European Aviation Safety Agency

# Notice of Proposed Amendment 2015-11

# Regular update of CS-25

RMT.0673 — 13.8.2015


**EXECUTIVE SUMMARY**

This Notice of Proposed Amendment (NPA) makes use of the 'systematic tasks' concept introduced in the revised EASA Management Board Decision amending and replacing the 'Rulemaking Procedure' (EASA MB Decision 01-2012 of 13 March 2012). This concept aims at improving the efficiency of the EASA rulemaking process.

The specific objective of this NPA is to propose an amendment to CS-25 based on the selection of non-complex, non-controversial and mature subjects. The ultimate goal is to increase safety.

This NPA proposes to:

— clarify the intent of CS 25.810(a)(1)(iv) on emergency egress assisting means, with regard to the demonstration of performance with the engine running at ground idle;

— update the references to the FAA Flight Test Guide (AC 25-7C);

— clarify the structure of CS 25.143(l) on 'Electronic flight control systems';

— correct an inaccuracy in the tables of CS 25.397(d)(1) on 'Limit pilot forces for aeroplanes equipped with side stick controls';

— introduce the content of the Certification Memorandum on 'Respecting Brake Energy Qualification Limits' into AMC 25.735(a);

— clarify the applicability of CS 25.729 on 'Retracting mechanism' to both retracting and extending mechanisms of the landing gear; and

— make typographic improvements: ensure that existing AMCs (Book 2) are correctly and clearly referenced in the CSs (Book 1), and correct other typographic errors.

The proposed changes are expected to contribute to an updated CS-25 reflecting the available state of the art and AMCs (complying with the objective of Article 19 of Regulation (EC) No 216/2008), and facilitate the certification process. Overall, this would bring a moderate safety benefit, have no social or environmental impacts, and may provide a slight economic benefit by streamlining the certification process.


| Applicability | | Process map | |
|---|---|---|---|
| Affected regulations and decisions: | CS-25 (ED Decision No. 2003/2/RM) | Concept Paper: | No |
| | | Terms of Reference: | 27.4.2015 |
| | | Rulemaking group: | No |
| Affected stakeholders: | Large aeroplane manufacturers and other design organisations dealing with Supplemental Type Certificates (STCs), repairs or changes to large aeroplanes. | RIA type: | None |
| | | Technical consultation during NPA drafting: | No |
| | | Duration of NPA consultation: | 2 months |
| Driver/origin: | Safety, efficiency/EASA MB Decision 01-2012 (Article 3.5. on 'systematic tasks'). | Review group: | No |
| | | Focussed consultation: | No |
| Reference: | N/A | Publication date of the Opinion: | N/A |
| | | Publication date of the Decision: | 2016/Q1 |

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# 1. Procedural information

## 1.1. The rule development procedure

The European Aviation Safety Agency (hereinafter referred to as the 'Agency') developed this Notice of Proposed Amendment (NPA) in line with Regulation (EC) No 216/2008[1] (hereinafter referred to as the 'Basic Regulation') and the Rulemaking Procedure[2].

This rulemaking activity is included in the Agency's 4-year Rulemaking Programme under RMT.0673.

The text of this NPA has been developed by the Agency. It is hereby submitted for consultation of all interested parties[3].

The process map on the title page contains the major milestones of this rulemaking activity to date and provides an outlook of the timescale of the next steps.

## 1.2. The structure of this NPA and related documents

Chapter 1 of this NPA contains the procedural information related to this task. Chapter 2 (Explanatory Note) explains the core technical content. Chapter 3 contains the proposed text for the amendment of CS-25. This NPA does not require a Regulatory Impact Assessment (RIA) (Please refer to Chapter 4).

## 1.3. How to comment on this NPA

Please submit your comments using the automated **Comment-Response Tool (CRT)** available at **http://hub.easa.europa.eu/crt/**[4].

The deadline for submission of comments is **13 October 2015**.

## 1.4. The next steps in the procedure

Following the closing of the NPA public consultation period, the Agency will review all comments. The outcome of this consultation will be reflected in a Comment-Response Document (CRD) which the Agency will publish together with the Decision amending CS-25.

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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, 19.3.2008, p. 1).

2 The Agency is bound to follow a structured rulemaking process as required by Article 52(1) of the Basic Regulation. Such process has been adopted by the Agency's Management Board and is referred to as the 'Rulemaking Procedure'. See 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 Decision No 01-2012 of 13 March 2012.

3 In accordance with Article 52 of the Basic Regulation and Articles 5(3) and 6 of the Rulemaking Procedure.

4 In case of technical problems, please contact the CRT webmaster (crt@easa.europa.eu).

# 2. Explanatory Note

## 2.1. Overview of the issues to be addressed

This NPA addresses the following topics:

— **Emergency egress assisting means (CS 25.810(a)(1)(iv))**: the intent of CS 25.810(a)(1)(iv) with regard to the demonstration of performance with the engine running at ground idle needs to be clarified;

— **Flight Test Guide (references to FAA AC 25-7A)**: Federal Aviation Authority (FAA) Advisory Circular (AC) 25-7A has the status 'Cancelled', therefore, the existing Book 2 references need to be updated to refer to the current AC 25-7C;

— **Electronic flight control systems (CS 25.143(l))**: there is a need to clarify the applicability of the lead-in condition ('which embody … aerodynamic limitation') of CS 25.143(l);

— **Limit pilot forces for aeroplanes equipped with side stick controls (CS 25.397(d))**: there is a need to correct an inaccuracy in the tables of CS 25.397(d)(1);

— **Respecting Brake Energy Qualification Limits:** a Certification Memorandum has been applied on several projects and is considered mature enough to be introduced in the AMC 25.735(a);

— **Retracting mechanism (CS 25.729)**: there is a need to clarify the applicability of CS 25.729 to both retracting and extending mechanisms of the landing gear;

— **Missing or wrong cross references in the CSs (Book 1) to specific AMCs (Book 2):** there is a need to review the consistency between the existing AMCs and the corresponding references in Book 1 in order to ensure that all existing AMCs are always and correctly referenced; and

— **Correction of typos:** several typos corrections are proposed.

## 2.2. Objectives

The overall objectives of the EASA system are defined in Article 2 of the Basic Regulation. This proposal will contribute to the achievement of the overall objectives by addressing the issues outlined in Chapter 2 of this NPA.

The specific objective of this NPA is to propose an amendment of CS-25 based on the selection of non-complex, non-controversial, and mature subjects. The ultimate goal is to increase safety.

## 2.3. Summary of the Regulatory Impact Assessment (RIA)

N/A (Please refer to Chapter 4)

## 2.4. Overview of the proposed amendments

— **Emergency egress assisting means (CS 25.810(a)(1)(iv))**: CS 25.810(a)(1)(iv) was amended at CS-25 Amendment 13 to include the engine(s) at ground idle when assessing escape slide performance in wind conditions. The reason for this change is that an aircraft design which places the deployment envelope of any of the escape slides in proximity to an engine intake presents an additional safety risk, particularly in the case where wind conditions are also compounding the situation.

However, since this Amendment, the Agency received some comments from stakeholders requesting that the intent of the amended specification is clarified. The applicability of the combined effect of a 25-knot wind and the engine(s) running at ground idle should be only to escape slides positioned forward of the engine(s) and in close proximity to the engine air intake(s).

The Agency agrees with this applicability which has been used on previous certification projects. It is indeed not realistic to expect that an escape slide is usable when submitted to the high-velocity wake of a jet engine running at ground idle.

It is, therefore, proposed to create a new AMC 25.810(a)(1)(iv).

— **Flight Test Guide (references to FAA AC 25-7A)**: As FAA AC 25-7A has the status 'Cancelled' and has been superseded by AC 25-7C, the following references in Book 2 are proposed to be updated: AMC 25.729, AMC 25.735, AMC 25.1322 and AMC No. 1 to CS 25.1329.

— **Electronic flight control systems (CS 25.143(l))**: CS 25.143(l) was created at CS-25 Amendment 13 to define a minimum normal load factor envelope for electronic flight control systems. During a certification project, it appeared that the structure of this CS should be improved. It was questioned whether the lead-in condition ('which embody a normal load factor limiting system and in the absence of aerodynamic limitation') is applicable to all subparagraphs of CS 25.143 (l), or to its first subparagraph only. The Agency proposes to amend the structure of CS 25.143(l) so that the lead-in condition is applicable to all subparagraphs.

— **Limit pilot forces for aeroplanes equipped with side stick controls (CS 25.397(d))**: Since the creation of this subparagraph at CS-25 Amendment 13, the Agency became aware that there is an inaccuracy in the tables of CS 25.397(d), i.e. the terminology used to designate the roll input.

The side stick allows to make inputs for pitch and roll control. Whilst for pitch control the directions of control input are correctly indicated as 'Nose up' and 'Nose down', for roll control the directions of control input are incorrectly indicated as 'Nose left' and 'Nose right'. When making an input on the roll control, the aeroplane would roll left or right. A lateral motion of the nose would normally be associated with rudder control input and seems to be a misnomer when associated to roll control.

Moreover, the tables can be simplified to show one row, as the current two rows contain the same values for both directions.

— **Respecting Brake Energy Qualification Limits:** A Certification Memorandum (EASA CM-HS-001, Issue 1, 24.8.2010) has been applied on several projects through Interpretative Material Certification Review Items (IM CRIs) and is considered mature enough to be introduced into AMC 25.735.

Brake assemblies are qualified against the minimum performance standard of ETSO-C135 (currently at revision 'a') which is an acceptable means of compliance to the requirement of CS 25.735(a).

Part of this ETSO standard is an 'Accelerate Stop Test' and a 'Most Severe Landing Stop Test' (if applicable), which establish the Kinetic Energy (KE) absorption capability of the brake assembly. The ETSO tests demonstrate the KE absorption capability of the brake with that brake at a predetermined (threshold) start temperature. Both of these tests are required to be performed

on (new and worn) brakes with threshold temperatures that must 'as closely as practicable, be representative of a typical in-service condition'.

It is necessary to ensure that the demonstrated brake KE absorption capability is not exceeded when the brake is installed on the aeroplane. Applicants must demonstrate how the threshold temperatures are to be respected.

Two acceptable methods of demonstrating this are the 'Use of Brake Temperature Monitoring' and the 'Use of Brake Cool Down Charts'.

It is proposed to amend AMC 25.735 to reflect this certification policy.

— **Retracting mechanism (CS 25.729)**: The title as well as several subparagraphs of the current CS 25.729 refer to retracting mechanisms, although the obvious intent is to designate both retracting and extending mechanisms. This has been correctly understood by the majority of the applicants, however, the Agency has also experienced that some applicants were litigious with regard to the precise wording of the rule. It is, therefore, proposed to amend CS 25.729 and AMC 25.729 to remove any ambiguities.

— **Missing or wrong cross references in the CSs (Book 1) to AMCs (Book 2):** It has been acknowledged that in the current CS-25 Book 1, some references to the corresponding AMCs are missing, some are incorrect, or the way the reference is made is not harmonised throughout the document.

Therefore, in order to improve the awareness of the reader and correct the references to AMCs, a review of Book 1 and Book 2 has been made and some changes to Book 1 are proposed such that:

- as soon as any AMC material is available in Book 2 for a given CS 25.XYZ paragraph, the reference '(See AMC 25.XYZ)' is indicated immediately below the title of this CS; and
- whenever an AMC material dedicated to a subparagraph of CS 25.XYZ is available (e.g. AMC 25.XYZ(c)), this is indicated at the level of this subparagraph.

— **Correction of typos:** The following corrections are proposed:

At the end of AMC 25.1593, and at the end of AMC to Appendix Q: the indications of the last amendment '[Amdt No: 25/2013]' should read '[Amdt No: 25/13]'. The digits '13' refer to the amendment number, not the year of publication.

AMC to Appendix Q should not appear on a page numbered 2-App N, but on a page numbered 2-App Q.

# 3. Proposed amendments

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

(a) deleted text is marked with ~~strike through~~;

(b) new or amended text is highlighted in grey;

(c) an ellipsis (…) indicates that the remaining text is unchanged in front of or following the reflected amendment.

## 3.1. Draft Certification Specifications (Draft EASA Decision)

BOOK 1

SUBPART B — FLIGHT

Amend CS 25.21 as follows:

**CS 25.21 Proof of compliance**

(See AMC 25.21)

(…)

(d) Parameters critical for the test being conducted, such as weight, loading (centre of gravity and inertia), airspeed, power, and wind, must be maintained within acceptable tolerances of the critical values during flight testing. (See AMC 25.21(d))

(…)

(g) The requirements of this subpart associated with icing conditions apply only if the applicant is seeking certification for flight in icing conditions. (See AMC 25.21(g))

(…)

Amend CS 25.101 as follows:

**CS 25.101 General**

(…)

(g) Procedures for the execution of balked landings and missed approaches associated with the conditions prescribed in CS 25.119 and 25.121(d) must be established. (See AMC 25.101(g))

(…)

Amend CS 25.103 as follows:

**CS 25.103 Stall speed**

(See AMC 25.103)

(…)

(b)(6) (…) and not greater than 1.3 $V_{SR}$. (See AMC 25.103(b))

(…)

(d) In addition to the requirements of subparagraph (a) (…)at which the device operates. (See AMC 25.103(d))

Amend CS 25.107 as follows:

**CS 25.107 Take-off speeds**

(See AMC 25.107)

(…)

Amend CS 25.109 as follows:

**CS 25.109 Accelerate-stop distance**

(See AMC 25.109)

(…)

Amend CS 25.113 as follows:

**CS 25.113 Take-off distance and take-off run**

(See AMC 25.113)

(…)

(c)(2)(ii) (…) by a procedure consistent with CS 25.111. (See AMC 25.113(a)(2), (b)(2) and (c)(2).)

Amend CS 25.119 as follows:

**CS 25.119 Landing climb: all- engines operating**

(See AMC 25.119)

In the landing configuration, the steady gradient of climb may not be less than 3·2 %, with the engines at the power or thrust that is available 8 seconds after initiation of movement of the power or thrust controls from the minimum flight idle to the go-around power or thrust setting ~~(see AMC 25.119)~~;

(…)

Amend CS 25.125 as follows:

**CS 25.125 Landing**

(See AMC 25.125)

(…)

Amend CS 25.143 as follows:

**CS 25.143 General**

(See AMC 25.143)

(a) (See AMC 25.143(a) and (b)~~.~~)

(…)

(b) (See AMC 25.143(a) and (b)~~.~~)

(…)

(l) Electronic flight control systems

For electronic flight control systems (EFCS) which embody a normal load factor limiting system and in the absence of aerodynamic limitation (lift capability at maximum angle of attack),

(1) The positive limiting load factor must not be less than:

(i) 2.5 g with the EFCS functioning in its normal mode and with the high-lift devices retracted up to $V_{MO}/M_{MO}$. The positive limiting load factor may be gradually reduced down to 2.25 g above $V_{MO}/M_{MO}$~~.~~;

(ii) 2.0 g with the EFCS functioning in its normal mode and with the high-lift devices extended~~;~~.

(2) The negative limiting load factor must be equal to or more negative than:

(i) 1.0 g with the EFCS functioning in its normal mode and with the high-lift devices retracted;

(ii) 0 g with the EFCS functioning in its normal mode and with the high-lift devices extended.

(3) The m~~M~~aximum reachable positive load factor wings level may be limited by flight control system characteristics or flight envelope protections (other than load factor limitation), provided that:

(i) the required values are readily achievable in turn, and

(ii) wings level pitch up responsiveness is satisfactory.

(4) The m~~M~~aximum reachable negative load factor may be limited by flight control system characteristics or flight envelope protections (other than load factor limitation), provided that:

(i) pitch down responsiveness is satisfactory, and

(ii) from level flight, 0 g is readily achievable, or, at least, a trajectory change of 5 degrees per second is readily achievable at operational speeds (from VLS to Max speed – 10 kt). VLS is the lowest speed that the crew may fly with auto thrust or auto pilot engaged. Max speed – 10 kt is intended to cover typical margin from VMO/MMO to cruise speeds and typical margin from VFE to standard speed in high-lift configurations.

(5) Compliance demonstrations with the ~~above~~ requirements (1) through (4) above may be performed without ice accretion on the airframe.

Amend CS 25.145 as follows:

**CS 25.145 Longitudinal control**

(See AMC 25.145)

(…)

Amend CS 25.147 as follows:

**CS 25.147 Directional and lateral control**

(See AMC 25.147)

(…)

Amend CS 25.173 as follows:

**CS 25.173 Static longitudinal stability**

(See AMC 25.173)

(…)

Amend CS 25.177 as follows:

**CS 25.177 Static directional and lateral stability**

(See AMC 25.177)

(…)

(b) (…)following airspeed ranges ~~(see AMC 25.177(b))~~:

(…)

Amend CS 25.201 as follows:

**CS 25.201 Stall demonstration**

(See AMC 25.201)

(…)

Amend CS 25.207 as follows:

**CS 25.207 Stall warning**

(See AMC 25.207)

(…)

(e) In icing conditions, the stall warning margin in straight and turning flight must be sufficient to allow the pilot to prevent stalling (as defined in CS 25.201 (c) and (d)) when (…)

(…)

Amend CS 25.251 as follows:

**CS 25.251 Vibration and buffeting**

(See AMC 25.251)

(…)

Amend CS 25.253 as follows:

**CS 25.253 High-speed characteristics**

(See AMC 25.253)

(…)

SUBPART C — STRUCTURE

Amend CS 25.301 as follows:

**CS 25.301 Loads**

(See AMC 25.301)

(…)

Amend CS 25.331 as follows:

**CS 25.331 Symmetric manoeuvring conditions**

(See AMC 25.331)

(…)

Amend CS 25.333 as follows:

**CS 25.333 Flight manoeuvring envelope**

(See AMC 25.333)

(…)

Amend CS 25.335 as follows:

**CS 25.335 Design airspeeds**

(See AMC 25.335)

(…)

Amend CS 25.345 as follows:

**CS 25.345 High lift devices**

(See AMC 25.345)

(…)

Amend CS 25.349 as follows:

**CS 25.349 Rolling conditions**

(See AMC 25.349)

(…)

Amend CS 25.365 as follows:

**CS 25.365 Pressurised compartment loads**

(See AMC 25.365)

(…)

Amend CS 25.393 as follows:

**CS 25.393 Loads parallel to hinge line**

(See AMC 25.393)

(…)

Amend CS 25.397 as follows:

**CS 25.397 Control system loads**

(…)

(d) (…)

(1) For all components between and including the handle and its control stops:

| ~~PITCH~~ | | ~~ROLL~~ | |
|---|---|---|---|
| ~~Nose up~~ | ~~890 N (200 lbf)~~ | ~~Nose left~~ | ~~445 N (100lbf)~~ |
| ~~Nose down~~ | ~~890 N (200 lbf)~~ | ~~Nose right~~ | ~~445 N (100 lbf)~~ |

| PITCH | ROLL |
|---|---|
| 890 N (200 lbf) | 445 N (100 lbf) |

(2) For all other components of the side stick control assembly, but excluding the internal components of the electrical sensor assemblies, to avoid damage as a result of an in-flight jam:

| ~~PITCH~~ | | ~~ROLL~~ | |
|---|---|---|---|
| ~~Nose up~~ | ~~556 N (125 lbf)~~ | ~~Nose left~~ | ~~222 N (50 lbf)~~ |
| ~~Nose down~~ | ~~556 N (125 lbf)~~ | ~~Nose right~~ | ~~222 N (50 lbf)~~ |

| PITCH | ROLL |
|---|---|
| 556 N (125 lbf) | 222 N (50 lbf) |

Amend CS 25.415 as follows:

**CS 25.415 Ground gust conditions**

(See AMC 25.415)

(…)

Amend CS 25.491 as follows:

**CS 25.491 Taxi, take-off and landing roll**

(See AMC 25.491)

Within the range of appropriate ground speeds and approved weights, the aeroplane structure and landing gear are assumed to be subjected to loads not less than those obtained when the aircraft is operating over the roughest ground that may reasonably be expected in normal operation. ~~(See AMC 25.491.)~~

Amend CS 25.571 as follows:

**CS 25.571 Damage- tolerance and fatigue evaluation of structure**

(See AMC 25.571)

(…)

Amend CS 25.581 as follows:

**CS 25.581 Lightning protection**

(See AMC 25.581)

(a) The aeroplane must be protected against catastrophic effects from lightning. (See also CS 25.899 ~~and AMC 25.581.~~)

(…)

SUBPART D — DESIGN AND CONSTRUCTION

Amend CS 25.603 as follows:

**CS 25.603 Materials**

(See AMC 25.603; ~~F~~for Composite Materials see AMC 20-29)

(…)

Amend CS 25.609 as follows:

**CS 25.609 Protection of structure**

(See AMC 25.609)

Each part of the structure must ~~(see AMC 25.609)~~

(…)

Amend CS 25.629 as follows:

**CS 25.629 Aeroelastic stability requirements~~.~~**

(See AMC 25.629)

(a) General. The aeroelastic stability(…) or some combination thereof as found necessary by the Agency ~~(see AMC 25.629)~~.

(…)

Amend CS 25.631 as follows:

**CS 25.631 Bird strike damage**

(See AMC 25.631)

The aeroplane must be designed to assure (…). Compliance may be shown by analysis only when based on tests carried out on sufficiently representative structures of similar design. ~~(See AMC 25.631.)~~

Amend CS 25.671 as follows:

**CS 25.671 General**

(See AMC 25.671)

(…)

Amend CS 25.672 as follows:

**CS 25.672 Stability augmentation and automatic and power-operated systems**

(See AMC 25.672)

(…)

Amend CS 25.679 as follows:

**CS 25.679 Control system gust locks**

(See AMC 25.679)

(…)Amend CS 25.685 as follows:

**CS 25.685 Control system details**

(See AMC 25.685)

(…)

Amend CS 25.701 as follows:

**CS 25.701 Flap and slat interconnection**

(See AMC 25.701)

(…)

Amend CS 25.729 as follows:

**CS 25.729 Extending and ~~R~~retracting mechanisms**

(See AMC 25.729)

(a) *General*. ~~-~~For aeroplanes with retractable landing gear, the following apply:

(1) The landing gear extending and retracting mechanisms, wheel well doors, and supporting structure, must be designed for~~—~~:

(i) ~~T~~the loads occurring in the flight conditions when the gear is in the retracted position;

(ii) ~~T~~the combination of friction loads, inertia loads, brake torque loads, air loads, and gyroscopic loads resulting from the wheels rotating at a peripheral speed equal to 1.23 $V_{SR}$ (with the flaps in take-off position at design take-off weight), occurring during retraction and extension at any airspeed up to 1.5 $V_{SR1}$ with the wing-flaps in the approach position at design landing weight, and

(iii) ~~A~~any load factor up to those specified in CS 25.345 (a) for the wing-flaps extended condition.

(2) Unless there are other means to decelerate the aeroplane in flight at this speed, the landing gear, the extending and retracting mechanisms, and the aeroplane structure

(including wheel well doors) must be designed to withstand the flight loads occurring with the landing gear in the extended position at any speed up to 0.67 $V_C$.

(3) Landing gear doors, their operating mechanism, and their supporting structures must be designed for the yawing manoeuvres prescribed for the aeroplane in addition to the conditions of airspeed and load factor prescribed in sub-paragraphs (a)(1) and (2) of this paragraph.

(b) *Landing gear lock*. There must be positive means to keep the landing gear extended in flight and on the ground. There must be positive means to keep the landing gear and doors in the correct retracted position in flight, unless it can be shown that lowering of the landing gear or doors, or flight with the landing gear or doors extended, at any speed, is not hazardous.

(c) *Emergency operation*. There must be an emergency means for extending the landing gear in the event of –

(1) Any reasonably probable failure in the normal extension and retraction systems; or

(2) The failure of any single source of hydraulic, electric, or equivalent energy supply.

(d) *Operation test*. The proper functioning of the extending and retracting mechanisms must be shown by operation tests.

(…)

Amend CS 25.745 as follows:

**CS 25.745 Nose-wheel steering**

(See AMC 25.745)

(…)

Amend CS 25.773 as follows:

**CS 25.773 Pilot compartment view**

(See AMC 25.773 ~~AMC 25.773(b)(1)(ii), AMC 25.773(b)(4), AMC 25.773(c)~~)

(…)

(b) *Precipitation conditions*. (…)

(1)(ii) The icing conditions specified in Appendix C and the following icing conditions specified in Appendix O, if certification for flight in icing conditions is sought (See AMC 25.773(b)(1)(ii)):

(…)

(4)(ii) An encounter with severe hail, birds, or insects. (See AMC 25.773(b)(4))

(c) *Internal windshield and window fogging*. (…) in which the aeroplane is intended to be operated. (See AMC 25.773(c)).

(…)

Amend CS 25.775 as follows:

**CS 25.775 Windshields and windows**

(See AMC 25.775)

(…)

Amend CS 25.783 as follows:

**CS 25.783 Fuselage Doors**

(See AMC 25.783)

(…)

Amend CS 25.787 as follows:

**CS 25.787 Stowage compartments**

(See AMC 25.787)

(…)

Amend CS 25.795 as follows:

**CS 25.795 Security considerations**

(…)

(a) (…)

(1) Resist forcible intrusion (…) including the doorknob or handle (See AMC 25.795(a)(1)), and

(…)

(2)(ii) Demonstration Projectile #2. (…) velocity 436 m/s (1,430 ft/s). (See AMC 25.795(a)(2))

(b) (…)

(1) Flight deck smoke protection. Means must be provided to limit entry of smoke, fumes, and noxious gases into the flight deck. (See AMC 25.795(b)(1))

(2) Passenger (…) carbon dioxide. (See AMC 25.795(b)(2))

(3)(iv) (…) from the cargo compartment. (See AMC 25.795(b)(3))

(c) (…)

(1) (…) the case of detonation. (See AMC 25.795(c)(1))

(2)(ii) (…) the survivability of those systems. (See AMC 25.795(c)(2))

(3)(iii) Life preservers or their storage locations must be designed so that tampering is evident. (See AMC 25.795(c)(3))

(…)

Amend CS 25.807 as follows:

**CS 25.807 Emergency exits**

(…)

(f) *Location*. (See AMC 25.807(f))

(…)

Amend CS 25.810 as follows:

**CS 25.810 Emergency egress assisting means and escape routes**

(See AMC 25.810)

(…)

(a)(1)(iv) It must have the capability, (…) to evacuate occupants safely to the ground. (See AMC 25.810(a)(1)(iv))

(…)

(c)(2) The escape route surface must have a reflectance of at least 80 %, and must be defined by markings with a surface-to-marking contrast ratio of at least 5:1. (See AMC 25.810(c)(2))

(…)

Amend CS 25.813 as follows:

**CS 25.813 Emergency exit access and ease of operation**

(See AMC 25.813~~ and AMC 25.813(c)~~)

(…)

(c) The following must be provided for each Type III or Type IV exit ~~–~~— (See AMC 25.813(c))

(…)

Amend CS 25.831 as follows:

**CS 25.831 Ventilation**

(See AMC 25.831)

(…)

Amend CS 25.851 as follows:

**CS 25.851 Fire extinguishers**

(See AMC 25.851)

(…)

Amend CS 25.856 as follows:

**CS 25.856 Thermal/acoustic insulation materials**

(See AMC 25.856~~(a) and AMC 25.856(b)~~)

(a) (…) of Appendix F to CS-25. (See AMC 25.856(a))

(b) (…) fire penetration resistance. (See AMC 25.856(b))

Amend CS 25.863 as follows:

**CS 25.863 Flammable fluid fire protection**

(See AMC 25.863)

(…)

Amend CS 25.869 as follows:

**CS 25.869 Fire protection: systems**

(See AMC 25.869)

(…)

SUBPART E — POWERPLANT

Amend CS 25.901 as follows:

**CS 25.901 Installation**

(See AMC 25.901)

(…)

Amend CS 25.903 as follows:

**CS 25.903 Engines**

(See AMC 25.903)

(…)

Amend CS 25.905 as follows:

**CS 25.905 Propellers**

(See AMC 25.905)

(…)

Amend CS 25.929 as follows:

**CS 25.929 Propeller de-icing**

(See AMC 25.929)

(…)

Amend CS 25.933 as follows:

**CS 25.933 Reversing systems**

(See AMC 25.933)

(…)

Amend CS 25.954 as follows:

**CS 25.954 Fuel system lightning protection**

(See AMC 25.954)

(…)

Amend CS 25.955 as follows:

**CS 25.955 Fuel flow**

(See AMC 25.955)

(…)

Amend CS 25.963 as follows:

**CS 25.963 Fuel tanks: general**

(See AMC 25.963)

(…)

Amend CS 25.967 as follows:

**CS 25.967 Fuel tank installations**

(See AMC 25.967)

(…)

Amend CS 25.979 as follows:

**CS 25.979 Pressure fuelling system**

(See AMC 25.979)

(…)

Amend CS 25.981 as follows:

**CS 25.981 Fuel tank ignition prevention**

(See AMC 25.981)

(…)

Amend CS 25.1043 as follows:

**CS 25.1043 Cooling tests**

(See AMC 25.1043)

(…)

Amend CS 25.1091 as follows:

**CS 25.1091 Air intake**

(See AMC 25.1091)

(…)

Amend CS 25.1093 as follows:

**CS 25.1093 Powerplant Icing**

(See AMC 25.1093)

(…)

(b)(2) (…) in accordance with CS 25.1521. (See AMC 25.1093(b))

Amend CS 25.1103 as follows:

**CS 25.1103 Air intake system ducts and air duct systems**

(See AMC 25.1103)

(…)

Amend CS 25.1121 as follows:

**CS 25.1121 General**

(See AMC 25.1121)

(…)

Amend CS 25.1141 as follows:

**CS 25.1141 Powerplant controls: general**

(See AMC 25.1141)

(…)

(f)(2)(ii)(…) to the selected position or function. (See AMC 25.1141(f))

Amend CS 25.1155 as follows:

**CS 25.1155 Reverse thrust and propeller pitch settings below the flight regime**

(See AMC 25.1155)

(…)

Amend CS 25.1193 as follows:

**CS 25.1193 Cowling and nacelle skin**

(See AMC 25.1193)

(…)

Amend CS 25.1195 as follows:

**CS 25.1195 Fire-extinguisher systems**

(See AMC 25.1195)

(…)

SUBPART F — EQUIPMENT

Amend CS 25.1303 as follows:

**CS 25.1303 Flight and navigation instruments**

(See AMC 25.1303)

(…)

Amend CS 25.1305 as follows:

**CS 25.1305 Powerplant instruments**

(See AMC 25.1305)

(…)

(a)(2)(iv)(B)(…) are not adversely affected by the same single failure. (See AMC 25.1305(a)(2))

(…)

Amend CS 25.1310 as follows:

**CS 25.1310 Power source capacity and distribution**

(See AMC 25.1310)

(…)

Amend CS 25.1315 as follows:

**CS 25.1315 Negative acceleration**

(See AMC 25.1315)

(…) expected for the acceleration. ~~(See also AMC 25.1315.)~~

Amend CS 25.1323 as follows:

**CS 25.1323 Airspeed indicating system**

(See AMC 25.1323)

(…)

Amend CS 25.1333 as follows:

**CS 25.1333 Instrument systems**

(See AMC 25.1333)

(…)

Amend CS 25.1351 as follows:

**CS 25.1351 General**

(See AMC 25.1351)

(…)

Amend CS 25.1353 as follows:

**CS 25.1353 Electrical equipment and installations**

(See AMC 25.1353)

(…)

Amend CS 25.1355 as follows:

**CS 25.1355 Distribution system**

(See AMC 25.1355)

(…)

Amend CS 25.1357 as follows:

**CS 25.1357 Circuit protective devices**

(See AMC 25.1357)

(…)

Amend CS 25.1360 as follows:

**CS 25.1360 Precautions against injury**

(See AMC 25.1360)

(…)

Amend CS 25.1436 as follows:

**CS 25.1436 Pneumatic systems – high pressure**

(See AMC 25.1436)

(…)

Amend CS 25.1438 as follows:

**CS 25.1438 Pressurisation and low pressure pneumatic systems**

(See AMC 25.1438)

(…)

Amend CS 25.1441 as follows:

**CS 25.1441 Oxygen equipment and supply**

(See AMC 25.1441)

(…)

Amend CS 25.1447 as follows:

**CS 25.1447 Equipment standards for oxygen dispensing units**

(See AMC 25.1447)

(…)

Amend CS 25.1459 as follows:

**CS 25.1459 Flight recorders**

(See AMC 25.1459)

(…)

SUBPART G — OPERATING LIMITATIONS AND INFORMATION

Amend CS 25.1519 as follows:

**CS 25.1519 Weight, centre of gravity and weight distribution**

(See AMC 25.1519)

The aeroplane weight, centre of gravity, and weight distribution limitations determined under CS 25.23 to CS 25.27 must be established as operating limitations. ~~(See AMC 25.1519.)~~

Amend CS 25.1523 as follows:

**CS 25.1523 Minimum flight crew**

(See AMC 25.1523)

The minimum flight crew must be established ~~(see AMC 25.1523)~~ so that (…)

Amend CS 25.1533 as follows:

**CS 25.1533 Additional operating limitations**

(See AMC 25.1533)

(…)

Amend CS 25.1545 as follows:

**CS 25.1545 Airspeed limitation information**

(See AMC 25.1545)

The airspeed limitations required by CS 25.1583(a) must be easily read and understood by the flight crew. ~~(See AMC 25.1545.)~~

Amend CS 25.1557 as follows:

**CS 25.1557 Miscellaneous markings and placards**

(See AMC 25.1557)

(…)

Amend CS 25.1583 as follows:

**CS 25.1583 Operating limitations**

(See AMC 25.1583)

(…)

(i) *Manoeuvring flight load factors*. The positive manoeuvring limit load factors for which the structure is proven, described in terms of accelerations, must be furnished. (See AMC 25.1583(i))

(…)

SUBPART J — AYXILIARY POWER UNIT INSTALLATIONS

Amend CS 25J901 as follows:

**CS 25J901 Installation**

(See AMC 25J901)

(…)

Amend CS 25J955 as follows:

**CS 25J955 Fuel flow**

(See AMC 25J955)

(…)

Amend CS 25J1093 as follows:

**CS 25J1093 Air intake system icing protection**

(See AMC 25J1093)

(…)

(b)(2) (…)the aeroplane operating limitations. (See AMC 25J1093(b))

Amend CS 25J1195 as follows:

**CS 25J1195 Fire extinguisher systems**

(See AMC 25J1195)

(…)

APPENDICES

Amend Appendix F as follows:

(…)

**Appendix F**

**Part IV –— Test Method to Determine the Heat Release Rate From Cabin Materials Exposed to Radiant Heat**

(See AMC to Appendix F, Part IV)

(…)

Amend Appendix H as follows:

**Appendix H**

**Instructions for Continued Airworthiness**

(See AMC to Appendix H)

(…)

Amend Appendix N as follows:

**Appendix N**

**Fuel Tank Flammability Exposure**

(See AMC to Appendix N)

(…)

Amend Appendix Q as follows:

**Appendix Q**

**Additional airworthiness requirements for approval of a Steep Approach Landing (SAL) capability**

(See AMC to Appendix Q)

(…)

BOOK 2

AMC SUBPART D

Amend AMC 25.729 as follows:

**AMC 25.729**

**Extending and ~~R~~retracting ~~M~~mechanisms**

(…)

2. RELATED DOCUMENTS.

a. *Related Certification Specifications*. CS 25.729 and other paragraphs relating to landing gear extending and retracting mechanisms installations together with their applicable AMCs, if any. Paragraphs which prescribe requirements for the design, substantiation, and certification of landing gear extending and retracting mechanisms include:

(…)

CS 25.729 Extending and ~~R~~retracting mechanisms

(…)

b. FAA *Advisory Circulars (AC's)*.

(…)

AC 25-7~~A~~C Flight Test Guide for Certification of Transport Category Airplanes

(…)

4. DISCUSSION.

a. *Intent of rule*. (Reference CS 25.729 Extending and ~~R~~retracting mechanisms)

This rule provides minimum design and certification requirements for landing gear actuation systems to address:

(1) Structural integrity for the nose and main landing gear, extending and retracting mechanism(s), doors, gear supporting structure for loads imposed during flight;

(…)

b. *Demonstration of extending and retracting mechanisms proper functioning*. (Reference CS 25.729(d) Operation test)

Guidance addressing flight testing used to demonstrate compliance with this paragraph may be found in ~~EASA AMC equivalent to~~ FAA Advisory Circular (AC) 25-7~~A~~C, Flight Test Guide for Transport Category Aeroplanes, chapter 4, section 4, paragraph 52, ~~issued June 3, 1999~~dated 16 October 2012.

c. *Extending and ~~R~~retracting mechanisms ~~I~~indication*. (Reference CS 25.729(e) Position indicator and warning device)

(…)

d. *Definitions*. For definitions of $V_{SR}$ and $V_C$, see CS-Definitions Chapter 2, entitled 'Abbreviations and symbols'.

Amend AMC 25.735 as follows:

**AMC 25.735**

**Brakes and Braking Systems Certification Tests and Analysis**

(…)

2. RELATED REGULATORY MATERIAL AND COMPLEMENTARY DOCUMENTS

a. Related EASA Certification Specifications

(…)

CS 25.729 Extending and ~~R~~retracting mechanisms

(…)

b. Complementary Documents

(…)

(ii) Advisory Circulars/Acceptable Means of Compliance

(…)

AC 25-7~~A~~C Flight Test Guide for Certification of Transport Category Airplanes

(…)

4. DISCUSSION

a. Ref. CS 25.735(a) Approval

(…)

(2) Respecting Brake Energy Qualification Limits

The ETSO standard for wheels and wheel and brake assemblies includes an '*Accelerate-Stop Test*' and a '*Most Severe Landing Stop Test*' (if applicable), which establish the Kinetic Energy (KE) absorption capability of the brake assembly. The ETSO tests demonstrate the KE absorption capability of the brake with that brake at a predetermined (threshold) start temperature. Both of these tests are required to be performed on (new and worn) brakes with threshold temperatures that must 'as closely as practicable, be representative of a typical in-service condition'.

Two methods are permitted and accepted by the Agency to calculate the energy required to bring the heat pack to this representative thermal condition:

(a) by a rational analysis; or

(b) by the addition of a percentage of the $KE_{RT}$ Wheel/Brake Rated Accelerate-Stop Energy: 10 % for '*Accelerate-Stop Test*' or 5 % for '*Most Severe Landing Stop Test*'.

It is assumed that if the brake were to be used in-service with an initial temperature higher than the threshold temperature, then its KE absorption capability during a subsequent stop would be reduced. This could lead to the brake being unable to generate the required torque to stop the aeroplane in the available distance, or being unable to safely dissipate the additional thermal energy generated during the stop (hence, a risk of fire). It is, therefore, necessary to ensure that the demonstrated brake KE absorption capability is not exceeded when the brake is installed on the aeroplane.

It should be demonstrated how the temperature thresholds, determined for the brake qualification testing, are to be respected.

Acceptable methods of demonstrating this include but are not limited to the following:

(a) use of Brake Temperature Monitoring: by allowing the crew to check the brake temperature prior to a take-off, it can be ensured that that the brake temperature does not exceed the temperature threshold of the demonstrated brake qualification testing, or

(b) use of Brake Cool Down Charts: by establishing the cool down rate of the brake heat sink, an estimate can be made that relates the energy absorbed by the brake to its temperature and also to the appropriate cool down time.

Appropriate limitations have to be specified in the Aeroplane Flight Manual (AFM).

(~~2~~3) Refurbished and Overhauled Equipment. (…)

(~~3~~4) Replacement and Modified Equipment. (…)

(…)

Create a new AMC 25.810(a)(1)(iv) as follows:

**AMC 25.810(a)(1)(iv)**

**Capability of assisting means in wind conditions**

The applicability of the combined effect of a 46 km/hr (25-knot) wind and the engine(s) running at ground idle should be only to escape slides positioned forward of the engine(s) and in close proximity to the engine air intake(s).

AMC — SUBPART F

Amend AMC 25.1322 as follows:

**AMC 25.1322**

**Flight Crew Alerting**

(…)

**Appendix 3**

**Regulations**

(…)

| **CS-25 Paragraph** | **Subject** |
|---|---|
| (...) | (...) |
| CS 25.729(e) | Extending and ~~R~~retracting mechanisms |
| (...) | (...) |

**Appendix 4**

**Related Documents**

(…)

2. ACs.

(…)

| **Number** | **Title** |
|---|---|
| (…) | (…) |
| AC 25-7C~~A, Change 1~~ | Flight Test Guide for Certification of Transport Category Airplanes |
| (…) | (…) |

(…)

Amend AMC No. 1 to CS 25.1329 as follows:

**AMC No. 1 to CS 25.1329**

**Flight Guidance System**

(…)

**3 RELATED ADVISORY MATERIAL**

(…)

| | |
|---|---|
| (...) | (...) |
| FAA AC 25-7CA | Flight Test Guide for Certification of Transport Category Airplanes |
| (...) | (...) |

Amend AMC 25.1435 as follows:

**AMC 25.1435**

**Hydraulic Systems — Design, Test, Analysis and Certification**

(…)

2. RELATED REGULATORY MATERIAL AND COMPLEMENTARY DOCUMENTS

(a) Related Certification Specifications

(…)

CS 25.729 Extending and retracting mechanisms

AMC — SUBPART G

Correct AMC 25.1593 as follows:

**AMC 25.1593**

**Exposure to volcanic cloud hazards**

(…)

[Amdt No: 25/2013]

AMC — APPENDICES

Correct AMC to Appendix Q as follows:

**AMC to Appendix Q**

**(SAL) 25.5 Safe operational and flight characteristics**

(…)

[Amdt No: 25/2013]

Note: Page numbering is corrected as follows: 2-App QN-1

# 4. Regulatory Impact Assessment (RIA)

This NPA does not create new requirements for applicants. Some clarifications of existing certification specifications are proposed, as well as new or updated AMCs based on common certification practices agreed with applicants. There is no need to develop a RIA.

# 5. References

## 5.1. Affected regulations

N/A

## 5.2. Affected CS, AMC and GM

CS-25 (ED Decision No. 2003/2/RM)

## 5.3. Reference documents

— FAA AC 25-7C: Federal Aviation Authority (FAA) Advisory Circular (AC) 25-7C, Flight Test Guide For Certification Of Transport Category Airplanes, 16.10.2012

— EASA Certification Memorandum CS-HS-001, Respecting Brake Energy Qualification Limits, Issue 1, issued on 24.8.2010 by the Hydromechanical Systems Section

— EASA European Technical Standard Order ETSO-C135a, Large Aeroplane Wheels And Wheel And Brake Assemblies, 21.12.2010

# 6. Appendices

N/A