CS-25 AMENDMENT 22 — CHANGE INFORMATION

EASA publishes amendments to certification specifications as consolidated documents. These documents are used for establishing the certification basis for applications made after the date of entry into force of the amendment.

Consequently, except for a note '[Amdt No: 25/22]' under the amended paragraph, the consolidated text of CS-25 does not allow readers to see the detailed changes introduced by the new amendment. To allow readers to also see these detailed changes this document has been created. The same format as for publication of notices of proposed amendments (NPAs) has been used to show the changes:

(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.

BOOK 1

SUBPART C — STRUCTURE

Create CS 25.353 as follows:

CS 25.353 Rudder control reversal conditions

(See AMC 25.353)

The aeroplane must be designed for loads, considered to be ultimate, resulting from the yaw manoeuvre conditions specified in sub-paragraphs (a) through (e) at speed from V_{MC} to V_C/M_C. Any permanent deformation resulting from these ultimate load conditions must not prevent continued safe flight and landing. These conditions are to be considered with the landing gear retracted and speed brakes (or spoilers when used as speed brakes) retracted. Flaps (or flaperons or any other aerodynamic devices when used as flaps) and slats-extended configurations are also to be considered if they are used in en-route conditions. Unbalanced aerodynamic moments about the centre of gravity must be reacted in a rational or conservative manner considering the aeroplane inertia forces. In computing the loads on the aeroplane, the yawing velocity may be assumed to be zero. The applicant must assume a pilot force of 890 N (200 lbf) when evaluating each of the following conditions:

(a) With the aeroplane in un-accelerated flight at zero yaw, it is assumed that the cockpit rudder control is suddenly and fully displaced to achieve the resulting rudder deflection, as limited by the control system or the control surface stops.

(b) With the aeroplane yawed to the overswing sideslip angle, it is assumed that the cockpit rudder control is suddenly and fully displaced in the opposite direction to achieve the resulting rudder deflection, as limited by the control system or the control surface stops.

(c) With the aeroplane yawed to the opposite overswing sideslip angle, it is assumed that the cockpit rudder control is suddenly and fully displaced in the opposite direction to achieve the resulting rudder deflection, as limited by the control system or the control surface stops.

(d) With the aeroplane yawed to the subsequent overswing sideslip angle, it is assumed that the cockpit rudder control is suddenly and fully displaced in the opposite direction to achieve the resulting rudder deflection, as limited by the control system or the control surface stops.

(e) With the aeroplane yawed to the opposite overswing sideslip angle, it is assumed that the cockpit rudder control is suddenly returned to neutral.

SUBPART G — OPERATING LIMITATIONS AND INFORMATION

<u>Amend CS 25.1583(a)(3) as follows:</u>

CS 25.1583 Operating limitations

(See AMC 25.1583)

(a) *Airspeed limitations*. The following airspeed limitations and any other airspeed limitations necessary for safe operation must be furnished.

(…)

(3) The manoeuvring speed ~~V_A~~ established under CS 25.1507 and ~~a statement~~ statements, as applicable to the particular design, explaining that:

(i) full application of ~~rudder and aileron~~ pitch, roll, or yaw controls~~, as well as manoeuvres that involve angles of attack near the stall,~~ should be confined to speeds below ~~this value~~ the manoeuvring speed; and

(ii) rapid and large alternating control inputs, especially in combination with large changes in pitch, roll, or yaw, and full control inputs in more than one axis at the same time, should be avoided as they may result in structural failures at any speed, including below the manoeuvring speed.

BOOK 2

AMC - SUBPART C

Create AMC 25.353 as follows:

AMC 25.353

Rudder control reversal conditions

1. Purpose.

This AMC describes acceptable means of compliance with the specifications of CS 25.353. These specifications provide structural design load conditions that apply to the airframe, and that occur as a result of multiple cockpit rudder control (e.g. pedal) inputs.

2. Related CS-25 specifications.

a. CS 25.351, Yaw manoeuvre conditions.

b. CS 25.353, Rudder control reversal conditions.

3. Background.

a. *Specifications*. CS 25.351 and CS 25.353 specify structural design load conditions that occur as a result of cockpit rudder control inputs. These conditions are intended to encompass all of the rudder manoeuvre loads expected to occur in service.

b. *Yaw manoeuvre conditions*. The design load conditions specified in CS 25.351 are considered to be limit load conditions, and a safety factor of 1.5 is applied to obtain the ultimate loads.

c. *Rudder control reversal load conditions*. The design load conditions specified in this CS 25.353 are more severe than those in CS 25.351, and include cockpit rudder control reversals. These conditions are anticipated to occur very rarely, and therefore these are considered to be ultimate load conditions, and no additional safety factor is applied.

d. *Overswing sideslip angle definition*: the maximum (peak) sideslip angle reached by the aeroplane with the cockpit rudder control displaced as specified in paragraph 4.b below.

4. Application of the specifications.

a. *General*

(1) The aeroplane must be designed for the cockpit rudder control reversal load conditions specified in CS 25.353. These are considered to be ultimate load conditions and, therefore, no additional safety factor is applied. However, any resulting permanent deformation must not prevent continued safe flight and landing.

(2) Design loads must be determined as specified in CS 25.321. The load conditions are considered from V_{MC} to V_C/M_C. A pilot force of 890 N (200 lbf) is assumed to be applied for all conditions. These conditions are to be considered with the landing gear retracted and speed brakes (or spoilers when used as speed brakes) retracted.

Flaps (or flaperons or any other aerodynamic devices when used as flaps) and slats-extended configurations are also to be considered if they are used in en-route conditions.

(3) System effects. System effects should be taken into account in the evaluation of this manoeuvre. For example, fly-by-wire aeroplanes should be analysed assuming that the aeroplane is in the normal control law mode. Any system function used to demonstrate compliance with these requirements should meet the following criteria:

(i) The system is normally operative during flight in accordance with the aeroplane flight manual procedures, although limited dispatch with the system inoperative could be allowed under applicable master minimum equipment list (MMEL) provisions, provided that the MMEL requirements are still complied with, taking into account the rudder reversal pedal inputs as the next critical event under dispatch configuration; and

(ii) Appropriate crew procedures should be provided in the event of a loss of function. If a loss of system function would not be detected by the flight crew, the probability of a loss of function (i.e. the failure rate multiplied by the maximum exposure period) should be less than 1/1000.

(4) Failure conditions. Assuming that the systems which are used to demonstrate compliance with CS 25.353 meet the criteria in 4.a(3)(i) and (ii) above, considering the very low probability of a full rudder control (e.g. pedal) doublet event, failure scenarios do not need to be addressed in combination with the rudder control reversal load conditions specified in CS 25.353.

b. Y*aw manoeuvre conditions*

Conditions (a) through (e) of CS 25.353 are intended to be a full displacement cockpit rudder control input followed by three cockpit rudder control reversals and a return to neutral.

The aeroplane airspeed should be kept reasonably constant throughout the manoeuvre using pitch control.

These conditions should be investigated assuming rational or conservative roll control input (pilot or system induced).

Refer to the illustration in Figure 1 below.

(1) *Rudder control input*. In the context of CS 25.353, 'suddenly' means as fast as possible within human and system limitations. In the absence of a rational analysis, the initial rudder control displacement is achieved in no more than 0.2 seconds, and full cockpit rudder control reversal displacement is achieved in 0.4 seconds. Alternatively, the applicant may assume that the rudder control is displaced instantaneously.

The resulting rudder displacement should take into account any additional displacement caused by sideslip build-up, and the effects of flexibility should be considered when relevant.

(2) *Rudder control reversals.* As soon as the maximum overswing yaw angle is achieved, full opposite rudder control input is applied. The achieved rudder deflection may be limited by control laws, system architecture, or air loads, and may not be of the same magnitude as the initial rudder deflection prior to the rudder control reversal. For a critically damped aeroplane response, the maximum overswing yaw angle may be assumed to occur when the sideslip angle is substantially stabilised.

Two additional rudder control reversals are performed as defined in paragraph 4.b(1) above. After the second reversal, as soon as the aeroplane yaws to the opposite overswing yaw angle, the rudder control is suddenly returned to neutral.

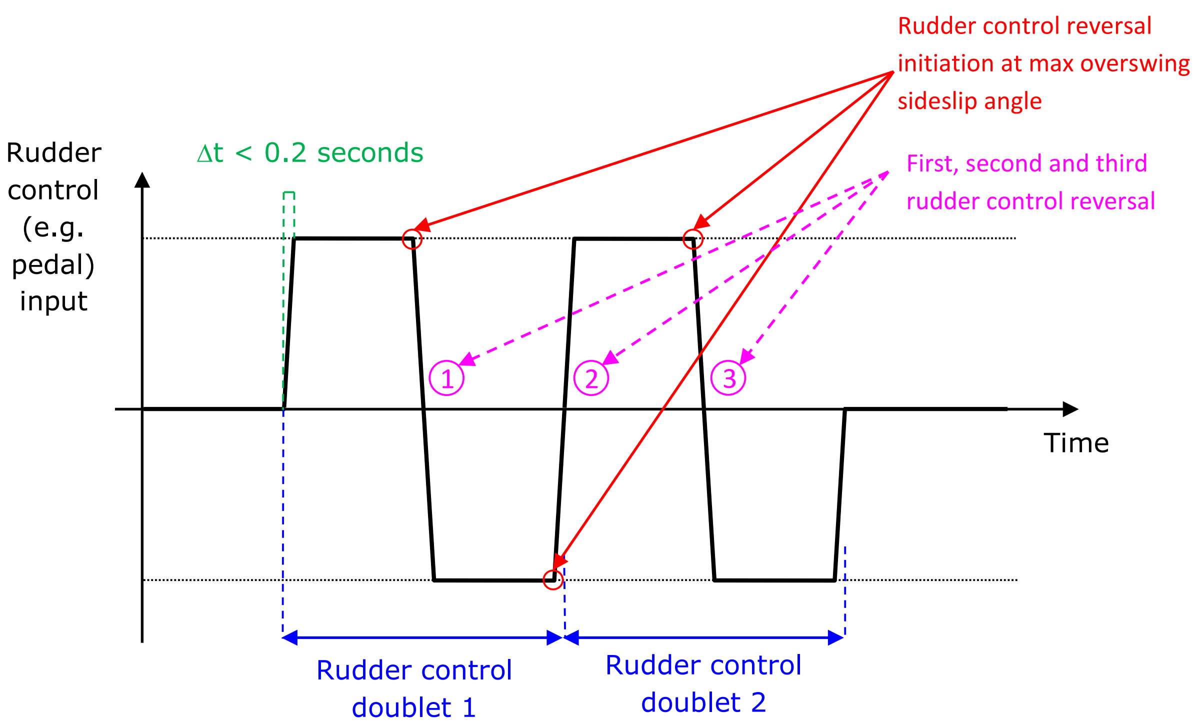

Figure 1: Illustration of the cockpit rudder control inputs

Amend AMC 25.1581 as follows:

AMC 25.1581
Aeroplane Flight Manual
(…)
6 *AEROPLANE FLIGHT MANUAL CONTENTS*
(…)
b. *Limitations Section*
(…)
(7) Airspeed and Mach Number Limitations.
(…)
~~(ii) Manoeuvring speed, V_A, together with a statement that full application of longitudinal, directional and lateral flight controls, as well as manoeuvres that involve angles-of-attack near the stall, should be confined to speeds below this value.~~
(ii) Manoeuvring speed (established under CS 25.1507) together with statements, as applicable to the particular design, explaining that:

(a) full application of pitch, roll, or yaw controls should be confined to speeds below the manoeuvring speed; and
(b) rapid and large alternating control inputs, especially in combination with large changes in pitch, roll, or yaw, and full control inputs in more than one axis at the same time, should be avoided as they may result in structural failures at any speed, including below the manoeuvring speed.

Amend AMC 25J1195(b as follows:

AMC 25J1195(b)
Fire Extinguisher Systems

Acceptable methods to establish the adequacy of the fire extinguisher system are laid down in FAA Advisory Circular 20 – 100, with reference to Halon concentration levels. This AC is not applicable to extinguishing agents alternative to Halon. ~~dated 21 September 1977.~~