



**European Aviation Safety Agency
Rulemaking Directorate**

EXPLANATORY NOTE

CS-25 Amendment 5

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1. GENERAL

Executive Director Decision 2008/006/R amends Decision No 2003/02/RM of 17 October 2003 (CS-25 Initial Issue) as last amended by Executive Director Decision 2007/020/R of 20 December 2007 (CS-25 Amendment 4). It represents Amendment 5 of CS-25: Large Aeroplanes, and incorporates the output from the following EASA rulemaking task:

Rulemaking Task No.	TITLE	NPA No.
MDM.002	Electrical Wiring Interconnection System	2007-01

The Notice of Proposed Amendment (NPA) has been subject to consultation in accordance with Article 52 of the Basic Regulation¹ and Article 15 of the Rulemaking Procedure established by the Management Board². For detailed information on the

¹ Regulation (EC) No 216/2008 of the European Parliament and of the Council of 20 February 2008 on common rules in the field of civil aviation and establishing a European Aviation Safety Agency, and repealing Council Directive 91/670/EEC, Regulation (EC) No 1592/2002 and Directive 2004/36/EC (OJ L 79, 19.03.2008, p. 1).

² 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/08/07, 13.6.2007.

proposed changes and their justification please consult the above NPA which is available on the Agency's website.

The Agency has addressed and responded to the comments received on each of the NPAs. The responses are contained in a comment-response document (CRD) which has been produced for this NPA (CRD 2007-01) and which is also available on the Agency's web-site.

2. CRD REACTIONS

In response to the CRD 2007-01, the Agency received the following substantive reactions, which are reproduced below together with the Agency's responses:

Reaction to	Reaction by	Reaction	Response
(general reactions)	Theisen André	Resulting text for Part-M.A.302 (g) in CRD to NPA 2007-01 does not correspond to resulting text for Part-M.A.302 (g) in CRD to NPA 2007-08. See attached. Could the agency advise what will be the consolidated resulting text out of the 2 CRD for Part-M.A.302?	See Opinion Nr. 02/2008. The text is renumbered M.A.302(h) and is the text as indicated in the CRD to NPA 2007-01.
the response to comment #9	Cessna Aircraft Company	Cessna Engineering supports comment 9 (on CS 25.1709 by DGAC-page 21). The authorities (both FAA and EASA) have not made a convincing case to clearly define and justify the impact of requiring SSA (System Safety Assessment) activity for EWIS (Electrical Wiring Interconnection System). Cessna is concerned with the statement that this issue has been "extensively discussed with all relevant stakeholders and accepted" implies a broad support within the technical community that these and other comments lead us to question.	The comment is in support of two previous comments which have been dispositioned as stated in the CRD document. Statement that this issue has been "extensively discussed with all relevant stakeholders and accepted" makes reference to the ATSRAC and Wiring Systems Harmonisation Working Group (WSHWG) work that led to the issuance of recommendations to the Authorities, including this provision on EWIS System Safety Assessment. In relation to making a convincing case, we have again to make reference to experience that showed that, although current 25.1309 assessment should already address EWIS, this did not prevent incidents and accidents caused by wire failures occurring.
the response to comment #100	Cessna Aircraft Company	Cessna Engineering supports comment 100 (on CS 25.1709 by Boeing-Page 22-23). The authorities (both FAA and EASA) have not made a convincing case to clearly define and justify the impact of requiring SSA (System Safety Assessment) activity for EWIS (Electrical Wiring Interconnection System). Cessna is concerned with the statement that this issue has been "extensively discussed with all relevant stakeholders and accepted" implies a broad support within the technical community that these and other comments lead us to question.	Same as above.

Reaction to	Reaction by	Reaction	Response
the response to comment #109	FR Aviation	<p>I agree with Boeings comment on 10% being "unreasonable" in terms of an allowance for deformation and stretching.</p> <p>Does the requirement become clearer from having a quantified value? I think not. Whilst I agree that wiring should not be of a brittle nature and should be tolerant to airframe deformation, adding a value is unnecessary. Airframe wiring being generally copper based material has natural elasticity. Will all wiring manufacturers support this AMC?</p> <p>Finally, the response suggests that despite what the FAA intended, they didn't publish a value. True?</p>	<p>The comment is in support of the previous comment which has been dispositioned as stated in the CRD document.</p> <p>An additional input disputes the need for having to quantify what is meant by reasonable degree of deformation and stretching.</p> <p>The 10% provision is mentioned in the AMC, as a classical way to add interpretative material to the rule. As stated in the CRD, there is historical evidence to justify these data and reference is made to FAR amendment 25-15 which was established in 1967.</p> <p>Equivalent disposition of comments provided by the FAA on their own AC 25-1701-1 (certification of EWIS) dated 12/4/07 provides documented reference to specific accident that led to this requirement. It is also worth to be mentioned in relation to last part of the comment that this 10% value is also quoted by the FAA in the AC 25-1701-1 referenced above.</p>
the resulting text for AMC 25.1707 System separation; EWIS"	Airbus	<p>We suggest addition of a sentence in paragraph 5 as highlighted below:</p> <p>The term "hazardous condition" in CS 25.1707 has the same meaning as the one used in CS 25.1309 or CS 25.1709. Unlike CS 25.1309 or CS 25.1709, no probability objectives are required for compliance. The intent of CS 25.1707 is that the applicant must perform a qualitative design assessment of the installed EWIS and the physical separation to guard against hazardous conditions. <i>To be consistent with CS 25.1309 and CS 25.1709, the single failure consideration should be limited to Catastrophic failure conditions.</i></p> <p>This sentence is proposed for clarification and consistency with 25.1309 and 25.1709. As described in CRD, 'hazardous condition' means 'Hazardous failure condition', in the sense of 25.1309. Since 25.1707 intent is not to overrule 25.1709 or 25.1309, single failure consideration should be limited to Catastrophic failure conditions. In addition we suggest modification to AMC 25.1707 paragraph 3 as follows:</p> <p>3 Determination of separation The following factors should be considered when determining the separation distance:</p> <p>a. The electrical characteristics, amount of power, and <i>severity of failure condition of the system functions performed by the signals criticality of the systems involved in</i></p>	<p>As proposed by the first part of the comment, the CS 25.1707 text would have to use the term "catastrophic condition" instead of "hazardous condition" wherever used. This goes beyond the original intent of this requirement which is to limit the effects to hazardous conditions following the EWIS components failures described in the rule.</p> <p>The second comment relates to the perimeter of 25.1707 and 25.1709 in relation to EWIS failures assessment. The Agency agrees that with the final text of CS 25.1707(a) resulting from the CRD, precise functional effects between wires are better addressed by 25.1709. The AMC 25.1707 § 3 text is modified as proposed in the comment.</p>

Reaction to	Reaction by	Reaction	Response
		<p>the EWIS and adjacent EWIS. Reason:</p> <p>As understood, the meaning of the paragraph 25.1707 is to perform a qualitative design assessment. The intent is not, as in paragraph 25.1709, to examine each individual wire and its relation to other wires. Therefore the severity of failure condition of the system functions should not be addressed in paragraph 25.1707, this is already integrated in paragraph 25.1709 compliance demonstration.</p>	
the response to comment #65	Airbus	<p>We quoted our comment on NPRM 05-08 and AC 25.17xx, as background information to our statement that the current CS 25.1309 was adequate. Our main point, demonstrated by a quote of the current CS 25.1309, was that the "traditional thinking", leading to ignore non-required equipment, was no longer possible with the current CS 25.1309.</p> <p>The Agency's response removes a factually incorrect statement, mentions a procedural point for a comment on the FAA text, and maintains its analysis in paragraph 2, which actually relates to former versions of CS 25.1309 and past practices that are now clearly prohibited by the current CS 25.1309. This response does not address the main substance of our comment, which is that the current CS 25.1309 is adequate.</p>	<p>The Agency has acknowledged that the reference to 25.1309(a) was inappropriate on the EASA side and has cancelled the corresponding statement in the AMC.</p> <p>The point debated by the commentator is that the current CS 25.1309 is adequate to cover all EWIS issues and all the problems can be associated to previous versions of 25.1309 or past practice. This comment goes further than previous comments done on the proposed 25.1709, which were proposing a modification of the EASA text but not a complete suppression.</p> <p>In response to this, the Agency notes that there is from a European point of view, no fundamental differences between CS 25.1309 current version and its AMC compared to previous JAR-25 versions.</p> <p>Starting objective of the FAA/JAA 25.1309 harmonisation, which took place before the EWIS initiative, has been to align on the European text with main improvement being the introduction of formal exclusion of a single failure leading to a catastrophic failure condition. This was somewhat buried in the JAR 25.1309 ACJ before. CS 25.1309(a) is very similar to previous JAR 25.1309(a). The 25.1309 AC/AMC harmonisation effort has led to improvements of the guidance notably for the assessment of common cause failures on highly integrated systems. It did not specifically address wiring issues nor does the AMC quote them anywhere.</p> <p>It is expected that improved consideration of EWIS related failures will result from the 25.1709 initiative. Need to further integrate the 25.1309/25.1709 processes will be seen in light of experience gained in the application of this new requirement.</p>
the response to comment #66	Airbus	<p>Historical data may be available for aircraft that were certificated using past versions of FAR/JAR 25.1309 and related advisory material, but this should not be extrapolated to the current practices based on the current CS 25.1309. See also our comment and reaction # 65.</p>	<p>Same as response above.</p>
the response	Airbus	<p>We do not ignore that "The authorities are</p>	<p>As stated in the CRD, the Agency's text is</p>

Reaction to	Reaction by	Reaction	Response
to comment #74		finally responsible for the final rule and therefore changes compared to the working group recommendations are possible". However we would expect an explanation of the reasons why the changed text is considered better.	based on the WSHWG recommendations and some improvements have been introduced. There is no formal requirement to trace the differences and justify them. The original comment was rather vague on the differences introduced. Reference to single failures and CS 25.1703(b) are considered clarifications of the original intent.
comment #113	FR Aviation	Could you explain why you have added "where appropriate" to the text at AMC 25.1723? Surely if the EWIS component is located in a fuel vapour zone, explosion proofness is going to be appropriate! The term "where appropriate" is too vague to add value.	AMC 25.1723 makes reference to very specific explosion proof qualification standards of EUROCAE ED14/RTCA DO160. As noted in the comment and also in the response to the comment, not all EWIS components can be directly tested with the quoted standards. Other methods to be proposed by the applicant may be more appropriate, hence the introduction of "where appropriate".
the response to comment #80	Airbus	Even though 21A.3B may allow the use of airworthiness directives for general retroactive safety improvements, the traditional use of airworthiness directives has been to correct identified deficiencies that may lead to unsafe conditions in a well-defined group of aircraft (type, series...) or equipment. In general, airworthiness directives have not been used to implement measures of general applicability that are meant to enhance the general level of safety. In its recent rules on ageing aircraft, the FAA set the design approval holders' responsibilities in a new FAR Part 26, and the operators' responsibilities in the operating rules. Although we objected to the need for a rule on design approval holders (see § 4 of our comment above), this approach has the merit of clearly setting the responsibilities without creating confusion about airworthiness directives. An equivalent European approach could be based on: <ul style="list-style-type: none"> • A provision in Part 21 allowing the Agency to issue retroactive airworthiness specifications, applicable to design approval holders (this provision and the resulting specifications would be equivalent to FAR Part 26), and • A provision in Part M asking operators to comply with relevant instructions issued by the design approval holder (this provision would be equivalent to e.g. FAR 121 Subpart AA). We suggest that the Agency urgently consider adopting this approach, possibly through the rulemaking task 21.039.	Noted. This will be taken into account in the 21.039 rulemaking task. One of the objectives of this task is to provide a regulatory tool for imposing retro-active measures that introduce safety enhancements.

3. EDITORIAL CORRECTIONS IN CS-25 AMENDMENT 5

Apart from the changes that resulted from the above NPA, this Amendment 5 of CS-25 also incorporates several changes aiming to remove certain editorial errors and inconsistencies identified. Their description/justification is as follows:

CS 25.991

Subparagraph (a) is corrected by adding the words "other than a fuel injection pump" in the last sentence as follows:

"(a) *Main pumps.* Each fuel pump required for proper engine operation, or required to meet the fuel system requirements of this Subpart (other than those in subparagraph (b) of this paragraph), is a main pump. For each main pump, provision must be made to allow the bypass of each positive displacement fuel pump other than a fuel injection pump approved as part of the engine."

Justification:

This error in CS-25 was introduced in JAR-25 Change 8. As JAR-25 was not applicable to aeroplanes with reciprocating engines, the FAR-25 text that was transposed into JAR-25 text was adapted to delete references to such engines and its components. However in doing this some text was accidentally deleted. This error is now corrected.

CS 25J991

Subparagraph (a) is corrected by adding the word "injection" in the last sentence as follows:

(a) *Main pumps.* Each fuel pump required for proper essential APU operation, or required to meet the fuel system requirements of this subpart (other than those in sub-paragraph (b) of this paragraph), is a main pump. For each main pump, provision must be made to allow the bypass of each positive displacement fuel pump other than a fuel injection pump approved as part of the APU.

Justification:

This error in CS-25 was introduced in amendment 1. When introducing the results of EASA NPA 10/2004 the word "injection" was accidentally removed. This error is now corrected.

CS 25.807, 25.812 and 25.1411

In Subparagraph 25.807(d)(3)(ii) a cross-reference to CS 25.809(h) is corrected as follows:

(ii) For a tail cone exit incorporating a floor level opening of not less than 51 cm (20 inches) wide by 1.52 m (60 inches) high, with corner radii not greater than one-third the width of the exit, in the pressure shell and incorporating an approved assist means in accordance with CS ~~25.809(h)~~ 25.810(a), 25 additional passenger seats.

In Subparagraph 25.812(g)(2) a cross-reference to CS 25.809(f) is corrected as follows:

(2) At each non-overwing emergency exit not required by CS ~~25.809(f)~~ 25.810(a) to have descent assist means the illumination must be not less than 0.3 lux (0.03 foot candle) (measured normal to the direction of the incident light) on the ground surface with the landing gear extended where an evacuee is likely to make his first contact with the ground outside the cabin.

In Subparagraph 25.1411(c) a cross-reference to CS 25.809(f) is corrected as follows:

(c) *Emergency exit descent device.* The stowage provisions for the emergency exit descent device required by CS ~~25.809(f)~~ 25.810(a) must be at the exits for which they are intended.

Justification:

These errors in CS-25 were introduced in JAR-25 Change 14. When transposing FAR Part 25 amendment 25-72 the necessary adaptation of cross-references to deleted subparagraphs was overlooked. This error is now corrected.

Book 2 Subpart E:

AMC 25.951(d) is deleted.

Justification:

When JAR-25 at Amendment 16 was transposed into CS-25 initial issue, subparagraph 25.951(d) was removed because it was superseded by Part 21A.18(b)1. As a result also AMC 25.951(d) should have been deleted, but this was overlooked. This error is now corrected. The text of the AMC will be considered as AMC or guidance material in CS-34.

4. APPLICABILITY TO EXISTING AIRCRAFT TYPES.

4.1 Requirement for TC holders.

The new EWIS requirements in CS-25 amendment 5 will be applicable to new aircraft types for which the application for type certification is filed after the date of the CS-25 amendment. However, as indicated in the NPA 2007-01, the Agency will also require type certificate (TC) holders of certain existing large aeroplane types to develop new instructions for continued airworthiness (ICA) in accordance with the AMC Appendix H25.5 paragraphs 1 and 6. The enabling requirement for this in Part 21 is paragraph 21A.3B(c)(1). The affected TC holders will be informed of this requirement by individual letters. Normally the use of 21A.3B(c)(1) leads to the issuance of Airworthiness Directives (AD) by the Agency however as explained under 4.2 below in this case the issuance of ADs is not necessary to achieve implementation by operators.

The affected aircraft types are large aeroplanes with a type certificate issued after 1st January 1958, that, as a result of original type certification or later increase in

capacity, have-

- a. a maximum type-certificated passenger capacity of 30 or more; or
- b. a maximum payload capacity of 3402 kg (7500 pounds) or more.

As already indicated in the NPA 2007-01 and similar to the corresponding measure by the Federal Aviation Administration, the following aeroplane models are exempted from the above affectivity:

- (1) Convair CV-240, 340, 440, if modified to include turbine engines;
- (2) Lockheed L-188;
- (3) Douglas DC-3, if modified to include turbine engines;
- (4) Bombardier CL-44;
- (5) British Aerospace BAC 1-11.

Each holder of a type certificate of an affected aeroplane type must develop and submit for approval by the Agency ICA derived from the enhanced zonal analysis procedure (EZAP), for the representative aeroplane's EWIS in accordance with CS 25 Appendix H paragraph H25.5. For the purpose of this paragraph, the "representative aeroplane" is the configuration of each model series aeroplane that incorporates all of the variations of EWIS used on that series aeroplane, and that includes all TC-holder designed modifications mandated by airworthiness directive.

By 10 December 2009, the TC holders of the affected aeroplane types identified above must gain approval of the enhanced ICA by the Agency.

4.2 Compliance with the new ICA by operators

Once the TC holders of the affected aeroplane types have obtained Agency approval of the ICA as required above, in accordance with paragraph 21A.61 of Part-21 these TC holders will have to make the ICA available to each owner/operator of the aeroplane type. Then, in accordance with paragraph M.A.302 of Part-M the operator is obliged to incorporate these new ICA in the relevant maintenance programme. The standard compliance time for this is 12 months. Therefore the envisaged compliance date for operators of the affected aeroplane types for inclusion of inspections and procedures for EWIS in the maintenance programme for that aeroplane is 12 months after the publication of the revised ICA.

5. APPLICABILITY TO NEW MODIFICATIONS AND SUPPLEMENTAL TYPE CERTIFICATES

The new EWIS requirements in CS-25 shall also apply to all new applications for major changes to a type certificate and new applications for supplemental type certificates (STCs) made after the date of the CS-25 amendment. This is not automatically achieved by the current Part 21A.101 provision that determines the applicable airworthiness code for changes and STCs, because it allows the use of earlier amendments of the airworthiness code if certain conditions are met. Therefore an amendment to 21A.101 is needed to achieve consistent applicability of the EWIS requirements to changes and STCs. This amendment is already foreseen in

rulemaking task 21.039³ which intends to establish in Part 21 provisions enabling the Agency to impose additional airworthiness specifications for a given type of operation. The NPA with the envisaged amendment to Part 21 resulting from this rulemaking task is scheduled for the fourth quarter of 2008.

³ Rulemaking task 21.039: Elaboration and adoption in the Community framework, of additional airworthiness specifications for a given type of aircraft and type of operation.