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.

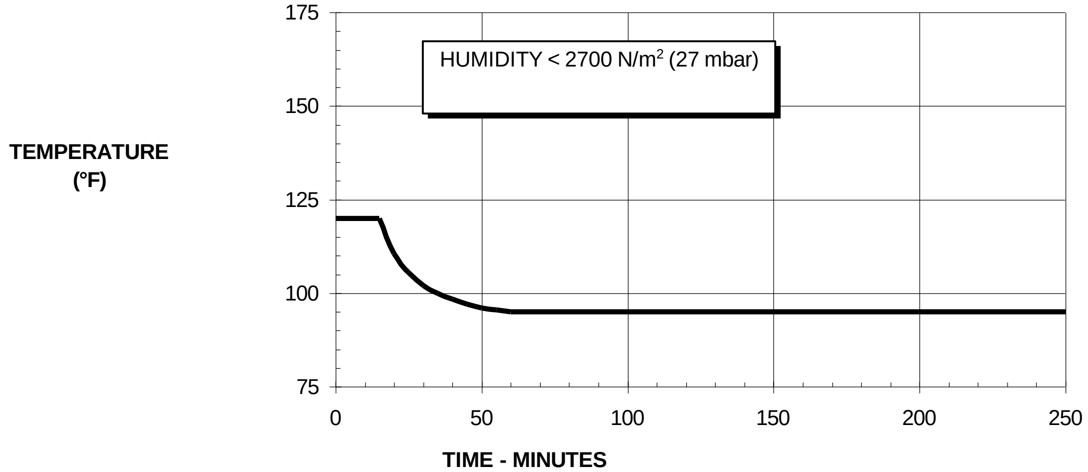
   b. Complete loss of thrust from engines.

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.

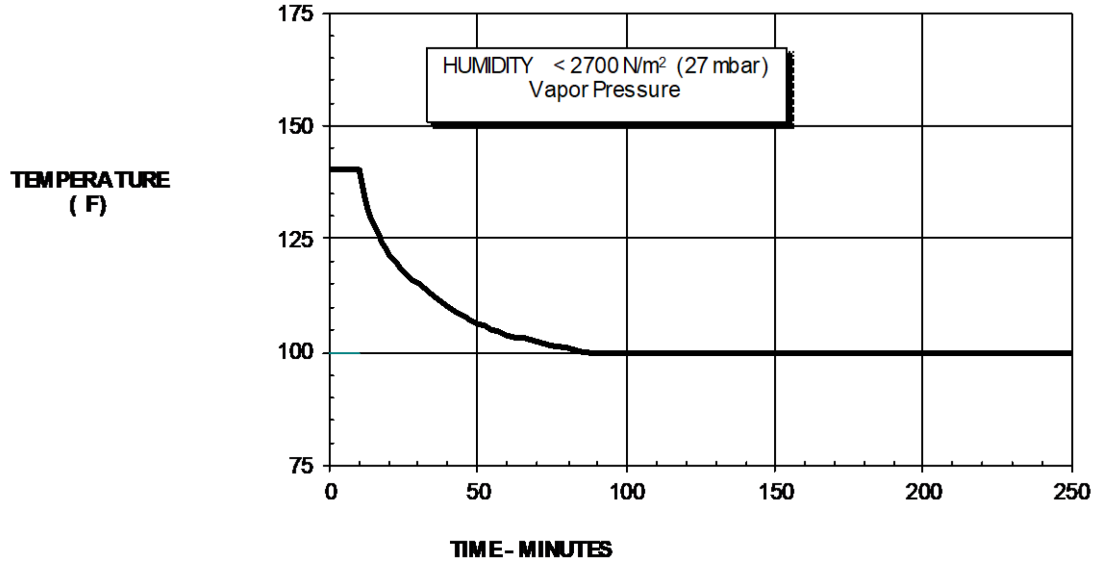
   For flight evaluation of the rapid descent, the test article must have the cabin volume representative of what is expected to be normal.

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 - TEMPERATURE RELATIONSHIP
FIGURE 1



TIME - TEMPERATURE RELATIONSHIP
FIGURE 2

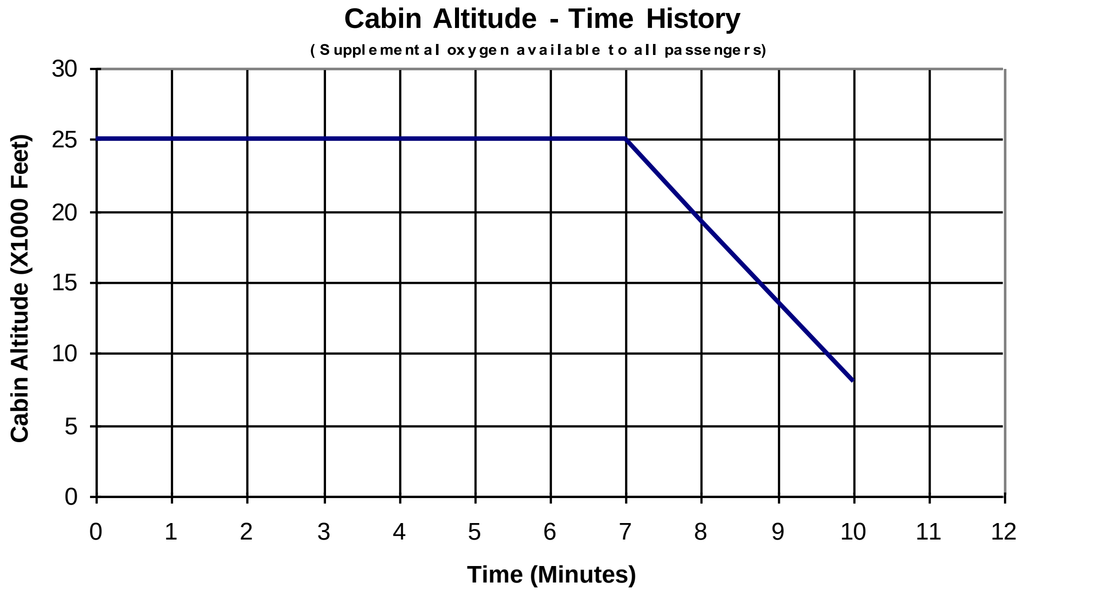


Figure 3

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.

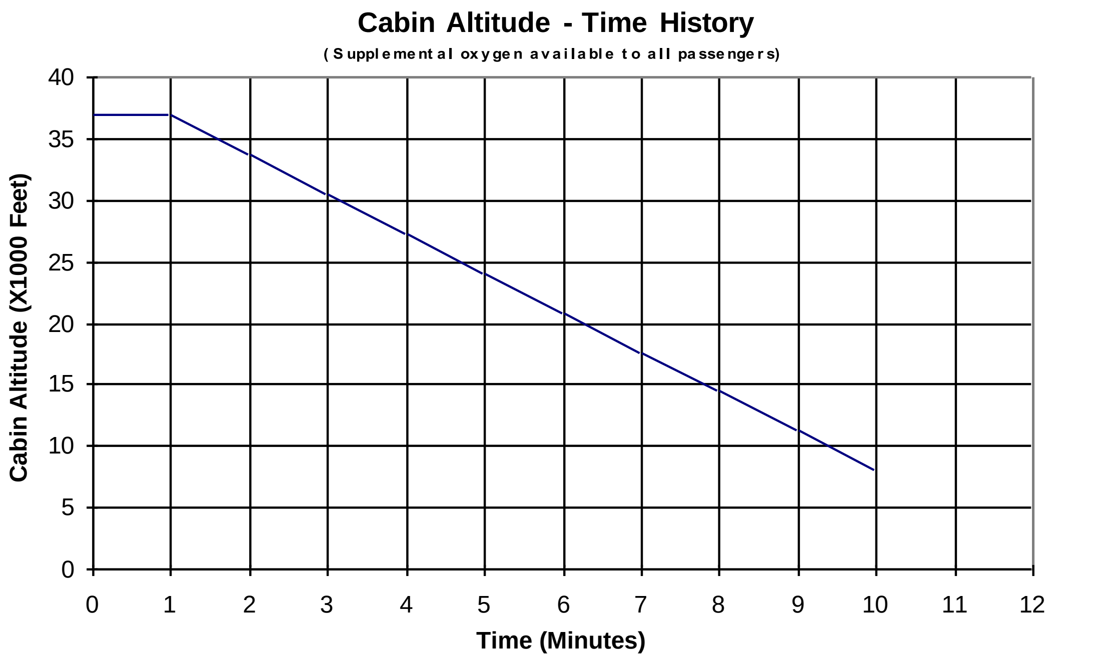


Figure 4

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-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 w ith the locks in the locked position. Locks must be designed to w ithstand the limit loads resulting from --
(i) the maximum operator effort w hen the latches are operated manually;
(ii) the pow ered latch actuators, if installed; and
(iii) the relative motion betw een the latch and the structural counterpart.
(e) *Warning, caution, and advisory indications.* Doors must be provided w ith the follow ing 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 w ould result in an erroneous closed, latched, and locked indication is improbable for —
(i) each door that is subject to pressurization and for w hich the initial opening movement is not inw ard, or
(ii) each door that could be a hazard if unlatched.
(4) There must be an aural w arning 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 w ould prevent a safe takeoff and return to landing.
(f) *Visual inspection provision.* Each door for w hich unlatching could be a hazard must have a provision for direct visual inspection to determine, w ithout 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 w ith certain paragraphs of this section as follow s:
(1) Access panels that are not subject to cabin pressurization and w ould not be a hazard if unlatched during flight need not comply w ith paragraphs (a) through (f) of this section, but must have a means to prevent inadvertent opening during flight.
(2) Inw ard-opening removable emergency exits that are not normally removed, except for maintenance purposes or emergency evacuation, and flight deck-openable w indow s need not comply w ith paragraphs (c) and (f) of this section.
(3) Maintenance doors that meet the conditions of § 25.783(h), and for w hich a placard is provided limiting use to maintenance access, need not comply w ith 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 show n to meet all of the follow ing conditions:
(1) Doors in pressurized compartments w ould remain in the fully closed position if not restrained by the latches w hen 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 w ould 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 w ould 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 w ould not create aerodynamic interference that could preclude safe f light and landing.
(5) The airplane w ould meet the structural design requirements w ith the door open. This assessment must include the aeroelastic stability requirements of § 25.629, as w ell 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 w ith 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-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

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 explosion 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 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 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