



**COMMENT RESPONSE DOCUMENT (CRD)
TO NOTICE OF PROPOSED AMENDMENT (NPA) 2010-06**

**for amending the Executive Director Decision No. 2003/16/RM of 14 November 2003
on certification specifications, including airworthiness codes and acceptable means
of compliance, for large rotorcraft (« CS-29 »)**

"Damage Tolerance and Fatigue Evaluation of Metallic Rotorcraft Structures"

Explanatory Note

I. General

1. The purpose of the Notice of Proposed Amendment (NPA) 2010-06, dated 27 May 2010 was to propose an amendment to Decision 2003/16/RM¹ 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 large rotorcraft (« CS-29 »).

II. Consultation

2. The draft Executive Director Decision amending Decision N° 2003/16/RM was published on the web site (<http://www.easa.europa.eu>) on 27 May 2010.

By the closing date of 27 August 2010, the European Aviation Safety Agency ("the Agency") had received 9 comments from 5 National Aviation Authorities, professional organisations and private companies.

III. Publication of the CRD

3. All comments received have been acknowledged and incorporated into this Comment Response Document (CRD) with the responses of the Agency.
4. In responding to comments, a standard terminology has been applied to attest the Agency's acceptance of the comment. This terminology is as follows:
 - **Accepted** – The comment is agreed by the Agency and any proposed amendment is wholly transferred to the revised text.
 - **Partially Accepted** – Either the comment is only agreed in part by the Agency, or the comment is agreed by the Agency but any proposed amendment is partially transferred to the revised text.
 - **Noted** – The comment is acknowledged by the Agency but no change to the existing text is considered necessary.
 - **Not Accepted** - The comment or proposed amendment is not shared by the Agency

The resulting text highlights the changes as compared to the NPA text.

5. The Executive Director Decision will be issued at least two months after the publication of this CRD to allow for any reactions of stakeholders regarding possible misunderstandings of the comments received and answers provided.
6. Such reactions should be received by the Agency not later than 15 September 2011 and should be submitted using the Comment-Response Tool at <http://hub.easa.europa.eu/crt>.

¹ Decision No 2003/16/RM of 14 November 2003 on certification specifications, including airworthiness codes and acceptable means of compliance, for large rotorcraft («CS-29»). Decision as last amended by Decision 2008/10/RM of the Executive Director of the Agency of 10 November 2008.

IV. CRD table of comments, responses and resulting text

(General Comments) -

comment	8	comment by: <i>Swedish Transport Agency, Civil Aviation Department (Transportstyrelsen, Luftfartsavdelningen)</i>
		The Swedish Transport Agency, Civil Aviation Department is supporting the content of Option 2 of the NPA 2010-06
response		<i>Noted</i>
comment	9	comment by: <i>Luftfahrt-Bundesamt</i>
		The LBA has no comments on NPA 2010-06.
response		<i>Noted</i>
comment	10	comment by: <i>Cessna Aircraft Company</i>
		Cessna Aircraft Company has no comments on this issue at this time.
response		<i>Noted</i>

B. Draft Decisions - I. Draft Decision CS-29 - Proposal 1: Delete existing CS 29.571 and replace it p. 9-10

comment	3	comment by: <i>Transport Canada Civil Aviation Standards Branch</i>
		<u>Document Text:</u> Page 10 - Paragraph 4 (f) A residual strength determination is required to establish the allowable damage size.
		<u>Proposed Comment:</u> Paragraph (f): The first sentence reads: " A residual strength determination is required to establish the allowable damage size.". Since the term "allowable damage" has been widely used by some aircraft manufacturers to set limit for the damages, below which there is no need for repair, it is suggested that this sentence is reworded to clearly indicate that the residual strength of the remaining structures is required to successfully carry limit loads.
response		<i>Accepted</i> (See proposed revised text.)
comment	4	comment by: <i>Transport Canada Civil Aviation Standards Branch</i>
		<u>Document Text:</u> In determining inspection intervals based on damage growth, the residual

strength evaluation must show that the remaining structure, after damage growth, is able to withstand design limit loads without failure within its operational life.

Proposed Comment:

Paragraph (f), second sentence reads "In determining inspection intervals based onthe remaining structure, after damage growth, is able to withstand design limit loads without failure within its operational life.". If this sentence truly intends to require determination of the critical size of damage in order to use it for the purpose of determining inspection intervals, is suggested that "...within its operational life." be removed from the sentence to avoid any misinterpretation. On the other hand, if this is to require limit loads be applied to ensure that within an inspection interval, the remaining structures would carry successfully the limit loads, "...within its operational life." should be replaced by "...within an inspection interval.". In summary, it seems that the whole paragraph (f) need some rewording to avoid all possible misunderstanding or misinterpretation.

response *Accepted*

(See proposed revised text.)

comment 5 comment by: *Transport Canada Civil Aviation Standards Branch*

Document Text:

A determination of the fatigue tolerance characteristics for the PSE with the damage identified in sub-paragraph (e)(4) that supports the inspection and retirement times, or other approved equivalent means.

Proposed Comment:

Is it acceptable that some PSEs on the rotorcraft, especially airframe structures, may be considered for inspection requirement alone (without being subjected to requirement for retirement) based on crack growth methodology? For fixed-wing aircraft, it is permissible that crack growth methodology is used to determine inspection intervals (and, in the process, inspection techniques) without retirement of the PSEs being required.

response *Not accepted*

The expectation is that both a retirement life and an inspection programme will be established for each PSE. While it may be possible to rely on an inspection programme alone for an airframe structure, the engineering data, including test evidence that supports the maintenance programme, is always limited in its extent. For this reason issues such as damage originating at multiple sites and the inevitability of the fatigue damage process are best addressed by limiting the validity of the maintenance programme or the life of the PSEs. A retirement life for a PSE is the preferred approach if the component can be transferred between rotorcraft. Exceptions to the need to provide a retirement life in the ALS are discussed in the AC (Section (f)(10)(iii))

comment 7 comment by: *FAA*

The FAA NPRM requires the compliance methodology be approved (CFR

29.573(c)). The EASA NPA does not require approval of the compliance methodology. (CS 29.571(c) is shown as "Reserved").

We recommend the NPA 2010-6, CS 29.571 incorporate the requirement for Authority approval of the compliance methodology, similar as currently required in FAA NPRM for metallics, 29.571. This addition will be consistent with the current EASA certification specifications, CS 27.571, and FAA federal regulations, CFR 27.571, that currently require the procedures for evaluation must be approved.

response *Not accepted*

The Agency does not approve compliance methodologies directly as it is the responsibility of the applicant to establish and demonstrate compliance. However, the intent of this paragraph is covered under Part-21, specifically during the establishment and acceptance of the certification programme under 21A.20.

resulting text

CS 29.571 Fatigue Tolerance Evaluation of Metallic Structure

 (f) A residual strength determination is required ~~to establish the allowable that substantiates the maximum damage size assumed in the fatigue tolerance evaluation.~~ In determining inspection intervals based on damage growth, the residual strength evaluation must show that the remaining structure, after damage growth, is able to withstand design limit loads without failure ~~within its operational life.~~

B. Draft Decisions - I. Draft Decision CS-29 - Proposal 2: Introduce a new AMC (AC) 29.571B - (e). Fatigue Tolerance Evaluation p. 15-18

comment

6 comment by: *Transport Canada Civil Aviation Standards Branch*

Corresponding Text:

Page 17, Paragraph 6

(A) Crack Growth Retirement is a crack growth method that explicitly addresses the largest damage that could occur during manufacture or operation of the rotorcraft. This damage is modelled as a crack with a bounding equivalent crack (BEC) established based on the results of the threat assessment. Application of this method results in a retirement time based on the time for the initial crack to grow large enough to reduce the residual strength to design limit level. Since typical BECs are relatively small and thus difficult to induce in test specimens, this method is typically implemented analytically. The rationale behind this method is based on part retirement before the largest probable damage, modelled as a crack, would reduce the residual strength below design limit. Use of this method by itself could achieve acceptable fatigue tolerance and preclude the need for any mandated inspections provided all threats are accounted for by the BECs. For compliance details, see paragraph f.(7)(iv)

Proposed Comment:

It is recommended for Crack Growth Retirement methodology **NOT** to be

included as a means of compliance. It is known that cracks, once initiated on dynamic components, would propagate at a very high rate due to high load frequency. If the retirement life were determined based on the time from crack initiation to the critical size, the resulting retirement life would be so short to be practical. As for airframe structures, crack growth may be slow and stable that would render a much longer retirement life. However, replacement of airframe structures may not, in some cases, very costly while it may not be necessary. Is it necessary to require retirement when crack is shown to be progressing at a slow and stable rate and is readily detectable, by established inspections, well before becoming unstable or critical?

response *Not accepted*

This is just one of several means of compliance offered and whether it is practical or not is design dependent. For airframe structure, refer to the response to comment 5.

B. Draft Decisions - I. Draft Decision CS-29 - Proposal 2: Introduce a new AMC (AC) 29.571B - (f). Means of Compliance - (7) RETIREMENT TIMES p. 25-30

comment 2 comment by: *Transport Canada Civil Aviation Standards Branch*

Document Text:

Page 27, Paragraphs 6-8 - Page 28, Paragraphs 1-4 - Page 29 - Page 30, Paragraphs 1-5

Proposed Comment:

It is suggested that the crack growth information in section f.(7)(iv), crack growth retirement, be transferred for use in section f.(8)(ii) for crack growth inspection methodology.

response *Not accepted*

As this relates to previous comment, which is not accepted, the paragraphs under crack growth retirement methodology are retained.