

NOTICE OF PROPOSED AMENDMENT (NPA) No 2007-17

**DRAFT DECISION OF THE EXECUTIVE DIRECTOR OF THE EUROPEAN AVIATION
SAFETY AGENCY**

amending Decision No 2003/15/RM of the Executive Director of the European
Aviation Safety Agency of 14 November 2003
on
certification specifications, including airworthiness codes and acceptable means of
compliance for small rotorcraft (« CS-27 »)

And

**DRAFT DECISION OF THE EXECUTIVE DIRECTOR OF THE EUROPEAN AVIATION
SAFETY AGENCY**

amending Decision No 2003/16/RM of the Executive Director of the European
Aviation Safety Agency of 14 November 2003
on
certification specifications for large rotorcraft (« CS-29 »)

And

**DRAFT DECISION OF THE EXECUTIVE DIRECTOR OF THE EUROPEAN AVIATION
SAFETY AGENCY**

amending Decision No 2003/17/RM of the Executive Director of the European
Aviation Safety Agency of 14 November 2003
on
certification specifications, including airworthiness codes and acceptable means of
compliance for very light rotorcraft (« CS-VLR »)

ADVISORY CIRCULARS REVISION (AC Revision)

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A. EXPLANATORY NOTE

I. General

1. The purpose of this Notice of Proposed Amendment (NPA) is to envisage amending Executive Director's Decisions 2003/15/RM¹ Certification Specifications for small rotorcraft (CS-27), Executive Director's Decisions 2003/16/RM² Certification Specifications for large rotorcraft (CS-29) and Executive Director's Decisions 2003/17/RM³ Certification Specifications for very light rotorcraft (CS-VLR). The scope of this rulemaking activity is outlined in Terms of Reference (ToR) 27&29.012 and is described in more detail below.
2. The Agency is directly involved in the rule-shaping process. It assists the Commission in its executive tasks by preparing draft regulations, and amendments thereof, for the implementation of the Basic Regulation⁴, which are adopted as "Opinions" (Article 14(1)). It also adopts Certification Specifications, including Airworthiness Codes and Acceptable Means of Compliance and Guidance Material to be used in the certification process (Article 14(2)).
3. When developing rules, the Agency is bound to following a structured process as required by Article 43(1) of the Basic Regulation. Such process has been adopted by the Agency's Management Board and is referred to as "The Rulemaking Procedure"⁵.
4. This rulemaking activity is included in the Agency's rulemaking programme for 2008. It implements the rulemaking task 27&29.012: AC Revision.
5. The text of this NPA has been developed by the Agency. It is submitted for consultation of all interested parties in accordance with Article 43 of the Basic Regulation and Articles 5(3) and 6 of the EASA rulemaking procedure.

II. Consultation

6. To achieve optimal consultation, the Agency is publishing the draft decisions of the Executive Director on its internet site. Comments should be provided within 3 months in accordance with Article 6(4) of the EASA rulemaking procedure. Comments on this proposal may be forwarded (*preferably by e-mail*), using the attached comment form, to:

CRT: Send your comments using the Comment-Response Tool (CRT) available at <http://hub.easa.europa.eu/crt/>

By e-mail: In case the use of CRT is prevented by technical problems these should be reported to the [CRT webmaster NPA@easa.europa.eu](mailto:NPA@easa.europa.eu)

1 Decision No 2003/15/RM of the Executive Director of the Agency of 14.11.2003 on certification specifications, including airworthiness codes and acceptable means of compliance for small rotorcraft (« CS-27 »)

2 Decision No 2003/16/RM of the Executive Director of the Agency of 14.11.2003 on certification specifications for large rotorcraft (« CS-29 »)

3 Decision No 2003/17/RM of the Executive Director of the Agency of 14.11.2003 on certification specifications, including airworthiness codes and acceptable means of compliance for very light rotorcraft (« CS-VLR »)

4 Regulation (EC) No 1592/2002 of the European Parliament and of the Council of 15 July 2002 on common rules in the field of civil aviation and establishing a European Aviation Safety Agency (OJ L 240, 07/09/2002, p.1). Regulation as last amended by Regulation (EC) No 334/2007 (OJ L 88, 29.3.2007, p. 39).

5 Management Board Decision concerning the procedure to be applied by the Agency for the issuing of opinions, certification specifications and guidance material ("Rulemaking Procedure"), EASA MB/8/07, 13.6.2007

By correspondence: If you do not have access to internet or e-mail you can send your comment by mail to:

Process Support
Rulemaking Directorate
EASA
Ref: NPA 2007-17
Postfach 10 12 53
D-50452 Cologne
Germany

Comments should be received by the Agency by 05 March 2008. If received after this deadline they might not be taken into account

III. Comment response document

7. All comments received in time will be responded to and incorporated in a comment response document (CRD). This may contain a list of all persons and/or organisations that have provided comments. The CRD will be available on the Agency's website and in the Comment-Response Tool (CRT).

IV. Content of the draft decisions

8. This proposal aims to adopt Federal Aviation Administration (FAA) Advisory Circular (AC) 27-1B Change 2 and FAA AC 29-2C Change 2, published by the FAA on 25th April 2006, as Acceptable Means of Compliance (AMC) to CS-27, CS-29 and CS-VLR. Where the FAA AC does not fully cover European rules or EASA interpretation of the rules, additional AMC has been developed and added to Book 2 of the Certification Specifications (CSs). Also, where existing Book 2 AMC is now fully contained within the FAA AC revision, these AMCs are removed.

V. Regulatory Impact Assessment

9. This NPA addresses AMC only and will have no significant impact. Adoption of the FAA AC will provide greater harmonisation in the acceptable means of compliance required by FAA and EASA. Where existing differences in FAA/EASA policy/rules/interpretation are present, additional AMC in Book 2 of the CSs aims to highlight these differences and to provide prior knowledge to applicants which is clear and transparent in order that they can plan accordingly.

B. BACKGROUND & DISCUSSION

I. Background

10. The EASA rotorcraft Certification Specifications (CS-27/29/VLR) make extensive use of FAA ACs and, together with the changes/additions given in Book 2 of the CSs, form Acceptable Means of Compliance (AMC) for demonstrating compliance with the CSs. The use of FAA AC material in the European certification system has a long history, dating back to the original publication of JAR-27/29. It is made possible by the near harmonisation of FAR Parts 27 and 29 with CS-27 and CS-29 respectively. Retaining a single, harmonised book of AC/AMC has many benefits and is an efficient and cost effective means of regulation.
11. The FAA AC material is reviewed and maintained on a two year revision cycle to ensure that it remains both relevant and up-to-date. It is intended to identify and correct editorial/clarification issues which have arisen in practice and is specifically limited to cover non-controversial issues. Any significant issues which are highlighted are normally addressed outside of this review cycle through dedicated harmonisation working groups and within specified Terms of Reference.

However, once AC material is mature and has undergone public consultation, it is included in the final publication of the revised AC 27 and AC 29.

12. The AC revision process was previously coordinated through the JAA Rotorcraft Steering Group (RSG), which had representatives from FAA, National Aviation Authorities (NAAs) and both USA and European manufacturing industry. It therefore ensured the active involvement of all interested parties.
13. In 2003, prior to the start of EASA, the FAA initiated the AC 2006 review with the aim of updating the AC material for publication in 2006. Many of the proposed changes were initiated at the request of European organisations and were in progress during the transition from JAA to EASA. However, prior to completion of this revision, the RSG was disbanded and the FAA progressed this activity with no or limited support from NAAs/EASA. In April 2006, the FAA published the AC revisions as AC 27-1B Change 2 and AC 29-2C Change 2.
14. CS-27/29/VLR Book 2 currently references the previous (2003) AC revision. In order to accept the latest (2006) AC revision, the EASA created rulemaking task 27&29.012 to review the FAA published revision and to determine the acceptance of the published material. A rulemaking group was established under a dedicated ToR¹ and with a group composition² consisting of FAA, EASA and NAAs.
15. The EASA rulemaking group concluded the following:
 - Subject to specific issues discussed below in the Explanation of Changes, the revised ACs could be proposed for acceptance as AMC and included by reference in Book 2 of the CSs.
 - The group noted that some comments previously submitted by European interested parties had not been fully dispositioned by the FAA prior to publication. However, these issues were considered not to be sufficiently major to prevent acceptance of the revision. The comments have been duly noted and will be taken forward for consideration in the next AC revision cycle.
 - It was noted that compliance methods for some issues (notably: External Loads and Night Vision Imaging Systems (NVIS)), had progressed considerably since publication of the revised ACs, and that the latest AC could no longer be considered as providing up-to-date guidance. However, as these issues were still subject to on-going discussions and no new guidance material was available, no further action was proposed at this time. Once harmonised AC/AMC is agreed, it will be included in the CS following a new NPA process.
16. Appendix 1 summarises the changes made in updating to AC 27-1B Change 2 and AC 29-2C. The complete revised text can be viewed on the FAA web site by following the links below:

AC 27-1B Change 2:

http://www.airweb.faa.gov/Regulatory_and_Guidance_Library/rgAdvisoryCircular.nsf/0/8C8DDE08737322428625719D0066C561?OpenDocument

AC 29-2C Change 2:

http://www.airweb.faa.gov/Regulatory_and_Guidance_Library/rgAdvisoryCircular.nsf/0/21891FD4AB8418EC8625719D0066C2EA?OpenDocument

¹ <http://www.easa.eu.int/doc/Rulemaking/ToR%2027&29.012.pdf>

² <http://www.easa.eu.int/doc/Rulemaking/GC%2027&29.012.pdf>

II. Explanation of Changes

a) Proposal Related to CS-27

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

With the removal of AMC 27.1305 (t) and (u), (See Proposal 8), references to these AMCs from CS 27.1305 (t) and CS 27.1305 (u)(1) are no longer valid and are removed.

Proposal 2: Amend CS-27 Appendix A A27.3 (b) to remove reference to AMC Appendix A A27.3 (b)

The reference is obsolete and is removed. AMC Appendix A A27.3 (previously ACJ Appendix A A27.3) was deleted by JAR-27 Amendment 3 dated April 2002.

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

Updates references to the latest FAA AC revision.

Proposal 4: Amend CS-27 Book 2, AMC 27 General, para 2, to refer to AC 27-1B Change 2

Updates the reference to the latest FAA AC revision.

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

FAR/CS 27.351 has been a controversial issue for many years, with different interpretations being applied amongst manufacturers and certifying authorities. In 1999 the JAA/FAA initiated the Yawing Conditions Working Group (YCWG) as a harmonisation task with the aim of providing additional clarification through changes to the associated AC. However, the WG completed its tasking without reaching full consensus on three issues, namely: the use of the sideslip/velocity diagram, the use of yaw limiting devices and environmental effects. FAA AC 27.351 (Amendment 27-26), as introduced in AC 27-1B Change 2 dated 25 April 2006, is derived from material developed by the YCWG.

EASA is concerned on wider issues regarding FAR/CS 27.351 and its applicability to modern rotorcraft designs, which have a greater yawing capability than was envisaged when the certification specification was previously developed. This issue, together with the controversial issues left unresolved within the YCWG are currently the subject of a dedicated EASA yawing conditions rulemaking task (Rulemaking Task 27&29.003) and a group is currently active.

Although EASA has found no evidence of catastrophic structural failure due directly to loads arising from yawing conditions, several examples of service incidents indicate that high sideslip angles, well above the 15 degrees stipulated in the certification specification have been achieved at high speed close to V_h resulting from tail rotor malfunctions or atmosphere disturbances. These examples showed that the rotorcraft had sufficient control capability to permit a recovery from such conditions or to perform a safe emergency landing/ditching. However, it is EASA's view that recovery was aided by the robust structural design of these rotorcraft, which had been designed to comply with more stringent yawing conditions (e.g. British Civil Airworthiness Requirements (BCAR) Section G or military requirements MIL-S-8698, DEF STAN 00-970), and that designing to the standards proposed in the latest revision of the FAA AC, would not provide the same margins of safety. EASA experience to date (e.g.

EC130, AB139, S92), shows that the limit sideslip angle proposed under CS 27.351 can be easily exceeded by modern rotorcraft. EASA wish to ensure that modern rotorcraft have a structural capability that is appropriate in relation to their manoeuvre capability. It is EASA's belief that the interpretation placed in AC 27.351 (Amendment 27-26) represents an erosion of these safety margins.

Following extensive review of the certification specifications, recent certification practice, discussions held within the EASA yawing conditions rulemaking group, and available service data, EASA has concluded that two aspects of the AC need further enhancement. These are identified as follows:

1. AC 27.351 (Amendment 27-26) established the defined sideslip angles required for the analysis as the limiting angles and disregards transient conditions beyond the limit. While this has been demonstrated to be acceptable for the design of modern helicopter structure subject to critical load combinations of anti-torque system thrust (e.g. tail rotor), inertia and aerodynamics, it does not represent an appropriate conservative standard for other structure which are primarily subjected in flight to significant aerodynamic loads (e.g. vertical empennage, fins, cowlings, doors, etc). This has been recognised by members of the EASA yawing conditions rulemaking group and a recommendation to change FAA Part 27.351 and/or a new rule is currently being developed to provide clarification of the manoeuvre to be performed.
2. The contents of AC 27.351 (Amendment 27-26) concerning failure of control system devices is poorly worded and could lead to non-compliance with CS 27.305, if misinterpreted.

In order to adopt FAA AC 27-1B Change 2 as AMC to CS-27, it is necessary to create additional AMC to CS-27 to address EASA's concerns. Failure to take this action would result in AC 27.351 (Amendment 27-26) becoming acceptable means of compliance with the certification specification, once AC 27-1B Change 2 was adopted, and any attempt by EASA to apply higher standards within individual certification programmes could then be challenged.

The new AMC represents a minimum standard acceptable to EASA, based on existing knowledge. Concerns EASA has regarding environmental effects have yet to be substantiated and do not form part of this proposed AMC. This issue will be discussed further in the Rulemaking Group. In due course, this AMC will be amended to align with the recommendations arising from the EASA group.

Proposal 6: Remove AMC 27.602: Critical Parts

Harmonised AC to CS 27.602 is now contained within AC 27-1B Change 2. AMC 27.602 is therefore removed as being obsolete.

Proposal 7: Add a new AMC 27.865 to provide guidance for Class D Human External Cargo (HEC) operations

In the USA, Class D HEC operations by Part 27 helicopters are prohibited under FAR Part 133.45. However, prior to publication of AC 27-1B Change 2, FAA published guidance for Class D HEC operations of Part 27 helicopters, primarily to support European operations, which are permitted under JAR.OPS 3 for aircraft that meet the Category A engine isolation specifications of CS-27 Appendix C.

With the withdrawal of guidance in AC 27-1B Change 2, a new AMC is added to fill the hole left and is based on the current AC 29.865.

Proposal 8: Remove AMC 27.1305(t) and (u): 2-Minute and 30-Second One Engine Inoperative (OEI) Power Level

AMC 27.1305(t) and (u) "2-Minute and 30-Second OEI Power Level" is deleted from Book 2 as the text had previously been incorporated in AC 27-1B Change 1 dated 12/02/2003.

b) Proposals related to CS-29

Proposal 1: Amend CS 29.1305 to remove reference to AMC 29.1305(a)(25) and (26)

With the removal of AMC 29.1305 (a)(25) and (26), (See Proposal 7), references to these AMCs from CS 29.1305 are no longer valid and are removed.

Proposal 2: Amend CS 29.1587 to remove reference to AMC 29.1587

Reference to AMC 29.1587 from CS 29.1587 is removed. AMC 29.1587 (previously ACJ 29.1587) was deleted from JAR-29 at Change 1 in December 1999.

Proposal 3: Amend CS-29 Appendix A A29.3(b)(2) to remove reference to AMC Appendix A A29.3(b)(2)

The text of AMC to Appendix A A29.3(b)(2) is now included in FAA AC 29-2C Change 2 Appendix A: Instructions for continued airworthiness.

Proposal 4: Amend CS-29 Book 2, AMC 29 General, to refer to AC 29-2C Change 2

Updates references to the latest FAA AC revision.

Proposal 5: Add a new AMC 29.351 to provide additional guidance for compliance with the EASA's interpretation of CS 29.351

FAA AC 29.351B (Amendment 29-40) is derived from the output of the YCWG. The working group completed its tasking without reaching full consensus on three issues, namely: the use of the sideslip/velocity diagram, the use of yaw limiting devices and environmental effects. Following extensive reviews of the proposed FAA AC, recent certification practice and available in-service data, EASA has concluded that the AC represents a reduced standard, and at a time when modern rotorcraft have higher yaw capability. With the exception of the environmental effect, which is still subject to review, an additional AMC is added to Book 2 to provide further guidance in meeting the EASA's interpretation of the CS 29.351.

(See also Proposal 5 for CS-27 above).

Proposal 6: Remove AMC 29.602: Critical Parts

Harmonised AC/AMC to CS 29.602 is now contained within AC 29-2C Change 2. AMC 29.602 is therefore removed as being obsolete.

Proposal 7: Remove AMC 29.1305(a)(25) and (26): 2-Minute and 30-Second OEI Power Level

AMC 29.1305(a)(25) and (26) "2-Minute and 30-Second OEI Power Level" is deleted from Book 2 as the text had previously been incorporated into AC 29-2C Change 1 dated 12/02/2003. (See AC 29.1305B. 29.1305 (Amendment 29-34)).

Proposal 8: Remove AMC to Appendix A A29.3(b)(2): Maintenance Instructions

The text of AMC to Appendix A A29.3(b)(2) is now included in FAA AC 29-2C Change 2 Appendix A: Instructions for continued airworthiness.

c) Proposals related to CS-VLR

Proposal 1: Amend CS VLR.602 to remove reference to AMC VLR.602

The reference to AMC VLR.602 is deleted as the AMC is deleted and is superseded by AC 27.602 contained within AC 27-1B Change 2 (see Proposal 4).

Proposal 2: Amend CS-VLR Book 2, AMC VLR General to refer to AC 27-1B Change 2

Updates the reference to the latest FAA AC revision.

Proposal 3: Add a new AMC VLR.351 to provide additional guidance for compliance with the EASA's interpretation of CS VLR.351

FAA AC 27.351 (Amendment 27-26) is derived from the "majority position" developed by the ARAC Yawing Conditions working group. The WG completed its tasking without reaching full consensus on three issues, namely: the use of the sideslip/velocity diagram, the use of yaw limiting devices and environmental effects. Following extensive reviews of the proposed FAA AC, recent certification practice and available in-service data, EASA has concluded that the AC represents a reduced standard, and at a time when modern rotorcraft have higher yaw capability. With the exception of the environmental effect, which is still subject to review, and the use of yaw limiting devices, which are not applicable to this category of rotorcraft, an additional AMC is added to Book 2 to provide further guidance in meeting the EASA's interpretation of the CS VLR.351.

(See also Proposal 5 for CS-27 above).

Proposal 4: Remove AMC VLR.602: Critical Parts

AMC to CS VLR.602 is now contained within AC 27-1B Change 2. AMC VLR.602 is therefore removed as being obsolete.

C. DRAFT DECISIONS

The text of the amendment is arranged to show deleted text, new text or new paragraph as shown below:

1. ~~Text to be deleted is shown with a line through it.~~
2. **New text to be inserted is highlighted with grey shading.**
3. New paragraph or parts are not highlighted with grey shading, but are accompanied by the following box text:

Insert new paragraph / part (*Include N° and title*), or replace existing paragraph/ part

4.

Indicates that remaining text is unchanged in front of or following the reflected amendment.

....

I. Proposals related to CS-27

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

CS 27.1305 Power Plant 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) ...

...

Proposal 2: Amend CS-27 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).)~~

...

Proposal 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)
(29.571

– Main and tail rotor structure.

– 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)

Proposal 4: Amend CS-27 Book 2, AMC 27 General, para 2, 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.

Proposal 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 that of FAA AC 27-1B Change 2 (AC 27.351. § 27.351 (Amendment 27-26) YAWING CONDITIONS).

The use of this AMC should take precedence over FAA AC in certification/validation activities in showing compliance with CS 27.351.

Specifically, this AMC addressed two areas where the FAA AC has been deemed by the Agency as being weak 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, this standard 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 has to 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 full rational simulation of the yaw manoeuvre of CS 27.351 extended, beyond the sideslip-speed envelope specified in the rule, 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.

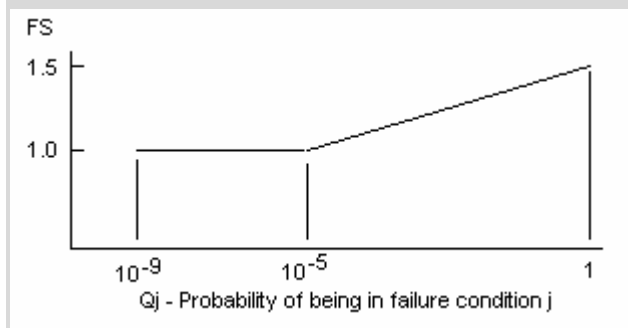
However, the probability of failure or malfunction of these system(s) should also be considered and if it is shown not to be extremely improbable then further load conditions with the system in the failed state should be evaluated. This evaluation may include Flight Manual Limitations, if failure of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

a) 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 the this AMC.

b) 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 P_j is greater than 1×10^{-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.

Proposal 6: Remove AMC 27.602: Critical PartsProposal 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 guidance¹ 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.

¹ See reference in AMC 27 General

- (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.
- (iii) In the case of hoist operations, consideration should also be given to the time required to recover (winch up and bring aboard) the Class D external load and to transition to forward flight. This time increment may limit the use of 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.

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

II. Proposals related to CS-29

Proposal 1: Amend CS 29.1305 to remove reference to AMC 29.1305(a)(25) and (26)

CS 29.1305 Power Plant Instruments

The following are required power plant instruments:

...

(25) 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 29.1305(a)(25) and (26).)~~

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

- (i) Automatically records each usage and duration of power at the 30-second and 2-minute OEI levels;
 - (ii) Permits retrieval of the recorded data;
 - (iii) Can be reset only by ground maintenance personnel; and
 - (iv) Has a means to verify proper operation of the system or device.
- ~~(See AMC 29.1305(a)(25) and (26).)~~

...

Proposal 2: Amend CS 29.1587 to remove reference to AMC 29.1587

CS 29.1587 Performance Information

~~(See AMC 29.1587)~~

Flight manual performance information which exceeds any operating ...

Proposal 3: Amend CS-29 Appendix A A29.3(b)(2) to remove reference to AMC Appendix A A29.3(b)(2)

Appendix A – Instructions for Continued Airworthiness

...

A29.3 Content

(a) ...

(b) *Maintenance instructions*

(1) ...

(2) Trouble-shooting information describing probable malfunctions, how to recognise those malfunctions, and the remedial action for those malfunctions.

~~(See AMC to Appendix A, A29.3(b)(2).)~~

...

Proposal 4: Amend CS-29 Book 2, AMC 29 General, to refer to AC 29-2C Change 2

AMC 29 General

1. The AMC to CS-29 consists of FAA ~~AC 29-2C Change 1~~ dated 12 February 2003 **AC 29-2C Change 2** dated 25 April 2006 with the changes/additions given in this Book 2 of CS-29.

2. The primary reference for each of these AMCs is the CS-29 paragraph. Where there is an appropriate paragraph in FAA AC 29-2C Change 2 dated 25 April 2006 ~~AC 29-2C Change 1 dated 12 February 2003~~ this is added as a secondary reference.

Proposal 5: Add a new AMC 29.351 to provide additional guidance for compliance with the EASA's interpretation of CS 29.351

AMC 29.351

Yaw manoeuvre conditions

1. Introduction

This AMC provides further guidance and acceptable means of compliance to that of FAA AC 29-2C Change 2 (AC 29.351B. § 29.351 (Amendment 29-40) YAWING CONDITIONS).

The use of this AMC should take precedence over FAA AC in certification/validation activities in showing compliance with CS 29.351.

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

a. Aerodynamic Loads

The certification specification CS 29.351 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, this standard 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 has to 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 full rational simulation of the yaw manoeuvre of CS 29.351 extended, beyond the sideslip-speed envelope specified in the rule, 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 29.397(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.

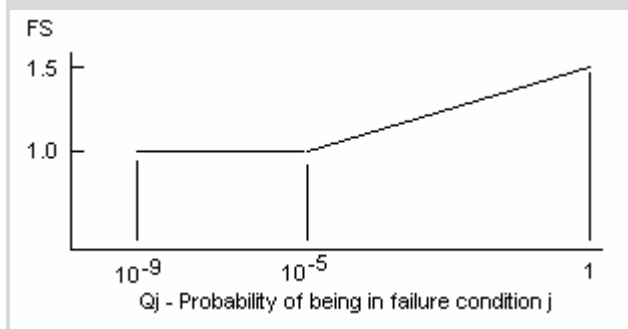
However, the probability of failure or malfunction of these system(s) should also be considered and if it is shown not to be extremely improbable then further load conditions with the system in the failed state should be evaluated. This evaluation may include Flight Manual Limitations, if failure of 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 29.351.

An acceptable methodology to investigate the effects of all system failures not shown to be extremely improbable on the loading conditions of CS 29.351 is as follows:

a) 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 29.351, when the manoeuvre is performed in accordance with the provisions of the this AMC.

b) The factor of safety to apply to the above specified loading conditions to comply with CS 29.305 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 P_j is greater than 1×10^{-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.

Proposal 6: Remove AMC 29.602: Critical Parts

Proposal 7: Remove AMC 29.1305 (a)(25) and (26): 2-Minute and 30-Second OEI Power Level

Proposal 8: Remove AMC to Appendix A, A29.3(b)(2): Maintenance Instructions

III. Proposals related to CS-VLR

Proposal 1: Remove reference in CS VLR.602 to AMC VLR.602: Critical Parts

CS VLR.602 Critical parts

(a) ...

(b) If the type design includes critical parts, a critical parts list shall be established. Procedures shall be established to define the critical design characteristics, identify processes that affect those characteristics, and identify the design change and process change controls necessary for showing compliance with the quality assurance requirements of Part-21.

~~(See AMC VLR.602)~~

Proposal 2: Amend CS-VLR Book 2, AMC VLR General, to refer to AC 27-1B Change 2

AMC VLR General

The AMC to CS-VLR consists of ~~FAA AC 27-1B dated 30.09.1999~~ AC 27-1B Change 2 dated 25 April 2006 with the changes/additions given in this Book 2 of CS-VLR.

Proposal 3: Add a new AMC VLR.351 to provide additional guidance for compliance with the EASA's interpretation of CS VLR.351.

AMC VLR.351

Yaw manoeuvre conditions

1. Introduction

This AMC provides further guidance and acceptable means of compliance to that of FAA AC 27-1B Change 2 (AC 27.351. § 27.351 (Amendment 27-26) YAWING CONDITIONS).

The use of this AMC should take precedence over FAA AC in certification/validation activities in showing compliance with CS VLR.351.

Specifically, this AMC addressed an area where the FAA AC has been deemed by the Agency as being at variance to the Agency's interpretation. This area is as follows:

a. Aerodynamic Loads

The certification specification VLR 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, this standard 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 has to 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 full rational simulation of the yaw manoeuvre of CS VLR.351 extended, beyond the sideslip-speed envelope specified in the rule, until the helicopter reaches the maximum overswing sideslip angle resulting from its motion around the yaw axis.

Proposal 4: Remove AMC VLR.602: Critical Parts

APPENDIX: List of changes made in FAA AC 2006 revision

FAA AC 27-1B Change 2 dated 25/04/06

Paragraph	Title	Comment
AC 27.351	Yawing Conditions	Addresses a "Significant Difference" between EASA and FAA interpretation of the rule. HWG established, but unable to fully resolve differences. (See additional EASA AMC 27.351)
AC 27.602	Critical Parts	Addresses a "Significant Difference" between EASA and FAA interpretation of the rule. HWG finally resolved through changes to AC material.
AC 27.672	Stability Augmentation, Automatic, and Power-Operated Systems.	AC added for clarification and to consider the consequence of inadvertent de-selection of the automatic stabilisation system.
AC 27.683	Operation Tests	Clarification of "excessive deflection" added.
AC 27.777	Cockpit Controls	Adds clarification on the accessibility of controls.
AC 27.801	Ditching	Additional AC resulting from recommendations of the WIDDCWG and HOSS reports.
AC 27.865B	External Load Attaching Means	Revises and simplifies the previous MG 12. (The absence of AC relating to the design standards of CS-27 Cat A rotorcraft performing Class D HEC operations is added as a new AMC 27.865 to CS-27 Book 2).
AC 27.1321	Arrangement and Visibility	Adds HF considerations for pilot size.
AC 27.1411	Safety Equipment-General	Additional AC resulting from recommendations of the WIDDCWG and HOSS reports.
AC 27.1585	Operating Procedures	Adds further considerations for emergency procedures, including tail rotor failure.
AC 27 MG 1	Certification Procedure for Rotorcraft Avionics Equipment	Removes reference to NVGs, which are now addressed in MG 16.
AC 27 MG 4	Full Authority Digital Electronic Controls(FADEC)	Provides further guidelines for EMC testing.
AC 27 MG 8	Substantiation of Composite Rotorcraft Structure	Provide a rotorcraft specific supplement to the general procedures outlined by AC 20-107A, "Composite Aircraft Structure."
AC 27 MG 12	External Loads	Deleted and reference made to AC 27.865B
AC 27 MG 16	Certification Procedure for Rotorcraft Night Vision Imaging Systems (NVIS) Lighting Equipment	Adds more extensive guidance on NVIS.
AC 27 MG 18	Helicopter Terrain Awareness and Warning System (HTAWS)	Adds new material for approval of HTAW systems fitted to rotorcraft.
AC 27 APPENDIX A	Instructions for Continued Airworthiness	Provides guidance on recognising malfunctions by reference to baseline vibration characteristics.
AC 27 APPENDIX B	Airworthiness Guidance for Rotorcraft Instrument Flight	Additional guidance given to preserve the integrity of information presented to the pilot. Further AC to address advanced instruments/ systems.

FAA AC 29-2C Change 2 dated 25/04/06

Paragraph	Title	Comment
AC 29.45	Performance - General	Guidance on Cat A cross-wind testing added.
AC 29.59A	Takeoff Path, Distance and Rejected Takeoff, Ground Level and Elevated Heliport: Category A	Guidance on Cat A cross-wind testing added. In addition, guidance given on the use of minimum power to ensure representative testing is carried out.
AC 29.75A	Landing	Guidance given on the use of minimum power to ensure representative testing is carried out.
AC 29.337	Limit Maneuvering Load Factor	Additional AC added to clarify the intent.
AC 29.351B	Yawing Conditions	Addresses a "Significant Difference" between EASA and FAA interpretation of the rule. HWG established, but unable to fully resolve differences. (See additional EASA AMC 29.351)
AC 29.547A	Main Rotor and Tail Rotor Structure	Additional clarification given with regard to the identification of Critical Parts.
AC 29.602	Critical Parts	Addresses a "Significant Difference" between EASA and FAA interpretation of the rule. HWG finally resolved through changes to AC material.
AC 29.631	Bird Strike	Clarification given on the extent of compliance necessary.
AC 29.672	Stability Augmentation, Automatic, and Power-Operated Systems.	AC added for clarification and to consider the consequence of inadvertent de-selection of the automatic stabilisation system.
AC 29.683	Operation Tests	Clarification of "excessive deflection" added.
AC 29.777	Cockpit Controls	Adds clarification on the accessibility of controls.
AC 29.801	Ditching	Additional AC resulting from recommendations of the WIDDCWG and HOSS reports.
AC 29.865B	External Load Attaching Means	Revises and simplifies the previous MG 12.
AC 29.917A	Design	Additional clarification given with regard to the identification of Critical Parts.
AC 29.1321	Arrangement and Visibility	Adds HF considerations for pilot size.
AC 29.1333	Instrument Systems	Additional AC to address advanced instruments/ systems.
AC 29.1351	Electrical Systems and Equipment - General	Further guidance added regarding services to be provided with emergency electrical power
AC 29.1411	Safety Equipment-General	Additional AC resulting from recommendations of the WIDDCWG and HOSS reports.
AC 29.1585	Operating Procedures	Adds further considerations for emergency procedures, including tail rotor failure.
AC 29 MG 1	Certification Procedure for Rotorcraft Avionics Equipment	Removes reference to NVGs, which are now addressed in MG 16.
AC 29 MG 4	Full Authority Digital Electronic Controls(FADEC)	Provides further guidelines for EMC testing.
AC 29 MG 8	Substantiation of Composite Rotorcraft Structure	Major update to provide further guidance and clarification.
AC 29 MG 12	External Loads	Deleted and reference made to AC 29.865B
AC 29 MG 16	Certification Procedure for Rotorcraft Night Vision Imaging Systems (NVIS) Lighting Equipment	Adds more extensive guidance on NVIS.
AC 29 MG 18	Helicopter Terrain	Adds new material for approval of HTAW

	Awareness and Warning System (HTAWS)	systems fitted to rotorcraft.
AC 29 APPENDIX A	Instructions for Continued Airworthiness	Provides guidance on recognising malfunctions by reference to baseline vibration characteristics.
AC 29 APPENDIX B	Airworthiness Guidance for Rotorcraft Instrument Flight	Additional guidance given to preserve the integrity of information presented to the pilot. Further AC to address advanced instruments/ systems.