This annex to the EASA TCDS IM.A.115 was created to publish selected special conditions / deviations / equivalent safety findings that are part of the applicable certification basis:

Contents

SPECIAL CONDITIONS	B-11: Human Factors
APPLICABILITY:	Boeing B787-8
REQUIREMENTS:	-
ADVISORY MATERIAL:	Interim Policy 25/14

SPECIAL CONDITION

a) The design of the integrated Flight Deck Interface must adequately address the foreseeable performance, capability and limitations of the Flight Crew.

b) More specifically the Authority must be satisfied with the following aspects of the Flight Deck Interface design:

i) ease of operation [including automation]

ii) the effects of crew errors in managing the aircraft systems, including the potential for error, the possible severity of the consequences, and the provision for recognition and recovery from error

iii) task sharing and distribution of workload between crew members during normal and abnormal operation

iv) the adequacy of feedback, including clear and unambiguous:

- presentation of information
- representation of system condition by display of system status
- indication of failure cases, including aircraft status
- indication when crew input is not accepted or followed by the system
- indication of prolonged or severe compensatory action by a system when such action could adversely affect aircraft safety

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Guidance Material

Guidance material for demonstrating compliance to the above Special Condition may be found in the Acceptable Means of Compliance to § 1302 of CS 25 at amendment 3. This guidance material is deemed equivalent or better to that published in the INT/POL/25.14, offering more detailed explanations, and more possibilities for the manufacturer in selecting the means of compliance as per §6 of the AMC.

SPECIAL CONDITIONS	C-02: Design Manoeuvre Requirements
APPLICABILITY:	Boeing B787-8
REQUIREMENTS:	CS25.331, 25.349, 25.351
ADVISORY MATERIAL:	-

SPECIAL CONDITION

Add to JAR/CS 25.331(c) paragraph (c)(3):

(c)(3) Manoeuvre loads induced by the system

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

Replace JAR/CS 25.349(a) by:

(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 *from zero to two-thirds* of the limit positive manoeuvring load factor. In determining the resulting control surface deflections the torsional flexibility of the wing must be considered in accordance with JAR/CS 25.301(b):

(1) Conditions corresponding to maximum 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 V_A 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 V_C, 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 V_D, 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.

Amend paragraph JAR/CS 25.351(a) as follows:

(a) With the aeroplane in unaccelerated flight at zero yaw, it is assumed that the cockpit rudder control is suddenly displaced (with critical rate) to the maximum deflection, *as limited by the stops.*

Add to JAR/CS 25.351 paragraph (e):

(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.

SPECIAL CONDITIONS	C-13: Tyre/Wheel Debris – Fuel Tank Penetration
APPLICABILITY:	Boeing B787-8
REQUIREMENTS:	CS25.963(g)
ADVISORY MATERIAL:	-

SPECIAL CONDITION

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), from any portion of a fuel tank *or fuel system* located within the tyre debris impact area, 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.

EASA also requires clarification regarding the definition of 'tyre debris larger than that specified in paragraph (b)'.

SPECIAL CONDITIONS	D-03: High Altitude Operation / High Cabin Heat Load
APPLICABILITY:	Boeing B787
REQUIREMENTS:	CS 25.831, 841, 903, 1309
ADVISORY MATERIAL:	AMC 20-128A, AMC 25.1309, INT/POL/25/16

SPECIAL CONDITIONS

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.

B – VENTILATION

In lieu of the requirements of CS25.831(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/GM25.831(a) of CS-25).

C - AIR CONDITIONING

In addition to the requirements of CS25.831, 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.

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

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 CS25.841, 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** after each of the following:

   a. Any probable double failure in the pressurisation system (CS25.1309 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** 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.

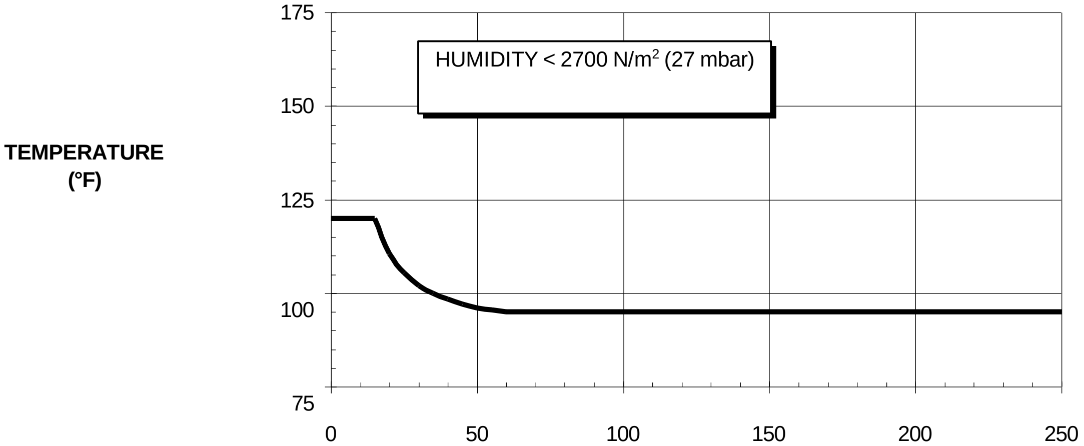
   b. Complete loss of thrust from engines.

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.

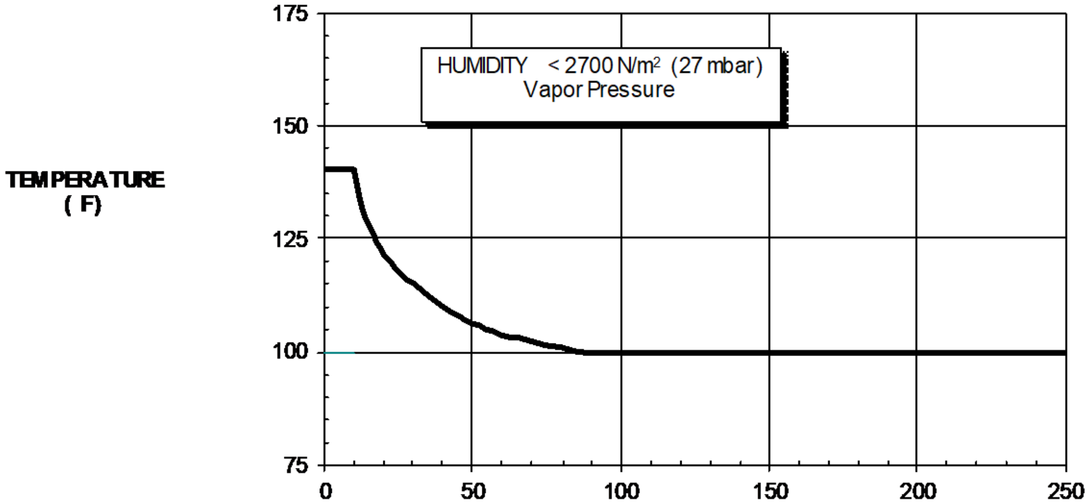
   For flight evaluation of the rapid descent, the test article must have the cabin volume representative of what is expected to be normal.

4. Engine rotor failures must be assessed according to the requirements of CS25.903(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.



TIME - MINUTES
TIME - TEMPERATURE RELATIONSHIP
FIGURE 1



TIME - MINUTES
TIME - TEMPERATURE RELATIONSHIP
FIGURE 2

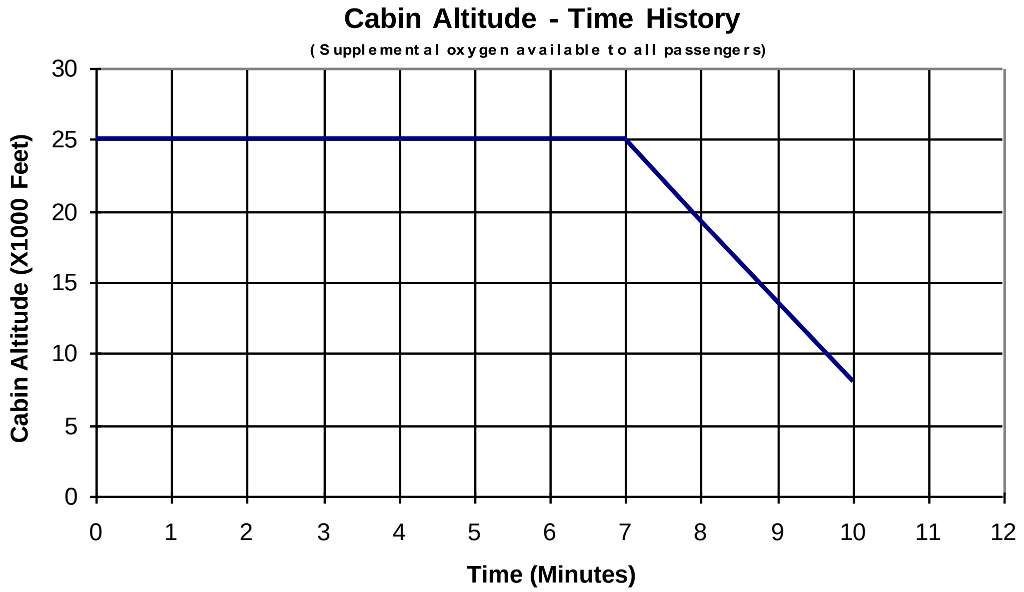


Figure 3

NOTE: For figure 3, time starts at the moment cabin altitude exceeds 8,000 feet during depressurization. If depressurization analysis shows that the cabin altitude limit of this curve is exceeded, the following alternate limitations apply: After depressurization, the maximum cabin altitude exceedence is limited to 30,000 feet. The maximum time the cabin altitude may exceed 25,000 feet is 2 minutes; time starting when the cabin altitude exceeds 25,000 feet and ending when it returns to 25,000 feet.

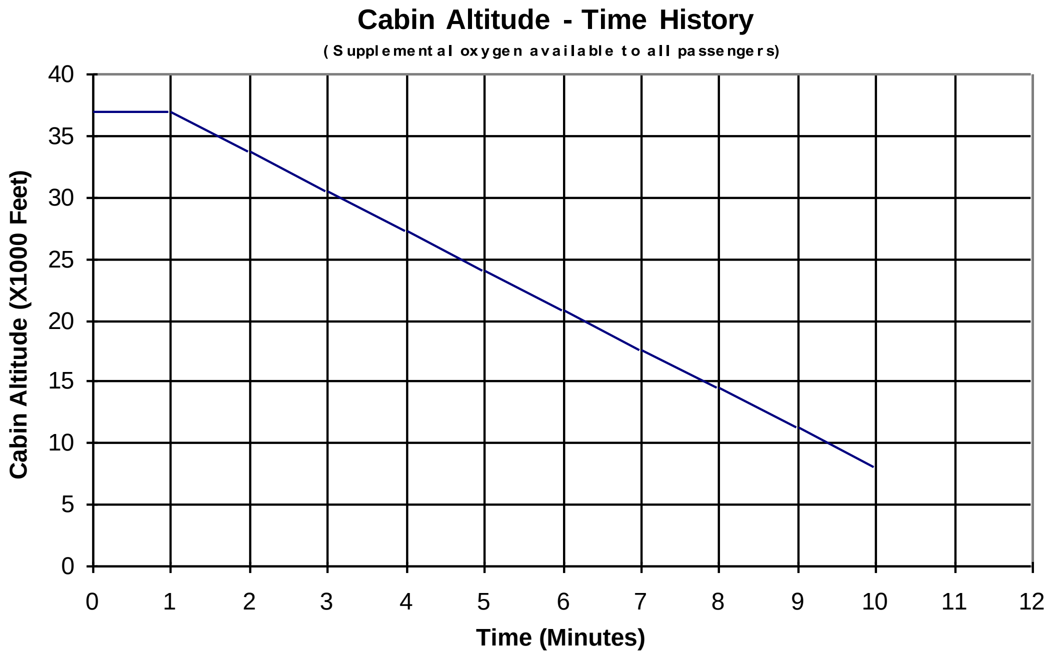


Figure 4

NOTE: For figure 4, time starts at the moment cabin altitude exceeds 8,000 feet during depressurization. If depressurization analysis shows that the cabin altitude limit of this curve is exceeded, the following alternate limitations apply: After depressurization, the maximum cabin altitude exceedence is limited to 40,000 feet. The maximum time the cabin altitude may exceed 25,000 feet is 2 minutes; time starting when the cabin altitude exceeds 25,000 feet and ending when it returns to 25,000 feet.

SPECIAL CONDITIONS	D-06: Fire Resistance of Thermal Insulation Material
APPLICABILITY:	Boeing B787-8
REQUIREMENTS:	CS25.856 & Appendix F
ADVISORY MATERIAL:	

SPECIAL CONDITIONS

Amending CS25.856:

"Thermal/acoustic insulation material installed in the fuselage must meet the flame propagation test requirements of part VI of Appendix F to CS25, or other approved equivalent test requirements. This requirement does not apply to "small parts," as defined in subpart I of Appendix F to CS25."

Also, to maintain consistency with existing requirements, this special condition amends CS 25.853(a) and CS 25.855(d) as follows:

" JAR 25.853 Compartment interiors.

(a) Except for thermal/acoustic insulation materials, materials (including finishes or decorative surfaces applied to the materials) must meet the applicable test criteria prescribed in part I of appendix F or other approved equivalent methods, regardless of the passenger capacity of the aeroplane. "

" JAR 25.855 Cargo or baggage compartments.

(d) Except for thermal/acoustic insulation materials, all other materials used in the construction of the cargo or baggage compartment must meet the applicable test criteria prescribed in part I of appendix F or other approved equivalent methods. "

SPECIAL CONDITIONS	D-GEN9 Incorporation of Inertia Locking Device in Dynamic Seats
APPLICABILITY:	Boeing B787-8, -9, -10
REQUIREMENTS:	CS25.562, 25.785
ADVISORY MATERIAL:	

SPECIAL CONDITIONS

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.

SPECIAL CONDITIONS	**D-GEN10: Installation of Suite Type Seating**
APPLICABILITY:	Boeing B787-8, -9, -10
REQUIREMENTS:	CS25.785(h), 25.813(e)
ADVISORY MATERIAL:	FAA AC 25-17A

SPECIAL CONDITIONS

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 by which cabin crew can 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. A narrower width at a height above 64 cm (25 inches) from the floor may be approved by the Agency considering compensating factors in the design that facilitate egress to the aisle.
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 emergency size 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.

SPECIAL CONDITIONS	**D-12: Fuselage Doors**
APPLICABILITY:	Boeing B787-8
REQUIREMENTS:	CS25.783 and NPA25D-301 issue 1
ADVISORY MATERIAL:	-

EASA will apply Issue 1 of the NPA 25D-301 Issue 1

SPECIAL CONDITIONS

The text of the existing JAR-25 Paragraph JAR25.783 would be amended to read as follows:
§ 25.783 Fuselage doors.
(See ACJ 25.783)
(a) *General*. This section applies to fuselage doors, w hich includes all doors, hatches, openable w indow s, access panels, covers, etc., on the exterior of the fuselage that do not require the use of tools to open or close. This also applies to each door or hatch through a pressure bulkhead, including any bulkhead that is specifically designed to function as a secondary bulkhead under the prescribed failure conditions of part 25. These doors must meet the requirements of this section, taking into account both pressurized and unpressurised flight, and must be designed as follow s:
(1) Each door must have means to safeguard against opening in flight as a result of mechanical failure, or failure of each single structural element.
(2) Each door that could be a hazard if it unlatches must be designed so that unlatching during pressurized and unpressurised flight from the fully closed, latched, and locked condition is extremely improbable. This must be show n by safety analysis.
(3) Each element of each door operating system must be designed or, w here impracticable, distinctively and permanently marked, to minimize the probability of incorrect assembly and adjustment that could result in a malfunction.
(4) All sources of pow er that could initiate unlocking or unlatching of each door must be automatically isolated from the latching and locking systems prior to flight and it must not be possible to restore pow er to the door during flight.
(5) Each removable bolt, screw , nut, pin, or other removable fastener must meet the locking requirements of § 25.607.
(6) Certain doors, as specified by § 25.807(h), must also meet the applicable requirements of §§ 25.809 through 25.812 for emergency exits.
(b) *Opening by persons*. There must be a means to safeguard each door against opening during flight due to inadvertent action by persons. In addition, design precautions must be taken to minimize the possibility for a person to open a door intentionally during flight. If these precautions include the use of auxiliary devices, those devices and their controlling systems must be designed so that:
(i) no single failure w ill prevent more than one exit from being opened, and
(ii) failures that w ould prevent opening of the exit after landing are improbable.
(c) *Pressurization prevention means*. There must be a provision to prevent pressurization of the airplane to an unsafe level if any door subject to pressurization is not fully closed, latched, and locked.
(1) The provision must be designed to function after any single failure, or after any combination of failures not show n to be extremely improbable.
(2) Doors that meet the conditions described in § 25.783(h) are not required to have a dedicated pressurization prevention means if, from every possible position of the door, it w ill remain open to the extent that it prevents pressurization, or safely close and latch as pressurization takes place. This must also be show n w ith each single failure and malfunction except that:
(i) w ith failures or malfunctions in the latching mechanism, it need not latch after closing, and
(ii) w ith jamming as a result of mechanical failure or blocking debris, the door need not close and latch if it can be show n that the pressurization loads on the jammed door or mechanism w ould not result in an unsafe condition.
(d) *Latching and locking.* The latching and locking mechanisms must be designed as follow s:
(1) There must be a provision to latch each door.
(2) The latches and their operating mechanism must be designed so that, under all airplane flight and ground loading conditions, w ith the door latched, there is no force or torque tending to unlatch the latches. In addition, the latching system must include a means to secure the latches in the latched position. This means must be independent of the locking system.
(3) Each door subject to pressurization, and for w hich the initial opening movement is not inw ard, must --
(i) have an individual lock for each latch,
(ii) have the lock located as close as practicable to the latch, and
(iii) be designed so that, during pressurized flight, no single failure in the locking system w ould prevent the locks from restraining the latches as necessary to secure the door.
(4) Each door for w hich the initial opening movement is inw ard, and unlatching of the door could result in a hazard, must have a locking means to prevent the latches from becoming disengaged. The locking means must ensure sufficient latching to prevent opening of the door even w ith a single failure of the latching mechanism.
(5) Each door for w hich unlatching w ould not result in a hazard is not required to have a locking mechanism.
(6) It must not be possible to position the lock in the locked position if the latch and the latching mechanism

are not in the latched position.
(7) It must not be possible to unlatch the latches with the locks in the locked position. Locks must be designed to withstand the limit loads resulting from --
(i) the maximum operator effort when the latches are operated manually;
(ii) the powered latch actuators, if installed; and
(iii) the relative motion between the latch and the structural counterpart.
(e) *Warning, caution, and advisory indications.* Doors must be provided with the following indications:
(1) There must be a positive means to indicate at the door operator's station for each door that all required operations to close, latch, and lock the door have been completed.
(2) There must be a positive means clearly visible from the operator station for each door to indicate if the door is not fully closed, latched, and locked for each door that could be a hazard if unlatched.
(3) There must be a visual means on the flight deck to signal the pilots if any door is not fully closed, latched, and locked. The means must be designed such that any failure or combination of failures that would result in an erroneous closed, latched, and locked indication is improbable for —
(i) each door that is subject to pressurization and for which the initial opening movement is not inward, or
(ii) each door that could be a hazard if unlatched.
(4) There must be an aural warning to the pilots prior to or during the initial portion of takeoff roll if any door is not fully closed, latched, and locked, and its opening would prevent a safe takeoff and return to landing.
(f) *Visual inspection provision.* Each door for which unlatching could be a hazard must have a provision for direct visual inspection to determine, without ambiguity, if the door is fully closed, latched, and locked. The provision must be permanent and discernible under operational lighting conditions, or by means of a flashlight or equivalent light source.
(g) *Certain maintenance doors, removable emergency exits, and access panels*. Some doors not normally opened except for maintenance purposes or emergency evacuation and some access panels need not comply with certain paragraphs of this section as follows:
(1) Access panels that are not subject to cabin pressurization and would not be a hazard if unlatched during flight need not comply with paragraphs (a) through (f) of this section, but must have a means to prevent inadvertent opening during flight.
(2) Inward-opening removable emergency exits that are not normally removed, except for maintenance purposes or emergency evacuation, and flight deck-openable windows need not comply with paragraphs (c) and (f) of this section.
(3) Maintenance doors that meet the conditions of § 25.783(h), and for which a placard is provided limiting use to maintenance access, need not comply with paragraphs (c) and (f) of this section.
(h) *Doors that are not a hazard*. For the purposes of this section, a door is considered not to be a hazard in the unlatched condition during flight, provided it can be shown to meet all of the following conditions:
(1) Doors in pressurized compartments would remain in the fully closed position if not restrained by the latches when subject to a pressure greater than ½ psi. Opening by persons, either inadvertently or intentionally, need not be considered in making this determination.
(2) The door would remain inside the airplane or remain attached to the airplane if it opens either in pressurized or unpressurized portions of the flight. This determination must include the consideration of inadvertent and intentional opening by persons during either pressurized or unpressurized portions of the flight.
(3) The disengagement of the latches during flight would not allow depressurization of the cabin to an unsafe level. This safety assessment must include the physiological effects on the occupants.
(4) The open door during flight would not create aerodynamic interference that could preclude safe flight and landing.
(5) The airplane would meet the structural design requirements with the door open. This assessment must include the aeroelastic stability requirements of § 25.629, as well as the strength requirements of this subpart.
(6) The unlatching or opening of the door must not preclude safe flight and landing as a result of interaction with other systems or structures.

SPECIAL CONDITIONS	**D-15: Post Crash Fire Resistance of Composite Material**
APPLICABILITY:	Boeing B787-8
REQUIREMENTS:	-
ADVISORY MATERIAL:	-

SPECIAL CONDITIONS

1. The applicant must demonstrate that negligible amounts of smoke, toxic gases and released fibres are produced by the composite material during a post-crash fire, before the fire penetrates the cabin.

2. It must be shown that no other aspects of post-crash survivability have been compromised, in comparison to a conventional aluminium structure, before the fire penetrates the cabin. For example, where the effects of fire on the composite fuselage could result in delays in the action of rescue crews, or increased danger to them, due to potential weakening of the aircraft during their rescue effort, additional training material should be developed by Boeing for use by airport fire services.

SPECIAL CONDITIONS	**D-16: In-Flight Fire Resistance of Composite Material**
APPLICABILITY:	Boeing B787-8
REQUIREMENTS:	-
ADVISORY MATERIAL:	-

SPECIAL CONDITIONS

The EASA has reviewed the FAA Special Condition defined here above and considers appropriate to incorporate it into the EASA TC base, according to the following terms :

"The in-flight fire safety of the Boeing Model 787 series composite fuselage must be shown resistant to flame propagation and if the products of combustion, beyond the test heat source are observed , these must be evaluated for acceptability."

SPECIAL CONDITIONS	D-22: Crew Rest Compartment (Non-TT&L) and Flight Crew Rest Compartment (TT&L)
APPLICABILITY:	Boeing B787-8, -9, -10
REQUIREMENTS:	CS25.831, 25.812, 25.853, 25.858, 25.14
ADVISORY MATERIAL:	-

B787 Special Condition
Crew Rest Compartment (non TT&L) and
Flight Crew Rest Compartment (TT&L)

1. CRC occupancy is not allowed during Taxi, Take off and Landing (TT&L) phases except for the Flight Crew Rest Compartments where Special Condition 21 applies. The Cabin Crew Rest Compartments (CCRC) shall not be occupied for Taxi, Take off and Landing. During flight, occupancy of the CRC is limited to the total number of bunks and / or seats that are installed in the compartment.
   a. There must be appropriate placards, inside and outside each entrance to the CRC to indicate:
      i. The maximum number of crewmembers allowed during flight and,
      ii. That occupancy is restricted to operating crewmembers trained in the use of emergency equipment, emergency procedures and the systems of the CRC,
      iii. That smoking is prohibited in the CRC,
      iv. 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 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 special tools. 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. The secondary evacuation route is not required for CRC located at a passenger deck level and when the CRC is a small room designed for only one occupant for short time duration, such as a changing area or lavatory or it can be shown that no one can be trapped in the CRC due to fire (inside or outside the CRC), mechanical or structural failure.
   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, these requirements may be subject to specific evaluation and possibly to a finding of equivalent level of safety:
   a. At least one exit sign, located near each crew rest door or hatch, meeting the 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 that defines the location and the operating instructions for each evacuation route.
   c. Placards must be readable from a distance of 30 inches under emergency lighting conditions.
   d. The door or hatch handles and evacuation path operating instruction placards must be illuminated to at least 160 microlamberts under emergency lighting conditions.

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 cabin 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.
   d. The illumination level must be sufficient, with the privacy curtains in the closed position, for each occupant of the crew rest to locate a deployed oxygen mask.

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, 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 berths and 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 any of the other requirements of these special conditions is predicated 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) devices approved to European Technical Standard Order (ETSO)-C116 or equivalent and meeting CS 25.1439, closed 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. 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, 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 when the CRC is not occupied 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 in-flight accessibility of large enclosed stowage compartments and the subsequent impact on the crewmembers' ability to effectively reach any part of the compartment with the contents of a hand fire extinguisher may require additional fire protection considerations similar to those required for inaccessible compartments such as Class C cargo compartments.

14. There must be a means provided to exclude hazardous quantities of smoke or extinguishing agent originating in the CRC from entering any other occupiable compartment.
    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. In the case of a CRC immediately adjacent to and on the same deck as passenger seated areas the smoke penetration requirements of (a) to (c) above do not apply. However, 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. When a CRC is installed or enclosed as a removable module in part of a cargo compartment or located directly adjacent to a cargo compartment without an intervening cargo compartment wall, the following applies:
    a. Any wall of the module (container) forming part of the boundary of the reduced cargo compartment, subject to direct flame impingement from a fire in the cargo compartment and including any interface item between the module (container) and the airplane structure or systems, must meet the applicable requirements of CS 25.855.

b. Means must be provided so that the fire protection level of the cargo compartment meets the applicable requirements of CS 25.855, CS 25.857 and CS 25.858 when the module (container) is not installed.

c. Use of the emergency evacuation route must not require occupants of the CRC to enter the cargo compartment in order to return to the passenger compartment.

16. There must be a supplemental oxygen system in the CRC as follows:

a. There must be at least one mask for each seat and berth in the CRC.

b. In long transition areas or destination areas (such as changing areas) where seats or berths are not installed, there must be an oxygen mask readily available for each occupant that can be reasonably expected to be present in the area at the same time, unless there are adequate oxygen outlets obviously available within 5 feet or 5 seconds reach of each area occupant.

c. The system must provide an aural and visual alert to warn the occupants of the CRC to don oxygen masks in the event of decompression. The aural and visual alerts must activate concurrently with or before the deployment of the oxygen masks in the passenger cabin. To compensate for sleeping occupants, the aural alert must be heard in each occupiable part of the CRC and must sound continuously for a minimum of five minutes or until a reset switch in the CRC is activated. The visual alert must be visible in each occupiable part of the CRC.

d. 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.

e. The masks shall be able to drop down automatically and a means to manually deploy the masks from the flight deck shall be provided.

f. The supplemental oxygen system for the CRC occupants shall meet the same CS 25 regulations as for the passenger cabin occupants, except that the ten percent excess of masks of CS 25.1447(c)(1) is not applicable to the CRC.

g. The illumination level of the automatic CRC lighting system must be sufficient for each occupant to readily locate a deployed oxygen mask.

17. 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:

   i. No smoking placard (Special Condition No. 1),
   ii. Emergency illumination (Special Condition No. 6),
   iii. Emergency alarm system (Special Condition No. 8),
   iv. Seat belt fasten signal or return to seat signal as applicable (Special Condition No. 9), and
   v. The smoke or fire detection system (Special Condition No. 12),
   vi. Oxygen system (Special Condition No. 16).

c. 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:

   i. 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. 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.
   ii. Any door between the sections must be shown to be openable when crowded against.
   iii. There may be no more than one door between any seat or berth and the primary emergency exit.

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

v. 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) and No. 12 (smoke or fire detection system) must be met with the door open or closed.

vi. 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.

18. Materials (including finishes or decorative surfaces applied to the materials) must comply with the flammability requirements of § 25.853(a). Mattresses must comply with the flammability requirements of § 25.853(c).

19. The addition of a lavatory within the CRC would require the lavatory to meet the same requirements as those for a lavatory installed on the passenger decks except that CS 25.854 (a) is replaced by the Special Condition No. 12 for smoke detection.

20. 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).

21. The following additional requirements apply to Flight Crew Rest Compartments (FCRC) that may be occupied during Taxi, Take off and Landing (TT&L):

a. During TT&L, occupancy of the FCRC is limited to the total number of installed seats approved to the flight / ground load conditions and emergency landing conditions.

b. For the configuration of the FCRC including seats occupiable for TT&L, these seats must be able to withstand crash load conditions and therefore comply with all related requirements (25.561 & 25.562). This CRI does not address any side facing attitude seats or bunks occupiable for TT&L and, therefore, in such cases, further considerations will be required.

c. Doors installed across emergency egress routes must have a means to latch them in the open position. The latching means must be able to withstand the loads imposed upon it when the door is subjected to the ultimate inertia forces, relative to the surrounding structure, listed in CS 25.561(b).

d. Doors or hatches that separate the FCRC compartment from a passenger deck must not adversely affect evacuation of occupants (slowing evacuation by encroaching into aisles, for example) or cause injury to those occupants during opening or while open.

e. A placard must be displayed in a conspicuous place on the crew rest entrance door and any other door(s) installed across emergency egress routes of the crew rest, that requires these doors to be latched open during TT&L when the crew rest is occupied.

f. An assessment must be done on design features affecting access to the evacuation routes. The design features that should be considered include, but are not limited to, seat deformations in accordance with 25.561(d) and 25.562(c)(8), seat back break over, the elimination of rigid structure that reduces access from one part of the compartment to another, the elimination of items that are known to be the cause of potential hazards, supplemental restraint devices to retain items of mass that could hinder evacuation if broken loose and load path isolation between components that contain the evacuation routes.

g. 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. This training must instruct them to ensure that the crew rest (i.e., seats, doors, etc.) is in its proper TT&L configuration. The limitation must furthermore restrict occupancy to flight crewmembers who the pilot in command has determined are able to rapidly use the evacuation routes. Placards inside and outside the FCRC must be provided accordingly.

SPECIAL CONDITIONS	**D-23: Application of heat release and smoke emission requirements to seats installations**
APPLICABILITY:	Boeing B787-8
REQUIREMENTS:	CS 25.853(d) Appendix F part IV & V
ADVISORY MATERIAL:	-

SPECIAL CONDITIONS

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 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 4.5 square feet excluded on any portion of the assembly (e.g., outboard seat place 1 square foot, middle 1 square foot, and inboard 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
   b. Airplanes exempted from smoke and heat release requirements

SPECIAL CONDITIONS	D-24: Strengthened Flight Deck Bulkhead
APPLICABILITY:	Boeing B787-8
REQUIREMENTS:	CS 25.795(a)
ADVISORY MATERIAL:	-

SPECIAL CONDITIONS

The reinforced bulkhead, including components that comprise the bulkhead, separating the flight crew compartment from occupied areas must be designed to meet the following standards:

It must resist forcible intrusion by unauthorized persons and be capable of withstanding impacts of 300 Joules (221.3 foot-pounds) at critical locations on the bulkhead as well as a 1113 Newton (250 pound) constant tensile load on accessible handholds.
It must resist penetration by small arms fire and fragmentation devices to a level equivalent to level IIIa of the National Institute of Justice Standard (NIJ) 0101.04.

EQUIVALENT SAFETY FINDING	E-17 : RR Turbine Overheat Detection
APPLICABILITY:	From Boeing B787-8 (Initial TC)
REQUIREMENTS:	CS 25.1203(d)
ADVISORY MATERIAL:	N/A

CS 25.1203(d) states: "there must be means to allow the crew to check, in flight, the functioning of each fire or overheat detector electrical circuit".

The turbine overheat detection portion of the Boeing 787 with Trent 1000 engines, does not allow the crew to check its functioning during flight.

The Rolls Royce Trent 1000 engine includes thermoc ouples installed in the intermediate pressure turbine section of the engine to detect overheat in this area. The overheat condition is monitored by the Electronic Engine Control (EEC) to prevent continued exposure to an overheat condition which could potentially lead to premature disk failure. In the event of an overheat, the EEC will signal via the aircraft data bus an engine overheat caution and the crew action is to retard the throttle and initiate an engine shutdown in accordance with engine overheat procedures.

Although, the EEC has built-in fault detection and isolation features to cross check thermoc ouple and channel status. The system includes also range checks and fault detection to ensure proper functionality.

The temperatures that are monitored are:
. Turbine Cooling Air Front (TCAF): Monitored by a dual element thermocouple, with one input to each channel of the EEC. It is mounted in front of the engine IP turbine disk.
. Turbine Cooling Air Rear (TCAR): Monitored by a dual element thermocouple, with one input to each channel of the EEC. It is mounted at the rear of the engine IP turbine disk.

In the case of a TCAF or TCAR element fault, a status message is set and broadcast to the crew via EICAS. These status messages can be viewed on the status page of the EICAS during flight. The continuously monitored functional checks and crew notifications are compensating factors providing an equivalent or increased level of safety to that of a design directly compliant with CS 25.1203(d).

SPECIAL CONDITIONS	F-03: HIRF Protection
APPLICABILITY:	Boeing B787-8
REQUIREMENTS:	CS-25 JAA INT/POL/25/2
ADVISORY MATERIAL:	

SPECIAL CONDITIONS

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.

SPECIAL CONDITIONS	**F-22: Aeroplane Systems Security and Domain Isolation and Protection**
APPLICABILITY:	Boeing B787-8
REQUIREMENTS:	CS25.1301, 25.1309, 25.1431, 25.1529
ADVISORY MATERIAL:	AMC 25.1309, CCIMB-2004-01-00x Part 1 to 3 FIPS PUB 197 Nov. 26, 2001

SPECIAL CONDITIONS

The design shall prevent either inadvertent or malicious change to any systems, software or data in the Aircraft Control Domain or Airline information Domain from any point within the Passenger Information and Entertainment Domain.

SPECIAL CONDITIONS	F-24: Lithium-Ion Batteries
APPLICABILITY:	Boeing B787-8
REQUIREMENTS:	CS 25.601, 863, 1353(c)
ADVISORY MATERIAL:	-

SPECIAL CONDITIONS

The following Special Condition applies to the Li-Ion batteries and battery installations of the B787-8, whose correct functioning is required for safe operation of the aircraft, in lieu of the requirements of CS 25.1353(c)(1) through (c)(4):

Lithium-ion batteries and battery installations of the B787-8 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 Li-ion battery installation must be designed to preclude explos ion in the event of those failures.

(2) Li-ion 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 Li-ion 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) Li-ion battery installations must meet the requirements of CS 25.863(a) through (d).

(5) No corrosive fluids or gasses that may escape from any Li-ion battery may damage surrounding aeroplane structures or adjacent essential equipment.

(6) Each Li-ion 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) Li-ion 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 systemwith a means for automatically disconnecting the battery from its charging source in the event of battery failure.

(8) Any Li-ion 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 SOC of the batteries have fallen below levels considered acceptable for dispatch of the aeroplane.

(9) The Instructions for Continued Airworthiness must contain maintenance requirements for measurements of battery capacity at appropriate intervals to ensure that batteries whose function is required fo r 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 Li-ion 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.

Compliance with the requirements of this Special Condition must be shown by test or, with the concurrence of EASA, by analysis.

SPECIAL CONDITIONS	**F-25: Aircraft System Security for the Aircraft Control Domain and Airline Information Services Domain from Internet and Operator Network Access and Electronic Transmission of Field-Loadable Software Applications and Databases**
APPLICABILITY:	Boeing B787-8
REQUIREMENTS:	CS25.1301, 25.1309, 25.1431, 25.1529
ADVISORY MATERIAL:	AMC 25.1309, AMC 20-115B, CCIMB-2004-01-00x Part 1 to 3 FIPS PUB 197 Nov. 26, 2001

SPECIAL CONDITIONS

System Security Protection for Aircraft Control Domain and Airline Information Services Domain from External Access.

The applicant shall ensure that security threats and risk mitigation strategies are identified to minimize the likelihood of occurrence of any of the following conditions:

- Reduction in airplane safety margins or airplane functional capabilities including possible maintenance activity;
- Increase in flight crew workload or conditions impairing flight crew efficiency, and;
- Distress or injury to airplane occupants.

SPECIAL CONDITIONS	F-GEN11 PTC: Non-rechargeable Lithium Batteries Installations
APPLICABILITY:	Boeing B717, B727, B737, B747, B757, B767, B777, B787, DC-10, MD11, DC-9, MD80
REQUIREMENTS:	CS 25.601, 25.863, 25.1353(c)
ADVISORY MATERIAL:	-

SPECIAL CONDITIONS

Applicability for all non-rechargeable Lithium batteries installations/relocations.

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 special conditions:

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 to all non-rechargeable lithium battery installations in lieu of 25.1353(c)(1) through (c)(4). Section 25.1353(c)(1) through (c)(4) will remain in effect for other battery installations.

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Change Record

Issue	Date	Changes and comments
Issue 1	18 Jan 19	Initial Issue
Issue 2	29 Aug 19	CRI ESF E-17 included in the Explanatory Note
Issue 3	18 June 24	CRI SC C-02 and CRI SC C-13 included in the Explanatory Note
Issue 4	06 Aug 24	CRI SC B-11 included in the Explanatory Note
Issue 5	04 Feb 25	CRI SC D-GEN10 included in the Explanatory Note
Issue 6	23 Apr 25	CRI SC D-24 included in the Explanatory Note
Issue 7	22 May 25	CRI SC D-22 included in the Explanatory Note
Issue 8	24 June 25	CRISC D-GEN9 included in the Explanatory Note