.). The operational environment need not be considered. With respect to this rule, the term "catastrophic" means the inability to conduct an autorotation to a safe landing, without exceptional piloting skills, assuming a suitable landing surface.~~

~~b. Documentation draws the attention of the personnel involved in the design, manufacture, maintenance, inspection, and overhaul of a critical part to the special nature of the part and details the relevant special instructions. For example all drawings, work sheets, inspection documents etc, could be prominently annotated with the words 'critical part' or equivalent and the instructions for continued airworthiness and overhaul manuals (if applicable) should clearly identify critical parts and include the needed maintenance and overhaul instructions. The documentation should:~~

~~(1) Contain comprehensive instructions for the maintenance, inspection and overhaul of critical parts and emphasise the importance of these special procedures;~~

~~(2) Indicate to operators and overhaulers that unauthorised repairs or modifications to critical parts may have hazardous consequences;~~

~~(3) Emphasise the need for careful handling and protection against damage or corrosion during maintenance, overhaul, storage, and transportation and the need for accurate recording and control of service life (if applicable).~~

~~(4) Require notification to the manufacturer of any unusual wear or deterioration of critical parts and the return of affected parts for investigation when appropriate;~~

~~c. To the extent needed for control of critical characteristics, procedures and processes for manufacturing critical parts (including test articles) are defined (for example material source, forging procedures, machining operations and sequence, inspection techniques, and acceptance and rejection criteria). Procedures for changing these manufacturing procedures should also be established.~~

~~d. Any changes to the manufacturing procedures, to the design of a critical part, to the approved operating environment, or to the design loading spectrum are evaluated to establish the effects, if any, on the fatigue evaluation of the part.~~

~~e. Materials review procedures for critical parts (i.e. procedures for determining the disposition of parts having manufacturing errors or material flaws) are in accordance with paragraphs c. and d. above.~~

~~f. Critical parts are identified as required and relevant records relating to the identification are maintained such that it is possible to establish the manufacturing history of the individual parts or batches of parts.~~

~~g. The critical characteristics of critical parts produced in whole or in part by suppliers are maintained."~~

7. Add a new AMC 27.865 to provide guidance for Class D HEC operations:

AMC 27.865
Class D (Human External Cargo) for Operations within Europe

1. Introduction

This Additional EASA AMC, used in conjunction with FAA guidance[1] on Human External Cargo (HEC), provides an acceptable means of compliance with CS 27.865 for rotorcraft intended for Class D Rotorcraft/Load Combinations (RLC) for the carriage of Human External Cargo (HEC). For all other RLC classes, reference should be made directly to the adopted FAA AC material.

The addition of this AMC has been necessary due to a difference in operational requirements within the USA and Europe and the absence of dedicated material within the FAA AC.

2. Basic Definition and Intended Use

A Class D RLC is one where personnel are at some point in the operation transported external to the rotorcraft, and the operator receives compensation from or on behalf of the person(s) being transported. e.g. Transfer of personnel to/from a ship.

3. Certification Considerations

Class D HEC was originally envisaged for Part 29/CS-29 rotorcraft only. However, CS-27 rotorcraft which have been shown to comply with the engine isolation specifications of CS-27 Appendix C are also eligible.

The rotorcraft must be certified for an OEI/OGE hover performance weight, altitude and temperature envelope. This becomes the maximum envelope that can be used for Class D HEC operations.

4. Compliance Procedures

4.1 The rotorcraft is required to meet the Category A engine isolation specifications of CS-27 Appendix C, and have One Engine Inoperative/Out of Ground Effect (OEI/OGE) hover performance capability in its approved, jettisonable HEC weight, altitude, and temperature envelope.

(i) In determining OEI hover performance, dynamic engine failures should be considered. Each hover verification test should begin from a stabilized hover at the maximum OEI hover weight, at the requested in-ground-effect (IGE) or OGE skid or wheel height, and with all engines operating. At this point the critical engine should be failed and the aircraft should remain in a stabilized hover condition without exceeding any rotor limits or engine limits for the operating engine(s). As with all performance testing, engine power should be limited to minimum specification power. Engine failures may be simulated by rapidly moving the throttle to idle provided a 'needle split' is obtained between the rotor and engine RPM.

(ii) Normal pilot reaction time should be used following the engine failure to maintain the stabilized hover flight condition. When hovering OGE or IGE at maximum OEI hover weight, an engine failure should not result in an altitude loss of more than 10 percent or four (4) feet, whichever is greater, of the altitude established at the time of engine failure. In either case, sufficient power margin should be available from the operating engine(s) to regain the altitude lost during the dynamic engine failure and to transition to forward flight.

[1] See reference in AMC 27 General

(iii) Consideration should also be given to the time required to recover or manoeuvre the Class D external load and to transition into forward flight. For example to winch up and bring aboard personnel in hoisting operations or manoeuvre clear of power lines for fixed strop/basket operations. The time necessary to perform such actions may exceed the short duration OEI power ratings. For example, for a helicopter with a 30sec/2 min rating structure that sustains an engine failure at a height of 40 feet, the time required to re-stabilise in a hover, recover the external load (given the hoist speed limitations), and then transition to forward flight (with minimal altitude loss) would likely exceed 30 seconds and a power reduction into the 2 minute rating would be necessary.

(iv) The Rotorcraft Flight Manual (RFM) should contain information that describes the expected altitude loss, any special recovery techniques, and the time increment used for recovery of the external load when establishing maximum weights and wheel or skid heights. The OEI hover chart should be placed in the performance section of the RFM or RFM supplement. Allowable altitude extrapolation for the hover data should not exceed 2000 feet.

4.2 For helicopters that incorporate engine driven generators, the hoist should remain operational following an engine or generator failure. A hoist should not be powered from a bus that is automatically shed following the loss of an engine or generator. Maximum two-engine generator loads should be established so that when one engine or generator fails, the remaining generator can assume the entire rotorcraft electrical load (including the maximum hoist electrical load) without exceeding approved limitations.

4.3 The external load attachment means and the personnel carrying device should be shown to meet the specifications of CS 27.865(a) for the proposed operating envelope.

4.4 The rotorcraft is required to be equipped for, or otherwise allow, direct intercommunication under any operational conditions among crew members and the HEC. For RCL Class D operations, two-way radios or intercoms should be employed.

8. Remove AMC 27.1305 (t) and (u): 2-Minute and 30-Second OEI Power Level

~~**AMC 27.1305 (t) and (u)**~~
~~**2-Minute and 30-Second OEI Power Level**~~

~~For the purpose of complying with CS 27.1305(t) and (u), the 2-minute OEI power level is considered to be achieved whenever one or more of the operating limitations applicable to the next lower OEI power rating is exceeded. The 30-second OEI power level is considered to be achieved whenever one or more of the operating limitations applicable to the 2-minute OEI power rating is exceeded.~~

9. Add a new AMC MG4 to clarity EASA certification procedures for FADEC systems

AMC MG4
Full Authority Digital Electronic Controls (FADEC)

Note: Certification procedures identified in MG4 refer specifically to the FAA regulatory system. For guidance on EASA procedures, reference should be made to Commission Regulation (EC) No 1702/2003 (as amended) (Part-21), AMC-20 (and specifically AMC 20-1 and 20-3) and to EASA internal working procedures, all of which are available on EASA's web

site: http://www.easa.europa.eu/