European Aviation Safety Agency
Rulemaking Directorate

EXPLANATORY NOTE

CS-25 Amendment 4

Executive Director Decision 2007/020/R amends Decision No 2003/02/RM of 17 October 2003 (CS-25 Initial Issue) as last amended by Executive Director Decision 2007/010/R of 12 September 2007 (CS-25 Amendment 3). It represents Amendment 4 of CS-25: Large Aeroplanes, and incorporates the output from the following EASA rulemaking tasks:

Rulemaking Task No.	TITLE	NPA No.
25.004	Flight Guidance Systems	18/2006
25.010	Doors & Mechanical Systems	02/2006

Each Notice of Proposed Amendment (NPA) has been subject to consultation in accordance with Article 43 of the Basic Regulation[1] and Article 15 of the Rulemaking Procedure established by the Management Board[2]. For detailed information on the proposed changes and their justification please consult the above NPAs which are 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 each NPA (CRD 18/2006 and CRD 02/2006) and which are also available on the Agency's web-site.

[1] 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, 7.9.2002, p.1.* Regulation as last amended by Regulation (EC) No 334/2007 *(OJ L 88, 29.3.2007, p. 39)*.

[2] Decision MB/08/2007 of the Management Board of the Agency of 13 June 2007 amending and replacing Decision MB/07/2003 concerning the procedure to be applied by the Agency for the issuing of Opinions, Certification Specifications and Guidance Material ("Rulemaking Procedure").

In response to the CRD 18/2006, the Agency received the following substantive comments, which are reproduced below together with the Agency's responses:

CRD Comment No.	Commenter	Comment	EASA Response
6.	DGAC France	Concerning our comment n°6 on compatibility of altitude capture mode and TCAS alarm, we have noted other related comments N°1 and 4 and the Agency's decision to defer the question to a rulemaking task. However in the 2009 inventory this question is apparently related to task ETSO.006 - ACAS indications, which does not seem directly connected to this question. We thus would appreciate if the Agency could specify whether it intends to redefine/expand task ETSO.OO6 or add a new rulemaking task.	EASA considers a new MDM rulemaking task to address the issue and the AIB recommendation No. 42 following a near mid-air collision in its full complexity. The new task would incorporate then the ETSO.006 task, which would be consequently deleted from the inventory.
	UK CAA	**AMC No.1 Section 8.4.1** Part 2) of this section is specifically referring to autopilot characteristics. The first sentence should therefore read 'If the autopilot is….', as opposed to 'If the FGS is…'	**Accepted.** The sentence now reads: "If the ~~FGS~~ autopilot is designed to …
8.	UK CAA	**AMC No.1 Section 9.3.2** The reference to CS-AWO 253 in this AMC is inappropriate since CS AWO-253 is deleted by NPA AWO-16 and is replaced by Para 8.1.2.1 of this AMC. The words 'as specified within CS-AWO 253' should be deleted from this section.	**Partially accepted.** EASA agrees that in fact there is no need to refer to either FAA AC 120-28D or to CS-AWO 253 since the new CS 25.1329(j) and Para 8.1.2.1 of AMC No. 1 to CS 25.1329 contains proper texts. The para 9.3.2 is amended so that reference to CS-AWO 253 is deleted and the references to CS 25.1329 (j) and Para 8.1.2.1 are added instead as follows: The loss of the approach mode requires immediate flight crew awareness. This may be accomplished through autopilot disengagement and related warning (as required by CS 25.1329 (j) and specified in 8.1.2.1), ~~as specified within CS-AWO 253~~.

			It the autopilot remains engaged and reverts to a non-approach mode, an appropriate aural warning and/or visual alert should be provided.
13	UK CAA	**AMC No.1 Section 14, Figure 14-1** For consistency with the rest of the document, the reference to FAA AC 25-7 (in the test methods box) should be deleted.	**Accepted**. The figure 14-1 is amended.
26.	UK CAA	**AMC No.1 Section 14.1.5.1 Autopilot Override** This section relates to the flight-testing of the override characteristics of autopilots in general. As such, the note at the end of this section, which originated in CS-AWO 107, is inappropriate since it is considered to be a specific design requirement for automatic landing systems. Not all autopilots will have automatic go-around features. This note should be deleted and as a separate activity, steps should be taken to re-instate CS-AWO 107, which was originally proposed for removal from CS-AWO by NPA-AWO-16. As NPA AWO-16 has not yet been circulated for public consultation, CAA will re-submit the NPA with the paragraph re-instated. JUSTIFICATION: Original comments have been reviewed and the decision to remove CS-AWO 107 in NPA AWO-16 has been reversed.	**Accepted**. The note in 14.1.5.1 is deleted. The proposal to keep CS-AWO 107 as currently is in CS-AWO will be taken into account in the course of the task AWO.001 implementation
		AMC No.1 Section 14.2.2 Take Off The last sentence of this section should be re-worded as follows: '…should be assessed in accordance with CS AWO Subpart 4.' JUSTIFICATION: Missing words.	**Accepted.** This typo was already noted and corrected in the final text.

In response to CRD 02/2006, the Agency received several substantive comments, which are reproduced below together with the Agency's responses:

CRD Comment No.	Commenter	Comment	EASA Response
11	FAA	CS 25.783(d)(8) requires that the latches be prevented from moving until the door is closed. We don't have this rule, although the philosophy is used for other things. In this case, there are doors, particularly passenger doors, that probably don't benefit from this requirement and having it could mean more interlocks, which could reduce evacuation reliability. EASA has acknowledged this, but their proposed remedy: the latches must not move to the latched position until the door is closed, "unless it can be shown that a door that is not closed would always be detected before flight.", could be problematic, in that how an applicant could show that it would 'always' be detected is not known. The FAA AC addresses this subject that acknowledges that some doors should have this provision to meet the rules we have already, but that not all doors would need it. EASA's approach is the converse. In the end, it is likely that there will be only a few cases where the issue is really debated.	**Partially Accepted** The design of the interlock must be taken into account in meeting the overall safety objectives of the door. It therefore does not follow that the reliability of the door latching mechanism will be any lower or that this will impact passenger evacuation in an emergency. EASA's approach to gain alleviation from the need to fit an interlock, is to put the burden of proof on to the applicant. Only if can be shown that a door that is not closed is clearly evident will the alleviation be granted. The text of CS 25.783(d)(8) is amended to clarify the intent. (See response to reaction #27)
12	FAA	AMC 3.n defines "locked" somewhat differently than in the FAA AC. This difference could result in some changes to the locking mechanism between an FAA-acceptable door and an EASA acceptable door, but the intent is not that different. The AMC makes the locking mechanism language parallel with the latching mechanism language. Whereas the rule is explicit regarding features of the latching mechanism, there is no similar requirement for features of the locking mechanism in either the FAR or the CS. Thus, there is an implication in the AMC that the locking mechanism must have those features even though the rule doesn't	**Noted** Only by adopting the locking definition defined in the AMC is a potential unsafe condition avoided.

		require them. Again, the practical differences to designs are not likely to be common; but, there can be cases where the difference in definition will come into play. Industry might then have to change their design to meet the CS, although the resulting design should still meet the FAR.	
20	Boeing	The EASA response asserts that the same locking mechanism element monitored by the flight deck indication must be the one checked for the visual indication. A more appropriate statement would be that the visual check must provide an equal or greater level of confidence than the flight deck indication. While visual inspection of the lock operating mechanism may be adequate, visual inspection of the locks themselves provide the most direct indication of the state of each lock. We suggest the AMC be revised to read: (a) The provisions should: (1) allow direct viewing of the position of the ***locks or*** locking mechanism to show, without ambiguity, whether or not each latch is latched and each lock is locked. For ... JUSTIFICATION: The suggested alternative adds text that allows inspection of the locks or the locking mechanism, as appropriate to a given design, without dictating a specific design solution. This CMT #20 is associated with CMT #29.	**Not Accepted** Monitoring only the position of the lock will not confirm that the lock is securely held in place.
24	Boeing	As stated in EASA's response in the CRD, *"The wording from Rev.1 has been simplified to clarify the need for a structural assessment under CS 25.571 for new aircraft. Certification to an older standard may be permitted, but is a procedural issue and is therefore addressed under 21A.101."* Boeing is in agreement with EASA's	**Partially Accepted** The existing AMC text is considered to be useful and is kept for new designs. A note is added to the AMC to limit its applicability to aircraft whose certification basis includes damage tolerance. AMC 783 para 6 now reads as follows:

		comment. However, the NPA proposed text states that the door, " ... must be designed to be damage tolerant ... ", which may or may not be the case, depending on the certification basis; and has to do with a general structural requirement, which may have a different certification basis compared to the door-specific requirements. Therefore, the AMC should be revised to delete the two sentences and read, instead, as follows: ~~In accordance with CS 25.571, the door structure, including its mechanical features (such as hinges, stops, and latches), that can be subjected to airframe loading conditions, must be designed to be damage tolerant.~~ In assessing the extent of damage under CS 25.571 and CS 25.783 consideration should be given to single element failures in the primary door structure, such as frames, stringers, intercostals, latches, hinges, stops, and stop supports. ~~The skin panels on doors should be designed to be damage tolerant with a high probability of detecting any crack before the crack causes door failure or cabin decompression.~~ JUSTIFICATION: Our suggested text deletions will clarify the advisory material and will be in agreement with EASA's response in the CRD.	**6. STRUCTURAL REQUIREMENTS** In accordance with CS 25.571, the door structure, including its mechanical features (such as hinges, stops, and latches), that can be subjected to airframe loading conditions, should be designed to be damage tolerant. In assessing the extent of damage under CS 25.571 and CS 25.783 consideration should be given to single element failures in the primary door structure, such as frames, stringers, intercostals, latches, hinges, stops and stop supports. The skin panels on doors should be designed to be damage tolerant with a high probability of detecting any crack before the crack causes door failure or cabin decompression. .... Note: This paragraph only applies to aircraft with a certification basis including CS 25.571 or equivalent requirements for damage tolerance. **Additional Note** FAR Part 26, Section 26.45 & 26.47 stipulate damage tolerance on all fatigue critical structure after January 11th 2008.
27	Boeing	Boeing is in general agreement with the revised CS and AMC text in the CRD, giving credit for observations made by trained cabin attendants and flight crew members. However, the revised CS and AMC text should be revised to: - clarify the requirement, and - address backup door operating systems used by trained mechanics.	**Partially Accepted** The definition is amended as recommended, to now read as follows: *CS 25.783 (d)(8) A door that could result in a hazard if not closed, must have means to prevent the latches from being moved to the latched position unless it can be*

		We recommend that the CS text be revised to read: (d)(8) A door that could result in a hazard if not closed, must have means to prevent the latches from being moved to the latched position unless it can be shown that a door that is not closed would ~~always~~ be ~~detected~~ ***clearly evident*** before flight. We recommend that the AMC text be revised to read: ... As an alternative to providing the feature described above, reliance can be placed on trained cabin attendants or flight crew members to determine that certain doors are not fully closed. This alternative is applicable only to doors that are normally operated by these crew members, and where it is clearly evident from within the aircraft by direct visual inspection that the door is not fully closed. ***In addition, for backup door operating systems requiring tools, reliance can be placed on trained mechanics to determine certain doors are not fully closed.*** JUSTIFICATION: Our suggested revision to the CS text clarifies the requirement and uses text similar to that used within the AMC. Our suggested addition to the AMC text addresses backup door operating systems requiring tools and intended to be used by trained mechanics. This suggested change to the AMC is not required if operating systems requiring tools and intended to be used by trained mechanics are not subject to this CS and AMC.	*shown that a door that is not closed would ~~always~~ be ~~detected~~ clearly evident before flight.* Back-up door operating systems requiring tools are not covered under these proposals, and the proposed change is therefore not accepted.
28	Boeing	Boeing is in agreement with most of the changes, but portions of the CRD proposed text [specifically subparagraph (b), and sub-items (1) and (2) of subparagraphs (c) and (d)] are unclear.	**Partially Accepted** The proposal to change (b) is accepted. EASA considers that the proposal to change paragraph (c) is too

		Therefore, we recommend that the AMC be revised to read: *For a door to be classified…:* *(a) …* *(b) The stops must be designed so that, under all 1g aeroplane* ***level*** *flight conditions,* ~~*when the door and fuselage stops are in contact, there is no net force from the pressure differential and door mass or balancing means*~~ ***the door to fuselage stop interfaces produce no net force*** *tending to move the door in the opening direction.* *(c) If the stops are used to provide the initial inward opening movement, the stops should be designed such* ***that*** *they cause the door to move inwards, typically at a minimum angle of 3° relative to the mean pressure plane, opposing any positive fuselage pressure differential:* *(1) ...; or* *(2) …;* ***or*** ***(3) until the door has moved a minimum 33% of the total movement needed to clear the fixed stops.*** *(d) …:* *(1) …; or* *(2) …;* ***or*** ***(3) until the door has moved a minimum 33% of the total movement needed to clear the fixed stops.*** *On these doors, the locking means* ~~*should*~~ ***could*** *monitor the latch securing means,* ~~*but need not*~~ ***or*** *directly monitor and lock each latch. Additionally, the locking means could be located such that all latches are locked by locking the latching mechanism. With any single failure in the latching mechanism, the means must still lock a sufficient number of latches to ensure that the door remains safely latched.*	prescriptive and is design specific. However, EASA accepts that there may be acceptable designs that do not comply with either of the stated criteria. In these cases, justified engineering judgement may be acceptable. The text of the AMC is amended and now reads as follows: AMC 25.783, Para 5, (d)(4) (a) … (b) The stops must be designed so that, under all 1g aeroplane level flight conditions, ~~when the door and fuselage stops are in contact, there is no net force from the pressure differential and door mass or balancing means~~ the door to fuselage stop interfaces produce no net force tending to move the door in the opening direction. (c) If the stops are used to provide the initial inward opening movement, the stops should be designed such that they cause the door to move inwards, typically at a minimum angle of 3° relative to the mean pressure plane, opposing any positive fuselage pressure differential: (1) until …; or (2) until …; *or* (3) if neither of the above options are appropriate, based on justified engineering judgement and agreed with the Agency. (d) If guides …: (1) until …; or

		JUSTIFICATION: Our suggested changes: - more clearly define the requirement for the design of the pressure stops; - add a more clear requirement for the minimum amount of movement in the minimum 3° angle of travel; and - clarify the last paragraph.	(2) until …; *or* (3) if neither of the above options are appropriate, based on justified engineering judgement and agreed with the Agency. On these doors …
29	Boeing	With respect to the proposed definition of "locked," the response in the CRD appears to reflect a partial understanding of the inter-relationship between the locking system and vent door. EASA's CRD response regarding the original (pre-ARAC) pressure prevention means requirement, states that, *"Such a requirement precludes vent panels as a means of compliance as pressure must be initiated in order for air to flow past the vent panel."* This is contradictory to JAA's NPA 25D-218, Revs. 2 and 3, both of which state that compliance with the requirement may be achieved by installing vent panels in doors. In addition, negative pressure is a design condition that must be accounted for in the design of the locking/vent door system, such that negative pressure does not unlock the door. The vent panel system, successfully used by Boeing, is always active and provides a secondary means of holding the locks (not the sole means) in the locked state once normal pressurization is achieved on a locked door. Biasing springs force the vent panel open in the event of a mechanism failure preventing pressurization to an unsafe level. We recommend that the AMC definition be revised to read: ***"Locked" means the locks are engaged, for locking systems that have only two stable end (one locked and one unlocked) states. Otherwise,*** "locked" means the locks are engaged and	**Not Accepted** The 2 stable ends concept is not accepted as it gives no consideration to possible jamming or failures of the mechanism.

		held in position by the lock operating mechanism. JUSTIFICATION: The proposed revised definition of "locked" ensures the safety requirements of locks are met, without narrowly defining the design solutions, particularly with respect to interconnected vent panel(s) used to prevent pressurization to an unsafe level if the door is not locked.	
31	Boeing	Boeing is in agreement with most of the proposed changes in the response to CMT #31. However, the text, *"In case of an indicator light, it should not be less reliable than the visual means in the cockpit as required per CS 25.783(e)(3."* in the NPA has not been addressed. We recommend the AMC be revised to read: ... For example, a vent door or indicator light that monitors the door locks and is located at the operator's station may be sufficient. In case of an indicator light, ~~it should not be less reliable than the visual means in the cockpit as required per CS 25.783(e)(3)~~ ***no probable single failure shall result in an erroneous closed, latched, and locked indication at the door operator station.*** The same sensors could be used for both indications in order to prevent any discrepancy between the indications. JUSTIFICATION: While reliable indication at the control panel is highly desirable, there is no specific regulation defining the reliability requirement. Imposing such a requirement solely via advisory material is not warranted. Our suggested changes more appropriately address the potential safety concerns of erroneous indications of closed, latched, and locked at the control panel.	**Not Accepted** The existing AMC text simply reconfirms the applicable reliability requirement of CS 25.1309 and provides an integrity level comparable with the cockpit warning to reduce the possibility of conflicting warnings.
	FAA	**Additional reaction:** The FAA AC and Order revision levels on page 54	**Accepted**

		of the NPA need to be updated as follows: "AC 23.17" should be "AC 23-17B" "Order 8110.4A" should be "Order 8110.4C"	
Comments 11, 16, 27, 46	UK-CAA	25.783(d)(8) Revised text in the Appendix to the CRD. In the context of previous CAA comment 16, CAA concurs with the EASA response. The objective must be to accept only those doors that are clearly and obviously open when positioned as nearly closed as possible with the latches in the latched position but disengaged from the structural attachments. As the new requirement states, "*unless it can be shown that a door that is not closed would always be detected before flight*" and consequently for clarification and consistency an amendment to the text in the Appendix pertinent to AMC (d)(8) is proposed below. PROPOSED TEXT: AMC 25.783, Para 5, (d)(8). "*This alternative is applicable only to doors that are normally operated by these crew members, and where it is **'visually'** clearly evident from within the aircraft **"without detailed inspection under all operational lighting conditions"** that the door is not fully closed.*"	**Accepted** AMC 25.783, para. 5, (d)(8) will now read as follows: … As an alternative to providing the feature described above, reliance can be placed on trained cabin attendants or flight crew members to determine that certain doors are not fully closed. This alternative is applicable only to doors that are normally operated by these crew members, and where it is visually clearly evident from within the aircraft without detailed inspection under all operational lighting conditions ~~by direct visual inspection~~ that the door is not fully closed.
	Airbus	Based on past experience on type design certification of previous aircraft programs, Airbus has noticed that the new § 25.783 as per FAR Amdt 25-114 and NPA 25D-301 / NPA 02-2006 uses terms that leave plenty of room for interpretation. It is in particular this new §25.783 that requires significant information on how to interpret the requirements. This led to the situation that authorities interpreted the advisory material like part of the rule text which made any deviation from the means of compliance almost	**Noted** The text of CS 25.783 and its associated AMC have been reviewed and further developed, where appropriate, to clarify the safety intent and to provide more flexibility in the showing of compliance. Unilateral changes to the HWG final text have been made by both EASA and FAA. This is in keeping with the independent nature of both regulators and

		impossible. Both NPA 25D-301 and NPA 02/2006 provide advisory material which gives a significant amount of design figures that will be, during future certification activities, considered to be mandatory and which will lead to specific designs of the door mechanism not required by the rule itself but by the AMC. For that purpose it is important to have an AMC that is kept quite general and which is fully harmonized with AC 25.783-1A in order to prevent that harmonisation between CS 25.783 and FAR 25.783 is lost. JUSTIFICATION: NPA 02-2006 was based on the JAA disposition of comments received on JAA NPA 25D-301, already resulting in some disharmonisation with FAR Amendment 25-114 and related AC 25.783-1A. Then the disposition of comments on NPA 02-2006 was done, without industry participation through a review group, in a way that introduces further differences with FAR Amendment 25-114 and AC 25.783-1A. Public comments should have been sought on those new differences that have a detrimental effect on the original purpose of JAA NPA 25D-301, which was to enhance the safety level in a harmonised manner.	the need to listen and respond to stakeholder inputs.

Note:

Following an adverse internal comment on the sub-paragraph 5 f. of AMC 25.851(b) received from the final internal consultation of CS-25 Amendment 4 files, the sub-paragraph 5 f. has been deleted. It was recognized that since the rulemaking activity related to Class F compartments is not yet completed such information would be premature.

Apart from the changes that came out of the above NPAs, this Amendment 4 of CS-25 also incorporates several changes aiming to remove certain editorial errors and inconsistencies identified. Their description/justification is as follows:

EDITORIAL CORRECTIONS IN AMENDMENT 4:

Appendix F, Part II:

In sub-paragraph (f)(4) correct the value of ±38 ºC to read ±56 ºC as follows:

(4) Turn on the burner and ensure that the thermocouples are reading 1038 ± ~~38~~56ºC (1900 ± 100ºF) to ensure steady state conditions have been achieved.

Justification:

When making conversions from imperial to SI units, the value of the ±100 ºF was incorrectly converted in the initial issue of CS-25 to ±38 ºC as if it was an absolute value. Since it is a differential value it corresponds to 56 ºC.

AMC 25.1309:

In Section 4 (***APPLICABILITY OF CS 25.1309),*** in paragraphs b., c. and d. correct the word "accepted" to read "excepted" as follows:

b. Certain single failures or jams covered by CS 25.671(c)(1) and CS 25.671(c)(3) are ~~accepted~~ excepted from the requirements of CS 25.1309(b)(1)(ii). FAR 25.671(c)(1) requires the consideration of single failures, regardless of the probability of the failure. CS 25.671(c)(1) does not consider the effects of single failures if their probability is shown to be extremely improbable and the failures also meet the requirements of CS 25.571(a) and (b).

c. Certain single failures covered by CS 25.735(b)(1) are ~~accepted~~ excepted from the requirements of CS 25.1309(b). The reason concerns the brake system requirement that limits the effect of a single failure to doubling the brake roll stopping distance. This requirement has been shown to provide a satisfactory level of safety without the need to analyse the particular circumstances and conditions under which the single failure occurs.

d. The failure effects covered by CS 25.810(a)(1)(v) and CS 25.812 are excepted ~~accepted~~ from the requirements of CS 25.1309(b). …

….

Justification:

The Agency was notified about typographical errors introduced into CS-25 Initial Issue. JAR-25 Amdt. 16 (the source code for CS-25 (Initial issue)) correctly reads "excepted". Checking on substance proved that CS 25.1309 (b) is not applicable to the above cases.

PREAMBLE

A complete list of the paragraphs affected by Amendment 4 can be found in the Preamble section of CS-25.

CHANGE INFORMATION

The Agency publishes amendments to Certification Specifications as consolidated documents. Therefore, except for a note under the amended paragraph the detailed amendments in the text of the consolidated version are not visible. To allow readers to see all the detailed amendments a Change Information document has been created and is published on the Agency's website as part of the amendment package.