

This document was created to make public non-proprietary data contained in Special Conditions, Equivalent Safety Findings and Deviations that are part of the applicable Certification Basis as recorded in TCDS EASA.IM.A.071

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Abbreviations

TCDS	Type Certificate Data Sheet
SC	Special Condition
DEV	Deviation
ESF	Equivalent Safety Finding
REV	Reversion per part 21.A.101

Disclaimer – This document is not exhaustive and it will be updated gradually. An update of this document will not cause an update of the TCDS.

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190/D-29 (DEV): Emergency Exit Marking	
APPLICABILITY:	ERJ 190-100ECJ
REQUIREMENTS:	JAR 25.812(b)(1), 25.811(d)(1)(2)(3)
ADVISORY MATERIAL:	AMC 25.812(b)(1) of CS-25 Amdt. 3

Deviation

Background:

JAR25.812 has size requirements for emergency exit marking and locator signs. EMBRAER requested EASA to allow smaller exit signs that do not meet the letter size and background requirements of 25.812(b)(1) on custom interiors of EMBRAER ERJ-190-100ECJ airplanes.

JAR 25.811(d)(1) requires an exit locator sign to be installed above the aisle near each passenger emergency exit, or at another overhead location if it is more practical because of low headroom, except that one sign may serve more than one exit if each exit can be seen readily from the sign.

JAR 25.811(d)(2) requires an exit marking sign to be installed next to each passenger emergency exit, except that one sign may serve two such exits if they both can be seen readily from the sign.

Section 25.811 (d)(3) requires a sign on each bulkhead or divider that prevents fore and aft vision along the passenger cabin to indicate emergency exits beyond and obscured by the bulkhead or divider, except that if this is not possible the sign may be placed at another appropriate location.

JAR 25.812(b)(1)(i) requires, for airplanes with passenger seating configuration of 10 or more, that each exit locator sign required by § 25.811(d)(1), each marking sign required by JAR 25.811(d)(2) and each passenger emergency exit sign required by 25.811(d)(3) to have red letters at least 1 ½ inches high on an illuminated white background, and to have an area of at least 21 square inches excluding the letters.

The ERJ 190-100 ECJ airplane was divided in different internal zones with, at least, three zones with short distances between dividers and presents a relatively small fuselage diameter. EMBRAER proposes to install electrically illuminated exit marker, exit locator, and bulkhead/divider exit signs that measure a minimum of 1,5 x 4,8 inches, with 1 inch high letters. These exit signs do not meet the letter size and background requirements of 25.812(b)(1).

The ERJ 190-100 ECJ will be certified for a maximum passenger capacity of 19 seats. The aircraft has a Type I entry door on the left side of the fuselage and a Type III overwing exit door on the right side of the fuselage.

Deviation:

EASA is aware that in the past exit signs smaller than required by the rule were accepted on VIP aircraft. Smaller exit signs with a letter height of not less than 1" were accepted based on the fact that in smaller aircraft the viewing distance for these signs is also reduced. Therefore the readability of the signs is not compromised by the smaller signs.

In the guidance material AMC 25.812(b)(1) published by EASA together with CS-25 Amdt. 3 a relation between viewing distance and size of symbolic exit signs is provided. EASA will accept smaller exit signs with a letter height of not less than 1", provided that:

The maximum viewing distance of a person seated in any seat certified for TTO&L is not exceeding the distance calculated by the formula given in the AMC material.

Furthermore, based on the below identified mitigating design features, EASA permits the use of:

- a) One combined sign to be installed above the Type III exit opening to serve as the exit locator sign and exit marker sign required by 25.811(d)(1) and (2) respectively.

Mitigating design feature:

As shown in FIGURE 1 below, the prism shape exit sign, functioning as exit locator and exit marker (thus complying with 25.811(d)(1) and 25.811(d)(2)), is to be installed in the lounge area located in the mid compartment, which is between two dividers. Its shape will allow legibility by occupants approaching along the aisle from forward and aft of the sign, and also from inboard of the sign.

Note: The measurements in the Figure 1 are only for reference.

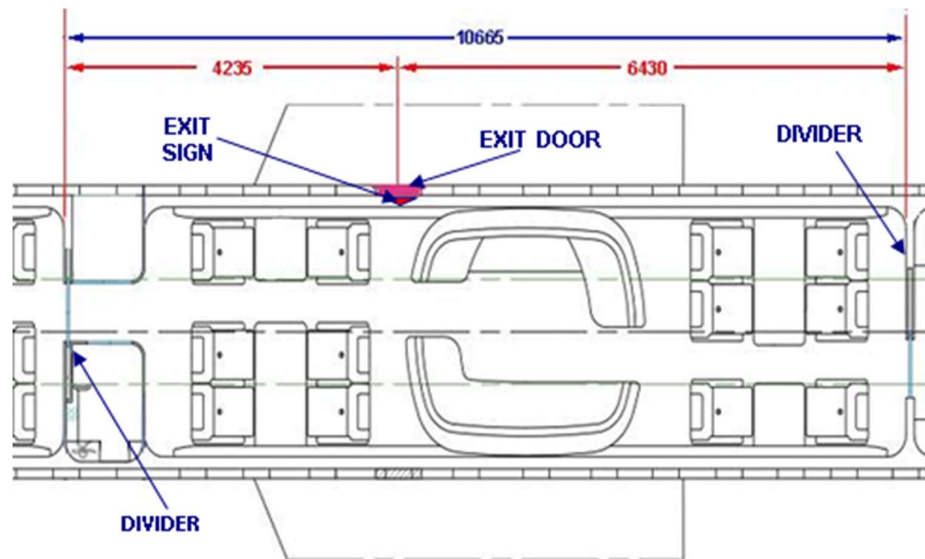


FIGURE 1 – EXIT SIGN OVER THE TYPE III OVERWING DOOR

- b) One combined sign to be installed on the aft face of the forward bulkhead, over the flight attendant seat to indicate the position of the Type I LH entry door, to use a combined exit locator sign to comply with 25.811(d)(1) and 25.811(d)(3).

Mitigating design feature:

The design of the ERJ-190-100 ECJ cabin provides features that compensate for the lack of bulkhead signs.

The principal feature is the proximity of the exits to the obscuring bulkheads or monuments.

The exit locator sign [required by 25.811(d)(1)], which is at the same fuselage station as the exit, also provides a clear indication of the exit location to the egressing passenger.

The forward exit and the location of the exit locator sign are close to the obscuring bulkhead or monument.

The single-aisle configuration of the ERJ-190-100 ECJ is also a benefit in that the egress paths are directly forward or aft with no need for bulkhead signs to prevent passengers from erroneously crossing into the other aisle.

The aisle will lead passengers directly to a point where the locator sign is visible.

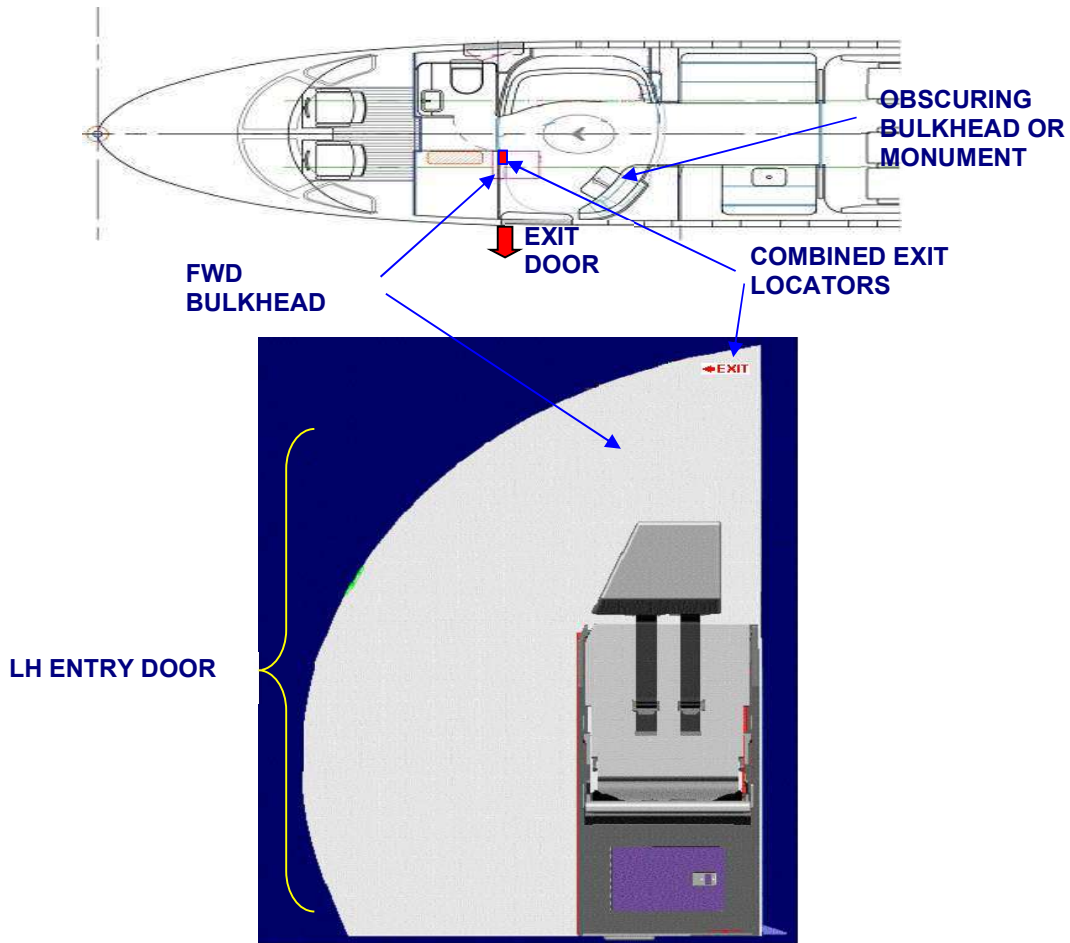


FIGURE 2: EXIT LOCATOR INSTALLED ON FWD BULKHEAD

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170/D-38 (SC): Application of heat release and smoke density requirements to seat materials	
APPLICABILITY:	ERJ 170/190
REQUIREMENTS:	JAR 25.853(c) at Change 14
ADVISORY MATERIAL:	N/A

Special Condition

1. Except as provided in paragraph 3 of these special conditions, compliance with JAR 25, Appendix F, parts IV and V, heat release and smoke emission, is required for seats that incorporate non- traditional, large, non-metallic panels that may either be a single component or multiple components in a concentrated area in their design.
2. The applicant may designate up to and including 0.13935 m² (1.5 square feet) of non-traditional, non-metallic panel material per seat place that does not have to comply with special condition Number 1, above. A triple seat assembly may have a total of 0.41805 m² (4.5 square feet) excluded on any portion of the assembly (e.g., outboard seat place 0.0929 m² (1 square foot), middle 0.0929 m² (1 square foot), and inboard 0.23225 m² (2.5 square feet)).
3. Seats do not have to meet the test requirements of JAR 25, Appendix F, parts IV and V, when installed in compartments that are not otherwise required to meet these requirements. Examples include:
 - a. Airplanes with passenger capacities of 19 or less and
 - b. Airplanes exempted from smoke and heat release requirements.
4. Only airplanes associated with new seat certification programs applied for after the effective date of these special conditions will be affected by the requirements in these special conditions. This Special Condition is not applicable to:
 - a. the existing airplane fleet and follow-on deliveries of airplanes with previously certified interiors,
 - b. For minor layout changes and major layout changes of already certified versions that:
 - ◆ does not affect seat design;
 - ◆ does not introduce changes to seat design that affect panels that could be defined as “non- traditional, large, non-metallic panels”.

190-E2/E-21 (SC): Cowl loss prevention	
APPLICABILITY:	ERJ 190-300
REQUIREMENTS:	CS 25.901(b)(2), 25.901(c), 25.1193
ADVISORY MATERIAL:	None

Special Condition

Add to CS 25.1193 the following material:

CS 25.1193 **Cowling and nacelle skin.**

(e) Each aeroplane must--

* * * * *

(4) Be designed and constructed to minimize any inflight opening or loss of engine cowling which could prevent continued safe flight and landing.

(f) The retention system for each removable or openable cowling must—

(1) Keep the cowling closed and secured under the operational loads identified in paragraph (a) of this requirement following each of these specific conditions:

(i) Improper fastening of any single latching, locking, or other retention device, or the failure of single latch or hinge; or

(ii) (reserved).

(2) Have readily accessible means of closing and securing the cowling that do not require excessive force or manual dexterity; and

(3) Have a reliable means for effectively verifying that the cowling is secured prior to each take-off.

Note 1: all dispatch configuration (MMEL and CDL) shall be considered for showing compliance with this Special condition.

Note 2: typically, for turbofan, the cowling addressed under this Special Condition are fan cowling; thrust reverser cowls have shown a satisfactory in-service experience and are not intended to be addressed under the requirements of this special condition.

190-E2/E-22 (ESF): PW1900G Nacelle Designated Fire Zones	
APPLICABILITY:	ERJ 190-300
REQUIREMENTS:	CS 25.1103(b), 25.1165(e), 25.1181, 25.1182, 25.1183, 25.1185(c), 25.1187, 25.1189, 25.1191, 25.1195 to 1203
ADVISORY MATERIAL:	None

Equivalent Safety Finding

The following shall be used as Equivalent Safety Finding to the requirements of CS 25.1181 and 25.1182 for the ERJ 190-300 Type Certification:

The non-exhaustive list of following aspects need to be considered and discussed as compensating factors:

- assessment, substantiation of means preventing fire migration to the aircraft
- assessment, substantiation and quantification of the amount of fluid(s) that could be released (such volume shall not be hazardous), and
- assessment of FFLZ drainage and drainage performance in the most detrimental conditions, and
- assessment of how the fire withstanding capability of the design is increased in comparison to the minimum required, and
- assessment of the design, including, but not limited to:
 - location segregation and clearances, of potential ignition or flammable fluid leakage sources, and
 - all surfaces or components, on top of firewalls, limiting the FFLZ in terms of heat isolation, air or fluid proofness, structural integrity and corrosion protection, and
- assessment of FFLZ ventilation, and
- how the probability of fire occurrence is reduced. In particular No Single Failure shall potentially generate a Fire in the FFLZ whatever the existing conditions in the, or adjacent to the zone.

Explanation of the above: CS25.1182 and CS25.1191 already forces a given set of fire precautions. From this protection baseline, the design means ON TOP of the ones required by CS25.1182 and CS25.1191 shall be identified. Precautions, such as the ones required by CS25.1182 and CS25.1191 without supplementary precautions, are not compensating factors that would justify the Equivalent Level of Safety, because they would be there anyway, independently whether the fire detection is present or not.

190-E2/D-53 (SC): Electrical/Electronic Equipment Bay Fire Detection and Smoke Penetration	
APPLICABILITY:	ERJ 190-300
REQUIREMENTS:	CS 25.831, 25.869, 25.1501(a), 25.1301, 25.1309
ADVISORY MATERIAL:	AC 25-9A; AC 25-16

Special Condition - Design Requirements for Smoke Detection and Smoke Penetration in distributed Electrical/Electronic Equipment bays.

a. Requirements to prevent propagation of smoke from entering the passenger cabin and cockpit:

1. To prevent such propagation, means to prevent hazardous quantities of smoke originating from the electrical equipment bays from incapacitating passengers and crew must be demonstrated. Flight tests must be part of such demonstration and shall cover all dispatchable system configurations.

2. A "small quantity" of smoke may enter an occupied area only under the following conditions:

- (a) The smoke enters occupied areas during system transients from below deck main deck sources. No sustained smoke penetration beyond that from environmental control system transients is permitted.*
- (b) Penetration of the small quantity of smoke is a dynamic event, involving either dissipation or mobility. Dissipation is rapid dilution of the smoke by ventilation air, and mobility is rapid movement of the smoke into and out of the occupied area. In no case, should there be formation of a light haze indicative of stagnant airflow, as this would indicate that the ventilation system is failing to meet the requirements of RBAC/14 CFR 25.831 (b).*
- (c) The smoke from a smoke source below the main deck must not rise above armrest height on the main deck.*
- (d) The smoke from a source in the main deck must dissipate rapidly via dilution with fresh air and be evacuated from the airplane. A procedure must be included in the Airplane Flight Manual (AFM) to evacuate smoke from the occupied areas of the airplane. In order to demonstrate -that the quantity of smoke is small, a flight test must be conducted which simulates the emergency procedures used in the event of a fire/smoke during flight, including the use of Vmo/Mmo descent profiles and a simulated landing, if such conditions are specified in the emergency procedure.*

b. Requirement for smoke or fire detection in electrical/electronic equipment bays:

A smoke or fire detection system compliant with RBAC/14 CFR 25.858 and 25855 must be provided for each electrical/electronic equipment bay in the pressurized cabin. Each system must provide a visual indication to the flight deck within one minute after the start of a fire.

Airplane light tests must be conducted to show compliance with these requirements, and the performance of the detectors must be shown in accordance with AC 25-9A or other means acceptable to ANAC.)

c. Requirement for AFM procedures safety evaluation:

It shall be demonstrated, by means of flight tests, that the AFM procedures that request to shut down electrical/electronic equipment bays, or part of them, in ' case of smoke detection, do not compromise the aircraft safe operation.

In case a procedure requests only part of the equipments to be shut down, the remaining equipments shall be incorporated with safety precautions against fire propagation.

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190-E2/F-58 (SC): SECURITY PROTECTION OF AIRCRAFT SYSTEMS AND NETWORKS	
APPLICABILITY:	ERJ 190-300
REQUIREMENTS:	CS 25.1309
ADVISORY MATERIAL:	EUROCAE ED-202/RTCA DO-326A, EUROCAE ED-204/RTCA DO-355, EUROCAE ED-203

Special Condition

- a) The applicant shall ensure security protection of the systems and networks of the aircraft from any remote or local access by unauthorized sources if corruption of these systems and networks (including hardware, software, data) by an inadvertent or intentional attack would impair safety, and
- b) The applicant shall ensure that the security threats to the aircraft, including those possibly caused by maintenance activity or by any unprotected connecting equipment/devices inside or outside the A/C, are identified, assessed and risk mitigation strategies are implemented to protect the aircraft systems from all adverse impacts on safety, and

Appropriate procedures shall be established to ensure that the approved security protection of the aircraft's systems and networks is maintained following future changes to the Type Certificated design.

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H-1 (SC): Enhanced Airworthiness Programme for Aeroplane Systems - ICA on EWIS	
APPLICABILITY:	ERJ 190
REQUIREMENTS:	CS 25 - H25.5
ADVISORY MATERIAL:	AMC 25 Subpart H

SPECIAL CONDITION

Add to: Appendix H Instructions for Continued Airworthiness

H25.5 Electrical Wiring Interconnection Systems Instructions for Continued Airworthiness

The applicant must prepare Instructions for Continued Airworthiness (ICA) applicable to Electrical Wiring Interconnection System (EWIS) as defined below that include the following:

Maintenance and inspection requirements for the EWIS developed with the use of an enhanced zonal analysis procedure (EZAP) that includes:

- a. Identification of each zone of the aeroplane.
- b. Identification of each zone that contains EWIS.
- c. Identification of each zone containing EWIS that also contains combustible materials.
- d. Identification of each zone in which EWIS is in close proximity to both primary and back-up hydraulic, mechanical, or electrical flight controls and lines.
- e. Identification of –
 - Tasks, and the intervals for performing those tasks, that will reduce the likelihood of ignition sources and accumulation of combustible material, and
 - Procedures, and the intervals for performing those procedures, that will effectively clean the EWIS components of combustible material if there is not an effective task to reduce the likelihood of combustible material accumulation.
- f. Instructions for protections and caution information that will minimize contamination and accidental damage to EWIS, as applicable, during the performance of maintenance, alteration, or repairs.

The ICA must be in the form of a document appropriate for the information to be provided, and they must be easily recognizable as EWIS ICA.

For the purpose of this Appendix H25.5, the following EWIS definition applies:

(a) Electrical wiring interconnection system (EWIS) means any wire, wiring device, or combination of these, including termination devices, installed in any area of the aeroplane for the purpose of transmitting electrical energy, including data and signals between two or more intended termination points. Except as provided for in subparagraph (c) of this paragraph, this includes:

- (1) Wires and cables.
- (2) Bus bars.
- (3) The termination point on electrical devices, including those on relays, interrupters, switches, contactors, terminal blocks, and circuit breakers and other circuit protection devices.
- (4) Connectors, including feed-through connectors.
- (5) Connector accessories.

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- (6) Electrical grounding and bonding devices and their associated connections.
 - (7) Electrical splices.
 - (8) Materials used to provide additional protection for wires, including wire insulation, wire sleeving, and conduits that have electrical termination for the purpose of bonding.
 - (9) Shields or braids.
 - (10) Clamps and other devices used to route and support the wire bundle.
 - (11) Cable tie devices.
 - (12) Labels or other means of identification.
 - (13) Pressure seals.
- (b) The definition in subparagraph (a) of this paragraph covers EWIS components inside shelves, panels, racks, junction boxes, distribution panels, and back-planes of equipment racks, including, but not limited to, circuit board back-planes, wire integration units and external wiring of equipment.
- (c) Except for the equipment indicated in subparagraph (b) of this paragraph, EWIS components inside the following equipment, and the external connectors that are part of that equipment, are excluded from the definition in subparagraph (a) of this paragraph:
- (1) Electrical equipment or avionics that is qualified to environmental conditions and testing procedures when those conditions and procedures are -
 - (i) Appropriate for the intended function and operating environment, and
 - (ii) Acceptable to the Agency.
 - (2) Portable electrical devices that are not part of the type design of the aeroplane. This includes personal entertainment devices and laptop computers.
 - (3) Fibre optics.

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170/B-12 (SC): Angle of Attack Limiting System	
APPLICABILITY:	ERJ 170/190
REQUIREMENTS:	JAR-25.103, 25.143 (h), 25.145, 25.201, 25.203, 25.207, 25.1323 at Change 14
ADVISORY MATERIAL:	AC 120-41

Special Condition

Normal operation

1. Onset characteristic of the angle of attack limiting system must be smooth, appropriate to the phase of flight and type of manoeuvre and not in conflict with the ability of the pilot to satisfactorily change airplane flight path, or attitude as needed.
2. Limiting values of any flight parameters must be compatible with:
 - a/ airplane structural limits,
 - b/ required safe and controllable manoeuvring of the airplane,
 - c/ margin to critical conditions.
3. Unsafe flight characteristics/conditions must not result from:
 - a/ dynamic manoeuvring,
 - b/ airframe and system tolerances (both manufacturing and in-service),
 - c/ non-steady atmospheric conditions, in any appropriate combination and phase of flight, if this manoeuvring can produce a limited flight parameter beyond the nominal design limit value.

Note: Reference may be made to FAA Advisory Circular AC120-41 for guidance on atmospheric conditions.
4. The airplane must respond to intentional dynamic manoeuvring within a suitable range of the parameter limit. Dynamic characteristics such as damping and overshoot must also be appropriate for the flight manoeuvre and limit parameter concerned.
5. Simultaneous activation with other flight control functions must not result in adverse characteristics.

Failure conditions

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

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E2/F-65 (SC): Non-rechargeable Lithium Batteries	
APPLICABILITY:	ERJ 190-300
REQUIREMENTS:	CS 25.863, 25.1301, 25.1309, 25.1353
ADVISORY MATERIAL:	---

Special Condition

Context: EASA has reviewed FCAR SE-09 closed by ANAC at Stage 4 and signed on 12 Apr. 2016. The ANAC position, as provided in FCAR SE-09, is functionally equivalent to the position EASA would establish if a dedicated EASA CRI were to be released for this subject.

Each non-rechargeable lithium battery installation must:

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. Meet RBAC 25.863.
5. Not damage surrounding structure or adjacent systems, equipment, or electrical wiring from corrosive fluids or gases that may escape.
6. Have provisions to prevent any hazardous effect on airplane structure or systems caused by the maximum amount of heat it can generate due to any failure of it or its individual cells.
7. Be capable of automatically controlling the discharge rate of each cell to prevent cell imbalance, back charging, overheating, and uncontrollable temperature, and pressure.
8. Have a means to be automatically disconnected from its discharging circuit in the event of an over-temperature condition, cell failure or battery failure.
9. Have a failure sensing and warning system to alert the flight crew if its failure affects safe operation of the airplane.
10. 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 RBAC 25.1353(b)(1) through (b)(4) for Amendment 25-123.

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0000424-0060085378 (REV): Flight Crew Alerting - reversion for CS 25.1322 Amdt 27 to JAR 25.1322 Change 15 – Design features	
APPLICABILITY:	ERJ 190-100 IGW post-MOD SB 190-25-0270 (E-Freighter)
REQUIREMENTS:	CS 25.1322
ADVISORY MATERIAL:	---

REVERSION

The installed Avionic Suite features a flight crew alerting system that is required to comply with JAR 25.1322 Change 15, but also elements of a later version of the requirement as outlined below:

The Flight crew alerts must:

- provide the flight crew with the information needed to:
 - identify non-normal operation or aeroplane system conditions, and
 - determine the appropriate actions, if any;
- be readily and easily detectable and intelligible by the flight crew under all foreseeable operating conditions, including conditions where multiple alerts are provided;
- be removed when the alerting condition no longer exists.

Alerts must conform to the following prioritisation hierarchy based on the urgency of flight crew awareness and response:

- (1) Warning: For conditions that require immediate flight crew awareness and immediate flight crew response.
- (2) Caution: For conditions that require immediate flight crew awareness and subsequent flight crew response.
- (3) Advisory: For conditions that require flight crew awareness and may require subsequent flight crew response.

The Warning and Caution alerts must:

- provide timely attention-getting cues through at least two different senses by a combination of aural, visual, or tactile indications;
- permit each occurrence of the attention-getting cues provided through at least two different senses to be acknowledged and suppressed, unless they are required to be continuous.

The alert function must be designed to minimise the effects of false and nuisance alerts. In particular it must be designed to:

- prevent the presentation of an alert when it is inappropriate or unnecessary;

Visual alert indications must:

- use visual coding techniques, together with other alerting function elements on the flight deck, to distinguish between Warning, Caution and Advisory alert indications presented on monochromatic Head-up displays (when installed).

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0000444-0060085378 (REV): Smoke Detection System - reversion from CS 25.1316 and CS 25.1317 Amdt 27 to JAR 25.1316 Change 15 and SC 170/F-01 – Design features	
APPLICABILITY:	ERJ 190-100 IGW post-MOD SB 190-25-0270 (E-Freighter)
REQUIREMENTS:	CS 25.1316, 25.1317
ADVISORY MATERIAL:	AMC 20-136A

REVERSION

The installed Smoke Detection System is required to comply with JAR 25.1431 Change 15 and SC 170/F-01, plus the requirements as outlined below:

The main deck smoke detection system consists of two main subsystems: flight deck interface and smoke detection. The flight deck interface subsystem is excluded from this reversion. It must comply with the qualification level at time of application if affected by a significant change.

The new Main Deck Smoke Detectors must be the same part number than the one already installed in lower deck cargo at time of initial TC.

The HIRF and Lightning environment where the smoke detection subsystem is installed must be similar between the lower deck cargo (original certification) and main deck cargo (freighter).

The Smoke Detectors must be qualified to levels compatible to the aircraft levels for similar regions.

The system criticality level combined with non-electromagnetic external events must remain the same as for the already certified lower deck smoke detection system because of no differences in the criticality or probability of fire and smoke occurrence.

A failure in the system is considered more severe than Major only in case of fire occurrence in the Main Deck Cargo, whose probability must be in the order of 10^{-7} for this project.

170/F-01 (SC): Protection from the Effects of HIRF	
APPLICABILITY:	ERJ 170-100/-200 and 190-100/-200
REQUIREMENTS:	JAR 25.1431 at Change 15
ADVISORY MATERIAL:	N/A

SPECIAL CONDITION

a) HIRF environments

Table I lists the Certification HIRF environment required by INT/POL/25/2 sub-paragraph (a).
Table II lists the Normal HIRF environment required by INT/POL/25/2 sub-paragraph (b).

b) Test levels for complying with INT/POL/25/2 sub-paragraph (c)

As a minimum, one of the following sets of equipment test levels shall be used:

- 1) From 10 kHz to 400 MHz, use conducted susceptibility tests with CW and 1 kHz square wave modulation of depth greater than 90 percent. The conducted susceptibility current shall start at 0.6 mA at 10 kHz, increasing 20 dB per frequency decade to 30 mA at 500 kHz. From 500 kHz to 400 MHz, the conducted susceptibility current shall be 30 mA. From 100 MHz to 400 MHz, use radiated susceptibility tests at 20 V/m peak, with CW and 1 kHz square wave modulation of depth greater than 90 percent. From 400 MHz to 8 GHz, use radiated susceptibility tests at 150 V/m peak with pulse modulation of 0.1 percent duty cycle with 1 kHz pulse repetition frequency. This signal should be switched on and off at a rate of 1 Hz with a duty cycle of 50 percent. Also, from 400 MHz to 8 GHz, use radiated susceptibility tests at 28 V/m peak with 1 kHz square wave modulation of depth greater than 90 percent. This signal should be switched on and off at a rate of 1 Hz (ref. ED-14D/DO-160D, Section 20, Cat. R).
- 2) Or, from 10 kHz to 400 MHz, use conducted susceptibility tests with CW and 1 kHz square wave modulation of depth greater than 90 percent. The conducted susceptibility current shall start at 0.6 mA at 10 kHz, increasing 20 dB per frequency decade to 30 mA at 500 kHz. From 500 kHz to 400 MHz, the conducted susceptibility current shall be 30 mA. From 100 MHz to 400 MHz, use radiated susceptibility tests at 20 V/m peak, with CW and 1 kHz square wave modulation of depth greater than 90 percent. From 400 MHz to 8 GHz, use radiated susceptibility tests at 150 V/m peak with pulse modulation of 4 percent duty cycle with a 1 kHz pulse repetition frequency. This signal should be switched on and off at a rate of 1 Hz with a duty cycle of 50 percent (ref. ED-14D/DO-160D, Section 20, Cat. R).
- 3) Or, the test level to be used during equipment testing may be based on the Normal HIRF environment in Table II with allowance made for aircraft attenuation using aircraft transfer function/attenuation curves. Testing must cover the frequency band of 10 kHz to 8 GHz.

c) Test levels for complying with INT/POL/25/2 sub-paragraph (d)

As a minimum, the following equipment test level shall be used:

From 10 kHz to 400 MHz, use conducted susceptibility tests, starting at 0.15 mA at 10 kHz,

increasing 20 dB per frequency decade to 7.5 mA at 500 kHz. From 500 kHz to 400 MHz, use conducted susceptibility tests at 7.5 mA. From 100 MHz to 8 GHz, use radiated susceptibility tests at 5 V/m (ref. ED-14D/DO-160D, Section 20, CAT T).

d) Test procedures

AC/AMJ 20.1317 Final Draft Issue (EEHWG Document WG-327 dated November 98) and EUROCAE ED-14D/RTCA Document DO-160D, Section 20 should be referred to for the applicability of tests and test details.

TABLE I
CERTIFICATION HIRF ENVIRONMENT

FREQUENCY	FIELD STRENGTH (V/m)	
	PEAK	AVERAGE
10 kHz - 100 kHz	50	50
100 kHz - 500 kHz	50	50
500 kHz - 2 MHz	50	50
2 MHz - 30 MHz	100	100
30 MHz - 70 MHz	50	50
70 MHz - 100 MHz	50	50
100 MHz - 200 MHz	100	100
200 MHz - 400 MHz	100	100
400 MHz - 700 MHz	700	50
700 MHz - 1 GHz	700	100
1 GHz - 2 GHz	2000	200
2 GHz - 4 GHz	3000	200
4 GHz - 6 GHz	3000	200
6 GHz - 8 GHz	1000	200
8 GHz - 12 GHz	3000	300
12 GHz - 18 GHz	2000	200
18 GHz - 40 GHz	600	200

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TABLE II
NORMAL HIRF ENVIRONMENT

FREQUENCY	FIELD STRENGTH (V/m)	
	PEAK	AVERAGE
10 kHz - 100 kHz	20	20
100 kHz - 500 kHz	20	20
500 kHz - 2 MHz	30	30
2 MHz - 30 MHz	100	100
30 MHz - 70 MHz	10	10
70 MHz - 100 MHz	10	10
100 MHz - 200 MHz	30	10
200 MHz - 400 MHz	10	10
400 MHz - 700 MHz	700	40
700 MHz - 1 GHz	700	40
1 GHz - 2 GHz	1300	160
2 GHz - 4 GHz	3000	120
4 GHz - 6 GHz	3000	160
6 GHz - 8 GHz	400	170
8 GHz - 12 GHz	1230	230
12 GHz - 18 GHz	730	190
18 GHz - 40 GHz	600	150

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170/F-012 (ESF): Equipment, Systems and Installation Requirements	
APPLICABILITY:	ERJ 170-100/-200 and 190-100/-200
REQUIREMENTS:	NPA 25F-281 addressing the requirements of JAR 25.1309
ADVISORY MATERIAL:	N/A

EQUIVALENT SAFETY FINDING

As per review in context of the ERJ 190-100 IGW post-MOD SB 190-25-0270 (E-Freighter) the required level of compliance demonstration per JAR 25.1309 Change 15 and ESF 170/F-12 corresponds to CS 25.1309 Amdt 1.

170/F-08 (SC): Engine sustained imbalance	
APPLICABILITY:	ERJ 170-100/-200 and 190-100/-200
REQUIREMENTS:	JAR 25.901, 25.903, 25.629, 25.571, E810
ADVISORY MATERIAL:	N/A

SPECIAL CONDITION

This Special Condition was an early introduction of material that is meanwhile formally published in CS-25 Amdt 8. Please refer to the corresponding AMC 25-24 'Sustained Engine Imbalance' – see <https://www.easa.europa.eu/en/document-library/easy-access-rules/easy-access-rules-large-aeroplanes-cs-25>)

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– END OF TCDS EXPLANATORY NOTE IM A.071 –