This document was created to make public non-proprietary data contained in Special Conditions and Equivalent Safety Findings that are part of the applicable Certification Basis as recorded in TCDS EASA.A.151

Content

Abbreviations

TCDS	Type Certificate Data Sheet
SC	Special Condition
DEV	Deviation
ESF	Equivalent Safety Finding

B-01 (SC): Stalling and Scheduled Operating Speeds	
APPLICABILITY:	A350
REQUIREMENTS:	CS 25.103, 25.143 (h), 25.145, 25.201, 25.203, 25.207, 25.1323
ADVISORY MATERIAL:	N/A

Special Condition

0 – Foreword
In the following paragraphs, “In icing conditions” means with the ice accretions (relative to the relevant flight phase) as defined in CS 25 amendment 3 appendix C.

1 - Definitions
This Special Condition addresses novel features of the A350 and uses terminology that does not appear in CS 25.
The following definitions shall apply:

- High incidence protection system : A system that operates directly and automatically on the aeroplane's flying controls to limit the maximum angle of attack that can be attained to a value below that at which an aerodynamic stall would occur.

- Alpha-floor system : A system that automatically increases thrust on the operating engines when angle of attack increases through a particular value.

- Alpha-limit : The maximum angle of attack at which the aeroplane stabilises with the high incidence protection system operating and the longitudinal control held on its aft stop.

- Vmin : The minimum steady flight speed in the aeroplane configuration under consideration with the high incidence protection system operating. See section 3 of this Special Condition.

- Vmin1g : Vmin corrected to 1g conditions. See section 3 of this Special Condition. It is the minimum calibrated airspeed at which the aeroplane can develop a lift force normal to the flight path and equal to its weight when at an angle of attack not greater than that determined for Vmin.

2 - Capability and Reliability of the Hiqh Incidence Protection System
Those paragraphs of CS 25 quoted in reference may be amended in accordance with this Special Condition provided that acceptable capability and reliability of the high incidence protection system can be established by flight test, simulation, and analysis as appropriate The capability and reliability required are as follows:

1- It shall not be possible during pilot induced manoeuvres to encounter a stall and handling characteristics shall be acceptable, as required by section 5 of this Special Condition.

2- The aeroplane shall be protected against stalling due to the effects of wind-shears and gusts at low speeds as required by section 6 of this Special Condition.
3- The ability of the high incidence protection system to accommodate any reduction in stalling incidence must be verified in icing conditions.

4- The high incidence protection system must be provided in each abnormal configuration of the high lift devices that is likely to be used in flight following system failures

5- The reliability of the system and the effects of failures must be acceptable in accordance with CS 25.1309.

3 - Minimum Steady Flight Speed and Reference Stall Speed
Delete existing CS-25.103 and replace as follows :

CS 25.103 : Minimum steady flight speed and Reference stall speed

(a) The minimum steady flight speed, Vmin, is the final stabilised calibrated airspeed obtained when the aeroplane is decelerated until the longitudinal control is on its stop in such a way that the entry rate does not exceed 1 knot per second. (See Interpretative Material IM B-1, paragraph 3).

(b) The minimum steady flight speed, Vmin, must be determined In icing and non-icing conditions with :

(1) The high incidence protection system operating normally.

(2) Idle thrust and alpha-floor system inhibited;

(3) All combinations of flaps setting and, landing gear position for which Vmin is required to be determined;

(4) The weight used when Vsr is being used as a factor to determine compliance with a required performance standard;

(5) The most unfavourable centre of gravity allowable; and

(6) The aeroplane trimmed for straight flight at a speed achievable by the automatic trim system.

(c) The one-g minimum steady flight speed, Vmin1g, is the minimum calibrated airspeed at which the aeroplane can develop a lift force (normal to the flight path) equal to its weight, whilst at an angle of attack not greater than that at which the minimum steady flight speed of sub-paragraph (a) was determined. It must be determined in icing and non-icing conditions.

(d) The reference stall speed, Vsr, is a calibrated airspeed defined by the applicant. Vsr may not be less than a 1-g stall speed. VSR must be determined in non-icing conditions and expressed as:

$$V_{SR} \geq \frac{V_{CL_{MAX}}}{\sqrt{n_{zw}}}$$

Where:

V_{CLMAX} = Calibrated airspeed obtained when the load factor corrected lift coefficient ($\frac{n_{zw}W}{qS}$) is first a maximum during the maneuver prescribed in sub-paragraph (f) of this paragraph.

n_{ZW} = Load factor normal to the flight path at V_{CLMAX}

W = Airplane gross weight;

S = Aerodynamic reference wing area; and

q = Dynamic pressure.

(e) V_{CLMAX} is determined in non-icing conditions with :

(1) Engines idling, or, if that resultant thrust causes an appreciable decrease in stall speed, not more than zero thrust at the stall speed;

(2) The aeroplane in other respects (such as flaps and landing gear) in the condition existing in the test or performance standard in which Vsr is being used;

(3) The weight used when Vsr is being used as a factor to determine compliance with a required performance standard;

(4) The centre of gravity position that results in the highest value of reference stall speed;

(5) The aeroplane trimmed for straight flight at a speed achievable by the automatic trim system, but not less than 1.13 Vsr and not greater than 1.3 Vsr;

(6) Alpha-floor system inhibited; and

(7) The High Incidence Protection System adjusted, at the option of the applicant, to allow higher incidence than is possible with the normal production system.

(8) Starting from the stabilised trim condition, apply the longitudinal control to decelerate the aeroplane so that the speed reduction does not exceed one knot per second.

4 - Stall Warning
Delete existing CS 25.207 and replace as follows:

4.1 Normal operation
If the conditions of paragraph 2 are satisfied, equivalent safety to the intent of CS 25.207, Stall Warning, shall be considered to have been met without provision of an additional, unique warning device.

4.2 High Incidence Protection System Failure
Following failures of the high incidence protection system, not shown to be extremely improbable, such that the capability of the system no longer satisfies items 1, 2 and 3 of paragraph 2, stall warning must be provided and must protect against encountering unacceptable characteristics and against encountering stall.

(a) Stall warning with the flaps and landing gear in any normal position must be clear and distinctive to the pilot and meet the requirements specified in paragraphs (d) and (e) below.

(b) Stall warning must also be provided in each abnormal configuration of the high lift devices that is likely to be used in flight following system failures.

(c) The warning may be furnished either through the inherent aerodynamic qualities of the airplane or by a device that will give clearly distinguishable indications under expected conditions of flight. However a visual stall warning device that requires the attention of the crew within the cockpit is not acceptable by itself. If a warning device is used, it must provide a warning in each of the aeroplane configurations prescribed in paragraph (a) above and for the conditions prescribed below in paragraphs (d) and (e) below.

(d) In non-icing conditions stall warning must meet the following requirements:

Stall warning must provide sufficient margin to prevent encountering unacceptable characteristics and encountering stall in the following conditions :

(1) In power off straight deceleration not exceeding one knot per second to a speed 5 knots or 5 per cent CAS, whichever is greater, below the warning onset.

(2) In turning flight stall deceleration at entry rates up to 3 knots per second when recovery is initiated not less than one second after the warning onset.

(e) In icing conditions stall warning must provide sufficient margin to prevent encountering stall and unacceptable characteristics, in power off straight and turning flight decelerations not exceeding one knot per second, when the pilot starts a recovery maneuver not less than three seconds after the onset of stall warning.

(f) An aeroplane is considered stalled when the behaviour of the aeroplane gives the pilot a clear and distinctive indication of an acceptable nature that the aeroplane is stalled. Acceptable indications of a stall, occurring either individually or in combination are:

(1) A nose-down pitch that cannot be readily arrested

(2) Buffeting, of a magnitude and severity that is strong and effective deterrent to further speed reduction; or

(3) The pitch control reaches the aft stop and no further increase in pitch attitude occurs when the control is held full aft for a short time before recovery is initiated

(g) An aircraft exhibits unacceptable characteristics during straight or turning flight decelerations if it is not always possible to produce and to correct roll and yaw by unreversed use of aileron and rudder controls, or abnormal nose-up pitching occurs.

5 - Handling Characteristics at High Incidence
Delete existing CS 25.201, 203 and replace as follows:

5.1High Incidence Handling Demonstrations

CS 25.201 : High incidence handling demonstration in icing and non icing conditions

(a) Manoeuvres to the limit of the longitudinal control, in the nose up sense, must be demonstrated in straight flight and in 30° banked turns with:

(1) The high incidence protection system operating normally.

(2) Initial power conditions of :
I: Power off
II: The power necessary to maintain level flight at 1.5 Vsr1, where Vsr1 is the reference stall speed with flaps in approach position, the landing gear retracted and maximum landing weight.(See Interpretative Material IM B-01 paragraph 5)

(3) Alpha-floor system operating normally unless more severe conditions are achieved with inhibited alpha floor.

(4) Flaps, landing gear and deceleration devices in any likely combination of positions (see Interpretative Material IM B-01 paragraph 6).

(5) Representative weights within the range for which certification is requested; and

(6) The aeroplane trimmed for straight flight at a speed achievable by the automatic trim system.

(b) The following procedures must be used to show compliance in non-icing and icing conditions :

(1) Starting at a speed sufficiently above the minimum steady flight speed to ensure that a steady rate of speed reduction can be established, apply the longitudinal control so that the speed reduction does not exceed one knot per second until the control reaches the stop (see Interpretative Material IM B-01 paragraph 3).

(2) The longitudinal control must be maintained at the stop until the aeroplane has reached a stabilised flight condition and must then be recovered by normal recovery techniques.

(3) Manoeuvres with increased deceleration rates

i) In non-icing conditions, the requirements must also be met with increased rates of entry to the incidence limit, up to the maximum rate achievable

ii) In icing conditions, with the anti-ice system working normally, the requirements must also be met with increased rates of entry to the incidence limit up to 3kt/s

(4)Manoeuver with ice accretion prior to operation of the normal anti-ice system With the ice accretion prior to operation of the normal anti-ice system, the requirement must also be met in deceleration at 1kt/s up to FBS (with and without alpha floor).

5.2 Characteristics in High Incidence Manoeuvres

CS 25.203: Characteristics in High Incidence
(see Interpretative Material IM B-01 paragraph 7)

In icing and non-icing conditions:

(a) Throughout manoeuvres with a rate of deceleration of not more than 1 knot per second, both in straight flight and in 30° banked turns, the aeroplane's characteristics shall be as follows:

(1) There shall not be any abnormal nose-up pitching.

(2) There shall not be any uncommanded nose-down pitching, which would be indicative of stall. However reasonable attitude changes associated with stabilising the incidence at Alpha limit as the longitudinal control reaches the stop would be acceptable. (See Interpretative Material IM B-1 paragraph 7.3).

(3) There shall not be any uncommanded lateral or directional motion and the pilot must retain good lateral and directional control, by conventional use of the controls, throughout the manoeuvre.

(4) The aeroplane must not exhibit buffeting of a magnitude and severity that would act as a deterrent from completing the manoeuvre specified in § 5.1.a).

(b) In manoeuvres with increased rates of deceleration some degradation of characteristics is acceptable, associated with a transient excursion beyond the stabilised Alpha-limit. However the aeroplane must not exhibit dangerous characteristics or characteristics that would deter the pilot from holding the longitudinal control on the stop for a period of time appropriate to the manoeuvre.

(c) It must always be possible to reduce incidence by conventional use of the controls.

(d) The rate at which the aeroplane can be manoeuvred from trim speeds associated with scheduled operating speeds such as V2 and Vref up to Alpha-limit shall not be unduly damped or be significantly slower than can be achieved on conventionally controlled transport aeroplanes.

5.3 Characteristics up to maximum lift angle of attack

(a) In non-icing conditions:

Manoeuvres with a rate of deceleration of not more than 1 knot per second up to the angle of attack at which V_{CLMAX} was obtained as defined in paragraph 3 must be demonstrated in straight flight and in 30° banked turns with:

(1) The high incidence protection deactivated or adjusted, at the option of the applicant, to allow higher incidence than is possible with the normal production system.
(2) Automatic thrust increase system inhibited
(3) Engines idling
(4) Flaps and landing gear in any likely combination of positions
(5) The aeroplane trimmed for straight flight at a speed achievable by the automatic trim system.

(b) In icing conditions:

Manoeuvres with a rate of deceleration of not more than 1 knot per second up to the maximum angle of attack reached during manoeuvres from 5.1 b)3)ii) must be demonstrated in straight flight with:

(1) The high incidence protection deactivated or adjusted, at the option of the applicant, to allow higher incidence than is possible with the normal production system.
(2) Automatic thrust increase system inhibited
(3) Engines idling
(4) Flaps and landing gear in any likely combination of positions
(5) The aeroplane trimmed for straight flight at a speed achievable by the automatic trim system.

(c) During such manoeuvres, the aeroplane must not exhibit dangerous characteristics , it must always be possible to reduce angle of attack by conventional use of the controls and there shall not be any uncommanded lateral or directional motion and the pilot must retain good lateral and directional control, by conventional use of the controls, throughout the manoeuvre.

6 - Atmospheric Disturbances

Operation of the high incidence protection system must not adversely affect aircraft control during expected levels of atmospheric disturbances, nor impede the application of recovery procedures in case of wind-shear. This shall be demonstrated in non-icing and icing conditions.

7 - Alpha floor

In icing and non-icing conditions, the Alpha-floor setting must be such that the aircraft can be flown at the speeds and bank angles specified in 25.143(h) and does not interfere with normal maneuvering of the aircraft.
In addition there must be no alpha-floor triggering unless appropriate when the aircraft is flown in usual operational manoeuvres and in turbulence.

8 – Proof of compliance

Add the following paragraph 25.21 (b):
(b) The flying qualities will be evaluated at the most unfavourable CG position.

9 – Change CS 25.145 (a), CS 25.145 (b) (6) and CS 25.1323(d) as follows:

CS 25.145 (a) Vmin in lieu of “stall identification”

CS 25.145 (b) (6) Vmin in lieu of Vsw

CS 25.1323 (d) "From 1.23 Vsr to Vmin" in lieu of "1.23 Vsr to stall warning speed"

– END –

B-02 (SC): Motion and Effect of Cockpit Controls	
APPLICABILITY:	A350
REQUIREMENTS:	CS 25.143, CS 25.777
ADVISORY MATERIAL:	N/A

Special Condition

1) Add to paragraph CS 25.777 (b) :

Pitch and roll control force and displacement sensitivity shall be compatible, so that normal inputs on one control axis will not cause significant unintentional inputs on the other.

2) Introduce new paragraph CS 25.143 (k) :

Pilot strength.
In lieu of the "strength of pilots" limits shown in CS 25.143 (d) for pitch and roll, and in lieu of specific pitch force requirement of CS 25.145 (b) and CS 25.175 (d), it must be shown that the temporary and maximum prolonged force levels for the side stick controllers are suitable for all expected operating conditions and configurations, whether normal or non-normal.

3) Introduce new paragraph CS 25.143 (l) :

Pilot control.
It must be shown by flight tests that turbulence does not produce unsuitable pilot-in-the loop control problems when considering precision path control/tasks.

4) Introduce new paragraph CS 25.143 (m) :

When a flight case exists where, without being commanded by the crew, control surfaces are coming so close to their limits that return to normal flight condition and (or) continuing of safe flight needs a specific crew action, a suitable flight control position annunciation shall be provided to the crew, unless other existing indications are found adequate or sufficient to prompt that action.

– END –

B-1002 (SC): Motion and Effect of Cockpit Controls	
APPLICABILITY:	A350-1000
REQUIREMENTS:	CS 25.143
ADVISORY MATERIAL:	N/A

Special Condition

Introduce new paragraph CS 25.143 (m):

When a flight case exists where, without being commanded by the crew, control surfaces are coming so close to their limits that return to normal flight condition and (or) continuing of safe flight needs a specific crew action, a suitable flight control position annunciation shall be provided to the crew, unless other existing indications are found adequate or sufficient to prompt that action.

– END –

B-04 (SC): Static Directional, Lateral and Longitudinal Stability and Low energy awareness	
APPLICABILITY:	A350
REQUIREMENTS:	CS 25.171, 25.173, 25.175, 25.177,SC B-01
ADVISORY MATERIAL:	N/A

Special Condition

1) Replace CS 25.171 by the following :

"The aircraft must be shown to have suitable lateral, directional and longitudinal stability in any condition normally encountered in service, including the effects of atmospheric disturbances.

The aircraft, fitted with flight control laws presenting neutral static longitudinal stability significantly below the normal operating speeds, must provide adequate awareness to the pilot of a low energy state. "

2) Remove CS 25.173

3) Remove CS 25.175

4) Remove CS 25.177 (b)

5) Replace CS 25.177 (c) by the following :

(c) In straight, steady sideslips over the range of sideslip angles appropriate to the operation of the aeroplane, but not less than those obtained with one-half of the available rudder control input or a rudder control force of 801 N (180 lbf), the rudder control movements and forces must be substantially proportional to the angle of sideslip in a stable sense; and the factor of proportionality must lie between limits found necessary for safe operation. This requirement must be met for the configurations and speeds specified in sub-paragraph (a) of this paragraph. (see AMC 25.177 (c))

– END –

B-05 SC: Flight envelope protection	
APPLICABILITY:	A350
REQUIREMENTS:	CS 25.143
ADVISORY MATERIAL:	List advisory material or N/A

Special Condition

SPECIAL CONDITION

Add a new paragraph CS 25.143 (n).
Normal operation:
1) Onset characteristics of each envelope protection feature must be smooth, appropriate to the phase of flight and type of manoeuvre and not in conflict with the ability of the pilot to satisfactorily change aeroplane flight path, or attitude as needed.

2) Limit values of protected flight parameters must be compatible with:
   a) aeroplane structural limits,
   b) required safe and controllable manoeuvring of the aeroplane and
   c) margin to critical conditions.

Unsafe flight characteristics/conditions must not result from:
- dynamic manoeuvring,
- airframe and system tolerances (both manufacturing and in-service), and
- non-steady atmospheric conditions, in any appropriate combination and phase of flight, if this manoeuvring can produce a limited flight parameter beyond the nominal design limi value.

Note : Reference may be made to FAA Advisory Circular AC 120-41 for guidance on atmospheric conditions.

3) The aeroplane must respond to intentional dynamic manoeuvring within a suitable range of the parameter limit. Dynamic characteristics such as damping and overshoot must also be appropriate for the flight manoeuvre and limit parameter concerned.

4) When simultaneous envelope limiting is engaged, adverse coupling or adverse priority must not result.

Failure states :
EFCS (including sensor) failures must not result in a condition where a parameter is limited to such a reduced value that safe and controllable manoeuvring is no longer available. The crew must be alerted by suitable means if any change in envelope limiting or manoeuvrability is produced by single or multiple failures of the EFCS not shown to be extremely improbable.

– END –

B-06 SC : Normal Load Factor limiting System	
APPLICABILITY:	A350
REQUIREMENTS:	CS 25.143
ADVISORY MATERIAL:	List advisory material or N/A

Special Condition

Add a new paragraph CS 25.143 (o) to read as follows:

CS 25.143 General
(o) In the absence of aerodynamic limitation (lift capability at AoA max):

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

a) 2.5g for the EFCS normal state with the high lift devices retracted up to VMO/MMO. The positive limiting load factor may be gradually reduced down to 2.25g above VMO/MMO.

b) 2.0 g for the EFCS normal state with the high lift devices extended.

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

a) minus 1.0 g for the EFCS normal state with high lift devices retracted.

b) 0 g for the EFCS normal state with high lift devices extended.

Maximum 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 the required values are readily achievable in turn and
- that wings level pitch up responsiveness is satisfactory

Maximum reachable negative load factor may be limited by flight control system characteristics or flight envelope protections (other than load factor limitation) provided:
- pitch down responsiveness is satisfactory
- From level flight, 0g is readily achievable or at least a trajectory change of 5°/s is readily achievable at operational speeds (From Vls*, to Max speed-10kt**)

Compliance with CS 25.337(d) should be established for positive limiting load factor gradually reduced down to 2.25g above VMO/MMO.

Compliance demonstration with the above requirements may be performed without ice accretion on the airframe.

* Vls is the lowest speed that the crew may fly with auto thrust or auto pilot engaged. It is displayed on primary flight displays as the top of the low speed amber band, and is the lower end of the normal flight envelope.

**Max speed-10kt is proposed to cover typical margin from VMO/MMO to cruise speeds and typical margin from VFE to standard speed in high lift configurations.

– END –

B-09 SC : Flight in Icing Conditions	
APPLICABILITY:	A350
REQUIREMENTS:	CS-25.21(g), 25.105, 25.107, 25.121, 25.123, 25.125, 25.143(j)
ADVISORY MATERIAL:	N/A

Special Condition

1) Change CS-25.21(g)(1) to read as follows:
CS-25.21 Proof of compliance
(g) The requirements of this subpart associated with icing conditions apply only if certification for flight in icing conditions is desired. If certification for flight in icing conditions is desired, the following requirements also apply (see AMC 25.21(g)):

(1) Each requirement of this subpart, except CS-25.121(a), 25.123(c),25.143(b)(1) and (b)(2), 25.149, 25.201(c)(2), 25.251(b) through (e), 25.207 (c) and (d) must be met in icing conditions. Compliance must be shown using the ice accretions defined in Appendix C, assuming normal operation of the aeroplane and its ice protection system in accordance with the operating limitations and operating procedures established by the applicant and provided in the Aeroplane Flight Manual.

2) Change CS-25.103 Stall speed to read as defined in SC B-01

3) Change and replace CS-25.105(a)(2)(i) to read as follows:
CS-25.105 Take-off
(a) The take-off speeds prescribed by CS-25.107, the accelerate-stop distance prescribed by CS-25.109, the take-off path prescribed by CS-25.111, and the take-off distance and take-off run prescribed by CS-25.113, must be determined, and the net take-off flight path prescribed by CS-25.115, must be determined in the selected configuration for take-off at each weight, altitude, and ambient temperature within the operational limits selected by the applicant -
. . .

(2) In icing conditions, if in the configuration of CS 25.121(b) with the “Take-off Ice” accretion defined in Appendix C:

i) the V2 speed scheduled in non icing conditions does not provide the manoeuvring capability specified in CS-25.143(h) for the takeoff configuration,
or

4) Change CS-25.107(c) (g) and add CS-25.107(c’) (g’) to read as follows:
CS-25.107 Take-off speeds
(c) In non-icing conditions V2, in terms of calibrated airspeed, must be selected by the applicant to provide at least the gradient of climb required by CS 25.121(b) but may not be less than –

(1) V2MIN;
(2) VR plus the speed increment attained (in accordance with CS 25.111(c)(2)) before reaching a height of 11 m (35 ft) above the takeoff surface; and
(3) A speed that provides the manoeuvring capability specified in CS 25.143(h).

(c') in icing conditions with the "Take-off ice" accretion defined in Appendix C, V2 may not be less than –

(1) the V2 speed determined in non icing conditions
(2) A speed that provides the manoeuvring capability specified in CS 25.143(h).

(g) in non icing conditions, VFTO, in terms of calibrated airspeed, must be selected by the applicant to provide at least the gradient of climb required by CS 25.121(c), but may not less than

(1) 1.18 VSR; and
(2) A speed that provides the manoeuvring capability specified in CS 25.143(h).

(g') in icing conditions with the "Final take-off ice" accretion defined in Appendix C,, VFTO, may not less than

(1) the VFTO speed determined in non-icing conditions
(2) A speed that provides the manoeuvring capability specified in CS 25.143(h).

5) Change CS-25.121(b)(2)(ii)(A), CS-25.121(c)(2)(ii)(A), CS-25.121(d)(2)(ii), replace by new paragraph CS-25.121(b)(2)(ii)(A), CS-25.121(c)(2)(ii)(A), CS-25.121(d)(2)(ii), to read as follows:

CS-25.121 Climb: one-engine inoperative :
(b) *Take-off; landing gear retracted.* In the take-off configuration existing at the point of the flight path at which the landing gear is fully retracted, and in the configuration used in CS25.111 but without ground effect,

. . .

(2) The requirements of subparagraph (b)(1) of this paragraph must be met:

. . .

(ii) In icing conditions with the "Take-off Ice" accretion defined in Appendix C, if in the configuration of CS 25.121(b) with the "Take-off Ice" accretion:

(B) The V2 speed scheduled in non-icing conditions does not provide the manoeuvring capability specified in CS-25.143(h) for the take-off configuration; or

(c) *Final take-off.* In the en-route configuration at the end of the take-off path determined in accordance with CS-25.111:

(2) The requirements of subparagraph (c)(1) of this paragraph must be met:

. . .

(ii) In icing conditions with the "Final Take-off Ice" accretion defined in Appendix C, if:

(A) The V_{FTO} speed scheduled in non-icing conditions does not provide the manoeuvring capability specified in CS-25.143(h) for the en-route configuration; or

(B) The degradation of the gradient of climb with the "Take-off Ice" in accordance with CS 25.121(b) is greater than one-half of the applicable actual-to-net take-off flight path gradient reduction defined in CS 25.115(b**).**

(d) (2) The requirements of sub-paragraph (d)(1) of this paragraph must be met
. . .

ii) In icing condition with the approach Ice accretion defined in Appendix C, in a configuration corresponding to the normal all-engines-operating procedure in which Vmin1g for this configuration does not exceed 110% of the Vmin1g for the related all-engines-operating landing configuration in icing, with a climb speed established with normal landing procedures, but not more than 1,4 Vsr (Vsr determined in non icing conditions).

6) Change CS-25.123 (b)(2)(i) to read as follows:
CS-25.123 En-route flight paths :
(b) The one-engine-inoperative net flight path data must represent the actual climb performance diminished by a gradient of climb of 1·1% for two-engined aeroplanes, 1·4% for three-engined aeroplanes, and 1·6% for four engined aeroplanes.

(1) In non-icing conditions; and

(2) In icing conditions with the “En-route ice” accretion defined in Appendix C, if:

(i) The minimum en-route speed scheduled in non-icing conditions does not provide the manoeuvring capability specified in CS-25.143(h) for the en-route configuration, or

(ii) [UNCHANGED]

7) Delete CS-25.125(b)(2)(ii)(B) and replace it by CS-25.125(b)(2)(ii)(C) to read as follows:
CS-25.125 Landing
. . .
(b) In determining the distance in (a):

(1) The aeroplane must be in the landing configuration.

(2) A stabilised approach, with a calibrated airspeed of not less than VREF, must be maintained down to the 15 m (50 ft) height.

(i) In non-icing conditions, VREF may not be less than:

(A) 1.23VSR0;

(B) VMCL established under CS-25.149(f); and

(C) A speed that provides the manoeuvring capability specified in CS-25.143(h).

(ii) In icing conditions, VREF may not be less than:

(A) The speed determined in sub-paragraph (b)(2)(i) of this paragraph;

(B) A speed that provides the manoeuvring capability specified in CS-25.143(h) with the landing ice accretion defined in appendix C.

8) Change CS-25.143(j)(2)(i) to read as follows:

Controllability and Manoeuvrability
CS-25.143 General
(j) For flight in icing conditions before the ice protection system has been activated and is performing its intended function, the following requirements apply:

(1) If activating the ice protection system depends on the pilot seeing a specified ice accretion on a reference surface (not just the first indication of icing), the requirements of CS-25.143 apply with the ice accretion defined in appendix C, part II(e).

(2) For other means of activating the ice protection system, it must be demonstrated in flight with the ice accretion defined in appendix C, part II(e) that:

(i) The aeroplane is controllable in a pull-up manoeuvre up to 1.5 g load factor or lower if limited by AOA protection; and

(ii) There is no pitch control force reversal during a pushover manoeuvre down to 0.5 g load factor

9) Change CS-25.207 Stall warning to read as defined in SC B-01

– END –

B-11 (SC): Soft Go-Around Mode	
APPLICABILITY:	A350
REQUIREMENTS:	CS 25.101(g) and (h), 25.119, 25.121(d), 25.1001, 25.1301, 25.1302, 25.1309, 25.1581, 25.1587(b)(3)(ii).
ADVISORY MATERIAL:	AMC 25.1581 (d) (13), (15) & (16)

Special Condition

1) CS 25.1587(b)(3)(ii) shall be amended as follows (new text is highlighted in yellow):

25.1587 Performance information
(b) …
(3) …
(ii) Climb in the approach configuration

Published approach climb performance shall represent the lower of
a. the performance obtained with GA thrust and one engine inoperative
b. the performance obtained with “Soft GA” thrust and all engines operating

OR

When “Soft GA” thrust setting is used and resulting climb gradient is lower than the climb gradient that would be obtained with GA thrust and one engine inoperative, there shall be a clear and unmistakable means to alert the flight crew of this situation.

2) An appropriate alert is required if the total aircraft thrust in the conditions OEI and throttle in MCT/FLX position are less than the total aircraft thrust obtained in OEI and throttle in TOGA position

For the particular case where an engine failure happens either immediately before or immediately after the G/A initiation with aircraft in landing configuration (LG extended), it should be shown at the landing in critical climb condition, by test or calculation that a safe go-around can be made at decision height with

- the critical engine inoperative
- a configuration and speed initially for landing and then in accordance with the go-around procedures, using actual time delays and, except for movements of the primary flying controls, not less than one second between successive crew actions.
- the power available with the thrust levers initially in the MCT/FLX position
- the landing gear selection to up being made after a steady positive rate of
- climb is achieved.

Alternatively, if a safe go-around can only be performed with an immediate crew action resetting the Thrust levers to TOGA position, a warning alert is required to prevent an unsafe condition.

The reset of the engine power/thrust setting must be demonstrated as acceptable in terms of pilot detection and required actions in high workload environment.

– END –

B-15 (SC): Shorter landing distances on eligible Wet Grooved or Porous Friction Course (PFC) Runways	
APPLICABILITY:	A350-941
REQUIREMENTS:	CS 25.125, CS 25.109, CS 25.1587, CAT.POL.A.230, CAT.POL.A.235
ADVISORY MATERIAL:	FAA Aviation Rulemaking Advisory Committee FTHWG Task 9 Wet Runway Stopping Performance Final Report, Recommendation Report March 16, 2018

Special Condition

1. Landing distance determination

1.1 Landing distance at dispatch determination based on friction according to CS 25.109(d)(2)

Landing distance at Dispatch to Wet Grooved/PFC runway is derived from FTHWG Task 9 Wet Runway Stopping Performance Final Report, based on CS 25.109(d)(2) friction, as described below.

a) The horizontal distance necessary to land and to come to a complete stop from a point 50 feet above the landing surface must be determined (for ambient temperatures, at each weight, altitude, and wind within the operational limits established by the applicant for the airplane):

(1) In non-icing conditions; and

(2) In icing conditions with the most critical of the landing ice accretion(s) defined in Appendices C and O of this part, as applicable, in accordance with CS 25.21(g), if V_{REF} for icing conditions exceeds V_{REF} for non-icing conditions by more than 5 knots CAS at the maximum landing weight.

b) The distance determined in paragraph (a) shall be the longest of:

(1) 110% of the horizontal distance necessary to land and to come to a complete stop from a point 50 feet above the landing surface with all engines operating.

(2) The horizontal distance necessary to land and to come to a complete stop from a point 50 feet above the landing surface assuming an inoperative engine.

c) In determining the distance in paragraph (a) of this section:

(1) The airplane must be in the landing configuration.

(2) A stabilized approach, with a calibrated airspeed of not less than V_{REF}, must be maintained down to the 50-foot height.

(i) In non-icing conditions, V_{REF} may not be less than:

(A) 1.23 VSR0;

(B) VMCL established under CS 25.149(f); and

(C) A speed that provides the manoeuvring capability specified in CS 25.143(h).

(ii) In icing conditions, V_{REF} may not be less than:

(A) The speed determined in paragraph (c)(2)(i) of this section;

(B) A speed that provides the maneuvering capability specified in CS-25.143(h) with the landing ice accretion defined in appendix C.

Note: *CS 25.125(b)(2)(ii)(B) deleted and replaced by SC B-09 25.125(b)(2)(ii)(C) applicable for A350 (quoted as change 7 of the A350 Special Condition B-09).*

(3) Changes in configuration, power or thrust, and speed, must be made in accordance with the established procedures for in-service operation.

(4) The landing must be made without excessive vertical acceleration, tendency to bounce, nose over, ground loop, or porpoise.

(5) The landings may not require exceptional piloting skill or alertness.

d) The wet runway landing distance must be determined from the V_{REF} defined to meet the requirements of above §(c) up to and including a minimum of 10 knots above the V_{REF} speed, V_{REF} +10.

e) The landing distance should be determined on a level wet hard-surfaced runway:

(1) Without exceeding the wheel brake ratings and limits as specified by the brake manufacturer.

(2) Without causing excessive wear of brakes or tires; and

(3) Optionally with other means than wheel brakes, including the effects of reverse thrust, if that means

i. is safe and reliable, and

ii. is used so that consistent results can be expected in service; and

iii. is such that exceptional skill is not required to control the airplane.

f) The stopping force attributed to the wheel brakes used for a wet grooved or PFC runway surface may not exceed:

(1) the force resulting from the dry runway braking in meeting the requirements of CS 25.125; and

(2) the force resulting from the wet runway braking coefficient of friction defined by CS 25.109(d)(2). This tyre-to-ground wet runway braking coefficient of friction must be adjusted to take into account the efficiency of the anti-skid system on a wet grooved or PFC runway. The anti-skid efficiency value may be the same as for the accelerate-stop distance determination on a smooth wet runway.

The force resulting from the wet runway braking coefficient of friction determined in accordance with paragraph (f) shall take into account the distribution of the normal load between braked and un-braked wheels at the most adverse center-of-gravity position approved for landing.

g) The landing distance data must include correction factors for not more than 50 percent of the nominal wind components along the landing path opposite to the direction of landing, and not less than 150 percent of the nominal wind components along the landing path in the direction of landing.

1.2 Time Of Arrival (TOA) landing distance assessment:

FAA AC 25-32 / EASA NPA 2016-11 do not define TOA assessment prior to landing on a wet runway with shorter landing distance at dispatch per this Special Condition. A valid TOA assessment can be performed in accordance with NPA 2016-11, but with the improved friction of CS 25.109(d)(2) used in the AFM:

i. A minimum 15% margin should be added to the distance defined in chapter 3 for the TOA landing distance assessment in the absence of in-flight failure affecting landing performance.

ii. Performance information for landing distance at the Time Of Arrival should be developed in accordance with the definitions of Appendix B and included in the operational documentation.

2 Airplane Flight Manual (Supplement) Content

a) The AFM shall contain a statement to the effect that: "For landing on grooved/PFC runways, the operator must comply with all eligibility criteria, weather and runway conditions”. Those conditions should be specified in the AFM.

   In addition, the AFM should also contain a note to the effect that:
   “Meeting those criteria and conditions does not constitute operational approval to base the landing performance requirements at dispatch, or to base the TOA landing performance assessments on these distances.

b) The distance established must not be less than the factored dry runway distances required by CAT.POL.A.230 (a)(1).

c) The AFM shall contain the performance information computed under the applicable provisions of chapter 1.1 above for landing distance at dispatch with an additional 15% margin.

Interpretative Material

1. Minimum Operational conditions for credit of shorter landing distances on Wet Grooved or PFC runways

1.1 Runway Eligibility Conditions for shorter landing distances on wet grooved or PFC runways determined under the Special Conditions in chapter 1:

1.1.1 An eligible runway for a shorter landing distance under appendix A chapter 1 should:

a) be described as having PFC/Grooved improved friction surfaces, on all declared length and width in the Aeronautical Information Publication (AIP) Aerodrome (AD) section issued by or under the responsibility of the relevant State.

b) be of crown transverse slope with minimum 1% value, with deviations allowed locally at intersections (with other runways or taxiways).

c) be maintained under an National Aviation Authority approved maintenance program, equivalent to the criteria in FAA AC 150/5320-12 at the latest issue. For runways not managed under the FAA AC 150/5320-12, an agreement should be obtained between the aircraft Operator and the aerodrome Operator specifying the equivalent minimum level of runway surface maintenance to be accomplished. These agreements should specify the runway inspection and maintenance frequencies, and promulgation of SLIPPERY WET information through an adequate text in NOTAM (Notice to Airmen) if the required friction levels might not be maintained, in which case shorter landing performance when wet is no longer applicable (e.g. drainage or surface texture deficiencies, groove wear or filling, or shorter performance when wet no longer applicable or equivalent wording to satisfy the objective of safe information to Operators/ Dispatchers / Crews).

d) be equipped with runway and touchdown markings and serviceable runway lighting systems. A Visual Approach Slope Indicator System (as e.g. a Precision Approach Path Indicator), which provides an acceptable threshold crossing height for the aircraft, should be provided and serviceable, to serve the approach to the runway. Such Visual Approach Slope Indicator System should be provided whether or not the runway is served by other visual approach aids or by non-visual aids (e.g. an electronic glide path).

e) be fitted with standard RSA as defined in FAA Part 139.309 or RESA as recommended by ICAO Annex 14, 3.5.4 for Code 3 and 4 Precision Instrumented runway (i.e. 1000 ft/300 m) or alternatively an arresting system meeting the specifications of FAA AC 150-5220-22B.

1.1.2 An aerodrome should be equipped with the effective capability to know precipitation intensity falling on the aerodrome:

- in order to identify when reaching or overshooting heavy rain threshold,
- with ATC actually reporting when heavy rain is present to aircraft in approach.

1.1.3 A compliance dossier should be established and maintained to demonstrate to the competent authority that all above-mentioned eligibility criteria are met.

1.2 Weather Conditions

The shorter landing performance when wet on eligible runway should not be used unless the following specific weather requirements are met:

a) Wind-shear: There should be no significant wind-shear reported:
   (i) By Aerodrome Low Level Wind-shear Alert System
   (ii) By Pilot Reports.

b) Rain intensity: There should be no report of heavy rain.

c) Visibility / RVR: The reported visibility / Runway Visual Range (RVR) should not be less than 1 statute mile (5000 ft / 1600 m).

1.3 Runway Conditions

The shorter landing performance when wet on an eligible runway should not be used unless the following specific requirements are met:

a) Contamination: There should be no frost, snow, standing water, slush, ice (other than isolated patches which do not impact braking action) observed or reported over full runway length within the width necessary for safe operations.

b) Pilot Reports and Operator aircraft performance monitoring: There should be no current Pilot Report of Braking Action less than "good" and no current Pilot Report of hydroplaning or slippery runway surface. There should be no alert in Operator FOM saying that aircraft Performance monitoring has detected an abnormal runway friction when wet.

1.4 Aircraft Operator Responsibilities

a) The aircraft operator approved training program and operating manual should specify the requirements necessary to assure that flight crews and dispatchers are cognizant of the runway eligibility, weather and runway condition requirements (or more restrictive per aircraft operator choice or operational authority choice) for shorter dispatch computation and TOA assessment when wet.

b) The aircraft operator should define and keep current in its Operating Manual a list of specific aerodromes/runways eligible for shorter landing performance when wet satisfying the requirements and conditions of this chapter 2, and inform dispatchers / crews when shorter dispatch computation and TOA assessment when wet are no longer applicable.

c) The aircraft operator should define, as part of a necessary Safety Management System for shorter landing performance on eligible runways, an aircraft braking performance monitoring program allowing to monitor if the aircraft Braking Action falls below the level of FAA AC 25-32 or EASA NPA 2016-11 associated with GOOD TO MEDIUM over partial or full landing roll. If such condition occurs, the aircraft operator should:
   - Inform the aerodrome operator.
   - Subject to confirmed analysis, remove the runway from the “operator manual list of runways” eligible for shorter landing performance when wet used in AFM, until corrective actions are performed by the aerodrome operator.
   - In absence of corrective action plan communicated by the aerodrome operator, inform its competent authority and manufacturer.

1.5 Deviations from Runway Eligibility Criteria:

a) If an aircraft operator seeks operational credit for shorter landing distances when wet that deviates from the runway eligibility criteria above, it should be demonstrated to the competent authority that an acceptable level of safety to the Special Condition in appendix A is maintained. These deviations may be general or specific to a certain runway. The demonstration may require manufacturer involvement because of the complexity of the testing and/or analysis. The performance for such operations is typically included as an AFM supplement for Operation on Shorter Landing Distances When Wet on Eligible Runways, and is included as part of Operator Flight Operating Manual. Approval for deviations specific to a certain runway may not be applied as general eligibility on other runways.

The above provisions of this Interpretative Material in chapter 1 do not constitute operational approval to base the landing performance requirements at dispatch, or to base the TOA landing performance assessments on these distances.

2. Definitions and other Interpretative Material

This Interpretative Material derived from proposed FAR 25/CS 25 for Landing - Wet Runway in FTHWG Task 9 Wet Runway Stopping Performance Final Report applies to the shorter landing distances on eligible wet PFC/Grooved Runway subject in the SC B-15, for:

- The landing distance at dispatch determination (Appendix A, section 1.1)
- The time of arrival landing distance assessment (Appendix A, section 1.2).

Landing distance definition:

The landing distance is the horizontal distance from the point at which the main gear of the airplane is 50ft above the landing surface (treated as a horizontal plane through the touchdown point) to the position of the nose gear when the airplane is brought to a stop. This definition is the existing one specified in FAA AC 25-7C (2012) and in the Advisory Material of future harmonized CS 25.126.

Air distance definition for Time Of Arrival landing distance:

The air-distance should be the one associated to operational landing distance defined in EASA NPA 2016-11 and FAA AC 25-32 for Time Of Arrival Landing Distance assessment:

NPA 2016-11:

Unless the air distance used for compliance with CS 25.125 is representative of an average pilot flying in normal operations (see flight test demonstration below), the air distance used for time-of-arrival landing performance assessments should be determined analytically as the distance traversed over a time period of 7 sec at a speed of 98 % of the recommended speed over the landing threshold, also referred to as the final-approach speed (VAPP). This represents a flare time of 7 sec and a touchdown speed

(VTD) of 96 % of the VAPP. The VAPP should be consistent with the procedures recommended by the applicant, including any speed additives, such as those that may be used for winds or icing. The effect of higher speeds, to account for variations that occur in operations or are caused by the operating procedures of individual operators, should also be provided.
If the air distance is determined directly from flight test data instead of using the analytical method provided above, the flight test data should meet the following criteria:

— procedures should be used that are consistent with the applicant's recommended procedures for operations in service; these procedures should address the recommended final-approach airspeed, flare initiation height, thrust/power reduction height and technique, and target pitch attitudes;

— at a height of 50 ft above the runway surface, the aeroplane should be at an airspeed not slower than the recommended final-approach airspeed; and

— the touchdown rate of descent should be in the range of 1–4 ft per sec.
If the air distance is based on a time of 7 sec at a speed of 98 % of the recommended speed over the runway threshold, this air distance is considered valid for downhill runway slopes up to 2 % in magnitude (no credit should be taken for an uphill runway slope).

AC 25-32:

*8.2.1 As shown in figure 1 of this AC, the air distance is the distance from a height of 50 feet above the landing surface to the point of main gear touchdown. This definition of the air distance is unchanged from that used for compliance with § 25.125. However, the air distance determined under § 25.125 may not be appropriate for use in making time-of-arrival landing performance assessments. Especially for airplanes for which the parametric method of determining the air distance was used as described in AC 25-7C, the air distances determined under § 25.125 may be shorter than the distance that the average pilot is likely to achieve in normal operations. **Note:** AC 25-7C states the air distance computed using the parametric method should only be used in conjunction with the factor as described in § 121.195(b) or (c); § 135.385(b), (c), or (f); or equivalent.*

8.2.2 There are reasons why the air distance determined under § 25.125 might be shorter than the distance the average pilot is likely to achieve in normal operations. First, the parametric method of determining the air distance presented in AC 25-7C, used by some manufacturers to provide landing distance in their AFMs allows the air distance to be based on a steeper-than-normal approach angle of -3.5°, followed by a flare in which the touchdown rate of descent can be as high as 8 feet per second. Second, the § 25.125 air distance is based on beginning at a speed of VREF, whereas the operating procedures may recommend a higher speed, particularly when headwinds are present. Third, the philosophy followed by some manufacturers during the certification process is to determine the maximum capability of the airplane.

8.2.3 The air distance used for any individual landing at any specific runway is a function of the runway approach guidance, runway slope, use of any airplane features or equipment (for example, heads-up guidance, autoflight systems, etc.), pilot technique, and the inherent flare characteristics of the specific airplane.

8.2.4 Unless the air distance used for compliance with § 25.125 is representative of an average pilot who is flying in normal operations (see paragraph 8.2.5 below), the air distance used for time-of-arrival landing performance assessments should be determined *analytically as the distance traversed over a time period of 7 seconds at a speed of 98 percent of the recommended speed over the landing threshold, also referred to as the final approach speed (VAPP). This represents a flare time of 7 seconds and a touchdown speed (VTD) of 96 percent of VAPP. VAPP should be consistent with the TC holder's recommended procedures and training material, including any speed additives, such as may be used for winds or icing. The effect of higher speeds, to account for variations that occur in operations or through the operating procedures of individual operators, should also be provided.*

8.2.5 If the air distance is determined directly from flight test data instead of the analytical method provided in paragraph 8.2.4 above, the flight test data should meet the following criteria:

8.2.5.1 Procedures should be used that are consistent with the TC holder's recommended procedures and training for operations in service. These procedures should address the recommended final approach airspeed, flare initiation height, thrust/power reduction height and technique, and target pitch attitudes.

8.2.5.2 At a height of 50 feet above the runway surface, the airplane should be at an airspeed no slower than the recommended final approach airspeed.

8.2.5.3 The touchdown rate of descent should be in the range of 1 to 4 feet per second. ***Note:*** *The criterion of paragraph 8.2.5.3 above should not be construed to mean that all of the landing data used to determine the air distance may have a touchdown rate of descent of 4 feet per second. The flight test data should contain a range of touchdown rates ranging from 1 to 4 feet per second.*

<u>Air distance definition for more recent landing distance at dispatch:</u>

FTHWG Task 9 Wet Runway Stopping Performance Final Report, has introduced complementary Advisory Material, from Manufacturers experience on introduction of Time Of Arrival in their operational documentation. The intent is to have normally a common operational air-distance for Time Of Arrival and for Dispatch.

Three acceptable means of compliance are described in paragraphs (1), (2), and (3) below.

(1) An accepted method for establishing an air distance reasonable for operating following operational procedures has been to use the following:
Air Distance (feet) = 0.5 * (V50 +VTD) *7*1.6878
Where V50 is the speed at 50 feet at the threshold, VTD is assumed touchdown speed, both in kts
7 = 7 seconds assumed from threshold to touchdown
1.6878 is the conversion from knots to ft/sec

This method is one method recognized in historical AC 121.195(d)-1A, Operational Landing Distances for Wet Runways; Transport Category Airplanes, and in AC 25-32, Landing Performance Data for Time-of-Arrival Landing Performance Assessments, with VTD = 0.96*V50 (4% speed decay in flare).

An applicant may choose to use these relationships to establish landing distance in lieu of measuring airborne distance and speed loss. If an applicant chooses to use these relationships, with VTD = 0.96 V50 or higher, the applicant should show by test or analysis that they do not result in non-conservative air distances or touchdown speeds.

(2) If an applicant chooses to measure airborne distance or time, at least six tests covering the landing weight and speed range are required for each airplane configuration for which certification is desired. These tests should meet the following criteria

a) A stabilized approach, targeting a glideslope of -3 degrees and an indicated airspeed of VREF, should be maintained for a sufficient time prior to reaching a height of 50 feet above the landing surface to simulate a continuous approach at this speed. During this time, there should be no appreciable change in the power or thrust setting, pitch attitude, or rate of descent. The average glideslope of all landings used to show compliance should not be steeper than -3 degrees.

b) Below 50 feet, there should be no nose depression by use of the longitudinal control and no change in configuration that requires action by the pilot, except for reduction in power or thrust.

c) The average touchdown rate of sink at TD shall not exceed 3 feet per second and the maximum rate of sink at TD not to exceed 6 ft/s.

(3) If the applicant conducts enough tests to allow a parametric analysis (or equivalent method) that establishes, with sufficient confidence, the relationship between airborne distance (or time) as a function of the rates of descent at 50 feet and touchdown, the part 25 airborne distances may be based on an approach angle of -3.0 degrees, and a touchdown sink rate of 3 ft/s (See paragraph 19.1h for an example of this analysis method).

Note: The same methods and data used to determine the coefficients for the air time in 19.1(g) may be used to compute the air time as long as the determination of those coefficients included speeds consistent with 19.2(a)(4) and an adequate number of landings at touchdown rates of sink from 1 to 4 ft/sec.

Speed:
The airspeed, for shorter landing distance computation at Dispatch and Time Of Arrival associated with Wet PFC/Grooved runway operations, should be based on the final approach speed flown, in accordance with operators recommended Standard Operating Procedure, as those landing distance computations are physics based.

Runway friction cap:
The coefficient of friction used for a wet runway surface may not exceed 90% of the dry runway coefficient of friction, when friction limited, used for CS 25.125 (except if determined from flight tests on rubber-contaminated portion of runway).

– END –

C-01 (SC): Crash Survivability for CFRP Fuselage	
APPLICABILITY:	A350
REQUIREMENTS:	CS 25.561
ADVISORY MATERIAL:	N/A

Special Condition

1. The A350 must provide an equivalent level of crash survivability to that demonstrated on conventional large transport aircraft (CLTA). This may be achieved by demonstrating for a representative fuselage section that, for a range of impact conditions and corresponding to vertical descent rates up to the values representing the Limits of Reasonable Survivability (LRS) for the CLTA that have been chosen for the comparative analysis:

a) The survivable volume is comparable to that of a CLTA. This means that structural deformation will not result in infringement of the occupants' normal living space, so that passenger survivability will not be significantly affected.

b) The occupants will be protected from injury as a result of release of seats, overhead bins and other items of mass due to impact loads and resultant structural deformation of the supporting airframe and floor structures. The attachments of these items need not be designed for static emergency landing loads in excess of those defined in CS 25.561 if impact response characteristics of the A350 yield load factors at the attach points that are equal to or less than those of a CLTA.

c) The selected injury criteria used for the comparison should demonstrate that the potential for the occupant injury will be equal or less than that experienced on CLTAs.

d) The suitability of the egress paths following a vertical impact event must be shown comparable that of a CLTA.

2. The loading configurations of the fuselage for this evaluation must be agreed with EASA, particularly with respect to the loading of the cargo compartment and the likely effect of this on the dynamic impact characteristics of the fuselage section.

3. As an alternative to a fuselage section analysis, a complete aircraft analysis may be performed to demonstrate an equivalent level of crash survivability to CLTA. In this case, the conditions must be also agreed with the EASA Structures Panel.

In order to show that the use of composite materials does not reduce the level of safety relative to existing experience with metallic structure, Airbus may choose one of the options described in the in the "A350 Interpretative Material C-01" and provided by EASA for information, or to combine the two approaches to satisfactorily evaluate the crashworthiness characteristics of the A350. An alternative approach can be proposed by Airbus.

– END –

C-02 (SC): Design Dive Speed	
APPLICABILITY:	A350
REQUIREMENTS:	CS 25.335 (b)(1) and (b)(2)
ADVISORY MATERIAL:	N/A

Special Condition

Modify CS 25.335(b)(1) to read:

(1) In lieu of compliance with CS 25.335(b)(1), if the flight control system includes functions that act automatically to initiate recovery before the end of the 20 second period specified in CS 25.335(b)(1), V_D/M_D must be determined from the greater of the speeds resulting from conditions (i) and (ii) below. The speed increase occurring in these manoeuvres may be calculated, if reliable or conservative aerodynamic data are used.

(i) From an initial condition of stabilised flight at Vc/Mc, the aeroplane is upset so as to take up a new flight path 7.5° below the initial path. Control application, up to full authority, is made to try and maintain this new flight path. Twenty seconds after initiating the upset manual recovery is made at a load factor of 1.5 g (0.5 g acceleration increment), or such greater load factor that is automatically applied by the system with the pilot's pitch control neutral. The speed increase occurring in this manoeuvre may be calculated, if reliable or conservative aerodynamic data is used. Power as specified in CS 25.175 (b) (1) (iv) is assumed until recovery is made, at which time power reduction and the use of pilot controlled drag devices may be assumed.

(ii) From a speed below Vc/Mc, with power to maintain stabilised level flight at this speed the aeroplane is upset so as to accelerate through Vc/Mc at a flight path 15° below the initial path (or at the steepest nose down attitude that the system will permit with full control authority if less than 15°). Pilots controls may be in neutral position after reaching Vc/Mc and before recovery is initiated.
Recovery may be initiated 3 seconds after operation of high speed, attitude or other alerting system by application of a load factors of 1.5 g (0.5 g acceleration increment), or such greater load factor that is automatically applied by the system with the pilot's pitch control neutral. Power may be reduced simultaneously. All other means of decelerating the aeroplane, the use of which is authorised up to the highest speed reached in the manoeuvre, may be used. The interval between successive pilot actions must not be less than one second.

– END –

C-05 (SC): Tyre Debris vs. Fuel Leakage for CFRP Fuel Tank	
APPLICABILITY:	A350
REQUIREMENTS:	CS 25.963(e)
ADVISORY MATERIAL:	N/A

Special Condition

Tyre Debris Impacts to Fuel Tanks

(a) Impacts by tyre debris to any fuel tank or fuel system component located within 30 degrees to either side of wheel rotational planes may not result in penetration or otherwise induce fuel tank deformation, rupture (for example, through propagation of pressure waves), or cracking sufficient to allow a hazardous fuel leak. A hazardous fuel leak results if debris impact to a fuel tank surface causes:

(1) a running leak,
(2) a dripping leak, or
(3) a leak that, 15 minutes after wiping dry, results in a wetted airplane surface exceeding 6 inches in length or diameter.

The leak must be evaluated under maximum fuel head pressure.

(b) Compliance with paragraph (a) must be shown by analysis or tests assuming all of the following:

(1) The tyre debris fragment size is 1 percent of the tyre mass.
(2) The tyre debris fragment is propelled at a tangential speed that could be attained by a tyre tread at the airplane flight manual airplane rotational speed (VR at maximum gross weight).
(3) The tyre debris fragment load is distributed over an area on the fuel tank surface equal to 1.5 percent of the total tyre tread area.

(c) Fuel leaks caused by impact from tyre debris larger than that specified in paragraph (b)(1), from any portion of a fuel tank or fuel system located within the tyre debris impact area (see also IM C-05), may not result in hazardous quantities of fuel entering any of the following areas of the airplane:

(1) Engine inlet,
(2) APU inlet, or
(3) Cabin air inlet.

This must be shown by test or analysis, or a combination of both, for each approved engine forward thrust condition and each approved reverse thrust condition.

Note:
Text '*or fuel system*' has been added to the original text of para. (c) of the FAA Special Condition 25-07-04-SC to maintain clear consistency of intent.

– END –

C-06 SC : Dynamic Braking	
APPLICABILITY:	A350
REQUIREMENTS:	CS 25.493(c) and (d)
ADVISORY MATERIAL:	N/A

Special Condition

SPECIAL CONDITION

Loads arising from the sudden application of maximum braking effort must be defined taking into account the behaviour of the braking system. Failure conditions of the braking system must be analysed in accordance with CS25 Appendix K “Interaction of Systems and Structures”.

– END –

C-07 SC : Limit Pilot Forces	
APPLICABILITY:	A350
REQUIREMENTS:	CS 25.397
ADVISORY MATERIAL:	N/A

Special Condition

For the A350 equipped with side stick controls designed for forces to be applied by one wrist and not arms, the limit pilot forces of CS 25.397(c) are changed as follows:

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

PITCH	ROLL
Nose up 200 lb.f	Nose left 100 lb.f
Nose down 200 lb.f	Nose right 100 lb.f

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 125 lb.f	Nose left 50 lb.f
Nose down 125 lb.f	Nose right 50 lb.f

– END –

C-10 (SC): Design Manoeuvre Requirements	
APPLICABILITY:	A350
REQUIREMENTS:	CS 25.331(c), 25.349(a), 25.351
ADVISORY MATERIAL:	N/A

Special Condition

1. Modify CS 25.349 (a) to read:

a) Manoeuvring : the following conditions, speeds and cockpit roll control motions (except as the motions may be limited by pilot effort) must be considered in combination with an aeroplane load factor of zero and the two-thirds of limit positive manoeuvring load factor. In determining the resulting control surface deflections the torsional flexibility of the wing must be considered in accordance with CS 25.301.

(b):

(1) Conditions corresponding to steady rolling velocities and conditions corresponding to maximum angular accelerations must be investigated. For the angular acceleration conditions zero rolling velocity may be assumed in the absence of a rational time history investigation of the manoeuvre.

(2) At VA, movement of the cockpit roll control up to the limit is assumed. The position of the cockpit roll control must be maintained until a steady roll rate is achieved and then must be returned suddenly to the neutral position.

(3) At VC, the cockpit roll control must be moved suddenly and maintained so as to achieve a roll rate not less than that obtained in sub-paragraph (2) of this paragraph.

(4) At VD, the cockpit roll control must be moved suddenly and maintained so as to achieve a roll rate not less than one third of that obtained in sub-paragraph (2) of this paragraph.

(5) It must be established that manoeuvre loads induced by the system itself (i.e. abrupt changes in orders made possible by electrical rather than mechanical combination of different inputs) are acceptably accounted for.

2. Add a new subparagraph (e) to CS 25.351 as follows:
CS 25.351 (e)
It must be established that manoeuvre loads induced by the system itself (i.e. abrupt changes in orders made possible by electrical rather than mechanical combination of different inputs) are acceptably accounted for.

– END –

C-11 ESF : Ground Loads Conditions	
APPLICABILITY:	A350
REQUIREMENTS:	CS 25.471, 25.473, 25.477, 25.479, 25.481, 25.485, 25.491, 25.493, 25.499, 25.503, 25.507, 25.511, 25.519, 25.723
ADVISORY MATERIAL:	Aviation Rulemaking Advisory Committee (ARAC) Loads and Dynamics Harmonisation Working Group (L&DHWG) Report on “Ground Loads Task” dated 26 November 2002

Equivalent Safety Finding

Change CS 25.471 to read as follows (changes marked in yellow):
CS 25.471 General.
(a) *Loads and equilibrium*. For limit ground loads -

(1) Limit ground loads obtained under this subpart are considered to be external forces applied to the airplane structure; and

(2) In each specified ground load condition, the external loads must be placed in equilibrium with the linear and angular inertia loads in a rational or conservative manner.

(b) Compliance with the ground load requirements of this subpart must be show considering appropriate high lift device positions, and critical payload and fuel distributions.

(c) *Critical centers of gravity*. The critical centers of gravity within the range for which certification is requested must be selected so that the maximum design loads are obtained in each landing gear element. Fore and aft, vertical, and lateral airplane centers of gravity must be considered. Lateral displacements of the center of gravity from the airplane centerline which would result in main gear loads not greater than 103 percent of the critical design load for symmetrical loading conditions may be selected without considering the effects of these lateral center of gravity displacements on the loading of the main gear elements, or on the airplane structure provided—

(1) The lateral displacement of the center of gravity results from random passenger or cargo disposition within the fuselage or from random unsymmetrical fuel loading or fuel usage; and

(2) Appropriate loading instructions for random disposable loads are included under the provisions of Sec. 25.1583(c)(2) to ensure that the lateral displacement of the center of gravity is maintained within these limits.

(d) *Landing gear dimension data*. Figure 1 of Appendix A contains the basic landing gear dimension data.

Change CS 25.473 to read as follows (changes marked in yellow):
CS 25.473 Landing load conditions and assumptions.

(a) The landing gear and aeroplane structure must be investigated for the landing conditions specified in CS 25.480 to CS 25.485. For these conditions, the aeroplane is assumed to contact the ground –

(1) In the attitudes defined in CS 25.480 and CS 25.483(b)

(2) At the descent velocities defined in CS 25.480 and CS 25.483. The prescribed descent velocities may be modified if it is shown that the aeroplane has design features that make it impossible to develop these velocities.

(b) Aeroplane lift, not exceeding aeroplane weight, may be assumed unless the presence of systems or procedures significantly affects the lift.

(c) The method of analysis of aeroplane and landing gear loads must take into account at least the following elements:

(1) Landing gear dynamic characteristics.
(2) Spin-up and spring back.
(3) Rigid body response.
(4) Structural dynamic response of the airframe, if significant.
(5) Each approved tyre with nominal characteristics.

(d) The landing gear dynamic characteristics must be validated by tests as defined in CS 25.723(a).

(e) The coefficient of friction between the tyres and the ground may be established by considering the effects of skidding velocity and tyre pressure. However, this coefficient of friction need not be more than 0.8.

Delete CS 25.477

Delete CS 25.479

Add CS 25.480 to read as follows:
CS **25.480 Symmetric landing load conditions.**
The landing gear and airframe structure must be designed for the dynamic landing conditions of this paragraph, using the assumptions specified in CS 25.473.
(a) The aeroplane is assumed to contact the ground -
(1) With an airspeed corresponding to the attitudes specified in paragraph (c) of this section, as applicable, in the following conditions:
(i) standard sea level conditions, and
(ii) at maximum approved altitude in a hot day temperature of 22.8°C (41°F) above standard.
The airspeed need not be greater than $1.25V_{S0}$, or less than V_{S0}, where V_{S0} = the 1-g stalling speed based on C_{NAmax} at the appropriate weight and in the landing configuration. The effects of increased ground contact speeds must be investigated to account for downwind landings for which approval is desired.

(2) With a limit descent velocity of 3.05 m/sec (10 fps) at the design landing weight (the maximum weight for landing conditions at maximum descent velocity); and,

(3) With a limit descent velocity of 1.83 m/sec (6 fps) at the design takeoff weight (the maximum weight for landing conditions at a reduced descent velocity).

(b) *Not applicable to* A350

(c) For aeroplanes with nose wheels, the conditions specified in this paragraph must be investigated assuming the following attitudes:

(1) An attitude in which the nose and main wheels are assumed to contact the ground simultaneously, as shown in figure 2 of Appendix A. For this condition, airplane pitching moment is assumed to be reacted by the nose gear.

(2) An attitude corresponding to the smallest pitch attitude at which all main landing gear units have reached their maximum vertical compression before impact on the nose gear.

(3) An attitude corresponding to either the stalling angle or the maximum angle allowing clearance with the ground by each part of the aeroplane other than any wheel of the main landing gear units, in accordance with figure 3 of Appendix A, whichever is less.

(4) For aircraft with more than two main landing gear units or more than two wheels per main landing gear unit, any intermediate attitude that may be critical.

(d) For airplanes with two main landing gear units, landing is considered on a level runway.

Delete CS 25.481
Change CS 25.483 to read as follows (changes marked in yellow):

CS **25.483 One-gear landing conditions.**

(a) For airplanes with two main landing gear units, the airplane is assumed to be in the level attitude and to contact the ground on one main landing gear unit, in accordance with figure 4 of Appendix A. In this attitude –

(1) The maximum vertical ground reactions on that side must be the same as that obtained under Sec. 25.480(c)(2), combined with an aft acting drag component of not less than 25% of this maximum vertical ground reaction, and

(2) Each unbalanced external load must be reacted by airplane inertia in a rational or conservative manner

(b) *Not applicable to A350*

Change CS 25.485 to read as follows (changes marked in yellow):
CS. **25.485 Side load conditions**.
For the side load conditions specified in paragraphs (a) and (b) of this paragraph, the vertical and drag loads are assumed to act at the wheel axle centreline; and the side loads are assumed to act at the ground contact point. The gear loads are balanced by inertia of the aeroplane.

(a) The most severe combination of loads that are likely to arise during a lateral drift landing must be taken into account. In the absence of a more rational analysis of this condition, the following must be investigated:

(1) A separate condition for each gear unit, for which the vertical load is assumed to be 75% of the maximum vertical reaction obtained in CS 25.480. For aeroplanes with more than two

main landing gear units, the vertical load on other gear units is assumed to be 75% of the correlated vertical load for those gear units in the same condition. The vertical loads for each gear unit are combined with drag and side loads of 40% and 25%, respectively, of the vertical load.

(2) The aeroplane is assumed to be in the attitude corresponding to the maximum vertical reaction obtained in CS 25.480.

(3) The shock absorber and tyre deflections must be assumed to be 75% of the deflection corresponding to the vertical loads obtained in CS 25.480

(b) In addition to CS 25.485(a), the following side load conditions must be considered for each main landing gear unit:

(1) A separate condition for each main landing gear unit, for which the vertical load is assumed to be 50% of the maximum vertical reaction obtained in CS 25.480. For aeroplanes with more than two main gear units, the vertical load on other gear unit is assumed to be 50% of the correlated vertical load for those gear units in the same condition. The vertical loads for each gear unit are combined with the side loads specified in paragraph (b)(3) or (b)(4) of this paragraph, as applicable.

(2) The aeroplane is assumed to be in the attitude corresponding to the maximum vertical reaction obtained in CS 25.480.

(3) For the outboard main landing gear units, side loads of 0.8 of the vertical reaction (on one side) acting inward and 0.6 of the vertical reaction (on the other side) acting outward as shown in figure 5 of Appendix A.

(4) *Not applicable to A350*

(5) The drag loads may be assumed to be zero.

(6) The shock absorber and tyre deflections must be assumed to be 50% of the deflection corresponding to the vertical loads of CS 25.480.

Change CS 25.491 to read as follows (changes marked in yellow):
CS 25.491 Taxi, takeoff and landing roll.
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. Steady aerodynamic effects must be considered in a rational or conservative manner (see AMC25.491)

Change CS 25.493 to read as follows (changes marked in yellow):
CS 25.493 Braked roll conditions.
(a) *Not applicable to A350*

(b) For an aeroplane with a nose wheel, the limit vertical load factor is 1.2 at the design landing weight, and 1.0 at the design ramp weight. A drag reaction equal to the vertical reaction, multiplied by a coefficient of friction of 0.8, must be combined with the vertical reaction and applied at the ground contact point of each wheel with brakes. The following two attitudes, in accordance with figure 6 of Appendix A, must be considered:

(1) The level attitude with the wheels contacting the ground and the loads distributed between the main and nose gear. Zero pitching acceleration is assumed.

(2) The level attitude with only the main gear units contacting the ground and with the pitching moment resisted by angular acceleration.

(c) An aeroplane equipped with a nose gear must be designed to withstand the loads arising from the dynamic pitching motion of the aeroplane due to sudden application of maximum braking force. The aeroplane is considered to be at design takeoff weight with the nose and main gears in contact with the ground, and with a steady-state vertical load factor of 1.0. The steady-state nose gear reaction must be combined with the maximum incremental nose gear vertical reaction caused by the sudden application of maximum braking force as described in paragraphs (b) and (e) of this paragraph.

(d) For airplanes with two main landing gear units, in the absence of a more rational analysis, the nose gear vertical reaction prescribed in paragraph (c) of this section must be calculated according to the following formula: *(FORMULA UNCHANGED FROM EXISTING FAR/CS).*

(e) A drag reaction lower than that prescribed in this paragraph may be used if it is substantiated that an effective drag force of 0.8 times the vertical reaction cannot be attained under any likely loading condition.

Change CS 25.499 to read as follows (changes marked in yellow):
CS 25.499 Nose-wheel yaw and steering.

(a) A vertical load factor of 1.0 at the aeroplane centre of gravity, and a side component at the nose wheel ground contact equal to 0.8 of the vertical ground reaction at that point are assumed.

(b) With the aeroplane assumed to be in static equilibrium with the loads resulting from the use of brakes on one side of the main landing gear system, the nose gear, its attaching structure, and the fuselage structure forward of the centre of gravity must be designed for the following loads:

(1) A vertical load factor at the centre of gravity of 1.0.

(2) For wheels with brakes applied, the coefficient of friction must be 0.8. Drag loads are balanced by aeroplane inertia. Aeroplane pitching moment is reacted by the nose gear.

(3) Side and vertical loads at the ground contact point on the nose gear that are required for static equilibrium.

(4) A side load factor at the aeroplane centre of gravity of zero.

(c) If the loads prescribed in paragraph (b) of this paragraph result in a nose gear side load higher than 0.8 times the vertical nose gear load, the design nose gear side load may be limited to 0.8 times the vertical load, with unbalanced yawing moments assumed to be resisted by aeroplane inertia forces.

(d) For other than the nose gear, its attaching structure, and the forward fuselage structure, the loading conditions are those prescribed in paragraph (b) of this paragraph, except that

(1) A lower drag reaction may be used if an effective drag force of 0.8 times the vertical reaction cannot be reached under any likely loading condition; and

(2) The forward acting load at the centre of gravity need not exceed the maximum drag reaction on the main landing gear, determined in accordance with CS 25.493(b).

(e) With the aeroplane at design ramp weight, and the nose gear in any steerable position, the combined application of full normal steering torque and vertical force equal to 1.33 times the maximum static reaction on the nose gear must be considered in designing the nose gear, its attaching structure, and the forward fuselage structure.

Change CS 25.507 to read as follows (changes marked in yellow):

CS 25.507 Reversed braking.

(a) The aeroplane must be in a static ground attitude. Horizontal reactions parallel to the ground and directed forward must be applied at the ground contact point of each wheel with brakes. The limit loads must be equal to 0.55 times the vertical load at each wheel or to the load developed by 1.2 times the nominal maximum static brake torque, whichever is less.

(b) For aeroplanes with nose wheels, the pitching moment must be balanced by rotational inertia.

(c) *Not applicable to A350*

Replace subparagraphs (d) and (e) of CS 25.511 to read as follows:

CS 25.511 Ground load: unsymmetrical loads on multiple-wheel units.

(d) *Landing conditions*. For one and for two deflated tyres, the applied load to each gear unit is assumed to be 60 percent and 50 percent, respectively, of the limit load applied to each gear unit for each of the prescribed landing conditions. However, for the side load condition of CS 25.485(b), 100 percent of the vertical load must be applied. CS 25.485(a) need not be considered with deflated tyres.

(e) *Taxiing and ground handling conditions*. For one and for two deflated tyres-

(1) The applied side or drag load factor, or both factors, at the centre of gravity must be the most critical value up to 50 percent and 40 percent, respectively, of the limit side or drag load factors, or both factors, corresponding to the most severe condition resulting from consideration of the prescribed taxiing and ground handling conditions;

(2) For the braked roll conditions of CS 25.493(a) and (b)(2), the drag loads on each inflated tyre may not be less than those at each tyre for the symmetrical load distribution with no deflated tyres;

(3) The vertical load factor at the centre of gravity must be 60 percent and 50 percent, respectively, of the factor with no deflated tyres, except that it may not be less than 1g; and

(4) The pivoting condition of CS 25.503 and the braked roll conditions of CS 25.493 (c) and (d) need not be considered with deflated tyres.

CS 25.723 Shock absorption tests.

(a) The analytical representation of the landing gear dynamic characteristics that is used in determining the landing loads must be validated by energy absorption tests. A range of tests must be conducted to ensure that the analytical representation is valid for the design conditions specified in CS 25.480 and in CS 25.483(b) if applicable.

(1) The configurations subjected to energy absorption tests at limit design conditions must include both the condition with the maximum energy absorbed by the landing gear and the condition with the maximum descent velocity obtained from CS 25.480 and CS 25.483(b) if applicable.

(2) The test attitude of the landing gear unit and the application of appropriate drag loads during the test must simulate the aeroplane landing conditions in a manner consistent with the development of rational or conservative limit loads.

(b) Each landing gear unit may not fail in a test, demonstrating its reserve energy absorption capacity, assuming—

(1) The weight and pitch attitude correspond to the condition from CS 25.480 or CS 25.483(b), if applicable, that provides the maximum energy absorbed by the landing gear;

(2) Aeroplane lift is not greater than the aeroplane weight acting during the landing impact, unless the presence of systems or procedures significantly affects the lift;

(3) The test descent velocity is 120% of that corresponding to the condition specified in paragraph (b)(1) of this paragraph;

(4) The effects of wheel spin-up need not be included.

(c) In lieu of the tests prescribed in this paragraph, changes in previously approved design weights and minor changes in design may be substantiated by analyses based on previous tests conducted on the same basic landing gear system that has similar energy absorption characteristics.

– END –

C-12 ESF : Undercarriage Lateral Turning Loads	
APPLICABILITY:	A350
REQUIREMENTS:	CS 25.495
ADVISORY MATERIAL:	N/A

Equivalent Safety Finding

Replace the current CS 25.495 requirement to read as follows:

CS 25.495 Turning

(a) The aeroplane is assumed to execute a steady turn by steering of any steerable gear or by application of any differential power. The limit vertical load factor must be 1.0 and the limit aircraft lateral load factor must be 0.5.

(b) The aeroplane is assumed to be in static balance, the lateral load factor being reacted by friction forces applied at the ground contact point of each tyre. The lateral load must be shared between each individual tyre in a rational or conservative manner. The distribution of the load on the tyre must account at least for the effects of the factors specified in the subparagraph (c).

(c) A limit value of lateral c.g. load factor not less than 0.5g (wing axis) must be used in a rational analysis, considering at least the following parameters:

(1) Landing gear spring curves and landing gear kinematics
(2) Reliable tyre friction characteristics
(3) Airframe and landing gear flexibility when significant
(4) Aircraft rigid body motion.

– END –

C-14 SC: Pivoting Loads	
APPLICABILITY:	A350
REQUIREMENTS:	CS 25.503
ADVISORY MATERIAL:	N/A

Special Condition

Replace CS 25.503 to read as follows:
The main landing gear and supporting structure must be designed for the loads induced by pivoting during ground maneuvers.

(1) The following rational pivoting maneuvers must be considered:*

(i) Towing at the nose gear at the critical towing angle, including cases with torque links disconnected, no brakes applied, and separately,
(ii) Application of symmetrical or unsymmetrical forward thrust to aid pivoting and with or without braking by pilot action on the pedals.

(2) The airplane is assumed to be in static equilibrium, with the loads being applied at the ground contact points.

(3) The limit vertical load factor must be 1.0, and

(i) For wheels with brakes applied, the coefficient of friction must be 0.8.
(ii) For wheels with brakes not applied, the ground tire reactions must be based on reliable tire data.

(4) The failure conditions must be analysed in accordance with the principles of CS25 Appendix K “Interaction of Systems and Structure”.

– END –

D-04 SC : Crew Rest Compartments	
APPLICABILITY:	Airbus A350
REQUIREMENTS:	CS 25.785, 25.789, 25.812, 25.831, 25.851, 25.853, 25.858
ADVISORY MATERIAL:	N/A

Special Condition

Special Condition

1. CRC occupancy is not allowed during Taxi, Take off and Landing (TT&L) phases. During flight, occupancy of the CRC is limited to the total number of bunks and / or seats that are installed in the compartment. In addition, the maximum occupancy in the overhead crew rest compartment may be limited as necessary to provide the required level of safety.

(a) There must be appropriate placards, inside and outside each entrance to the CRC to indicate

(1) The maximum number of crewmembers allowed during flight and,

(2) That occupancy is restricted to operating crewmembers trained in the use of emergency equipment, emergency procedures and the systems of the CRC,

(3) That smoking is prohibited in the CRC,

(4) That the crew rest area is limited to the stowage of crew personal luggage and must not be used for the stowage of cargo or passenger baggage.

(b) There must be at least one ashtray on the inside and outside of any entrance to the CRC.

(c) A limitation in the Airplane Flight Manual or other suitable means must be established to restrict occupancy to crewmembers and to specify the phases of flight occupancy that are allowed for each installed CRC.

(d) For each occupant permitted in the CRC, there must be an approved seat or berth that must be able to withstand the maximum flight loads when occupied.

2. For all doors and hatches installed, there must be a means to preclude anyone from being trapped inside the CRC. If a locking mechanism is installed, it must be capable of being unlocked from the outside without the aid of a key or other tool. The lock must not prevent opening from the inside of the compartment at any time.

3. There must be at least two emergency evacuation routes, which could be used by each occupant of the CRC to rapidly evacuate to the passenger decks.

(a) The routes must be located with sufficient separation within the CRC, and between the evacuation routes, to minimize the possibility of an event, either inside or outside of the crew rest compartment, rendering both routes inoperative.

(b) The routes must be designed to minimize the possibility of blockage, which might result from fire (inside or outside the CRC), mechanical or structural failure, or persons standing below or against crew rest exits doors or hatches. If there is low headroom at or near the evacuation route, provisions must be made to prevent or to protect occupants (of the CRC) from head injury. The use of evacuation routes must not be dependent on any powered device. If a crew rest exit route is in an area where there are passenger seats, a maximum of five passengers may be displaced from their seats temporarily during the evacuation process of an incapacitated person(s). If the evacuation procedure involves the evacuee stepping on seats, the seats must not be damaged to the extent that they would not be acceptable for occupancy during an emergency landing.

(c) Emergency evacuation procedures, including the emergency evacuation of an incapacitated occupant from the CRC, must be established and demonstrated.

(d) There must be a limitation in the Airplane Flight Manual or other suitable means requiring that crewmembers be trained in the use of evacuation routes.

(e) There must be a means to prevent passengers on the passenger decks from entering the CRC in the event of an emergency, including an emergency evacuation, or when no flight attendant is present.

(f) The means of opening CRC doors and hatches must be simple and obvious. In addition, the CRC doors and hatches must be able to be closed from outside.

(g) It must be shown by actual demonstration that the maximum allowed number of CRC occupants can easily evacuate the CRC using the main access route. This demonstration must also be performed using the alternate evacuation route.

4. The evacuation of an incapacitated person (representative of a ninety-fifth percentile male in size, at the corresponding weight) must be demonstrated for all evacuation routes. The number of crewmembers, which may provide assistance in the evacuation from inside, are limited by the available space. Additional assistance may be provided by up to three persons in the passenger compartment.

5. The following signs and placards must be provided in the CRC:

(a) At least one exit sign, located near each crew rest door or hatch, meeting the requirements of CS 25.812(b)(1)(i). However, in the case of Flight Crew Rest Compartments limited to four occupants or fewer, the Agency agrees that internal electrical illumination of the sign is not required provided Airbus can demonstrate that the emergency lighting system providing general lighting in the compartment sufficiently highlights an exit sign meeting all other requirements of CS 25.812(b)(1)(i).

(b) An appropriate placard located conspicuously on or near each crew rest emergency exit door or hatch to identify its location and the operating instructions.

(c) Placards must be readable from a distance of 30 inches under emergency lighting conditions.

(d) The door or hatch handles and operating instruction placards must be illuminated to at least 160 micro lamberts under emergency lighting conditions. The above requirements may be subject to specific evaluation and possibly to a finding of equivalent level of safety.

6. There must be a means in the event of failure of the aircraft's main power system, or of the normal CRC lighting system, for emergency illumination to be automatically provided for the CRC.

(a) This emergency illumination must be independent of the main lighting system.

(b) The sources of general illumination may be common to both the emergency and the main lighting systems if the power supply to the emergency lighting system is independent of the power supply to the main lighting system.

(c) The illumination level must be sufficient for the occupants of the CRC to locate and transfer to the passenger cabin by means of each evacuation route.

7. There must be means for two-way voice communications between crewmembers on the flight deck and occupants of the CRC. There must also be two-way communications between the occupants of the CRC and each flight attendant station required to have a public address system microphone per CS 25.1423(g) in the passenger cabin. In addition, the public address system must include provisions to provide only the relevant information to the crewmembers in the CRC (e.g., fire in flight, aircraft depressurization, etc.). That is, provisions must be provided so that occupants of the CRC will not be disturbed with normal, non-emergency announcements made to the passenger cabin.

8. There must be a means for manual activation of an aural emergency alarm system, audible during normal and emergency conditions and certain to wake a sleeping occupant, to enable crewmembers on the flight deck and at each pair of required floor level emergency exits to alert occupants of the CRC of an emergency situation. Use of a public address or crew interphone system will be acceptable, provided an adequate means of differentiating between normal and emergency communications is incorporated. The system must be powered in flight, after the shutdown or failure of all engines and auxiliary power units (APU), for a period of at least ten minutes.

9. There must be a means, readily detectable by seated or standing occupants of the CRC, which indicates when seat belts should be fastened. Seat belt type restraints must be provided for all seats and berths in the CRC and in the latter case must be compatible for the sleeping attitude during cruise conditions. There must be a placard on each berth requiring that these restraints be fastened when occupied. If compliance with this or any of the other requirements of these special conditions is based on specific head location, there must be a placard identifying the head position.

10. Means must be provided to cover turbulence. If the seat backs do not provide a firm handhold, or if there is no seat installed, there must be a handgrip or rail to enable persons to steady themselves while in the CRC, in moderately rough air.

11. The following safety equipment must also be provided in the CRC:

(a) At least one approved hand-held fire extinguisher appropriate for the kinds of fires likely to occur,

(b) One Portable Protective Breathing Equipment (PBE) device approved to European Technical Standard Order (ETSO)-C116 or equivalent and meeting CS 25.1439, close to each hand-held fire extinguisher. If only one hand-held fire extinguisher is installed in the compartment, two PBE devices must be provided.

(c) One flashlight

12. A smoke or fire detection system (or systems) must be provided that monitors each occupiable area within the CRC, including those areas partitioned by curtains. Flight tests must be conducted to show compliance with this requirement. Each system (or systems) must provide:

(a) A visual indication to the flight crew within one minute after the start of a fire,

(b) An aural warning in the CRC that would be certain to wake a sleeping occupant, And

(c) A warning in the passenger decks. This warning must be readily detectable by a flight attendant, taking into consideration the positioning of flight attendants throughout the passenger compartment during various phases of flight.

13. A means to fight and suppress a fire in the CRC must be provided. This means can either be a built-in extinguishing system or manual hand held bottle extinguishing system.

(a) The design shall be such that any fire within the compartment can be controlled without entering the compartment or the design of the access provisions must allow crewmembers equipped for fire fighting to have unrestricted access to the compartment.

(b) If a built-in fire extinguishing system is used in lieu of manual fire fighting, the system must have adequate capacity to suppress any fire occurring in the crew rest compartment, considering the fire threat, volume of the compartment, the ventilation rate and the minimum performance standards (MPS) that have been established for the agent being used. In addition it must be shown that a fire will be contained within a controlled volume meeting the requirements of Appendix F, Part III.

(c) The fire fighting procedures must describe the methods to search the crew rests for fire sources(s).Training and procedures must be demonstrated by test and documented in the suitable manuals.

(d) The time for a crewmember on the passenger deck to react to the fire alarm, to don the fire fighting equipment and to gain access to the crew rest compartment must not exceed the time for the compartment to become smoke-filled, making it difficult to locate the fire source.

(e) The material used to construct each enclosed stowage compartment up to 25 cft must at least be fire resistant (45° bunsen burner test according App. F, Part I (a)(2)(ii)) and must meet the flammability standards for interior components specified in § 25.853. For bigger compartments design standards must be agreed with the Agency.

14. There must be a means provided to exclude hazardous quantities of smoke or extinguishing agent originating in the CRC from entering any other compartment occupied by crewmembers or passengers. This means must include the time periods during the evacuation of the overhead crew rest compartment and, if applicable, when accessing the overhead crew rest compartment to manually fight a fire. Flight tests must be conducted to show compliance with this requirement.

(a) Small quantities of smoke may penetrate from the crew rest compartment into other occupied areas during the one-minute smoke detection time.

(b) When built in fire extinguishing systems are used, there must be a provision in the fire fighting procedures to ensure that all door(s) and hatch(es) at the crew rest compartment emergency exits are closed after evacuation of the crew rest and during fire fighting.

(c) Smoke entering any occupiable compartment when access to the CRC is open must dissipate within five minutes after the access to the CRC is closed.

(d) It must be demonstrated that the complete fire detection and fire fighting procedure can be conducted effectively without causing a hazard to passengers due to excess quantities of smoke and/or extinguishant accumulating and remaining in occupied areas.

15. There must be a supplemental oxygen system within the crew rest compartment as follows:

(a) There must be at least one mask for each seat, and berth in the crew rest compartment.

(b) If a destination area (such as a changing area) is provided in the overhead crew rest compartment, then there must be an oxygen mask readily available for each occupant that can reasonably be expected to be in the destination area (with the maximum number of required masks within the destination area being limited to the placarded maximum occupancy of the crew rest).

(c) There must also be an oxygen mask readily accessible to each occupant that can reasonably be expected to be either transitioning from the main cabin into the crew rest compartment, transitioning within the crew rest compartment, or transitioning from the crew rest compartment to the main cabin.

(d) The system must provide an aural (that would be certain to wake a sleeping occupant) and visual alert to warn the occupants of the overhead crew rest compartment to don oxygen masks in the event of decompression. The aural and visual alerts must activate concurrently with the deployment of the oxygen masks in the passenger cabin. To compensate for sleeping occupants, the aural alert must be heard in each section of the overhead crew rest compartment and must sound continuously for a minimum of five minutes or until a reset switch within the overhead crew rest compartment is activated. A visual alert that informs occupants that they must don an oxygen mask must be visible in each section.

(e) There must also be a means by which the oxygen masks can be manually deployed from the flight deck.

(f) Procedures for crew rest occupants in the event of decompression must be established. These procedures must be transmitted to the operator for incorporation into their training programs and appropriate operational manuals.

(g) The supplemental oxygen system for the crew rest shall meet the same CS-25 requirements as the supplemental oxygen system for the passenger cabin occupants except for the 10 percent additional masks required by CS 25.1447(c)(1).

(h) The illumination level of the normal overhead crew rest compartment lighting system must automatically be sufficient for each occupant of the compartment to locate a deployed oxygen mask.

16. The following requirements apply to CRC that are divided into several sections by the installation of curtains or partitions:

(a) A placard is required adjacent to each curtain that visually divides or separates, for privacy purposes, the CRC into small sections. The placard must require that the curtain(s) remains open when the private section it creates is unoccupied.

(b) For each section of the CRC created by the installation of a curtain, the following requirements of these special conditions must be met with the curtain open or closed:

(1) Visibility of the No smoking placards (Special Condition No. 1),

(2) Emergency illumination (Special Condition No. 6),

(3) Emergency alarm system (Special Condition No. 8),

(4) Seat belt fasten signal or return to seat signal as applicable (Special Condition No. 9), unless it is agreed by the Agency that only short term occupancy is possible (e.g. a changing area with room for only one standing person and possessing no seat or feature useable as a seat), and

(5) The smoke or fire detection system (Special Condition No. 12).

(6) The oxygen system (Special Condition No. 15).

(c) A CRC visually divided to the extent that evacuation could be affected must have exit signs that direct occupants to the primary evacuation route. The exit signs must be provided in each separate section of the CRC, except for curtained bunks, and must meet the requirements of CS 25.812(b)(1)(i).

(d) For sections within an CRC that are created by the installation of a partition with a door separating the sections, the following requirements of these special conditions must be met with the door open or closed:

(1) There must be a secondary evacuation route from each section to the passenger decks, or alternatively, it must be shown that any door between the sections has been designed to preclude anyone from being trapped inside the compartment (i.e. any locking mechanism must be capable of being unlocked from either side without the aid of a key or other tool). Removal of an incapacitated occupant from within this area must be considered. A secondary evacuation route from a small room designed for only one occupant for short time duration, such as a changing area or lavatory, is not required. However, removal of an incapacitated occupant, from within a small room, such as a changing area or lavatory, must be considered.

(2) Any door between the sections must be shown to be openable when crowded against.

(3) There may be no more than one door between any seat or berth and the primary emergency exit.

(4) There must be exit signs in each section meeting the requirements of CS 25.812(b)(1)(i) that direct occupants to the primary outlet. For single bed or small compartments reduced sizes might be acceptable.

(5) Special Conditions No. 1 (no smoking placards), No. 6 (emergency illumination), No. 8 (emergency alarm system), No. 9 (fasten seat belt signal or return to seat signal as

applicable), No. 12 (smoke or fire detection system) and No. 15 (oxygen system) must be met with the door open or closed.

(6) Special Conditions No. 7 (two-way voice communication) and No. 11 (emergency fire fighting and protective equipment) must be met independently for each separate section except for lavatories or other small areas that are not intended to be occupied for extended periods of time.

17. Materials, Seat cushions and mattresses must comply with the requirements of CS 25.853(a)(c).

18. Where a waste disposal receptacle is fitted, it must be equipped with an automatic fire extinguisher that meets the performance requirements of CS 25.854(b).

– END –

D-05 (SC): Towbarless Towing	
APPLICABILITY:	A350
REQUIREMENTS:	CS 25.745(d)
ADVISORY MATERIAL:	N/A

Special Condition

Replace the entire text of the current paragraph CS 25.745(d) with the following:

CS 25.745 Nose-Wheel Steering

(d) The nose-wheel steering system, towing attachment(s), and associated elements must be designed or protected by appropriate means such that during ground manoeuvring operations effected by means independent of the aeroplane:

> **(1)** Damage affecting the safe operation of the nose-wheel steering system is precluded, or
>
> **(2)** A flight crew alert is provided, before the start of taxiing, if damage may have occurred. (see AMC 25.1322)

(see AMC 25.745(d) as defined in the Interpretative Material D-05)

– END –

D-06 SC: High Operation / High Cabin Heat Load	
APPLICABILITY:	A350-900
REQUIREMENTS:	CS 25.831, CS 25.841, CS 25.903, CS 25.1309
ADVISORY MATERIAL:	AMC 20-128A, AMC 25.1309, INT/POL/25/16

Special Condition

System Operation above 41 000ft

A - PRESSURE VESSEL INTEGRITY
For the damage tolerance evaluation, in addition to the damage sizes critical for residual strength, the damage sizes critical for depressurisation decay must be considered, taking also into account the (normal) unflawed pressurised cabin leakage rate. The resulting leakage rate must not result in the cabin altitude exceeding the cabin altitude time history shown in Figure 4 of Appendix 1.

B - VENTILATION
In lieu of the requirements of CS 25.831(a), the ventilation system must be designed to provide a sufficient amount of uncontaminated air to enable the crew members to perform their duties without undue discomfort and fatigue and to provide reasonable passenger comfort during normal operating conditions and also in the event of any probable failure of any system which could adversely affect the cabin ventilating air. For normal operations, crew members and passengers must be provided with at least 0·55 lb/min of fresh air per person or the equivalent in filtered, recirculated air based on the volume and composition at the corresponding cabin pressure altitude of not more than 8000 ft. The supply of fresh air in the event of the loss of one source, should not be less than 0·4 lb/min per person for any period exceeding five minutes. However, reductions below this flow rate may be accepted provided that the compartment environment can be maintained at a level which is not hazardous to the occupant (text of the AMC 25.831(a) of CS 25).

C - AIR CONDITIONNING
In addition to the requirements of CS 25.831, paragraphs (b) through (e), the cabin cooling system must be designed to meet the following conditions during flight above 15 000 ft mean sea level (MSL):

1. After any probable failure, the cabin temperature-time history may not exceed the values shown in Figure 1 of Appendix 1.
2. After any improbable failure, the cabin temperature-time history may not exceed the values shown in Figure 2 of Appendix 1.

Other temperatures standards could be accepted by the EASA if they provide an equivalent level of safety.

D - PRESSURISATION
In addition to the requirements of CS 25.841, the following apply:

1. The pressurisation system, which includes for this purpose bleed air, air conditioning and pressure control systems, must prevent the cabin altitude from exceeding the cabin altitude-time history shown in Figure 3 of Appendix 1 after each of the following :

a) Any probable double failure in the pressurisation system (CS 25.1309 may be applied).

b) Any single failure in the pressurisation system combined with the occurrence of a leak produced by a complete loss of a door seal element, or a fuselage leak through an opening having an effective area 2.0 times the effective area which produces the maximum permissible fuselage leak rate approved for normal operation, whichever produces a more severe leak.

2. The cabin altitude-time history may not exceed that shown in Figure 4 of Appendix 1 after each of the following :

a) The pressure vessel opening or duct failure resulting from probable damage (failure effect) while under maximum operating cabin pressure differential due to a tyre burst, loss of antennas or stall warning vanes, or any probable equipment failure (bleed air, pressure control, air conditioning, electrical source(s) ...) that affects pressurisation.

b) Complete loss of thrust from engines.

3. In showing compliance with paragraph D.1 and D.2 of this special condition, it may be assumed that an emergency descent is made by an approved emergency procedure. A 17-seconds crew recognition and reaction time must be applied between cabin altitude warning and the initiation of emergency descent. For flight evaluation of the rapid descent, the test article must have the cabin volume representative of what is expected to be normal.

4. Engine rotor failures must be assessed according to the requirements of CS 25.903(d)(1). *In considering paragraph 8.d(2) of AMC 20-128A, consideration must be given to the practicability and feasibility of minimising the depressurisation effects, assessing each aircraft configuration on a case-by-case basis, and taking into account the practices in the industry for each configuration.*

E - OXYGEN SUPPLY

AFM procedure must be introduced to require that when operating at flight altitudes above flight level 410, one pilot at the controls of the airplane shall at all times wear and use an oxygen mask secured, sealed, and supplying oxygen. If certification for operation above 41,000 feet without equipment donned is intended, the applicant must substantiate that if a rapid depressurization occurs, the crew can recognize it and don equipment quickly enough to prevent unacceptable levels of hypoxia.

– END –

D-07 (SC): Control Surface Position Awareness / Electronic Flight Control Systems	
APPLICABILITY:	A350
REQUIREMENTS:	CS 25.671 and 25.672
ADVISORY MATERIAL:	N/A

Special Condition

In addition to current CS 25.671 paragraph and A350 SC B-02 paragraph 4, the following conditions are applicable :

1. The flight control system shall be designed to continue to operate and must not hinder aircraft recovery from any attitude.

2. If the design of the flight control system has multiple modes of operation, a means must be provided to indicate to the crew any mode that significantly changes or degrades the normal handling or operational characteristics of the aeroplane.

– END –

D-11 ESF : Pack Off Operation	
APPLICABILITY:	A350-900
REQUIREMENTS:	CS 25.831(a)
ADVISORY MATERIAL:	N/A

Equivalent Safety Finding

The following shall be used as equivalent safety finding to the requirements of CS 25.831(a) for the A350 Type Certification:

1. There must be a means to annunciate to the flight crew that the pressurisation system (conditioned air supply) is selected off.

2. It must be demonstrated that the ventilation system continues to provide an acceptable environment in the passenger cabin and cockpit for the brief period when the pressurisation system is not operating. The degradation of crewmember air quality will not reach the level that would cause undue discomfort and fatigue to the point that it could affect the performance of their duties.

3. Furthermore, equipment environment shall be evaluated during those short periods to ensure equipment reliability and performances are not impaired. This evaluation should cover the extremes of ambient hot air temperatures in which the aeroplane is expected to operate.

4. In addition, it will be demonstrated that no unsafe condition due to limited packs-off operation will result, should a fire occur. Following criteria will be considered:

   (b) Cockpit Smoke Penetration and Evacuation regarding any cargo or electronic compartment fire and Cabin Smoke Penetration regarding cargo compartment fire will not be impaired by packs off operation.

   (c) During limited duration packs-off operation the smoke detection systems are effective and the AC packs can be turned on and returned to the approved packs-on configuration to exclude hazardous quantities of smoke.

5. Finally, the air conditioning packs-off operation is intended to be a short duration operation. Therefore, the maximum period of operation in this configuration will be defined by the applicant and specified in the AFM, along with any related operating procedures necessary to maintain compliance with the regulatory issues discussed above.

– END –

D-14 SC : Application of Heat Release and Smoke Density Requirements to Seat Materials	
APPLICABILITY:	A350-900
REQUIREMENTS:	CS 25.853(d); Appendix F Part IV & V
ADVISORY MATERIAL:	N/A

Special Condition

1. Except as provided in paragraph 3 of these special conditions, compliance with CS25, Appendix F, parts IV and V, heat release and smoke emission, is required for seats that incorporate non-traditional, large, non-metallic panels that may either be a single component or multiple components in a concentrated area in their design.

2. The applicant may designate up to and including 0.139 m² (1.5 square feet) of non traditional, non-metallic panel material per seat place that does not have to comply with special condition Number 1, above. A triple seat assembly may have a total of 0.418 m² (4.5 square feet) excluded on any portion of the assembly (e.g., outboard seat place 0.093 m² (1 square foot), middle 0.093 m² (1 square foot), and inboard 0.231 m² (2.5 square feet)).

3. Seats do not have to meet the test requirements of CS25, Appendix F, parts IV and V, when installed in compartments that are not otherwise required to meet these requirements. Examples include:

a. Airplanes with passenger capacities of 19 or less and
b. Airplanes exempted from smoke and heat release requirements.

– END –

D-15 ESF : Post Crash Fire – Composite Fuselage Construction	
APPLICABILITY:	A350-900
REQUIREMENTS:	CS 25.856 (b)
ADVISORY MATERIAL:	N/A

A350 Equivalent Safety Finding D-15

Instead of applying the flammability standards of CS 25.856(b) and corresponding Appendix F Part VII to the thermal/acoustic insulation materials installed in the lower half of the A350 fuselage, the following approach shall be used as equivalent safety finding to the requirements of CS 25.856(b) for the A350 Type Certification:

1. The A350 composite fuselage shall be proven to present an equivalent level of resistance to flame penetration as a traditional metallic fuselage furnished with a CS 25.856(b) compliant insulation system.

2. It must be demonstrated that the levels of hazardous products such as smoke, toxic products and released composite fibres in the A350 occupied areas during an external post crash fire will be no higher than if the structure were of conventional aluminium alloy.

3. The flame penetration resistance test and smoke and toxic gases evaluation will be carried out in accordance with the test conditions prescribed in Appendix F Part VII as regards the fire threat with the following conditions:
   (a) The test specimen will be a flat, plain composite panel representative of the minimum skin thickness found in the lower half of the fuselage. The corresponding A350 insulation material will be installed on the bask face of the panel.
   (b) The test specimen will be mounted onto one face of an approximately 4”X4”X4” metallic box.
   (c) The fire source will be the oil burner calibrated according to the test method of Appendix F Part VII.
   (d) The test specimen will be exposed to the oil burner flame for 5 minutes and the environmental conditions within the box will be monitored during this period to assess the survivability.
   (e) Smoke emission and toxicity will be assessed in comparative tests between a generic aluminium fuselage equipped with 25.856(b) compliant insulation and the A350 CFRP fuselage and insulation.
   (f) The acceptance criteria will be:
      - No flame penetration within 5 minutes.
      - the smoke emission curves from the CFRP panel tests should not reach 10% light transmission significantly earlier than those from the aluminium construction tests.
      - Toxicity assessment will be based on the measurement of the concentrations of THC, HCN, SO2, CO and NOx measured in the “box” during the five minutes of the test. The concentrations will be compared to the acceptable limits identified by the FAA Technical Centre (ref. presentation “Update on Toxicity of Burn through-Compliant Insulation “held at the IAMFT WG, Atlantic City, NJ on 21. Oct. 2008, by Tim Marker (FAA-TC).

– END –

D-16 SC : In flight fire – Composite Fuselage Construction	
APPLICABILITY:	A350-900
REQUIREMENTS:	CS 25.853(a)
ADVISORY MATERIAL:	N/A

Special Condition

A. It must be demonstrated that the use of composite structural materials does not introduce any additional in-flight fire risks (e.g. reduced flame propagation resistance, emission of hazardous quantities of toxic products into occupied areas) that would not be present if the structure were of conventional aluminium alloy.

– END –

D-19 ESF : Overpressure Relief Valves and Outflows Valves	
APPLICABILITY:	A350-900
REQUIREMENTS:	CS 25.841(b)(1), 25.843(b)(1) and 25.1309
ADVISORY MATERIAL:	N/A

Equivalent Safety Finding

Conclusion

An equivalent safety finding shall be used for the A350 Type Certification by showing compliance to CS 25.841(b)(1) and 25.843(b)(1) by the following:

1. The SSA of the cabin pressure control system will demonstrate that an uncontrollable over-pressure by the pressure relief function will be extremely improbable by not taking credit of the independent mechanical (pneumatic) relief valve.

2. The one independent mechanical (pneumatic) relief valve (ORV) will be adequate to automatically limit the positive pressure differential at the maximum rate of flow delivered by the pressure sources.

3. Airbus will develop appropriate tests to cover the intent of CS 25.843(b)(1).

4. The “maximum pressure release valve setting” is understood as the maximum pressure allowed by the overpressure relief function embedded in the software logic governing the regulating outflow valves.

5. Airbus must show that the risk of common cause failures and of development errors has been adequately mitigated, and that the proposed design is equivalently safe or safer, with respect of such risks, to a conventional design.

– END –

D-20 SC : Lateral Trim Function through Differential Flap Setting	
APPLICABILITY:	A350-900
REQUIREMENTS:	CS 25.701, 25.671, 25.672 and 25.1309
ADVISORY MATERIAL:	N/A

Special Condition

In lieu of the current CS 25.701 (a) and (d) paragraphs, the following conditions are applicable:

1. Airbus must demonstrate that an unsafe condition is not created by using the flaps asymmetrically.

2. The degree of acceptable asymmetry must be defined and justified for all flight phases with respect to :

   − CS 25.701 (b) and (c), with the worst case asymmetric flap configurations, and

   − Providing equivalent protection against excess asymmetry in the same manner as CS 25.701 provides to systems that are synchronized or use another equivalent means to prevent asymmetry.

3. The lateral trim function is a flight control system and therefore must show compliance to both general system requirements as well as general flight control requirements.
Therefore, the function must be demonstrated:

   − To comply with CS 25.671 , 25.672 and CS 25.1309
   − Not to embody, where practicable, significant latent failures
   − Where significant latent failures are unavoidable, to satisfy the minimum requirements as it is proposed in the CDD and 1/1000 criteria for the flight controls

– END –

D-21 SC : Type C Passenger Exits	
APPLICABILITY:	A350-900
REQUIREMENTS:	CS 25.785, 25.807, 25.810, 25.813
ADVISORY MATERIAL:	N/A

Special Condition

CS 25.785(h) to be amended by the following:

A flight attendant seat must be located near the Type C emergency exits.

CS 25.807(a)(8) to be added:

A Type C exit is a floor-level exit with a rectangular opening of not less than 30 inches (762 mm) wide by 48 inches (1.219 m) high, with corner radii not greater than 10 inches (254 mm).

CS 25.807(d)(2) to be amended by the following:

The maximum number of passenger seats permitted for each pair of Type C exits is 55. There must be at least two Type C exits, one on each side of the fuselage.

CS 25.807(k) to be amended as follows:

Each passenger entry door in the side of the fuselage must qualify as a Type A, Type C, Type I or Type II passenger emergency exit. Each Type C passenger entry door in the side of the fuselage must meet the requirements of 25.807 to 25.813 for a Type II or larger passenger exit (including those identified below).

CS 25.810(a)(1)(ii) to be amended by the following:

Assisting means installed at Type C exits must be automatically erected within 10 seconds from the time the opening means of the exit is actuated.

CS 25.813(a) to be amended by the following:

There must be a passageway leading from the nearest main aisle to each Type C emergency exit and between individual passenger areas. Passageways between individual passenger areas and those leading to Type C emergency exits must be unobstructed and at least 20 inches wide. There must be a cross-aisle which leads to the immediate vicinity of each passageway between the nearest main aisle and a Type C exit.

CS 25.813(b) to be amended by the following:

An assist space must be provided at one side of a Type C exit.

– END –

D-23 ESF : Indication of the Passenger door from outside Position if the Door is not fully Closed, Latched and Locked	
APPLICABILITY:	A350-900
REQUIREMENTS:	CS 25.783(e)(2)
ADVISORY MATERIAL:	AMC 25.783

Equivalent Safety Finding

An equivalent safety finding shall be used for the A350 Type Certification by showing compliance to CS 25.783(e)(2), AMC 25.783 by the following:

The compliance demonstration to CS 25.783 is based on 2 separate independent chains being:

- The Signalisation of the doors status and
- The Mechanical Design of the doors including the direct indication of the door status at the door operator station.

With the assumption that the doors might be also operated from the outside, without providing a direct indication of the door status for the person operating the door, the second chain must be replaced by a design that is independent from the signalisation of the door status in order to guarantee an equivalent level of safety.

The Airbus proposal to use the mechanical link between the door CLL (closed, latched and locked) position and the slide arming mechanism as such independent means of design to allow for operating of the doors from the outside is acceptable based on the following:

1) In case the corresponding door is not fully closed, latched and locked, it will not be possible to move the slide selection lever to the armed position. This function is ensured by mechanical connection between the slide blocking unit and the drive shaft. The monitoring of the drive shaft by the slide blocking unit ensures the integrity of the complete chain between outside handle and the locking mechanism. When this condition (CLL) is not reached, the slide selection lever can not be moved in the armed position and this status is the positive means required for compliance with CS 25.783(e)(2).

2) A mandatory action for the Cabin crew is included in the CCOM to move the slide selection lever to the armed position.

3) In the event that the door/slide is dispatched as inoperative, in accordance with an MMEL procedure, the door will be required to be closed from the inside.

– END –

D-28 ESF: Green Arrow and “Open” Placard for Emergency Exit Marking	
APPLICABILITY:	A350
REQUIREMENTS:	CS 25.811(e)(4)
ADVISORY MATERIAL:	N/A

Equivalent Safety Finding

An equivalent safety finding shall be used for the A350 Type Certification by showing compliance to CS 25.811(e)(4) by the following:

1. The word “green” may be optionally substituted for “red” in two places in CS 25.811(e)(4).

2. Airbus shall put in place controls to ensure that, in case a customer request that red text “EXIT” signs (as still optionally accepted by CS25) are fitted to an A350, these red “EXIT” signs be matched by the fitment of red arrows and “OPEN” placards, as required by the un-amended requirement.

3. Airbus shall ensure that the green arrows and “OPEN” placard door markings will be highlighted to affected operators, particularly the aspect that they must ensure that the images portrayed on the safety cards required by operational rules reflect the colour of the markings on their aircraft.

– END –

D-30 ESF: Installation of Angled Seats	
APPLICABILITY:	A350
REQUIREMENTS:	CS 25.785(d), 25.562(b)
ADVISORY MATERIAL:	AMC 25.785(d)

Equivalent Safety Finding

An equivalent safety finding shall be used for the A350 Type Certification by showing compliance to CS 25.785(d) for passenger seats that are installed in the aircraft making an angle up to 30° with the aircraft longitudinal axis by the following:

1) The design of the seat and the surrounding items should be developed to maximise the capability of the occupant to align with the deceleration vector during the impact.

2) The installation of an airbag-belt system may be required if the occupant does not realign as much as expected or if testing shows that an airbag (that is part of the seat design) would play a significant role in maintaining acceptable protection.

3) ATD internal force and moment measurements, in addition to those required by CS 25.562 (c), are necessary for comparative purposes. These measurements can be taken during dynamic testing and compared with values from tests conducted on a seat installed at less than 18 degrees with respect to the aircraft centreline. It should be noted that this approach cannot at present involve consideration of absolute values as research data do not exist to back this up. Rather, this will involve a check that the values observed are of comparable magnitude and range and will provide confidence that the mitigating factors are achieving the desired outcome.

4) Seats installed above 30° degrees to the aircraft longitudinal axis must be subject to further discussion in order to identify the need for additional and/or modified conditions for an ESF.

– END –

D-31 ESF : Application of reduced intrusion loads in certain areas of the Flight Deck Boundaries	
APPLICABILITY:	A350
REQUIREMENTS:	CS 25.795(a)(1)
ADVISORY MATERIAL:	AMC 25.795(a) / AC 25.795-1A

Equivalent Safety Finding

A finding of equivalent safety (ESF) for the A350 Type Certification in the case of CS 25.795 (a)(1) is agreed.

This ESF allows an impact energy lower than that defined in the rule to be assumed in the case of some monument designs behind the cockpit boundary.

This must be justified on the basis of aspects such as:

a) insufficient room between fixed monument walls etc. to allow an assailant to carry out the actions necessary (e.g. kicking, punching, use of an item such as a fire extinguisher etc.) to produce the impact energy defined in the rule, and/or

b) an area being only accessible with some difficulty (e.g. requiring ceiling panel removal, entry into a locked crew rest area, etc. to access the cockpit boundary).

The limiting geometrical and/or construction features of monument layouts for allowing a lower impact energy, the magnitude of the lower impact energy in each case, and the method of generation of the lower impact energy in the associated certification testing must be fully detailed and agreed with EASA.

– END –

D-32 SC: Use of Magnesium Alloys for Passenger Seat Components	
APPLICABILITY:	A350
REQUIREMENTS:	ETSOC127a
ADVISORY MATERIAL:	N/A

Special Condition

1) Airbus must show that the use of magnesium alloys in passenger seats does not reduce post-crash or in-flight fire safety as compared with the use of conventional aluminium alloys.

2) In addition, Airbus must show that the magnesium alloy, when ignited, will not pose a hazard to fire fighters and/or evacuees, when using common fire suppression agents.

– END –

D-34 ESF : APU Doors Compliance to CS.783(a)	
APPLICABILITY:	A350
REQUIREMENTS:	CS 25.783(a)
ADVISORY MATERIAL:	AMC 25.795(a) / AC 25.795-1A

Equivalent Safety Finding

The following shall be used as equivalent safety finding to the requirements of CS 25.783(a) for the A350 Type Certification:

The APU overpressure panel and APU access doors design is such that improper closing following a maintenance procedure is minimised through the following means:

- The RH APU door cannot be closed unless the LH APU door is first closed, thanks to the angle device.
- The RH APU door cannot be closed with the safety pin in the locked position.
- The overpressure relief panel can only be closed at platform level once the RH APU door has been closed and the safety lever is in the locked position.
- Airbus shall present the associated AMM procedure for opening and closure of the APU doors to EASA for agreement.
- Airbus shall install a placard on the inner side of the overpressure relief panel to remind the maintenance personnel to ensure that the 8 latches (4 hook and keeper latches + 4 pin latches) are properly engaged (no bright orange surfaces of the latches are visible) before the overpressure relief panel is closed.

In addition, it has to be noted that:

- Access to the APU compartment requires the use of a platform, and so are only opened/closed by qualified personnel for maintenance purposes,
- Regular APU servicing is made through the overpressure relief panel only,
- All pin latches and hook and keeper latches are painted in bright orange such that any improper latching conditions can be detected from ground.

– END –

D-35 SC: Installation of inflatable seat belts	
APPLICABILITY:	A350
REQUIREMENTS:	CS 25.562, 25.785
ADVISORY MATERIAL:	N/A

Special Condition

1) HIC Characteristic
The existing means of controlling Front Row Head Injury Criterion (HIC) result in an unquantified but normally predictable progressive reduction of injury severity for impact conditions less than the maximum specified by the rule. Airbag technology however involves a step change on protection for impacts below and above that at which the airbag device deploys. This could result in the HIC being higher at an intermediate impact condition than that resulting from the maximum.
It is acceptable for HIC to have such a non-linear or step change characteristic provided that the value does not exceed 1000 at any condition at which the airbag does or does not deploy, up to the maximum severity pulse specified by the requirements. Tests must be performed to demonstrate this taking into account any necessary tolerances for deployment.

2) Intermediate Pulse Shape
The existing ideal triangular maximum severity pulse is defined in FAA AC 25.562-1B. EASA considers that for the evaluation and testing of less severe pulses, a similar triangular pulse should be used with acceleration, rise time, and velocity change scaled accordingly.

3) Protection During Secondary Impacts
EASA acknowledges that the inflatable lap belt will not provide protection during secondary impacts after actuation. However, evidence must be provided that the post-deployment features of the installation shall not result in an unacceptable injury hazard. This must include consideration of the deflation characteristics in addition to physical effects. As a minimum, a qualitative assessment shall be provided.
Furthermore, the case where a small impact is followed by a large impact must be addressed. In such a case if the minimum deceleration severity at which the airbag is set to deploy is unnecessarily low, the bag's protection may be lost by the time the second larger impact occurs. It must be substantiated that the trigger point for airbag deployment has been chosen to maximize the probability of the protection being available when needed.

4) Protection of Occupants other than 50th Percentile
The existing policy is to consider other percentile occupants on a judgmental basis only i.e. not using direct testing of inquiry criteria but evidence from head paths etc. to determine likely areas of impact. The same philosophy may be used for inflatable lap belts in that test results for other size occupants need not be submitted. However, sufficient evidence must be provided that other size occupants are protected.
A range of stature from a two-year-old child to a ninety-five percentile male must be considered.
In addition the following situations must be taken into account:

- The seat occupant is holding an infant, including the case where a supplemental loop infant restraint is used:
- The seat occupant is a child in a child restraint device.
- The seat occupant is a pregnant woman

5) Occupants Adopting the Brace Position
There is no requirement for protection to be assessed or measured for seat occupants in any other position or configuration than seated alone upright, as specified in FAA AC 25.562-1B. However, it must be shown that the inflatable lap belt does not, in itself, form a hazard to any occupant in a brace position or a person in between the brace position and upright position during deployment.

6) It must be shown that the gas generator does not release hazardous quantities of gas or particulate matter into the cabin.

7) It must be ensured by design that the inflatable lap belt cannot be used in the incorrect orientation (twisted) such that improper deployment would result.

8) The probability of inadvertent deployment must be shown to be acceptably low. The seated occupant must not be seriously injured as a result of the inflatable label deployment, including when loosely attached. Inadvertent deployment must not cause a hazard to the aircraft or cause injury to anyone who may be positioned close to the inflatable lap belt (e.g. seated in an adjacent seat or standing adjacent to the seat). Cases where the inadvertently deploying inflatable lap belt is buckled or unbuckled around a seated occupant and where it is buckled or unbuckled in an empty seat must be considered.

9) It must be demonstrated that the inflatable restraint belt when deployed does not impair access to the seatbelt or harness release means, and does not hinder evacuation, including consideration of adjacent seat places and the aisle.

10) There must be a means for a crewmember to verify the integrity of the inflatable lap belt activation system prior to each flight, or the integrity of the inflatable lap belt activation system must be demonstrated to reliably operate between inspection intervals.

11) It must be shown that the inflatable lap belt is not susceptible to inadvertent deployment as a result of wear and tear, or inertial loads resulting from in-flight or ground manoeuvres likely to be experienced in service.

12) The equipment must meet the requirements of CS 25.1316 with associated guidance material (A350 Interpretative Material F11) for indirect effects of lightning. Electro static discharge must also be considered.

13) The equipment must meet the requirements for HIRF (A350 SC F-12 issue 2) with an additional minimum RF test as per the applicable category of RTCA DO-160 Section 20.

14) The inflatable lap belt mechanisms and controls must be protected from external contamination associated with that which could occur on or around passenger seating.

15) The inflatable lap belt installation must be protected from the effects of fire such that no hazard to occupants will result.

16) The inflatable lap belt must provide adequate protection for each occupant regardless of the number of occupants of the seat assembly or adjacent seats considering that unoccupied seats may have active inflatable lap belt.

17) The inflatable lap belt must function properly after loss of normal aircraft electrical power and after a transverse separation in the fuselage at the most critical location. A separation at the location of the airbag does not have to be considered.

18) It is accepted that a material suitable for the inflatable bag that will meet the normally accepted flammability standard for a textile, i.e. the 12 second vertical test of CS-25 Appendix F, Part 1, Paragraph (b)(4), is not currently available.
In recognition of the overall safety benefit of inflatable lap belts, and in lieu of this standard, it is acceptable for the material of inflatable bag to have an average burn rate of no greater than 2.5 inches/minute when tested using the horizontal flammability test of CS-25 Appendix F, part I, paragraph (b)(5).

19) If lithium-ion non-rechargeable batteries are used to power the AAIR, the batteries must be DO-227 and TSO 142A compliant. However, if rechargeable lithium-ion batteries are used, additional special conditions may apply.

– END –

D-36 SC: Installation of structure-mounted airbag	
APPLICABILITY:	A350
REQUIREMENTS:	CS 25.562, 25.785
ADVISORY MATERIAL:	N/A

Special Condition

1) HIC Characteristic
The existing means of controlling Front Row Head Injury Criterion (HIC) result in an unquantified but normally predictable progressive reduction of injury severity for impact conditions less than the maximum specified by the rule. Airbag technology however involves a step change on protection for impacts below and above that at which the airbag device deploys. This could result in the HIC being higher at an intermediate impact condition than that resulting from the maximum.
It is acceptable for HIC to have such a non-linear or step change characteristic provided that the value does not exceed 1000 at any condition at which the airbag does or does not deploy, up to the maximum severity pulse specified by the requirements. Tests must be performed to demonstrate this taking into account any necessary tolerances for deployment.

2) Intermediate Pulse Shape
The existing ideal triangular maximum severity pulse is defined in FAA AC 25.562-1B. EASA considers that for the evaluation and testing of less severe pulses, a similar triangular pulse should be used with acceleration, rise time, and velocity change scaled accordingly.

3) Protection During Secondary Impacts
EASA acknowledges that the structure mounted airbag will not provide protection during secondary impacts after actuation. However, evidence must be provided that the post-deployment features of the installation shall not result in an unacceptable injury hazard. This must include consideration of the deflation characteristics in addition to physical effects. As a minimum, a qualitative assessment shall be provided.
Furthermore, the case where a small impact is followed by a large impact must be addressed. In such a case if the minimum deceleration severity at which the airbag is set to deploy is unnecessarily low, the bag's protection may be lost by the time the second larger impact occurs. It must be substantiated that the trigger point for airbag deployment has been chosen to maximize the probability of the protection being available when needed.

4) Protection of Occupants other than 50th Percentile
The existing policy is to consider other percentile occupants on a judgmental basis only i.e. not using direct testing of injury criteria but evidence from head paths etc. to determine likely areas of impact. The same philosophy may be used for structure mounted airbags in that test results for other size occupants need not be submitted. However, sufficient evidence must be provided that other size occupants are protected.
A range of stature from a two-year-old child to a ninety-five percentile male must be considered.
In addition the following situations must be taken into account:
- The seat occupant is holding an infant, including the case where a supplemental loop infant restraint is used:
- The seat occupant is a child in a child restraint device.
- The seat occupant is a pregnant woman

5) Occupants Adopting the Brace Position
There is no requirement for protection to be assessed or measured for seat occupants in any other position or configuration than seated alone upright, as specified in FAA AC 25.562-1B. However, it must be shown that the structure mounted airbag does not, in itself, form a hazard to any occupant in a brace position or a person in between the brace position and upright position during deployment.

6) It must be shown that the gas generator does not release hazardous quantities of gas or particulate matter into the cabin.

7) Airbag Deployment
Evaluation of the deployment of the airbag must take into account the deflection or deformation of the installation during the crash pulse. If installed in a monument used for stowage, this should include the possible range of loading conditions. The effects of any loads imposed by the airbag deployment on the positioning of the airbag should also be included in the evaluation.
The HIC test may be performed with the airbag deploying from a rigid test fixture provided that the above factors and the occupant size considerations in paragraph 4) are taken into account. A rational analysis supported by static deployment tests would be acceptable.

8) The probability of inadvertent deployment must be shown to be acceptably low and in accordance with the severity of the failure condition resulting. The seated occupant must not be seriously injured as a result of the structure mounted airbag deployment. Inadvertent deployment must not cause a hazard to the aircraft or cause injury to anyone who may be positioned close to the structure mounted airbag (e.g. seated in an adjacent seat or standing adjacent to the airbag installation or the subject seat). Cases where the inadvertently deploying structure mounted airbag is near a seated occupant or an empty seat must be considered.

9) It must be demonstrated that the structure mounted airbag when deployed does not impair access to the seatbelt or harness release means, and does not hinder evacuation, including consideration of adjacent seat places and the aisle.

10) There must be a means for a crewmember to verify the integrity of the structure mounted airbag activation system prior to each flight, or the integrity of the structure mounted airbag activation system must be demonstrated to reliably operate between inspection intervals.

11) It must be shown that the structure mounted airbag is not susceptible to inadvertent deployment as a result of wear and tear, or inertial loads resulting from in-flight or ground manoeuvres likely to be experienced in service.

12) The equipment must meet the requirements of CS 25.1316 with associated guidance material (A350 Interpretative Material F11) for indirect effects of lightning. Electro static discharge must also be considered.

13) The equipment must meet the requirements for HIRF (A350 SC F-12 issue 2) with an additional minimum RF test as per the applicable category of RTCA DO-160 Section 20.

14) The structure mounted airbag mechanisms and controls must be protected from external contamination associated with that which could occur on or around passenger seating.

15) The structure mounted airbag installation must be protected from the effects of fire such that no hazard to occupants will result.

16) The structure mounted airbag must provide adequate protection for each occupant regardless of the number of occupants of the seat assembly or adjacent seats considering that unoccupied seats may have active structure mounted airbag.

17) The structure mounted airbag must function properly after loss of normal aircraft electrical power and after a transverse separation in the fuselage at the most critical location. A separation at the location of the airbag does not have to be considered.

18) It is accepted that a material suitable for the inflatable bag that will meet the normally accepted flammability standard for a textile, i.e. the 12 second vertical test of CS-25 Appendix F, Part 1, Paragraph (b)(4), is not currently available.
In recognition of the overall safety benefit given by the installation of structure mounted airbags, and in lieu of this standard, it is acceptable for the material of inflatable bag to have an average burn rate of no greater than 2.5 inches/minute when tested using the horizontal flammability test of CS-25 Appendix F, part I, paragraph (b)(5).

19) If lithium-ion non-rechargeable batteries are used to power the inflatable restraint, the batteries must be DO-227 and TSO 142A compliant. However, if rechargeable lithium-ion batteries are used, additional special conditions may apply.

20) Structure mounted airbag systems should not introduce additional hazards in respect to occupant safety when compared to certified systems.

21) In case structure mounted airbag systems are installed in or close to passenger evacuation routes (other than for the passenger seat the airbag is mounted for) a possible impact on emergency evacuation (e.g. hanging in the aisle, building a potential trip hazard, etc.) should be evaluated.

22) The airbag, once deployed, must not adversely affect the emergency lighting system (i.e. block escape path lighting to the extent that the light(s) no longer meet their intended function).

23) Neck Injury Criteria: The installation of the structure mounted airbag must protect the occupant from experiencing serious neck injury. The assessment of neck injury must be conducted with the airbag activated unless there is reason to also consider that the neck injury potential would be higher below the airbag activation threshold. If so, additional tests may be required.
EASA finds that it is reasonable to adopt the neck injury criteria recently proposed by the FAA listed in the FMVSS 571.208 using the FAA Hybrid III ATD.

a) The neck loads and moments during the entire impact event are limited as follows:
The N_{ij} must be below 1.0, where $N_{ij} = F_z/F_{zc} + M_y/M_{yc}$, and N_{ij} intercepts limited to:
F_{zc} = 1530 lb for tension
F_{zc} = 1385 lb for compression
M_{yc} = 229 lb·ft in flexion
M_{yc} = 100 lb·ft in extension

b) In addition, peak F_Z must be below 937 lb in tension and 899 lb in compression.

c) Available biomechanics texts, citing relevant research literature[1], indicate that there is a high risk of injury for head rotation over 114 degrees (Ref. Accidental Injury, Second Edition, Chapter 15). To account for the degree of uncertainty in determining the rotation angle from observation of test video, rotation of the head about its vertical axis relative to the torso is limited to 105 degrees in either direction from forward-facing.

d) Impact of the neck with any surface could cause serious neck injury from concentrated loading and is not allowed.

[1] "*Accidental Injury, Biomechanics and Prevention", Third Edition 2015, N. Yoganandan, A. Nahum, J. Melvin editors, Chapter 11"Neck Injury Biomechanics", R Nightingale, B. Myers, N. Yoganandan, Section 11.4.3 "Torsion*".
In that section, 114 degrees is cited from a study by Myers as the "rotation required to produce injury in the cadaver". The injury cited is "atlantoaxial dislocation" which is an AIS-3 (Serious) injury.

– END –

D-37 SC: Installation of mini-suite type seating	
APPLICABILITY:	A350
REQUIREMENTS:	CS 25.785(h)(2), 25.813(e) at Amendment 8
ADVISORY MATERIAL:	FAA AC 25-17A

Special Condition

1. Only single occupancy of the Mini-suite is allowed during taxi, take-off and landing.
2. The mini-suite entrance must only provide access to the specific mini-suite.
3. Mini-suites must not provide the required egress path for any passenger other than for its single occupant.
4. Installation of the mini-suites must not introduce any additional obstructions or diversions to evacuating passengers, even from other parts of the cabin.
5. The design of the doors and surrounding "furniture" above the cabin floor in the aisles must be such that each passenger's actions and demeanour can be readily observed by cabin crew members with stature as low as the 5th percentile female.
6. The mini-suite door(s) must be open during taxi, take-off and landing.
7. A hold open retention mechanism for mini-suite doors must be provided and must hold the doors open under CS 25.561(b) emergency landing conditions.
8. There must be a secondary, backup hold open retention mechanism for the mini-suite doors that can be used to “lock” the doors in the open position if there is an electrical or mechanical failure of the primary retention mechanism. The secondary retention mechanism must hold the doors open under CS 25.561(b) emergency landing conditions.
9. There must be a means to readily check that all mini-suite doors are fully open and in the latched condition.
10. There must be means to prevent the seated mini-suite occupant from operating the doors and thus ensure that the doors remain open during the TTOL phases of the flight.
11. Appropriate placards, or other equivalent means, must be provided to ensure the mini-suite occupants know that the doors must be in the open position for taxi, take-off and landing.
12. Operating instruction materials necessary to provide adequate compliance with SC 5, 9 and 10, considering also the number of individual mini-suites, shall be discussed and agreed with EASA and shall be provided to the operator for incorporation into their cabin crew training programs and associated operational manuals. This may affect the minimum acceptable number of cabin crew required to operate the aeroplane.
13. In the TT&L configuration, the mini-suite must provide an unobstructed access to the main aisle having a width of at least 30 cm (12 inches) at a height lower than 64 cm (25 inches) from the floor, and of at least 38 cm (15 inches) at a height of 64 cm (25 inches) and more from the floor.
A narrower width not less than 23 cm (9 inches) at a height below 64 cm (25 inches) from the floor may be approved when substantiated by tests found necessary by the Agency.
14. In addition, the mini-suite must have an Emergency Passage Feature (EPF) to allow for evacuation of the mini-suite occupant in the event a door closes and becomes jammed during an emergency landing. The EPF must provide a free aperture for passage into the aisle consistent with SC 13 or meeting the requirements of CS 25.807 applicable to a Type IV size emergency exit.
If the EPF consists of frangible and/or removable elements they must be easily broken/removed by the occupant of the mini-suite when a door becomes jammed.
If an EPF consists of dual independent sliding doors opening in opposite directions, the remaining unobstructed access width with one door in the fully closed position must be consistent with SC 13 or meet the requirements of CS 25.807 applicable to a Type IV size emergency exit.

The occupant of the mini-suite must be made aware of the EPF and its way of operation. In no case shall the occupant using the EPF have to rely on another occupant to assist in passage.
15. The height of the mini suite walls and doors must be such that a 95th percentile male can fit between them and the aeroplane interior furnishing.
16. No mechanism to latch the door(s) in the closed position shall be provided.
17. The mini-suite door(s) must be openable from the inside or outside with 25 pounds force or less regardless of power failure conditions.
18. If the mini-suite doors are electrically powered, in the event of loss of power to the mini-suite with the door(s) open, the door(s) must remain latched in the open position.
19. The mini-suites installation must not encroach into any required main aisle, cross aisle or passage ways.
20. No mini-suite door may impede main aisle or cross aisle egress paths in the open, closed or translating position.
21. The mini-suite doors must remain easily openable, even with a crowded aisle.
22. The seat of the Cabin Crew responsible for a suite area must be located to provide a direct view of the egress path from each mini-suite and of each main aisle adjacent to the mini-suites.

– END –

D-39 ESF: Type A+ Emergency Exits	
APPLICABILITY:	A350
REQUIREMENTS:	CS 25.807(g) amendment 20
ADVISORY MATERIAL:	FAA AC 25-17A, FAA AC 25.803-1A

Equivalent Safety Finding

1. Definition of the design and operation of a Type A+ emergency exit.

   (a) The Type A+ emergency exit shall meet all the requirements applicable to Type A emergency exits included in CS 25.807, 25.809, 25.810, 25.811, 25.812 and 25.813 amdt. 20, and all relevant Special Conditions and Equivalent Safety Findings as per the applicable type certification basis.

   (b) The design of the Type A+ emergency exit type shall include marking and lighting features to delineate the following under all lighting conditions:

   (i) Indication on where a passenger should enter the slide and strike the slide after the jump for each lane;
   (ii) Slide lane division;
   (iii) The point that the slide transitions from the sill to the sliding portion, if applicable;
   (iv) The end of the sliding portion; and
   (v) The path leading away from each lane at the bottom of the slide.

   (c) Each Type A+ emergency exit shall be equipped with an escape slide meeting the technical conditions specified in ETSO-C69c or its subsequent revisions.

   (d) Assisting means installed at Type A+ exits shall be automatically erected within 10 seconds from the time the opening means of the exit is actuated.

   (e) There shall be a minimum of three cabin crew members stationed at each pair of Type A+ emergency exits.

   (f) For the cabin crew members required by (e), procedures shall be specified in order to ensure that two cabin crew members are able to occupy the assist spaces available at one of the two doors of the Type A+ emergency exit pair.

   (g) Each seat designated for use during take-off and landing by a cabin crew member required by (e) shall be located near the type A+ emergency exit. A cabin crew member seat shall be located adjacent to each Type A+ emergency exit.

   (h) The AFM shall include limitations and procedures that address the requirements in (e) and (f).

2. Demonstration of increased performance of a Type A+ emergency exit.

   (a) The increase in performance of a Type A+ emergency exit with respect to that of a Type A emergency exit shall be quantified and demonstrated through comparative testing, taking into account also the different performance of emergency exits located at the ends of the cabin (fed by two flows) and in the middle of the cabin (fed by three flows). The degree to which an exit can sustain three flows in actual practice shall also be considered. The maximum number of passenger seats permitted for each pair of Type A+ emergency exits (a pair being two emergency exits, one installed on each side of the fuselage) will not be above 120, irrespective of the demonstrated increase in performance.

(b) It shall be demonstrated by test that the increase in evacuation performance of the Type A+ emergency exit with respect to that of a Type A emergency exit is achieved regardless of the outside lighting conditions. The testing campaign shall be designed to identify the added value given by the design and operational improvements of the Type A+, individually (e.g. cabin crew members required by (1.(e)) or in combination (e.g. design features required by (1.(b))).

(c) The effectiveness of the cabin crew tasks required by 1.(f) shall be demonstrated by testing.

(d) It shall be demonstrated that the aeroplane equipped with one or more pairs of Type A+ emergency exits, meets the requirements of CS 25.803, for the desired increased MPSC. In the testing conducted to show compliance with CS 25.803(c), it is expected that the effectiveness of the tasks required by 1.(f) is confirmed.

A350 specific cabin interior limitations associated with the installation of Type A+ emergency exits

The following limitations have been established based on the cabin layout configuration successfully tested by Airbus on 22 April 2018 in order to demonstrate compliance with requirement (2)(d) above for the A350-941/-1041 with Type A+ emergency exits.

1) Any change to the A350 type design definition specified in the test plan affecting the following items shall be discussed and agreed with EASA:

   - locations of cabin attendant seats
   - assist spaces definition
   - external and internal emergency lighting system
   - door design

2) The zonal capacity limits of any delivered cabin configuration will not exceed the zonal capacities specified in the table below, unless an EASA agreed evacuation analysis provides further substantiation to change such limits.

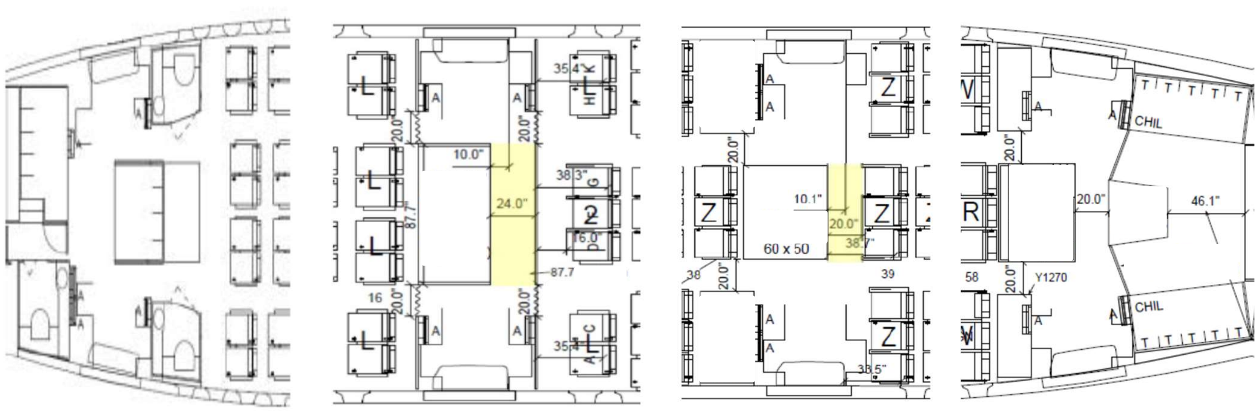
Exit Arrangement	D1-D4	D1-D2	D2-D3	D3-D4	D1-D3	D2-D4
A+ A+ A+ A+	480	120	180	180	300	360

3) A minimum overlapping of at least 10” between the cross aisle and the projected exit opening has to be maintained for each Type A+ emergency exit.

4) For exit arrangements with Type A+ exits at Door 2, the cross aisle at Door 2 will have a minimum width of 24”.

5) The maximum width of the monuments in the various door areas shall not exceed the following limits.

Door	Position of the monument/partition	lateral monument max Y dimension	center monument dimension
D1	Aft of the cross aisle	1356,2mm	62,2" (monument)
D2	Forward of the cross aisle	1585 mm	84,8" (monument) with possibility to have ancillary equipment provided that the total width is not exceeding 88,3 in width (e.g. with literature pocket, etc.)
	Aft of the cross aisle	1621,8 mm	87,7" (monument)
D3	Forward of the cross aisle	1270 mm	60" (monument) with possibility to have ancillary equipment provided that the total width is not exceeding 63,5 in width (e.g. with literature pocket, etc.)
D4	Forward of the cross aisle	1270 mm	60" (monument)



6) For exit arrangements with Type A+ exits at Door 4, in the D4 area it is required to have a straight cross-aisle between the exits.

7) No visual obstructions (e.g. curtains) is allowed in Door 3 and Door 4 area.

A350 specific cabin crew training content associated with the installation of Type A+ emergency exits

The training of cabin crew members shall include a Crowd Control training module as per the approved cabin crew data.

Acronyms and Abbreviations

TCDS	Type Certificate Data Sheet
ESF	Equivalent Safety Finding
ETSO	European Technical Standard Order

– END –

D-42 SC: Installation of stowage or charging stations for Personal Electronic Devices (PED) in an aircraft cabin	
APPLICABILITY:	A350
REQUIREMENTS:	CS 25.601, 25.1301 at Amdt 8 (A350-941) / Amdt 13 (A350-1041)
ADVISORY MATERIAL:	EASA CM-ES-001 Issue 1

Special Condition

1. Each PED stowage or charging station must be designed to prevent the propagation of a fire starting from a PED to adjacent compartments.

2. It must be demonstrated that a fire originating from a PED stowed in a PED stowage or charging station is detected and extinguished before it can propagate to other PEDs or it can create any hazard (smoke, toxic gases, explosions, etc.) to cabin occupants.

3. Each stowage or charging station must be limited to the maximum battery capacity or to the specific PED that will be allowed inside.

4. A manual or automatic shutdown of the electrical power supply must be provided and usable in case of smoke or fire detection at the PED stowage or charging station.

Acronyms and Abbreviations

TCDS	Type Certificate Data Sheet
SC	Special Condition
PED	Personal Electronic Devices

– END –

D-43 SC: Installation of oblique seats	
APPLICABILITY:	A350
REQUIREMENTS:	CS 25.562, 25.785(d) at Amdt 8 (A350-941) / Amdt 13 (A350-1041)
ADVISORY MATERIAL:	SAE AS6316

Special Condition

The special condition applies to seats with an occupant facing direction greater than 18° and no greater than 45° relative to the aircraft longitudinal axis.

Seats installed at angles greater than 30° relative to the aircraft longitudinal axis must have an energy absorbing rest or shoulder harness and must satisfy the special condition.

The installation of oblique seats must comply with the additional performance standards outlined in Section 10 of SAE AS6316 (Performance Standards for Oblique Facing Passenger Seats in Transport Aircraft), dated 28 June 2017, which is reported below.

10. ADDITIONAL PERFORMANCE STANDARDS FOR OBLIQUE FACING SEATS

This section provides standards and information not provided in AS8049C necessary to run and evaluate dynamic tests on oblique facing seats. The test set ups and orientations are exactly as described in AS8049C. Test 1 is commonly referred to as the vertical test and is defined in AS8049C, Section 5.3.1.1. Test 2 is commonly referred to as the horizontal test and is defined in AS8049C, Sections 5.3.1.2 and 5.3.1.3. Information relevant to the conducting of both these tests is contained throughout AS8049C, Section 5.3.
10.1 Test 1 - Structural and Occupant Injury Evaluation (AS8049C, Section 5.3.1.1)

10.1.1 Occupant Simulation

For Test 1, an ATD representing a 50th percentile male as defined in 49 CFR Part 572, Subpart B, or an equivalent shall be used to simulate each occupant. See AS8049 5.3.2 for further information on ATDs and equivalency standards.

10.1.2 Contactable Items

Items contactable by the occupant shall be included in the test, replaced with a part shown to create a conservative test condition, or excluded based upon a rational analysis. Any replaced or excluded part shall be documented together with a rational analysis substantiating the action.

Items that do not influence the test such as trim, placards, wires, finishes, etc., may be omitted from the test article.

10.1.3 Occupant Injury Criteria

The injury criteria listed in AS8049C are applicable to this test.

10.2 Test 2 - Structural Evaluation (AS8049C, Sections 5.3.1.2 and 5.3.1.3)

10.2.1 Occupant Simulation

For Test 2 (structural evaluation), an ATD representing a 50th percentile male as defined in 49 CFR Part 572, Subpart B, or an equivalent shall be used to simulate each occupant. See AS8049 5.3.2 for further information on ATDs and equivalency standards.

10.2.2 Contactable Items

Items contactable by the occupant shall be included in the test, replaced with a part shown to create a conservative test condition, or excluded based upon a rational analysis. Any replaced or excluded part shall be documented together with a rational analysis substantiating the action.

Items that do not influence the test such as trim, placards, wires, finishes, etc., may be omitted from the test article.

10.2.3 Selection of Test Conditions

AS8049C Section 5.3.6 provides requirements applicable to all structural evaluation tests. In addition, due to the lack of seat symmetry about the load direction, both yaw directions (±10°), relative to the aircraft longitudinal axis, shall be tested to show structural integrity of the seat system, unless previous testing and/or rational analysis can demonstrate that a single yaw direction encompasses all critical structural aspects of the seat and its attachments.

10.2.4 Combining Structural and Occupant Injury Tests

Combining the structural evaluation test(s) with the occupant injury test(s) is not recommended. If the applicant decides to combine the tests, the additional set up to ensure the ATD contacts the supporting structure at the correct contact point to collect the necessary occupant injury criteria shall be documented. This document provides no guidance or recommendations on this topic.

10.3 Test 2 - Occupant Injury Evaluation (AS8049C, Section 5.3.1.2)

10.3.1 Occupant Simulation

For Test 2 (occupant injury evaluation), an FAA Hybrid III ATD shall be used. A floor under the ATD’s feet shall be used.

10.3.2 Contactable Items and Occupant Injury Assessments

Items contactable by the occupant shall be included in the test, replaced with a part shown to create a conservative test condition, or excluded based upon a rational analysis. Any replaced or excluded part shall be documented together with a rational analysis substantiating the action.

Damage or failure of these items shall be assessed to ensure that valid results have been obtained and that no sharp edges, injurious protrusions or egress impediments have been produced.

The aircraft fittings, or track, need not be representative. Any bracing or reinforcement of items included in the test shall be documented and shown to create a conservative test condition.

Items that do not influence the test such as trim, placards, wires, finishes, etc., may be omitted from the test article.

10.3.3 Selection of Test Conditions

AS8049C, Section 5.3.6 and Table 2 in this document provide the requirements for all occupant injury evaluation tests. Data from previous tests, simulation, or rational analysis shall be used to determine the critical case(s). When determining the critical case(s) all yaw angles within the ±10° range must be considered. Multiple tests may be necessary to examine all injury criteria. Tests that only evaluate injury criteria do not require floor deformation.

10.3.4 Occupant Injury Criteria

Table 2 – Occupant injury criteria

Body Part	**Injury Criterion**
Head	(1) HIC ≤ 1000 (AS8049C, Section 5.3.9.4) in the event of head contact with seats, or other structure (including airbags), ① or (2) HIC 15 ≤ 700 (49 CFR 571.208) in the event of head contact with an airbag only ② ①Following a test, calculate HIC. If this value is ≤1000, the test is successful. If HIC is >1000, and contact is made with the seat or other structure, regardless of airbag usage, the test has failed. ②Use of HIC 15 is permitted as an alternate to HIC if the ATD head only contacts an airbag and makes no head contact with the seat or other structure. ATD head contact with the seat or other structure, through the airbag, or contact subsequent to contact with the airbag requires the use of HIC. HIC 15 is not applicable if head contact has occurred. The following evaluations of the test data should be used to determine if head contact has occurred: a. A review of the dynamic test videos and evaluation of the ATD head path movement, head contact, and head reaction at contact should be made. There should be a noticeable change in the head movement at the time of contact. b. A review and evaluation of the ATD head acceleration plots (x, y, z, and resultant) should be made. The resultant ATD head acceleration plot during the time period in which the critical HIC calculation was made should show an abrupt change in the head acceleration.
Neck	Nij (49 CFR 571.208) (1) Nij shall be below 1.0, where Nij = Fz/Fzc + My/Myc, and Nij critical values: (a) Fzc = 1530 pounds (6805 N) tension (b) Fzc = 1385 pounds (6160 N) compression (c) Myc = 229 foot-pounds (310 Nm) in flexion (d) Myc = 100 foot-pounds (136 Nm) in extension (2) Peak Fz shall be below 937 pounds (4168 N) in tension and 899 pounds (3999 N) in compression. (3) Rotation of the head about its vertical axis relative to the torso is limited to 105° in either direction from forward-facing. (4) Concentrated loading on the neck is unacceptable during any phase of the test and the neck shall not carrying any load between the ATD and the seat system.

Body Part	Injury Criterion
	Incidental contact of the neck, such as a sliding motion against a flat surface, or a headrest, during rebound may be acceptable. (Visual evidence and load data shall be collected during the test to show that neck contact is not load carrying.)
Shoulder	(1) Where upper torso straps are used, tension loads in individual straps shall not exceed 1750 pounds (7784 N). If dual straps are used for restraining the upper torso, the total strap tension loads shall not exceed 2000 pounds (8896 N). (2) The upper torso restraint straps (where installed) shall remain on the ATD's shoulder during the impact.
Thorax	Significant contact between the thorax and seat system structure is not permitted during initial impact, except for intentional contact with an airbag or shoulder restraint. For example, contact with a corner or protrusion would be significant contact and be unacceptable. Sliding along a smooth wall is not significant contact and could be acceptable, provided all other injury criteria are met. Rebound contact that produces an x direction acceleration exceeding 20g for more than 3ms is not permitted.
Abdomen	Significant contact between the abdomen and seat structure is not permitted except for intentional contact with an airbag or seat cushion.
Spine	1) The lumbar spine force (Fz) shall not exceed 1200 pounds (5338 N) tension and 1500 pounds (6673 N) compression. (2) Spine forces and moments shall be recorded using a six axis load cell and shall be reported. This data is collected for knowledge gathering. There are no pass/fail criteria associated with this data except as noted above for Fz.
Pelvis	(1) The pelvic restraint shall remain on the ATD's pelvis during the impact and rebound phases of the test. Provided that the pelvic restraint remains on the ATD's pelvis, trapping of the belt between the ATD leg and the pelvis is acceptable. (2) The load-bearing portion of the bottom of the ATD pelvis must not translate beyond the edges of its seat's bottom seat-cushion supporting structure.
Femur	(1) Where leg contact with seats or other structure occurs, the axial compressive load in each femur shall not exceed 2250 pounds (10008 N). (2) Axial rotation of the upper leg shall be limited to 35° in the strike direction from the nominal seated position. Evaluation during rebound is not biofidelic and need not be considered.
All	Contact between the head, pelvis, torso, or shoulder area of one ATD with the adjacent-seated ATD's head, pelvis, torso, or shoulder area is not allowed. Contact during rebound is allowed.

10.4 Restraint Systems

10.4.1 General Design

The design and installation of restraint systems shall prevent unbuckling or detachment due to applied inertial forces or impact of the hands/arms of the occupant during Tests 1 and 2.

10.4.2 Airbags

Airbag systems include inflatable restraints and structure mounted airbags.

For seats with airbag systems, it shall be shown that the system will deploy and provide protection under emergency conditions where it is necessary to prevent serious injury. The system shall provide a consistent approach to injury protection throughout the range of occupants two year old child to 95th percentile male, whether it is designed to manage injury parameters (HIC, Nij, Neck Rotation, etc.) or occupant motion. The system shall be included in each of the certification tests as it would be installed in the airplane. If airbag systems influence the test results, they shall be active during the test.

Airbag systems may also be used to control occupant motion. The intended function of the airbag system shall be demonstrated during each applicable test.

Oblique seating systems including airbags shall be shown to meet the occupant injury criteria of Table 2 throughout the entire range of yaw that encompasses the installation angle ±10° relative to the aircraft longitudinal axis.

Other considerations for airbag systems are outside the scope of this document.

10.5 Other Considerations

10.5.1 Recording of Shoulder Harness Loads

If a shoulder belt incorporating an airbag is used, care shall be taken when placing the webbing load cell to ensure that an accurate measurement is made and that the load cell does not affect the performance of the airbag.

10.5.2 ATD Placement

As an alternative to AS8049C, Section 5.3.8.3(b) through (e), the following procedure has been found to be adequate from previous experience for placing the ATD in a consistent manner for Test 2 and to determine the nominal (1g) seated position for Test 1:

1. Lower the ATD vertically into the seat while simultaneously (see Figure 3 for illustration):
   a. Aligning the midsagittal plane (a vertical plane through the midline of the body; dividing the body into right and left halves) with the middle of the seat place.
   b. Applying a horizontal x-axis direction (in the ATD coordinate system) force of approximately 20 pounds (89N) to the torso at the intersection of the midsagittal plane and lower sternum of the HII or FAA HIII at the midsagittal plane, to compress the seat back cushion.
   c. Keeping the upper legs as horizontal as possible by supporting them just behind the knees, or using an equivalent procedure.
2. Once all lifting devices have been removed from the ATD:
   a. Rock the ATD slightly to settle it in the seat.

b. Separate the knees by about 100 mm (4 inches).
c. Position the HII or FAA HIII hands on top of its upper legs.
d. Position the feet such that the centerlines of the lower legs are approximately parallel to a lateral vertical plane (in the aircraft coordinate system).

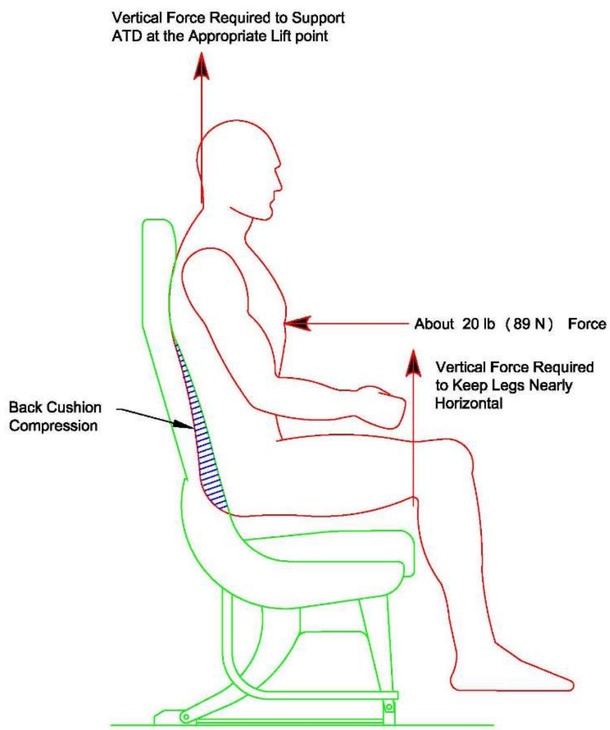


FIGURE 3 - ATD Placement

Acronyms and Abbreviations

ATD	Anthropomorphic Test Dummy
SC	Special Condition
TCDS	Type Certificate Data Sheet

– END –

D-44 SC: Installation of Three Point Restraint & Pretensioner System	
APPLICABILITY:	A350
REQUIREMENTS:	CS 25.562, 25.785, 25.1316, 25.1317 at Amdt 8 (A350-941) / Amdt 13 (A350-1041)
ADVISORY MATERIAL:	AMC 20-136, AMC 20-158

Special Condition

1. HIC Characteristic

The existing means of controlling Front Row Head Injury Criterion (HIC) result in an unquantified but normally predictable progressive reduction of injury severity for impact conditions less than the maximum specified by the rule. Pretensioner technology however involves a step change on protection for impacts below and above that at which the device deploys. This could result in the HIC being higher at an intermediate impact condition than that resulting from the maximum.
It is acceptable for HIC to have such a non-linear or step change characteristic provided that the value does not exceed 1000 at any condition at which the Pretensioner does or does not deploy, up to the maximum severity pulse specified by the requirements. Tests shall be performed to demonstrate this, taking into account any necessary tolerances for deployment.

2. Intermediate Pulse Shape

The existing ideal triangular maximum severity pulse is defined in FAA AC 25.562-1B. For the evaluation and testing of less severe pulses, a similar triangular pulse shall be used with acceleration, rise time, and velocity change scaled accordingly.

3. Protection During Secondary Impacts

The pretensioner might not provide protection during secondary impacts after actuation. Therefore, the case where a small impact is followed by a large impact shall be addressed. In such a case if the minimum deceleration severity at which the pretensioner is set to deploy is unnecessarily low, the protection offered by the pretensioner may be lost by the time the second larger impact occurs. It shall be substantiated that the trigger point for the activation of the pre-tensioner has been chosen to maximize the probability of the protection being available when needed.

4. Protection of Occupants other than 50th Percentile

A range of stature from a two-year-old child to a ninety-five percentile male shall be considered. In addition no hazard shall be introduced by the pre-tensioner due to the following seating configurations:

- The seat occupant is holding an infant, including the case where a supplemental loop infant restraint is used:
- The seat occupant is a child in a child restraint device.
- The seat occupant is a pregnant woman

5. Occupants Adopting the Brace Position

There is no requirement for protection to be assessed or measured for seat occupants in any other position or configuration than seated alone upright, as specified in FAA AC 25.562-1B. In addition it shall be shown that there is no adverse effect on PAX adapting the traditional brace position if the pre-tensioner is activated.

6. The probability of inadvertent actuation shall be shown to be acceptably low. The seated occupant must not be seriously injured as a result of the actuation. Inadvertent activation must not cause a hazard to the aircraft or cause injury to anyone who may be positioned close to the retractor or belt (e.g. seated in an adjacent seat or standing adjacent to the seat).

7. There shall be a means for a crewmember to verify the availability of pre-tensioner function prior to each flight, or the probability of failure of the pre-tensioner function shall be demonstrated to be acceptably low between inspection intervals. It shall be demonstrated that an acceptable level of performance of the pre-tensioner is maintained between inspection intervals.

8. It shall be shown that the system is not susceptible to inadvertent actuation as a result of wear and tear, or inertial loads resulting from in-flight or ground manoeuvres likely to be experienced in service

9. It shall be ensured by design that any incorrect orientation (twisting) of the belt does not compromise the pre-tensioning protection function.

10. The equipment shall meet the requirements for HIRF and Indirect Effect of Lightning with additional tests as per the applicable category of sections 20 and 22 of RTCA DO-160G.

11. The mechanisms and controls shall be protected from external contamination associated with that which could occur on or around passenger seating.

12. The pre-tensioner system shall not induce a hazard to the occupants in case of fire.

13. The system shall function properly after loss of normal aircraft electrical power and after a transverse separation in the fuselage at the most critical location. A separation at the location of the system does not have to be considered.

Acronyms and Abbreviations

TCDS	Type Certificate Data Sheet
SC	Special Condition
HIC	Head Injury Criterion
HIRF	High Intensity Radiated Fields

– END –

D-45 SC: Incorporation of Inertia Locking Device in Dynamic Seats	
APPLICABILITY:	A350
REQUIREMENTS:	CS 25.562, 25.785 at Amendment 8 (A350-941) / Amendment 13 (A350-1041)
ADVISORY MATERIAL:	-

Special Condition

1) Level of Protection provided by Inertia Locking Device(s) (ILD)
The ILD is a mechanically deploying feature of a seat with a fore/aft tracking system. The ILD will self-activate only in the event of a predetermined aircraft loading condition such as that occurring during crash or emergency landing. The ILD will interlock the seat tracking mechanism so as to prevent excessive seat forward translation. EASA considers that a minimum level of protection should be provided if the device does not deploy. It must be demonstrated by test that the seat and attachments, when subject to the emergency landing dynamic conditions specified in CS 25.562 and with the ILD not deploying, do not suffer structural failure that could result in:

a. separation of the seat from the aircraft floor,
b. separation of any part of the seat that could form a hazard to the seat occupant or any other aircraft occupant,
c. failure of the occupant restraint or any other condition that could result in the occupant separating from the seat. However, failure of the occupant restraint may occur where it can be demonstrated that the seat occupant cannot form a hazard to any other aircraft occupant. This would normally only be agreed by the Agency on the basis of physical separation of the seat from other seats in the aircraft, for example in a mini-suite type arrangement.

2) Protection provided below and above the ILD Actuation Condition
The normal means of satisfying the structural and occupant protection requirements of CS 25.562 result in a non-quantified but nominally predictable progressive structural deformation and/or reduction of injury severity for impact conditions less than the maximum specified by the rule. A seat using the ILD technology however involves a step change in protection for impacts below and above that at which the ILD activates and deploys to its ‘retention’ position. This could result in the effects of the impact, for example structural deformation and occupant injury criteria, being higher at an intermediate impact condition than that resulting from the maximum.
It is acceptable for these effects to have such non-linear or step change characteristics provided that they do not exceed the allowable maximum at any condition at which the ILD does or does not deploy, up to the maximum severity pulse specified by the requirements. Tests must be performed to demonstrate this taking into account any necessary tolerances for deployment.

3) Intermediate Pulse Shape
The existing ideal triangular maximum severity pulse is defined in FAA AC 25.562.1B. EASA considers that for the evaluation and testing of less severe pulses, a similar triangular pulse should be used with acceleration, rise time, and velocity change scaled accordingly.

4) Protection over a range of crash pulse vectors
The device will be tested at the CS 25.562 specified crash pulse vectors of 14g at 30 degrees to the vertical and 16g at the horizontal. In addition it shall be shown that the device will also operate at a range of crash pulse vectors between those specified.

5) Protection during Secondary Impacts
The design of the ILD shall be such that if there is more than one impact, for the final impact that is above the severity at which the device is intended to deploy, the maximum protection of the device must be provided.

6) Protection of Occupants other than 50th percentile
The ILD shall not affect compliance of the seat and installation with CS 25 requirements, or those of this Special Condition, with respect to protecting the specified range of occupant sizes.

7) It must be shown that any inadvertent operation of the device, for example during extreme flight manoeuvres, does not affect the performance of the seat during a subsequent emergency landing.

8) The installation of the ILD on the seat shall be physically protected from any contamination likely to occur during operation, e.g. drink, food etc. The installation should also be protected against other foreign object ingress.

9) The effects of wear and criticality of manufacturing tolerances should be considered with respect to reliability and adverse effect on operation of the ILD. In addition other possible effects that may render the device inoperative must be taken into account such as aging/drying of lubricants and corrosion.

10) The design, installation and operation of the ILD shall be such that it is possible, by maintenance action, to check the functioning, i.e. movement, of the device in-situ.

11) A method of functional checking and a maintenance check interval should be established (if applicable).

12) If there is a need to include any means to release an inadvertently operated device (i.e. that has engaged in a non-crash condition where the seat could otherwise remain in-situ on the aircraft), this function shall not introduce additional hidden failures.

– END –

E-04 ESF : Thrust Reverser Testing	
APPLICABILITY:	A350-900
REQUIREMENTS:	CS 25.934, CS-E 890
ADVISORY MATERIAL:	N/A

Equivalent Safety Finding

The following substantiation method provides a level of safety equivalent to a literal compliance demonstration with CS 25.934/CS-E 890.

1) Forward testing part
Strict compliance with CS-E 890(b) requirements for the forward mode testing part will not be demonstrated. Indeed, slave C-ducts instead of a real A350 thrust reverser will be used for the engine CS-E 740 endurance certification test. The intent for this test is indeed to have as much flexibility as possible to adapt the nozzle size and thus reach the engine redlines (LP, IP (RR engine) and HP shaft rotational speeds + TGT).

Engine manufacturers and their Engine Airworthiness Authorities have agreed in the past that the effect on the engine functioning of slave C-ducts with aerodynamic and mechanical characteristics equivalent to those of a real thrust reverser will be similar to the effect of a real thrust reverser.

Therefore, the evaluation of the impact of the engine functioning on the stowed thrust reverser, as required by CS-E 890(b) requirements, will be based on use of other engine service readiness endurance testing.

Airbus, in association with the Engine and Nacelle manufacturers, will define an acceptable endurance cycle format for these alternate tests in order to demonstrate that:

- the time spent at maximum level of thrust will be at least equivalent to the one for CS-E 740 endurance test
- the number of accelerations / decelerations from extreme levels of thrust will be at least equivalent to the one for CS-E 740 endurance test

Details of the cycle format and comparison versus CS-E 740 requirements will be presented in the "Thrust reverser compliance with CS 25.934 - test plan" (ref. 00V710PRR43/P04 for the Rolls-Royce Trent XWB engine).

2) Reverse testing part
The same thrust reverser unit that had performed the forward thrust endurance testing, will then be installed on an engine in order to perform the 200 reverse cycles required by CS-E 890(c).

Complete substantiation for compliance with CS 25.934 will be detailed in certification documents that will include test plan and report for complete compliance with CS-E 890 requirements as pertinent for each engine application.

– END –

E-1004 ESF: Trent XWB 97k Thrust Reverser Testing	
APPLICABILITY:	A350-1000
REQUIREMENTS:	CS 25.934, CS-E 890
ADVISORY MATERIAL:	N/A

Equivalent Safety Finding

The following substantiation method provides a level of safety equivalent to a literal compliance demonstration with CS 25.934/CS-E 890(b).

For the effects of the engine on the stowed Thrust Reverser, for CS 25.934 compliance demonstration purpose, Airbus relies on the following compensating factors intended to justify an equivalent level of safety:

- The 150 hours of forward thrust running is not significantly loading the Thrust Reverser
- The Thrust Reverser structure is designed for a significant greater life cycle and significant higher loads (FBO and in flight limit manoeuvres)
- The durability of the Thrust Reverser components is not significantly exposed during the 150 hour running and the CS E-890(c) reverse cycles which will be performed for the A350-1000 certification are more constraining for this respect.

– END –

E-07 ESF : Warning Means for Rolls Royce Engine Fuel Filters	
APPLICABILITY:	A350-900
REQUIREMENTS:	CS 25.1305(c)(6), 25.997(d)
ADVISORY MATERIAL:	N/A

Equivalent Safety Finding

The following factors substantiate an equivalent level of safety compared to a direct demonstration of compliance to CS 25.1305(c)(6):

1. The impending bypass of the main LP fuel filter is indicated by an amber warning (ENG X FUEL FILTER CLOG) on ECAM E/WD and by a CLOG indication on ECAM ENGINE SD, that puts the aircraft in an MMEL situation at next landing. The fuel filter must be changed before dispatch. An audio chime also accompanies the ECAM warning.

2. Even though the HP fuel filter does not have an indication of clogging, it is considered that this filter improves the minimum safety level warranted by the literal compliance with § 25.1305(c)(6). Blockage of this filter may occur due to a contamination of the engine fuel system itself and lead at worst to a complete single engine thrust loss. The same type of contamination in the engine fuel system not equipped with such a filter but fully compliant with § 25.997 would result in an engine casing burn through which is considered to have more adverse consequences on the aircraft than a single engine thrust loss.

3. Tests performed for Engine type certification, as part of demonstration of compliance with CSE-560 & E-670, shall show that even in case of LP filter bypass operation, the HP filter is not susceptible to blockage. In-service experience of the Rolls-Royce RB211 engines (which include the Trent family and exceed 100 million engine operating hours) confirm that the HP filter is not susceptible to blockage under normal engine operation.

4. The maintenance procedure associated with a blocked LP filter includes checking of the HP filter.

– END –

E-08 SC : Fire withstanding Capability of CFRP Wing Fuel Tanks	
APPLICABILITY:	A350-900
REQUIREMENTS:	CS 25.867
ADVISORY MATERIAL:	ISO 2685

Special Condition

1) In the absence of applicable specific rule and guidance material, Airbus is required to show that the use of composite materials for the fuel tank structure does not reduce the level of safety relative to existing experience with metallic structure.

2) This could be achieved by showing that:

− from a fire withstanding capability, a composite wing is at least equivalent to a similarly sized aluminium structure.

Or

− a composite wing and fuel tank design, including any composite access panels, can endure an external fuel fed fire for at least five minutes.

3) The assessment shall be performed evaluating all relevant parameters, including fuel loading or external airflow. The ability to carry the relevant loads shall be demonstrated for in-flight fires as well as for under wing fires or post-crash fires. The assessment of in flight fire conditions is considered to be addressed under the threats to be defined for compliance demonstration to A350 Interpretative Material C-15. The study shall take into account the guidelines of ISO 2685. Composite structure being more sensitive to vibrations than metallic structures, those should be taken into account.

– END –

E-09 ESF : Rolls Royce Engine turbine Overheat Detection	
APPLICABILITY:	A350-900
REQUIREMENTS:	CS 25.1203(d)
ADVISORY MATERIAL:	N/A

Equivalent Safety Finding

The following design of the A350 turbine overheat detection system is agreed to provide an equivalent level of safety compared to a direct demonstration of compliance to CS 25.1203(d) for the A350 Type Certification:

The turbine overheat detection system installed on the Rolls Royce Trent XWB engines fitted on A350 aircraft ensures that the turbine does not overheat in case of failure of the internal cooling air system or in case of internal oil fires.

This turbine overheat detection system is comprised of:

- A duplex thermocouple at the Turbine Cooling Air Front location to protect HP and IP turbines from failure of the HP3 cooling air system and oil fires

- A duplex thermocouple at the Turbine Cooling Air Rear location, to protect the LP turbine from failure of the IP8 cooling air system and oil fires.

The duplex thermocouple is made of two measuring elements mounted side by side within a single common housing. Each sensor feeds into a separate channel of the EEC (A and B respectively). The EEC is in turn linked to the Flight Warning System (FWS) to generate a warning to the cockpit (with associated procedure), if an overheat is detected by the thermocouples.
The condition of the turbine overheat detection system is continuously monitored by the EEC from power-up. Any system fault generates a maintenance message. Flight deck effect will depend on the detected fault and associated dispatch condition:

- If faults affecting only one channel are detected, then a cockpit message associated with a limited dispatch condition will be triggered.

- If faults affecting both channels are detected, then a cockpit message associated with a DO NOT DISPATCH condition will be triggered.

Based on the system design described above it is concluded that the intent of CS 25.1203(d) is met. There is no need on the A350 to provide a means to allow the flight crew to be able to directly check the turbine overheat system's functioning in flight.

– END –

E-12 SC : Ice in Fuel system	
APPLICABILITY:	A350
REQUIREMENTS:	CS 25.951(c)
ADVISORY MATERIAL:	N/A

Special Condition

The applicant shall establish that:

1) The free water (or ice) remains evenly dispersed in the fuel under all operating conditions, or

2) the amount of ice that could be released as a slug must be minimised. The applicant must establish the threat(s) (quantity of ice, temperature) that can be released. The complete fuel system (including the engine) must be shown to be tolerant to such sudden release of ice, without significant adverse effect(s) on the powerplant system.

– END –

E-13 ESF : Fire Extinguishing Agent Concentration	
APPLICABILITY:	A350
REQUIREMENTS:	CS 25.1195(c)
ADVISORY MATERIAL:	AMC 25.1195(b), AC 20-100

Equivalent Safety Finding

The engine fire extinguishing system as defined for the A350 is considered to meet the intent of CS 25.1195(c) and to provide the necessary level of safety for the reasons detailed hereafter:

1. There will be a unique agent discharge action that will ensure flowing of the agent towards all three nacelles zones

2. Each DFZ, individually considered, will have all its portions simultaneously protected as per the AC 20-100 0.5s minimum agent concentration presence time criterion.

3. The DFZ will be separated by firewall constructions demonstrated compliant to CS 25.1191(b) ensuring no hazardous quantity of fluid, air or flame can pass from the compartment to other zone.

4. As on previous programs, maintenance instructions will be defined and provided to the operators, as part of the Instructions for Continued Airworthiness (ICA), with the objective to ensure that the firewall integrity is maintained throughout the operational life of the nacelle.

5. Airbus has no in-service experience of fire propagation from one nacelle zone to the other

6. Test conducted in the past for fire characterization and development of concentration criteria's (AC 20-100) showed that:

   a. A key parameter in extinguishing fires is the homogeneity of agent diffusion in the considered nacelle radial section and the rapidity to achieve this diffusion. The AC 20-100 0.5s criterion is particularly meaningful in characterizing this parameter.

   b. A fire ignited in a section never went through a firewall inducing a fire into another section.

7. In the frame of those tests, FAA stated that […] '*each fire zone may be treated individually with respect to the "simultaneous" requirement*' […](ref to report FAA DS 70-3).

– END –

E-14 ESF : Pressure fuelling system shut-off operation check	
APPLICABILITY:	A350
REQUIREMENTS:	CS 25.979(b)(1)
ADVISORY MATERIAL:	N/A

Equivalent Safety Finding

The pressure fuelling system as defined for the A350 is considered to ensure an equivalent level of safety to a literal compliance to CS 25.979(b)(1) for the reasons detailed hereafter:

1. The shut-off means redundancy built in the A350 pressure fuelling system is considered to provide a compensating factor for the lack of complete operational check of the normal shut-off means.

2. Demonstration of the overall pressure fuelling system compliance will be documented in the Fuel System Safety Assessment, Fuel Quantity Management System Equipment Qualification, Fuel System Ground Testing and Fuel System Refuel Analysis.

– END –

E-1022 ESF: Trent XWB -97 zone 2 and 3 (seals and caps) fire withstanding capability	
APPLICABILITY:	A350-1000
REQUIREMENTS:	CS 25.1181, 25.1191, 25.1193(e) (at amendment 13)
ADVISORY MATERIAL:	AMC 25.1193(e), ISO 2685

Equivalent Safety Finding

CS 25.1191 (b) at Amdt 13 stipulates

(b) Each firewall and shroud must be –

- (1) Fireproof;
- (2) Constructed so that no hazardous quantity of air, fluid, or flame can pass from the compartment to other parts of the aeroplane;
- (3) Constructed so that each opening is sealed with close fitting fireproof grommets, bushings, or firewall fittings; and
- (4) Protected against corrosion.

In lieu of showing that engine firewall components are fireproof for all airplane operating conditions, it may be acceptable to show that these components provide an equivalent level of safety to the fireproof requirement in § 25.1191(b)(1) by demonstrating for airplane ground operations:

1. Firewall structure where the component is installed is fireproof.
2. No air, fluid, or flame can pass from one designated fire zone into another designated fire zone.
3. Component burn-through (or other adverse effects of a fire) will not result in a hazard to the airplane or serious injury to crew, passengers or ground personnel.
   Hazards of concern include, but are not limited to, events such as:
   a. Spread of fire around the firewall or loss of firewall structural integrity;
   b. Impingement of flame on the wing, potentially resulting in fuel tank breach or explosion;
   c. Spread of fire to flammable fluid sources outside the fire zone;
   d. Spread of fire to areas with systems wiring or flight control cables, rods, etc.;
   e. Engine ingestion of flammable fluid released from the fire zone, which could prevent safe engine shutdown;
   f. Overheating of critical structural elements outside the fire zone;
   g. Failure or significant deformation of the engine mounting system or pylon; and
   h. Fuselage penetration.
4. Compliance with CS 25.865 is maintained for engine mounts and other flight structures located in the designated fire zone after bum-through (or other adverse effects of a fire).
5. Component bum-through (or other adverse effects of a fire) will not compromise fire detection and extinguishing capability of the designated fire zone for a period of at least 5 minutes after the initiation of a detectable fire to allow for fire detection, extinguishing and safe engine shutdown.

– END –

F-12 SC : HIRF Protection	
APPLICABILITY:	A350-900
REQUIREMENTS:	CS-25
ADVISORY MATERIAL:	INT/POL 25/2 Issue 2

Special Condition

HIRF protection
The aeroplane electrical and electronic systems, equipment, and installations considered separately and in relation to other systems must be designed and installed so that:

a. Each function, the failure of which would prevent the continued safe flight and landing of the aeroplane:

1. Is not adversely affected when the aeroplane is exposed to the Certification HIRF environment defined in Appendix 1.

2. Following aeroplane exposure to the Certification HIRF environment, each affected system that performs such a function automatically recovers normal operation unless this conflicts with other operational or functional requirements of that system.

b. Each system that performs a function, the failure of which would prevent the continued safe flight and landing of the aeroplane, is not adversely affected when the aeroplane is exposed to the normal HIRF environment defined in Appendix 1.

c. Each system that performs a function, the failure of which would cause large reductions in the capability of the aeroplane or the ability of the crew to cope with adverse operating conditions, is not adversely affected when the equipment providing these functions is exposed to the equipment HIRF test levels defined in Appendix 1.

d. Each system that performs a function, the failure of which would reduce the capability of the aeroplane or the ability of the crew to cope with adverse operating conditions, is not adversely affected when the equipment providing these functions is exposed to the equipment HIRF test levels defined in Appendix 1.

– END –

F-13 SC : Lithium Battery Installations	
APPLICABILITY:	A350-900
REQUIREMENTS:	CS 25.601, 25.863, 25.1353(c)
ADVISORY MATERIAL:	N/A

Special Condition

Lithium Battery Installations
In lieu of the requirements of CS 25.1353(c)(1) through (c)(4), Lithium batteries and battery installations of the A350 must be designed and installed as follows:

(1) Safe cell temperatures and pressures must be maintained during any probable charging or discharging condition, or during any failure of the charging or battery monitoring system not shown to be extremely remote. The Lithium battery installation must be designed to preclude explosion in the event of those failures.

(2) Lithium batteries must be designed to preclude the occurrence of self-sustaining, uncontrolled increases in temperature or pressure.

(3) No explosive or toxic gasses emitted by any Lithium battery in normal operation or as the result of any failure of the battery charging or monitoring system, or battery installation not shown to be extremely remote, may accumulate in hazardous quantities within the aeroplane.

(4) Lithium battery installations must meet the requirements of CS 25.863(a) through (d).

(5) No corrosive fluids or gasses that may escape from any Lithium battery may damage surrounding structure or any adjacent systems, equipment or electrical wiring, of the airplane in such a way as to cause a major or more severe failure condition in accordance with CS 25.1309 (b) (TBC with §25.1309 update).

(6) Each Lithium battery installation must have provisions to prevent any hazardous effect on structure or essential systems that may be caused by the maximum amount of heat the battery can generate during a short circuit of the battery or of its individual cells.

(7) Lithium battery installations must have a system to control the charging rate of the battery automatically so as to prevent battery overheating or overcharging, and,

> (i) A battery temperature sensing and over-temperature warning system with a means for automatically disconnecting the battery from its charging source in the event of an over-temperature condition or,
>
> (ii) A battery failure sensing and warning system with a means for automatically disconnecting the battery from its charging source in the event of battery failure.

(8) Any Lithium battery installation whose function is required for safe operation of the aeroplane, must incorporate a monitoring and warning feature that will provide an indication to the appropriate flight crewmembers, whenever the state of charge (SOC) of the batteries have fallen below levels considered acceptable for dispatch of the aeroplane.

(9) The Instructions for Continued Airworthiness required by CS 25.1529 must contain maintenance instructions for measurements of battery capacity at appropriate intervals to ensure that batteries whose function is required for safe operation of the aeroplane will perform their intended function as long as the batteries are installed in the aeroplane. The Instructions for Continued Airworthiness must also contain maintenance procedures for Lithium batteries in spares storage to prevent the replacement of batteries whose function is required for safe operation of the aeroplane, with batteries that have experienced degraded charge retention ability or other damage due to prolonged storage at low SOC.

– END –

F-22 ESF : Minimum Mass Flow of Supplemental Oxygen	
APPLICABILITY:	A350
REQUIREMENTS:	CS 25.1443(c)
ADVISORY MATERIAL:	N/A

Equivalent Safety Finding

For passengers and cabin crew members, it shall be shown, that the passenger oxygen system provides an equivalent level of protection from hypoxia as detailed below:

(1) Between 10,000 ft and 18,500 ft cabin pressure altitude, the supplemental oxygen system for the passenger and cabin crew shall provide a blood oxygenation level that is equivalent with the blood oxygenation level reached at 10,000 ft cabin pressure altitude when breathing standard air. Breathing standard air at 10,000 ft cabin pressure altitude provides a mean tracheal oxygen partial pressure of 100 mmHg as required by CS 25.1443(c).

(2) Between 18,500 ft and 40,000 ft cabin pressure altitude, the supplemental oxygen system for the passenger and cabin crew shall provide a blood oxygenation level that is equivalent with the blood oxygenation level reached at 14,000 ft cabin pressure altitude when breathing standard air. Breathing standard air at 14,000 ft cabin pressure altitude provides a mean tracheal oxygen partial pressure of 83.8 mmHg as required by CS 25.1443(c).

– END –

F-23 ESF : Landing Light Switch	
APPLICABILITY:	A350
REQUIREMENTS:	CS 25.1383(b)
ADVISORY MATERIAL:	N/A

Equivalent Safety Finding

For the A350 Type Certification it is agreed that the design of the landing light switch for the Airbus A350 as defined below is showing an equivalent level of safety compared to a direct compliance to CS 25.1383(b).

On A350, as on any A320/330/340/A380 aircraft, the overhead panel landing lights switches are “command” switches that provide a command signal to the actual power switching device.

On the A350 the status information of the landing light switch is provided by two independent sources. In case of discrepancy between those two signals the default value is ON. The FMEA/FMES data provided by lighting dependent systems and exterior lighting supplier will give the adequate answer to the probability requirements, which derive from the FHA. In terms of human factors and cockpit design the single switch has the following advantages: it is more logical to associate a single switch with a single function than two switches with a single function; it results in a less-cluttered overhead panel which makes switch identification easier and thus reduces workload and errors; it reduces the risk of mis-selection (selecting only one switch when the intention was to select both). In-service experience with the A330/340 and A380 reveals no problems with the single switch design, and indicates universal pilot preference for the single switch. In terms of safety, night landings without landing lights are common, particularly in misty conditions where the glare from the lights is distracting, and should be well within the capabilities of all qualified commercial pilots. Thus a complete failure of the landing lights would have only minor repercussions.

– END –

F-26 SC: Flight Recorders including Data Link Recording	
APPLICABILITY:	A350
REQUIREMENTS:	CS 25.1301, 25.1457 25.1459
ADVISORY MATERIAL:	N/A

Special Condition

The flight recorder (Cockpit Voice Recorder or Flight Data Recorder) shall record:

(a) Data link communications related to air traffic services (ATS Communications*) to and from the aeroplane.

(b) All messages whereby the flight path of the aircraft is authorized, directed or controlled, and which are relayed over a digital data link rather than by voice communication.

(c) The minimum recording duration shall be equal to the duration of the Cockpit Voice Recorder, and the recorded data shall be time correlated to the recorded cockpit audio.

(d) To enable an aircraft operator to meet the intent of EU OPS 1.160 (a)(4)(ii), information shall be provided explaining how the recorded data can be converted back to the format of the original data link messages in order to determine an accurate sequence of events for the aircraft and the cockpit operation.

* **ATS communications (ATSC)** are defined by ICAO as communications related to air traffic services including air traffic control, aeronautical and meteorological information, position reporting and services related to safety and regularity of flight.

– END –

F-33 ESF : Pneumatic System – harmonised 25.1438	
APPLICABILITY:	A350
REQUIREMENTS:	CS 25.1436, 25.1438
ADVISORY MATERIAL:	AMC 25.1436, 25.1438

Equivalent Safety Finding

An equivalent safety finding to CS 25.1438 and CS 25.1436 is proposed by the following:

Delete CS 25.1436
Replace CS 25.1438 by the following CS 25.1438
Delete AMC 25.1436(b)(3)
Delete AMC 25.1436(c)(2)
Delete AMC 25.1438
Delete Appendix L of CS 25

CS 25.1438 Pneumatic Systems

(a) This requirement applies to pneumatic systems and elements (components and ducting) served by gas storage devices such as, evacuation, water systems, accumulators and/or pressurised gas from compressors such as engine and APU bleed air, air conditioning, pressurisation, engine starting, ice protection, and pneumatic actuation systems. Design compliance may be in the form of analysis, test, or combination of analysis and test. All foreseen normal and failure mode combinations of environmental loads (installation, thermal, vibration, and aerodynamic), pressures, temperatures, material properties, and dimensional tolerances must be considered. This requirement is not applicable to portable gas storage devices.

(b) Each element of the system must be designed to operate without detrimental permanent deformation or increase in design leakage that would prevent the element from performing its intended function. For demonstrating compliance, the following factors are to be applied to the pressure at the associated temperature for the most critical of the following conditions. The pressure must be applied long enough to ensure complete expansion of the test element. After being subjected to the above conditions and on normal operating conditions being restored, the element should operate as designed.

1) 1.5 times maximum normal operating pressure

2) 1.33 times the failure pressure occurring in the probability range between 10E-03 to 10E-05 failures per flight hour

3) 1.0 times the failure pressure occurring in the probability range between 10E-05 and 10E-07 failures per flight hour

4) 1.0 times the maximum normal operating pressure in combination with the limit structural loads.

(c) Each element of the system must be designed to operate without rupture or increase in design leakage, that is likely to endanger the aeroplane or its occupants. For demonstrating compliance, the following factors are to be applied to the pressure at the associated temperature for the most critical of the following conditions. The pressure must be applied long enough to ensure complete expansion of the test element. After being subjected to the above conditions and on normal operating conditions being restored, the element need not operate normally.

1) 3.0 times maximum normal operating pressure. Except for pressurisation system elements which shall use a factor of 2.0 time maximum normal operating pressure
2) 2.66 times the failure pressure occurring in the probability range between 10E-03 to 10E-05 failures per flight hour

3) 1.5 times the failure pressure occurring in the probability range between 10E-05 to 10E-07 failures/flight hour is applicable to components. Except for ducting which shall use a factor of 2.0 times the failure pressure occurring in the probability range between 10E-05 to 10E-07 failures per flight hour

4) 1.0 times the failure pressure occurring in the probability range 10E-07 and 10E-09 failures per flight hour

5) 1.5 times the maximum normal operating pressure in combination with the 1.0 times the ultimate structural loads.

(d) If the failure of an element can result in a hazardous condition, it must be designed to withstand the fatigue effects of all cyclic pressures, including transients, and associated externally induced loads and perform as intended for the design life of the element under all environmental conditions for which the aeroplane is certified.

(e) In addition, each gas storage device installed on an aeroplane must meet the requirement of this rule and not cause hazardous effects by exploding.

– END –

F-38 SC: Security Assurance Process to isolate or protect the aircraft Systems and Networks from Internal and External Security Threats	
APPLICABILITY:	A350
REQUIREMENTS:	CS 25.1301, 25.1309, 25.1431, 25.1529
ADVISORY MATERIAL:	N/A

Special Condition

(a) The applicant shall ensure security protection of the systems and networks of the aircraft from access by unauthorized sources, both internal and external, if their corruption (including hardware, software, data) by an inadvertent or intentional attack would impair safety, and

(b) The applicant shall ensure that the security threats to the aircraft (including those possibly caused by maintenance activity or any unprotected connecting equipment/devices) or from the on board passengers, are identified, assessed and risk mitigation strategies are implemented to protect the aircraft systems from all adverse impacts on safety, and

(c) The applicant shall ensure that continued airworthiness of the aircraft is maintained, including all post Type Certificate modifications, which have an impact on the approved network security safeguards, by establishing appropriate procedures.

– END –

F-52 ESF : Crew Determination of quantity of Oxygen in Passenger Oxygen System	
APPLICABILITY:	A350
REQUIREMENTS:	CS 25.1441 (c)
ADVISORY MATERIAL:	N/A

Equivalent Safety Finding

1) A detailed description of the design details must be provided to describe the compensating features which provide an equivalent level of safety.

2) The oxygen supply source is designed and tested to ensure that it will retain its required quantity of oxygen or chemicals throughout its expected life limit under foreseeable operating conditions.

3) A means is provided for maintenance to readily determine when oxygen is no longer available in the supply source due to inadvertent activation.

4) The life limit of the oxygen supply source is established by test and analysis.

5) Each oxygen supply source is labelled such that the expiration date can be easily determined by maintenance.

6) Airbus defines maintenance and inspection procedures in the maintenance planning documents to ensure that the oxygen supply source

a. that are discharged are removed from the airplane,
b. are not installed on the airplane past their expiration date.

7) Each oxygen supply source does not supply oxygen to more than six oxygen masks.

– END –

F-53 SC : Fuel System Low Level Indication / Fuel Exhaustion	
APPLICABILITY:	A350
REQUIREMENTS:	CS 25.1305(a)(2)
ADVISORY MATERIAL:	N/A

Special Condition

Replace the current CS 25.1305(a) (2) with the following requirement:

(a)(2) A fuel quantity indicating system, which:

(i) displays to the crew the total quantity of usable fuel on board,
(ii) is capable of indicating to the crew the total quantity of usable fuel in each tank
(iii) provides a low fuel level warning for any tank and/or collector cell that should not be depleted of fuel in normal operations. This warning must be such that:

(1) it is provided to the crew in a timely manner in order to allow continued safe flight and landing,

(2) its correct functioning is not affected by any single failure that could cause an erroneous indication of the normal fuel gauging system.

(iv) provides adequate fuel system information to the crew, including alerts, that consider abnormal fuel management or transfer between tanks, and possible fuel leaks in the tanks, the fuel lines and other fuel system components and the engines.

– END –

F-63 ESF : Improved Passenger Oxygen Mask Deployment System	
APPLICABILITY:	A350
REQUIREMENTS:	CS 25.1301, CS 25.1309, CS 25.1447(c)
ADVISORY MATERIAL:	N/A

Equivalent Safety Finding

In order to show an equivalent safety level to CS 25.1447(c)(1), Airbus must demonstrate that upon "State-B light" system activation:

1. Each and every occupant wherever seated, has visibility to a dispensing unit the same or better than the conventional system and has access to a dispensing unit in the same or shorter time as a conventional system,

2. Each and every occupant wherever seated, is protected, oxygen mask in place and oxygen flow being delivered, in a same or shorter time than with a conventional system,

3. The usage of the oxygen dispensing unit by "naïve" cabin occupants is comparable or improved as compared to a conventional system.

– END –

F-69 ESF : Pitot Heat Indication System	
APPLICABILITY:	A350
REQUIREMENTS:	CS 25.1326
ADVISORY MATERIAL:	N/A

Equivalent Safety Finding

For the A350 Type Certification the design of the pitot heating system alerting function following a single failure, as described below, demonstrates an equivalent level of safety compared to compliance with CS 25.1326 (2) (b).

The A350 design provides:

1. automatically reconfiguration without indication to the flight crew (ie without any crew action) in case of Air Data & Inertial Reference Systems (ADIRS) loss and/or failure detection and display of this information on PFD. This includes loss/failure of the pitot heating system.

2. Additional redundancy through back-up airspeed and altitude data, computed from engine air data and AOA data. This is used for PRIM monitoring and automatic display. The back-up airspeed and altitude data can also be manually selected by the crew in case of unreliable airspeed or altitude.

3. In case several pitot heating systems are detected as inoperative, the flight crew is informed when a flight crew action is required and/or when aircraft capabilities are lost as per CS 25.1301(a), CS 25.1302(b), (c) and CS 25.1309 (c) requirements.

– END –

F-76 ESF: First Aid Oxygen Equipment	
APPLICABILITY:	A350
REQUIREMENTS:	CS 25.1443(d)(9)
ADVISORY MATERIAL:	

Equivalent Safety Finding

1. The first-aid oxygen equipment shall ensure
   a. a blood oxygen saturation equivalent to or better than per CS 23.1443(d) compliant constant flow technology
   b. a user recovery from lowered SpO2 levels, at similar levels and at a rate equal to or better than per CS 25.1443(d) compliant constant flow technology addressing also non-healthy occupants.
2. The first-aid oxygen equipment shall be able to deliver a 4 liters constant flow per minute, STPD, to address unconscious passengers.
3. For the calculation of the quantity of oxygen for a given supply time, an average use of the 2 settings, equivalent safe to 4 lpm STPD and 2 lpm STPD as per CS 25.1443(d), shall be the minimum flow to consider. In case only the setting equivalent safe to 4 lpm STPD is provided, the quantity calculation shall be based on that one.

Acronyms and Abbreviations

TCDS	Type Certificate Data Sheet
SC	Special Condition
DEV	Deviation
ESF	Equivalent Safety Finding
STPD	Standard Temperature Pressure Dry

– END –

FCD-MULTI-01 ESF : CS-FCD T3 Evaluation Process	
APPLICABILITY:	A318/A319/A320/A321, A330, A340, A350, A380
REQUIREMENTS:	CS FCD.425(g)
ADVISORY MATERIAL:	

Equivalent Safety Finding

1. APPLICABILITY

This ESF to CS FCD.425(g) may be applied if
- Type specific pilot training is required for the installation of the same equipment, system or function on more than one aircraft type of the same type certificate holder.
- The training differences levels associated with the installation of this equipment, system or function on a candidate aircraft are determined as level C or D in accordance with CS-FCD initial issue.

1.1 AFFECTED CS
CS FCD.425(g)

2. Equivalent Safety Finding

In lieu of direct compliance to CS FCD.425(g), and provided that the below compensating factors are fulfilled, for the installation of the same equipment, system or function on an additional aircraft type or variant of the same type certificate holder, the validity of the T3 evaluation results for the basic aircraft may be extended to a variant of that aircraft type or to another aircraft type of the same applicant and training credits between types based on commonalities shall be granted, even if the appropriate level for training is determined as level C or D.

3. COMPENSATING FACTORS

a. The equipment, system or function installed on a variant of the same aircraft type or another aircraft type of the same type certificate holder shall:
   - be identical; and:
   - have the same pilot interface; and
   - be operated according to the same procedures, under normal, abnormal and emergency operations; and
b. The variant of the aircraft type or the other aircraft type from the same type certificate holder on which the equipment, system or function is installed has no influence on its functionality and the related pilot interface; and
c. The proposed differences training and checking programmes and training devices are evaluated through a T3 evaluation in accordance with CS FCD.425(g) by the same type certificate holder; and
d. It is excluded that a new T3 evaluation on the candidate aircraft would lead to a different result compared to the results from the original T3 evaluation performed in accordance with CS FCD.425(g).

– END –

F-GEN-01 (SC) : Non-rechargeable lithium battery installations	
APPLICABILITY:	A350
REQUIREMENTS:	CS 25.601, 25.863, 25.869, 25.1301, 25.1309, 25.1353(c), 25.1529, 25.1360(b)
ADVISORY MATERIAL:	N/A

Special Condition

In lieu of the requirements of CS 25.1353(c)(1) through (c)(4), non-rechargeable lithium batteries and battery installations must comply with the following:

1. Be designed so that safe cell temperatures and pressures are maintained under all foreseeable operating conditions to preclude fire and explosion.
2. Be designed to preclude the occurrence of self-sustaining, uncontrolled increases in temperature or pressure.
3. Not emit explosive or toxic gases in normal operation, or as a result of its failure, that may accumulate in hazardous quantities within the airplane.
4. Must meet the requirements of CS 25.863(a) through (d).
5. Not damage surrounding structure or adjacent systems, equipment or electrical wiring of the airplane from corrosive fluids or gases that may escape and that may cause a major or more severe failure condition.
6. Have provisions to prevent any hazardous effect on airplane structure or essential systems caused by the maximum amount of heat it can generate due to any failure of it or its individual cells.
7. Have a means to detect its failure and alert the flight crew in case its failure affects safe operation of the aircraft.
8. Have a means for the flight crew or maintenance personnel to determine the battery charge state if its function is required for safe operation of the airplane.

Note 1: A battery system consists of the battery and any protective, monitoring and alerting circuitry or hardware inside or outside of the battery. It also includes vents (where necessary) and packaging. For the purpose of this special condition, a battery and battery system are referred to as a battery.

Note 2: These Special Conditions apply in lieu of 25.1353(c)(1) through (c)(4) to non-rechargeable lithium battery and battery installations as follows:

- To all changed installation (new battery part number or new environment) except if the design change can be considered cosmetic. A cosmetic change is a change in appearance only, and does not change any function or safety characteristic of the battery installation.

- To all relocated lithium batteries, except if the relocation is demonstrated to improve the safety of the airplane and of the occupants, leading to a change that provides a substantial, fire safety improvement.
- To all existing non-rechargeable lithium battery installations affected by a design change, even if the battery or battery installation itself does not change.(e.g. change in ambient temperature or pressure environment in which the battery operates, change on the electrical load on a battery). Except if the design change improves the safety of the non-rechargeable lithium battery installation.

Applicants who intend to justify that this Special Condition is not applicable shall generate the evidence that the proposed design meets the above criteria in this note 2. This evidence shall include a detailed assessment of the battery installation on the baseline aircraft and the improvement due to the proposed change considering a battery thermal runaway failure for both installations. The assessment should:

- Consider the battery thermal runaway effects of heat, explosive energy, projecting debris and toxic gases.
- Address the proximity of the battery to occupants, critical systems and equipment, structure, and any other installations that could be a hazard if exposed to a battery thermal runaway (e.g., oxygen bottles/lines, fuel lines).

The above exceptions are limited to changes/relocations to baseline aircraft installations approved for certification projects for which the special condition was not applicable.

Section 25.1353(c)(1) through (c)(4) will remain in effect for other battery installations.

Note 3: For very small non-rechargeable lithium batteries (equal or less than 2 Watt-hour of energy), an acceptable MoC with this Special Conditions is showing these batteries compliant with Underwriters Laboratories (UL) 1642 or UL 2054

Note 4: For the purpose of SCs 7 and 8, “safe operation of the airplane” is defined as continued safe flight and landing following failures or other non-normal conditions. The following are examples of devices with batteries that are not required for continued safe flight and landing of the airplane: emergency locator transmitters, underwater locator beacons, seat belt air bag initiators and flashlights. A backup flight instrument with a non-rechargeable lithium battery is an example that would be required for safe operation of the airplane.

Note 5: Minimum Operational Performance Standards (MOPS) for Non–Rechargeable Lithium Batteries DO-227A + risk assessment at A/C level (limited to SC 3, 4, 5 & 6) is an acceptable MoC to the SC’s 1 to 6 contained in this SC. Alternative Means of Compliance can be proposed by the applicant to show compliance with these SC’s and agreed by EASA in a case by case basis.

– END –

G-01 (SC): ETOPS Approval	
APPLICABILITY:	A350
REQUIREMENTS:	CS-Definitions, CS-25
ADVISORY MATERIAL:	N/A

Special Condition

The text of the this Special Condition is identical to the wording of EASA NPA 2008-01 dated 1 March 2008 except for the following:

text : Text marked in yellow indicates that the content of this Special Condition has been changed/amended compared to EASA NPA 2008-01.

1. Amend CS-Definitions in order to introduce new definitions as follows:

'ETOPS Configuration, Maintenance and Procedures (CMP) Standard' means the particular aeroplane or engine configuration minimum requirements, including any special inspection, hardware life limits, Master Minimum Equipment List (MMEL) constraints and maintenance practices found necessary by the Agency to establish the suitability of an airframe/engine combination for ETOPS.

'ETOPS (Extended Range Operations for Two-Engined Aeroplanes)' means those operations of two-engined aeroplanes that are approved by the Authority (ETOPS approval), to operate beyond the threshold distance determined in accordance with operational requirements from an "Adequate Aerodrome".

'Adequate Aerodrome' means an aerodrome which the operator considers to be satisfactory, taking account of the applicable performance requirements and runway characteristics; at the expected time of use, the aerodrome will be equipped with necessary ancillary services such as ATS, sufficient lighting, communications weather reporting, navaids and emergency services.

2. Amend CS-25 in order to introduce new paragraph CS 25.1535 to read as follows**:**

CS 25.1535 ETOPS approval
Each applicant seeking type design approval for ETOPS suitability must:

(a) Comply with the requirements of CS-25 considering the maximum mission time and the longest diversion time for which approval is being sought.

(b) Consider flight crew workload and operational implications and the crew's and passenger's physiological needs of continued operations with failure effects for the longest diversion time for which approval is being sought.

(c) Establish appropriate limitations.

(See AMC 20-6)

3. With reference to chapter 5 of the interpretative material G-01, Airbus shall provide an Approval Plan or “Early” ETOPS Type Design Approval that is subject of agreement by EASA.

– END –

G-05 ESF : Engine Oil Temperature Indication	
APPLICABILITY:	A350-900
REQUIREMENTS:	CS 25.1549(a)
ADVISORY MATERIAL:	N/A

Equivalent Safety Finding

An equivalent safety finding to CS 25.1549(a) is defined by the following:

The A350 oil temperature indication on ECAM does not literally comply with CS 25.1549(a) which would require the indication to turn red instead of amber when the maximum limit is exceeded.
It is however consistent with Airbus past practice for Engine oil temperature indication to have green digits for normal range, flashing green digits between steady state and transient declared (Engine TCDS) limits when duration is below declared time limit, and steady amber digits above the declared time limit and when oil temperature is beyond transient limit. Such display is already into service on all other Airbus applications.

Airbus believe that the engine oil temperature indication as defined for the A350 provides a level of safety equivalent to an indication literally compliant to CS 25.1549(a) for the reasons detailed hereafter:

The exceedance of the maximum oil temperature limit does not require an immediate action from the crew. This has been justified on previous Airbus application and will equally be true for the A350. As such an amber color is appropriate as per CS 25.1322.

The exceedance of the maximum oil temperature limit is annunciated, in addition to the amber indication on the ECAM, by an amber master caution located in each pilot field of view associated with a single aural chime (inhibited during critical flight phases such as take-off). This amber caution triggers an ECAM message procedure (reduce power and shut down the engine if it is not possible to maintain the oil temperature below the limit). CS 25.1305, which lists the required powerplant instruments and warnings, requires an oil pressure warning or caution. The current design therefore exceeds the current CS 25 requirements by providing an unmistakable indication to the crew in case of oil temperature exceedance.

– END –

G-06 SC : Cancellation of AFM Engine Management Tables	
APPLICABILITY:	A350
REQUIREMENTS:	CS 25.1587
ADVISORY MATERIAL:	AMC 25.1581 6.d.(3)

Special Condition

1) The classification of failure conditions for A350 shall be assessed taking into account the take-off procedure as proposed and

2) The compliance with allocated safety objectives shall be performed according to the assumption that the crew will only check that THR rating limit value is reached by the actual THR of each engine (i.e. erroneous thrust target computation is potentially catastrophic).

In addition, depending on design of the FADEC, thrust management may result in continuous and significantly changing THR rating limit value until and beyond the speed at which the thrust is checked during take-off roll.

For A350, if the above design characteristics are confirmed, the following is proposed:

3) It shall be checked that design characteristics are consistent with the safety analysis and assumptions regarding crew management of thrust variation during take-off and

4) It shall be shown that normal thrust management leading to thrust change during take-off can be clearly distinguished from abnormal and erroneous thrust behaviour.

– END –

G-11 ESF: Alternative to CS 25.1563 Airspeed Placard	
APPLICABILITY:	A350-941 A350-1041
REQUIREMENTS:	CS 25.1563
ADVISORY MATERIAL:	--

Equivalent Safety Finding

Alternative to CS 25.1563 Airspeed Placard

Limitations of the Equivalent Safety Finding:

a. Additional high lift configurations are provided for the take-off phase only (Enhanced Take-Off Configuration {ETOC} function), i.e. these additional configurations cannot be set in approach and landing flight phases.

b. All non-ETOC related VFE are provided on the airspeed placard.

Set of compensating factors for the omission of high lift take-off configuration VFE from the airspeed placard as otherwise specified by CS 25.1563:

1. The maximum flap extended speed (VFE) for a selected flap/slat configuration is displayed on the primary flight display (PFD) on the speed scale when the "VFE" is within the speed range visible on the speed scale.

2. As soon as the flap lever is moved out of the selected take-off position during an ETOC take-off, the maximum flap extended speed (VFE) of the configuration attained is provided on the airspeed placard.

3. In the case of loss of VFE indications on all PFDs during an ETOC take-off, if the flight crew is directed to refer to the VFE of an ETOC configuration, the placard shall be complemented with the information that the airspeed placard does not indicate the VFE for ETOC configurations. If the placard is not complemented in this way, an appropriate AFM instruction shall be established how to derive adequate maximum speeds to respect while completing the take-off.

4. The maximum flap extended speeds (VFE) for all flap/slat configurations including ETOC configurations selectable in normal operations are provided via the aircraft flight manual (AFM).

5. All ETOC flap/slats configurations are protected either by a flaps load relief system or an auto-retraction system.

6. For all ETOC flap/slats configurations, an overspeed warning is provided.

Acronyms and Abbreviations

ETOC	Enhanced Take-Off Configuration
ESF	Equivalent Safety Finding
TCDS	Type Certificate Data Sheet
V_{FE}	Maximum Flap Extended Speed

– END –

K-03 ESF : Localizer Excessive Deviation Alerts	
APPLICABILITY:	A350
REQUIREMENTS:	CS-AWO 236, CS-AWO 321
ADVISORY MATERIAL:	N/A

Equivalent Safety Finding

The LOC Excess Dev threshold setting down to 15 ft as proposed by Airbus is tighter (i.e. 20 mA) than the setting as required per CS-AWO (i.e. 25 mA).

It has to be demonstrated that, with a localizer deviation of 20 mA at 15 ft, a safe landing or a go-around can be made under all operating conditions.

– END –

K-04 ESF : Limit Risk	
APPLICABILITY:	A350
REQUIREMENTS:	CS-AWO 131(c)(4), CS-AWO 131(c)(6)
ADVISORY MATERIAL:	N/A

Equivalent Safety Finding

Statement of Issue

1. Revise CS-AWO 131(c)(4) to read: "(4) Structural Limit Load."

2. Delete CS-AWO 131(c)(6).

– END –

K-08 ESF : CAT 3 Operations – Super Fail Passive Anomalies	
APPLICABILITY:	A350
REQUIREMENTS:	CS AWO 161, 300 (b), 304 (c), 321 (b)(3), 364, 365
ADVISORY MATERIAL:	N/A

Equivalent Safety Finding

CS-AWO Book 1 Paragraphs Affected

CS-AWO 300 (b) Terminology
CS-AWO 304 (c) Control of Flight Path and Ground Roll
CS-AWO 321 (b) (3) Installed Equipment
CS-AWO 364 Fail Passive Automatic Landing System
CS-AWO 365 Fail Operational Landing System

1. Revise CS-AWO-300 (b) paragraph (4) to add new definition for Super Fail-passive Automatic Landing System as follows and re-number subsequent paragraphs.

> (4) Super Fail-passive Automatic Landing System: An automatic landing system which meets the requirements of paragraph (3) above but has additional features such as automatic align, roll-out and go-around modes which, along with other aircraft characteristics defined under CS-AWO 321 (b) (2), permit operations in lower RVRs than less sophisticated fail passive landing systems.

2. Revise CS-AWO 304 (c) to read as follows:

> (c) If the landing rollout is to be accomplished automatically using rudder control, the rudder axis should be engaged during the approach phase.

3. Revise CS-AWO 321 (b)(3)(i) to read as follows:
(3) (i) Super Fail-passive automatic landing system, provided that:

4. Revise CS-AWO 364 title as follows:
CS-AWO 364 Fail-passive automatic landing system including Super Fail-passive
(See AMC No.1 and AMC No.2 to CS-AWO 364(a)
Delete AMC references from end of paragraph 364 (b).

5. Revise CS-AWO 365 (b) and (c) as follows:
Delete all references to AMC No. 1 to CS-AWO 361

– END –