This appendix to the EASA TCDS A.015 was created to publish selected special conditions that are part of the applicable certification basis:

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## SPECIAL CONDITIONS

| SPECIAL CONDITION | A-2: Interaction of systems and structure |
|---|---|
| APPLICABILITY: | A330 / A340 |
| REQUIREMENTS: | JAR 25 subpart C and D |
| ADVISORY MATERIAL: | N/A |

There is a need to develop interpretative material of existing requirements of subpart C and D to account for new features.

The NPA 25C-199 based on A320 special condition has been issued to that purpose.
It is proposed to use the NPA (issue 6 of March 7, 1990) as a basis for a special condition with a few amendments.

**Add a new paragraph 25.302 reading:**

25.302 Interaction of systems and structures
For an aircraft equipped with systems which directly or as a result or a failure or malfunction affect its structural performance, the influence of these systems and their failure conditions shall be taken into account in showing compliance with the requirements of Subpart C and D. (See ACJ 25.302).

| SPECIAL CONDITION | A-3: Design manoeuver requirements |
|---|---|
| APPLICABILITY: | A330 / A340 |
| REQUIREMENTS: | JAR 25.331(c)(1), 25.331(c)(2), 25.349(a), 25.351 |
| ADVISORY MATERIAL: | N/A |

The existing requirements for design manoeuvres need to be modified because they are not adequate for an aircraft with electronic flight controls.

**Replace JAR 25.331 paragraph (c)(1) and (c)(2) by:**

(c)(1) Maximum elevator displacement at $V_A$

The aeroplane is assumed to be flying in steady level flight (point A1 within the manoeuvring envelope of JAR 25.333(b) and except as limited by pilot effort in accordance with JAR 25.397(b) the cockpit pitching control device is suddenly moved to obtain extreme positive pitching acceleration (nose up). In defining the tail load condition the response of the aeroplane may be taken into account. Loads occurring beyond the point in time where no acceleration at the CG exceeds the maximum positive limit manoeuvring factor may be ignored.

(c)(2) Checked manoeuver between $V_A$ and $V_D$

A checked manoeuver, based on a rational cockpit pitching control device motion versus time profile must be established in which the design limit load factor specified in JAR 25.337 will not be exceeded.

**Add to JAR 25.331 (c) paragraph (c)(3):**

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

It must be established that manoeuver 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 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 of zero and the two-thirds of limit positive manoeuvring load factor. In determining the resulting control surface deflections the torsional flexibility of the wing must be considered in accordance with JAR 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 25.351 as follows:**

The aeroplane must be designed for loads resulting from the conditions specified in sub-paragraphs (a) and (b) of this paragraph. Unbalanced aerodynamic moments about the centre of gravity must be reacted in a rational or conservative manner considering the principal masses furnishing the reacting inertia forces:

(a) Manoeuvring: At speeds from $V_{MC}$ to $V_D$, the following manoeuvres must be considered. In computing the tail loads, the yawing velocity may be assumed to be zero.
Physical limitations of the aircraft from the cockpit yaw control device to the control surface deflection, such as control stop position, maximum power and displacement rate of the servo controls, control law limiters may be taken into account.

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

(2) With the cockpit yaw control device (pedal) deflected as specified in sub-paragraph (1) of this paragraph, it is assumed that the aeroplane yaws to the resulting sideslip angle.

(3) With the aeroplane yawed to the static sideslip angle with the cockpit yaw control deflected as in sub-paragraph (1) of this paragraph, it is assumed that the cockpit yaw control device is returned to neutral.

Note: Physical limitations of the aircraft from the cockpit yaw control device to the control surface deflection, such as control stop position, maximum power and displacement rate of the servo controls, control law limiters may be taken into account.

| SPECIAL CONDITION | A-4: Design dive speed VD |
|---|---|
| APPLICABILITY: | A330 / A340 |
| REQUIREMENTS: | JAR 25.335(b)(1) and (b)(2) |
| ADVISORY MATERIAL: | N/A |

**Modify JAR 25.335(b) to read:**

(b) Design Dive speed $V_D$. $V_D$ must be selected so that $V_C/M_C$ is not greater than 0.8 $V_D/M_D$, or so that the minimum speed margin between $V_C/M_C$ and $V_D/M_D$ is the greater of the following values:

(1) The speed increase above $V_C/M_C$ resulting from the following manoeuvres:

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

(ii) From a speed below $V_C/M_C$, with power to maintain stabilized level flight at this speed the aeroplane is upset so as to accelerate through $V_C/M_C$ at a flight path 15° below the initial path (or at the steepest nose down attitude that the system will permit with full control authority if less than 15°).

Note: Pilots controls may be in neutral position after reaching $V_C/M_C$ and before recovery is initiated.

Recovery may be initiated 3 seconds after operation of high speed, attitude or other alerting system by application of a load factor of 1.5 g (0.5 g acceleration increment), or such greater load factor that is automatically applied by the system with the pilot's pitch control neutral. Power may be reduced simultaneously.
All other means of decelerating the aeroplane, the use of which is authorized up to the highest speed reached in the manoeuvre, may be used. The interval between successive pilot actions must not be less than one second.

(2) The minimum speed margin must be enough to provide for atmospheric variations (such as horizontal gusts, and penetration of jet streams and cold fronts) and for instruments errors and airframe production variations. These factors may be considered on a probability basis. However, the margin at altitude where MC is limited by compressibility effects may not be less than .05 M. (see ACJ 25.335(b)(2)).

| SPECIAL CONDITION | A-7: Stalling speeds for structural design |
|---|---|
| APPLICABILITY: | A330 / A340 |
| REQUIREMENTS: | JAR 25.331, 25.333, 25.335, 25.479, 25.481, 25.729 |
| ADVISORY MATERIAL: | N/A |

For the structural design purposes, the stalling speeds in the following paragraphs have been redefined:

| | |
|---|---|
| JAR 25.333 | use .94 Vs1g in lieu of Vs1 in manoeuvring envelope diagram |
| JAR 25.335 | use .94 Vs1g in lieu of Vs0 and Vs1 |
| JAR 25.335(c) and (d) | use .94 Vs1g in lieu of Vs1 and Vs0 |
| JAR 25.335(e) | use .94 Vs1g in lieu of Vs1 and Vs0 |
| JAR 25.479(a) | use .94 Vs1g in lieu of Vs0 |
| JAR 25.481(a)(1) | use .94 Vs1g in lieu of Vs1 and Vs0 |
| JAR 25.729(a)(1)(ii) | use .94 Vs1g in lieu of Vs1 and Vs |

| SPECIAL CONDITION | E-05.1: Lower Deck Lavatories Compartment |
|---|---|
| APPLICABILITY: | A330 / A340, A330-200 |
| REQUIREMENTS: | JAR 25.819, 25.785, 25.812, 25.811, 25.1447, 25.1439, 25.858, 25.853, 25.855 (JAR 25 at change 13), JAR 25.1423 (change 14) |
| ADVISORY MATERIAL: | N/A |

General Description:

This special condition is applicable to lower deck lavatory compartment with the following typical design characteristics:

Up to 6 lavatories, a stairway from the main deck to the lower deck, a waiting area with or w/o benches, emergency equipment, system installations such as for air-conditioning, communication, smoke detection, oxygen, illumination and all relevant placards and signs.

Applicable detailed requirements:

a) There must be appropriate placarding to indicate the maximum allowed number of occupants in the waiting area and on stairs, and to indicate that smoking is not permitted and that occupancy is not permitted during taxi, take-off and landing. If it is not intended that waiting on stairs is to be acceptable there must be appropriate placarding that restricts waiting on stairs. There shall also be a lavatory occupied sign in a conspicuous location visible for passengers waiting at before entering the entrance to the stairway.
Ref. JAR 25.819(f)

b) Reserved.

c) Unless it can be shown that only one escape route provides sufficient performance with respect to the evacuation capability from the lower deck compartment, and sufficient protection against risk of mechanical blockage, fire induced blockage and structural failure, at least two evacuation routes between the lower deck compartment and the main passenger cabin must be provided.

If there is only one evacuation route, the design of the lower deck lavatory compartment and its access should be such as to minimise the potential fire sources near the escape route. Potential fire sources to be considered include stowage compartments and high power electrical equipment.

It must be demonstrated that the evacuation routes are obvious and usable by naïve passengers.

The evacuation of an incapacitated person (representative of a 95th percentile male), with assistance, from the lower deck to the main passenger cabin floor must be demonstrated. The routes must not be dependent on any powered device. The routes must be designed to minimize the possibility of blockage which might result from fire, mechanical or structural failure, or persons standing on top of or against the escape routes.

There must be a means to prevent passengers from entering the compartment in the event of an emergency, or when the compartment is not to be occupied. If a powered lift system is installed JAR 25.819(g) must be included.

Ref. JAR 25.819(a)

It must be demonstrated that the lower deck lavatory compartment access provisions must allow a flight attendant, equipped for fire fighting, an unrestricted access.

In the case of a fire in the lower deck lavatory compartment, a flight attendant on the main deck shall be able to react to the fire alarm, don the fire fighting equipment, and gain access in a time compatible with the location of and fighting the fire.

The tests or a combination of test and analysis required to demonstrate this capability should be conducted in conditions of smoke and should take into account the movement of passengers up and waiting on the stairs (if waiting on stairs is to be allowed).

d) For any barrier or similar device (e.g. half-height door) installed between the lower deck lavatory compartment and the main passenger compartment, the opening device must be such that it can be opened from both sides without the aid of special tools. When secured in any position, the securing device must sustain the flight loads, and additionally the emergency landing loads in the closed position.

Ref. JAR 25.819(a), JAR 25.561(b)(3)

e) Reserved

f) refer to c)

g) If inflight seating provisions are installed, seat belts must be provided for each seating position. The maximum number of occupants per seat must be placarded.

Appropriate handholds must be provided where people are likely to be in a standing position.

Obstacles and protrusions at or near the evacuation routes must be padded.

Ref. JAR 25.785(c), (j), (k), JAR25.1301

h) Exit signs meeting the requirements of JAR 25.812(b)(1)(i) must be provided in the lower deck compartment. If devices in evacuation routes require particular operating instructions, appropriate placarding should be provided, and should be readable under emergency lighting conditions.

Ref. JAR 25.812(a)(b)

Low level escape routes identification means, supporting escape routes identification, must be provided.

Ref. JAR 25.811(c)

i) In the event of failure of the aircraft's main power system, or of the main passenger compartment lighting system, emergency illumination independent of the main lighting system of the lower deck compartment must be automatically provided. However, the sources of illumination in the lower deck compartment may be common to both, the emergency and the main lighting system if the power supply to the emergency lighting system is independent of the power supply to the main lighting system. The illumination level must be sufficient for the occupants of the lower deck compartment to locate and transfer to the main passenger cabin floor, and to read any required operating instructions.

Ref. JAR 25.812(a)

j) There must be at least one flight attendant call button in an appropriate location in the waiting area.

There must be means for two way voice communication between a cabin attendant in the lower deck area, and crew members in the cockpit and at cabin attendant seating position at each pair of required floor level emergency exit.

k) There must be an aural emergency alarm system, which meets JAR 25.1423, audible during normal and emergency conditions, to enable crew members on the flight deck and at each pair of required floor level emergency exits to alert occupants of each passenger compartment of an emergency situation. Use of a public address system would be acceptable, provided an adequate means to differentiate between normal and emergency communications is incorporated.

Ref. JAR 25.819(c), JAR 25.1423 introduced by change 14

l) Reserved.

m) There must be a means, readily detectible by occupants of the waiting area and on the stairs (if waiting on stairs is to be allowed), that indicates when they should return to their seats and when seat belts should be fastened. In the event there are no seats, at least one sign must be provided.

n) A supplemental oxygen system equivalent to that provided for main deck passengers must be provided for occupants in the waiting area and on the stairs (if waiting on stairs is to be allowed), with the number of oxygen masks equalling the maximum allowed number of occupants, plus 10%. The additional masks shall be distributed taking into account the likely location of the occupants.

Ref. JAR 25.1447

o) At least one each of the following equipment must be provided within the lower deck compartment:

- A Halon fire extinguisher or equivalent as required by JAR 25.851 in addition to those required in the main cabin.
- Protective breathing equipment, approved to TSO-C116 or equivalent and suitable for fire fighting.
- Flashlight
- Approved portable oxygen bottle with 2 masks

The same equipment shall be available on the main deck near the stairway entrance.

Ref. JAR 25.1447(c)(4), JAR 25.1439(a)

p) The waiting area must be equipped with a smoke detector system that meets JAR 25.858(a), provides a visual cockpit warning and a visual and audio warning in each passenger cabin which would be readily detectible by a cabin crew member, taking into consideration the positioning of the cabin crew member throughout the main passenger compartment during various phases of flight. The smoke detection system must be able to detect smoke in areas of the compartment which may be closed off. Additionally unsupervised areas need be considered.

q) If a waste container is fitted in the waiting area, it must meet the requirements of JAR 25.853(e).

Ref. JAR 25.853(e) at change 13

r) Smoking is prohibited in the waiting area. An ashtray must be provided at the entrance to the stairway on the main deck.

s) Materials must comply with JAR 25.853(a) and (c). If seating provisions are installed in the waiting area, they must comply with the requirements for seat cushions.

Ref. JAR 25.853(a), (b) and (c) at change 13

t) Reserved.

u) Any wall of the fixed compartment, forming part of the boundary of the reduced cargo compartment, or facing an open area in the cargo compartment capable of holding cargo, including any interface item between the module (container) and the airplane structure or systems must meet the applicable requirements of JAR 25.855.

Ref. JAR 25.855

v) Operational crew members procedures and training must be established for the use of the compartment for normal and emergency procedures. In particular, training should cover the evacuation of an incapacitated person.

| **SPECIAL CONDITION** | **E-08.1: Lower Deck Stowage Area**<br>(Installed in combination with a Lower Deck Lavatories Compartment) |
|---|---|
| APPLICABILITY: | A330 / A340 |
| REQUIREMENTS: | JAR 25.819, 25.853, 25.855, 25.857, 25.858 |
| ADVISORY MATERIAL: | N/A |

General

The following design characteristics are typical for the proposed lower deck stowage area concept:

Up to 288 cft compartment volume utilized for stowage of standard galley containers (up to 45 cft) blankets/pillows (up to 9 cft) and crew baggage (up to 35 cft), emergency equipment, system installations such as for air-conditioning, smoke detection, illumination and all relevant placards and signs.

This Special Condition applies in addition to basic requirements applicable to stowage compartments: JAR 25.853, 25.855, 25.857.

Applicable detailed requirements

a) There must be appropriate placarding to indicate that smoking is not permitted and that occupancy is not permitted during taxi, take-off and landing. There must also be appropriate placarding to indicate that no waiting on the stairway is allowed.

   Ref. JAR 25.819(f)

b) Reserved.

c) Unless it can be shown that only one escape route provides sufficient performance with respect to the evacuation capability from the lower deck compartment, and sufficient protection against risk of mechanical blockage, fire induced blockage and structural failure, at least two evacuation routes between the lower deck compartment and the main passenger cabin must be provided.

   If there is only one evacuation route, the design of the lower deck compartment and its access should be such as to minimise the potential fire sources near the escape route. Potential fire sources to be considered include stowage compartments and high power electrical equipment.

   It must be demonstrated that the evacuation routes are obvious and usable by naïve passengers

   The evacuation of an incapacitated person (representative of a 95th percentile male), with assistance, from the lower deck to the main passenger cabin floor must be demonstrated. The routes must not be dependent on any powered device. The routes must be designed to minimize the possibility of blockage which might result from fire, mechanical or structural failure, or persons standing on top of or against the escape routes.

   There must be a means to prevent passengers from entering the compartment in the event of an emergency, or when the compartment is not to be occupied. If a powered lift system is installed, JAR 25.819(g) must be included.

   Ref. JAR 25.819(a)

It must be demonstrated that the lower deck stowage compartment access provisions must allow a flight attendant, equipped for fire fighting, an unrestricted access.

In the case of a fire in the lower deck stowage compartment, a flight attendant on the main deck shall be able to react to the fire alarm, don the fire fighting equipment, and gain access in a time compatible with the location of and fighting the fire.

The tests required to demonstrate this capability should be conducted in conditions of smoke and should take into account the movement of passengers up the stairs.

d) For any barrier or similar device (e.g. half-height door) installed between the lower deck compartment and the main passenger compartment, the opening device must be such that it can be opened from both sides without the aid of special tools. When secured in any position the securing device must sustain the flight loads, and additionally the emergency landing loads in the closed position.

Ref. JAR 25.819(a), JAR 25.561(b)(3)

e) There must be a door separating the stowage area from the lower deck compartment allowing for sufficient access by a crew member for fire fighting purposes, as required in (c). The opening device must be such that it can be opened from both sides without the aid of special tools.
Means should be provided to avoid unsupervised use of the stowage by passengers.

f) Refer to c)

g) Reserved

h) Exit signs meeting the requirements of JAR 25.812(b)(1)(i) must be provided in the lower deck compartment, but not necessarily in the stowage area itself, due to the limited size. If devices in the evacuation routes require particular operating instructions, appropriate placarding should be provided, and should be readable under emergency lighting conditions.

Ref. JAR 25.812(a), (b)

Low level escape routes identification means, supporting escape routes identification, must be provided.

Ref. JAR 25.811 (c)

i) In the event of failure of the aircraft's main power system, or of the main passenger compartment lighting system, emergency illumination independent of the main lighting system of the lower deck compartment must be automatically provided. However, the sources of general cabin illumination may be common to both, the emergency and the main lighting system if the power supply to the emergency lighting system is independent of the power supply to the main lighting system. The illumination level must be sufficient for the occupants of the lower deck compartment to locate and transfer to the main passenger cabin floor, and to read any required operating instructions.

Ref. JAR 25.812(a)

j) There must be at least one flight attendant call button in an appropriate location in the waiting area. There must be means for two way voice communication between a cabin attendant in the lower deck area, and crew members in the cockpit and at cabin attendant seating position at each pair of required floor level emergency exit.

k) There must be an aural emergency alarm system, which meets JAR 25.1423, audible during normal and emergency conditions, to enable crew members on the flight deck and at each pair of required floor level emergency exits to alert lower deck occupants of an emergency situation.

Use of public address system or crew interphone system would be acceptable, provided an adequate means to differentiate between normal and emergency communications is incorporated.

Ref. JAR 25.819(c), JAR 25.1423 introduced by Change 14

l) Reserved.

m) There must be a means, readily detectable by occupants of the lower deck compartment that indicates when they should return to the main deck. In the event there are no seats, at least one sign must be provided.

n) A supplemental oxygen system equivalent to that provided for main deck passengers must be provided in the lower deck compartment, with the number of oxygen masks equalling at least the maximum allowed number of occupants, plus 10 %. The additional masks shall be distributed taking into account the likely location of the occupants.

Ref. JAR 25.1447

o) At least one each of the following equipment must be provided within the lower deck compartment:

- A Halon fire extinguisher or equivalent as required by JAR 25.851 in addition to those required in the main cabin or other lower deck compartments.
- Protective breathing equipment, approved to TSO-C116 or equivalent and suitable for fire fighting.
- Flashlight
- An approved portable oxygen bottle with 2 masks.

The same equipment shall be available on the main deck near the stairway entrance.

Ref. JAR 25.1447(c)(4), JAR 25.1439(a)

p) The lower deck compartment must be equipped with a smoke detector system that meets JAR 25.858(a), provides a visual cockpit warning and a visual and audio warning in each passenger cabin which would be readily detectible by a cabin crew member, taking into consideration the positioning of the cabin crew member throughout the main passenger compartment during various phases of flight.

The smoke detection system must be able to detect smoke in areas of the compartment which may be closed off like the stowage area. Additionally unsupervised areas need be considered.

q) There should be sufficient access in flight to enable a crew member to reach all parts of the compartment, to extinguish a fire using a hand held fire extinguisher, when standing at any one access point without stepping into the compartment.

If some parts of the stowage area cannot comply with the above mentionned access provisions (e.g. standard galley containers), those portions of the stowage area not directly accessible from the entrance must comply with the fire containement requirements of JAR 25.853 (f) at change 14.

r) Smoking is prohibited in the lower deck compartment.

s) Materials outside of the stowage area must comply with JAR 25.853(a) and (b).

Ref. JAR 25.853 (a), (b) and (c)

t) Reserved.

u) The lining of the stowage area must be in accordance with JAR 25.855(a)(1)(ii)

v) Information regarding the fire fighting techniques applicable to the stowage area must be provided to the airline.

w) There must be a means to shut off the ventilation flow, if the stowage area is ventilated.

When the access provisions are being used, no hazardous quantity of smoke, flames or extinguishing agent shall enter any compartment occupied by the crew or passengers.

Ref JAR 25.857(b)(2), JAR 25.855(e)(2).

| SPECIAL CONDITION | E-19: First Class Sliding Screens |
|---|---|
| APPLICABILITY: | A330 / A340 |
| REQUIREMENTS: | JAR 25.813(e) |
| ADVISORY MATERIAL: | N/A |

First Class mini-suites are acceptable as complying with the intent of JAR 25.813 (e) provided the following Special Condition is met:

a) Robust design and/or procedural safeguards must be developed to assure that the doors will be secured open during taxi, take-off and landing. When the doors are in the open position, each must have a means to securely latch it in this position and the means must be able to withstand the loads imposed upon it when the door is subjected to the inertia forces listed in JAR 25.561 (b).

b) It must be demonstrated that the normal door actuation system is sufficiently reliable that inadvertent closing during the critical flight phases is precluded.

c) There must be a means by which cabin crew can readily check that all mini-suite doors are in the fully open and latched condition. There must be means by which cabin crew can prevent the seated mini-suite occupant from operating the doors.

d) Opening of the doors, by someone inside or outside a mini-suite, in the event of electrical power loss or system failure, must be demonstrated to be instinctive and require no excessive strength or manual dexterity. This demonstration must cover the range of passenger size from 5th percentile female to 95th percentile male, and the fact that in the event of electrical power loss the cabin may be in emergency lighting conditions.

e) The height of the doors and adjacent "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.

| SPECIAL CONDITION | E-130: Application of heat release and smoke density requirements to seat materials |
|---|---|
| APPLICABILITY: | A330 / A340 |
| REQUIREMENTS: | JAR 25.853(a)(1) Chg. 13, JAR 25.853(c) Chg. 14 |
| ADVISORY MATERIAL: | N/A |

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".

| SPECIAL CONDITION | E-1014: HIC Compliance (Inflatable Restraints) |
|---|---|
| APPLICABILITY: | A330 / A340 |
| REQUIREMENTS: | JAR 25.562(c)(5) |
| ADVISORY MATERIAL: | N/A |

1) HIC Characteristic

The existing means of controlling Head Injury Criterion (HIC) result in an unquantified but nominally predictable progressive reduction of injury severity for impact conditions less than the maximum specified by the rule. Airbag technology however involves a step change in protection for impacts below and above that at which the airbag device deploys. This could result in the HIC being higher at an intermediate impact condition than that resulting from the maximum.

It is acceptable for the HIC to have such a non-linear or step change characteristic provided that the value does not exceed 1000 at any condition at which the inflatable lapbelt does or does not deploy, up to the maximum severity pulse specified by the requirements. Tests must be performed to demonstrate this taking into account any necessary tolerances for deployment.

2) Intermediate Pulse Shape

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

3) Protection during Secondary Impacts

EASA acknowledges that the inflatable lapbelt will not provide protection during secondary impacts after actuation. However, evidence must be provided that the post-deployment features of the installation shall not result in an unacceptable injury hazard. This must include consideration of the deflation characteristics in addition to physical effects. As a minimum, a qualitative assessment shall be provided.

Furthermore, the case where a small impact is followed by a large impact must be addressed. In such a case if the minimum deceleration severity at which the airbag is set to deploy is unnecessarily low, the bag's protection may be lost by the time the second larger impact occurs. It must be substantiated that the trigger point for airbag deployment has been chosen to maximise the probability of the protection being available when needed.

4) Protection of Occupants other than 50th Percentile

The existing policy is to consider other percentile occupants on a judgmental basis only i.e. not using direct testing of inquiry criteria but evidence from head paths etc. to determine likely areas of impact.

The same philosophy may be used for inflatable lapbelts in that test results for other size occupants need not be submitted. However, sufficient evidence must be provided that other size occupants are protected.

A range of stature from a two year old child to a ninety-five percentile male must be considered.

In addition the following situations must be taken into account:

The seat occupant is holding an infant, including the case where a supplemental loop infant restraint is used

- The seat occupant is a child in a child restraint device.
- The seat occupant is a pregnant woman

5) Occupants Adopting the Brace Position

There is no requirement for protection to be assessed or measured for set occupants in any other position or configuration than seated alone upright, as specified in FAA AC 25.562-1A (dated 19 January 1996). However, it must be shown that the inflatable lapbelt does not, in itself, form a hazard to any occupant in a brace position during deployment.

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

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

8) The probability of inadvertent deployment must be shown to be acceptably low. The seated occupant must not be seriously injured as a result of the inflatable lapbelt deployment, including when loosely attached.

Inadvertent deployment must not cause a hazard to the aircraft or cause injury to anyone who may be positioned close to the inflatable lapbelt (e.g. seated in an adjacent seat or standing adjacent to the seat). Cases where the inadvertently deploying inflatable lapbelt is buckled or unbuckled around a seated occupant and where it is buckled or unbuckled in an empty seat must be considered.

9) It must be demonstrated that the inflatable lapbelt when deployed does not impair access to the buckle, and does not hinder evacuation, including consideration of adjacent seat places and the aisle.

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

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

12) The equipment must meet the requirements of JAR 25.1316 with associated guidance material IM S-1006 for indirect effects of lightning.

Electro static discharge must also be considered.

13) The equipment must meet the requirements for HIRF (SC S-10.2 and IM S-10.2) with an additional minimum RF test for the threat from passenger electronic devices of 15 Watts radiated power

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

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

16) The inflatable lapbelt must provide adequate protection for each occupant regardless of the number of occupants of the seat assembly or adjacent seats considering that unoccupied seats may have active inflatable lapbelts, which may be buckled or unbuckled.

17) Each inflatable lapbelt must function properly following any separation in the fuselage.

18) It is accepted that a material suitable for the inflatable bag that will meet the normally accepted flammability standard for a textile, i.e. the 12 second vertical test of JAR25 Appendix F, Part 1, paragraph (b)(4), is not currently available.

In recognition of the overall safety benefit of inflatable lapbelts, and in lieu of this standard, it is acceptable for the material of the inflatable bags to have an average burn rate of no greater than 2.5 inches/minute when tested using the horizontal flammability test of JAR25 Appendix F, part I, paragraph (b)(5).

See CRI E-1023 for a more detailed discussion of the flammability issue.

| SPECIAL CONDITION | E-1023: Side Facing Seats with Inflatable Restraints |
|---|---|
| APPLICABILITY: | A330 / A340 |
| REQUIREMENTS: | JAR 25.785, 25.562, 25.853 |
| ADVISORY MATERIAL: | N/A |

1. Injury Criteria

(a) Existing Criteria: All injury protection criteria of § 25.562(c)(1) through (c)(6) apply to the occupant of a side facing seat. HIC assessments are only required for head contact with the seat and/or adjacent structures.

(b) Body-to-wall/furnishing contact: The seat must be installed aft of a structure such as an interior wall or furnishing that (perhaps in combination with an inflatable lapbelt) will support the pelvis, upper arm, chest, and head of an occupant seated next to the structure. A conservative representation of the structure and its stiffness and, if applicable, a fully functioning inflatable lapbelt, representative of the final production standard, must be included in the tests.

(c) Thoracic Trauma: Testing with a Side Impact Dummy (SID), as defined by 49 CFR Part 572, Subpart F, or its equivalent, must be conducted and Thoracic Trauma Index (TTI) injury criteria acquired with the SID must be less than 85, as defined in 49 CFR Part 572, Subpart F. SID TTI data must be processed as defined in Federal Motor Vehicle Safety Standard (FMVSS) Part 571.214, section S6.13.5.

(d) Pelvis: Pelvic lateral acceleration must be shown by dynamic tests and/or by rational analysis to not exceed 130g. Pelvic acceleration data must be processed as defined in FMVSS Part 571.214, section S6.13.5.

2. Plinths and Pallets Conditions.

It must be demonstrated that the installation of the seats via plinths or pallets meets all applicable airworthiness requirements.

In this regard, compliance to the published guidance contained in FAA Policy PS-ANM 100-2000-00123 dated 22/02/2000 titled "Guidance for Demonstrating Compliance with Seat Dynamic Testing for Plinths and Pallets" will be acceptable to the Agency.

3. Inflatable Restraints Conditions.

a) HIC Characteristic

The existing means of controlling Head Injury Criterion (HIC), Thoracic Trauma Index and Pelvic Lateral acceleration result in an unquantified but nominally predictable progressive reduction of injury severity for impact conditions less than the maximum specified by the requirements. Airbag technology however involves a step change in protection for impacts below and above that at which the airbag device deploys. This could result in the one or more of the injury criteria being higher at an intermediate impact condition than that resulting from the maximum.

It is acceptable for the injury criteria to have such non-linear or step change characteristics, provided that the values do not exceed the maxima allowed at any condition at which the inflatable lapbelt 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.

b) Intermediate Pulse Shape

The existing ideal triangular maximum severity pulse is defined in FAA AC 25.562.1. The Agency 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.

c) Protection during Secondary Impacts

The Agency acknowledges that the inflatable lapbelt will not provide protection during secondary impacts after actuation. However, evidence must be provided that the post-deployment features of the installation shall not result in an unacceptable injury hazard. This must include consideration of the deflation characteristics in addition to physical effects. As a minimum, a qualitative assessment shall be provided.

Furthermore, the case where a small impact is followed by a large impact must be addressed. In such a case if the minimum deceleration severity at which the airbag is set to deploy is unnecessarily low, the bag's protection may be lost by the time the second larger impact occurs. It must be substantiated that the trigger point for airbag deployment has been chosen to maximise the probability of the protection being available when needed.

d) Protection of Occupants other than 50th Percentile

The existing policy is to consider other percentile occupants on a judgmental basis only i.e. not using direct testing of inquiry criteria but evidence from head paths etc. to determine likely areas of impact.

The same philosophy may be used for inflatable lapbelts in that test results for other size occupants need not be submitted. However, sufficient evidence must be provided that other size occupants are protected.

A range of stature from a two year old child to a ninety-five percentile male must be considered.

In addition the following situations must be taken into account:

The seat occupant is holding an infant, including the case where a supplemental loop infant restraint is used

- The seat occupant is a child in a child restraint device.
- The seat occupant is a pregnant woman

e) Occupants Adopting the Brace Position

There is no requirement for protection to be assessed or measured for seat occupants in any other position or configuration than seated alone upright, as specified in FAA AC 25.562-1A (dated 19 January 1996). However, it must be shown that the inflatable lapbelt does not, in itself, form a hazard to any occupant in a brace position during deployment.

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

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

h) The probability of inadvertent deployment must be shown to be acceptably low. The seated occupant must not be seriously injured as a result of the inflatable lapbelt deployment, including when loosely attached.

Inadvertent deployment must not cause a hazard to the aircraft or cause injury to anyone who may be positioned close to the inflatable lapbelt (e.g. seated in an adjacent seat or standing adjacent to the seat). Cases where the inadvertently deploying inflatable lapbelt is buckled or unbuckled around a seated occupant and where it is buckled or unbuckled in an empty seat must be considered.

i) It must be demonstrated that the inflatable lapbelt when deployed does not impair access to the buckle, and does not hinder evacuation, including consideration of adjacent seat places and the aisle.

j) There must be a means for a crew member to verify the integrity of the inflatable lapbelt activation system prior to each flight, or the integrity of the inflatable lapbelt activation system must be demonstrated to reliably operate between inspection intervals.

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

l) The equipment must meet the requirements of JAR 25.1316 with associated guidance material IM S-1006 for indirect effects of lightning.
Electro static discharge must also be considered.

m) The equipment must meet the requirements for HIRF (SC S-10.2 and IM S-10.2) with an additional minimum RF test for the threat from passenger electronic devices of 15 Watts radiated power

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

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

p) Each inflatable lapbelt must function properly following any separation in the fuselage.

q) The material of the inflatable bags may not have an average burn rate of greater than 2.5 inches/minute when tested using the horizontal flammability test as defined in JAR25 Appendix F, part I, paragraph (b)(5).

| SPECIAL CONDITION | F-3: Static longitudinal stability |
|---|---|
| APPLICABILITY: | A330 / A340 |
| REQUIREMENTS: | JAR 25.171, 25.173, 25.175, SC F-1 |
| ADVISORY MATERIAL: | N/A |

The aircraft shall be shown to have suitable stability in any condition normally encountered in service, including the effects of atmospheric disturbances.

Interpretative material:

The evaluation of the aeroplane's static longitudinal stability characteristics shall be by flight and simulator tests. Control laws that result in neutral static stability throughout most of operational flight envelope may be accepted in principle subject to:

- adequate speed control without excessive pilot workload
- acceptable high and low speed protection
- provision of adequate cues to the pilot of significant speed excursions beyond $V_{MO}/M_{MO}$ and below take-off and landing scheduled speeds.

The following considerations will be relevant to the evaluation:

- accurate speed control will be particularly relevant in the full range of operating speeds including low speeds (scheduled speeds at take-off and landing with or without engine failed) and high speeds for each configuration including $V_{MO}/M_{MO}$
- Since conventional relationships between stick forces and control surface displacements do not apply to a manoeuvre demand control system, longitudinal static stability characteristics will need to be determined on the basis of the aeroplane's response to disturbances rather than simply on the basis of stick force versus speed gradients.
- Adequate high or low speed cues may be provided by a strong positive stability gradient and/or alerting system.
- A force gradient of 1 lb for each 6 knots, applied through the side-stick, shall be considered as providing this strong stability.

| SPECIAL CONDITION | F-4: Static directional and lateral stability |
|---|---|
| APPLICABILITY: | A330 / A340 |
| REQUIREMENTS: | JAR 25.177(c) |
| ADVISORY MATERIAL: | N/A |

**JAR 25.177(c) is replaced by the following:**

In straight, steady sideslips (unaccelerated forward slips) the rudder control movements and forces must be substantially proportional to the angle of sideslip, and the factor of proportionality must be between limits found necessary for safe operation throughout the range of sideslip angles appropriate to the operation of the aeroplane. At greater angles up to the angles at which full rudder control is used or a rudder pedal force of 180 pounds is obtained, the rudder pedal forces may not reverse and increased rudder deflection must produce increased angles of sideslip. Unless the aeroplane has a sideslip indication there must be enough bank and lateral control deflection and force accompanying sideslipping to clearly indicate any departure from steady unyawed flight.

| SPECIAL CONDITION | F-5: Flight envelope protections |
|---|---|
| APPLICABILITY: | A330 / A340 |
| REQUIREMENTS: | JAR 25.143(g) |
| ADVISORY MATERIAL: | N/A |

**Add a new paragraph 25.143 (g):**

Normal operation:

1) Onset characteristic of each envelope protection feature must be smooth, appropriate to the phase of flight and type of manoeuvre and not in conflict with the ability of the pilot to satisfactorily change airplane flight path, or attitude as needed.

2) Limit values of protected flight parameters must be compatible with:

   a) airplane structural limits,
   b) required safe and controllable manoeuvring of the airplane and
   c) margin to critical conditions.

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

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

3) 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.

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

| SPECIAL CONDITION | F-6: Normal load factor limiting system |
|---|---|
| APPLICABILITY: | A330 / A340 |
| REQUIREMENTS: | JAR 25.143 |
| ADVISORY MATERIAL: | N/A |

As the A320, the A330/A340 have a normal load factor limiting feature implemented in the flight control laws. A special condition is necessary to address this unusual feature.

**Add a new paragraph JAR 25.143 (h):**

In the absence of other limiting factors

1. The positive limiting load factor must not be less than 2.5 g (2.0 g with high-lift devices extended) for the EFCS normal state.

2. The negative limiting load factor must be equal to or more negative than minus 1,0 g (0 g with high lift devices extended) for the EFCS normal state.

| SPECIAL CONDITION | G-7: Function and reliability testing |
|---|---|
| APPLICABILITY: | A330 / A340 |
| REQUIREMENTS: | JAR 21.35 |
| ADVISORY MATERIAL: | N/A |

There are no JAR 25 requirements requiring actual demonstration that the aircraft, its components, and its equipment are reliable and function properly.

In view of the reduction or suppression of the national requirements, harmonisation condition based on CC paper 36.3 issue 2 and associated interpretative material was issued.

**Special Condition**

(a) The applicant must make all flight tests that the Authority finds necessary:

(1) To determine compliance with applicable certification requirements

(2) To determine whether there is a reasonable assurance that the aircraft, its components, and its equipment are reliable and function properly (see IM G-7 paragraph A)

(b) The flight tests prescribed in sub paragraph (a)(2) of this SC must include:

(1) For aircraft incorporating turbine engines of a type not previously used on a type certificated aircraft, at least 300 hours of operation with a full complement of engines that conform to a type certificate (see IM G-7 B(1)).

(2) For all other aircraft, at least 150 hours of operation (see IM G-7 paragraph B(2).

| SPECIAL CONDITION | H-01: Enhanced Airworthiness Programme for Aeroplane Systems - ICA on EWIS |
|---|---|
| APPLICABILITY: | A300/3101/A300-600, A318/A319/A320/A321, A330/A340, A380 |
| REQUIREMENTS: | 21A.168(a)(3), 21A.38(c)(1), CS 25.1529 & App. H |
| ADVISORY MATERIAL: | N/A |

**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.

(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.

Failure states:

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

| SPECIAL CONDITION | P-1018: Engine sustained imbalance |
|---|---|
| APPLICABILITY: | A340-500/-600 |
| REQUIREMENTS: | JAR 25.901, 25.903, 25.629, JAR 25.571 |
| ADVISORY MATERIAL: | IM P-1018 |

**A340-500/-600 Special Condition P-1018**

It must be shown by a combination of tests and analyses, that Airbus A340-500/-600 aircraft are capable of continued safe flight and landing under the following conditions:

a) Windmilling condition:

This condition occurs after complete loss of an engine fan blade, or after a shaft support failure, including ensuing damage to other parts of the engine. The evaluation must show, that during continued operation at windmilling engine rotational speeds, the engine induced vibrations will not cause damage to either the primary structure of the airplane, or to critical equipment that would jeopardize continued safe flight and landing.

The evaluation must consider the effects from the possible damage to primary structure, including, but not limited to, engine mounts, wing, and flight control surfaces, as well as inlets, nacelles, and critical equipment (including connectors) mounted on the engine or the airframe. The degree of flight deck vibration must not prevent the flight crew from operating the airplane in a safe manner during all phases of flight.

The evaluation must cover the expected diversion time for the airplane.
(See IM P-1018 Chapter 5)

b) High power condition:

This condition occurs immediately after partial engine blade failure which may not be sufficient to cause the engine to spool down on its own. It must be shown that:

- The attitude, airspeed, and altimeter indications will withstand the vibratory environment and operate accurately in that environment.

- Adequate cues are available to the flight crew to determine which engine is damaged.
(See IM P-1018 Chapter 9).

| SPECIAL CONDITION | **P-27: Flammability Reduction System**<br>(consisting of Conditioned Serviced Air System (CSAS)<br>and Inert Gas Generation System (IGGS)) |
|---|---|
| APPLICABILITY: | A330 / A340 |
| REQUIREMENTS: | JAR 25.1309, FAR 25.981 (c) |
| ADVISORY MATERIAL: | N/A |

On Airbus A330/340 a Flammability Reduction System (FRS) is introduced for the center tank in the form of a Conditioned Service Air System (CSAS) and Inert Gad Generation System (IGGS) to reduce the flammability of the center fuel tank by utilization of nitrogen enriched air (NEA).

The IGGS is intended to reduce the fleet average flammability exposure of the center fuel tank to a level equal to or less than that of an unheated aluminium wing tank. The IGGS is intended to minimise the development of flammable vapours in compliance with FAR 25.981(c) amendment 25-125 (September 2008). JAR 25 does not contain any certification material applicable to IGGS. The IGGS represents technology and fuel tank inerting principles not previously used on this class of aircraft. This document defines special conditions to supplement existing JARs because existing requirements are not considered adequate or appropriate to set safety and performance standards for the design and installation of such systems.

FAA has published special condition no. 25-285-SC for the Nitrogen Generating System installed on Boeing 747 aircraft models and EASA has published a corresponding harmonized special condition.

**Special Condition**

The following special conditions are part of the type design certification basis for Airbus A330/A340 with a center tank equipped with a FRS (Flammability reduction system).

Compliance with these special conditions does not relieve the applicant from compliance with the existing certification requirements.

These special conditions define additional requirements for the design and installation of a FRS that will inert fuel tanks with NEA in order to reduce the fleet average flammability exposure to 3% or less of the operational time for the aeroplane under evaluation. This 3% value is based upon the results of unheated wing tank Monte Carlo flammability analysis that gives results typically around this value. In order to address the high-risk phases of flight (i.e., warm/hot day pre-flight ground operations and climb where flammable conditions are more likely to occur), when the FRS is functional, it will be required to reduce the flammability exposure in each of these phases of operation to 3% or less of the operational time in those phases.

Irrespective of the addition of FRS, ignition source minimisation must still be applied to the tanks. Therefore the applicant is required to summarise modifications required for ignition source minimisation to be applied to the centre tank in compliance with INT/POL/25/12 (CS 25.1309).

The applicant may propose that MMEL relief is provided for aircraft operation with the FRS unavailable. Appropriate justification in accordance with normal policies and procedures including mitigating factors must be provided.

Definitions

(a) *Bulk Average Fuel Temperature*. The average fuel temperature within the fuel tank, or different sections of the tank if the tank is subdivided by baffles or compartments.

(b) *Flammability Exposure Evaluation Time (FEET).* For the purpose of these special conditions, the time from the start of preparing the aeroplane for flight, through the flight and landing, until all payload is unloaded and all passengers and crew have disembarked.

In the Monte Carlo programme, the flight time is randomly selected from the Mission Range Distribution (Appendix 2, Table 3), the pre-flight times are provided as a function of the flight time, and the post- flight time is a constant 30 minutes.

(c) *Flammable.* With respect to a fluid or gas, flammable means susceptible to igniting readily or to exploding. A non-flammable ullage is one where the gas mixture is too lean or too rich to burn and/or is inert per the definition below.

(d) *Flash Point.* The flash point of a flammable fluid is the lowest temperature at which the application of a flame to a heated sample causes the vapour to ignite momentarily, or "flash". A test for jet fuel is defined in the ASTM specification, D56, *"Standard Test Method for Flash Point by Tag Close Cup Tester".*

(e) *Hazardous Atmosphere*. An atmosphere that may expose any person(s) to the risk of death, incapacitation, impairment of ability to self-rescue (escape unaided from a space), injury, or acute illness.

(f) *Inert.* For the purpose of these special conditions, the tank is considered inert when the bulk average oxygen concentration within each compartment of the tank is 12% or less at sea level up to 10,000 feet, then linearly increasing from 12% at 10,000 feet to 14.5% at 40,000 feet, and extrapolated linearly above that altitude (based on FAA test data).

(g) *Inerting*. A process where a non-combustible gas is introduced into the ullage of a fuel tank to displace sufficient oxygen so that the ullage becomes inert.

(h) *Monte Carlo Analysis*. An analytical tool that provides a means to assess the degree of fleet average and warm day flammability exposure time for a fuel tank. *Transport Effects*. Transport effects are the effects on fuel vapour concentration caused by low fuel conditions (mass loading), fuel condensation, and vaporisation.

(i) *Ullage, or Ullage Space*. The volume within the tank not occupied by liquid fuel at the time interval under evaluation.

System Performance and Reliability

It must be demonstrated that the IGGS reduces tank flammability to levels defined in these special conditions. This should be shown by complying with performance and reliability requirements as follows:

(a) The applicant must submit a combined fleet performance and reliability analysis (Monte Carlo analysis as described in Appendices 1 and 2) that must:

(1) Demonstrate that the overall fleet average flammability exposure of each fuel tank with a NGS installed is equal to or less than 3% of the FEET; and

(2) Demonstrate that neither the performance (when the FRS is operational) nor reliability (including all periods when the FRS is inoperative) contributions to the overall fleet average flammability exposure of a tank with a FRS installed are more than 1.8 percent (this will establish appropriate maintenance inspection procedures and intervals as required in paragraph 1.4 of these special conditions).

(b) The applicant must submit a Monte Carlo analysis that demonstrates that the FRS, when functional, reduces the overall fleet average flammability exposure of each fuel tank with a FRS installed for warm day ground and climb phases to a level equal to or less than 3% of the FEET in each of these phases for the following conditions:

(1) The analysis must use the subset of 80°F (26.7°C) and warmer days from the Monte Carlo analyses done for overall performance, and

(2) The flammability exposure must be calculated by comparing the time during ground and climb phases for which the tank was flammable and not inert with the total time for the ground and climb phases.

(c) The applicant must provide data from ground testing and flight testing that:

(1) validate the inputs to the Monte Carlo analysis needed to meet paragraphs 1.3(a), (b) and (c)(2) of these special conditions; and

(2) substantiate that the NEA distribution is effective at inerting all portions of the tank where the inerting system is needed to show compliance with these paragraphs.

(d) The applicant must validate that the FRS meets the requirements of paragraphs (a), (b), and (c)(2) of this section with any combination of interfacing systems (eg electrical power system) approved for the aeroplane that may affect IGGS reliability and performance.

(e) Sufficient accessibility for maintenance personnel, or the flightcrew, must be provided to FRS status indications that are necessary to meet the reliability requirements of paragraph 1.3(a) of these special conditions.

(f) The access doors and panels to the fuel tanks (including any tanks that communicate with an inerted tank via a vent system), and to any other enclosed areas that could contain NEA under normal or failure conditions, must be permanently stenciled, marked, or placarded as appropriate to warn maintenance crews of the possible presence of a potentially hazardous atmosphere. The proposal for markings does not alter the existing requirements that must be addressed when entering aeroplane fuel tanks.

(g) Oxygen-enriched air produced by the FRS must not create a hazard during normal operating conditions.

(h) Any FRS failures, or failures that could affect the FRS, with potential catastrophic consequences shall not result from a single failure or a combination of failures not shown to be extremely improbable.

(1) It must be shown that the fuel tank pressures will remain within limits during normal operating conditions and failure conditions.

(2) Identify critical features of the fuel tank system to prevent an auxiliary fuel tank installation from increasing the flammability exposure of main tanks above that permitted under paragraphs 1.3(a)(1), (2) and (b) of these special conditions and to prevent degradation of the performance and reliability of the FRS.

<u>Maintenance</u>

The FRS shall be subject to analysis using conventional processes and methodology to ensure that the minimum scheduled maintenance tasks required for securing the
continuing airworthiness of the system and installation are identified and published as part of the CS 25.1529 compliance. Maintenance tasks arising from either the Monte Carlo analysis or a CS 25.1309 safety assessment shall be dealt with in accordance with the principles laid down in FAA AC 25.19. The applicant shall prepare a validation programme for the associated continuing airworthiness maintenance tasks, fault finding procedures, and maintenance procedures.

In-Service Monitoring

Following introduction to service the applicant must introduce an event monitoring programme, accruing data from a reasonably representative sample of global operations, to ensure that the implications of component failures affecting the FRS are adequately assessed on an on-going basis. The applicant must:

(a) Provide a report to the primary certification authority (PCA) on a quarterly basis for the first five years of service introduction. After that period the requirement for continued reporting will be reviewed by the PCA.

(b) Provide a report to the validating authorities on a quarterly basis for a period of at least two years following introduction to service.

(c) Develop service instructions or revise the applicable aeroplane manuals, in accordance with a schedule agreed by the PCA, to correct any failures of the IGGS that occur in service that could increase the fleet average or warm day flammability exposure of the tank to more than the exposure requirements of paragraphs 1.3(a) and 1.3(b) of these special conditions.

| SPECIAL CONDITION | S-6: Lightning protection indirect effects |
|---|---|
| APPLICABILITY: | A330 / A340 |
| REQUIREMENTS: | JAR 25.581, 25.X899, 25.954, 25.1309 |
| ADVISORY MATERIAL: | N/A |

Each system whose failure to function properly would prevent the continued safe flight and landing of the aircraft must be designed and installed to ensure that the operation of the aircraft is not affected during and after exposure to lightning.

Each system whose failure to function properly would reduce the capability of the aircraft or the ability of the flight crew to cope with adverse operating conditions, must be designed and installed to ensure that it can perform its intended function after exposure to lightning.

The lightning strike model to be used for system justification shall be as follows: it is based on SAE-AE4R report AE4L-87.3 rev. B dated January 1989.

Severe strike (first return stroke)

| | |
|---|---|
| Peak amplitude | 200 KA |
| Peak Rate of Rise | 140 KA/micro-second |
| Action Integral bi-exponential wave shape | $2 \times 10^6$ $Amp^2$ -sec |

Multiple stroke flash (cloud to ground strikes)

The model shall consist of 24 strokes randomly distributed within 2 seconds, with the following characteristics:

| | |
|---|---|
| First Stroke - | Peak Amplitude, 200 KA<br>Peak Rate of Rise, 140 KA/micro-second<br>Action Integral, $2 \times 10^6$ $Amp^2$ -sec. |
| 23 Strokes - | Peak Amplitude, 50KA<br>Peak Rate of Rise, 70KA/micro-second<br>Action Integral, each $0.062 \times 10^6$ $Amp^2$ -sec. |

Repetition rate between each stroke will be between 10 ms and 200 ms.

Multiple burst (cloud to cloud strikes)

The model used to assess the functional effects of the multiple burst shall consist of 24 sets of 20 strokes randomly distributed within 2 seconds, with the following characteristics:

- Peak Amplitude 10KA
- Peak Rate of Rise 200KA/Micro-second

Repetition rate between each of the 24 sets will be between 10 ms and 200 ms.

NOTE: While the detailed M.O.C. will need to be agreed with the AA, taking into account the effect on the aircraft, it should be noted that

(i) Any combination of analysis and testing should be agreed with the JAA.
(ii) For test results an extrapolation of the threat current parameters of more than a factor of 10 is not likely to be acceptable without an additional safety factor being applied.
(iii) For a proven analysis technique, a safety factor of at least 2 will be required.

| SPECIAL CONDITION | S-23: Miscellaneous electrical requirements |
|---|---|
| APPLICABILITY: | A330 / A340 |
| REQUIREMENTS: | JAR 25.1309, 25.1351, 25.1353, 25.1359, NPA 25DF-191 Rev. 2 |
| ADVISORY MATERIAL: | N/A |

Some requirements amendments introduced by NPA 25DF-191 have been considered sufficiently important to be applied to the A340 as special condition:

**Special Condition**

1. Amend the cross reference of JAR 25.1309(b) as follows:

> (b) The aeroplane systems and associated components, considered separately and in relation E to other systems, must be designed so that (see AMJ 25.1309 and ACJN (No.3 to JAR25.1309 and AMJ25.1309(b))

2. Amend JAR 25.1351(b)(5) to read:

> (5) There are means accessible where necessary, in flight, to appropriate crew members for the individual and rapid disconnection of each electrical power source. (See ACJ 25.1351 (b)(5)).

3. Amend JAR 25.1353(d) to read:

> (d) Electrical cables and cable installations must be designed and installed as follows:
>
> (1) The electrical cables used must be compatible with the circuit protection devices required-by JAR 25.1357 such that a fire or smoke hazard cannot be created under temporary or continuous fault conditions.
>
> (2) Means of permanent identification must be provided for electrical cables, connectors and terminals.
>
> (3) Electrical cables must be installed such that the risk of mechanical damage and/or damage caused by fluids, vapours or sources of heat, is minimised. )

4. Amend JAR 25.1359(d) to read:

> (d) Insulation on electrical wire and electrical (cable installed in any area of the aeroplane must be self-extinguishing when tested at an angle of 600 in accordance with the applicable portions of Appendix F or other approved equivalent methods. The average burn length may not exceed 3 inches and the average flame time after removal of the flame source may not exceed 30 seconds. Drippings from the test specimen may not continue to flame for more than an average of 3 seconds after falling.

5. Add a cross reference to JAR 25X1362 as follows:

> **JAR 25x1362 Electrical supplies for emergency conditions**
>
> A suitable supply must be maintained to those services which are required, either by this JAR-25 (e.g. JAR 25.1195) or in order that emergency landing or ditching. The circuits to these services must be so designed and protected that the risk of their causing a fire under these conditions is minimised (See ACJ25X1362).

6. Amend JAR 25.1363 to read:

**JAR 25.1363 Electrical system tests**
(See ACJ25X1363)

(a) Tests must be made to determine that the performance of the electrical supply systems meets the requirements of this JAR-25 under all the appropriate normal and failure conditions. When laboratory tests of the electrical system are conducted –

7. Add a new subparagraph (d) to JAR 25.1431 reading:

(d) Electronic equipment must be designed and installed such that it does not cause essential loads to become inoperative, as a result of electrical power supply transients or transients from other causes.

- END -